EVENTECH

New Eventech Time Tagger: ESTT 7 Series

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2023 ILRS TECHNICAL/SPECIALTY WORKSHOP:
New Developments in Satellite Laser Ranging

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Company Updates

- New Timer / Time Tagger:
  **Eventech Stream Time Tagger
  - ESTT 7 Series**

- **First tests** at Latvian Institute
  of Astronomy (Kalvis S.)

- Latest updates on **LSMT (HERA mission)**
  - Space Timer

- New **ESA project for Quantum technologies**
  (QIN)

New Timer. ESTT – Welcome

RMS, time tags (typical)	1.5 ps
RMS, time tags (max)	1.8 ps
RMS, differences (typical)	2.1 ps
RMS, differences (max)	2.5 ps
Operating temperature range	5–40 °C
Communication interface	USB 3.0
Continuous Event Rate	25 MEPS

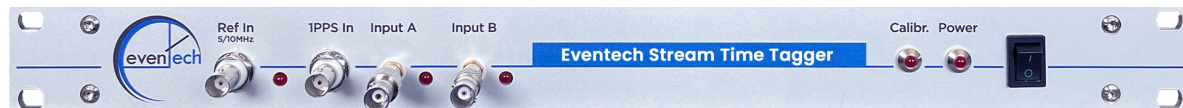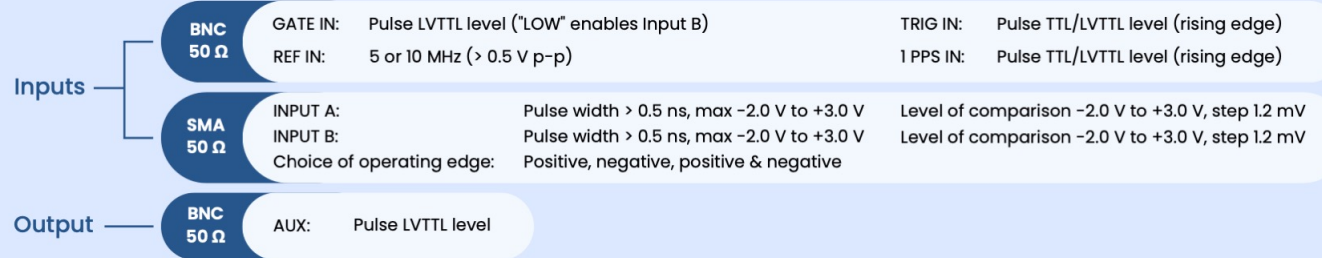|	
Single-input time tag drift	< 1 ps / °C
Synchronisation error of input signals and signal 1 PPS	± 15 ps (max)
Interval non-linearlity for time intervals greater than 100 ns	± 1 ps max
Dead time	40 ns
Input-to-input offset	40 ps
Input-to-input offset drift	< 0.15 ps / °C
EMC Shielding	~ 30 dB(A) at 1 GHz

Inputs

BNC 50 Ω
- GATE IN: Pulse LVTTL level ("LOW" enables Input B)
- REF IN: 5 or 10 MHz (> 0.5 V p-p)
- TRIG IN: Pulse TTL/LVTTL level (rising edge)
- 1 PPS IN: Pulse TTL/LVTTL level (rising edge)

SMA 50 Ω
- INPUT A: Pulse width > 0.5 ns, max –2.0 V to +3.0 V — Level of comparison –2.0 V to +3.0 V, step 1.2 mV
- INPUT B: Pulse width > 0.5 ns, max –2.0 V to +3.0 V — Level of comparison –2.0 V to +3.0 V, step 1.2 mV
- Choice of operating edge: Positive, negative, positive & negative

Output

BNC 50 Ω
- AUX: Pulse LVTTL level

Ref In 5/10MHz   1PPS In   Input A   Input B   Eventech Stream Time Tagger   Calibr.   Power

100-240VAC   Fuse 1A/250V   Aux Out   Gate In   USB3   Trig In   MADE IN LATVIA
LVTTL   LVTTL   LVTTL

