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Lightweight Acquisition System For Analogue Signals

B.Bielawski

CERN, Geneva, Switzerland
Beams Department, Radio Frequency Group

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Outline

- Available solutions
- The original system
- Why custom solution?
- The system
  - Hardware
  - Software
  - Deployments
- Future plans & conclusions

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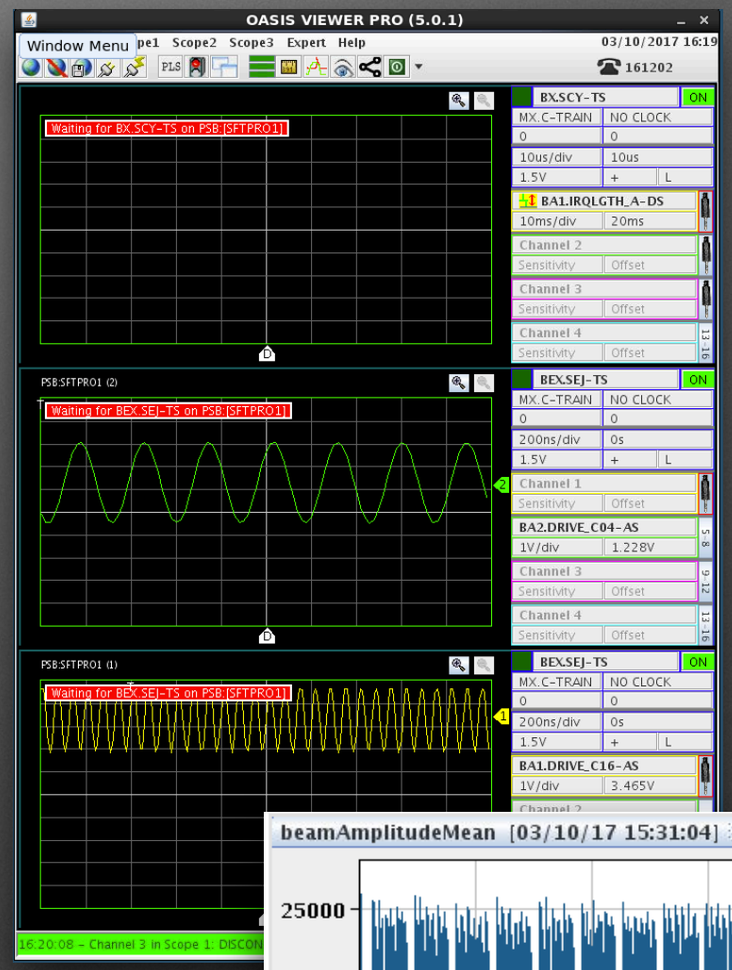
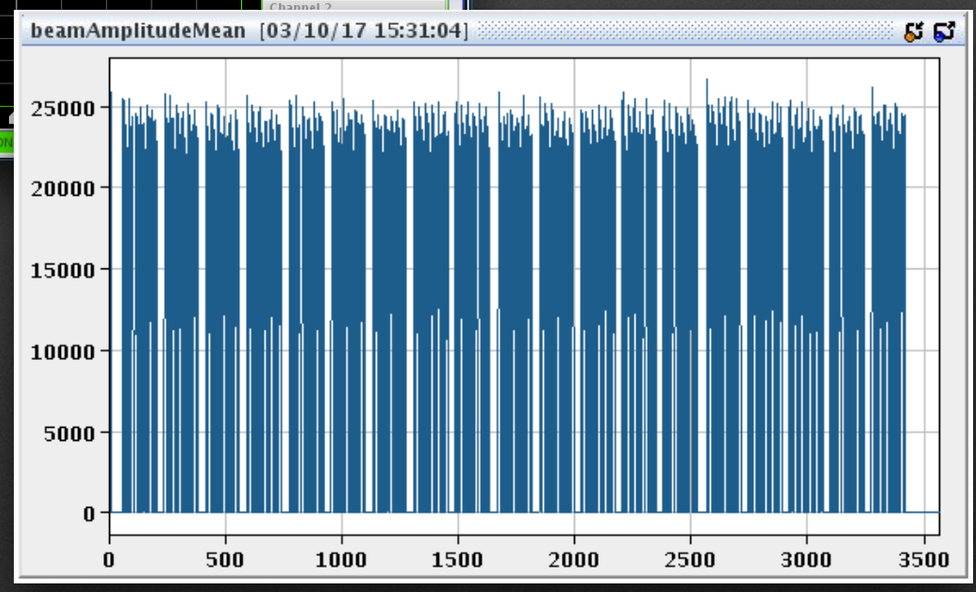
Available solutions

