The Data Product Screening System for XMM products

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ABSTRACT

The Data Product Screening System (DPSS), the core pipeline processing (PPS), the PPS Import Component (PPS-IC) provided by the XMM File Transfer System (XFTS), the archival catalogue and database subsystem (ACDS) and the SSC database system (SSC-DB) are primary components of the SSC pipeline system. The DPSS validates and verifies PPS products and provides scientific assessment based in part on visual inspection. The basic aim of the DPSS is to ensure the highest reliability of the results from the automatic analysis of all scientific data produced by the instrumentation of the XMM satellite for the benefit of the astronomical community. The experience gained through this assessment process will provide important information on the performance of the PPS/IAS software and the validity of instrumental calibration parameters and may help to improve components of the PPS. This evolutionary strategy is expected to result in the production of higher level PPS products and will optimize the product assessment step. Validation reports will be created for all screened PPS data products. The validation reports will be routinely sent to the SSC-Leicester.

1. General requirements

The systematic automatic analysis of all scientific data produced by the instrumentation on board the XMM satellite will be performed by the PPS. PPS products will be generated for each sub-instrument and per observation. The task of the DPSS is to validate and verify all PPS products. A detailed definition of the DPSS requirements is given in the document 'XMM PPS data product screening requirements' (available at http://www.rosat.mpe−garching.mpg.de/ bol/). A TBD interface will manage the data flow of PPS products to the DPSS. The validation and verification of the PPS products is a large and complex task. Experience with the scientific quality assessment of data products of the ROSAT satellite revealed that the combination of an automatic and a visual screening step ensures a high quality of the data products. It is expected that during the first months of PPS operations on flight data the quality assessment of PPS data products will be performed at Leicester by teams of 'duty scientists' drawn from the entire Consortium. At this early stage intense discussions will be essential in establishing an effective and successful DPSS. Later, during routine operations, scientific quality assessment will be performed by SSC personnel at their home institutes. A DPSS administrator at the processing site and local DPSS managers at the CoI home institutes should manage and control the quality assessment of PPS data.

2. Validation and verification process

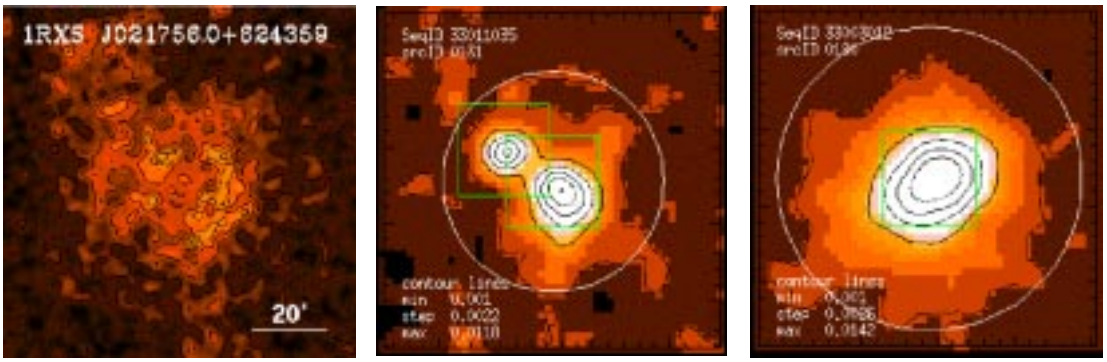

Fig. 1.— Examples of sources which were flagged in the screening process of ROSAT All-Sky Survey data. The left image is an example for a source showing a complex and diffuse emission pattern. The middle image displays two sources with overlapping extraction radii. In this case, the count rate determination is affected and the 'nearby' warning flag was given to both sources. The right image shows an example for a source, for which the source extraction radius was not determined correctly in the standard analysis software. Within the screening process of the ROSAT All-Sky Surve data, a new extraction was determined, indicated by the white circle, and the warning flag 'source extended beyound SASS extraction radius' was given to that source.

During the validation and verification process of ROSAT pointed and survey data a separation into an automatic validation and a visual verification process has been proven as an effective and powerful method to secure a high quality of the data products. Sources were flagged as (i) complex diffuse emission patterns, (ii) nearby sources, (iii) sources extended beyond SASS extraction radius and (iv) possible problem with position determination. Flags were used to give warnings to the reliability of the parameters determined by the standard analysis system and to mark sources which underwent a reprocessing step. Much attention was given to the automatic step. This minimized the required human action in the flag setting, the dispersion in the flag setting of different persons and the required time for checking individual sky fields. The experience gained through this assessment process provided important information on the standard analysis software. The automatic validation process shall validate the EPIC-pn, EPIC-MOS, RGS, OM, and the observation summary PPS products as defined in the product specification document XMM-SOC-ICD-0006-SSC (and revised versions). The interactive verification step is based on Graphical User Interfaces. All PPS products shall be able to be visualized with the option to set them 'valid' or 'invalid' in an validation report. The GUI will contain source and sequence flag check-buttons. The check-buttons are used to set the flag status of a source to true or false. The GUI will allow to give comments up to TBD characters to sources and the sequences. The final flag setting definition can be done on the experience the first in-flight PPS products.