

Helping CERN explore the origins of the universe and improve our future on Earth

The neutron Time-of-Flight (n_TOF)

n_TOF is a pulsed neutron source at CERN, the European Organization for Nuclear Research, that studies neutron interactions as function of the energy using time-of-flight method. This research will help astrophysicists understand how stars are born, grow and die. It also furthers the general understanding of nuclear physics and in particular, its application in strongly reducing the production of nuclear waste in future nuclear plants.



+ n_TOF experiment area

Redefining radioactive experiments

Nuclear fission is at the heart of n_TOF's experiments and this creates a huge amount of data. The data acquisition systems (DAQs) in n_TOF were upgraded in 2014 and CERN's DAQ Coordinator, Alessandro Masi, chose Teledyne SP Devices' digitizers to process experimental data. We worked with Alessandro to optimize the digitizer's programmable gain amplifier's high gain stability and optimized the data transfer rate from the card memory, to the CPU memory, in order to perform consecutive acquisitions every 1.2s at the maximum sampling frequency. Combining this with efficient data reduction algorithms in the CPU, we significantly improved data quality while reducing the volume of data generated by each experiment.

Highlights

+ Last year our digitizers processed over 1 petabyte of data from a single experiment in just one month, the equivalent to recording the DNA of the entire US population, three times.

+ The n_TOF DAQ can run 100 channels, operating at a minimum speed of 0.5GS/s, though some experiments have run as high as 1.8GS/s.

An on-demand partnership

The radioactive samples used in n_TOF's experiments are expensive and require secure transport and need different experimental detectors depending on the specificity of the sample. The DAQ system has to adapt to different detectors and so be flexible. We customized our standard digitizers to meet CERN's requirements, including regularly optimizing the set-up on-demand. Daniela Macina, Run Coordinator of n_TOF's experiments acknowledged this by commenting, "Our research requires continuous innovation, so there is always a call for new detectors and we believe Teledyne SP Devices offer the flexibility we need."



+ Our digitizers in the n_TOF DAQ chassis