

INTEGRAL Y7+ IUG 10-11 Dec 2009



IBIS Status
P. Ubertini



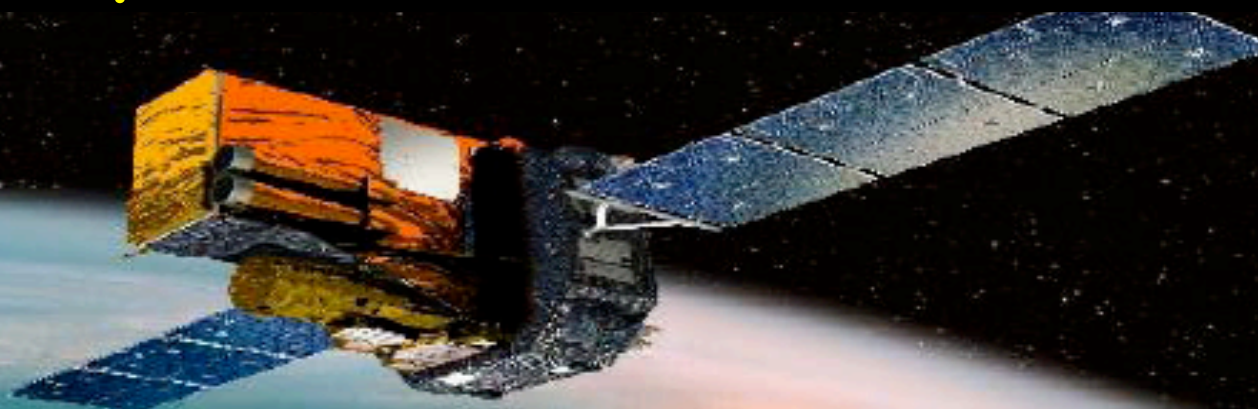
ESTEC May 7- 8, 2007

INTEGRAL Mission Extension Operation Review Meeting

P. Ubertini, IASF/INAF - Roma



Status April 2007 vs December 2009



*IBIS status
and time evolution outlook*

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IBIS HARDWARE STATUS

- All the on board IBIS subsystems are currently nominal.
- 4.5 years after the injection in orbit (17th of October 2002) no equipment has been lost.
- No redundant part has been used so far, a part for the redundant calibration unit active/triggering system that has been operated during the commissioning phase to test it.
- Then the instrument is running with all subsystems in nominal configuration (DPE1, ISGRI, PICsIT, VETO, CU1 and HEPI).
- **No single failure or degradation has been reported so far.**



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IBIS OPERATION: Status of the Instrument

- The IBIS instrument operates nominally to date
- No degradation has been observed in science data production and/or quality
- Since the launch several anomalies occurred.
- Most of them can be considered minor since they were fixed following the recovery actions described in the IBIS User Manual with an on-call support from the Operations Manager
- Few of them required a support/advice at MOC of people from the IBIS System Team and were resolved accordingly



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Temperature & count rate evolution

- The IBIS detector temperatures have been evolving well within safe range.
- The IBIS TM allocation has been 120 KTS/cycle since 20/03/2006 when 1 packet was conceded to SPL. To minimise the impact on IBIS science data flow a change of configuration for PRCsIT calibration histograms was applied.
- Apart for periods very close to the radiation belts, the detectors and veto counter rates are very stable and fully modelised also taking into account the on board calibration data.
- In the following the Veto HKD total counts versus time are reported from Jan 2004 to date. The picture shows the continuous and nominal performance of Veto subsystem following the actual background variation.



CONCLUSIONS

Based on the operations to date, the outlook for the future operations and scientific performance of IBIS is very good:

all prime units are still in use and full redundancy preserved

No big issue is expected in correlation with the perigee drop in view of the SIGMA experience, initial orbit operation data and strong solar flares activation performance of IBIS. ~~Perigee raise is also possible.~~

On Board and on Ground available redundancy and status:

- all the in flight redundant systems are untouched
- all the needed procedures are implemented and available
- IBIS QM is fully maintained and operative at IASF-Roma clean room, inclusive of ground test equipment and S/C simulators
- Full support available for calibration and software upgrade by the IBIS Instrument Team



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IBIS TIME EVOLUTION OUTLOOK

The main effect that can affect the IBIS performance in the future is the possible instrument degradation due to in orbit operation. So far this evolution has been minimal and no actual failures reported.

The main signs of stability are:

- the **stability of the gain** and evident slow increase of ISGRI and PICSIT **dead pixels** (negligible so far)
- the **high voltage stability of the VETO** (due to good performance of the BGO and PMs) and
- the stability of the countrate and the exp drop of calibration count/rate, fully compensated by initial cross-check with ground calibration and background line fitting for ISGRI and long term stability of PICSIT.

