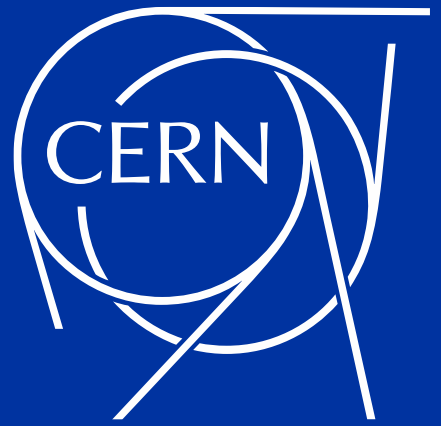


Xbox Measurement Discussion:

Pulse-to-pulse Data Logging

03/2023

Xbox Data Taking

As a reminder, two files are logged during Xbox operation, EVENTdata and TRENDdata.

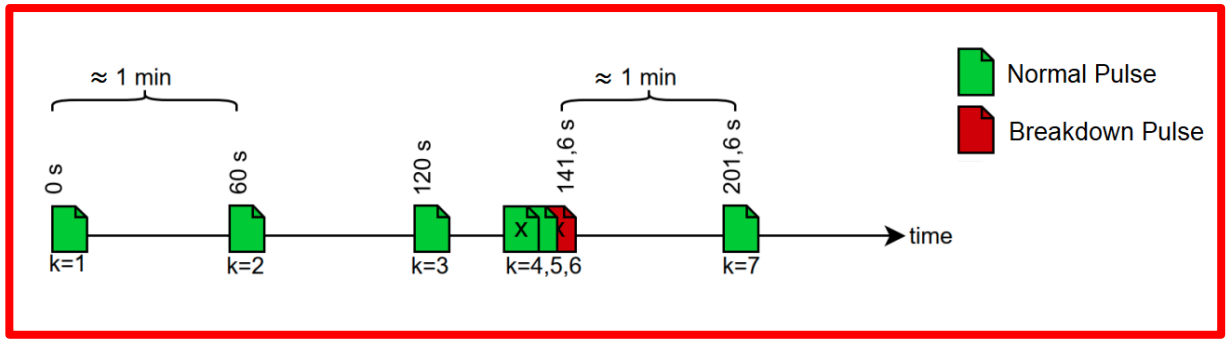
EVENTdata:

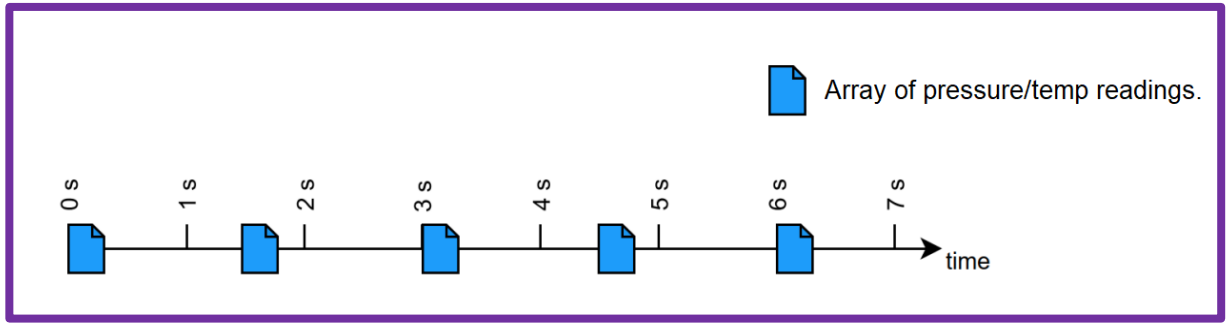
- RF waveforms, Faraday cup signals.
- We save ≈ one pulse per minute, and all breakdown/pre-breakdown pulses.

TRENDdata:

- Vacuum/temperature sensors.
- Usually we record ≈ one data point per second.