Comparison

VS

Eventech **"RIGA TIMER"**
A033-ET Event Timer

Eventech Stream Time Tagger
ESTT 7 Series

Eventech "RIGA TIMER" **A033-ET** Event Timer

|	Eventech Stream Time Tagger ESTT 7 Series	Eventech "RIGA TIMER" A033-ET Event Timer
RMS, time tags (typical)	1.5 ps	n/a
RMS, differences (typical)	2.1 ps	3.5 ps
RMS, differences (max)	2.5 ps	5 ps
Input minimum pulse width	> 0.5 ns width	> 5 ns width
Continuous Event Rate	25 MEPS	1 MEPS
Dead time	40 ns	50 ns
Synchronisation error of input signals and signal 1 PPS	± 15 ps (max)	± 10 ns (max)
Single-input time tag drift	< 1 ps / °C	< 2 ps / °C
Input-to-input offset drift	< 0.15 ps / °C	< 0.5 ps / °C
Communication interface	USB 3.0	USB 2.0
Operating temperature range	5–40 °C	15–30 °C

VS

Significant "stand-out" properties of ESTT:

- Additional Front-End features
- Better precision
- Better parameter stability
- Quicker response time
- Higher Event Rate
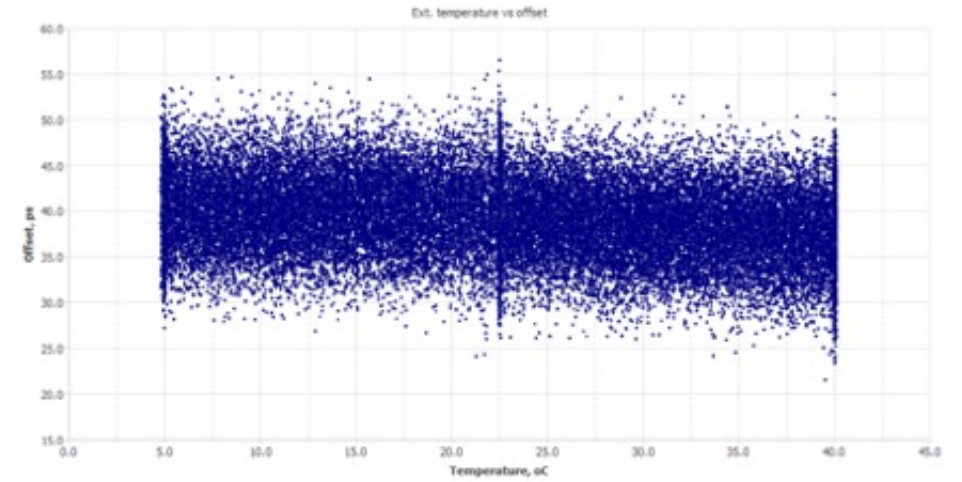- Better synchronization precision with external time scale
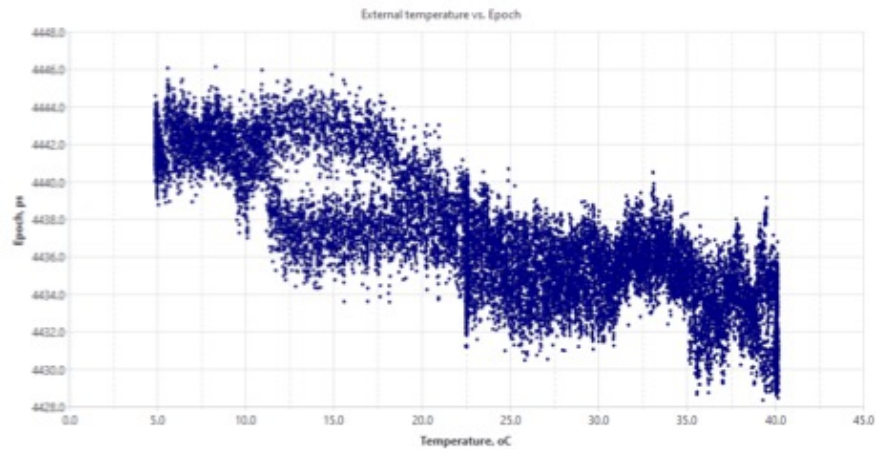- Improved API
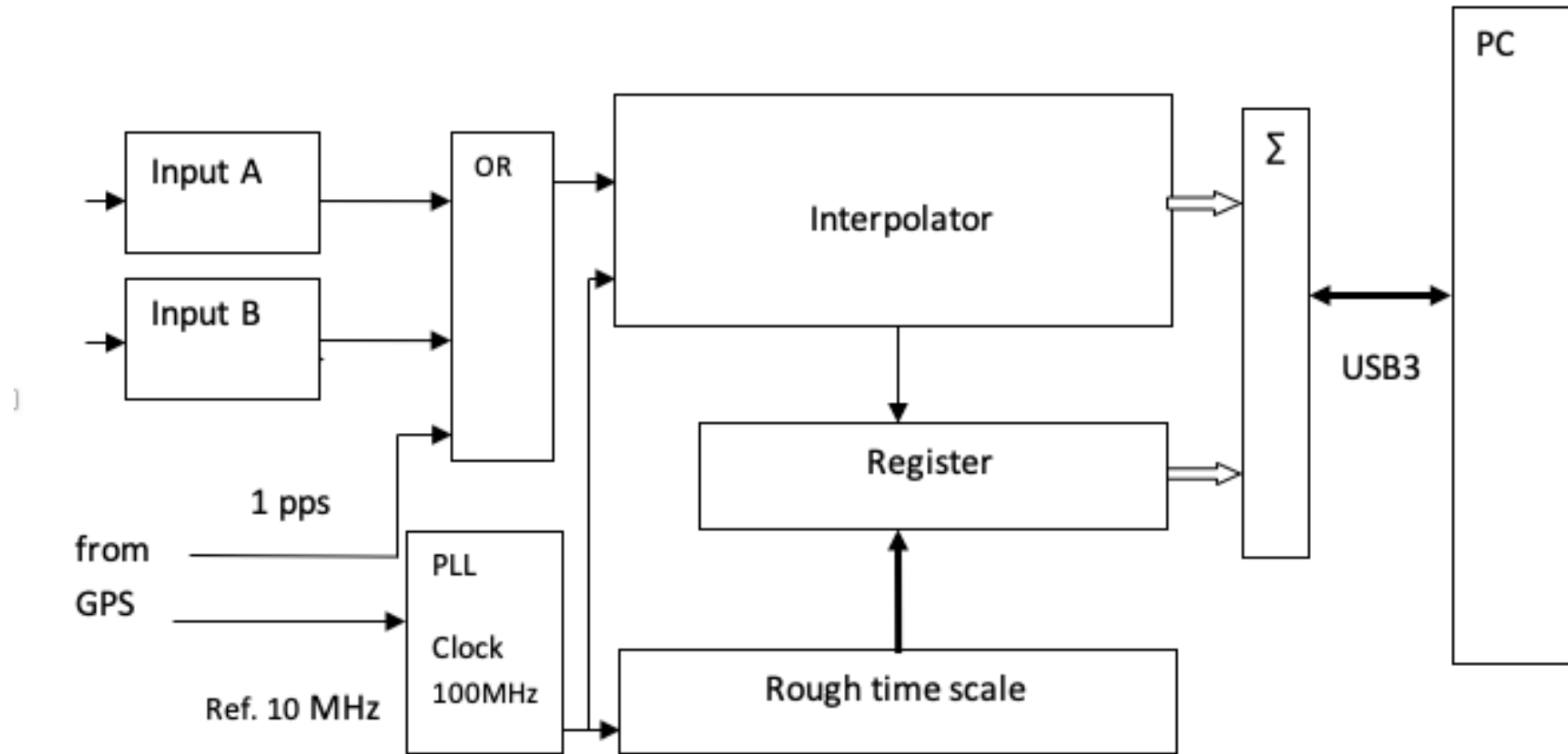
New Timer. ESTT – Tests
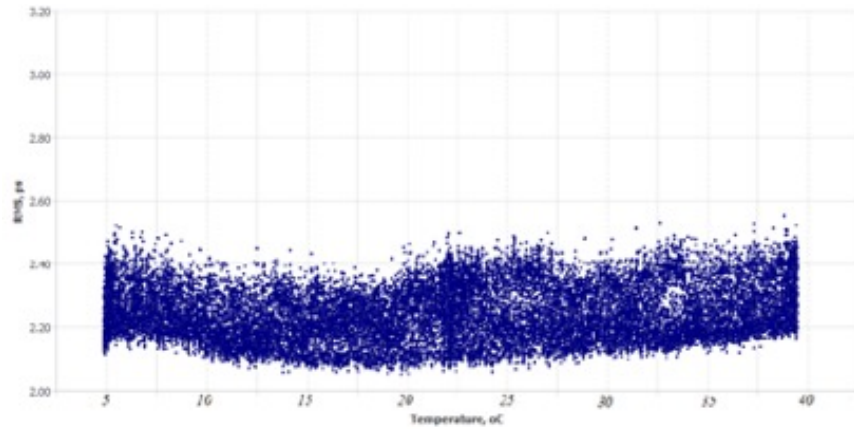
Temperature stability of precision.