- **OASIS**:
  - generic and mature,
  - support for many digitizers,
  - well integrated in the CS,
  - complex, expensive.
- Group specific (for example):
  - **RF Acquisition Buffers**:
    - built into RF hardware,
  - **RF ObsBox**:
    - high throughput,
    - specialised.





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The original system

The original system was used for monitoring the health of the LHC klystrons. Klystrons are microwave amplifiers and they are delicate devices that can be damaged by an electric arc.

It was decided the monitoring is crucial and has to be upgraded due to problems with reliability and lack of integration with the rest of the control system.

The solution consisted of:

- Windows XP PC (in TN),
- USB-Ethernet bridge device,
- LabVIEW software interface,
- PicoScope 6000 series.

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Why a custom solution?

Custom solution for custom needs:

- Limited space available in HV Bunkers,
- No need for a big system:
  - only 8 channels needed per bunker,
  - we already had oscilloscopes.

Non-periodic signals to be acquired:

- Long idle periods between events,
- Triggered by the signal,
- Specific trigger requirements:
  - trigger by ANY channel.

Hardware

Using COTS hardware:

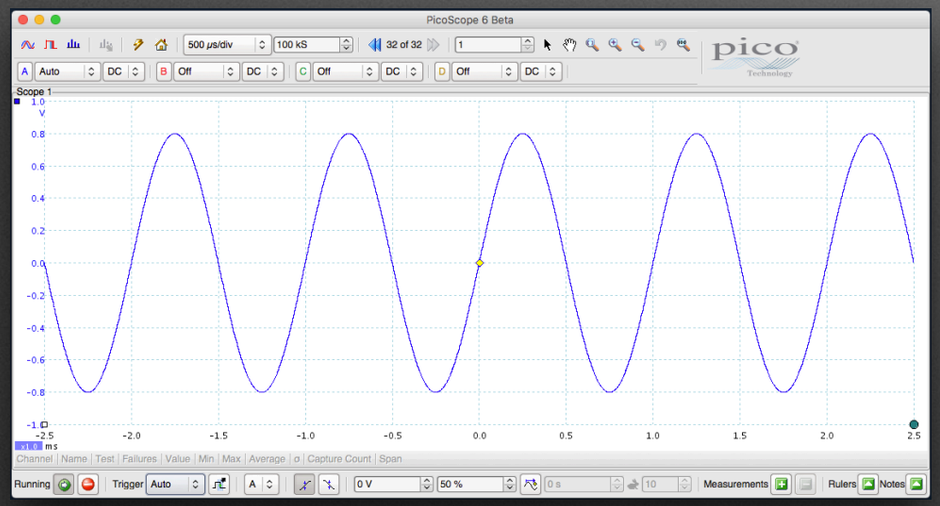
- USB-enabled oscilloscopes from PicoTech (PS3000 and PS6000),
- Standard PCs running SLC6/CC7 (Kontron KISS, Intel NUC)

