Space Qualification of the New Pico Event Timer

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Overview

- Sub-ps single shot resolution
- Sub-ps timing linearity
- TDEV < 10 fs over a 1000 second averaging period
- Stability
Operating Principle
Applications
Current Applications

- General purpose event timing
- Satellite laser ranging

Station delay calibration for...
- Laser time transfer
- One-way ranging
- Debris tracking

- Two-Way Time Transfer (TWTT)
Future Applications

- Laser Time Transfer

- European Laser Timing
  - Atomic Clock Ensemble in Space (ACES)
  - ISS Space Optical Clock (I-SOC)

- GNSS Missions
  - BeiDou Navigation Satellite System (BNS)

- Tiangong-2 Space Station
Development for Space Qualification
Space-Grade Components

- Replace all components by space-grade equivalents
- A list has been compiled
- Final product will be radiation tested
- Design and construction still necessary
New FPGA Firmware - Development

- Converts digitized samples to time interval estimates
- Rewritten to be open, customizable and maintainable
- To be ported to space qualified FPGA
New FPGA Firmware - Structure

Digitized Samples

ADC Interface → DSP Stage → Output Stage

Time Interval Estimate
New FPGA Firmware - Status

- Input and output stages to be completed
- DSP stage ≈ 60% complete
- Operating frequency ≈ 16 kHz
Summary

- Space-qualified NPET board to be constructed
- Firmware to be completed
- Final product to be tested
- Completed in three years?
Thank You for Listening
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