Gaia DPAC

Data Processing & Analysis Consortium

SPSS@SSDC
the Database and the Archive

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Abstract

This documents presents and describes the spectrophotometric standard stars archive and database hosted by the Space Science Data Center of the Italian Space Agency (SPSS@SSDC hereafter).

Document History

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Contents

1 Introduction

The SPSS@SSDC archive responds to the needs for systematic management and organization of CU5-DU13 data, acquired and reduced to produce the SPSS grid created for the purpose of the absolute calibration of Gaia spectro-photometric data.

The idea to move the old Bologna Local SPSS Archive in a professional architecture dates back to early 2011 and is described in EP-008. The SPSS@SSDC archive superseeded the Bologna Local SPSS Archive in early 2013.

In the SPSS@SSDC system, DU13 data are divided into different datatypes according to their characteristics: the organization of the data passes through a careful definition of datamodel for each datatype. The structure of the archive guarantees data consistency and no redundancy is allowed, not in data files nor in metadata: through data versioning, different SPSS releases can coexist without conflicts. The system is a living archive and database: both are up to date with every advancement of the reduction process, and no data are lost. This allows the DU13 team to keep the status of the project under control, and to be aware of what is missing at any time. At the moment, the SPSS@SSDC Archive access is restricted to CU5-DU13 team, but a public access to a SPSS Release (a subset of the SPSS@SSDC datatypes) is foreseen.

In this document the SPSS@SSDC system is presented, providing information about the database and archive organization and describing in details the SPSS datatypes datamodel. The Web interface tool for the SPSS data access will be described in a forthcoming document.

2 Which kind of data are hosted in the SPSS@SSDC system?

As shown in Figure 1 the SPSS@SSDC system is essentially formed by three parts:

1. the **archive**, where the datatype files are stored, appropriately divided into different directories according to their main characteristics and for versioning needs (see Section 5);

2. the **MySQL database**, where metadata are ingested and stored in tables. Two different kinds of metadata are present in database:

   - *datatype metadata*: every datatype in the system is described by a set of keywords forming its own datamodel (see Section 4). For each datatype, the database hosts two different kind of tables: the *Base Tables* (containing datatype metadata as defined in datamodels), and *View Tables* (containing all the keywords we want to be displayed by the interface, i.e., for a given datatype, its own datamodel plus a set of keywords inherited from one or more related datatypes). The View Tables in our system are of two types, each of them used for a different metadata visualization in the web interface.

- *interface metadata*: these tables are needed for the creation, management and operation of the web interface (see SMR-007 Section 2.1).

Each datatype is represented in the database by a metadata table (Base Table, defined by a specific datamodel) and a given number of View Tables used to create different visualizations in the web interface. Each datatype View Table corresponds to one or more entries in some of the interface metadata tables.

3. the **web interface** tool, which is the access point to both the database and the archive and allows DU13 team users to query, browse, retrieve and ingest the data (see SMR-007).

3   SPSS Datatypes

In order to design the appropriate architecture for DU13 data management, a careful analysis of the SPSS data characteristics is fundamental.
DU13 data come in essentially 4 flavours:

- The **reference** data collect all the needed information from the literature for all the SPSS candidates: these data are available in WikiBo[1] and are the fundamental basis of one of the most important datatype in the system, the SPSSREFERENCE datatype.

- The **raw data**: all data acquired during the 967 different observing nights allocated to the SPSS observing campaigns are hosted in the archive. Since raw data are uploaded only once in the system, even if they contains a lot of different kind of exposures (calibrations, scientific frames, test data, see GA-001; GA-002; GA-003; EP-001; EP-003; EP-006) coming from 8 different telescopes (using 14 different CCD+instrument combinations), they are all grouped in one single datatype. This means that the datamodel for raw data contains all the columns needed to fully characterize this group, and a huge effort was dedicated to the homogenization of the needed keywords.

- The **reduced data**: for reduced data, each reduction step defines one datatype. This choice was based on two main reasons. The first one is due to the fact that reduction steps are performed in sequence, and a lot of time can pass between the first and the last step of the process. The second one is based on the double nature of the data: we have both photometric and spectroscopic observations and they are processed in very different ways. This means that the characteristics, and so the datamodel, of these datatypes can be very different.

- The **advanced data products** which are the DU13 high level deliverables.

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[1]WikiBo access available at: `http://yoda.bo.astro.it/wiki/`
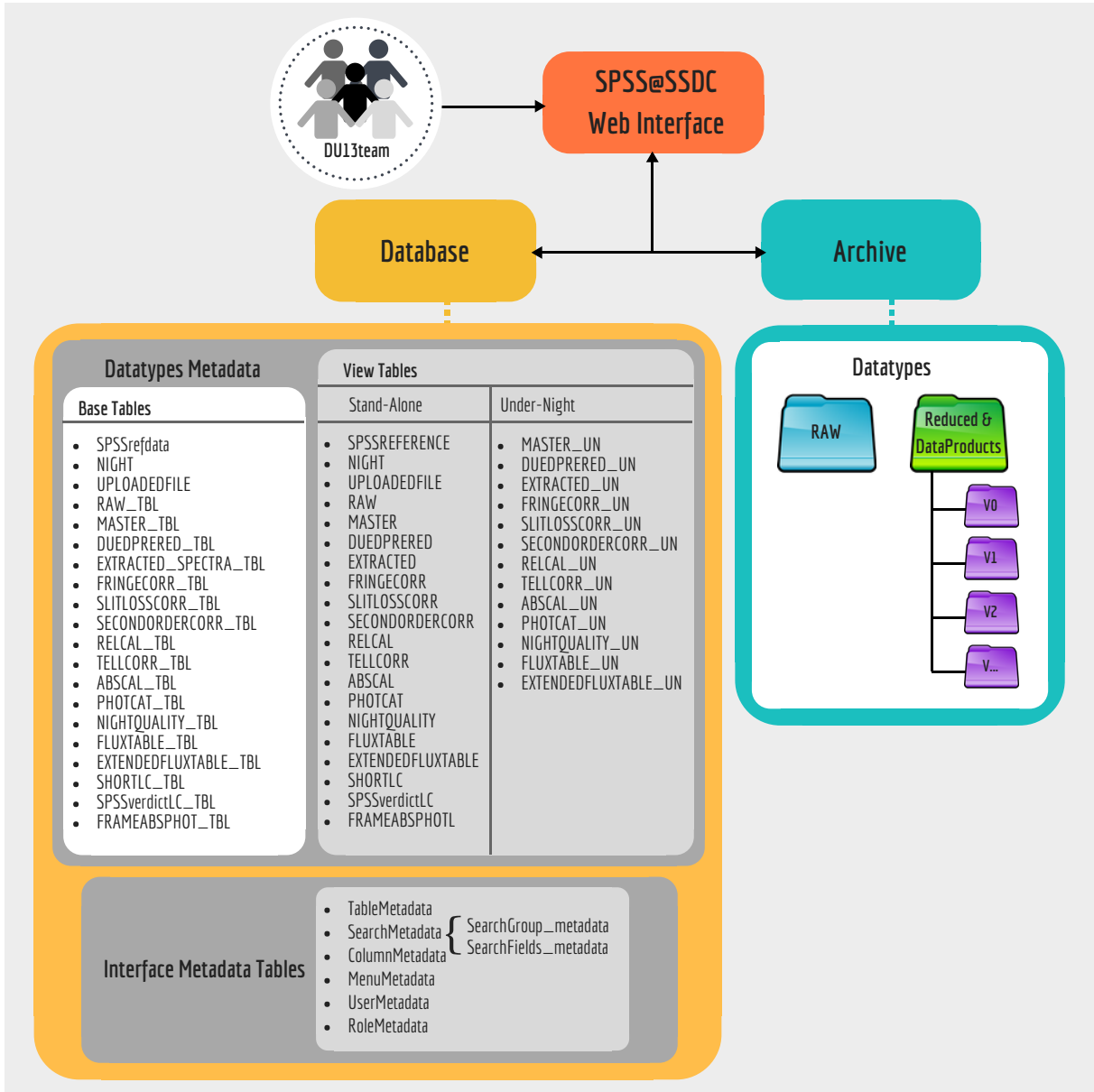
FIGURE 1: The SPSS@SSDC system. Database and archive are accessed through web interface. All the metadata tables needed to manage the system and to allow data retrieval are stored in the database. Also the ingestion of new data in the system is managed via web interface.

In addition, all SPSS datatypes can be divided in 2 main groups: **night-and-SPSS dependent** and **SPSS-only dependent** data. This characteristic is the keyword for the creation of the 2 main tables which are the basis of our database architecture.

In the first group, we have datatypes which main characteristic is to belong to a given observing night. The minimum set of keywords uniquely defining a single observing night form the datamodel of our first main table called NIGHT table. This table rules the organization of night-

TABLE 1: SPSS datatypes. The columns contain: (1) the datatype name; (2) the group to which the datatype belongs; (3) observing mode (photometry, spectroscopy or common to both) ; (4) further information on this datatype are available in the documents listed in this column.

Datatype name	Group type	Observing mode	Naming convention	Datamodel described in Section	Reference document
SPSSREFERENCE	main table	common	not applicable	Section 4.2	GA-001; GA-002
NIGHT	main table	common	not applicable	Section 4.3	this document
UPLOADEDFILE	auxiliary table	common	not applicable	Section 4.4	this document
RAW	raw data	common	<filename>.fits	Section 4.5	EP-001; EP-003; EP-006
MASTER	reduced data	common	m.<run>-<tel>-<inst>-<night>_-<type+info>.fits ex.<run>-<tel>-<inst>-<night>.fits extell.<run>-<tel>-<inst>-<night>.fits rc.<run>-<tel>-<inst>-<night>-<grism>-<slit>.fits rctell.<run>-<tel>-<inst>-<night>-<grism>-<slit>.fits	Section 4.6	SMR-001; SMR-002; GCC-001
2DPREREDUCED	reduced data	common	r.<filename>.fits	Section 4.7	SMR-001; GCC-001
EXTRACTED	reduced data	spectroscopy	x.<filename>.fits	Section 4.8	GCC-001
FRINGECORR	reduced data	spectroscopy	i.<filename>.fits	Section 4.9	GA-006
SLITLOSSCORR	reduced data	spectroscopy	l.<filename>.fits	Section 4.10	GA-006
2ndORDERCORR	reduced data	spectroscopy	s.<filename>.fits	Section 4.11	SR-007 in preparation
RELCAL	reduced data	spectroscopy	c.<filename>.fits	Section 4.12	SR-007 in preparation
TELLCORR	reduced data	spectroscopy	t.<filename>.fits	Section 4.13	GA-006
SYNTHPHOT	reduced data	spectroscopy	TBD	Section 4.23	TBD
ABSCAL	reduced data	spectroscopy	f.<filename>.fits	Section 4.14	TBD
PHOTCAT	reduced data	photometry	c.<filename>.cat np.<filename>.cat	Section 4.15	SMR-003
NIGHTQUALITY	reduced data	common	not applicable	Section 4.16	SGL-001 and TBD for ABSCAL
FLUXTABLE	data product	spectroscopy	ft.SPSS<ID>.fits	Section 4.17	TBD
EXTENDEDFLUXTABLE	data product	spectroscopy	eft.SPSS<ID>.fits	Section 4.18	TBD
SHORTLC	reduced data	photometry	st.SPSS<ID>-<RUN>-<NIGHT>-<FILTER>.lc	Section 4.19	SMR-004
SPSSverdictSLC	data product	photometry	not applicable	Section 4.20	SMR-005, Marinoni et al. (2016)
FRAMEABSPHOT	reduced data	photometry	not applicable	Section 4.21	SGL-001
SPSSABSPHOT	data product	photometry	not applicable	Section 4.22	SGL-001

dependent data files into the Archive and allows to link different datatypes belonging to the same night.

The second group is formed by advanced data products no longer belonging to a single night, but referring to a specific SPSS candidate. Our second main table uniquely identify each SPSS and contains information from both literature and DU13 data. The organization of this kind of data into the archive relies on the `SPSSrefdata` table, that can also be used to link different datatypes referring to the same SPSS even if they belong to different nights.

All datatypes defined for the different kind of SPSS data are listed in Table 1. While the vast majority of datatypes are well established and consolidated, some of them need further planning and analysis in order to fully define their datamodels, and thus are not yet implemented in the SPSS@SSDC Archive.

4   SPSS@SSDC Database design and organization

All datatype metadata are stored as tables in a MySQL database.
The design of the SPSS database is quite complex: one of the main characteristic of SPSS datatypes is that they can be linked by a parent-child hierarchy. In this kind of hierarchy each child has a *contained in* relation with the parent: each parent (the container) can have (i.e. contains) any number of children (the contents), and each child will have (i.e. will be contained in) one and only one parent (the container).

This is the reason why the SPSS database is formed by tables (one for each datatype) connected by foreign key constraint relations: the foreign keys tie the child to the parent being the constraint on the child versus the parent. The main feature of this type of relation is that a child (content) exists only if the parent (container) exists. The data must therefore be entered starting from the parent and then descending towards the children. Also data modifications must respect this path in order not to break the parent-child relationship.

In the simplified scheme shown in Figure 2, each box represents a single datatype, and for each datatype there is a single table in the SPSS database. There are some lines connecting different datatypes: these lines represent some of the existing links (as foreign key constraint relations) between different database tables. Each datatype is connected directly with its parent datatype and with its children datatypes. For example, see the EXTRACTED datatype: it is connected with 2DPREREDUCED (its parent) and with different children depending on the needed reduction steps for that telescope, instrument, and observing setup combination used. This connection net allows to travel back and forth the history of each file in the archive, starting from raw data down to the final data products. This means that it is not possible to archive a given file of a given datatype if the corresponding parent file is not yet present in the system, ensuring in this way both integrity and consistency.
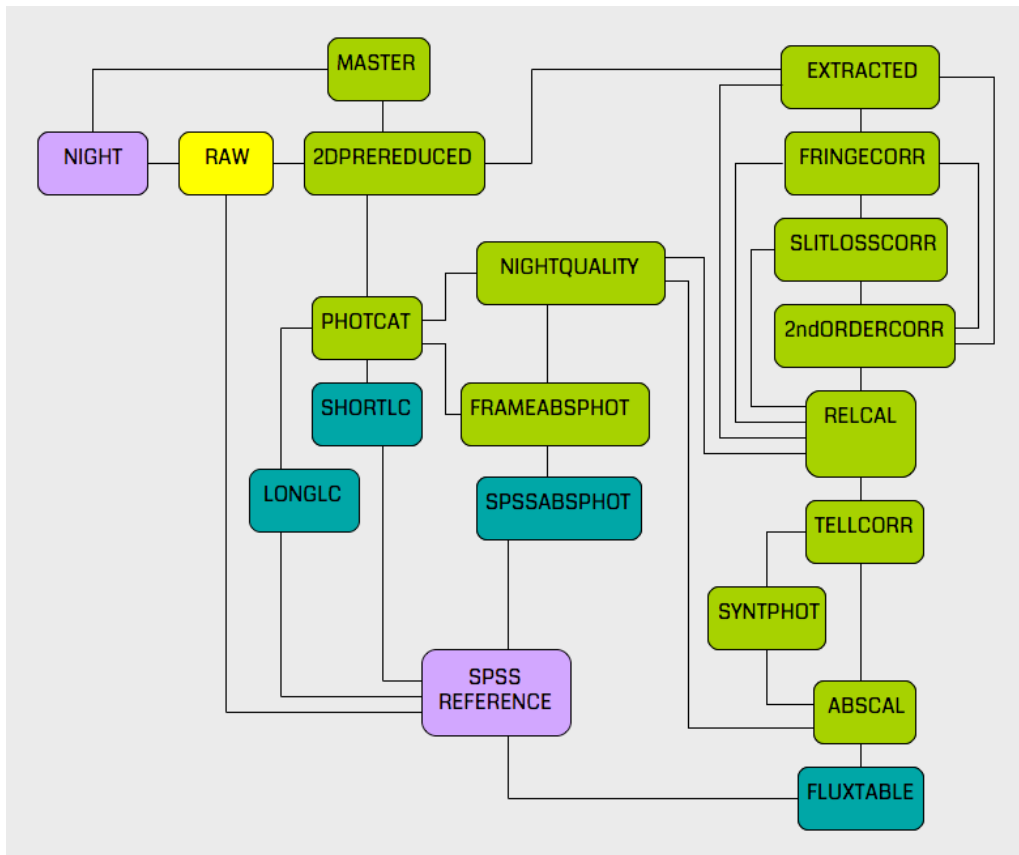
FIGURE 2: Schematic (and incomplete) view of how the SPSS database tables are related to each other. The number of possible links between tables is high: for the sake of clarity, we indicate in this diagram only the most straightforward.

The same type of relation described for the SPSS datatypes can be applied also to the interface metadata tables.

In the following, we concentrate on the datamodel definition for SPSS datatypes. A careful description of all interface metadata datamodels is beyond the scope of this (and future) technical report. Nevertheless, some information on both these tables and on how they are used to produce the web inteface can be found in SMR-007.

4.1 Common to all SPSS datatypes

There are some considerations that are appicable to many SPSS datatypes.

1. **Quality control**. Datatypes belonging to the reduced data or advanced dataproduct categories always pass through a series of quality control procedures. If problems are found, a flag is used to code the various cases that can occur. This flag is present in the metadata under the keyword G_QCval. In general, if a given datatype passes the quality control without warnings and/or problems, the value of G_QCval is set to NULL. The G_QCval allowed

values are 4-digit number, the first (and, sometimes, the second) digit always indicating to which datatype a quality control code refers to. In order to reflect more than one problem, the final value of G_QCval can be a series of (allowed) numbers concatenated using a point between them (for example, 1xxx.1xxx for masterframes, 2xxx.2xxx.2xxx for prereduced files and so on). It is important to note that the ingestion procedure allows the presence of some quality control code belonging to parent file in childen datatypes metadata: during data ingestion all codes are arranged in the proper table. In addition, in the View tables visualized via web interface, the G_QVCval values following the reduction chain are recollected and presented (when needed) for all datatypes to allow the user to see the quality control history of each file in a glance. More information about quality control codes are available in the following datatype dedicated sections.

2. **Metadata pipeline outputs**. When needed, for each datatype a dedicated pipeline[2] produces the corresponding metadata file in two different formats: the first one is a human readable version while the second one is the file to be used to ingest data in the SPSS@SSDC system. In general, for night-and-SPSS dependent datatypes, the metadata filenames are compliant with the following naming convention

   - meta<datatype>_WikiBo_<run>_<night>.txt : is the human readable version;
   - meta<datatype>_ASDC_<run>_<night>.txt : is the file to be used to ingestion in the SPSS@SSDC system.

   For SPSS-only dependent datatypes, the naming convention is:

   - meta<datatype>_WikiBo.txt : is the human readable version;
   - meta<datatype>_ASDC.txt : is the file to be used to ingestion in the SPSS@SSDC system.

   The metadata files in the ASDC format are saved and versioned in the SPSS@SSDC archive during the ingestion. A copy is also saved in a dedicated table hosted on the page of each observing run in WikiBo. Some example of metadata filenames compliant to the naming convention are reported in table 2.

4.2 Datatype SPSSREFERENCE: datamodel definition

The SPSSrefdata table contains useful information about the SPSS candidates observed during the DU13 observational campaigns. At the time it was created, most of this information came from the literature. As DU13 advanced datatypes for photometry and spectroscopy become available (magnitudes (see Section 4.22), short variability verdicts (see Section 4.20) , flux

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[2]All the pipelines for metadata production are saved and versioned in SSDC. Pipelines dedicated to reduced data and data products are also available in WikiBo at the page:http://yoda.bo.astro.it/wiki/index.php/Reduced_Data_Pipelines_for_Metadata_Production.

TABLE 2: **Examples of metadata filenames.**

MetaMASTER_WikiBo_M001_20071011.txt	MetaTELLCORR_ASDC_M009_20090606.txt
Meta2DPRERED_ASDC_V006_20080820.txt	MetaABSCAL_ASDC_M007_20081126.txt
MetaEXTRACTED_ASDC_M028_20150101.txt	MetaPHOTCAT_WikiBo_V040_20150511.txt
MetaFRINGECORR_WikiBo_M024_20130806.txt	MetaSHORTTERMLC_ASDC_V023_20110505.txt
MetaSLITLOSSCORR_ASDC_M017_20100921.txt	MetaNIGHTQUALITY_ASDC_M027_20140724.txt
Meta2ndORDERCORR_WikiBo_M018_20101225.txt	MetaFRAMEABSPHOT_ASDC_M030_20141004.txt
MetaRELCAL_WikiBo_M007_20100325.txt	MetaFLUXTABLE_WikiBo.txt

tables (see Sections 4.17 and 4.18), other columns are being added to this table in its view and made available to the DU13 users through the web interface.