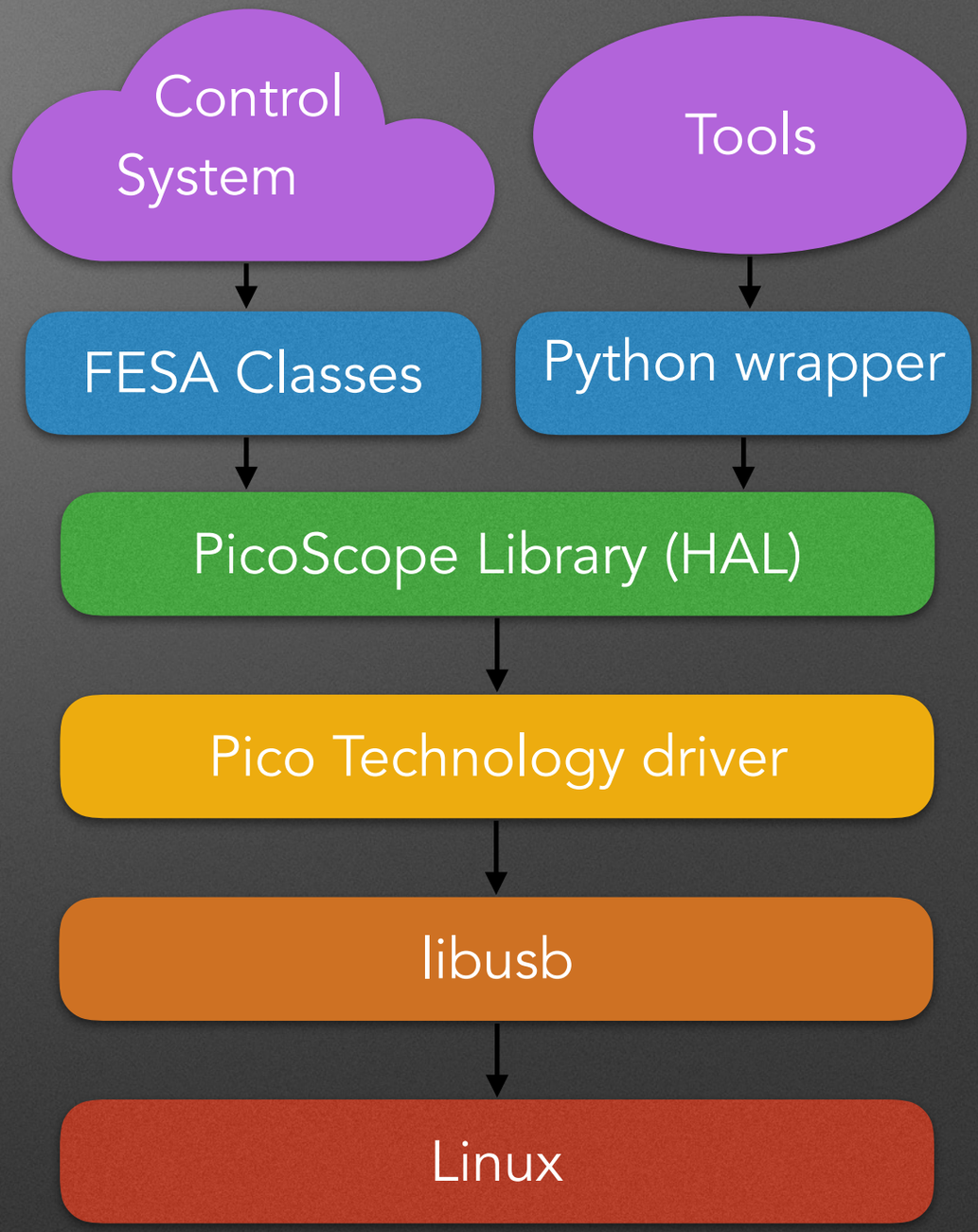
	CH	BW [MHZ]	MEM [MS]	
PS3000	2, 4	50–200	64-512	cheap
PS4000	2,4,8	5—20	25	12-14 bit
PS5000	2, 4	60–200	16-512	8-16 bit
PS6000	4	250–1G	256-2G	high speed

Software

The manufacturer provides:

- Drivers for Windows, OS X and Linux,
- SDK,
- Their own custom software,





We have wrapped the driver to create an abstraction layer and created a FESA class on top of it.

