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Timing Board: a new module for very low-consumption timing applications

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ABSTRACT

CEA/DAM, in partnership with the startup FullScale, has developed a compact board, targeted to easily integrate any equipment with accurate timing needs.

Based on GNSS reception to get an absolute time reference anywhere in the world, the Timing Board provides standard PPS signal and NMEA frames, and optionally a stabilized 4 MHz clock. Its extra small size and very low consumption (<40 mW) allow it to be embedded in any kind of device, such as compact digitizers or digital sensors.

The Timing Board module offers a very high stability without GNSS reception: the maximum drift is +/- 20 ppb over a wide temperature range [-20°C; +70°C].

This module meets the PTS requirements in terms of timing and will be integrated in SMAD and MB3d digitizers soon.

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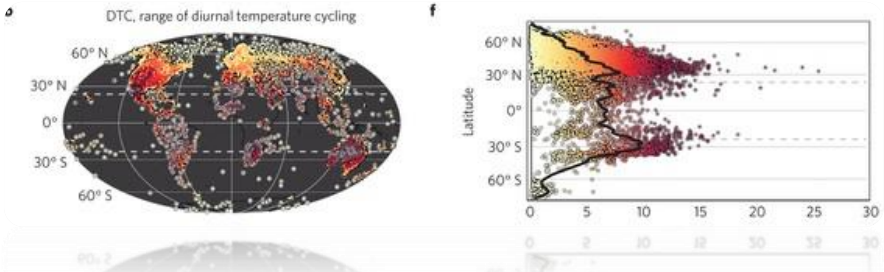
INTRODUCTION

Objectives :

- Generate timing signals (PPS, 4MHz, NMEA) in absolute time based on satellite positioning system (GNSS)
- For a precise timing of the geophysical digitizer samples

Specifications :

- GNSS Compatible: GPS, GALILEO, GLONASS…
- Low cost
- Low consumption : <40 mW (nominal mode)
- Improved stability without GNSS signal: 20 ppb over 40°C thermal range (between -20°C et +70°C)
- Configurable, depending on the digitizer



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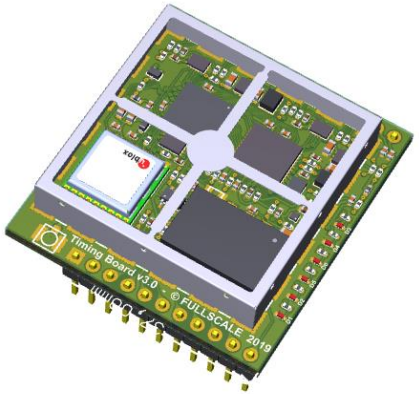
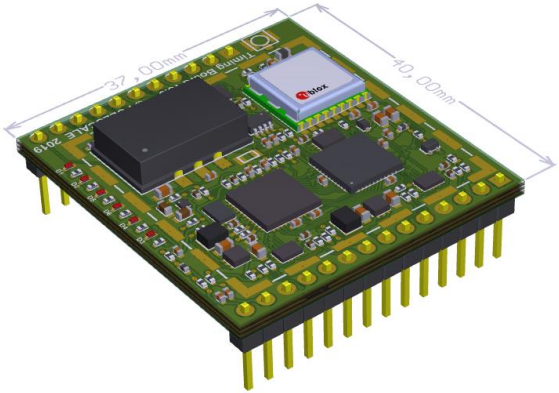
INTRODUCTION

- 3D representation of the TimingBoard :
  - ✓ 40mm x 37mm sized
  - ✓ With IEM protection shield