In order to describe the datamodel for the SPSSREFERENCE datatype, we report here the MySQL *create table* command for the `SPSSrefdata` database table:

```
CREATE TABLE IF NOT EXISTS `SPSSrefdata` (
  `G_ID` int(3) unsigned zerofill NOT NULL,
  `G_NAME` varchar(80) COLLATE latin1_general_cs NOT NULL,
  `G_TYPE` enum('Pillar','Primary','Secondary') COLLATE latin1_general_cs NOT NULL,
  `G_STATUS` ENUM('Accepted','Rejected') NOT NULL DEFAULT 'Accepted',
  `G_LRA` char(12) COLLATE latin1_general_cs NOT NULL,
  `G_LDEC` char(13) COLLATE latin1_general_cs NOT NULL,
  `LRAdeg` double NOT NULL DEFAULT '0',
  `LDECdeg` double NOT NULL DEFAULT '0',
  `G_LBMAG` decimal(5,2) DEFAULT NULL,
  `G_LVMAG` decimal(5,2) DEFAULT NULL,
  `G_LSPTYP` varchar(20) COLLATE latin1_general_cs DEFAULT NULL,
  `G_STVmonitoring` enum('Y', 'N') DEFAULT NULL,
  `G_SPSSwarnings` enum('A', 'B', 'C', 'D', 'E', 'F', 'G', 'X') DEFAULT NULL,
  `G_NOTES` text COLLATE latin1_general_cs,
  PRIMARY KEY (`G_ID`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `SPSSrefdata` database table keywords are available in Table 3.

TABLE 3: `SPSSrefdata` **keywords description**

Keyword	Description
G_ID	is the SPSS unique identifier.
G_NAME	is the star's name as chosen by DU13.
G_TYPE	identifies the SPSS type out of Pillar, Primary or Secondary.
G_STATUS	indicates if the SPSS candidate is accepted or rejected. By default, the value of this keyword is set to Accepted but can change in Rejected depending on the value of the G_SPSSwarnings column and the value of the *VarMonitoringResult* column that is built in the view table available via web interface.

TABLE 3: **Continued.**

G_LRA	is the Right Ascension of the SPSS candidate from literature, in hh:mm:ss format.
G_LDEC	is the Declination of the SPSS candidate from literature, in ±dd:mm:ss format.
LRAdeg	calculated during ingestion, is the G_LRA in decimal degrees.
LDECdeg	calculated during ingestion, is the G_LDEC in decimal degrees.
G_LBMAG	is the B magnitude of the SPSS candidate from literature.
G_LVMAG	is the V magnitude of the SPSS candidate from literature.
G_LSPTYP	is the spectral type of the SPSS candidate from literature.
G_STVmonitoring	indicates if for the SPSS candidate the short-term variability monitoring is needed (value = Y) or not needed (value = N).
G_SPSSwarnings	reports chatacteristics or problems either from literature or DU13 observations and/or reduction related to the SPSS candidate. Different values of this keyword indicates different features: A = close companion, B = crowded field, C = variability in literature, D = binarity, E = high magnetic field, F = discordant data in literature, G = faint star, H : SPSS rejected by mistake. The value of this keyword is set to NULL if no warnings are related to the SPSS candidate.
G_NOTES	contains notes on the SPSS candidate.

4.3 Datatype NIGHT: datamodel definition

The keywords used for the definition of the NIGHT table are all those keywords that keep their value unchanged during the entire observation night. For this reason, they can be used to define an observing night in a unique way. The NIGHT table is filled when the RAW metadata are loaded in the system, by extrapolating some keywords present in these metadata. The NIGHT table binds all night-dependent datatypes, be they raw data, reduced data or advanced data products. With each new RAW metadata ingestion, the NIGHT table is updated by inserting a new entry if the night loaded is not yet present in the table.

In order to describe the datamodel for the NIGHT datatype, we report here the MySQL *create table* command for the NIGHT database table:

```
CREATE TABLE IF NOT EXISTS `NIGHT` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `G_SITE` enum('Loiano','CalarAlto','LaPalma','LaSilla','SanPedroMartir','Montsec') NOT NULL,
  `G_TEL` enum('Cassini','CAHA2.2','TNG','NTT','SPM1.5','REM','TJO','NOT') NOT NULL,
  `G_INST` enum('BFOSC','CAFOS','DoLoRes','EFOSC2','LaRuca','ROSS','ROSS2','MEIA','ALFOSC')
          CHARACTER SET latin1 COLLATE latin1_general_ci NOT NULL,
  `G_NIGHT` date NOT NULL,
  `G_RUNTYP` enum('P','V','M') NOT NULL,
  `G_RUNID` int(3) unsigned zerofill NOT NULL,
  `G_CCD` enum('EEV1300x1340OLD','EEV1300x1340NEW','SITE1d_15','E2V4240','CCD40','SITE1','ESOPO',
          'Marconi1','Marconi2','SITE4','Marconi47-10','E2VCCD42-40_Ross2','E2V4240-1-B',
          'E2VCCD42-40') NOT NULL,
  `G_LON` double NOT NULL,
  `G_LAT` double NOT NULL,
  `G_ALT` int(10) unsigned NOT NULL,
  `G_SKY` enum('Clear','Cloudy','Veiled','Varying','Clear+Calima','Cloudy+Calima','Veiled+Calima',
```

```
            'Varying+Calima','Overcast','Unknown') DEFAULT NULL,
  'G_MOON' int(2) NOT NULL,
  'G_OBS' char(20) NOT NULL,
  PRIMARY KEY ('NN'),
  UNIQUE KEY ('G_SITE','G_TEL','G_INST','G_NIGHT')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `NIGHT` database table keywords are available in Table 4.

TABLE 4: `NIGHT` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
G_SITE	is the observing site.
G_TEL	is the telescope used.
G_INST	is the instrument used for data acquisition.
G_NIGHT	is the observing night.
G_RUNTYP	defines the run type, as defined in DU13 observing protocols (P = pilot, M = main campaign, V = auxiliary campaign)
G_RUNID	is the numerical identifier of the run.
G_CCD	is the CCD used for data acquisition.
G_LON	is the longitude of the observing site (in decimal degrees and positive towards the East).
G_LAT	is the latitude of the observing site (in decimal degrees and positive towards the North).
G_ALT	it is the height above sea level (in metres) of the observing site.
G_SKY	indicates the atmospheric conditions of the night, according to the judgment of the observer.
G_MOON	indicates the moon phase counted in days since the (nearest) new moon.
G_OBS	indicates who made the observations during that night (the observer).

4.4 Datatype UPLOADEDFILE: datamodel definition

The UPLOADEDFILE is an auxiliary datatype. Its database table is filled with a new entry every time a user uploads data in the archive. The aim of this auxiliary datatype is to keep track of useful information about data uploads. The UPLOADEDFILE metadata are automatically generated by the ingestion pipeline.

In order to describe the datamodel for the UPLOADEDFILE datatype, we report here the MySQL *create table* command for the UPLOADEDFILE database table:

```
CREATE TABLE IF NOT EXISTS 'UPLOADEDFILE' (
  'NN' int unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  'FILENAME' varchar(400) NOT NULL,
  'UPTIME' datetime NOT NULL,
```

```
‘ENDTIME‘ datetime default NULL,
‘UPLOADER‘ varchar(16) NOT NULL,
‘STATUS‘ enum(’OK’,’FAILED’,’PARTIALLY LOADED’),
‘NOTES‘ MEDIUMTEXT
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `UPLOADEDFILE` database table keywords are available in Table 5.

TABLE 5: `UPLOADEDFILE` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each entry in this table.
FILENAME	is the name of the tar file uploaded.
UPTIME	is the upload starting time.
ENDTIME	is the time at which the ingestion of the data in the archive and in database ended.
UPLOADER	indicates who made that data upload and ingestion.
STATUS	indicates the status of that data ingestion. It can be OK if data has been ingested without problems, FAILED if an error was encountered in the metadata file and no data was ingested, PARTIALLY LOADED if more than one night and/or datatype was present in the tar file but only some of them have been successfully ingested.
NOTES	indicates the name of the metadata file (one or more) that has not been processed (and the data not ingested) if STATUS value for a given upload is equal to FAILED or PARTIALLY LOADED.

4.5   Datatype RAW: datamodel definition

All raw frames are grouped in this datatype and listed in the corresponding database table (an entry for each file): in the RAW datatype we therefore have both photometric and spectroscopic data, as well as calibrations and test data. In order to describe the datamodel for the RAW datatype, we report here the MySQL *create table* command for the `RAW_TBL` database table:

```
CREATE TABLE IF NOT EXISTS ‘RAW_TBL‘ (
  ‘NN‘ int(10) unsigned NOT NULL AUTO_INCREMENT,
  ‘NNNight‘ int(10) unsigned,
  ‘G_ID‘ int(10) DEFAULT NULL,
  ‘G_FILE‘ varchar(400) NOT NULL,
  ‘G_OBJECT‘ varchar(80) NOT NULL,
  ‘G_TYPE‘ enum(’Focus’,’SlitView’,’PreImaging’,’Test’,’Dark’,’Bias’,’DomeFlat’,’SkyFlat’,
              ’LampFlat’,’IllumFlat’,’WaveLamp’,’PhotStd’,’TellStd’,’Pillar’,’Primary’,
              ’Secondary’,’Rejected’,’UNKNOWN’) COLLATE latin1_general_cs DEFAULT NULL,
  ‘G_RAhms‘ char(12) DEFAULT NULL,
  ‘G_DECdms‘ char(13) DEFAULT NULL,
  ‘RA‘ double DEFAULT NULL,
  ‘DECL‘ double DEFAULT NULL,
  ‘G_DATE‘ date NOT NULL,
  ‘G_UT‘ time DEFAULT NULL,
  ‘G_EPOCH‘ decimal(18,10) DEFAULT NULL,
  ‘G_HJD‘ decimal(17,8) DEFAULT NULL,
```

```
'G_DMOON' double DEFAULT NULL,
'G_EXPT' double NOT NULL,
'G_AMstart' double DEFAULT NULL,
'G_EFFAM' double DEFAULT NULL,
'G_SEEING' double DEFAULT NULL,
'G_FILTER' enum('U','B','V','R','I','g','i','z','GG495','free') DEFAULT NULL,
'G_GRISM' enum('LR-R','LR-B','G11','G16','G5','G3','G1','B-100','B-200','B-400','R-200','G-200',
               'G-200','gr3','gr4','gr5','gr6','gr7','VHR-V','free','FocWedge','LyotStop',
               'Pyramid') DEFAULT NULL,
'G_SLIT' enum('free','12.0','11.7','11.4','11.0','10.7','10.0','6.0','5.0','3.5','3.0',
              '2.5','2.0','1.5','1.0','0.7','HMask','Mos1') DEFAULT NULL,
'G_LAMP' enum('Ar','He','Kr','Ne','HeAr','HgCdArHeRb','ArNe','Ar+Kr+Ne+Hg','Ne+Hg',
              'Halogen','Halogen1','Quartz','Xenon') DEFAULT NULL,
'G_MODE' enum('Image','Spectrum','Both','Special','UNKNOWN') NOT NULL,
'G_CATEG' enum('Calib','Science','Special','UNKNOWN') DEFAULT NULL,
'G_PROD' enum('Raw') DEFAULT NOT NULL,
'G_RANGE' enum('Red','Blue','Special') DEFAULT NULL,
'G_SPEC' enum('Wide','Narrow') DEFAULT NULL,
'G_NOTES' text COLLATE latin1_general_cs,
'UPLOADEDFILENN' int unsigned NOT NULL,
PRIMARY KEY ('NN'),
UNIQUE KEY ('G_FILE','G_ID'),
CONSTRAINT FOREIGN KEY ('NNNight') REFERENCES 'NIGHT' ('NN'),
CONSTRAINT FOREIGN KEY ('UPLOADEDFILENN') REFERENCES 'UPLOADEDFILE' ('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `RAW_TBL` database table keywords are available in Table 6.

TABLE 6: `RAW_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	during the data ingestion, the value of this keyword is extrapolated from the `NIGHT` table (keyword NN) using G_SITE, G_TEL, G_INST, G_NIGHT (these keywords form the unique key of the `NIGHT` table). NNNight is then used to link `RAW_TBL` entries to the `NIGHT` table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. For frames not related to a particular SPSS (like, for example, the vast majority of calibration frames) G_ID is set to -1 (to NULL in the View table).
G_FILE	is the the original filename from the telescope.
G_OBJECT	is the object keyword written in the FITS header, eventually corrected according to the observer's notes.
G_TYPE	defines which kind of data are we dealing with.
G_RAhms	is the Right Ascension of the telescope, in sexagesimal units.
G_DECdms	is the Declination of the telescope, in sexagesimal units.
RA	calculated during ingestion, is the G_RAhms in decimal degrees.
DECL	calculated during ingestion, is the G_DECdms in decimal degrees.
G_DATE	indicates the start of the acquisition date.

TABLE 6: **Continued.**

G_UT	is the UT of the start of the acquisition.
G_EPOCH	is the epoch of the observation, in Julian years.
G_HJD	is the Heliocentric Julian Date at the middle of the observation.
G_DMOON	is the distance from the Moon of the pointing coordinates, in decimal degrees.
G_EXPT	is the exposure time, in seconds.
G_AMstart	is the airmass at the start of the exposure.
G_EFFAM	is the effective airmass.
G_SEEING	is the seeing (in arcseconds) as measured by the observer during the night.
G_FILTER	is the filter used during the acquisition.
G_GRISM	is the grism used during the acquisition.
G_SLIT	is the slit used during the acquisition.
G_LAMP	is the lamp used during the acquisition of a certain type of calibrations frames (wave calibrations, dome and lamp flats).
G_MODE	defines the observing mode (Image or Spectrum) and/or if a certain calibration can be used for both photometric and spectroscopic reduction. For frames acquired for test purposes and/or using non-standard setup, this keyword is set to Special.
G_CATEG	defines the purpose of the acquisition of that frame: calibration, science, special (for test purposes), unknown (for data archived in the old Bologna SPSS archive for mistake, for example, ToO observations activated during SPSS observing time).
G_PROD	defines the datatype. For RAW datatype is always set to Raw.
G_RANGE	for spectroscopic observations defines the wavelength range covered by the grism used (red, blue, special). For photometric observations is set to NULL.
G_SPEC	for spectroscopic observations defines if the spectrum is Narrow or Wide following the definition explained in the DU13 observing protocol for spectroscopy. In case of raw data, it is not related with the seeing but only with the width of the slit used during the acquisition.
G_NOTES	contains the notes taken by the observer at the time of observations.
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `RAW_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.5.1 RAW metadata production

The pipeline for the production of RAW metadata (an IRAF+sm+shell composite script) manages and homogenizes metadata for raw fits files coming from each telescope involved in the DU13 observing campaigns. Depending on the telescope used for data acquisition, the script may need as input an auxiliary file containing the positions of the Moon in the period covered by a certain run, calculated with a time resolution of one minute. To produce this file the

HORIZONS[3] online tool, useful for generating the ephemeris of the Solar System bodies was used.

For each observing night a file containing the metadata for raw files is produced. These metadata files are uploaded in the system and used for data ingestion in both NIGHT and `RAW_TBL` tables. The order in which the 38 keywords are listed in the RAW metadata files is the following: G_SITE, G_TEL, G_INST, G_CCD, G_LON, G_LAT, G_ALT, G_RUNTYP, G_RUNID, G_NIGHT, G_OBS, G_SKY, G_ID, G_FILE, G_OBJECT, G_TYPE, G_RAhms, G_DECdms, G_DATE, G_UT, G_EPOCH, G_HJD, G_MOON, G_DMOON, G_EXPT, G_AMstart, G_EFFAM, G_SEEING, G_FILTER, G_GRISM, G_SLIT, G_LAMP, G_MODE, G_CATEG, G_PROD, G_RANGE, G_SPEC, G_NOTES.
Keywords G_SITE, G_TEL, G_INST, G_CCD, G_LON, G_LAT, G_ALT, G_RUNTYP, G_RUNID, and G_NIGHT are extrapolated by the RAW metadata files and used to fill the NIGHT table.

4.6 Datatype MASTER: datamodel definition

Masterframes filenames have to be compliant with the following naming convention:

- **m.**<**run**>**-**<**tel**>**-**<**inst**>**_**<**night**>**_**<**type+info**>**.fits** : these are masterbias, masterflats, masterdark, masterwavelamps and bad pixel mask;

- **ex.**<**run**>**-**<**tel**>**-**<**inst**>**_**<**night**>**.fits** : these are extinction curves for spectroscopy, and are setup independent;

- **extell.**<**run**>**-**<**tel**>**-**<**inst**>**_**<**night**>**.fits** : these are extinction curves derived from telluric corrected spectra and also these ones are setup independent;

- **rc.**<**run**>**-**<**tel**>**-**<**inst**>**_**<**night**>**_**<**grism**>**_**<**slit**>**.fits** : these are response curves for spectroscopy;

- **rctell.**<**run**>**-**<**tel**>**-**<**inst**>**_**<**night**>**_**<**grism**>**_**<**slit**>**.fits** : these are response curves derived from telluric corrected spectra.

Some example of masterframe filenames compliant to the naming convention are reported in Table 7.

Since, in order to produce master frames, several raw frames are combined together, masterframes do not have a direct 1:1 match with the raw frames. For this reason it is not possible to directly exploit the data contained in `RAW_TBL` to inherit keywords, and they have to be present also in MASTER metadata files. Nevertheless, some keywords are common to the the

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[3]The HORIZON tool is available at `http://ssd.jpl.nasa.gov/horizons.cgi#top`.

TABLE 7: **Examples of master calibration frames names.**

m.M001-CAHA2.2-CAFOS_20071011_BIAS_PHOT.fits
m.M001-CAHA2.2-CAFOS_20071011_BIAS_SPEC.fits
m.M005-TNG-DOLORES_20080525_BIAS_FULL.fits
m.V011-Cassini-BFOSC_20090214_SKY_V.fits
m.V011-Cassini-BFOSC_20090214_DOME_B.fits
m.M007-NTT-EFOSC2_20081126_LAMP_G16_1.5_ID002_BIN2x2.fits
m.M005-TNG-DOLORES_20080525_WAVE_LR-B_2.fits
m.M002-TNG-DOLORES_20080120_ILL_LR-B_2.fits
m.V006-SPM1.5-LaRuca_20080819_BPM_SITE1ccd.fits
rc.M007-NTT-EFOSC2_20081127_G11_10.fits
rc.M007-NTT-EFOSC2_20081127_G16_10.fits
ex.M007-NTT-EFOSC2_20081126.fits

MASTER and RAW datatypes and RAW metadata can be exploited in the MASTER metadata production, changing its values. The MASTER datatype is obviously linked to the NIGHT table: some keyword belonging to the NIGHT datamodel are reported in the MASTER metadata in order to recover from the NIGHT table unique identifier of the night. This value is stored in the NNNight keyword and used for all joins between these two tables.

In order to describe the datamodel for the MASTER datatype, we report here the MySQL *create table* command for the MASTERFRAME_TBL database table:

```
CREATE TABLE IF NOT EXISTS `MASTERFRAME_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `G_ID` int(10) DEFAULT NULL,
  `G_FILE` varchar(400) NOT NULL,
  `G_TYPE` enum('Dark','Bias','DomeFlat','SkyFlat','LampFlat','IllumFlat','WaveLamp','ExtCurve',
        'RespCurve','BPM') COLLATE latin1_general_cs DEFAULT NULL,
  `G_EXPT` double DEFAULT NULL,
  `G_FILTER` enum('U','B','V','R','I','i','z','free') DEFAULT NULL,
  `G_GRISM` enum('LR-R','LR-B','G11','G16','G3','G1','B-100','B-200','B-400','R-200','G-200',
            'gr3','gr5','gr6','gr7') DEFAULT NULL,
  `G_SLIT` enum('12.0','11.7','11.4','11.0','10.7','10.0','6.0','5.0','3.5','3.0','2.5','2.0',
            '1.5','1.0','0.7') DEFAULT NULL,
  `G_LAMP` enum('Ar','He','Kr','Ne','HeAr','HgCdArHeRb','ArNe','Ar+Kr+Ne+Hg','Ne+Hg','Halogen',
            'Halogen1','Quartz','Xenon') DEFAULT NULL,
  `G_MODE` enum('Imaging','Spectrum','Both','Special') NOT NULL,
  `G_CATEG` enum('Calib') DEFAULT NOT NULL,
  `G_PROD` enum('Master') NOT NULL,
  `G_RANGE` enum('Red', 'Blue', 'Special') DEFAULT NULL,
  `G_RED` char(20) NOT NULL,
  `G_QCflag` enum('0','1','2') NOT NULL,
  `G_QCval` varchar(255),
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int unsigned NOT NULL,
  PRIMARY KEY (`NN`),
  KEY `NNNight` (`NNNight`),
  UNIQUE KEY (`G_FILE`,`G_ID`,`VERSION`),
  CONSTRAINT `night_ibfk_1` FOREIGN KEY (`NNNight`) REFERENCES `NIGHT` (`NN`),
  CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `MASTER_TBL` database table keywords are available in Table 8.

TABLE 8: `MASTER_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion.
NNNight	during the data ingestion, the value of this keyword is extrapolated from the `NIGHT` table (keyword NN) using G_SITE, G_TEL, G_INST, G_NIGHT (these keywords form the unique key of the `NIGHT` table). NNNight is then used to link `MASTERFRAME_TBL` entries to the `NIGHT` table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. For masterframes not related to a particular SPSS (the vast majority) G_ID is set to -1 (to NULL in the View table).
G_FILE	is the filename (naming convention compliant) of the masterframe (including the directory path).
G_TYPE	define which kind of masterframe are we dealing with.
G_EXPT	is the exposure time. The value of this keyword is NOT NULL only for masterdark and some dome/lamp masterflats acquired for linearity tests.
G_FILTER	is the filter used.
G_GRISM	is the grism used.
G_SLIT	is the slit used.
G_LAMP	is the lamp used.
G_MODE	defines if a certain masterframe can be used for both photometric and spectroscopic prereduction. For masterframes acquired for test purposes, this keyword is set to Special.
G_CATEG	for MASTER datatype this keyword value is always set to Calib.
G_PROD	defines the datatype. For MASTER datatype is always set to Master.
G_RANGE	for spectroscopic masterframes defines the wavelength range covered by the grism used (red, blue, special). For photometric masterframes is set to NULL.
G_RED	indicates who produced that masterframe (the reducer).
G_QCflag	is the quality control flag for that masterframe. If no problems are encountered with the masterframe, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this masterframe, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with the masterframe and/or why the quality control failed (see Section 4.6.2 Table 9 for further information).
G_NOTES	contains the notes taken by the reducer during the masterframe production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).

TABLE 8: **Continued.**

FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `MASTERFRAME_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.6.1 MASTER metadata production

In the metadata file uploaded in SSDC for the ingestion of MASTER data there are 25 keyword listed in the following order: G_SITE, G_TEL, G_INST, G_LON, G_LAT, G_ALT, G_RUNTYP, G_RUNID, G_NIGHT, G_ID, G_FILE, G_TYPE, G_EXPT, G_FILTER, G_GRISM, G_SLIT, G_LAMP, G_MODE, G_CATEG, G_PROD, G_RANGE, G_RED, G_QCflag, G_QCval, G_NO-TES. Even if keywords G_LON, G_LAT, G_ALT, G_RUNTYP, G_RUNID are not used by the ingestion program, they are reported in the MASTER metadata files for DU13 team convenience.

The pipeline for the production of MASTER metadata[4] is composed by two different shell scripts to be run in sequence.

4.6.2 G_QCval values for datatype MASTER

The G_QCval allowed values for MASTER datatype are 4-digit number, the first digit always being equal to 1. These values, together with a brief description of their meaning, are reported in Table 9.

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[4]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaMASTER.tar`.

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TABLE 9: **G_QCval definition for MASTER datatype**

Value	Description
1000	generic problem on master frame.
1100	generic problem on masterbias.
1110	bias level: if the bias level for a given masterbias is very different from those of other masterbias belonging to the same run, then this flag is activated.
1120	bias 2D structure: if the masterbias presents a 2D structure, then this flag is activated
1200	generic problem on masterflat.
1210	flat level: if the masterflat was built using flats that should have been eliminated, but that were used because there was no alternative (for example: all the flats in a night were taken with low level), then this flag is activated.
1211	low level: this flag is activated when the masterflat level is < 15000 ADU.
1212	high level: this flag is activated when the masterflat level is > 50000 ADU.
1220	flat 2D structure: if the masterflat has a large-scale structure variation larger than 1% compared to the masterflat used as a reference in that run, then this flag is activated.
1230	stars in masterflat: if there are residual stars in the masterflat this flag is activated.
1240	non-standard CCD section for flat acquisition: this flag is activated when the fits acquisition windowing is different from the one defined in the DU13 observing protocols.
1300	generic problem on response curve.
1310	data quality: this flag is activated when the data used to produce the response curve have problems (if, for example, they are partially negative) or if the response curve is too noisy
1320	fit quality: this flag is activated if the fit is not good (for any reason), but it is not possible to obtain a better result
1330	reference star: this flag is activated when the reference CALSPEC star has problems, for example when we do not trust much on its calibration and the spectrum is truncated and/or does not cover the entire wavelength range.
1340	night quality: this flag is activated when the night (or a part of it) is definitely not photometric.
1400	generic problem on extinction curve.
1410	data quality: this flag is activated when the spectra used to build the extinction curve are very different or when they generate a too noisy extinction curve due to too low SNR.
1420	fit quality: this flag is activated if the fit is not good (for any reason), but it is not possible to obtain a better result
1430	airmass coverage: this flag is activated when the airmass difference between two set of spectra used to produce the extinction curve is too low. This results in too scattered or unreliable (for example negative) extinction curves.
1440	scaling problems: this flag is activated when it was needed to scale to the median value at least one of the spectra used to produce the extinction curve because it deviated more than 1% in flux. Nevertheless, the shape of this spectrum was sufficiently similar to the others
1450	night quality: this flag is activated when the night (or a part of it) is definitely not photometric.

4.7 Datatype 2DPREREDUCED: datamodel definition

The 2DPREREDUCED filenames must be compliant with the following naming convention: **r.**<**filename**>**.fits**.

2DPREREDUCED frames have a direct 1:1 link with the raw frames, and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that 2DPREREDUCED datatype can inherit many keywords from both these tables. All these potentially inherited keywords are not present in the 2DPREREDUCED datamodel, but are added in its view available to DU13 users via web interface. Since prereduced frames are produced using masterframes, the 2DPREREDUCED datatype is linked also to the MASTER datatype in order to know which masterframes were used to produce that prereduced file.

In order to describe the datamodel for the 2DPREREDUCED datatype, we report here the MySQL *create table* command for the DUEDPRERED_TBL database table:

