Immediately after a supernova explosion, strong ultraviolet (UV) emission is produced during the shock breakout, when the shock wave reaches the stellar surface, and during the subsequent cooling emission from the outer stellar layers. Observations of these emissions can provide important constraints on the properties of the progenitor star and its circumstellar environment. However, silicon (Si)–based detectors are also sensitive to visible light, requiring optical blocking filters for UV observations. Such filters inevitably reduce the transmission of UV photons.

Silicon carbide (SiC), with its wide bandgap of 3.26 eV, is intrinsically insensitive to photons with wavelengths longer than approximately 380 nm, making it a promising material for visible-blind UV detection without the need for optical blocking filters.

We are developing a pixel detector for UV imaging that combines a SiC photodiode array sensor chip with a Si readout chip through hybrid bonding. The designs of both chips have been completed. As a preliminary study, we evaluated the UV response of a commercially available 4H-SiC photodiode using fourteen LEDs with wavelengths ranging from 235 to 405 nm. The responsivity estimated from the nominal LED optical output was found to be 0.45 to 1.2 times the values reported in the photodiode datasheet at seven wavelengths between 255 and 325 nm.

In this presentation, we report the current status of the detector development, with particular emphasis on the characterization results of the 4H-SiC photodiode.