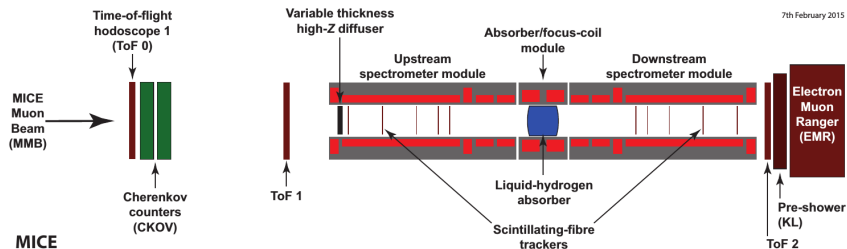# DAQ Update - CM45

Y. Karadzhov
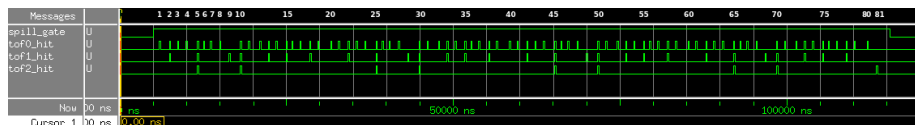
UNIGE - DPNC

July 28, 2016

Prescaled Trigger for MICE

Aimed to measure the particle transmission efficiency of the MICE Cooling channel

A trigger can be generated by TOF0, TOF1 or TOF2.
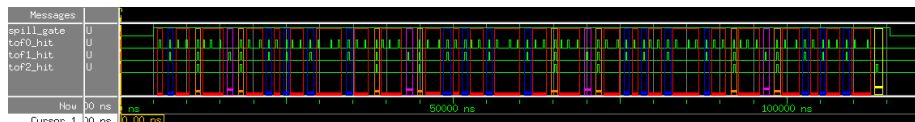
Prescaled Trigger for MICE

Trigger logic simulation

In this example:

The simulated spill includes 81 events of different types.

Different configurations of the logic will be tested against this input (always the same)
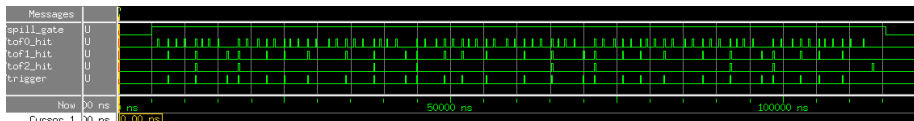
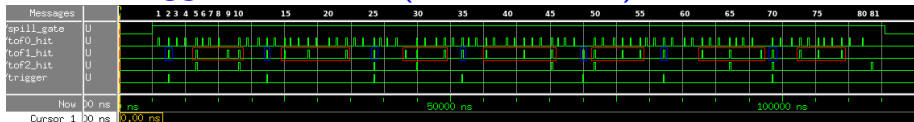# Input of the simulation

Breakdown of the input events:

- TOF0 only - 52 event.
- TOF0 and TOF1 - 16 event.
- TOF0, TOF1 and TOF2 - 8 event.
- TOF1 only - 4 event.
- TOF2 only - 1 event.

*TOF*1 Trigger (the most simple case)

28 Particle triggers.

*TOF*1 Trigger Prescaled (scale factor 4)

- Events, being filtered by the prescaler.
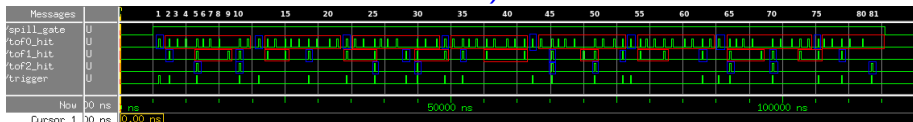- Events, being considered by the trigger logic.

7 Particle triggers. But be careful - when you measure 7 Prescaled Particle triggers, this does not mean that the real number of triggers is 28 (25, 26 or 27 will do the same).