Temperature stability of offset

Temperature drift of the systematic error in event time recording

New Timer. ESTT – Features

- **Comparison levels** of Input signals can be **set via software** in the range −2 +3V step 1mV

- **Effective edge** of the input signal (rising or falling) can be **selected via software**

- **Dead Time 40 ns** and **25 MEPS continuous Event Rate** with **Full recording option.**

  (The interface with the PC enables continuous operation for continuous (skip-free) logging of event arrival times with almost no time limit)

- **Full recording option** allows to implement **Gate Generator on a software level**.

  This allows for unlimited opportunities to implement various algorithms
  for useful signal separation from the noise:
  - both during post-processing of measurement data,
  - and during operational monitoring of the laser ranging process

- Certain difficulties utilizing the Full recording option may be contributed to the necessity to process very large amounts of measurement data

- **Full recording data allows** for a fundamentally new option of **enabling atmospheric lidar functionality**

- **Full recording Option** implementation **was verified** during the laser ranging **experiment on the Riga 1884 Station** (more info in Kalvis Presentation)
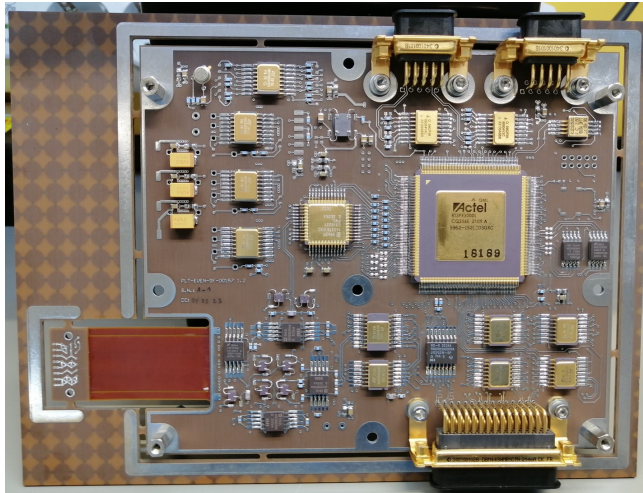
Our Space-related experience – HERA mission

- **Time Interval Meter for Planetary Altimeter (PALT),** to be used in ESA's planetary **mission HERA**, is developed by Eventech

  (ESA Contract No. 4000125526)

- FM model Manufactured and is currently being tested.