>>> We can conclude that the IBIS gain/evolution is FULLY under control and the instrument is, overall, very healthy



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National Agencies Support

- Most of the IBIS Team national agencies are still supporting the mission at an excellent level of funding. Sap/Saclay, IASF/INAF and other Institutes are still providing staff members and facilities available. The main activity has been so far the monitoring of the instrument performance, calibration and up-date of the scientific data analysis SW
- In particular, the 16 of April 2010 IASF has co-signed the Integral support contract for the next 3 years (till April 2010) at a level of funding that is about 50% of the initial one (12 FTE)+ 20% funds for data analysis ~0.7M€/year. There are also more than 20 INAF staff FULL TIME dedicated to INTEGRAL equivalent to ~2M€/year
- No problem for the future availability and operability of the QM actually fully working in the dedicated clean room at the premises of IASF-Rome.
- To date the total number of people on contracts directly devoted to the Integral in orbit maintenance and data analysis is 12, vs the 18 of the initial phase. Supporting contracts for data analysis are also undergoing on dedicated scientific topics.

Contracts on going I/008/07/0

Situazione dei Contratti a termine, assegni di ricerca e borse di dottorato: come previsto nell'offerta, sono stati perfezionati tutti i rinnovi del personale ex art. 23, già impegnato nel programma INTEGRAL, ed e' stato espletato il concorso per il rinnovo degli stabilizzati INAF.

Tipologia	n.	Durata (anni)
Assegno di ricerca	2	3
Art. 23	7	3
Borsa di dottorato	2	3

Lista del personale a contratto attualmente impiegato nel programma:

Contrattista	Tipologia Istituto	Decorrenza
★ F. Capitanio	Art 15 IASF-Roma	1 novembre 2009 Rinn. 4 mesi
★ M. T. Focchi	Art. 15 IASF-Roma	1 agosto 2009
★ R. Landi	Art. 15 IASF-Bologna	1 aprile 2009
★ V. Sguera	Art. 15 IASF-Roma	1 giugno 2009
★ A. Paizis	Art. 15 IASF-Milano	1 novembre 2009 Rinn. 4 mesi
★ F. Panessa	Art. 15 IASF-Roma	1 giugno 2009
★ A. Tarana	Art. 15 IASF-Roma	1 agosto 2009
★ A. Tarana	Ass. Ric. IASF-Roma	1 dicembre 2008
★ V. Bianchin	Ass. Ric. IASF-Bologna	1 settembre 2009
★ P. Parisi	Borsa di dottorato IASF-Bologna,	Attiva
★ S. Gianni'	Borsa di dottorato IASF-Roma,	Attiva

Work Package 1000 STATUS

★ Facilities & Equipments

- IASF clean room with EQM/FS IBIS in Rome fully operative and ready for ad hoc intervention on the QM

★ Ibis CED and Mass Storage (Resp. M. Federici)

Nominally operating 24 hours-7days

Il centro di calcolo è attualmente strutturato con 2 sistemi di storage dati **da 50 TeraBytes**. L'unità di calcolo è stata rinnovata attraverso un cluster di 30 macchine con processore intel quad6600, per un totale di 120 cpu che consentono una potenza di calcolo di circa **300 GigaFlops**. Il cluster è dotato di una area Home di circa 6 TerabBytes in configurazione Raid 6 su cui sono depositati i risultati delle analisi scientifiche. In aggiunta, i dati sono distribuiti on- line in una struttura di Shared File System. Il precedente sistema è tuttora mantenuto in vita come sistema di emergenza.

Dai test effettuati risulta un aumento di velocità di un fattore 60 rispetto al vecchio sistema.

★ Calibration Activities (Resp. A. Bazzano): See Francois Lebrun presentation

Work Package 1000 status

★ Procedure Operazionali. (Operation Manager G.La Rosa)

During the reference period no main anomalies:

1) 25/05/09. IBIS MCE 5,6,7 e 8 OFF: LATCH UP on POWER MODULE

Reason thought to be due to Single Event Upset (SEU) due to Cosmic radiation with Electronics that has induced a latch-up.

Action: OFF-ON Procedure solved the problem.

The apparatus was the Power Module that powerises ISGRI modules 5,6,7 and 8.

2) 26/06/09. IBIS PICSIT PDM01 LATCH UP

Same as above: latch-up due to SEU on PICSIT module PDM01. It has been switched on with a standard procedure.

The last latch up, on a PICSIT module, happened the 02/04/09 (modulo PDM03).

