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DOCUMENT

NIRSpec IPC Kernerl Reference Files for Build 7

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1 INTRODUCTION

In this report we describes the process for the generation of the reference files for the correction of the intra pixel capacitance (IPC) of the NIRSpec detectors for the STScI build 7 pipeline. A more detailed description of the IPC effect and correction can be found in reports from previous reference file deliveries (Sirianni 2014).

It should be noted that IPC correction reference files are delivered for completeness only. At the current stage the recommendation from the NIRSpec Instrument Definition Team is not to apply IPC correction to the science data.

The flight NIRSpec Focal Plane Array (FPA), serial number 106 (hereafter referred as FPA106) consists of two Sensor Chip Assemblies (SCAs) controlled by two ASIC SIDECAR. Table 1 lists the serial number of the SCAs and ASICs in the two separate channels of FPA106. In the following sections we will use 491 and 492 to indicate the SCAs

	Channel 1 (**491**)	Channel 2 (**492**)
SCA S/N	17163	17280
SIDECAR ASIC S/N	252	244

Table 1. Component of FPA106 and paired ASIC controllers.

2 CREATION OF THE IPC KERNEL REFERENCE FILES

The characterization of FPA106 at NASA Detector Characterization Laboratory (DCL) occurred between May and September 2014. The entire set of data and the overall characterization results are reported in Lindler (2015).

For the creation of the reference files we adopted the average IPC measurement from hot pixels as listed in table 2 from Lindler (2015)

Table 2. IPC for FPA106 from hot pixels(reproduction of Table 2.1 from Lindler 2015).

Output	491			492		
1	0.0005	0.0069	0.0006	-0.0002	0.0042	0.0006
	0.0062	0.9704	0.0071	0.0048	0.9818	0.0048
	0.0005	0.0071	0.0006	0.0000	0.0041	-0.0001
2	0.0006	0.0065	0.0004	0.0001	0.0057	0.0001
	0.0075	0.9711	0.0064	0.0061	0.9756	0.0064
	0.0007	0.0061	0.0007	0.0005	0.0051	0.0004
3	0.0009	0.0068	0.0003	0.0006	0.0054	0.0002
	0.0057	0.9709	0.0072	0.0056	0.9763	0.0059
	0.0007	0.0069	0.0007	0.0002	0.0052	0.0005
4	0.0003	0.0065	0.0004	0.0006	0.0053	0.0003
	0.0066	0.9730	0.0055	0.0053	0.9757	0.0060
	0.0005	0.0064	0.0007	0.0004	0.0054	0.0010
Average	0.0006	0.0067	0.0004	0.0003	0.0051	0.0003
	0.0065	0.9714	0.0065	0.0055	0.9774	0.0058
	0.0006	0.0066	0.0007	0.0003	0.0050	0.0004

The scripts to generate the reference files are available in the ESA JWST SVN repository in JWST_IDL/lib/nirspec/Reference_Files/IPC/.

```
IPC_Ref_files_main.pro (script – to be edited as needed)
create_IPCC_reffile.pro (procedure)
Ipc_kernel_create_ref_file_b7.pro (procedure)
```

Following McCullog (2008) the ICP correction is applied by convolving each pixel with a 3x3 pixel kernel where the 8 non central coefficients are replaced by their own negative value, while the central coefficient then becomes 1+the sum of the surrounding coefficients). The integrated value of the nine elements is 1. Tables 3 and 4 list the kernel obtained from the global IPC for SCA491 and SCA492 respectively.

Table 3 Kernel for FPA106-SCA491 based on the Global average IPC

-0.00060	-0.00670	-0.00040
-0.00650	1.04030	-0.00650
-0.00060	-0.0066	-0.00070

Table 4. Kernel for FPA106-SCA492 based on the Global average IPC

-0.00030	-0.00510	-0.00030
-0.00550	1.02900	-0.00580
-0.00030	-0.00500	-0.00040

The structure and format of the files follow the instructions from the confluence page "JWST Calibration Reference Files: File Format for Build 6 Pipeline", with one important exception: the orientation of the images is in the native readout orientation, in order to be compatible with the ESA NIRSpec pipeline. Keywords that indicate the orientation (FASTAXIS and SLOWAXIS) are populated accordingly, so DMS can handle the reference file as needed .

Figuer 2-1 shows the structure of the IPC correction reference file for one SCA.
The second extension, labelled SCI contains the 3x3 IPC Kernels for the convolution with the image array.

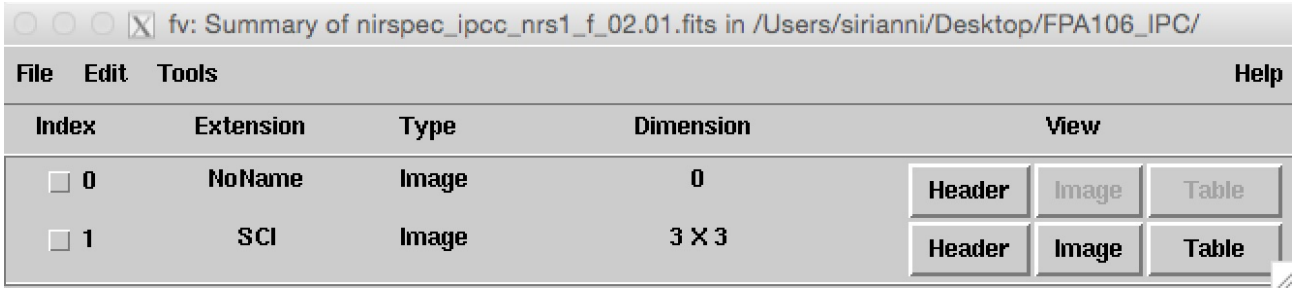

Figure 2-1. Structure of the delivered reference files

Table 5 lists the names of the two reference files delivered for build7.

Table 5. Delivered Reference Files

NAME	USE-AFTER
nirspec_ipcc_nrs1_f_02.01.fits	2015-01-01
nirspec_ipcc_nrs2_f_02.01.fits	2015-01-01

3 REFERENCES

Lindler, D. 2015 NIRSpec DS Focal Plane Assembly S/N 106 Characterization with SCAs 17163 and 17280 JWST-RPT-025384

McCullough, P. 2008, Interpixel Capacitance: property for deconvolution, IRS WFC3 2008-26, Space Telescope Science Institute.

Sirianni, M., 2014, Interpixel Capacitance in NIRSpec FPA104 from hot pixels Tech. Rep. ESA-JWST-TN-20929/NRN-2014-009, ESA