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## Development of the detector simulation framework for the Wideband Hybrid X-ray Imager onboard FORCE

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FORCE is a space-based astronomy mission for an X-ray imaging spectroscopy in an energy range of 1–80 keV. The Wideband Hybrid X-ray Imager (WHXI), which is the main focal plane detector, will use a hybrid semiconductor imager stack composed of silicon and cadmium telluride (CdTe). The silicon imager, for which we will adopt a certain type of the XRPIX series, will be based on the silicon-on-insulator (SOI) technology to meet requirements of a thick depletion layer and short timing resolution that realizes anti-coincidence particle background rejection. Since the sensor has a small pixel size of 36  $\mu\text{m}$  and the thick sensitive region, understanding the detector response is not trivial and is important to optimize the camera design and to make science planning.

We have developed a simulation framework for the WHXI to predict observed spectra based on Compton Soft, a software suite for Monte Carlo simulation and data analysis. To determine the physical parameters of the XRPIX required for the simulation, we made a comparison of simulations with laboratory measurements. The measurements were conducted using the XRPIX 6H and 6C sensors and radioactive isotopes to evaluate spectra at various energies. The spatial distribution of the charge collection efficiencies, the noise level and diffusion length were considered as parameters to be determined. We compared the measured branching ratio and spectra of single- and double-pixel events to those of simulations at 5.90 keV and 32.2 keV. The simulations well agreed with the measurements mainly by optimizing charge collection efficiencies around the edges of each pixel. This framework is also applicable to future XRPIX updates including the one will be part of the WHXI. In this talk, we present the framework design, evaluations of the measurements and simulations, as well as the expected WHXI spectrum of the Crab Nebula, a standard celestial reference source in the X-ray sky.

### Submission declaration

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