

## Event recording

We deliver new generation signal processing and data acquisition equipments for neutron scattering spectrometers - either hardware units with software in packages or customizable hardware plus software systems. All these units and modules are constructed to fully support the **event recording**. This kind of the data acquisition means that every single event during the scattering measurement is recorded together with a high resolution timestamp and all these events are collected into a list. Typical events are:

- neutron detection event and position from the detector(s)
- starting / stopping the data acquisition according to the monitor count limit
- chopper opening signals from each chopper disk
- in case of a spallation source: Source Pulse ( $T_0$ ) signal
- in case of dynamic or stroboscopic measurement: start / end of excitation

Event recording obviously provides the following benefits:

- It suits best to Time Of Flight measurements.
- It is not necessary to collect the scattering data into (1D, 2D) spectrum immediately, during the measurement. Instead, user can select or reject parts of the measured data later (offline) to avoid errors.
- User has the option to "replay" (revisit) the whole experiment later and to improve the primary data handling algorithm also.
- Revisiting the data is similar to replay a film taken from several camera positions.
- You can reveal dynamic - time dependent - scattering effects also.

Data types at event recording:

Timestamp	Event Source	Event Name	Param-1	Param-2
Values with 100 ns resolution	Detector-18	Data Acquisition	Start	-
	Detector-22	Chopper 1	Open	-
		Chopper 3	Open	-
		Source Pulse	$T_0$	-
		Monitor Control	Start	-
		PSD Detector	X position	Y position
		Stroboscopic	Ultrasonic On	-
		Stroboscopic	Ultrasonic Off	-
		Monitor Control	Stop	-
		Data Acquisition	Stop	-

Example records from event recording:

Timestamp (in 100 ns units)	Event Source (Hw unit code)	Event Name	Param-1	Param-2
12345678901234	Control	Data Acquisition	Start	-
12345678902345	LisTDC-1	Chopper 1	Open	-
12345678903456	LisTDC-1	Neutron Detection PSD	1546	1234
12345678904567	LisTDC-1	Source Pulse	T <sub>0</sub>	-
12345678905678	LisTDC-1	Chopper 3	Open	-
12345678906789	LisMON	Monitor Control	Start	-
12345678907891	LisTDC-1	Chopper 1	Open	-
12345678909876	LisTDC-1	Neutron Detection PSD	1823	956
12345678909877	LisTDC-1	Source Pulse	T <sub>0</sub>	-
12345678909878	LisTDC-1	Chopper 3	Open	-
12345679901234	LisMON	Monitor Control	Stop	-
12345679902345	LisTDC-1	Chopper 1	Open	-
12345679903456	LisTDC-1	Neutron Detection PSD	2511	1345
12345679904567	LisTDC-1	Chopper 3	Open	-
12345679905678	Control	Data Acquisition	Stop	-

A possible disadvantage of event recording seems that the extraction of scattering data from the event lists needs extra efforts. **Our company, however, makes the event recording system as convenient as the traditional data handling.**

Our data processing software produces the 1D or 2D spectra from the event record list immediately, during the measurement. Any knowledge about event recording details is not required from the users. The application software enables the user for later revisiting the collected events simply by setting / modifying several parameters for the spectrum data selection. Examples:

- Revisiting of 2D spectrum of neutron intensity by setting absolute time interval (in case of traditional SANS experiments to reveal time dependence effect or error)
- Revisiting 2D spectrum of neutron intensity by setting periodic time intervals relative to the excitation cycle (in case of dynamical / stroboscopic experiments)
- Revisiting 2D spectrum of neutron intensity by selecting a wavelength interval (in case of TOF experiment using choppers and 2D detector)
- Revisiting 1D spectrum of neutron intensity by setting absolute time interval (in case of testing time dependence or error in TOF experiment using choppers)