```
CREATE TABLE IF NOT EXISTS `DUEDPRERED_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `NNRaw` int(10) unsigned NOT NULL,
  `G_FILE` varchar(400) NOT NULL,
  `G_PROD` enum('2DPreRed') DEFAULT NOT NULL,
  `G_RED` char(20) NOT NULL,
  `G_PMB` varchar(400),
  `NNBias` int(10) unsigned,
  `G_PMF` varchar(400),
  `NNFlat` int(10) unsigned,
  `G_PMD` varchar(400),
  `NNDark` int(10) unsigned,
  `G_PBPM` varchar(400),
  `NNBadPixelMask` int(10) unsigned,
  `G_PMI` varchar(400),
  `NNIllumFlat` int(10) unsigned,
  `G_QCflag` enum('0','1','2') NOT NULL,
  `G_QCval` varchar(255),
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int unsigned NOT NULL,
  `NNSTLC` int(10) unsigned DEFAULT NULL,
  PRIMARY KEY (`NN`),
  UNIQUE KEY (`G_FILE`,`NNRaw`,`VERSION`),
  CONSTRAINT FOREIGN KEY (`NNNight`) REFERENCES `NIGHT` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNBias`) REFERENCES `MASTERFRAME_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNFlat`) REFERENCES `MASTERFRAME_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNDark`) REFERENCES `MASTERFRAME_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNBadPixelMask`) REFERENCES `MASTERFRAME_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNIllumFlat`) REFERENCES `MASTERFRAME_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNRaw`) REFERENCES `RAW_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNSTLC`) REFERENCES `SHORTTERMLC_TBL` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `DUEDPRERED_TBL` database table keywords are available in Table 10.

TABLE 10: `DUEDPRERED_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night at which that prereduced file belongs. It is extrapolated from metadata during data ingestion and used to link `DUEDPRERED_TBL` entries to the `NIGHT` table entries.
NNRAW	is the unique entry identifier of the raw frame from which that prereduced file was produced. It is extrapolated from metadata (using G_FILE) during data ingestion and used to link `DUEDPRERED_TBL` entries to the `RAW_TBL` entries.
G_FILE	is the filename (naming convention compliant) of the prereduced file (including the directory path)
G_PROD	defines the datatype. For 2DPREREDUCED datatype is always set to 2DPreRed.
G_RED	indicates who produced that prereduced frame (the reducer).
G_PMB	is the filename (naming convention compliant) of the masterbias used to produce this prereduced frame (i.e. its *parent* masterbias). If no masterbias was used, this keyword is set to NULL.
NNBias	is the unique entry identifier of the parent masterbias extrapolated from G_PMB during data ingestion ans used to link this `DUEDPRERED_TBL` entry to its parent master. If G_PMB is NULL, also NNBias is set to NULL.
G_PMF	is the filename (naming convention compliant) of the masterflat used to produce this prereduced frame (i.e. its *parent* masterflat). If no masterflat was used, this keyword is set to NULL.
NNFlat	is the unique entry identifier of the parent masterflat extrapolated from G_PMF during data ingestion ans used to link this `DUEDPRERED_TBL` entry to its parent master. If G_PMF is NULL, also NNFlat is set to NULL.
G_PMD	is the filename (naming convention compliant) of the masterdark used to produce this prereduced frame (i.e. its *parent* masterdark). If no masterdark was used, this keyword is set to NULL.
NNDark	is the unique entry identifier of the parent masterdark extrapolated from G_PMD during data ingestion ans used to link this `DUEDPRERED_TBL` entry to its parent master. If G_PMD is NULL, also NNDark is set to NULL.
G_BPM	is the filename (naming convention compliant) of the bad pixel mask used to produce this prereduced frame (i.e. its *parent* bad pixel mask). If no bad pixel mask was used, this keyword is set to NULL.
NNBadPixelMask	is the unique entry identifier of the parent bad pixel mask extrapolated from G_BPM during data ingestion ans used to link this `DUEDPRERED_TBL` entry to its parent master. If G_BPM is NULL, also NNBadPixelMask is set to NULL.

TABLE 10: **Continued.**

G_PMI	is the filename (naming convention compliant) of the masterIllumFlat used to produce this prereduced frame (i.e. its *parent* masterIllumFlat). If no masterIllumFlat was used, this keyword is set to NULL.
NNIllumFlat	is the unique entry identifier of the parent illumflat extrapolated from G_PMI during data ingestion ans used to link this `DUEDPRERED_TBL` entry to its parent master. If G_BPI is NULL, also NNIllumFlat is set to NULL.
G_QCflag	is the quality control flag for this prereduced frame. If no problems are encountered with the prereduced, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/orthere are serious problems with this frame, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with the prereduced frame and/or why the quality control failed (see Section 4.7.2 Table 11 for further information).
G_NOTES	contains the notes taken by the reducer during the prereduced frame production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `DUEDPRERED_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.
NNSTLC	is the unique entry identifier of the short-term light curve extrapolated the `SHORTTERMLC_TBL` (see Section 4.19) produced using this prereduced file.

4.7.1 2DPREREDUCED metadata production

In the metadata file uploaded in SSDC for the ingestion of 2DPREREDUCED data there are 11 keywords listed in the following order: G_FILE, G_PROD, G_RED, G_PMB, G_PMF, G_PMD, G_PBPM, G_PMI, G_QCflag, G_QCval, G_NOTES.

`DUEDPRERED_TBL` entries are linked to NIGHT table using the keyword G_FILE in order to recover the unique identifier of the night these entries belong to. In addition, `DUEDPRERED_TBL` entries are linked to MASTER_TBL table using the keywords G_PMB, G_PMF, G_PMD, G_PBPM, G_PMI in order to recover the unique identifiers of these entries in the master table. The G_ID keyword is inherited in 2DPREREDUCED view table from `RAW_TBL`. Through G_ID keyword, 2DPREREDUCED entries can be linked also to SPSSreference datatype. Finally, `DUEDPRERED_TBL` entries used to produce a short-term light curve are linked to the corre-

sponding SHORTTERMLC_TBL entry when the curve is ingested in the archive.

The pipeline for the production of 2DPREREDUCED metadata[5] is composed by two different shell scripts to be run in sequence.

4.7.2 G_QCval values for datatype 2DPREREDUCED

The G_QCval allowed values for 2DPREREDUCED datatype are 4-digit number, the first digit always being equal to 2. These values together with a brief description of their meaning are reported in Table 11.

TABLE 11: **G_QCval definition for 2DPREREDUCDED datatype**

Value		Description
2000		generic problem on prereduced frame.
	2010	other night masterbias: this flag is activated if during prereduction a masterbias coming from a different night was used for the prereduced frame production.
	2020	other night masterflat: this flag is activated if during prereduction a masterflat coming from a different night was used for the prereduced frame production.
	2030	no SPSS-related masterflat for NTT: this flag is activated (only for red NTT spectra) if during prereduction was used a masterflat not directly related to the SPSS spectrum (i.e. the masterflat produced using flats acquired in daylight).
	2040	non-standard CCD section for science frame acquisition: this flag is activated if the windowing used for science frame acquisition was different from the one indicated in the observing protocol.
2100		disturbing features.
	2110	satellite or asteroid: this flag is activated if the image is affected by the presence of an asteroid (or artificial satellite) trace.
	2120	close companions: this flag is activated if there are one (or more) contaminating stars very close to the SPSS.
	2130	instrumental features: this flag is activated when in the image is affected by halos, stains, wide stripes caused by both the instrument or CCD electronics.
2200		telescope problems.
	2210	moved image: this flag is activated if the image in the frame is moved, for example if there was problems with the telescope guide.
	2220	focus problems: this flag is activated if the image is strongly defocused.
	2230	light-concentration: this flag is activated if a light-concentration effect is clearly present in the image.

---

[5]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:Meta2DPRERED.tar.`

TABLE 11: **Continued.**

2300		generic problem in 2D spectrum
	2310	low counts: this flag is activated if the spectrum seems to have low counts, but SNR has not been measured yet.
	2320	high counts: this flag is activated if a part of the spectrum seems to exceed the linearity limit counts.
	2330	multiple objects: this flag is activated if there is more than one star in the slit, or if if the spectrum of a single object is split in two for diffraction reasons (high airmass).
2400		useless frame.
	2410	no stars: this flag is activated if there are no object in the image (due to heavy clouds, errors during the acquisition, shutter closed,...)
	2420	no comparison stars: this flag is activated if the frame belongs to a time series for the short-term variability monitoring and there are no comparison stars in the FoV.

A very important warning about the 24XX flags is that, when one of them is activated, not only the reduction is no longer carried out, but the download of the file from the archive is disabled. These flags must be used with caution, because an automatic roll-back method that allows to restore the database as it was before the flag activation has not been implemented. This choice may seem a drawback, but it was done to encourage the reducers to try to extract the maximum possible from DU13 data, and to use these flags only if no alternative remains. This does not mean that a possible error can not be repaired: if a 24XX flag has been inserted by mistake, it is sufficient to send an email to the DU13 team in SSDC[6].

4.8   Datatype EXTRACTED: datamodel definition

The filenames of the extracted and wavelength calibrated spectra (EXTRACTED for brevity) must be compliant with the following naming convention: **x.<filename>.fits**.

EXTRACTED frames have a direct 1:1 link with the previous datatype in the reduction chain (the 2DPREREDUCED spectra), and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that EXTRACTED datatype can inherit a lot of keywords from not only these two tables, but also from RAW table (through the 2DPREREDUCED link). All these potentially inherited keywords are not present in the EXTRACTED datamodel, but can be added in its view available to DU13 users via web interface. Since extracted spectra are produced using prereduced spectra, and the latter are linked also to the MASTER datatype, it is always possible to know which masterframes were used at the start of the reduction chain.

In order to describe the datamodel for the EXTRACTED datatype, we report here the MySQL *create table* command for the EXTRACTED_SPECTRA_TBL database table:

---

[6]silvia.marinoni@ssdc.asi.it or giuseppe.altavilla@ssdc.asi.it

```
CREATE TABLE IF NOT EXISTS `EXTRACTED_SPECTRA_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `NNPrered` int(10) unsigned NOT NULL,
  `G_FILE` varchar(400) NOT NULL,
  `G_PROD` enum('Extracted') NOT NULL,
  `G_RED` char(20) NOT NULL,
  `G_SPECAPER` int(10) NOT NULL,
  `G_SIGWAVE` double NOT NULL,
  `G_SEEING` double NOT NULL,
  `G_SPEC` enum('Wide','Narrow','Rejected','WaveCalOnly') NOT NULL,
  `G_QCflag` enum('0','1','2') NOT NULL,
  `G_QCval` varchar(255),
  `G_NOTES` text COLLATE latin1_general_cs DEFAULT NULL,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int unsigned NOT NULL,
  PRIMARY KEY (`NN`),
  UNIQUE KEY (`G_FILE`,`NNPrered`,`VERSION`),
  CONSTRAINT FOREIGN KEY (`NNNight`) REFERENCES `NIGHT` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNPrered`) REFERENCES `DUEDPRERED_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the EXTRACTED_SPECTRA_TBL database table keywords are available in Table 12.

TABLE 12: EXTRACTED_SPECTRA_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the extracted spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link EXTRACTED_SPECTRA_TBL entries to the NIGHT table entries.
NNPrered	is the unique entry identifier of the prereduced frame from which this spectrum was extracted. It is extrapolated from metadata (using G_FILE + G_ID) during data ingestion and used to link EXTRACTED_SPECTRA_TBL entries to the DUEDPRERED_TBL entries.
G_FILE	is the filename (naming convention compliant) of the extracted spectrum file (including the directory path)
G_PROD	defines the datatype. For EXTRACTED datatype is always set to Extracted.
G_RED	indicates who produced this extracted spectrum (the reducer).
G_SPECAPER	is the aperture (in pixel) used to extract the spectrum.
G_SIGWAVE	is the wavelength calibration error (in Å) of the spectrum.
G_SEEING	is the seeing value (in arcsec) as measured on the spectrum.

TABLE 12: **Continued.**

G_SPEC	defines the class of the spectrum out of: Wide, Narrow, WaveCalOnly, Rejected. This keyword was present also in the RAW datamodel and in the 2DPREREDU-CED View table. The difference here is that the class is assigned to the spectrum depending on the relation between the slit width and the seeing. To be more precise: if 2DPREREDUCED = Wide: G_PROD set to Wide if G_SLIT $\geq$ 6(G_SEEING) G_PROD set to Narrow if 1.5(G_SEEING) $\leq$ G_SLIT < 6(G_SEEING) G_PROD set to Rejected if G_SLIT < 1.5(G_SEEING) if 2DPREREDUCED = Narrow: G_PROD set to Narrow if 1.5(G_SEEING) $\leq$ G_SLIT < 6(G_SEEING) G_PROD set to WaveCalOnly if G_SLIT < 1.5(G_SEEING)
G_QCflag	is the quality control flag for this extracted spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL or 4410). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with this extracted spectrum and/or why the quality control failed (see Section 4.8.2 Table 13 for further information).
G_NOTES	contains the notes taken by the reducer during the extracted spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information)
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `EXTRACTED_SPECTRA_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.8.1 EXTRACTED metadata production

In the metadata file uploaded in SSDC for the ingestion of EXTRACTED data there are 11 keywords listed in the following order: G_ID, G_FILE, G_PROD, G_RED, G_SPECAPER, G_SIGWAVE, G_SEEING, G_SPEC, G_QCflag, G_QCval, G_NOTES.
Entries in the `EXTRACTED_SPECTRA_TBL` table are linked to `DUEDPRERED_TBL` using the unique entry identifier of the prereduced parent spectrum, extrapolated from G_FILE during the ingestion phase exploiting the DU13 naming convention rules. The apparently redundant presence of G_ID keyword in the EXTRACTED metadata is due to the possible presence of two SPSS spectra in the same 2DPREREDUCED frame. When this occurs, since we have two different extracted spectra belonging to different SPSS from the same prereduced frame, the

filename for these spectra can not strictly follow the naming convention. In this case, the file-name of the second spectrum follows the naming convention: x.<filename>_2.fits. So, it is not possible to use only G_FILE (conveniently treated) in order to recover the proper NNPre-red during data ingestion, because in this case in the `DUEDPRERED_TBL` table we have two different entries for G_FILE = r.<filename>.fits (same filename, different G_ID). To select the correct one, we have to combine G_FILE and G_ID in a sort of unique key. For this reason G_ID keyword must be present in the EXTRACTED metadata files used for data ingestion. In addition, through G_ID keyword, `EXTRACTED_SPECTRA_TBL` entries can be linked also to SPSSreference datatype.

The pipeline for the production of EXTRACTED metadata[7] is composed by two different shell scripts to be run in sequence.

4.8.2 G_QCval values for datatype EXTRACTED

The G_QCval allowed values for EXTRACTED datatype are 4-digit number, the first digit always being equal to 4.

Also for EXTRACTED datatype, the 2400 flag can be activated, if needed. When this occurs, the 2400 flag is propagated backward across the reduction chain of the file up to its 2DPRE-REDUCED parent file. Also in this case, the 2400 flag implies that the reduction is no longer carried out. In addition, the download from the archive is disabled not only for the file for which the 2400 flag was activated, but also for all its parent files along the reduction chain (masterframes are not affected).

The G_QCval values for EXTRACTED datatype are reported in Table 13.

TABLE 13: **G_QCval definition for EXTRACTED datatype**

Value		Description
4000		generic problem on extracted spectrum.
4100		bright spectrum.
	4110	close to saturation: this flag is activated if a part of the spectrum is close to saturation, and problems with linearity can arise.
	4120	saturated spectrum: this flag is activated when a part of the spectrum is saturated but its unsaturated parts can however be used, for example to reduce the fringing (this implies that, despite being saturated in some parts, it is still possible to calibrate the spectrum in wavelength).

---

[7]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaEXTRACTED.tar`.

TABLE 13: **Continued.**

4200		faint spectrum: this flag is activated when the SNR of the spectrum is low.
4300		Wide spectrum declassed to Narrow: this flag is activated if the spectrum, acquired with a wide slit, is declassed to Narrow due to poor seeing.
	4310	Wide spectrum delcassed to Rejected: this flag is activated if the spectrum, acquired with a wide slit, is declassed to Rejected due to very bad seeing.
4400		Narrow spectrum declassed to WaveCalOnly: this flag is activated if the spectrum, acquired with a narrow slit, is declassed to WaveCalOnly due to poor seeing.
	4410	Narrow spectrum raised to Wide: this flag is activated if the spectrum, acquired with a narrow slit, is raised to Wide due to very good seeing.
4500		bad wavelength calibration: this flag is activated if it is not possible to calibrate in wavelength a saturated spectrum, or if the wavelength calibration lamp frame has very low SNR and the wavelength calibration is not possible.
4600		calibrated via cross-correlation: this flag is activated if the spectrum was calibrated via cross-correlation and not using its dedicated calibration lamp frame.
2400		useless frame.

4.9   Datatype FRINGECORR: datamodel definition

The filenames of the fringing-corrected spectra (FRINGECOR for brevity) must be compliant with the following naming convention: **i.**<**filename**>**.fits**.

FRINGECORR spectra are the first of the Advanced Reduction Steps for spectroscopy. The fringing correction should be applied to all red spectra, both narrow and wide, beacuse fringing is CCD-dependent and not tied to the intrinsic characteristics of the red grism+slit setup used for acquisition.

FRINGECORR frames have a direct 1:1 link with the previous datatype in the reduction chain (the red EXTRACTED spectra), and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that FRINGECOR datatype can inherit many keywords from not only these two tables, but also from those linked to them along the reduction chain. Normally these keywords are not present in the datamodel, but can be added in the FRINGECORR view available to DU13 users via web interface.

In order to describe the datamodel for the FRINGECORR datatype, we report here the MySQL *create table* command for the `FRINGECORR_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `FRINGECORR_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `NNExtracted` int(10) unsigned NOT NULL,
  `G_ID` int(10),
  `G_FILE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_PROD` enum('FringeCorr') COLLATE latin1_general_cs NOT NULL,
  `G_RED` char(20) COLLATE latin1_general_cs NOT NULL,
```

```
'G_SPEC' enum('Wide','Narrow','Rejected','WaveCalOnly') COLLATE latin1_general_cs NOT NULL,
'G_QCflag' enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
'G_QCval' varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
'G_NOTES' text COLLATE latin1_general_cs,
'VERSION' int(3) unsigned NOT NULL,
'FROMREL' int(3) unsigned NOT NULL,
'UPLOADEDFILENN' int(10) unsigned NOT NULL,
PRIMARY KEY ('NN'),
UNIQUE KEY 'G_FILE' ('G_FILE','NNExtracted','VERSION'),
KEY 'NNNight' ('NNNight'),
KEY 'NNPrered' ('NNExtracted'),
KEY 'UPLOADEDFILENN' ('UPLOADEDFILENN'),
CONSTRAINT 'FRINGECORR_TBL_ibfk_1' FOREIGN KEY ('NNExtracted') REFERENCES 'EXTRACTED_SPECTRA_TBL' ('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the FRINGECORR_TBL database table keywords are available in Table 14.

TABLE 14: FRINGECORR_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the fringing corrected spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link FRINGECORR_TBL entries to the NIGHT table entries.
NNExtracted	is the unique entry identifier of the extracted spectrum from which this fringing corrected spectrum was extracted. It is extrapolated from metadata (using G_FILE + G_ID) during data ingestion and used to link FRINGECORR_TBL entries to the EXTRACTED_SPECTRA_TBL entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the previous datatype, we decided to add it directly in the datamodel in order to keep as simple as possible the join between spectroscopic Advanced Reduction Steps datatypes.
G_FILE	is the filename (naming convention compliant) of the fringing corrected spectrum file (including the directory path).
G_PROD	defines the datatype. For FRINGECORR datatype is always set to FringeCorr.
G_RED	indicates who produced this fringing-corrected spectrum (the reducer).
G_SPEC	defines the class of the spectrum out of: Wide, Narrow, WaveCalOnly, Rejected. This keyword is derived directly from the EXTRACTED metadata, and kept in the FRINGECORR datamodel for consistency check purposes.
G_QCflag	is the quality control flag for this fringing-corrected spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.

TABLE 14: **Continued.**

G_QCval	is a flag indicating which problem(s) was encountered with this fringing corrected spectrum and/or why the quality control failed (see Section 4.9.2 Table 15 for further information).
G_NOTES	contains the notes taken by the reducer during the fringing corrected spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `FRINGECORR_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.9.1 FRINGECORR metadata production

In the metadata file uploaded in SSDC for the ingestion of FRINGECORR data there are 8 keywords listed in the following order: G_ID, G_FILE, G_PROD, G_RED, G_SPEC, G_QCflag, G_QCval, G_NOTES.

The presence of G_ID keyword in the FRINGECOR metadata is due to the same reason for which this keyword is present in the EXTRACTED metadata files. The second redundant keyword is G_SPEC, coming directly from the EXTRACTED metadata files, and added here to be used for consistency check through the database. Through G_ID keyword, `FRINGECORR_TBL` entries can be linked also to SPSSreference datatype.

The pipeline for the production of FRINGECORR metadata[8] is composed by two different shell scripts to be run in sequence.

4.9.2 G_QCval values for datatype FRINGECORR

The G_QCval allowed values for FRINGECORR datatype are 4-digit number, the first and second digit always being equal to 51. Also for FRINGECORR datatype, the 2400 flag can be activated, if needed.

The G_QCval values for FRINGECORR datatype are reported in Table 15.

---

[8]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaFRINGECORR.tar.`

TABLE 15: **G_QCval definition for FRINGECORR datatype**

Value	Description
5000	generic problem on Spectra Advanced Reduction Step.
5100	generic problem on the fringing-corrected spectrum.
5110	beatings: this flag is activated when beats occur in the fringing correction residuals. This id due to the fact that the fringing pattern of the masterflat used for the correction is not perfectly matching the fringing pattern of the spectrum. It usually happens when an afternoon flat instead of the one taken immediately after the acquisition of the spectrum is used for fringing correction.
5120	large residual fringing pattern: this flag is activated if the fringing correction residuals are large despite of the use of a proper flat (i.e. a flat taken immediately after the acquisition of the spectrum).
5130	detrimental fringing correction: this flag is activated if the fringing correction is not applied because, otherwise, the quality of the spectrum would get worse. In this case a fake FRINGECORR spectrum is created. This fake spectrum is stored in a fits file with the same structure of a FRINGECORR, but its content is identical to the previous reduction step spectrum (the fringing pattern is set constant to 1).
2400	useless frame.

4.10   Datatype SLITLOSSCORR: datamodel definition

The filenames of the slit-loss-corrected spectra (SLITLOSSCORR for brevity) must be compliant with the following naming convention: **l.<filename>.fits**.

SLITLOSSCORR spectra are the second of the Advanced Reduction Steps for spectroscopy. The correction for slit losses must be made on all Narrow and WaveCalOnly spectra, both red and blue, as long as a Wide reference spectrum is available. For the correction not always a wide spectrum acquired during the same night is used: if for a given SPSS the seeing is so bad that results in a downgrading of a Wide spectrum into Narrow (or, even worse, Rejected), then the correction is applied using a wide spectrum acquired during another night or is not applied at all.

SLITLOSSCORR frames have a direct 1:1 link with the previous datatype in the reduction chain and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that SLITLOSSCORR datatype can inherit a lot of keywords from not only these two tables, but also from those linked to them along the reduction chain. Normally, these keywords are not present in the datamodel, but can be added in the SLITLOSS-CORR view available to DU13 users via web interface. The parent datatype is not always the same for all SLITLOSSCORR spectra:

- for blue spectra: their parent frame is always an EXTRACTED;

- for red spectra:

  - the fringing correction was not applied (for example, in SPSS V0 release): their parent file is an EXTRACTED;

  - the fringing correction was applied: their parent file is a FRINGECORR;

In order to describe the datamodel for the SLITLOSSCORR datatype, we report here the MySQL *create table* command for the SLITLOSSCORR_TBL database table:

```
CREATE TABLE IF NOT EXISTS `SLITLOSSCORR_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `G_ID` int(10) DEFAULT NULL,
  `G_FILE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_PROD` enum('SlitLossCorr') COLLATE latin1_general_cs NOT NULL,
  `G_LPARENT` varchar(400) COLLATE latin1_general_cs DEFAULT NULL,
  `XPARENT` int(10) unsigned DEFAULT NULL,
  `IPARENT` int(10) unsigned DEFAULT NULL,
  `G_LREFWIDE` varchar(400) COLLATE latin1_general_cs DEFAULT NULL,
  `G_LREFWIDEPATH` varchar(400) COLLATE latin1_general_cs DEFAULT NULL,
  `XREFWIDE` int(10) unsigned DEFAULT NULL,
  `IREFWIDE` int(10) unsigned DEFAULT NULL,
  `G_RED` char(20) COLLATE latin1_general_cs NOT NULL,
  `G_SPEC` enum('NarrowCorrected','WaveCalOnlyCorrected') COLLATE latin1_general_cs NOT NULL,
  `G_QCflag` enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
  `G_QCval` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int(10) unsigned NOT NULL,
  PRIMARY KEY (`NN`),
  UNIQUE KEY `G_FILE` (`G_FILE`,`VERSION`),
  KEY `NNNight` (`NNNight`),
  KEY `XPARENT` (`XPARENT`),
  KEY `IPARENT` (`IPARENT`),
  KEY `XREFWIDE` (`XREFWIDE`),
  KEY `IREFWIDE` (`IREFWIDE`),
  KEY `UPLOADEDFILENN` (`UPLOADEDFILENN`);
  CONSTRAINT `SLITLOSSCORR_TBL_ibfk_2` FOREIGN KEY (`XPARENT`) REFERENCES `EXTRACTED_SPECTRA_TBL` (`NN`),
  CONSTRAINT `SLITLOSSCORR_TBL_ibfk_3` FOREIGN KEY (`XREFWIDE`) REFERENCES `EXTRACTED_SPECTRA_TBL` (`NN`),
  CONSTRAINT `SLITLOSSCORR_TBL_ibfk_4` FOREIGN KEY (`IPARENT`) REFERENCES `FRINGECORR_TBL` (`NN`),
  CONSTRAINT `SLITLOSSCORR_TBL_ibfk_5` FOREIGN KEY (`IREFWIDE`) REFERENCES `FRINGECORR_TBL` (`NN`),
  CONSTRAINT `SLITLOSSCORR_TBL_ibfk_6` FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE`(`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the SLITLOSSCORR_TBL database table keywords are available in Table 16.

TABLE 16: SLITLOSSCORR_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the slit-loss corrected spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link SLITLOSSCORR_TBL entries to the NIGHT table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the parent datatype, we decided to add it directly in the datamodel in order to keep as simple as possible the join between spectroscopic Advanced Reduction Steps datatypes.
G_FILE	is the filename (naming convention compliant) of the slit-loss corrected spectrum file (including the directory path)
G_PROD	defines the datatype. For SLITLOSSCORR datatype is always set to SlitLossCorr.
G_LPARENT	is the filename (naming convention compliant) of the parent file from which the slit-loss corrected spectrum was produced.
XPARENT	is the unique entry identifier of the parent file, if it is an extracted spectrum. It is extrapolated from metadata (using G_LPARENT+G_ID) during data ingestion and used to link SLITLOSSCORR_TBL entries to the EXTRACTED_SPECTRA_TBL entries.
IPARENT	is the unique entry identifier of the parent file, if it is a fringing corrected spectrum. It is extrapolated from metadata (using G_LPARENT+G_ID) during data ingestion and used to link SLITLOSSCORR_TBL entries to the FRINGECORR_TBL entries.
G_LREFWIDE	is the filename (naming convention compliant) of the wide spectrum at which the slit-loss corrected spectrum is scaled.
G_LREFWIDEPATH	is the path of the G_LREFWIDE file in the archive. The presence of this keyword is due to the fact that the reference wide spectrum can belong to a different night with respect to the slit-loss-corrected spectrum.
XREFWIDE	is the unique entry identifier of the reference wide spectrum used, if it was an extracted spectrum. It is extrapolated from metadata during data ingestion (using G_LREFWIDE + G_LREFWIDEPATH) and used to link this SLITLOSSCORR_TBL entry to its reference wide spectrum in the EXTRACTED_SPECTRA_TBL table.
IREFWIDE	is the unique entry identifier of the reference wide spectrum used, if it was a fringing corrected spectrum. It is extrapolated from metadata during data ingestion (using G_LREFWIDE+G_LREFWIDEPATH) and used to link this SLITLOSSCORR_TBL entry to its reference wide spectrum in the EXTRACTED_SPECTRA_TBL table.
G_RED	indicates who produced this slit-loss corrected spectrum (the reducer).
G_SPEC	defines the class of the spectrum out of: NarrowCorrected or WaveCalOnlyCorrected, depending on the value of G_SPEC keyword in the parent file of this slit-loss-corrected spectrum.

TABLE 16: **Continued.**

G_QCflag	is the quality control flag for this slit-loss corrected spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with this slit-loss corrected spectrum and/or why the quality control failed (see Section 4.10.2 Table 17 for further information).
G_NOTES	contains the notes taken by the reducer during the slit-loss corrected spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information)
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `SLITLOSSCORR_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom given data was loaded and the name of the tarfile in which it was contained.

4.10.1 SLITLOSSCORR metadata production

In the metadata file uploaded in SSDC for the ingestion of SLITLOSSCORR data there are 11 keywords listed in the following order: G_ID, G_FILE, G_PROD, G_SPEC, G_LPARENT, G_LREFWIDE, G_LREFWIDEPATH, G_RED, G_QCflag, G_QCval, G_NOTES.
Entries in the `SLITLOSSCORR_TBL` table are linked to EXTRACTED_TBL and/or to FRINGE-CORR_TBL tables through the keywords G_LPARENT and G_LREFWIDE+G_LREFWIDE-PATH. Through G_ID keyword, `SLITLOSSCORR_TBL` entries can be linked also to SPSSreference datatype.

The pipeline for the production of SLITLOSSCORR metadata[9] is composed by two different shell scripts to be run in sequence.

4.10.2 G_QCval values for datatype SLITLOSSCORR

The G_QCval allowed values for SLITLOSSCORR datatype are 4-digit number, the first and second digit always being equal to 52. Also for SLITLOSSCORR datatype, the 2400 flag can be activated, if needed. The G_QCval values for SLITLOSSCORR datatype are reported in Table 17.

---

[9]A direct download is available at: `http://yoda.bo.astro.it/wiki/index.php/File:` `MetaSLITLOSSCORR.tar`.

TABLE 17: **G_QCval definition for SLITLOSSCORR datatype**

Value	Description
5000	generic problem on Spectra Advanced Reduction Step.
5200	generic problem on the slit-loss-corrected spectrum.
5210	uncertain fit: this flag is activated if the residuals of the correction fit are relatively large and we can still try to save the spectrum for further reduction steps. If the fit is so bad that it is not worth continuing with the reduction, then in addition to this flag, also the 2400 flag must be activated.
5220	missing data for slit-loss correction: this flag is activated if we do not have data to perform the correction for slit losses, and then we create a fake SLITLOSSCORR spectrum. This fake spectrum is recorded in a fits file with the same structure of a SLITLOSSCORR, but its content is identical to the previous reduction step spectrum. In this case, the parent file and the reference wide spectrum must be the same.
5230	detrimental slit-loss correction: this flag is activated if the slit-loss correction is not applied because, otherwise, the quality of the spectrum would get worse. Also in this case a fake SLITLOSSCORR spectrum is created. his fake spectrum is recorded in a fits file with the same structure of a SLITLOSSCORR, but its content is identical to the previous reduction step spectrum. In this case, the parent file and the reference wide spectrum must be the same.
2400	useless frame.

4.11 Datatype 2ndORDERCORR: datamodel definition

The filenames of the spectra corrected for second order contamination (2ndORDERCORR for brevity) must be compliant with the following naming convention: **s.<filename>.fits**.

2ndORDERCORR spectra are the third of the Advanced Reduction Steps for spectroscopy. Not all spectra need to be corrected for the 2nd order contamination: only those acquired using EFOSC2@NTT and DOLORES@TNG are affected by 2nd order contamination and must be properly corrected. In order to apply the 2nd order correction a wide blue spectrum of the same SPSS is needed, possibly acquired during the same night (the optimal would be a wide blue spectrum acquired just before or just after the red one). If such kind of spectrum is not available, one acquired during another good night (the closest available), obviously of the same SPSS and acquired using the same instrumental setup, can be used for the correction .

2ndORDERCORR frames have a direct 1:1 link with the previous datatype in the reduction chain and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that 2ndORDERCORR datatype can inherit a lot of keywords from these two tables, but also from those linked to them along the reduction chain. Normally, these keywords are not present in the datamodel, but can be added in the 2ndORDER-CORR view available to DU13 users via web interface.

The parent datatype is not always the same for all 2ndORDERCORR spectra:

- for NarrowCorrected spectra: their parent frame is always a SLITLOSSCORR;

- for WaveCalOnlyCorrected spectra: their parent frame is always a SLITLOSSCORR;

- for Wide spectra:

  - the fringing correction was not applied (for example, in SPSS V0 release): their parent file is an EXTRACTED;

  - the fringing correction was applied: their parent file is a FRINGECORR;