Parameter	Value
Precision (single-shot RMS resolution)	7 - 8 ps
Input offset drift	0.4 ps / °C
Power consumption	3.5 W
Form factor	One 8-layer PCB (150 x 130 mm)

New Project – QuanTiTag

- In August 2023, **Eventech signed new Project ESA**
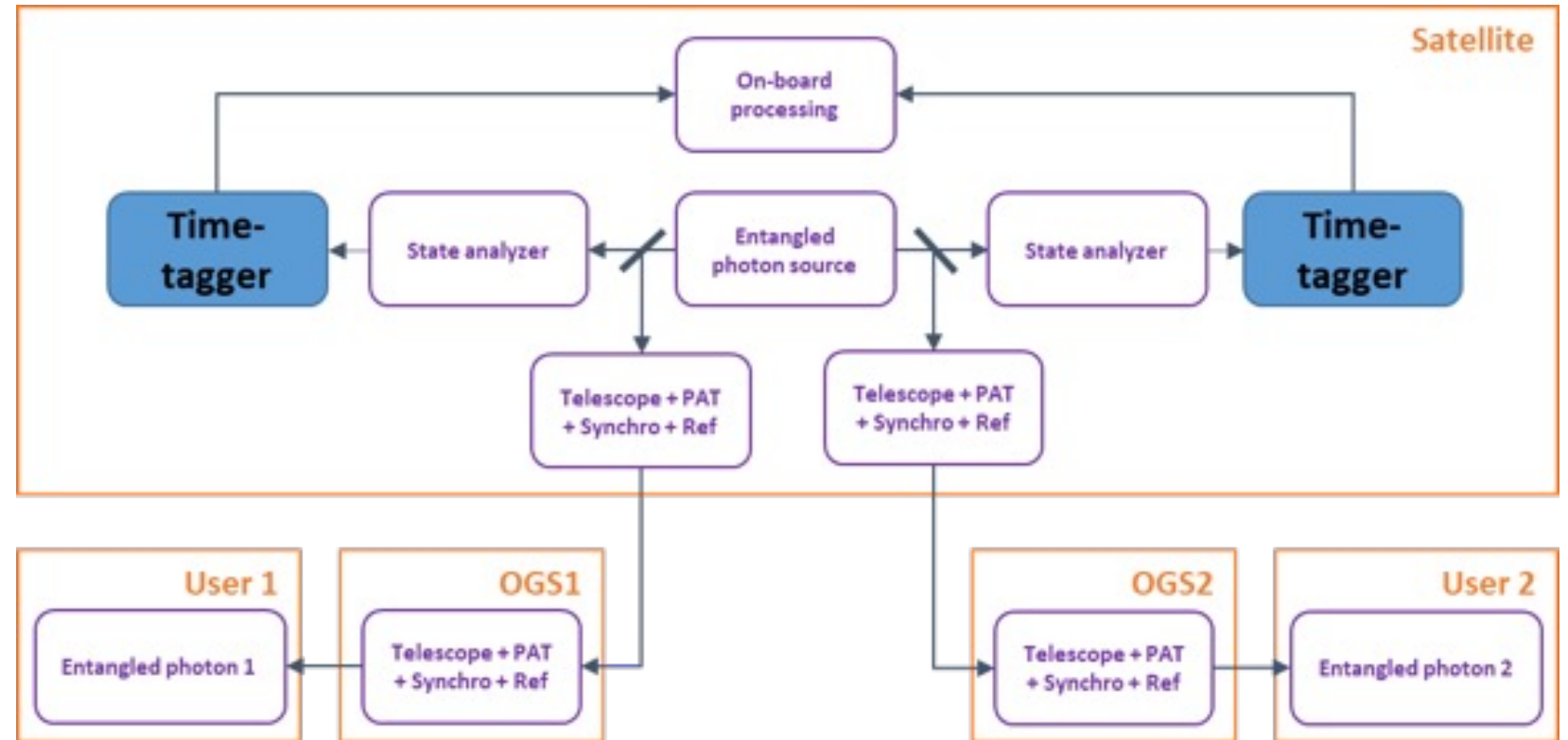
  (Contract No.: 4000142071/23/NL/MH/mp)

- **Name:** Development of Quantum Time-Tagger (QuanTiTag)

