JUICE/GALA-J (4): Electronics and detector development for Ganymede Laser Altimeter (GALA) for the JUICE mission

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Ganymede Laser Altimeter (GALA) is scheduled on board JUICE mission by ESA to be launched in 2022. GALA will be developed and manufactured jointly by teams of Germany, Japan, Switzerland, and Spain. Japanese team is responsible for subunits of a receiver unit out of GALA instrument; a backend optics (BEO), a focal plane assembly (FPA) accommodating an APD sensor module and an analog electronic module (AEM). In our poster presentation, the current development status of APD module and AEM of GALA will be reported.
The APD sensor is mounted on a hybrid IC of the APD module including a trans-impedance amplifier (TIA) for signal readout in a wide band width as 100MHz, a thermo-sensor for measurement of the APD sensor temperature and a thermoelectric (TE) cooler for control of the APD sensor temperature to stabilize the temperature as 25 deg-C or so. The APD sensor has an enhanced quantum efficiency of up to 40% at 1060 nm. APD typically has a large temperature dependency of gain. The APD module is equipped with TE cooler and the TE cooler is capable to control the temperature of APD precisely.
The TIA in the APD module outputs voltage signals corresponding to the input light pulses. The voltage signals are fed into the AEM. The transmitted pulses introduced from LHM are attained not to overshoot by a programmable amplifier in the AEM because the following part of analogue signal processing circuit in AEM is to be tuned for signals returned from the target body which are much smaller than the introduced laser pulses. Signal waveform from the introduced laser pulse to the received return pulse is converted to digital data by analogue-to-digital conversion (ADC) circuit and digitized waveform are transmitted to a range finder module (RFM).
As of writing this abstract, we are preparing radiation test campaign of APD to evaluate and qualify the APD sensor of the module and also building a bread board model of AEM to evaluate development challenges in that.

Keywords: JUICE, GALA, APD, Ganymede, Laser Altimeter