In order to describe the datamodel for the 2ndORDERCORR datatype, we report here the MySQL *create table* command for the SECONDORDERCORR_TBL database table:

```
CREATE TABLE IF NOT EXISTS `SECONDORDERCORR_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `G_ID` int(10) DEFAULT NULL,
  `G_FILE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_RED` char(20) COLLATE latin1_general_cs NOT NULL,
  `G_PROD` enum('2orderCorr') COLLATE latin1_general_cs NOT NULL,
  `G_SPEC` enum('Wide','Narrow','Rejected','WaveCalOnly','NarrowCorrected',
              'WaveCalOnlyCorrected') COLLATE latin1_general_cs NOT NULL,
  `G_PEXTCURVE` varchar(400) DEFAULT NULL,
  `EXTCURVE` int(10) unsigned NOT NULL,
  `G_PREDRESPCURVE` varchar(400) DEFAULT NULL,
  `REDRESPCURVE` int(10) unsigned NOT NULL,
  `G_PBLUERESPCURVE` varchar(400) DEFAULT NULL,
  `BLUERESPCURVE` int(10) unsigned NOT NULL,
  `G_SPARENT` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `XPARENT` int(10) unsigned DEFAULT NULL,
  `IPARENT` int(10) unsigned DEFAULT NULL,
  `LPARENT` int(10) unsigned DEFAULT NULL,
  `G_SREFBLUE` varchar(400) COLLATE latin1_general_cs DEFAULT NULL,
  `G_SREFBLUEPATH` varchar(400) COLLATE latin1_general_cs DEFAULT NULL,
  `XREFBLUE` int(10) unsigned DEFAULT NULL,
  `LREFBLUE` int(10) unsigned DEFAULT NULL,
  `G_2ordZP` DOUBLE NOT NULL,
  `G_ERR2ordZP` DOUBLE NOT NULL,
  `G_2ordSLOPE` DOUBLE NOT NULL,
  `G_ERR2ordSLOPE` DOUBLE NOT NULL,
  `G_VER2ORDPIPE` CHAR(8) NOT NULL,
  `G_QCflag` enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
  `G_QCval` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int(10) unsigned NOT NULL,
  PRIMARY KEY (`NN`),
  UNIQUE KEY `G_FILE` (`G_FILE`,`VERSION`),
  KEY `NNNight` (`NNNight`),
  KEY `EXTCURVE` (`EXTCURVE`),
  KEY `REDRESPCURVE` (`REDRESPCURVE`),
  KEY `BLUERESPCURVE` (`BLUERESPCURVE`),
  KEY `XPARENT` (`XPARENT`),
  KEY `IPARENT` (`IPARENT`),
  KEY `LPARENT` (`LPARENT`),
  KEY `XREFBLUE` (`XREFBLUE`),
  KEY `LREFBLUE` (`LREFBLUE`),
```

```
KEY 'UPLOADEDFILENN' ('UPLOADEDFILENN'),
CONSTRAINT FOREIGN KEY ('EXTCURVE')  REFERENCES 'MASTERFRAME_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('REDRESPCURVE') REFERENCES 'MASTERFRAME_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('BLUERESPCURVE') REFERENCES 'MASTERFRAME_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('XPARENT') REFERENCES 'EXTRACTED_SPECTRA_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('IPARENT') REFERENCES 'FRINGECORR_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('LPARENT') REFERENCES 'SLITLOSSCORR_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('XREFBLUE') REFERENCES 'EXTRACTED_SPECTRA_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('LREFBLUE') REFERENCES 'SLITLOSSCORR_TBL' ('NN'),
CONSTRAINT FOREIGN KEY ('UPLOADEDFILENN') REFERENCES 'UPLOADEDFILE'('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the SECONDORDERCORR_TBL database table keywords are available in
Table 18.

TABLE 18: SECONDORDERCORR_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the 2nd order corrected spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link SECONDORDERCORR_TBL entries to the NIGHT table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the parent datatype, we decided to add it directly in the datamodel in order to keep as simple as possible the join between spectroscopic Advanced Reduction Steps datatypes.
G_FILE	is the filename (naming convention compliant) of the 2nd order corrected spectrum file (including the directory path)
G_RED	indicates who produced this 2nd-order-corrected spectrum (the reducer).
G_PROD	defines the datatype. For 2ndORDERCORR datatype is always set to 2orderCorr.
G_SPEC	defines the class of the spectrum out of: Wide, Narrow, Rejected, WaveCalOnly, NarrowCorrected, WaveCalOnlyCorrected, depending on the value of the G_SPEC keyword in the parent file of this 2nd order corrected spectrum. Even if this keyword is redundant, it is kept in the datamodel for consistency check purposes.
G_PEXTCURVE	is the filename (naming convention compliant) of the extinction curve masterframe used to produce this 2nd order corrected spectrum.
EXTCURVE	is the unique entry identifier of the G_PEXTCURVE masterframe, extrapolated during data ingestion exploiting the naming convention followed by masterframes.
G_PREDRESPCURVE	is the filename (naming convention compliant) of the red response curve masterframe used during this 2nd order corrected spectrum production.
REDRESPCURVE	is the unique entry identifier of the G_PREDRESPCURVE masterframe, extrapolated during data ingestion exploiting the naming convention followed by masterframes.

TABLE 18: **Continued.**

G_PBLUERESPCURVE	is the filename (naming convention compliant) of the blue response curve masterframe used during this 2nd order corrected spectrum production.
BLUERESPCURVE	is the unique entry identifier of the G_PBLUERESPCURVE masterframe, extrapolated during data ingestion exploiting the naming convention followed by masterframes.
G_SPARENT	is the filename (naming convention compliant) of the parent file from which the 2nd order corrected spectrum was produced.
XPARENT	is the unique entry identifier of the parent file, if it is an extracted spectrum. It is extrapolated from metadata (using G_SPARENT+G_ID) during data ingestion and used to link SECONDORDERCORR_TBL entries to the EXTRACTED_SPECTRA_TBL entries.
IPARENT	is the unique entry identifier of the parent file, if it is a fringing corrected spectrum. It is extrapolated from metadata (using G_SPARENT+G_ID) during data ingestion and used to link SECONDORDERCORR_TBL entries to the FRINGECORR_TBL entries.
LPARENT	is the unique entry identifier of the parent file, if it is a slit-loss corrected spectrum. It is extrapolated from metadata (using G_SPARENT+G_ID) during data ingestion and used to link SECONDORDERCORR_TBL entries to the SLITLOSSCORR_TBL entries.
G_SREFBLUE	is the filename (naming convention compliant) of the wide spectrum at which the 2nd order corrected spectrum is scaled.
G_SREFBLUEPATH	is the path of the G_SREFBLUE file in the archive. The presence of this keyword is due to the fact that the reference wide blue spectrum can belong to a different night with respect to the 2nd order corrected spectrum.
XREFBLUE	is the unique entry identifier of the reference blue spectrum used, if it was an extracted spectrum. It is extrapolated from metadata (using G_SREFBLUE+ G_SREFBLUEPATH) during data ingestion and used to link this SECONDORDERCORR_TBL entry to its reference wide spectrum in the EXTRACTED_SPECTRA_TBL table.
LREFBLUE	is the unique entry identifier of the reference blue spectrum used, if it was a fringing corrected spectrum. It is extrapolated from metadata (using G_SREFBLUE+G_SREFBLUEPATH) during data ingestion and used to link this SECONDORDERCORR_TBL entry to its reference wide spectrum in the SLITLOSSCORR_TBL table.
G_2ordZP	is the median offset of the 2nd order corrected-spectrum residuals with respect to a literature spectrum (when available).
G_ERR2ordZP	is the error on G_2ordZP.
G_2ordSLOPE	is the slope of the linear fit of the 2nd order corrected-spectrum residuals with respect to a literature spectrum (when available).
G_ERR2ordSLOPE	is the error on G_2ordSLOPE.
G_VER2ORDPIPE	is the version of the pipeline used to produce this 2nd order corrected spectrum.

TABLE 18: **Continued.**

G_QCflag	is the quality control flag for this 2nd order corrected spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with this 2nd order corrected spectrum and/or why the quality control failed (see Section 4.11.2 Table 19 for further information).
G_NOTES	contains the notes taken by the reducer during this 2nd ordercorrected spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `SECONDORDERCORR_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom given data was loaded and the name of the tarfile in which it was contained.

4.11.1 2ndORDERCORR metadata production

In the metadata file uploaded in SSDC for the ingestion of 2ndORDERCORR data there are 19 keywords listed in the following order: G_ID, G_FILE, G_RED, G_PROD, G_SPEC, G_PEXTCURVE, G_PREDRESPCURVE, G_PBLUERESPCURVE, G_SPARENT, G_SREFBLUE, G_SREFBLUEPATH, G_2ordZP, G_ERR2ordZP, G_2ordSLOPE, G_ERR2ordSLOPE, G_VER2ORDPIPE, G_QCflag, G_QCval, G_NOTES.

Entries in the `SECONDORDERCORR_TBL` table are linked to `EXTRACTED_SPECTRA_TBL` and/or to `FRINGECORR_TBL` and/or to `SLITLOSSCORR_TBL` tables through the keywords G_SPARENT and G_LREFBLUE+G_LREFBLUEPATH. MASTER_TBL entries used in the production of the 2ndORDERCORR data are linked through the keywords G_PEXTCURVE, G_PREDRESPCURVE and G_PBLUERESPCURVE. Through G_ID keyword, 2ndORDERCORR_TBL entries can be linked also to SPSSreference datatype.

The pipeline for the production of 2ndORDERCORR metadata[10] is composed by two different shell scripts to be run in sequence.

---

[10]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:Meta2ndORDERCORR.tar.`

4.11.2 G_QCval values for datatype 2ndORDERCORR

The G_QCval allowed values for 2ndORDERCORR datatype are 4-digit number, the first and second digit always being equal to 53. The activation of the 2400 flag is allowed also for 2ndORDERCORR datatype. The G_QCval values for 2ndORDERCORR datatype are reported in Table 19.

TABLE 19: **G_QCval definition for 2ndORDERCORR datatype**

Value		Description
5000		generic problem on Spectra Advanced Reduction Step.
5300		generic problem on the 2nd-order-corrected spectrum.
	5310	Used problematic response curve: this flag is activated if the response curve used to produce the 2nd order corrected spectrum was affected by problems (see G_QCval values for response curve at Section 4.6.2).
	5320	TNG bump at $\lambda > 9500$ Å: this flag is activated if, for TNG spectra, the correction failed due to the huge telluric band present in that zone of the spectrum.
	5330	TNG spectra going below zero after correction: this flag is activated if the second order correction results in a spectrum with negative values
	5340	correction performed using a narrow blue spectrum: this flag is activated when a reference wide blue spectrum was not available in the same run.
2400		useless frame.

4.12 Datatype RELCAL: datamodel definition

The filenames of the spectra relatively calibrated in flux (RELCAL for brevity) must be compliant with the following naming convention: **c.<filename>.fits**.

RELCAL spectra are the fourth of the Advanced Reduction Steps for spectroscopy. The relative calibration in flux is performed on all spectra.
RELCAL frames have a direct 1:1 link with the previous datatype in the reduction chain and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that RELCAL datatype can inherit a lot of keywords from these two tables, but also from those linked to them along the reduction chain. Normally, these keywords are not present in the datamodel, but can be added in the RELCAL view available to DU13 users via web interface.

The parent datatype is not always the same for all RELCAL spectra because, depending on the sptectrum type (wide or narrow) and on the instrument used for the observations, the reduction chain is different:

- parent file for Wide spectra:

    - EFOSC2 red spectra: 2NDORDERCORR;

    - EFOSC2 blue spectra: EXTRACTED;

    - DOLORES red spectra: 2NDORDERCORR;

    - DOLORES blue spectra: EXTRACTED;

    - CAFOS red spectra: EXTRACTED;

    - CAFOS blue spectra: EXTRACTED;

    - BFOSC red spectra: FRINGECORR;

    - BFOSC blue spectra: EXTRACTED;

- parent file for Narrow, NarrowCorrected and WaveCalOnlyCorrected spectra:

    - EFOSC2 red spectra: 2NDORDERCORR;

    - EFOSC2 blue spectra: SLITLOSSCORR;

    - DOLORES red spectra: 2NDORDERCORR;

    - DOLORES blue spectra: SLITLOSSCORR;

    - CAFOS red spectra: SLITLOSSCORR;

    - CAFOS blue spectra: SLITLOSSCORR;

    - BFOSC red spectra: SLITLOSSCORR;

    - BFOSC blue spectra: their parent frame is an SLITLOSSCORR;

In order to describe the datamodel for the RELCAL datatype, we report here the MySQL *create table* command for the `RELCAL_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `RELCAL_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `NNNight` int(10) unsigned NOT NULL,
  `G_ID` int(10) DEFAULT NULL,
  `G_FILE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_RED` char(20) COLLATE latin1_general_cs NOT NULL,
  `G_PROD` enum('RelCal') COLLATE latin1_general_cs NOT NULL,
  `G_SPEC` enum('Wide','Narrow','Rejected','WaveCalOnly','NarrowCorrected',
                'WaveCalOnlyCorrected') COLLATE latin1_general_cs NOT NULL,
  `G_PEXTCURVE` varchar(400) DEFAULT NULL,
  `PEXTCURVE` int(10) unsigned NOT NULL,
  `G_SPSSNIGHTCAL` varchar(400) DEFAULT NULL,
  `G_PRESPCURVE` varchar(400) DEFAULT NULL,
  `PRESPCURVE` int(10) unsigned NOT NULL,
  `G_CPARENT` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `XPARENT` int(10) unsigned DEFAULT NULL,
  `IPARENT` int(10) unsigned DEFAULT NULL,
  `LPARENT` int(10) unsigned DEFAULT NULL,
  `SPARENT` int(10) unsigned DEFAULT NULL,
  `G_RELCALOFF` DOUBLE NOT NULL,
```

```
`G_ERRRELCALOFF` DOUBLE NOT NULL,
`G_VERRELCALPIPE` CHAR(8) NOT NULL,
`G_QCflag` enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
`G_QCval` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
`G_NOTES` text COLLATE latin1_general_cs,
`VERSION` int(3) unsigned NOT NULL,
`FROMREL` int(3) unsigned NOT NULL,
`UPLOADEDFILENN` int(10) unsigned NOT NULL,
 UNIQUE KEY `G_FILE` (`G_FILE`,`VERSION`),
 KEY `NNNight` (`NNNight`),
 KEY `PEXTCURVE` (`PEXTCURVE`),
 KEY `PRESPCURVE` (`PRESPCURVE`),
 KEY `XPARENT` (`XPARENT`),
 KEY `IPARENT` (`IPARENT`),
 KEY `LPARENT` (`LPARENT`),
 KEY `SPARENT` (`SPARENT`),
 KEY `UPLOADEDFILENN` (`UPLOADEDFILENN`),
 CONSTRAINT FOREIGN KEY (`NNNight`) REFERENCES `NIGHT`(`NN`),
 CONSTRAINT FOREIGN KEY (`PEXTCURVE`)  REFERENCES `MASTERFRAME_TBL` (`NN`),
 CONSTRAINT FOREIGN KEY (`PRESPCURVE`) REFERENCES `MASTERFRAME_TBL` (`NN`),
 CONSTRAINT FOREIGN KEY (`XPARENT`) REFERENCES `EXTRACTED_SPECTRA_TBL` (`NN`),
 CONSTRAINT FOREIGN KEY (`IPARENT`) REFERENCES `FRINGECORR_TBL` (`NN`),
 CONSTRAINT FOREIGN KEY (`LPARENT`) REFERENCES `SLITLOSSCORR_TBL` (`NN`),
 CONSTRAINT FOREIGN KEY (`SPARENT`) REFERENCES `SECONDORDERCORR_TBL` (`NN`),
 CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE`(`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the RELCAL_TBL database table keywords are available in Table 20.

TABLE 20: RELCAL_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night at which the RELCAL spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link RELCAL_TBL entries to the NIGHT table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the parent datatype, we decided to add it directly in the datamodel in order to keep as simple as possible the joins between spectroscopic Advanced Reduction Steps datatypes.
G_FILE	is the filename (naming convention compliant) of the RELCAL spectrum file (including the directory path).
G_RED	indicates who produced this RELCAL spectrum (the reducer).
G_PROD	defines the datatype. For RELCAL datatype is always set to RelCal.
G_SPEC	defines the class of the spectrum out of: Wide, Narrow, Rejected, WaveCalOnly, NarrowCorrected, WaveCalOnlyCorrected, depending on the value of the G_SPEC keyword in the parent file of this RELCAL spectrum. Even if this keyword is redundant, it is kept in the RELCAL datamodel for consistency check purposes.

TABLE 20: **Continued.**

G_PEXTCURVE	is the filename (naming convention compliant) of the extinction curve masterframe used to produce this RELCAL spectrum.
EXTCURVE	is the unique entry identifier of the G_PEXTCURVE masterframe, extrapolated during data ingestion exploiting the naming convention followed by masterframes.
G_SPSSNIGHTCAL	the G_ID of the SPSS used as calibrators. It is possible that more than one SPSS is used to build the response curve. For this reason this keyword is a VARCHAR and, in case more than one SPSS G_ID is present, a dot (.) is used as separator.
G_PRESPCURVE	is the filename (naming convention compliant) of the response curve (red or blue) masterframe used during this RELCAL spectrum production.
PRESPCURVE	is the unique entry identifier of the G_PRESPCURVE masterframe, extrapolated during data ingestion exploiting the naming convention followed by masterframes.
G_CPARENT	is the filename (naming convention compliant) of the parent file from which this RELCAL spectrum was derived.
XPARENT	is the unique entry identifier of the parent file, if it is an extracted spectrum. It is extrapolated from metadata (using G_CPARENT+G_ID) during data ingestion and used to link `RELCAL_TBL` entries to the `EXTRACTED_SPEC-TRA_TBL` entries.
IPARENT	is the unique entry identifier of the parent file, if it is a fringing corrected spectrum. It is extrapolated from metadata (using G_CPARENT+G_ID) during data ingestion and used to link `RELCAL_TBL` entries to the `FRINGECORR_TBL` entries.
LPARENT	is the unique entry identifier of the parent file, if it is a slit-loss corrected spectrum. It is extrapolated from metadata (using G_CPARENT+G_ID) during data ingestion and used to link `RELCAL_TBL` entries to the `FRINGECORR_TBL` entries.
SPARENT	is the unique entry identifier of the parent file, if it is a 2nd order corrected spectrum. It is extrapolated from metadata (using G_CPARENT+G_ID) during data ingestion and used to link `RELCAL_TBL` entries to the `SECONDORDERCORR_TBL` entries.
G_RELCALOFF	is the median normalized offset (relative median offset) of the single spectrum with respect to the median of all good spectra available in this night for a given SPSS.
G_ERRRELCALOFF	is the error on G_RELCALOFF.
G_VERRELCALPIPE	is the version of the reduction pipeline used to produce this RELCAL spectrum.
G_QCflag	is the quality control flag for this RELCAL spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.

TABLE 20: **Continued.**

G_QCval	is a flag indicating which problem(s) was encountered with this RELCAL spectrum and/or why the quality control failed (see Section 4.12.2 Table 21 for further information).
G_NOTES	contains the notes taken by the reducer during the RELCAL spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the UPLOADEDFILE table (keyword NN), and used here to link each RELCAL_TBL entry to the corresponding UPLOADEDFILE table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.12.1   RELCAL metadata production

In the metadata file uploaded in SSDC for the ingestion of RELCAL data there are 15 keywords listed in the following order: G_ID, G_FILE, G_RED, G_PROD, G_SPEC, G_PEXTCURVE, G_SPSSNIGHTCAL, G_PRESPCURVE, G_CPARENT, G_RELCALOFF, G_ERRRELCALOFF, G_VERRELCALPIPE, G_QCflag, G_QCflag, G_NOTES.

Entries in the RELCAL_TBL table are linked to EXTRACTED_TBL or FRINGECORR_TBL or SLITLOSSCORR_TBL or SECONDORDERCORR_TBL tables through the keyword G_CPARENT. MASTER_TBL entries used in the production of the RELCAL data are linked through the keywords G_PEXTCURVE and G_PRESPCURVE. Through G_ID keyword, RELCAL_TBL entries can be linked also to SPSSreference datatype.

The pipeline for the production of RELCAL metadata[11] is composed by two different shell scripts to be run in sequence.

4.12.2   G_QCval values for datatype RELCAL

The G_QCval allowed values for RELCAL datatype are 4-digit number, the first and second digit always being equal to 54. The 2400 flag can be activated, if needed, also for the RELCAL datatype. The G_QCval values for RELCAL datatype are reported in 21.

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[11]A direct download is available at:
http://yoda.bo.astro.it/wiki/index.php/File:MetaRELCAL.tar.

TABLE 21: **G_QCval definition for RELCAL datatype**

Value	Description
5000	generic problem on Spectra Advanced Reduction Step.
5400	generic problem on the relatively-flux-calibrated spectrum.
5410	single spectrum different shape: this flag is activated if a single RELCAL spectrum of a given SPSS has a different shape with respect to the median of the RELCAL spectra of the same star.
5420	single spectrum different offset: this flag is activated if a single RELCAL spectrum of a given SPSS has a significant offset ($>1\%$) with respect to the median of the RELCAL spectra of the same star.
5430	red-blue offset: this flag is activated if there is a significant offset ($>1\%$) between the spectra of the same star acquired with different grisms. In this case, the this flag applies to all spectra.
2400	useless frame: this flag is activated if both shape and level of a single spectrum are completely messed up and it useless to proceed with the next reduction steps

4.13 Datatype TELLCORR: datamodel definition

The filenamens of the spectra corrected for telluric absorption (TELLCORR for brevity) must be compliant with the following naming convention: **t.<filename>.fits**.

TELLCORR spectra are the fifth of the Advanced Reduction Steps for spectroscopy. The telluric correction is performed on all spectra.
TELLCORR frames have a direct 1:1 link with the previous datatype in the reduction chain (the RELCAL datatype) and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that TELLCORR datatype can inherit a lot of keywords from these two tables, but also from those linked to them along the reduction chain (2ndORDERCORR, SLITLOSSCORR, FRINGECORR, EXTRACTED, 2DPRE-RED and RAW datatypes). Normally, these keywords are not present in the datamodel, but can be added in the TELLCORR view available to DU13 users via web interface.

In order to describe the datamodel for the TELLCORR datatype, we report here the MySQL *create table* command for the TELLCORR_TBL database table:

```
CREATE TABLE IF NOT EXISTS 'TELLCORR_TBL' (
  'NN' int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  'NNNight' int(10) unsigned NOT NULL,
  'G_ID' int(3) unsigned zerofill NOT NULL,
  'G_FILE' varchar(400) COLLATE latin1_general_cs NOT NULL,
  'G_RED' char(20) COLLATE latin1_general_cs NOT NULL,
  'G_PROD' enum('TellCorr') COLLATE latin1_general_cs NOT NULL,
  'G_RMSNLINES' INT NOT NULL,
  'G_RMSCORR' DOUBLE NOT NULL,
  'CPARENT' int(10) unsigned NOT NULL,
  'G_QCflag' enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
  'G_QCval' varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
```

```
'G_NOTES' text COLLATE latin1_general_cs,
'VERSION' int(3) unsigned NOT NULL,
'FROMREL' int(3) unsigned NOT NULL,
'UPLOADEDFILENN' int(10) unsigned NOT NULL,
KEY 'G_ID' ('G_ID'),
KEY 'CPARENT' ('CPARENT'),
KEY 'NNNight' ('NNNight'),
UNIQUE ('G_FILE', 'VERSION'),
CONSTRAINT FOREIGN KEY ('G_ID') REFERENCES 'SPSSrefdata' ('G_ID'),
CONSTRAINT FOREIGN KEY ('NNNight') REFERENCES 'NIGHT' ('NN'),
CONSTRAINT FOREIGN KEY ('CPARENT') REFERENCES 'RELCAL_TBL' ('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the TELLCORR_TBL database table keywords are available in Table 22.

TABLE 22: TELLCORR_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night at which the telluric corrected spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link TELLCORR_TBL entries to the NIGHT table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the parent datatype, we decided to add it directly in the datamodel in order to keep as simple as as possible the joins between spectroscopic Advanced Reduction Steps datatypes.
G_FILE	is the filename (naming convention compliant) of the telluric corrected spectrum file (including the directory path).
G_RED	indicates who produced this telluric corrected spectrum (the reducer).
G_PROD	defines the datatype. For TELLCORR datatype is always set to TellCorr.
G_RMSNLINES	is the number of telluric lines on which G_RMSCORR is computed.
G_RMSCOR	is an estimate of the RMS of the telluric correction. It is calculated as the median of RMS correction on H_2O and O_2 absorption bands and lines due to terrestrial atmosphere and present in the spectrum.
CPARENT	is the unique entry identifier of the RELCAL file from which this telluric corrected spectrum is derived. It is directly extrapolated from G_FILE+G_ID during data ingestion.
G_QCflag	is the quality control flag for this telluric-corrected spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.

TABLE 22: **Continued.**

G_QCval	is a flag indicating which problem(s) was encountered with this telluric corrected spectrum and/or why the quality control failed (see Section 4.13.2 Table 23 for further information).
G_NOTES	contains the notes taken by the reducer during the telluric corrected spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `TELLCORR_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.13.1 TELLCORR metadata production

In the metadata file[12] uploaded in SSDC for the ingestion of TELLCORR data there are 9 keywords listed in the following order: G_ID, G_FILE, G_RED, G_PROD, G_RMSCORR, G_RMS-NLINES, G_QCflag, G_QCflag, G_NOTES.

Entries in the `TELLCORR_TBL` table are linked to `RELCAL_TBL` using the unique entry identifier of the telluric-corrected spectrum parent file, extrapolated from G_FILE+G_ID during the ingestion phase exploiting the DU13 naming convention rules. This link is used to connect `TELLCORR_TBL` entries to all other tables along the reduction chain. Through G_ID keyword, `TELLCORR_TBL` entries can be linked also to SPSSreference datatype.

4.13.2 G_QCval values for datatype TELLCORR

The G_QCval allowed values for TELLCORR datatype are 4-digit number, the first and second digit always being equal to 55. The activation of the 2400 flag is allowed also for TELLCORR datatype.

The G_QCval values for TELCORR datatype are reported in Table 23.

---

[12]Produced using a shell pipeline dedicated to TELLCORR datatype and available at: `http://yoda.bo.astro.it/wiki/index.php/File:MetaTELLCORR.tar`.

TABLE 23: **G_QCval definition for TELLCORR datatype**

Value	Description
5000	generic problem on Spectra Advanced Reduction Step.
5500	generic problem on the telluric-corrected spectrum.
5510	decent correction: this flag is activated if between 50% and 70% of the points in the QC plot falls within $\pm3\%$ of the continuum RMS
5520	bad correction: this flag is activated if less than 50% of the points in the QC plot falls within $\pm3\%$ of the continuum RMS
5530	telluric in star absorption line: this flag is activated if less than 50% of the points in the QC plot falls within $\pm3\%$ of the continuum RMS, but it is due to a telluric line falling within a star absorption line. In this case the measure of the telluric correction RMS is misrepresented.
5540	undercorrection: this flag is activated if the correction applied is not sufficient to correct the telluric line (after the correction the telluric is still clearly present and the continuum in that area is depressed.
5550	overcorrection: this flag is activated if the correction applied is larger than needed and the continuum in the telluric zone presents a bump.
5560	shift in wavelength: this flag is activated if after the correction the continuum is ruined by the presence of spurious peaks at the ends of the telluric zone.
5570	Detrimental correction: this flag is activated if the telluric correction is not applied because, otherwise, the quality of the spectrum would get worse. In this case a fake TELLCORR spectrum is created. This fake spectrum has the TELLCORR structure but its content is identical to the previous reduction step spectrum (RELCAL spectrum).
2400	useless frame.

4.14 Datatype ABSCAL: datamodel definition

The filenames of the absolutely calibrated spectra (ABSCAL for brevity) must be compliant with the following naming convention: **f.<filename>.fits**.

ABSCAL spectra are the sixth of the Advanced Reduction Steps for spectroscopy. The absolute calibration is performed on all telluric-corrected spectra, red and blue ones.
ABSCAL frames have a direct 1:1 link with the previous datatype in the reduction chain (the TELLCORR datatype) and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that ABSCL datatype can inherit keywords not only from these two tables, but also from those linked to them along the reduction chain (RELCAL,2ndORDERCORR, SLITLOSSCORR, FRINGECORR, EXTRACTED, 2DPRERED and RAW datatypes). Normally, these keywords are not present in the datamodel, but can be added in the ABSCL view available to DU13 users via web interface.