- **Duration:** 22 Months

- **TRL:** 4+

- **Partner:** Thales Alenia Space France
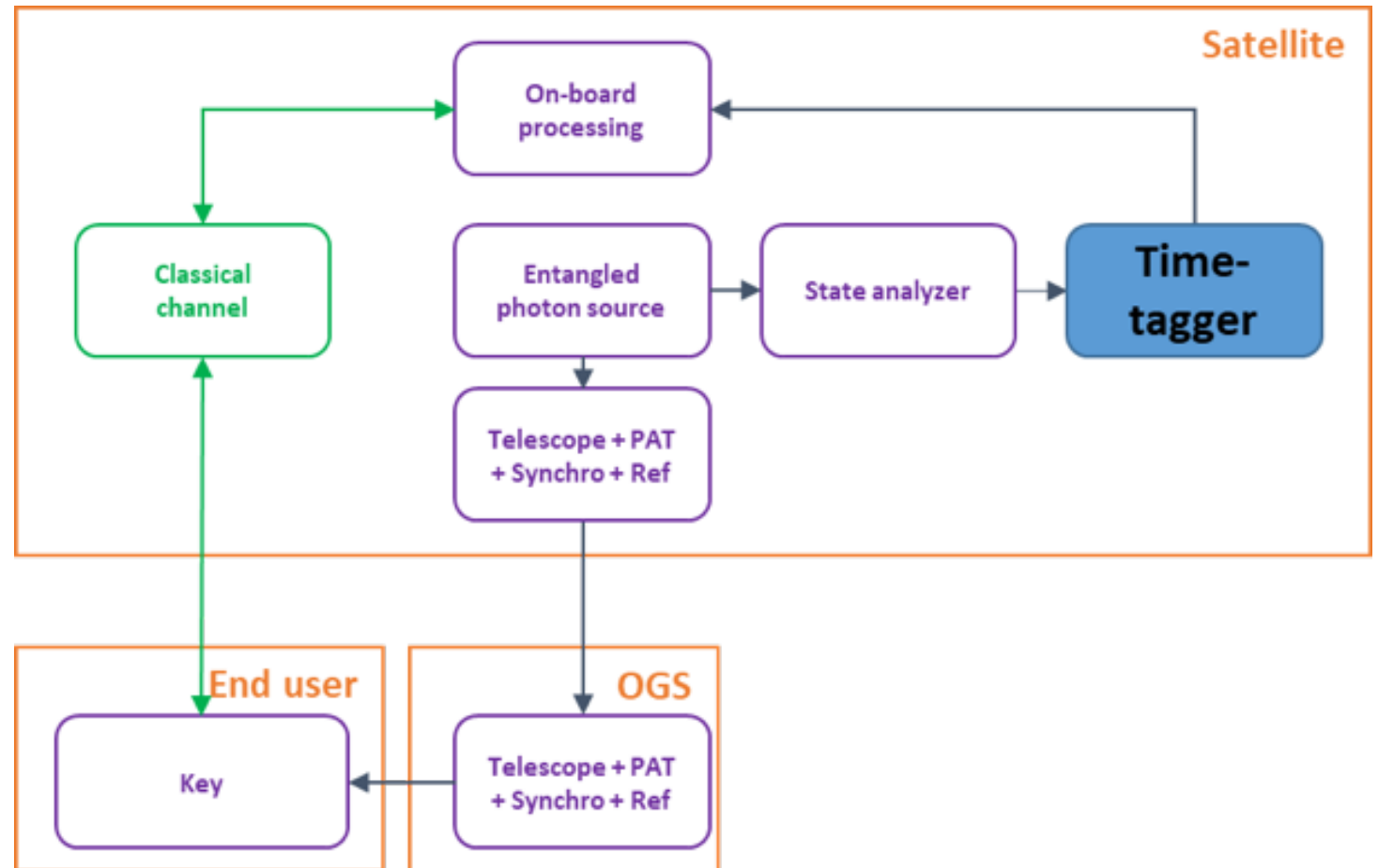
- **Planned application:** LEO missions

- The application is **Quantum Information Networks (QIN),**

  which aims at connecting separated quantum devices

  with the use of entangled photons.

- The application **is Quantum Key Distribution (QKD),**

  but is not our baseline today, as other schemes are more efficient.

Summary

Looking for:

- Partners for

  Joint Product / Technology development

- Industrial Expertise

- Testing our TDC & TT solutions

- Space missions

Have a Good Day &
Thank You for Your Attention!

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