SIXE: A PAYLOAD FOR MINISAT–02

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Abstract. A description of the X-ray instrument SIXE proposed for the MINISAT–02 mission is presented. The description includes the scientific goals and instrument performances.

1. Introduction

The Spanish Italian X-ray Experiment (SIXE), is a project fruit of the collaboration between the Institute for Space Studies of Catalonia (IEEC) and the Instituto di Astrofisica Spaziale (IAS) which was presented in response to the call for proposals for the Spanish satellite MINISAT–02. According to the philosophy of MINISAT–0X program, SIXE was conceived with three ideas in mind: 1) the main goal of the experiment had to be its scientific outcome, 2) the requirements of the instrument should be compatible with the performance of MINISAT, and 3) an important part of the design and manufacturing of the instrument should take place in Spain. SIXE was one of the 4 proposals selected for phase-A study. The results of the study have shown that the experiment is scientifically and technologically feasible within the framework of the MINISAT programme.

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2. Scientific goals

Previous space-borne instruments (Turner et al. 1989; Swank et al. 1994) have shown that many interesting sources, most of them of variable nature, emit appreciably in hard X-rays (HXR). These sources are mainly related to accreting compact objects, and include galactic and extra-galactic phenomena. The most valuable information about the nature of these phenomena has been gained through the study of their rich variability signatures (bursts, pulsations, quasi-periodic oscillations, etc) and their spectral properties. Accordingly, SIXE is conceived as an excellent tool for providing variability monitoring and moderate energy resolution spectroscopy of HXR targets, while at the same time proposing an innovative philosophy to observe these sources.

All major HXR instruments share a limitation when observing targets. These missions have to satisfy a great number of observers and, in many cases, the requirements of several instruments. Thus, long-lasting exposures of individual objects are excluded of their observing programmes. However, a plenty of questions about HXR emitters require either a long-term monitoring or very long integration times, and longer exposures are demanded. Such observations will be possible for a small mission devoted to a reduced number of targets as proposed for SIXE. During 2 years, the experiment will observe ~ 20 targets for accumulated periods of ~ 2 months. Targets will be selected among the brightest candidates of different classes of phenomena, and taken as their prototypes. Observations carried out by SIXE will provide a unique database which shall give answer to some of these open questions. At the same time, SIXE is designed to reach the best time resolution and accuracy attained up to now in X-rays. With this combination of capabilities, SIXE will allow to study the variability in an unprecedented range of time-scales going from $10^{-6}$ to $10^7$ s, which covers from the characteristic time-scales of instabilities in the accretion flow onto neutron stars up to that of AGN variability. Moreover, an agreement has been reached with the team developing the Optical Monitoring Camera (OMC) on INTEGRAL, to include a modified version of the OMC on MINISAT-02 (Más-Hesse et al. 1998). The combined operation of both instruments will provide an unprecedented continuous multi-band campaign, which will enhance the scientific outcome of the mission.

It is planned to set up a scientific committee formed by experts in the different classes of sources to be observed, which will be responsible for the definition of the observing program. A preliminary list of phenomena to be studied is shown below:

- **Galactic**: pre-main sequence stars, flaring stars, X-ray pulsars, low-mass X-ray binaries, high-mass X-ray binaries, black hole candidates