In order to describe the datamodel for the ABSCAL datatype, we report here the MySQL *create table* command for the ABSCAL_TBL database table:

```
CREATE TABLE IF NOT EXISTS 'ABSCAL_TBL' (
  'NN' int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  'NNNight' int(10) unsigned NOT NULL,
  'G_ID' int(3) unsigned zerofill NOT NULL,
  'G_FILE' varchar(400) COLLATE latin1_general_cs NOT NULL,
  'G_RED' char(20) COLLATE latin1_general_cs NOT NULL,
  'G_PROD' enum('AbsCal') COLLATE latin1_general_cs NOT NULL,
  'G_FSCALE' DOUBLE NOT NULL,
  'G_FSCALERMS' DOUBLE NOT NULL,
  'G_FSHIFT' DOUBLE NOT NULL,
  'G_FSHIFTRMS' DOUBLE NOT NULL,
  'G_FSCALEMODE' ENUM('MEDIAN','SYNTH') NOT NULL,
  'TPARENT' int(10) unsigned NOT NULL,
  'G_QCflag' enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
  'G_QCval' varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  'G_NOTES' text COLLATE latin1_general_cs,
  'VERSION' int(3) unsigned NOT NULL,
  'FROMREL' int(3) unsigned NOT NULL,
  'UPLOADEDFILENN' int(10) unsigned NOT NULL,
  'NNFLUXTABLE' int(10) unsigned DEFAULT NULL,
  UNIQUE KEY ('G_FILE', 'VERSION'),
  KEY 'G_ID' ('G_ID'),
  KEY 'NNNight' ('NNNight'),
  KEY 'TPARENT' ('TPARENT'),
  KEY 'NNFLUXTABLE' ('NNFLUXTABLE'),
  CONSTRAINT FOREIGN KEY ('G_ID') REFERENCES 'SPSSrefdata' ('G_ID'),
  CONSTRAINT FOREIGN KEY ('NNNight') REFERENCES 'NIGHT' ('NN'),
  CONSTRAINT FOREIGN KEY ('TPARENT') REFERENCES 'TELLCORR_TBL' ('NN'),
  CONSTRAINT FOREIGN KEY ('NNFLUXTABLE') REFERENCES 'FLUXTABLE_TBL' ('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the ABSCAL_TBL database table keywords are available in Table 24.

TABLE 24: ABSCAL_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night at which the ABSCAL spectrum belongs to. It is extrapolated from metadata during data ingestion and used to link ABSCAL_TBL entries to the NIGHT table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the parent datatype, we decided to add it directly in the datamodel in order to keep as simple as as possible the joins between spectroscopic Advanced Reduction Steps datatypes.
G_FILE	is the filename (naming convention compliant) of the ABSCAL spectrum file (including the directory path).
G_RED	indicates who produced this ABSCAL spectrum (the reducer).
G_PROD	defines the datatype. For ABSCAL datatype is always set to AbsCal.

T ABLE 24: **Continued.**

G_FSCALE	is the factor for which each spectrum of a given SPSS is scaled in order to match the SPSS median spectrum (produced using all good available spectra of that SPSS, regardless of the night they belongs). G_FSCALE is obtained from the relation: G_FSCALE = 1/[1+(0.01*scale_offset)] where scale_offset is the percentage offset measured between the single and the median spectra.
G_FSCALERMS	is the semi-interquartile calculated on scale_offset and indicates that the scale factor is not always the same for each point of the spectrum. As G_FSCALE depends on scale_offset, we report this value in G_FSCALERMS as a measure of the error on the scaling factor.
G_FSHIFT	it is the wavelength shift added to each spectrum of that SPSS in order to match the SPSS median spectrum (already combined).
G_FSHIFTRMS	the mean of the wavelength shifts is calculated together with its error on both blue and red spectra, treating the two groups separately. G_FSHIFTRMS is computed as the arithmetic mean of the errors in blue and red (so, is the same for each single spectrum of a given SPSS).
G_FSCALEMODE	indicates the scaling method. The value is set to MEDIAN if the applied scaling factor is calculated with respect to the median of that SPSS spectra acquired during a photometric night, or to SYNTH if the spectrum is scaled using synthetic photometry (method applied to spectra acquired in not perfectly photometric nights).
TPARENT	is the unique entry identifier of the TELLCORR file from which this ABSCAL spectrum is derived. It is directly extrapolated from G_FILE+G_ID during data ingestion.
G_QCflag	is the quality control flag for this ABSCAL spectrum. If no problems are encountered with the spectrum, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this frame, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with this ABSCAL spectrum and/or why the quality control failed (see Section 4.14.2 Table 25 for further information).
G_NOTES	contains the notes taken by the reducer during the ABSCAL spectrum production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the UPLOADEDFILE table (keyword NN), and used here to link each ABSCAL_TBL entry to the corresponding UPLOADEDFILE table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.
NNFLUXTABLE	is the unique entry identifier of the flux table extrapolated the FLUXTABLE_TBL (see Section 4.17) produced using this ABSCAL file.

4.14.1 ABSCAL metadata production

In the metadata file[13] uploaded in SSDC for the ingestion of ABSCAL data there are 12 keywords listed in the following order: G_ID, G_FILE, G_RED, G_PROD, G_FSCALE, G_FSCALERMS, G_FSHIFT, G_FSHIFTRMS, G_FSCALEMODE, G_QCflag, G_NOTES.

Entries in the `ABSCAL_TBL` table are linked to `TELLCORR_TBL` using the unique entry identifier of the telluric-corrected spectrum parent file, extrapolated from G_FILE+G_ID during the ingestion phase exploiting the DU13 naming convention rules. This link is used to connect `ABSCAL_TBL` entries to all other tables along the reduction chain. Through G_ID keyword, `ABSCAL_TBL` entries can be linked also to SPSSreference datatype. Finally, `ABSCAL_TBL` entries used to produce a flux table are linked to the corresponding `FLUXTABLE_TBL` entry when the flux table is ingested in the archive.

4.14.2 G_QCval values for datatype ABSCAL

The G_QCval allowed values for ABSCAL datatype are 4-digit number, the first and second digit always being equal to 56. The use of the 2400 flag is allowed also for the ABSCAL datatype. The G_QCval values for ABSCAL datatype are reported in Table 25.

TABLE 25: **G_QCval definition for ABSCAL datatype**

Value		Description
5000		generic problem on Spectra Advanced Reduction Step.
5600		generic problem on the ABSCAL spectrum.
	5610	scaling factor too high or too low: this flag is activated if the scaling factor to be applied in order to match the single spectrum to the median spectrum of the same SPSS is too high or too low ($|$G_FSCALE$| > 10$).
	5620	shift factor too high or too low: this flag is activated if the wavelength shift to be applied in order to macth the single spectrum to the median spectrum of the same SPSS is too high or too low ($|$G_FSHIFT$| > 10$).
	5630	quality night wrong: this flag is activated if the night turned out to be non-photometric but the ABSCAL spectra were still produced (using the MEDIAN method).
	5640	saturated parts: this flag is activated if the spectrum is saturated is some limited regions
	5650	peculiar structure: this flag is activated if the spectrum has a peculiar structure.
2400		useless frame.

---

[13]Produced using a shell pipeline dedicated to ABSCAL datatype and available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaABSCAL.tar`

4.15 Datatype PHOTCAT: datamodel definition

The filenames of the photometric catalogues (PHOTCAT for brevity) must be compliant with the following naming convention:

- **c.**<**filename**>**.cat**: these are ascii files containing the aperture photometry obtained using SExtractor on photometric 2DPREREDUCED frames belonging to a time series for the SPSS short-term variability monitoring;

- **np.**<**filename**>**.cat**: these are ascii file containing the aperture photometry obtained using SExtractor on photometric 2DPREREDUCED frames belonging to a SPSS or Landolt night-point.

PHOTCAT datatype has a direct 1:1 link with the previous datatype in the reduction chain (the 2DPREREDUCED photometric frames), and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that PHOTCAT datatype can inherit a lot of keywords from not only these two tables, but also from RAW table (through the 2DPREREDUCED link). All these potentially inherited keywords are not present in the PHOTCAT datamodel, but can be added in its view available to DU13 users via web interface. Since photometric catalogues are produced using prereduced photometric frames, and the latter are linked also to the MASTER datatype, it is always possible to know which masterframes were used at the start of the reduction chain.

In order to describe the datamodel for the PHOTCAT datatype, we report here the MySQL *create table* command for the `PHOTCAT_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `PHOTCAT_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `NNPrered` int(10) unsigned NOT NULL,
  `G_FILE` varchar(400) NOT NULL,
  `G_PROD` enum('PhotCat') NOT NULL,
  `G_RED` char(20) NOT NULL,
  `G_SEEING` double NOT NULL,
  `G_QCflag` enum('0','1','2') NOT NULL,
  `G_QCval` varchar(255),
  `G_NOTES` text COLLATE latin1_general_cs DEFAULT NULL,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int unsigned NOT NULL,
  PRIMARY KEY (`NN`),
  UNIQUE KEY (`G_FILE`,`NNPrered`,`VERSION`),
  CONSTRAINT FOREIGN KEY (`NNNight`) REFERENCES `NIGHT` (`NN`),
  CONSTRAINT FOREIGN KEY (`NNPrered`) REFERENCES `DUEDPRERED_TBL` (`NN`),
  CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `PHOTCAT_TBL` database table keywords are available in Table 26.

TABLE 26: PHOTCAT_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night at which the photometric catalogue belongs to. It is extrapolated from metadata during data ingestion and used to link PHOTCAT_TBL entries to the NIGHT table entries.
NNPrered	is the unique entry identifier of the prereduced frame from which this photometric catalogue was extracted. It is extrapolated from metadata (using G_FILE) during data ingestion and used to link PHOTCAT_TBL entries to the DUEDPRERED_TBL entries.
G_FILE	is the filename (naming convention compliant) of the photometric catalogue file (including the directory path).
G_PROD	defines the datatype. For PHOTCAT datatype is always set to PhotCat.
G_RED	indicates who produced this photometric catalogue (the reducer).
G_SEEING	is the seeing value as measured by SExtractor during the photometric catalogue production.
G_QCflag	is the quality control flag for this photometric catalogue. If no problems are encountered with the stars in the catalogue, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this catalogue, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with this photometric catalogue and/or why the quality control failed (see Section 4.15.2 Table 27 for further information).
G_NOTES	contains the notes taken by the reducer during the photometric catalogue production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the UPLOADEDFILE table (keyword NN), and used here to link each PHOTCAT_TBL entry to the corresponding UPLOADEDFILE table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.15.1 PHOTCAT metadata production

In the metadata file uploaded in SSDC for the ingestion of PHOTCAT data there are 7 keywords listed in the following order: G_FILE, G_PROD, G_RED, G_SEEING, G_QCflag, G_QCval, G_NOTES.

Entries in the `PHOTCAT_TBL` table are linked to `DUEDPRERED_TBL` using the unique entry identifier of the photometric prereduced parent file, extrapolated from G_FILE during the ingestion phase exploiting the DU13 naming convention rules. The G_ID keyword is inherited in PHOTCAT view table from `DUEDPRERED_TBL`. Through G_ID keyword, PHOTCAT entries can be linked also to SPSSreference datatype.

The pipeline for the production of PHOTCAT metadata[14] is composed by two different shell scripts to be run in sequence.

TABLE 27: **G_QCval definition for PHOTCAT datatype**

Value	Description
3000	generic problem on photometric catalogue.
3100	generic problem on the SPSS.
3110	star level QC step a failed on SPSS: this flag is activated if there are problems in the SPSS mesurements (SExtractor flag value not zero).
3120	star level QC step b failed on SPSS: this flag is activated if the SPSS SNR is too low (SNR<100).
3130	star level QC step c failed on SPSS: this flag is activated if the seeing is too bad (seeing>5.0 arcsec).
3130	star level QC step d failed on SPSS: this flag is activated if the SPSS is disturbed by the presence of bad pixels.
3200	less than 2 good comparison stars: this flag is activated only for photometric catalogues used to perform relative photometry, and only if there are less than 2 comparison stars passing the star level QC (all steps).
3210	only 2 comparison stars, one failing star level QC step d: this flag is activated if there are only 2 comparison stars in the catalogue, one passing the star level QC and the other affected by bad pixels only (and thus failing step d).
3220	only 2 comparison stars, both failing star level QC step d: this flag is activated if there are only 2 comparison stars in the catalogue, both affected by bad pixels only (and thus failing step d).
3300	no good Landolt star: this flag is activated only for photometric catalogues containing Landolt stars if all of them failed the star level QC (all steps).
3310	only 1 Landolt star failing star level QC step d: this flag is activated if there is only one Landolt star in the catalogue that is affected by bad pixels only (and thus failing step d).
2400	useless frame.

---

[14]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaPHOTCAT.tar`.

4.15.2 G_QCval values for datatype PHOTCAT

The G_QCval allowed values for PHOTCAT datatype are 4-digit number, the first digit always being equal to 3. Also for PHOTCAT datatype, the 2400 flag can be activated, if needed. The G_QCval values for PHOTCAT datatype are reported in Table 27.

4.16 Datatype NIGHTQUALITY: datamodel definition

The NIGHTQUALITY datatype contains the quality parameters of the observing night. These parameters can be either photometric (derived from Landolt standard stars night points) or spectroscopic (derived from the RELCAL spectra). Some nights may have photometric quality parameters only, some spectroscopic ones only, others both, others none of them (normally, those nights without standard and/or pillar observations): this last group never enters in the NIGHTQUALITY datatype. Being a pure metadata datatype, there are no files to be loaded into the archive for NIGHTQUALITY.

NIGHTQUALITY datatype does not have a direct 1:1 link with previous datatypes (many of them are used to find the quality parameters and the solution of the night), but retains 1:1 correspondence with the NIGHT table. This implies that a link with the NIGHT table entries is always possible, and that NIGHTQUALITY datatype can inherit keywords from this table. All these potentially inherited keywords are not present in the NIGHTQUALITY datamodel, but can be added in its view available to DU13 users via web interface.

In order to describe the datamodel for the NIGHTQUALITY datatype, we report here the MySQL *create table* command for the `NIGHTQUALITY_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `NIGHTQUALITY_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `NNNight` int(10) unsigned NOT NULL,
  `G_NIGHT` date NOT NULL,
  `G_RUNTYP` enum('P','V','M') NOT NULL,
  `G_RUNID` int(3) unsigned zerofill NOT NULL,
  `G_PROD` enum('NightQuality') NOT NULL,
  `G_TSPAN` DOUBLE DEFAULT NULL,
  `G_SCALE` DOUBLE DEFAULT NULL,
  `G_SCALEERR` DOUBLE DEFAULT NULL,
  `G_REDSPEC` char(20) COLLATE latin1_general_cs DEFAULT NULL,
  `G_BZP` DOUBLE DEFAULT NULL,
  `G_VZP` DOUBLE DEFAULT NULL,
  `G_RZP` DOUBLE DEFAULT NULL,
  `G_IZP` DOUBLE DEFAULT NULL,
  `G_BCT` DOUBLE DEFAULT NULL,
  `G_VCT` DOUBLE DEFAULT NULL,
  `G_RCT` DOUBLE DEFAULT NULL,
  `G_ICT` DOUBLE DEFAULT NULL,
  `G_BRMS` DOUBLE DEFAULT NULL,
  `G_VRMS` DOUBLE DEFAULT NULL,
  `G_RRMS` DOUBLE DEFAULT NULL,
  `G_IRMS` DOUBLE DEFAULT NULL,
  `G_BEXT` DOUBLE DEFAULT NULL,
```

```
'G_VEXT' DOUBLE DEFAULT NULL,
'G_REXT' DOUBLE DEFAULT NULL,
'G_IEXT' DOUBLE DEFAULT NULL,
'G_BERREXT' DOUBLE DEFAULT NULL,
'G_VERREXT' DOUBLE DEFAULT NULL,
'G_RERREXT' DOUBLE DEFAULT NULL,
'G_IERREXT' DOUBLE DEFAULT NULL,
'G_REDPHOT' char(20) COLLATE latin1_general_cs DEFAULT NULL,
'G_SPNQUAL' enum('Photometric', 'Uncertain', 'NonPhotometric') DEFAULT NULL,
'G_PHNQUAL' enum('Photometric', 'Uncertain', 'NonPhotometric') DEFAULT NULL,
'G_NOTES' text COLLATE latin1_general_cs,
'VERSION' int(3) unsigned NOT NULL,
'FROMREL' int(3) unsigned NOT NULL,
'UPLOADEDFILENN' int(10) unsigned NOT NULL,
PRIMARY KEY ('NN'),      -----CONTROLLA CON GIORGIO PERCHE' NON C'E'
UNIQUE KEY 'G_NIGHT' ('G_NIGHT','G_RUNTYP','G_RUNID','VERSION'),
KEY 'NNNight' ('NNNight'),
KEY 'UPLOADEDFILENN' ('UPLOADEDFILENN'),
CONSTRAINT FOREIGN KEY ('NNNight')  REFERENCES 'NIGHT' ('NN').
CONSTRAINT FOREIGN KEY ('UPLOADEDFILENN') REFERENCES 'UPLOADEDFILE'('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `NIGHTQUALITY_TBL` database table keywords are available in Table 28.

TABLE 28: `NIGHTQUALITY_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the quality parameters belongs to. It is extrapolated from metadata (using G_NIGHT+G_RUNTYP+G_RUNID) during data ingestion and used to link `NIGHTQUALITY_TBL` entries to the `NIGHT` table entries.
G_NIGHT	is the observing night.
G_RUNTYP	defines the run type, as defined in DU13 observing protocols (P=pilot, M=main campaign, V= auxiliary campaign).
G_RUNID	is the numerical identifier of the run.
G_PROD	defines the datatype. For NIGHTQUALITY datatype is always set to NightQuality.
G_TSPAN	is the time coverage of the spectroscopic standard stars used for calibration (in decimal hours).
G_SCALE	it is the average of the scaling factors resulting from all SPSS used to check the quality of the night.
G_SCALEERR	is the error on G_SCALE.
G_REDSPEC	indicates who produced the spectroscopic quality parameters of the night (the reducer for spectroscopy).
G_BZP	is the night solution zero point for the B band computed using the (B-V) colour.

TABLE 28: **Continued.**

G_VZP	is the night solution zero point for the V band computed using the (B-V) colour (or (V-R) colour if no observations in B filter were made).
G_RZP	is the night solution zero point for the R band computed using the (V-R) colour.
G_IZP	is the night solution zero point for the I band computed using the (V-I) colour.
G_BCT	is the night solution colour term for the B band computed using the (B-V) colour.
G_VCT	is the night solution colour term for the V band computed using the (B-V) colour (or (V-R) colour if no observations in B filter were made).
G_RCT	is the night solution colour term for the R band computed using the (V-R) colour.
G_ICT	is the night solution colour term for the I band computed using the (V-I) colour.
G_BRMS	is the night solution rms for the B band computed using the (B-V) colour.
G_VRMS	is the night solution rms for the V band computed using the (B-V) colour (or (V-R) colour if no observations in B filter were made).
G_RRMS	is the night solution rms for the R band computed using the (V-R) colour.
G_IRMS	is the night solution rms for the I band computed using the (R-I) colour.
G_BEXT	is the extinction coefficient in B band.
G_VEXT	is the extinction coefficient in V band.
G_REXT	is the extinction coefficient in R band.
G_IEXT	is the extinction coefficient in I band.
G_BERREXT	is the error on G_BEXT.
G_VERREXT	is the error on G_VEXT.
G_RERREXT	is the error on G_REXT.
G_IERREXT	is the error on G_IEXT.
G_REDPHOT	indicates who produced the photometric quality parameters of the night (the reducer for photometry).
G_SPNQUAL	is the quality of the night derived from photometry. When not NULL, this keyword can assume the following values: Photometric, Uncertain, NonPhotometric.
G_PHNQUAL	is the quality of the night derived from spectroscopy. When not NULL, this keyword can assume the following values: Photometric, Uncertain, NonPhotometric.
G_NOTES	contains the notes taken by the reducer during the night quality production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the UPLOADEDFILE table (keyword NN), and used here to link each PHOTCAT_TBL entry to the corresponding UPLOADEDFILE table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.16.1 NIGHTQUALITY metadata production

In the metadata file uploaded in SSDC for the ingestion of NIGHTQUALITY data there are 32 keywords listed in the following order: G_NIGHT, G_RUNTYP, G_RUNID, G_PROD, G_TSPAN, G_SCALE, G_SCALEERR, G_REDSPEC, G_BZP, G_VZP, G_RZP, G_IZP, G_BCT, G_VCT, G_RCT, G_ICT, G_BRMS, G_VRMS, G_RRMS, G_IRMS, G_BEXT, G_VEXT, G_REXT, G_IEXT, G_BERREXT, G_VERREXT, G_RERREXT, G_IERREXT, G_REDPHOT, G_SPNQUAL, G_PHN-QUAL, G_NOTES.

The apparently redundant presence of G_NIGHT, G_RUNTYP and G_RUNID, keywords in the NIGHTQUALITY metadata is due to the absence of a file to be uploaded in the archive for this datatype: this implies that it is not possible to use the keyword G_FILE to extract the necessary information to univocally identify the night to which the datatype refers. For this reason G_NIGHT, G_RUNTYP and G_RUNID keywords must be present in the NIGHTQUALITY metadata files used for data ingestion.

The pipeline for the production of NIGHTQUALITY metadata[15] is composed by two different shell scripts to be run in sequence.

4.17 Datatype FLUXTABLE: datamodel definition

The filenames of the flux tables must be compliant with the following naming convention: **ft.<filename>.fits**.

FLUXTABLE datatype is the first of the Spectra Advanced Data Products. FLUXTABLE is a datatype that does not have a direct 1:1 link with the previous datatype in the reduction chain (the ABSCAL spectra), since many ABSCAL possibly coming from different nights, runs and/or telescopes are used to produce the final flux table of a given SPSS. For this same reason, flux tables also lose the link with the NIGHT table. The only link that remains is with the SPSSreference table: this implies that FLUXTABLE datatype can inherit keywords from the SPSSreference table (and vice versa). These potentially inherited keywords are not present in the FLUXTABLE datamodel, but can be added in the FLUXTABLE view available to DU13 users via web interface.

In order to describe the datamodel for the FLUXTABLE datatype, we report here the MySQL *create table* command for the FLUXTABLE_TBL database table:

```
CREATE TABLE IF NOT EXISTS `FLUXTABLE_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `G_ID` int(3) unsigned zerofill NOT NULL,
```

---

[15]A direct download is available at:
http://yoda.bo.astro.it/wiki/index.php/File:MetaNIGHTQUALITY.tar.

```
'G_FILE' varchar(400) COLLATE latin1_general_cs NOT NULL,
'G_RED' char(20) COLLATE latin1_general_cs NOT NULL,
'G_PROD' enum('FluxTable') COLLATE latin1_general_cs NOT NULL,
'G_WAVEERROR' DOUBLE NOT NULL,
'G_FLUXCALERROR' DOUBLE NOT NULL,
'G_SPSSCLASS' ENUM('A','B','C','D','E') NOT NULL,
'G_QCflag' enum('0','1') COLLATE latin1_general_cs NOT NULL,
'G_QCval' varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
'G_NOTES' text COLLATE latin1_general_cs,
'VERSION' int(3) unsigned NOT NULL,
'FROMREL' int(3) unsigned NOT NULL,
'UPLOADEDFILENN' int(10) unsigned NOT NULL,
UNIQUE KEY ('G_FILE', 'VERSION'),
KEY 'G_ID' ('G_ID'),
CONSTRAINT FOREIGN KEY ('G_ID') REFERENCES 'SPSSrefdata' ('G_ID')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the FLUXTABLE_TBL database table keywords are available in Table 29.

TABLE 29: FLUXTABLE_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
G_ID	this is the SPSS ID, a unique number associated to each SPSS and used to link FLUXTABLE_TBL entries to the SPSSrefdata entries.
G_FILE	is the filename (naming convention compliant) of the FLUXTABLE file (including the directory path).
G_RED	indicates who produced this FLUXTABLE (the reducer).
G_PROD	defines the datatype. For FLUXTABLE datatype is always set to FluxTable.
G_WAVEERROR	is the wavelength calibration error (in nm). This keyword is set to NULL if the wavelength calibration error is estimated using spectra belonging to a single night.
G_FLUXCALERROR	the global percentage error of the flux calibration.
G_SPSSCLASS	is a flag indicating the calibrator class. This keyword can assume the following values: A: the SPSS is calibrated using the CALSPEC spectrum of one or more pillars in photometric nights (see GA-001); B: the SPSS is calibrated using a class A calibrator in photometric nights; C: the SPSS is calibrated using DU13 absolute photometry through synthetic photometry method; D: the SPSS is calibrated using a literature spectrum in photometric nights; E: the SPSS is calibrated using a literature spectrum in non perfectly photometric nights.

