

# Improvements in calibration of GSO scintillators in the Suzaku Hard X-ray Detector

Shin'ya Yamada, Kazuo Makishima, Kazuhiro Nakazawa, Motohide Kokubun, Madoka Kawaharada, Takao Kitaguchi, Shin Watanabe, Hiromitsu Takahashi, Hirofumi Noda, Hiroyuki Nishioka, Kazuyoshi Hiragi, Katsuhiro Hayashi, Kenta Nakajima, Makoto Tashiro, Makoto Sasano, Sho Nishino, Shunsuke Torii, Soki Sakurai, Tadayuki Takahashi, Tsunefumi Mizuno, Teruaki Enoto, Takayuki Yuasa, Takaaki Tanaka, Tomomi Kouzu, Toshio Nakano, Yasushi Fukazawa, Yukikatsu Terada, Yasunobu Uchiyama, Wataru Iwakiri, the HXD Collaboration

(Submitted on 25 Jul 2011)

Improvements of in-orbit calibration of GSO scintillators in the Hard X-ray Detector on board Suzaku are reported. To resolve an apparent change of the energy scale of GSO which appeared across the launch for unknown reasons, consistent and thorough re-analyses of both pre-launch and in-orbit data have been performed. With laboratory experiments using spare hardware, the pulse height offset, corresponding to zero energy input, was found to change by  $\sim 0.5$  of the full analog voltage scale, depending on the power supply. Furthermore, by carefully calculating all the light outputs of secondaries from activation lines used in the in-orbit gain determination, their energy deposits in GSO were found to be effectively lower, by several percent, than their nominal energies. Taking both these effects into account, the in-orbit data agrees with the on-ground measurements within  $\sim 5\%$ , without employing the artificial correction introduced in the previous work (Kokubun et al. 2007). With this knowledge, we updated the data processing, the response, and the auxiliary files of GSO, and reproduced the HXD-PIN and HXD-GSO spectra of the Crab Nebula over 12-300 keV by a broken powerlaw with a break energy of  $\sim 110$  keV.

Comments: Suzaku HXD-GSO detector, calibration update; PASJ, May 2011

Subjects: **Instrumentation and Methods for Astrophysics (astro-ph.IM)**; High Energy Astrophysical Phenomena (astro-ph.HE)

Cite as: **arXiv:1107.4857 [astro-ph.IM]**  
(or **arXiv:1107.4857v1 [astro-ph.IM]** for this version)

## Submission history

From: Shin'ya Yamada [[view email](#)]

[v1] Mon, 25 Jul 2011 07:43:50 GMT (1881kb)

*Which authors of this paper are endorsers?*

## Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

## Current browse context:

astro-ph.IM

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1107](#)

## Change to browse by:

astro-ph

astro-ph.HE

## References & Citations:

- [INSPIRE HEP](#)  
([refers to](#) | [cited by](#))
- [NASA ADS](#)

## Bookmark([what is this?](#))



Science  
WISE