Progress of Space Qualification of the NPET Timing System for SLR and Time Transfer Applications

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The New Pico-Event Timer (NPET) is used for time tagging of events generated in experiments. A typical application is the Time of Flight (ToF) measurement, where the arrival times of optical laser pulses are measured. It was developed at the Czech Technical University in Prague and has demonstrated unmatched timing performance. Specifically, its single shot resolution and timing linearity are both on a sub-ps level and its timing stability is on the order of TDEV < 10 fs over a 1000 s averaging period. The device is used in many ground-based SLR applications, most commonly in the calibration of ToF measurement system delays in SLR stations. Recent NPET development efforts are focused on qualifying the device for spaceflight applications. These include the two ESA European Laser Timing (ELT) missions Atomic Clock Ensemble in Space (ACES) and the ISS Space Optical Clock (I-SOC), as well as several GNSS missions. The ground-based device will be upgraded by replacing all of its electronic components by space-grade equivalents. This device will be tested in series of radiation experiments to qualify it for spaceflight. The latest FPGA firmware is redesigned without using proprietary tools in order to make it more maintainable. The device is expected to be ready for spaceflight within the coming three years.