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MECS Ground Calibration Report

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Contents

1. Introduction

The Medium Energy Concentrator Spectrometer (MECS), one of the four narrow field instruments on-board the SAX observatory, is operating in the medium X-ray energy band. Its main scientific objectives are: spectroscopy in the energy range from 1.3 to 10 keV ($E/\Delta E$ in the range 6-16); imaging with angular resolution at the arcmin level; timing variability on time scales down to the millisecond.

The present report describes the pre-launch calibrations of the MECS instrument, mainly performed at the 130-meter long X-ray PANTER facility of the Max-Planck-Institut für ExtraterrestriSche Physik in Munich, Germany, in the period October/November 1994; other calibration tests, performed during the satellite integration at ESTEC, are also reported. The paper is organized as follows: Sect. 2 outlines aspects of the MECS instrument; Sect. 3 describes the experimental setup and the calibrations which have been done; Sect. 4 details the calibration data reduction and analysis procedures; Sect. 5 shows the calibration results and the derived scientific capabilities of MECS; Sect. 6 gives results from special calibration tests; and Sect.7 describes the MECS response matrix. Some software utilities are reported in annex.

Remarks:

- **PANTER calibration (and related data analysis) was performed on the MECS flight model having a METOREX anti-ion grid. Unfortunately, after vibration tests, one of the METOREX filters was found to be destroyed and in the final flight configuration each detector was newly protected by LEXAN or KAPTON filters. For this reason, the MECS effective area (necessary to define the MECS response matrix) has been computed based on these new filters.**

- **After PANTER tests, the ^{55}Fe inner calibration sources were replaced on the MECS flight model to fulfill the requirement of 1 cts/s at the launch time. Consequently, their position in flight could be different.**

- **All the results of the on ground calibrations have been checked and updated (whenever necessary) during the in-flight Science Calibration and Verification Phase. The MECS in-flight calibration results will be the subject of a further report; neverthless, the main updating obtained during the in-flight calibrations are mentioned in this report as *"Note"*.**

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