ELSEVIER

Chinese Astronomy and Astrophysics 33 (2009) 113–120

CHINESE
ASTRONOMY
AND ASTROPHYSICS

The High-energy Burst Spectrometer for SMESE Mission † ⋆

GU Qiang[1,2△] CHANG Jin[1,3]

[1] *Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing 210008*

[2] *Graduate School of Chinese Academy of Sciences, Beijing 100039*

[3] *National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012*

Abstract The SMall Explorer for Solar Eruptions (SMESE) is a small satellite being developed jointly by China and France. It is planed to launch around the next solar maximum year (∼ 2011) for observing simultaneously the two most violent types of eruptive events on the sun (the coronal mass ejection (CME) and the solar flare) and investigating their relationship. As one of the 3 main payloads of the small satellite, the high energy burst spectrometer (HEBS) adopts the up-to-date high-resolution $LaBr_3$ scintillation detector to observe the high-energy solar radiation in the range 10 keV—600 MeV. Its energy resolution is better than 3.0% at 662 keV, 2-fold higher than that of current scintillation detectors, promising a breakthrough in the studies of energy release in solar flares and CMEs, particle acceleration and the relationship between solar flares and CMEs.

Key words: instrumentation: spectrographs—space vehicles: instruments

1. A BRIEF INTRODUCTION OF SMESE

The SMall Explorer for Solar Eruption (SMESE) is a small satellite which is being developed jointly by China and France. Using the Myraid small satellite platform of French Space Agency, SMESE is planned for launch around 2011 to carry out space observations for 3 years. The orbit of SMESE is a sun-synchronous orbit of 650—750 km, and the platform has a pointing accuracy better than 36″. The 3 main payloads of the satellite are: a

† Supported by National Natural Science Foundation
Received 2007–06–25; revised version 2007–07–24
⋆ A translation of *Acta Astron. Sin.* Vol. 49, No. 3, pp. 339–347, 2008
△ guqiang_@hotmail.com

doi:10.1016/j.chinastron.2009.01.009

Lyman-α solar full-disk high-resolution telescope and coronagraph, LYOT (LYman Orbiting Telescopes), a solar far-infrared telescope DESIR (Detection of Eruptive Solar InfraRed emission), and a solar high-energy burst spectrometer HEBS (High Energy Burst Spectrometer). Fig.1 shows the designed layout of the satellite's payloads (HEBS is on the lower-left).

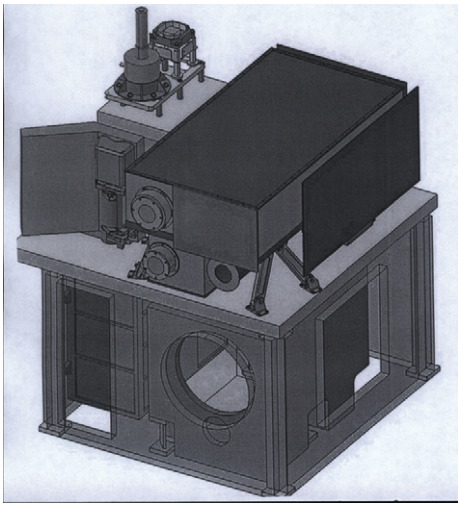

Fig. 1 The scientific instruments onboard the SMESE satellite

As mentioned, LYOT consists of two telescopes, a full-disk high-resolution telescope working in Lα and a coronagraph. The former works at the wavelength of 121.6 nm, has a field of view of 1.2 solar radii and an angular resolution of $1''.1$. The operating wavelength of the coronagraph is also 121.6 nm, its field of view is 1.15-2.5 solar radii, and the angular resolution is $2''.3$. Depending on the solar activity, the temporal resolutions of the two telescopes can reach 0.2 s.

DESIR has two operating wavebands, 35-80 μm, and 100-250 μm. It observes solar radio emission at frequencies corresponding to higher than 10^{12} Hz. The size of the detector is 245×325 pixels, each of size about $44''$. It can provide information on the position and size of emission sources during a solar burst, and its time resolution can reach the order of milliseconds.

HEBS consists mainly of 3 large-size (7.6 cm×7.6 cm) $LaBr_3$ scintillators of high energy resolution. It observes solar radiation in the high-energy range 10 keV–600 MeV, with an energy resolution better than 3.0% at 662 keV and with an adjustable temporal resolution, which can reach 32 ms.

The three payloads are put together to observe solar radiation stretching from far-infrared to γ-ray, it is the first time in the world for a single satellite to make observations over such a wide energy range. Compared with the other similar satellites in the world that make solar observations from space, SMESE, although a small satellite, has concentrated in it all the essentials of the three France-China small satellites, namely:

(1) For the first time in the world, a single satellite makes cross-checking observation