TABLE 29: **Continued.**

G_QCflag	is the quality control flag for FLUXTABLE. If no problems are encountered, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. The value G_QCflag=2 is not allowed for FLUXTABLE datatype.
G_QCval	is a flag indicating which problem(s) was encountered with this flux table (see Section 4.17.2 Table 30 for further information).
G_NOTES	contains the notes taken by the reducer during the flux table production.
VERSION	indicates to which SPSS release belongs a given entry in this flux table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `FLUXTABLE_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.17.1 FLUXTABLE metadata production

In the metadata file uploaded in SSDC for the ingestion of FLUXTABLE data there are 10 keyword listed in the following order: G_ID, G_FILE, G_PROD, G_RED, G_SPSSCLASS, G_WAVEERROR, G_FLUXCALERROR, G_QCflag, G_QCval, G_NOTES.

FLUXTABLE data files are FITS tables containing in the header the list of the ABSCAL spectra used to produce the flux table. This list is used to link, in `ABSCAL_TBL` table, each flux table with the ABSCAL spectra combined to produce it.

The pipeline for the production of FLUXTABLE metadata[16] is composed by two different shell scripts to be run in sequence.

4.17.2 G_QCval values for datatype FLUXTABLE

The G_QCval allowed values for FLUXTABLE datatype are 4-digit number, the first digit always being equal to 7. For FLUXTABLE datatype, the 24xx flags are not available and can not be activated. The G_QCval values for FLUXTABLE datatype are reported in Table 30.

---

[16]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaFLUXTABLE.tar.`

TABLE 30: **G_QCval definition for FUXTABLE datatype**

Value		Description
7000		generic problem on the flux table.
7100		Problems coming from spectra used to produce the flux table.
	7110	no RV systematic error estimate: this flag is activated the wavelength calibration error is estimated using spectra belonging to a single night.
	7120	featureless star: this flag is activated for featureless stars because for these kind of stars the systematic wavelength error estimation is not straightforward.
	7130	non perfect blue-red junction: this flag is activated if a significant mismatch between the red and blue part of the spectrum occurs.
	7140	non perfect telluric correction: this flag is activated if the spectrum is affected by a non perfect telluric correction.
	7150	non perfect 2nd order correction: this flag is activated if the correction for second order contamination is not so good.
	7160	low SNR spectrum: this flag is activated if low SNR spectra was used in the flux table production.
	7170	no wide spectra available: this flag is activated if the flux table was produced using narrow (corrected) spectra only.
	7180	other spectrum defects: this flag is activated if the spectra used to produce the flux table were affected by other defects (for example holes).
7200		Calibration problems.
	7210	uncertain or bad night quality: this flag is activated if, for lack of better spectra, those acquired in "uncertain" or "maybe grey" or even "non-photometric" nights were used to produce the flux table.
	7220	M star released even if uncertain quality spectrum: the need to add to the SPSS release spectra of red stars, can lead to deliver not so good flux tables. In these cases, this flag is activated.
	7230	calibration not reliable in the red part of the spectrum: this flag is activated if problems in the calibration of the red part of the spectrum were encountered.
	7240	Steep increasing flux at the red edge after flux calibration.
	7250	calibration not reliable in the blue part of the spectrum: this flag is activated if problems in the calibration of the blue part of the spectrum were encountered.

4.18 Datatype EXTENDEDFLUXTABLE: datamodel definition

The filenames of the extended flux tables must be compliant with the following naming convention: **eft.<filename>.fits**.

EXTENDEDFLUXTABLE datatype is the second of the Spectra Advanced Data Product. EXTENDEDFLUXTABLE files have a direct 1:1 link with the previous datatype in the reduction chain (the FLUXTABLE datatype). Given that FLUXTABLE datatype is not linked to a specific night, also EXTENDEDFLUXTABLE files lose the link with the `NIGHT` table. The only other link that remains is with the SPSSreference table: this implies that EXTENDED-

FLUXTABLE datatype can inherit keywords from both `FLUXTABLE_TBL` and `SPSSrefdata` table (and vice versa for the latter, if needed). These potentially inherited keywords are not present in the EXTENDEDFLUXTABLE datamodel, but can be added in the EXTENDED-FLUXTABLE view available to DU13 users via web interface.

In order to describe the datamodel for the EXTENDEDFLUXTABLE datatype, we report here the MySQL *create table* command for the `EXTENDEDFLUXTABLE_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `EXTENDEDFLUXTABLE_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `G_ID` int(3) unsigned zerofill NOT NULL,
  `G_FILE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_RED` char(20) COLLATE latin1_general_cs NOT NULL,
  `G_PROD` enum('FluxTable') COLLATE latin1_general_cs NOT NULL,
  `FTPARENT` int(10) unsigned NOT NULL,
  `G_REFSOURCE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_REFSPECTYPE` enum('Observed','Synthetic') COLLATE latin1_general_cs NOT NULL,
  `G_REFTEFF` DOUBLE DEFAULT NULL,
  `G_REFLOGG` DOUBLE DEFAULT NULL,
  `G_REFFeH` DOUBLE DEFAULT NULL,
  `G_REFAV` DOUBLE DEFAULT NULL,
  `G_REFWAVESHIFT` DOUBLE NOT NULL,
  `G_REFSCALE` DOUBLE NOT NULL,
  `G_WAVECUTMIN` DOUBLE NOT NULL,
  `G_WAVECUTMAX` DOUBLE NOT NULL,
  `G_QCflag` enum('0','1') COLLATE latin1_general_cs NOT NULL,
  `G_QCval` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int(10) unsigned NOT NULL,
  UNIQUE KEY (`G_FILE`, `VERSION`),
  KEY `G_ID` (`G_ID`),
  KEY `FTPARENT` (`FTPARENT`),
  CONSTRAINT FOREIGN KEY (`G_ID`) REFERENCES `SPSSrefdata` (`G_ID`),
  CONSTRAINT FOREIGN KEY (`FTPARENT`) REFERENCES `FLUXTABLE_TBL` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `EXTENDEDFLUXTABLE_TBL` database table keywords are available in Table 31.

No dedicated pipeline is needed (at the moment) for EXTENDEDFLUXTABLE metadata production as they can be directly extracted from an existing wiki table in WikiBo[17]. At present, the code for the ingestion of EXTENDEDFLUXTABLE in SPSS@SSDC archive and database is to be finalized. For this reason, the EXTENDEDFLUXTABLE datatype is not yet present in the SPSS@SSDC system.

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[17]http://yoda.bo.astro.it/wiki/index.php/V1_release_summary_page_-_V1.0

TABLE 31: EXTENDEDFLUXTABLE_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
G_ID	this is the SPSS ID, a unique number associated to each SPSS and used to link EXTENDEDFLUXTABLE_TBL entries to the SPSSrefdata entries.
G_FILE	is the filename (naming convention compliant) of the EXTENDEDFLUXTABLE file (including the directory path).
G_RED	indicates who produced this EXTENDEDFLUXTABLE (the reducer).
G_PROD	defines the datatype. For EXTENDEDFLUXTABLE datatype is always set to ExtendedFluxTable.
FTPARENT	is the unique entry identifier of the FLUXTABLE file from which this EXTENDEDFLUXTABLE file is derived. It is directly extrapolated from G_FILE+G_ID during data ingestion.
G_REFSOURCE	is the literature source for the reference spectrum.
G_REFTYPE	indicates whether the reference is an observed or a synthetic spectrum.
G_REFTEFF	indicates the T_{eff} of the synthetic spectrum used as reference (this keyword is NULL if the reference was an observed spectrum).
G_REFLOGG	indicates the $\log g$ of the synthetic spectrum used as reference (this keyword is NULL if the reference was an observed spectrum).
G_REFFeH	indicates the metallicity of the synthetic spectrum used as reference (this keyword is NULL if the reference was an observed spectrum).
G_REFAV	indicates the reddening applied to the synthetic spectrum used as reference (this keyword is NULL if the reference was an observed spectrum).
G_REFWAVESHIFT	is the wavelength shift (in nm, positive towards red wavelengths and equal to 0 if no shift was applied) applied to the reference spectrum in order to match the SPSS spectrum.
G_REFSCALE	is the scaling factor applied to the reference spectrum in order to match the SPSS spectrum (equal to 1 if no scaling was applied).
G_WAVECUTMIN	indicates the junction point in the blue between the model and the DU13 spectrum (for shorter wavelengths, the model replaces and extends the spectrum).
G_WAVECUTMAX	indicates the junction point in the red between the model and the DU13 spectrum (for longer wavelengths, the model replaces and extends the spectrum).
G_QCflag	is the quality control flag for EXTENDEDFLUXTABLE. If no problems are encountered, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. The value G_QCflag=2 is not allowed for EXTENDEDFLUXTABLE datatype.
G_QCval	is a flag indicating which problem(s) was encountered with this extended flux table (see Section 4.18.1 Table 32 for further information).
G_NOTES	contains the notes taken by the reducer during the extended flux table production.
VERSION	indicates to which SPSS release belongs a given entry in this extended flux table (see Section 5.1 for further information).

TABLE 31: **Continued.**

FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `EXTENDEDFLUXTABLE_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.18.1   G_QCval values for datatype EXTENDEDFLUXTABLE

The G_QCval allowed values for EXTENDEDFLUXTABLE datatype are 4-digit number, the first digit always being equal to 8. Also for EXTENDEDFLUXTABLE datatype, the 24xx flags are not available and can not be activated. The G_QCval values for EXTENDEDFLUXTABLE datatype are reported in Table 32.

TABLE 32: **G_QCval definition for EXTENDEDFUXTABLE datatype**

Value		Description
8000		generic problem on the extended flux table.
8100		Bad fit.
	8110	Bad fit at the red edge: this flag is activated if, at the red edge of the spectrum, the DU13 SPSS spectrum and the reference spectrum are not in good agreement.
	8120	Bad fit at the blue edge: this flag is activated if, at the blue edge of the spectrum, the DU13 SPSS spectrum and the reference spectrum are not in good agreement.
	8130	Slope in SPSS/Reference fit residuals: this flag is activated if the slopes of the two spectra are significantly different. In this case, a slope in the fit of the residual remains.
8200		Different spectral type: this flag is activated if the spectral type of the synthetic spectrum used as reference to extend the spectrum of a given SPSS is in disagreement with the literature SPSS spectral type.

4.19   Datatype SHORTLC: datamodel definition

The filenames of the photometric short-term light curves (SHORTLC fro brevity) must be compliant with the following naming convention: **st.SPSS**<**id**>_<**run**>_<**night**>_<**filter**>**.lc**.

SHORTLC datatype is the first of the Photometry Advanced Reduction Steps. The SHORTLC files are ASCII tables containing the SPSS light curve derived using photometric catalogues belonging to a time series acquired for stort-term variability monitoring purposes. Since many

catalogues are used to produce a light curve, SHORTLC does not have a direct 1:1 link with the previous datatype in the reduction chain. Nevertheless, SHORTLC datatype still remains tied to NIGHT table (because no light curves are built using photometri catalogues coming from different nights) and, obviously, with SPSSreference datatype: this implies that SHORTLC datatype can inherit keywords from both these tables. All these potentially inherited keywords are not present in the SHORTLC datamodel, but can be added in its view available to DU13 users via web interface.

In order to describe the datamodel for the SHORTLC datatype, we report here the MySQL *create table* command for the `SHORTTERMLC_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `SHORTTERMLC_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `NNNight` int(10) unsigned NOT NULL,
  `G_FILE` varchar(400) NOT NULL,
  `G_ID` int(10) NOT NULL,
  `G_PROD` enum('ShortLC') NOT NULL,
  `G_RED` char(20) NOT NULL,
  `G_FILTER` enum('B','V','R','I') NOT NULL,
  `G_VARIFLAG` enum('uncertain','constant','variable') NOT NULL,
  `G_SHORTAMP` double NOT NULL,
  `G_SIGPREC` double NOT NULL,
  `G_SIGSPSS` double NOT NULL,
  `G_QCflag` enum('0','1','2') NOT NULL,
  `G_QCval` varchar(255),
  `G_NOTES` text COLLATE latin1_general_cs DEFAULT NULL,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int unsigned NOT NULL,
  PRIMARY KEY (`NN`),
  UNIQUE KEY (`G_FILE`,`NNNight`,`VERSION`),
  CONSTRAINT FOREIGN KEY (`NNNight`) REFERENCES `NIGHT` (`NN`),
  CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the `SHORTTERMLC_TBL` database table keywords are available in Table 33.

TABLE 33: `SHORTTERMLC_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the short-term light curve belongs to. This is extrapolated from metadata during data ingestion and used to link `SHORTTERMLC_TBL` entries to the `NIGHT` table entries.

TABLE 33: **Continued.**

G_FILE	is the filename (naming convention compliant) of the short-term light curve file (including the directory path).
G_PROD	defines the datatype. For SHORTLC datatype is always set to ShortLC.
G_RED	indicates who produced this short-term light curve (the reducer).
G_FILTER	is the filter used during acquisition.
G_VARIFLAG	is the variability flag (out to uncertain, constat or variable) assigned to the short-term light curve.
G_SHORTAMP	contains different information depending on the G_VARIFLAG value: if G_VARIFLAG = constant: G_SHORTAMP is the minimum tested amplitude (even if the SPSS varies, its amplitude is lower than this value); if G_VARIFLAG = variable: G_SHORTAMP is the maximum amplitude observed in the light curve ; if G_VARIFLAG = uncertain: G_SHORTAMP is set equal to $3*$G_SIGSPSS
G_SIGPREC	is the average standard deviation of the comparison star light curves (in millimag) and tracks the precision to which the magnitude of constant stars is reproduced over the whole time series.
G_SIGSPSS	is the standard deviation of the SPSS light curve (in millimag).
G_QCflag	is the quality control flag for this short-term light cuerve. If no problems are encountered with the light curve, G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with the light curve, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered with this short-term light curve and/or why the quality control failed (see Section 4.19.2 Table 34 for further information).
G_NOTES	contains the notes taken by the reducer during the light curve production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `SHORTTERMLC_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom given data was loaded and the name of the tarfile in which it was contained.

4.19.1 SHORTLC metadata production

In the metadata file uploaded in SSDC for the ingestion of SHORTLC data there are 12 key-words listed in the following order: G_FILE, G_PROD, G_RED, G_ID, G_FILTER, G_VARI-FLAG, G_SHORTAMP, G_SIGPREC, G_SIGSPSS, G_QCflag, G_QCval, G_NOTES.

The first column of the light curve file lists the 2DPREREDUCED frames used to produce the

photometric catalogues needed to build the light curve. This list is used to link, in `DUEDPRERED_TBL` table each light curve with the prereduced frames used to produce it.

The pipeline for the production of SHORTLC metadata[18] is composed by two different shell scripts to be run in sequence.

4.19.2 G_QCval values for datatype SHORTLC

The G_QCval allowed values for SHORTLC datatype are 4-digit number, the first and second digit always being equal to 61. For SHORTLC datatype, the 2400 flag is not available and can not be activated. The G_QCval values for SHORTLC datatype are reported in Table 34.

TABLE 34: **G_QCval definition for SHORTLC datatype**

Value		Description
6000		generic problem on Photometry Advanced Reduction Steps.
6100		generic problem on the short-term light curve.
6110		less than 30 acquired frames in the time series.
	6111	less than 30 frames passing the quality control: this flag is activated if, after performing both star and frame level quality control procedures (described in SMR-003), less than 30 frames remain in the time series.
	6112	less than 30 survived points: this flag is activated if, although the points formally passed the quality control, they are excluded from the light curve (exclusion due, for example, to veils) and in the light curve less than 30 points remain.
6120		less than 1 hour: this flag is activated if the time series lasts less than 1 hour (even if there are more than 30 points in the light curve).
6130		G_SIGSPSS> 10 mmag: this flag is activated if the standard deviation of the SPSS light curve exceeds 10 mmag.
6140		G_SIGPREC> 10 mmag: this flag is activated if the precision of the light curve exceeds 10 mmag.
6150		only one good comparison star: this flag is activated if only one comparison star passing the quality control is present in the catalogues used to produce the light curve.
6160		only one comparison star in the field of view: this flag is activated if only two stars are present in the prereduced frames (the SPSS and one comparison star).

---

[18]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaSHORTTERMLC.tar`.

Technical Note

4.20 Datatype SPSSverdictSLC: datamodel definition

SPSSVERDICTSLC contains the final verdict concerning the monitoring of short-term variability of each SPSS as reported in Table 1 of SMR-005 (see also Marinoni et al. (2016) for more details). Each SPSS candidate was observed multiple times (on average, roughly 3 time series per SPSS), either to repeat a non-optimal series, or to observe a subset of SPSS with different telescopes to compare the results: the verdict is based on the best light curve obtained for each star.

SPSSVERDICTSLC, being the final result of the first of the Photometry Advanced Reduction Steps (the datatype SHORTLC), together with the best light curve available for a given SPSS is the first Photometry Advanced Data Product of the SPSS observing campaigns. Being a pure metadata datatype, there are no files to be loaded into the archive for SPSSVERDICTSLC. In addition, no pipeline is needed for metadata production as they are directly extracted from an existing table. SPSSVERDICTSLC datatype does not have a direct 1:1 link with the NIGHT table, but retains a direct 1:1 link with both the SPSSrefdata table and some specific entries of the SHOLTLC_TBL. This implies that SPSSVERDICTSLC datatype can inherit (and donate) keywords from (to) both of them. All these potentially inherited keywords are not present in the SPSSVERDICTSLC datamodel, but can be added in its view available to DU13 users via web interface. Likewise, the keywords potentially donated by SPSSVERDICTSLC can be displayed in the SPSSreference datatype view table.

In order to describe the datamodel for the SPSSverdictSLC datatype, we report here the MySQL *create table* command for the SPSSVERDICTSLC_TBL database table:

```
CREATE TABLE IF NOT EXISTS `SPSSVERDICTSLC_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `G_ID` int(3) unsigned zerofill NOT NULL,
  `G_FILESLC` varchar(400) NOT NULL,
  `NNSHORTTERMLC` int(10) unsigned NOT NULL,
  `G_NUMCOMP` int(2) NOT NULL,
  `G_AMPLIM` enum('leq','eq','geq') NOT NULL,
  `G_VERDICTSV` enum('Constant','Variable') NOT NULL,
  `G_PROD` enum('ShortTermConstancyVerdict') NOT NULL,
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  UNIQUE KEY `G_ID` (`G_ID`),
  KEY `NNSHORTTERMLC` (`NNSHORTTERMLC`),
  CONSTRAINT FOREIGN KEY (`NNSHORTTERMLC`) REFERENCES `SHORTTERMLC_TBL` (`NN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the SPSSVERDICTSLC_TBL database table keywords are available in Table 35.

TABLE 35: `SPSSVERDICTSLC_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
G_ID	is the SPSS ID, a unique number associated to each SPSS. It is used to link `SPSSVERDICTSLC_TBL` entries to `SPSSrefdata` entries.
G_FILESLC	is the filename (naming convention compliant) of the best light curve available for the SPSS. From this light curve the verdict about constancy or variability of the SPSS is derived.
NNSHORTTERMLC	is the unique entry identifier of the G_FILESLC in the `SHORTTERMLC_TBL` table. It is extrapolated during ingestion and used to link `SPSSVERDICTSLC_TBL` entries to the corresponding `SHORTTERMLC_TBL` entry.
G_NUMCOMP	is the number of comparison stars used for the light curve production.
G_AMPLIM	indicates whether the measured amplitude of the light curve is an upper (leq) or lower (geq) limit or a determination (eq) of the amplitude.
G_VERDICTSV	is the final verdict about constancy or variability for the SPSS candidate.
G_PROD	defines the datatype. For SPSSVERDICTSLC datatype is always set to ShortTermConstancyVerdict.
G_NOTES	contains the notes as in Table 1 of SMR-005.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).

4.21 Datatype FRAMEABSPHOT: datamodel definition

The FRAMEABSPHOT datatype contains the SPSS absolute magnitude measured on single frames. They are the second of the Photometry Advanced Reduction Steps. Being a pure metadata datatype, there are no files to be loaded into the archive for FRAMEABSPHOT.

FRAMEABSPHOT datatype has a direct 1:1 link with the previous datatype in the reduction chain (PHOTCAT), and obviously belong to a single observing night: this implies that a link with the NIGHT table entries is always possible, and that FRAMEABSPHOT datatype can inherit a lot of keywords from not only these two tables, but also from all other linked tables up to RAW table (through the 2DPREREDUCED link). All these potentially inherited keywords are not present in the FRAMEABSPHOT datamodel, but can be added in its view available to DU13 users via web interface.

In order to describe the datamodel for the FRAMEABSPHOT datatype, we report here the MySQL *create table* command for the `FRAMEABSPHOT_TBL` database table:

```
CREATE TABLE IF NOT EXISTS `FRAMEABSPHOT_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
```

```
'NNNight' int(10) unsigned NOT NULL,
'G_ID' int(10) DEFAULT NULL,
'G_2DPARENT' varchar(400) DEFAULT NULL,
'DUEDPARENT' int(10) unsigned NOT NULL,
'G_MAG' DOUBLE NOT NULL,
'G_ERRMAG' DOUBLE NOT NULL,
'G_PROD' enum('FrameAbsPhot') NOT NULL,
'G_RED' char(20) COLLATE latin1_general_cs NOT NULL,
'G_QCflag' enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
'G_QCval' varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
'G_NOTES' text COLLATE latin1_general_cs,
'VERSION' int(3) unsigned NOT NULL,
'FROMREL' int(3) unsigned NOT NULL,
'UPLOADEDFILENN' int(10) unsigned NOT NULL,
UNIQUE KEY 'G_ID' ('G_ID', 'G_2DPARENT','VERSION'),
KEY 'NNNight' ('NNNight'),
KEY 'DUEDPARENT' ('DUEDPARENT'),
KEY 'UPLOADEDFILENN' ('UPLOADEDFILENN'),
CONSTRAINT FOREIGN KEY ('NNNight')  REFERENCES 'NIGHT' ('NN'),
CONSTRAINT FOREIGN KEY ('DUEDPARENT') REFERENCES 'DUEDPRERED_TBL'('NN'),
CONSTRAINT FOREIGN KEY ('UPLOADEDFILENN') REFERENCES 'UPLOADEDFILE'('NN')
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

More information on the FRAMEABSPHOT_TBL database table keywords are available in Table 36.