3) 21/07/09. IBIS VETO VDM08 HV BREAKDOWN

This is a well known anomaly with a consolidated procedure to solve it, in this case for VETO module VDM08.

Work Package 1000 status

★ On-board SW (IASF-VEGA): no anomaly Status of the GSE Hardware

1. No crash of the Instrument Application Software (IASW) in the last period
2. After the agreement between INAF, ESA and VEGA, all the equipments and the associated know-how of the support activity for the IBIS IASW maintenance and improvement had been moved from IAAT Tuebingen to MOC (ESA) Darmstadt
3. The Hardware problem related to one of the computer of the Software Development and Validation Facility (SDVF) has been fixed. Now the system is ready to operate as planned
4. A new patch of the on board SW has been compiled. It contains a minor change: namely, the alert class of the On Event Message "PICSIT NOISY PIXEL" has been dropped from 2 (alarm) to 0 (notify), as already decided in the previous meeting. The Patch will be finally implemented after tests on the simulator.

Seven years of INTEGRAL

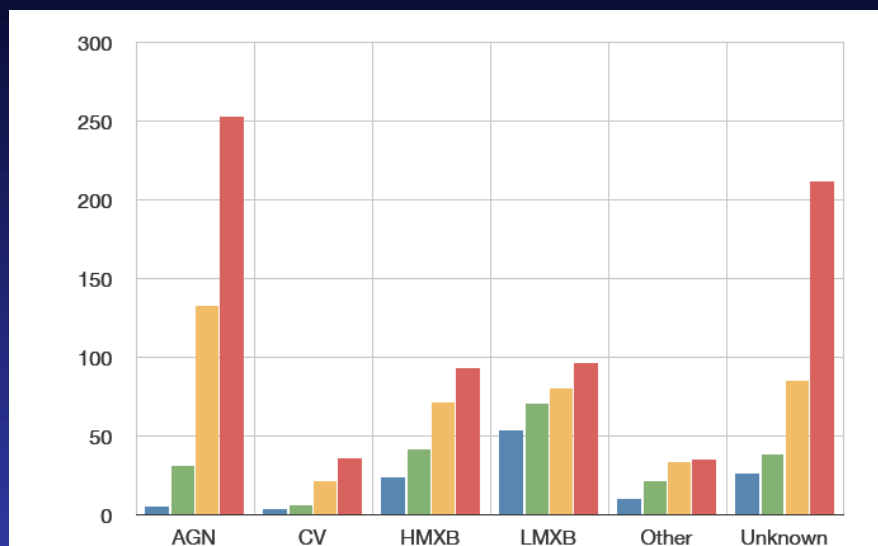
"EXREME UNIVERSE "

Otranto, Lecce, Italy, October 13-17 2009

100 participants
Successfully exploited
Proceedings ongoing

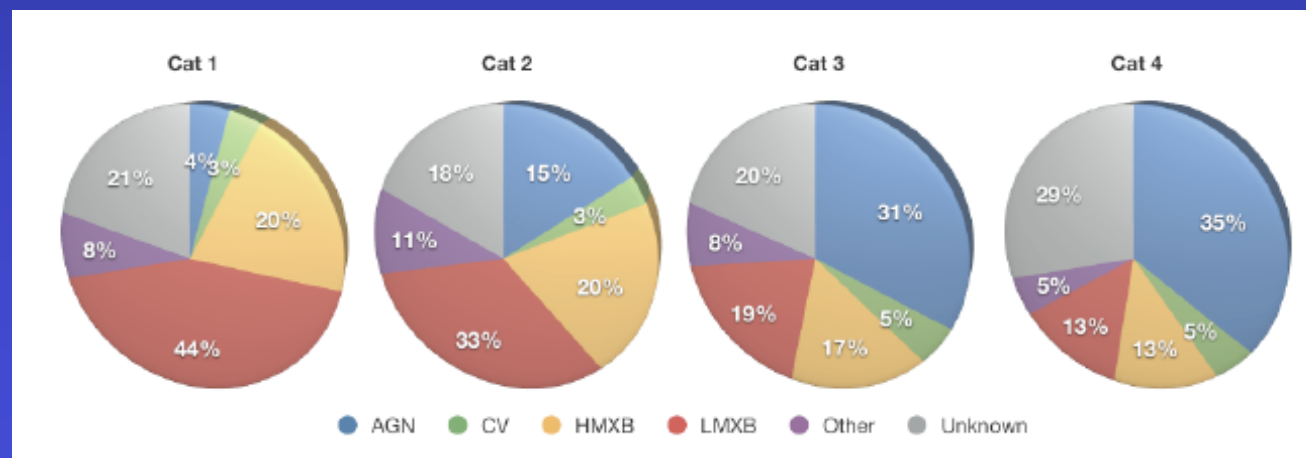


4th Catalogo IBIS



Evoluzione del tipo e del numero di sorgenti dal primo al quarto Catalogo. L'esposizione e' chiaramente riflessa in questa evoluzione.