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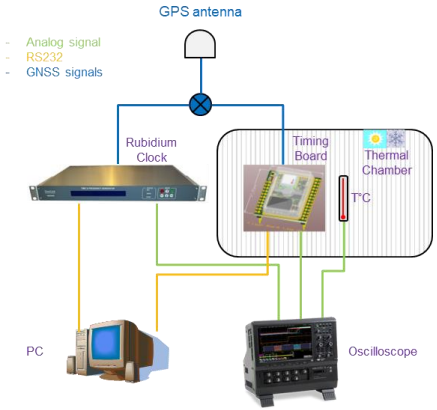
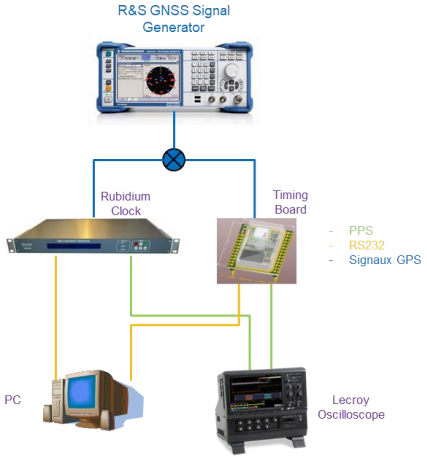
METHODS

- Testing equipment :
  - ✓ Reference clock used for the tests :
    - Meinberg GPS170SV
    - TimeLink microsystems TMG5090
  - ✓ Temperature test chamber : Weiss WTL64
  - ✓ Oscilloscope: Teledyne Lecroy HDO8108 (8 ch, 1GHz, 2.5Gs/s)
  - ✓ GNSS signal generator: R&S®SMBV100A





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METHODS

- PERFORMANCE QUALIFICATION
  - ✓ Temperature stability
  - ✓ Low GPS/GALILEO signal level PPS stability
  - ✓ PPS Stability without GPS/GALILEO signal
- FUNCTIONAL QUALIFICATION
  - ✓ GPS/GALILEO system test
  - ✓ Leap second test
  - ✓ GPS week roll over test
  - ✓ leap year/new year test

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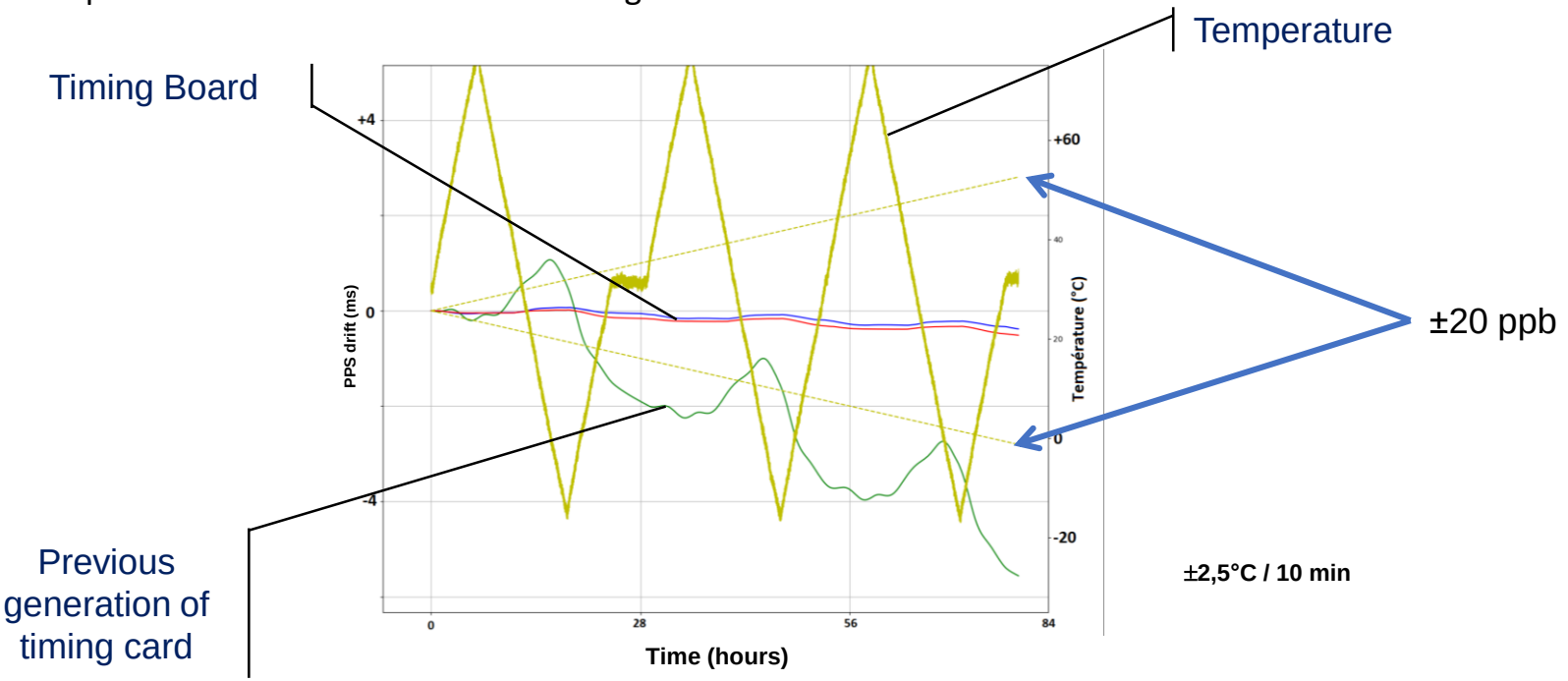
RESULTS