Normal Operation



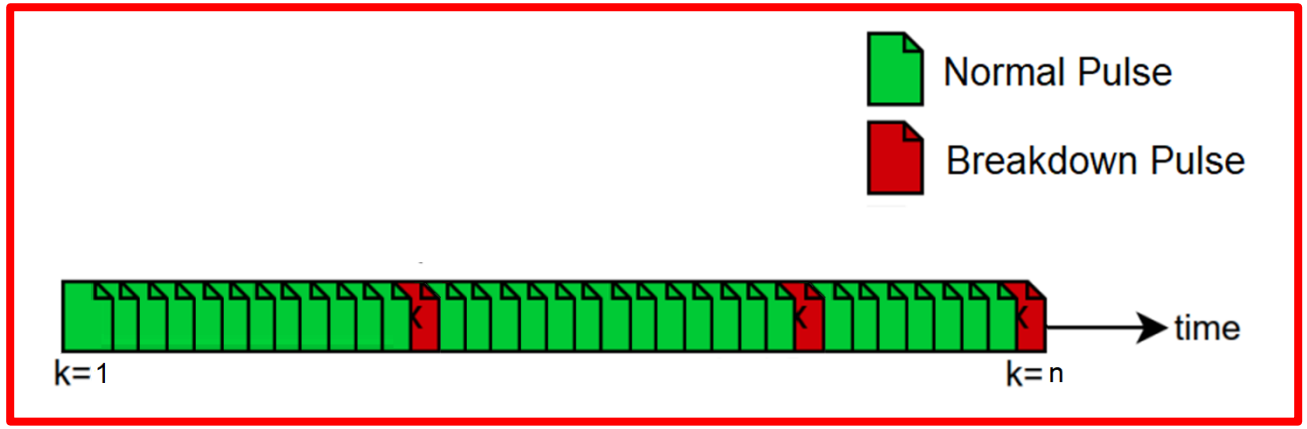


Measurement Proposal

HUJI would like to examine pulse-to-pulse dark current data. To acquire the data, the proposal is to:

1. Modify the code to save every pulse (acquisition setting on the GUI).
2. Reduce repetition rate (so data throughput is manageable for the software).
3. Run with a fixed, chosen gradient and pulse length until we collect a few BDs (while saving every pulse).
4. End measurement. Restore previous settings and continue running as normal.

To run like this.

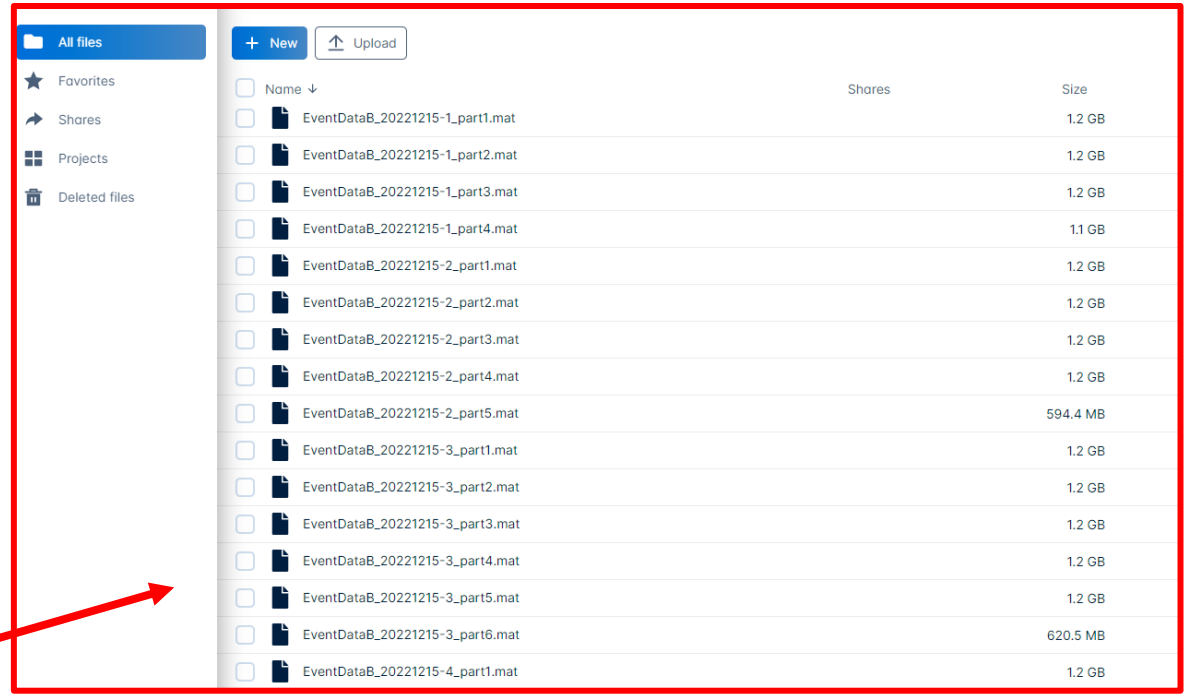


First Measurement

Discussed in Xbox meeting on 16th Nov 2022: https://indico.cern.ch/event/1202116/

First measurement performed by on Marçà on 15th Dec 2022.

