

**NEW USB VERSION OF THE RIGA EVENT TIMER AND ADDITIONAL SOFTWARE SUPPORT FOR LINUX.** V.Vedin<sup>1</sup>, E. Boole<sup>1</sup>, Girts Ozolins<sup>2</sup> André Kloth<sup>3</sup>, Jens Steinborn<sup>3</sup>, <sup>1</sup>Institute of Electronics and Computer Science [buls@edi.lv](mailto:buls@edi.lv), <sup>2</sup>Eventech Ltd. [go@eventechsite.com](mailto:go@eventechsite.com), <sup>3</sup>SpaceTech GmbH [andre.kloth@spacotech-i.com](mailto:andre.kloth@spacotech-i.com), <sup>3</sup>SpaceTech GmbH [jens.steinborn@spacotech-i.com](mailto:jens.steinborn@spacotech-i.com).

**Introduction:** The Event Timer A033-ET [1], [2] is a computer-based instrument that measures time instants when input events (represented by electrical pulses) occur. Distinguishing feature of the A033-ET is extremely high precision combined with a high measurement rate. In particular, single-shot RMS resolution better than 5 ps and measurement rate up to 20 MSPS in burst make the A033-ET one of a few best event timers currently available. Combining the A033-ET hardware (ET-device) with application-specific software, a number of top-quality and reasonably priced event timer systems can be created.

**A033-ET/USB:** As a version of A033-ET with Parallel Port interface the A033-ET/usb with USB2 interface is well suited for applications related to Satellite Laser Ranging (SLR), but having the higher measurement rate (1 MEPS continuously) it can additionally be used in many other applications, such as LIDAR and 3-D laser scanning systems, time-of-flight and time-of-life spectroscopy, data transfer by laser link, signal analysis etc.

The ET-device offers two inputs (A and B) to measure events on these inputs alternately with 50 ns dead time. Result of every single measurement (epoch time-tag) is represented in digital form with 1 ps LSB resolution. Time-tags appear at the timer's output in order of event measurement. Each time-tag is marked to indicate the input where the measured event came from. It is well suitable to measure the overlapped time intervals between Start and Stop events that come at the separate inputs (either A or B) of the ET-device in arbitrary order. In particular, this is the case of advanced SLR at KHz repetition rate. The input B can be externally gated by a control signal connected to the input GATE IN.

The ET-device (with the standard software package – installable program “A033-ET/usb Server software”) provides network interface based on TCP/IP communication protocols to interact with any remote application requiring precise event timing. Such interfacing is well suited for designing distributed multi-user event timer systems where user's application software is separated from the specialised software supporting event measurement. In this case the user's software can remotely control the A033-ET/usb full operation.

In addition to the A033-ET/usb standard set, the Sample program is supplied. This program presents all particularities of processing the data that are obtained

directly from the A033-ET/usb hardware via PC USB port

**Event Timer Daemon:** The Event Timer Daemon (ETD) is a Linux program which can replace the Windows based A032/A033-ET server programs originally shipped with recent versions of the Riga Event Timer. The program was initially developed by SpaceTech for the SLR station of the GFZ German Research Centre for Geosciences in Potsdam. The development was driven by the lack of support for full access to computers parallel port in most recent 64 bit MS Windows operating systems. After two years of operational experience and good performance results in Potsdam, Eventech decided to offer this Linux software also to other Riga Event Timer customers.

The current ETD version supports the Event Timer models A032 and A033 with parallel port, and implements the same functionality and also the same TCP communication protocol like the original Windows A032/A033 server programs. Therefore, it is possible to switch from the Windows A032/A033 server programs to the ETD without modifying the interface of client applications.

Despite the fact that the ETD also runs on a normal, non-real time Linux system, it was primarily developed for a Linux real time system. Being a real time application the ETD always gets the required execution time from the Linux system. This ensures the proper timing constraints for reading the measurements from the Event Timer via parallel port even at high system load.

#### References:

[1] Artyukh Yu. et al. (2008) Advances of High-precision Riga Event Timers, *Proceedings of the 16th International Workshop on Laser Ranging*, Poznan, Poland, pp. 398–403.

2) Artyukh Yu. et al. (2011) Main Directions of Riga Event Timer Development and Current Results, *Proceedings of the 17th International Workshop on Laser Ranging*, Bad Kotzting, Germany, pp. 111–115.