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INTEGRAL Coordination Meeting
P. Ubertini, IASF/INAF - Roma

OSA 6fb matrix – first delivery

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COMPUTATION OF EFFECTIVE AREA CURVES IN OSA-6

A "BACKUP" SOLUTION USING STANDARD IBIS CORRECTION MAPS

Report by IBIS Team / IASF Rome
24 November 2006

Version 1.0

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INTRODUCTION

The release of OSA v.6.0 carries important changes in ISGRI calibration, especially related to tables of pixel gain/offset (LUT1) and event energy correction (LUT2). An important issue is also related to the production of new off-axis correction maps by ISDC (Lubinsky 2006). These maps, delivered as file *isgr-effi-mode-0008.fits*, are computed in 62 energy bands and replace the original standard correction file (256 maps in *isgr-effi-mode-0004.fits*).

During November, first extensive tests made in Rome, Saclay and ISDC especially on the Crab calibration data, have emphasized some important difference respect to OSA v.5, i.e.:

- **an important count rate increase at low energies (E<100 keV), quantified as ~5 to 10%**
- **slightly lower count rates at high energies**
- **residual structure around ~90 keV**

The main reason of the count rate increase was identified to be related to the new off-axis correction, giving significantly lower efficiency compared to the standard ones, while the less counts at higher energies can be attributed to the change of the default Rise-Time acceptance window (upper threshold lowered from 90 to 80). The structure around 90 keV can be ascribed to a non-accurate modelling og the gold fluorescence line (F. Lebrun, email 16 Nov 2006).

While the last two effects can be considered marginal, the first one (count rate increase) is relevant.

A practical problem rising with the new maps is that they require a different S/W processing (in particular, they are normalised in different way respect to the standard maps) and hence require changes in the OSA-6 modules, especially *ii-map-rebin* and *ii-spectra-extract*. These changes have been well-determined only recently, after the first tests were performed.

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PRODUCTION OF RESPONSE MATRICES

Another important issue is related to the redistribution matrix (RMF), which is now computed by MC taking into account the modelling of the Rise-Time. The current RMF/ARF delivered to ISDC is the raw response derived by MC and must be corrected for threshold evolution and (possibly) residual gain/offset changes. However, in order to perform this we need a stable OSA-6 release on which to extract the in flight calibration data. Due to the above problems, it was decided and agreed to have a backup solution based on:

- **implementation of the standard maps**
- **use of the current OSA-5 redistribution matrix**

This solution consists in the production of ARF files similar to the ones delivered in OSA-5. Original ARF curves derived by MC are corrected by the count rate spectra from Crab, extracted with a test release of OSA-6 made available by ISDC (as of 20 Sept 2006) and replacing the off-axis maps in the IC file tree with the old standard maps. See Appendix for the exact configuration of the IBIS executables in this OSA-6 release.

This short document is conceived as an accompanying note to the delivery of these ARFs.

Old off-axis maps have been used to avoid normalisation problems

ARF VALIDITY

Three ARFs were produced and delivered to ISDC. Here it follows the energy range and periods of validity to which they are related:

File Name	Energy Range	Time Period
isgri-smo-rev039-osa6fb.arf	20-450 keV	Rev < 64
isgri-smo-rev170-osa6fb.arf	18.5-450 keV	65 < Rev < 255
isgri-smo-rev300-osa6fb.arf	18.5-450 keV	Rev > 255

In Fig.1 are plotted the shapes of the newly delivered curves while in Fig.2, is shown the performance of the correction for the 3 Crab observations to which the ARFs are nromalised.

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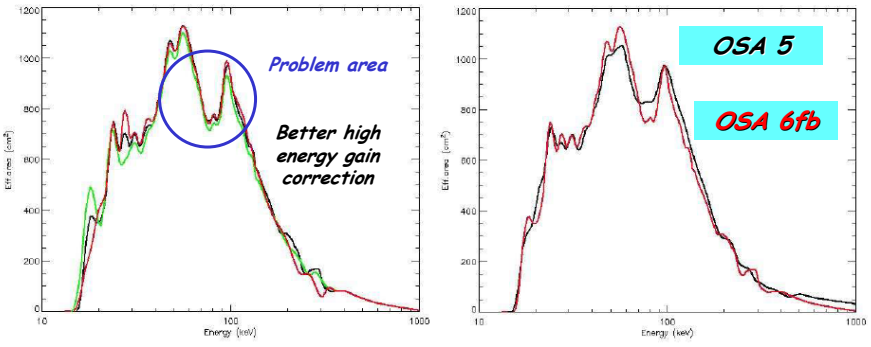
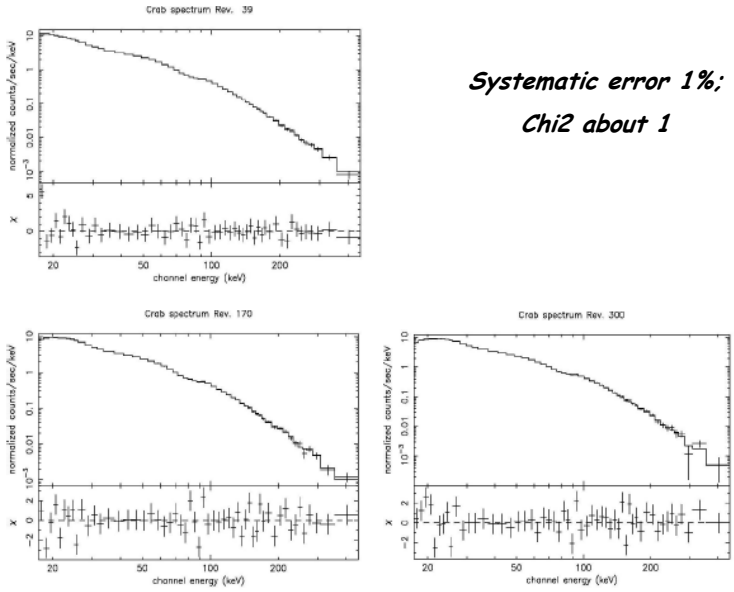


Fig. 1 ARF curves delivered for testing. ***Left panel***: the 3 effective area curves for Rev. 39 (green Rev.170 (black) and Rev.300 (red) are shown. ***Right panel***: the Rev.170 ARF (red) is compare with the current (OSA-5) curve shown in black colour.



Systematic error 1%;

Chi2 about 1

Fig. 2 Fits to the three Crab spectra of Rev.39,170 and 300 showing residuals left by the correction with the corresponding three ARFs.

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