1. Marçà found a rep rate we could run at (10Hz per line) and prepared the software to log all the pulses.
2. Ran for a few hours, recorded 50000 pulses with some BDs. In total, around 10 GB of data.
3. Initial conditions restored and operation resumed.
4. Raw data stored here: https://cernbox.cern.ch/s/kcsAzTunZGbNpwT
5. Data was then cleaned, split into manageable files, and shared in MAT format on CERNbox here: https://cernbox.cern.ch/s/YzhaFAqF3EDyQeH



First Response

Feedback from Yinon:

"The two big problems we have:

- **We look for fluctuations and changes in these, but we have temporal "edge contaminations,"**
- **Signal is expected to be low due to relatively low driving force.**

Possible solutions:

- **Increase the field closer to BD threshold so we get larger elastic fields and so larger expected signal.**
- **Varying pulse length so we get better estimates on "edge effects".**

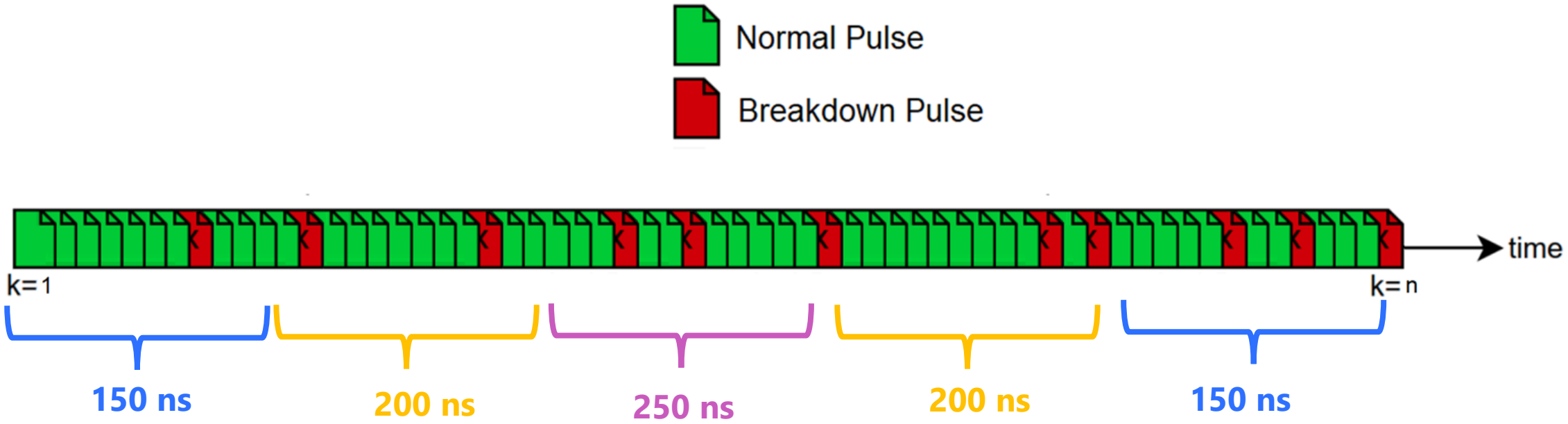
I request :

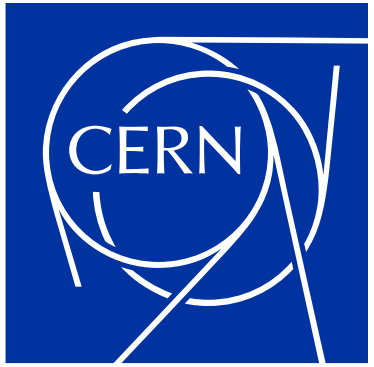
a) **Most important - increase field.**

b) **Have two or three pulse lengths. I think it is best if they rotate, so we have long and shorter pulses at different times. Maybe do a pyramid structure? 150 ns, 200ns, 250 ns, 200ns, 150 …. Etc"**

New Proposal

Based on the feedback, it seems HUJI would like us to operate at the highest field we can and collect data like this (details e.g. no. pulses, pulse lengths, power, to be discussed):

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