TABLE 36: FRAMEABSPHOT_TBL **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
NNNight	is the unique entry identifier of the night the absolute magnitude measure belongs to. It is extrapolated from metadata during data ingestion and used to link FRAMEABS-PHOT_TBL entries to the NIGHT table entries.
G_ID	this is the SPSS ID, a unique number associated to each SPSS. Although this keyword is redundant and would have been possible to inherit it directly from the parent datatype, we decided to add it directly in the datamodel in order to keep as simple as possible the join between Photometry Advanced Reduction Steps datatypes.
G_2DPARENT	is the filemane (naming convention compliant) of the prereduced frame from which the photometric catalogue used to compute the absolute magnitude was extracted. Even if this keyword is redundant, it is kept in the FRAMEABSPHOT datamodel for consistency check purposes.
DUEDPARENT	is the unique entry identifier of the prereduced frame from which this absolute magnitude was measured using the extracted photometric catalogue. It is extrapolated from metadata (using G_2DPARENT + G_ID) during data ingestion and used to link FRAMEABS-PHOT_TBL entries to the corresponding DUEDPRERED_TBL entry.
G_MAG	is the absolute magnitude for a given SPSS computed from the G_2DPARENT prereduced frame.
G_ERRMAG	is the error on G_MAG.

TABLE 36: **Continued.**

G_PROD	defines the datatype. For FRAMEABSPHOT datatype is always set to FrameAbsPhot.
G_RED	indicates who produced this absolute magnitude measure (the reducer).
G_QCflag	is the quality control flag for this absolute magnitude measure. If no problems are encountered G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. If the quality control fails and/or there are serious problems with this measure, then G_QCflag is set to 2.
G_QCval	is a flag indicating which problem(s) was encountered and/or why the quality control failed (see Section 4.21.2 Table 37 for further information).
G_NOTES	contains the notes taken by the reducer during the frame absolute photometry production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).
UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `FRAMEABS-PHOT_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.21.1 FRAMEABSPHOT metadata production

In the metadata file uploaded in SSDC for the ingestion of FRAMEABSPHOT data there are 9 keyword listed in the following order: G_ID, G_2DPARENT, G_MAG, G_ERRMAG, G_PROD, G_RED, G_QCflag, G_QCval, G_NOTES.

Entries in the `FRAMEABSPHOT_TBL` table are linked to `DUEDPRERED_TBL` using the unique entry identifier of the photometric prereduced parent file, extrapolated from G_2DPARENT+G_ID during the ingestion phase exploiting the DU13 naming convention rules. Through G_ID keyword, `FRAMEABSPHOT_TBL` entries can be also linked to SPSSreference datatype.

The pipeline for the production of FRAMEABSPHOT metadata[19] is composed by two different shell scripts to be run in sequence.

---

[19]A direct download is available at:
`http://yoda.bo.astro.it/wiki/index.php/File:MetaFRAMEABSPHOT.tar.`

4.21.2 G_QCval values for datatype FRAMEABSPHOT

The G_QCval allowed values for FRAMEABSPHOT datatype are 4-digit number, the first and second digit always being equal to 62. For FRAMEABSPHOT datatype, the 2400 flag is not available and can not be activated. The G_QCval values for FRAMEABSPHOT datatype are reported in 37.

TABLE 37: **G_QCval definition for FRAMEABSPHOT datatype**

Value	Description
6000	generic problem on Photometry Advanced Reduction Step.
6200	generic problem on frame absolute photometry.
6210	too short time exposure: this flag is activated if Texp < minimum shutter time.
6220	night worsening: this flag is activated if the quality during the night worsens, passing from photometric to non-photometric.
6230	problems coming from frames used: this flag is activated if at least one of the images of the night point is affected by problems
6240	outlier: this flag is activated if, in a given filter of a given night point, one of the measures significantly differs from the others.

4.22 Datatype SPSSABSPHOT: datamodel definition

The SPSSABSPHOT datatype contains the SPSS final absolute magnitudes calculated using all the (good) measurements available in the FRAMEABSPHOT datatype for the SPSS. Even if it is a datatype of pure metadata, it will be accompanied by a plot (displayed as a thumbnail in the view available via web interface) showing the absolute magnitude of a given SPSS at different epochs. The filename of the plot must be compliant with the following naming convention: **SPSS<id>_ABSPHOT.jpg**.
For each SPSS the corresponding plot will be saved in the archive using the appropriate directory tree created for the SPSS-only dependent datatypes (one versioned directory for each SPSS).

SPSSABSPHOT is the second Photometry Advanced Data Product of the SPSS observing campaigns. This datatype does not have a direct 1:1 link with the NIGHT table (nor with previous datatypes), but retains a direct 1:1 link with the SPSSrefdata table. This implies that SPSS-ABSPHOT datatype can inherit (and donate) keywords from (to) the SPSSrefdata table. All these potentially inherited keywords are not present in the SPSSABSPHOT datamodel, but can be added in its view available to DU13 users via web interface. Likewise, the keywords potentially donated by SPSSABSPHOT can be shown in the SPSSreference datatype view table.

At the moment, the SPSSABSPHOT datamodel is well defined, but the implementation of this

datatype in the SSDC system is ongoing, as well as the pipeline for the metadata production and the G_QCval allowed values definition.

In order to describe the datamodel for the SPSSABSPHOT datatype, we report here the MySQL *create table* command that will be run when the `SPSSABSPHOT_TBL` database table entries will be ready to be ingested in the system:

```
CREATE TABLE IF NOT EXISTS `SPSSABSPHOT_TBL` (
  `NN` int(10) unsigned NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `G_ID` int(3) unsigned zerofill NOT NULL,
  `G_FILE` varchar(400) COLLATE latin1_general_cs NOT NULL,
  `G_PROD` enum('SPSSabsPhot') COLLATE latin1_general_cs NOT NULL,
  `G_RED` char(20) COLLATE latin1_general_cs NOT NULL,
  `G_NBPOINTS` INT NOT NULL,
  `G_NBNIGHTS` INT NOT NULL,
  `G_NBTELS` INT NOT NULL,
  `G_B` DOUBLE DEFAULT NULL,
  `G_BERR` DOUBLE DEFAULT NULL,
  `G_BLIT` DOUBLE DEFAULT NULL,
  `G_BERRLIT` DOUBLE DEFAULT NULL,
  `G_BLITSOURCE` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_Bbest` DOUBLE NOT NULL,
  `G_BERRbest` DOUBLE NOT NULL,
  `G_NVPOINTS` INT NOT NULL,
  `G_NVNIGHTS` INT NOT NULL,
  `G_NVTELS` INT NOT NULL,
  `G_V` DOUBLE DEFAULT NULL,
  `G_VERR` DOUBLE DEFAULT NULL,
  `G_VLIT` DOUBLE DEFAULT NULL,
  `G_VERRLIT` DOUBLE DEFAULT NULL,
  `G_VLITSOURCE` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_Vbest` DOUBLE NOT NULL,
  `G_VERRbest` DOUBLE NOT NULL,
  `G_NRPOINTS` INT NOT NULL,
  `G_NRNIGHTS` INT NOT NULL,
  `G_NRTELS` INT NOT NULL,
  `G_R` DOUBLE DEFAULT NULL,
  `G_RERR` DOUBLE DEFAULT NULL,
  `G_RLIT` DOUBLE DEFAULT NULL,
  `G_RERRLIT` DOUBLE DEFAULT NULL,
  `G_RLITSOURCE` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_Rbest` DOUBLE NOT NULL,
  `G_RERRbest` DOUBLE NOT NULL,
  `G_NIPOINTS` INT NOT NULL,
  `G_NINIGHTS` INT NOT NULL,
  `G_NITELS` INT NOT NULL,
  `G_I` DOUBLE DEFAULT NULL,
  `G_IERR` DOUBLE DEFAULT NULL,
  `G_ILIT` DOUBLE DEFAULT NULL,
  `G_IERRLIT` DOUBLE DEFAULT NULL,
  `G_ILITSOURCE` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_Ibest` DOUBLE NOT NULL,
  `G_IERRbest` DOUBLE NOT NULL,
  `G_QCflag` enum('0','1','2') COLLATE latin1_general_cs NOT NULL,
  `G_QCval` varchar(255) COLLATE latin1_general_cs DEFAULT NULL,
  `G_NOTES` text COLLATE latin1_general_cs,
  `VERSION` int(3) unsigned NOT NULL,
  `FROMREL` int(3) unsigned NOT NULL,
  `UPLOADEDFILENN` int(10) unsigned NOT NULL,
  UNIQUE KEY (`G_ID`, `VERSION`),
  KEY `G_ID` (`G_ID`),
  CONSTRAINT FOREIGN KEY (`G_ID`) REFERENCES `SPSSrefdata` (`G_ID`)
  CONSTRAINT FOREIGN KEY (`UPLOADEDFILENN`) REFERENCES `UPLOADEDFILE` (`UPLOADEDFILENN`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_cs;
```

Technical Note

More information on the `SPSSABSPHOT_TBL` database table keywords are available in Table 38.

TABLE 38: `SPSSABSPHOT_TBL` **keywords description**

Keyword	Description
NN	is the incremental unique numeric identifier of each table entry, added at each new entry ingestion in the table.
G_ID	this is the SPSS ID, a unique number associated to each SPSS.
G_FILE	is the filename (naming convention compliant) of the plot associated with the final absolute photometry (including the directory path).
G_PROD	defines the datatype. For SPSSABSPHOT datatype is always set to SPSSabsPhot.
G_RED	indicates who produced this SPSS final absolute photometry measurements (the reducer).
G_NBPOINTS	is the number of single measurements in the B filter used to obtain G_B and G_BERR.
G_NBNIGHTS	is the number of different nights all the points used to calculate G_B and G_BERR belong to.
G_NBTELS	is the number of different telescopes used to acquire all the points used for G_B and G_BERR computation.
G_B	is the SPSS absolute magnitude in B band as computed using DU13 data.
G_BERR	is the error on G_B.
G_Blit	is the absolute magnitude in B band from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_BERRlit	is the error on G_Blit from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_BlitSOURCE	is the literature source for G_Blit and G_BERRlit.
G_Bbest	is the best choice between G_B and G_Blit.
G_BERRbest	is the error on the best choice and obviously depends on which measure is kept. If G_Bbest=G_B, G_BERRbest=G_BERR. Otherwise, G_BERRbest=G_BERRlit.
G_NVPOINTS	is the number of single measurements in the V filter used to obtain G_V and G_VERR.
G_NVNIGHTS	is the number of different nights all the points used to calculate G_V and G_VERR belong to.
G_NVTELS	is the number of different telescopes used to acquire all the points used for G_V and G_VERR computation.
G_V	is the SPSS absolute magnitude in V band as computed using DU13 data.
G_VERR	is the error on G_V.
G_Vlit	is the absolute magnitude in V band from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_VERRlit	is the error on G_Vlit from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_VlitSOURCE	is the literature source for G_Vlit and G_VERRlit.
G_Vbest	is the best choice between G_V and G_Vlit.
G_VERRbest	is the error on the best choice and obviously depends on which measure is kept. If G_Vbest=G_V, G_VERRbest=G_VERR. Otherwise, G_VERRbest=G_VERRlit.

TABLE 38: **Continued.**

G_NRPOINTS	is the number of single measurements in the R filter used to obtain G_R and G_RERR.
G_NRNIGHTS	is the number of different nights all the points used to calculate G_R and G_RERR belong to.
G_NRTELS	is the number of different telescopes used to acquire all the points used for G_R and G_RERR computation.
G_R	is the SPSS absolute magnitude in R band as computed using DU13 data.
G_RERR	is the error on G_R.
G_Rlit	is the absolute magnitude in R band from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_RERRlit	is the error on G_Rlit from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_RlitSOURCE	is the literature source for G_Rlit and G_RERRlit.
G_Rbest	is the best choice between G_R and G_Rlit.
G_RERRbest	is the error on the best choice and obviously depends on which measure is kept. If G_Rbest=G_R, G_RERRbest=G_RERR. Otherwise, G_RERRbest=G_RERRlit.
G_NIPOINTS	is the number of single measurements in the I filter used to obtain G_I and G_IERR.
G_NINIGHTS	is the number of different nights all the points used to calculate G_I and G_IERR belong to.
G_NITELS	is the number of different telescopes used to acquire all the points used for G_I and G_IERR computation.
G_I	is the SPSS absolute magnitude in I band, as computed using DU13 data.
G_IERR	is the error on G_I.
G_Ilit	is the absolute magnitude in I band from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_IERRlit	is the error on G_Ilit from literature. This keyword is NOT NULL only if needed (i.e. we do not have good measurements for a given SPSS).
G_IlitSOURCE	is the literature source for G_Ilit and G_IERRlit.
G_Ibest	is the best choice between G_I and G_Ilit.
G_IERRbest	is the error on the best choice and obviously depends on which measure is kept. If G_Ibest=G_I, G_IERRbest=G_IERR. Otherwise, G_IERRbest=G_IERRlit.
G_QCflag	is the quality control flag for these final absolute photometry measurements. If no problems are encountered G_QCflag value is set to 0 (and G_QCval is NULL). If the quality control is partially passed, G_QCflag is set to 1. The value G_QCflag=2 is not allowed for SPSSABSPHOT datatype.
G_QCval	is a flag indicating which problem(s) was encountered with this SPSS final absolute photometry (at present, the flag allowed values are under definition).
G_NOTES	contains the notes taken by the reducer during the SPSS final absolute photometry production.
VERSION	indicates to which SPSS release belongs a given entry in this table (see Section 5.1 for further information).
FROMREL	indicates to which SPSS release the "real" file saved in the archive belongs to (see Section 5.1 for further information).

TABLE 38: **Continued.**

UPLOADEDFILENN	during the ingestion, the value of this keyword is extrapolated from the `UPLOADEDFILE` table (keyword NN), and used here to link each `SPSSABS-PHOT_TBL` entry to the corresponding `UPLOADEDFILE` table entry. This is useful to know, in case of problems, when and by whom certain data was loaded and the name of the tarfile in which it was contained.

4.23 Datamodels still to be defined

Among the work in progress we have the SYNTHPHOT datatype, for which the datamodel is still to be defined. Synthetic photometry will be used during the ABSCAL production in order to scale spectra observed in grey nights. At the moment, the reduction pipelines for synthetic photometry are not finalized yet, and no data coming from non perfectly photometric nights have been released to CU5. When reduction pipelines will be finalized and the definition of the datatype robust enough, its datamodel will be decided, the metadata pipelines will be produced and the SYNTHPHOT datatype will be added to the SPSS@SSDC system.
This document will be updated accordingly.

5 SPSS@SSDC Archive organization

As shown in Figure 3 the SPSS@SSDC Archive is formed by two different branches: the *RAW* and the *Reduced and DataProduct*.
In the *RAW* branch data are divided into different directories depending on which night they were acquired in. The RAW directory names follow the naming convention: <run>-<tel>-<inst>_<night>. Being RAW the data as they come from the telescopes used during the observing campaigns, they do not change and this part of the archive does not need to be versioned.
In the *Reduced and DataProduct* branch, instead, the data needs to be versioned to trace the different SPSS internal deliveries to DPAC. This is the reason why there are several sub-branches, all of them organized in the same way. Depending on datatypes, data are organized in two different kind of directories:

- Night-dependent datatypes: these data are divided into different directories depending on which night they belong to. These directory follow the naming convention: RED_<run>-<tel>-<inst>_<night>;

- SPSSonly-dependent datatypes: these data are divided into different directories depending on which SPSS they belong to. These directory follow the naming convention: SPSS<id>.
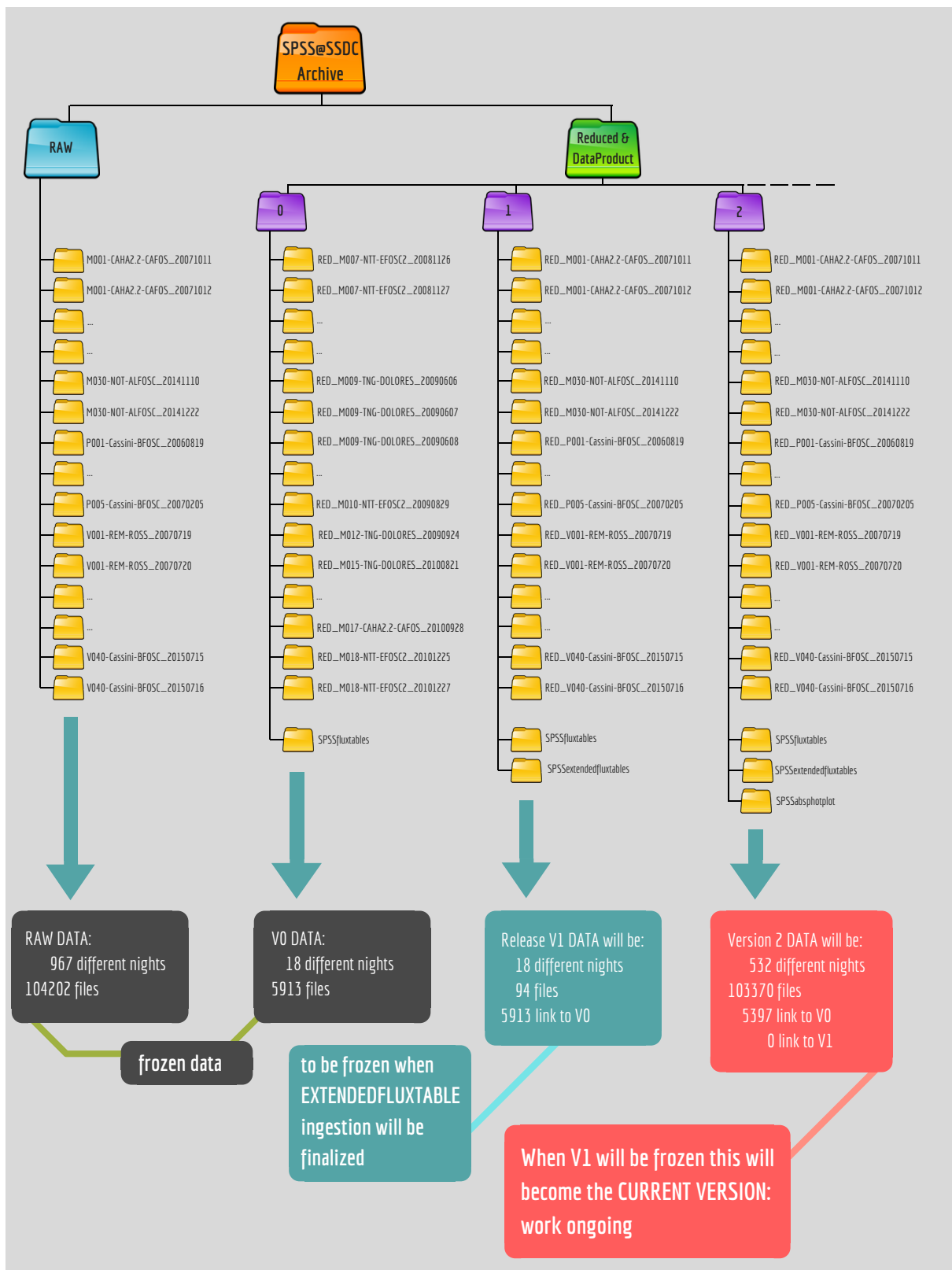
FIGURE 3: Schematic view of how the SPSS archive is organized. The content of the current version of the archive is continuously updated: numbers in the figure are up to date as July 2018.

The final number of the *Reduced and DataProduct* sub-branches will depend on the number of the SPSS internal releases that will be delivered to DPAC.

5.1 Archive versioning

Since there are different SPSS internal releases, used to calibrate the Gaia spectrophotometric data belonging to different Gaia data releases, also the SPSS database and archive in SSDC need to be versioned.

For both timing[20] and architecture[21] issues, it was not possible to ingest data starting from release V0 and then continuing with the ingestion of the following releases. Instead, the current version of the archive was set to 1 and all data were ingested as they belonged to this archive version. Files belonging to the V0 release were then were then frozen manually as soon as the different datatypes were implemented in the system and files belonging to release V0 were ingested. This means that in the SPSS@SSDC system the versioning is built backwards, building the release starting from a "current version" of both archive and database.

A release freezing is obtained in this framework in the following way:

- in the archive, the versioning is performed by creating, in the *Reduced and DataProduct* branch, sub-branches with the same structure but different roots: 0 for V0, 1 for V1, 2 for V2 and so on. In the directories contained in each sub-branch, files are hosted in two different ways:

  - if the file belongs to a given release, in its corresponding directory in the release branch there will be the "real" file. When a frozen release is created, the frozen file is moved from the current version of the archive to the frozen one. In the current version, a symbolic link pointing to the frozen file is created;

  - if this file does not change from one release to the next one, in the following release there will be a symbolic link to the "real" file contained in the previous release. Obvioulsy, if the current version a given file (linked to a real file frozen in a given previous relese) is changed by a new one (obtained, let's say, using a different and more complete version of the reduction pipeline), the symbolic link will be broken and the new file saved in the corresponding directory.

- in the database, the versioning is obtained by adding a new entry for each frozen file, and changing:

  - in the added entry the value of the VERSION keyword from the current version value to the frozen release value;

---

[20]The SPSS@SSDC project started after the first SPSS data delivery to DPAC. In addition, the DU13 work dedicated to V1 and V2 deliveries was started yet and not all datatypes werefully defined.

[21]Datatypes are related using a parent-child relation, and data must therefore be entered in the system starting from the parent and then descending towards the children.

- in the added entry the value of the FROMREL keyword from the current version value to the frozen release value;

- in the added entry the value of the G_FILE keyword in order to point the real file in the frozen release;

- in the entry pointing to the current version, the value of the FROMREL keyword from the current version value to the frozen release value (until a new, different file will be possibly ingested in the current version).

This means that, for a given file belonging to a given datatype, up to N entries in the corresponding database table could be present (with N being equal to the current version value).

At moment, in the archive we have a frozen the V0 release, and the current release is set to 1. When EXTENDEDFLUXTABLE data will be uploaded in the system, the V1 freezing will take place. To do this, the current version will be set to 2, and all real files and symbolic links present in the sub-branch 1 on the archive will be moved to sub-branch 2 leaving the directory structure unchanged. Then, the V1 release will be build backward moving back the EXTENDEDFLUXTABLE files, because the only difference between V0 and V1 release is the extension of V0 FLUXTABLE using models. The same will be done when the V2 release will be frozen: all files and link will be moved in the current version 3 of the archive, and only files really belonging to V2 will be moved back to this release.

6 References

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