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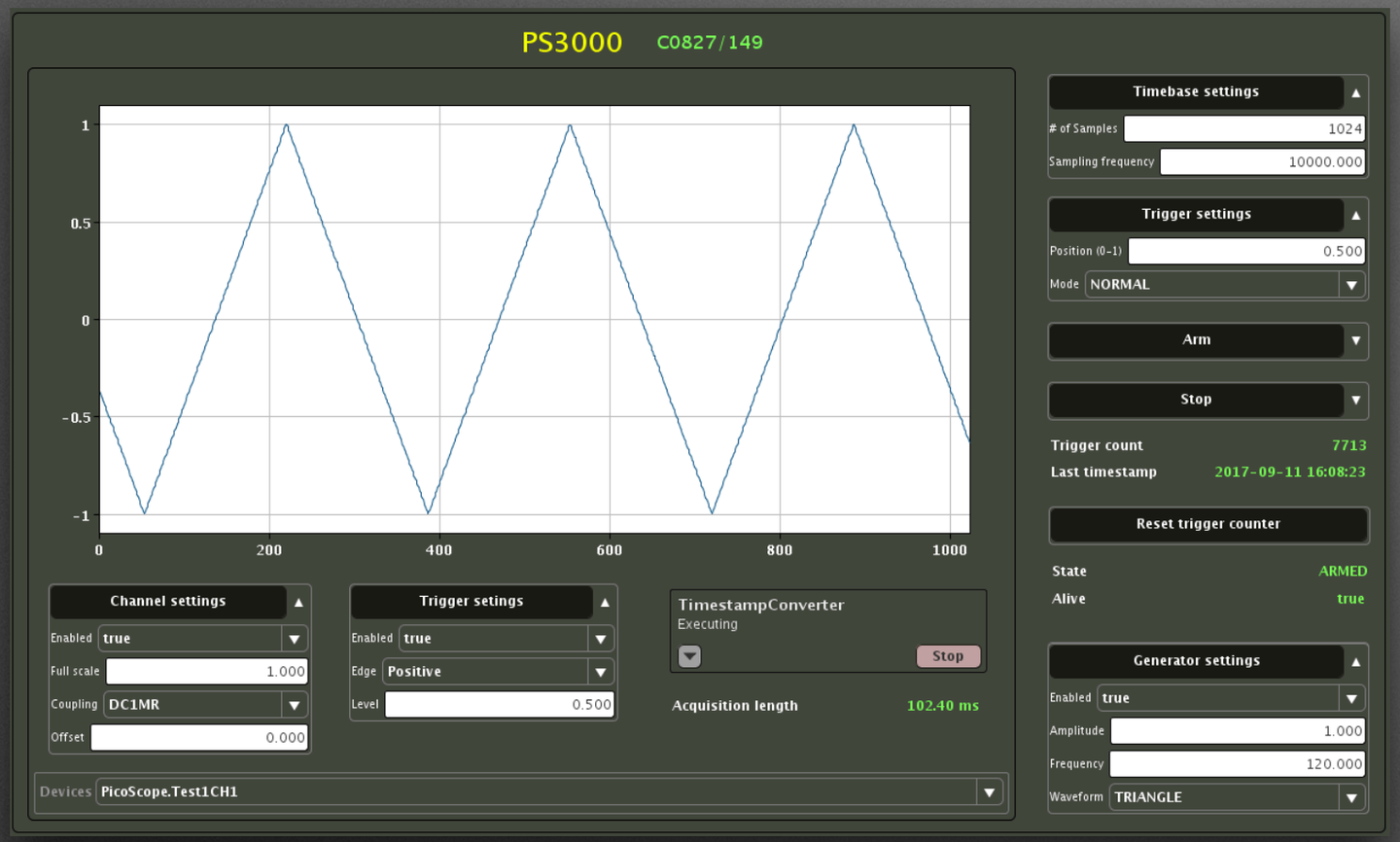
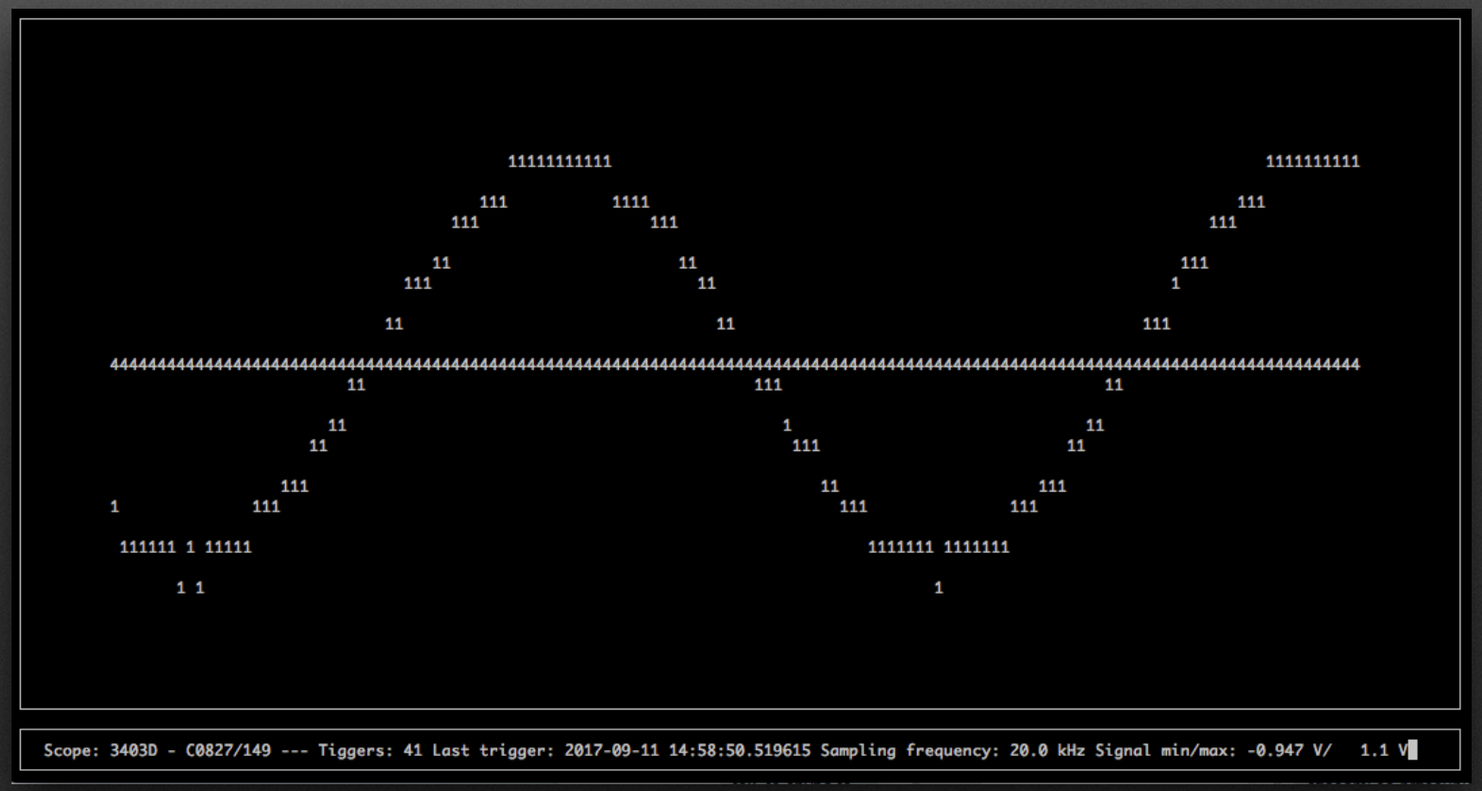


