Development of filter photometers onboard the TARANIS satellite

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In order to study the generation region and mechanism of terrestrial gamma-ray flashes (TGFs) and to identify the relationship between TGFs and transient luminous events (TLEs), a micro satellite mission named TARANIS (Tool for the Analysis of RAdiations from lightNIngs and Sprites) is under way. The scientific payload consists of two cameras, three photometers, one hard X-ray/gamma-ray detector, one energetic electron detector, and electric/magnetic field sensors. The orbit of the satellite will be polar sun-synchronous with an altitude of 700 km, and the local time of ascending node is required to be 22 LT with a slow drift of the order of 2 LT/year. Our group has joined the TARANIS mission as co-investigators, and started development of the photometers. The photometers consist of four channels;

PH1: a wide-FOV (42.7 deg.) photometer with wideband filter (150-280 nm),
PH2: a wide-FOV (42.7 deg.) photometer with narrowband filter (337+/-5 nm),
PH3: a wide-FOV (42.7 deg.) photometer with narrowband filter (762.5+/-5 nm),
PH4: a wide-FOV (86.8 deg.) photometer with wideband filter (600-800 nm).

As the optical detector of these photometers, metal-package photomultiplier tubes (PMTs) will be used for PH1-PH3. On the other hand, a photodiode with 10x10 mm^2 size will be used for PH4. As the optics of the photometers, telecentric dioptrics system is adopted.

The dimension (LxDxH) and mass of the photometers is 12x19x14 cm and 1 kg, respectively. We have developed breadboard model last year and started various tests for the performance check, such as sensitivity and SNR measurements and sun exposure tests. Based on these results, we started designing of the engineering model (EM) of the photometers. At the presentation, we will discuss the results derived from the performance check tests and will present the EM design of the photometers more in detail.