NA62 dump experiment read out

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Project

- New read out for the NA62 experiment running **in dump mode.**

- Remove the L0 trigger level.

- Much more flexibility, simplicity in debug, complexity of the algorithm, easy to simulate in montecarlo.

- What is different from existing projects (LHCb, PANDA) ?
  - With continuous particle flow, there is no external trigger source, DAQ must be ready to accept data at any time.
  - The merging of the event on the PC-farm has to handle the time of what is coming to define the event itself.

- Existing proposal of similar projects: SHiP experiment.
  - Can be considered as a test for future similar read-out of dump experiments.

From Dump mode run in 2017

- **RUN 8279 (credits B. Dobrich):**
  - CHOD
    - Q1: 300 kHz;
    - Q2: 6 kHz;
    - LKr > 2 Cluster && LKr energy > 2 GeV: 166 Hz

- To study:
  - HNL decays
  - ALPs
  - Dark Photons
  - ….

**Rate has to be checked:
100% of intensity and new sweeping**

**NA62 detector is limited
by design in terms of data
bandwidth: 1 MHz**

**In the upgraded readout architecture, all FE electronics record and transmit
data continuously, triggerless:
All the upstream detector are not anymore present: low rate environment.**

Upgrade for dump experiment

- Only channels with signals will be transmitted:
  - i.e. Zero suppression for LKr, coincidence in CHOD slabs…
- PC-Farm will take care of realigning hit in time (or maybe they arrived already aligned in time from the ROB?), merging the event.
  - The purpose of the PC-Farm is to gather data from all sub-detectors, to combine them into "trigger candidates", and to subsequently subject these trigger candidates to a suite of software triggers to filter the data.

- L1 becomes the "main trigger", giving the time of the event.
- If L1 is strong enough, L2 can reconstruct the event (even during the inter-spill), writing the information directly in ROOT format.
- FE chips will not receive triggers, but rather commands associated to a particular conditions (e.g. calibration commands, reset commands, periodic commands) => we can still use L0TP as interface.

conclusion

- This idea cannot be a PRIN proposal:
  - too easy (?)
  - not so many resources needed (is the actual NA62 computing power enough?) except man-power.
  - Not really needed from the point of view of physics: we can take data with the current TDAQ.

- Can be considered as part of a PRIN?
  - If we want to follow the idea of a DUMP experiment, i.e. adding a pre-shower, then we can add also this proposal…