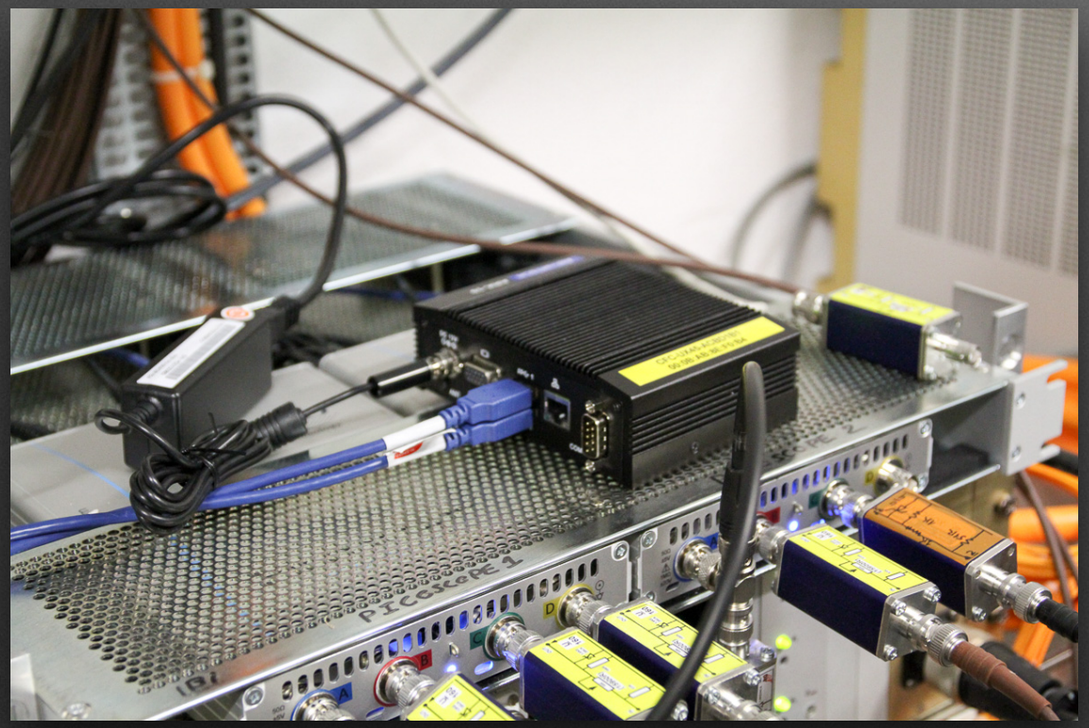
Universal oscilloscope panel implemented in Inspector using the FESA class as a data source.