Classificazione delle sorgenti rivelate. Anche in questa figura e' riflessa la strategia di osservazioni: dal Core Programme ai Key Programmes



4th IBIS Catalogue: per 1 anno a caccia di sorgenti nelle mappe IBIS in 5 diverse bande di energia su 4 tempi scala diversi : mosaici di tutto il cielo in 4 proiezioni, mappe a livello di rivoluzione, di sequenze di rivoluzioni con lo stesso puntamento



e mappe con la miglior rivelazione come derivata dalle curve di luce dei 1200 eccessi. Abbiamo ora 723 sorgenti con una detezione > 4.5 sigma di cui conosciamo anche il livello di variabilita. Circa il 30% di queste sorgenti non e' associata ancora ad oggetti specifici.

Bird et al. APJS, in press



The Fermi/LAT sky as seen by INTEGRAL/IBIS
Ubertini et al. 2009, ApJ, 706L, 7



The fraction of Compton-thick sources in an INTEGRAL complete AGN sample
Malizia et al., 2009, MNRAS, 399, 944



A failed outburst of H1743-322
Capitanio et al., 2009, MNRAS, 398, 1194

The End...

Articoli scientifici Rilevanti per il Programma (Pubblicati o accettati da Giugno al 30 Novembre 2009)

ApJ: 2 Main Journal and Letter

A&A: 2 Main Journal

NMRAS: 6 Letters & Main Journal

Altro: 6 Articoli accettati per la pubblicazione

Proceedings di Conferenze con referes: 4

ATELs con nuove rivelazioni di IGR sources o follow-ups:
12

GCNs per GRBs or AXPs and SGRs con IBAS:
8

OUTPUT dell'Attività sul Core Programme

Per le attività scientifiche relative al Core Programme sono stati pubblicati o presentati risultati su tutti i Topics assegnati a ricercatori italiani:

- ★ Nuove sorgenti scoperte con INTEGRAL nell'ambito della Surevey di IBIS
- ★ Correlazioni con sorgenti al TeV
- ★ X-ray Burster e loro comportamento ad alte energie, nuovi "outbursts"
- ★ Black Holes deboli
- ★ Pulsars Wind Nebulae
- ★ Black hole in outburst
- ★ Pulsars in sistemi binari
- ★ Blazars
- ★ Soft Gamma-Ray repeaters
- ★ Caratterizzazione di AGNs ad alta energia
- ★ Identificazione di Transienti molto deboli

L'esperienza in questi campi e' stata fondamentale per i giovani ricercatori che hanno poi facilmente applicato per tempo osservativo per XMM, CHANDRA, Suzaku e Agile nonche' per proposte di Key Programme e relativi data rights su targets specifici per INTEGRAL

Il consorzio ha infatti avuto piu di 20 proposte approvate per l'AO7 per molti targets nei diversi campi. Inoltre sono state assegnate 2 Possibili ToO (P.I. E. Pian e N. Masetti) e ha ottenuto un KP con data rights su 6 oggetti (P.I. Pietro Ubertini).

The new Integral User Group IUG

INTEGRAL Users Group

Jörn Wilms (Chair)	External
Angela Bazzano	External
Tomaso Belloni	External
Konstantin Postnov	External
Andrea Goldwurm	External
Mark Leising	External
Ed van den Heuvel	TAC chair
Giorgio Palumbo	Mission Scientist
Jacques Paul	Mission Scientist
Neil Gehrels	Mission Scientist
Sergei Grebnev	Mission Scientist
Wim Hermsen	Mission Scientist
Pietro Ubertini	Co-PI IBIS
François Lebrun	Co-PI IBIS
Jean-Pierre Roques	Co-PI SPI
Roland Diehl	Co-PI SPI
Søren Brandt	PI JEM-X
Miguel Mas-Hesse	PI OMC
Roland Walter	PI ISDC
Rashid Sunyaev	Repr. PROTON Launcher
Christoph Winkler	Project Scientist
Arvind Parmar	Mission Manager
Peter Kretschmar	Secretary
joern.wilms@sternwarte.uni-erlangen.de	

"The Extreme Sky" - 7 years of INTEGRAL, Otranto (Italy)
13-17 October 2009
Christoph Winkler