- Temporal PPS Time drift without GNSS signal



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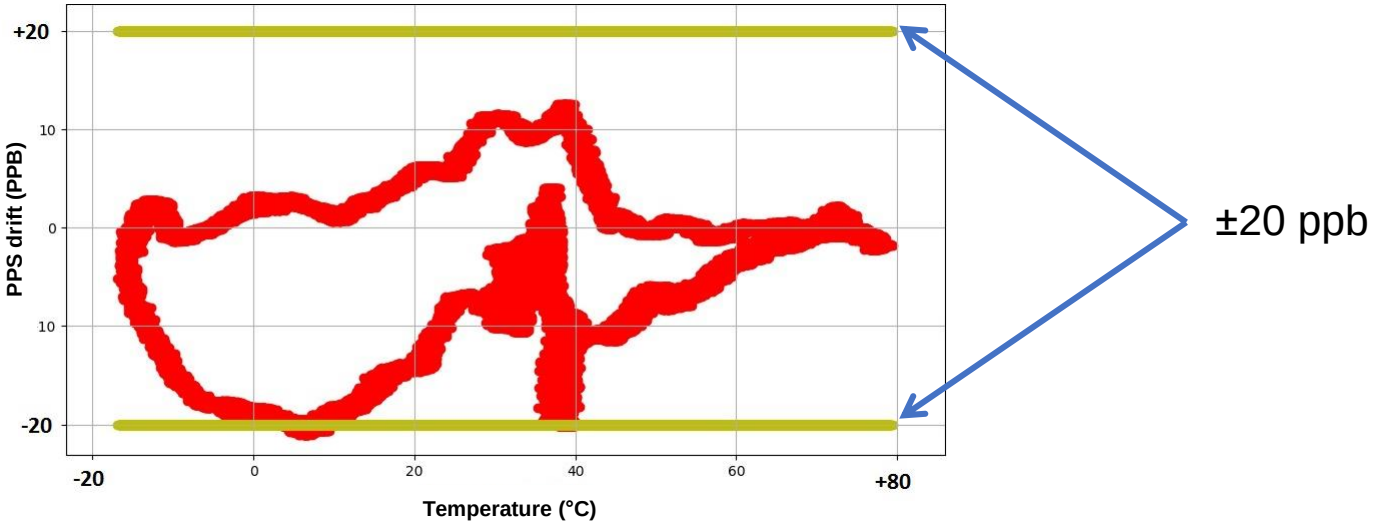
RESULTS

- PPS time drift over temperature without GNSS signal



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CONCLUSIONS

Soon available, visit website for contact : http://fullscale-labs.com/