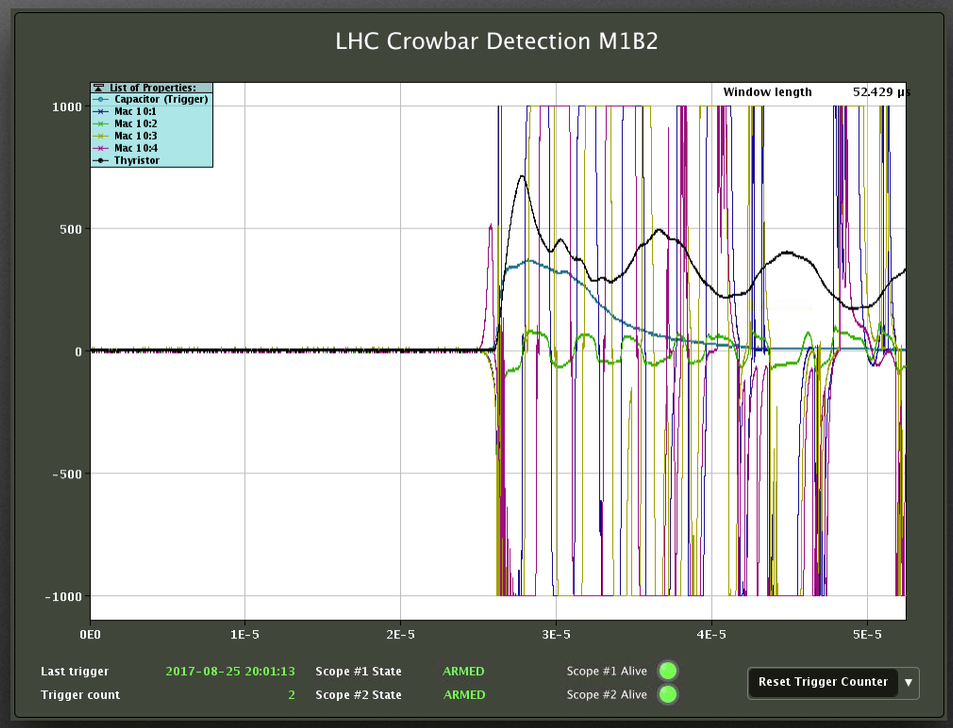
The same device interfaced using a Python wrapper. This test tool is distributed with the library.



Deployments

At the moment 16 oscilloscopes with accompanying computers are deployed in the LHC. 8 for current monitoring and 8 for arc monitoring.





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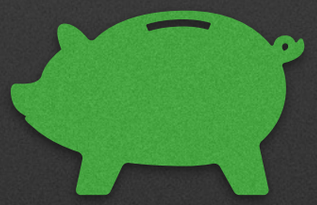
Future plans & conclusions

The complete and already used system could be expanded by:

- adding support for more device families,
- providing a “scope&computer” kit for rapid deployment,
- integrating HAL into OASIS.

The solution may be especially interesting for:

- debugging machines by monitoring extra signals,
- providing low-cost-per-channel long term acquisition,
- deployment when limited space is available.



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Thank you for the attention.

Questions?


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