Monolithic Active Pixel Sensors (MAPS) integrate the sensor and readout circuit on the same semiconductor substrate, enabling compact, low-material-budget, and cost-effective detectors. We are developing a novel type of MAPS featuring an internal gain layer that amplifies the charge generated by ionizing particles within the sensor. This approach is expected to improve the signal-to-noise ratio (S/N) while simplifying the in-pixel readout circuit and reducing power consumption. In the future, this technology could be applied not only to particle detectors requiring high spatial and temporal resolution but also to quantum radiation imaging.

In this presentation, we will report on the current status of research and development of gain-layer MAPS in Japan, including the characterization of the electrical properties and laser response of the CASSIA prototype chip.