*TOF*0 OR *TOF*1 Prescaled (*TOF*0 scale factor 4)

41 Particle triggers.

*TOF*0 OR *TOF*1 OR *TOF*2 Prescaled (*TOF*0 scale factor 10, *TOF*1 scale factor 3)

24 Particle triggers.

Debugging with beam.

A bug has been found in the new version of the firmware of the trigger.
The issue is described here:
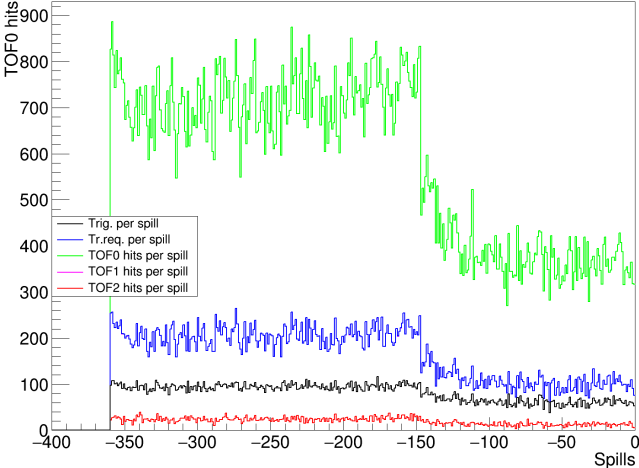https://micewww.pp.rl.ac.uk/elog/Shift+summary/126

- The problem was discovered by the shift crew.
- I wasn't able to provide a quick fix, I decided to roll-back to the old version of the firmware.

Debugging with beam.

Run 7981 taken with the old version of the trigger firmware - expected behaviour:
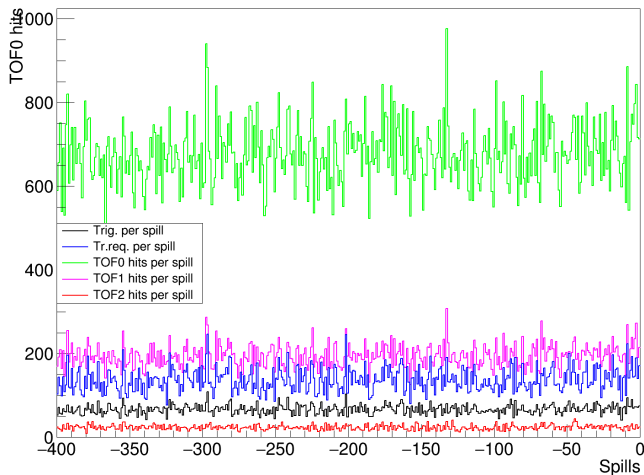

TOF hits per spill

Debugging with beam.

Run 7980 taken with the new version of the trigger firmware - unexpected behaviour:

TOF hits per spill

Debugging with beam.

- The reason for this unexpected behaviour is not clear yet.
- I am not able to reproduce it in the simulation of the logic of the trigger.
- I will need at least $1/2$ day beam time dedicated only for the debugging of the trigger in order to investigate the problem.

Tracker Hall Probes

- The readout of the hall probes is recorded in the binary data stream.
- This is implemented using the DATE $\leftrightarrow$ Epics interface.
- We must be very careful - a malfunction of one ore more probes will cause a DAQ error and will stop the run autocratically.
- The problem can be worked around by removing the corresponding PV from the configuration file of the DATE $\leftrightarrow$ Epics interface (this is what we do right now).
- However, such a modification needs to be very well documented and taken into account when interpreting the binary data.

Conclusion

- A new version of the Trigger firmware which includes prescalers has been developed.
- The prescaled trigger logic will introduce additional level of complexity in the reconstruction of the raw data, therefore this modification has to be well motivated.
- Although the new firmware was fully simulated, a bug has been found during the operation with beam.
- At the moment we use the old firmware and an additional debugging with beam will be needed before migrating to the new version.
- The readout of the hall probes is recorded in the binary data.
- We need to decide what to do in the case of a malfunction of one ore more probes.