

# DAQ Status and perspectives

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2021/11/11

Already shown  
@ collaboration  
meeting  
2021/05/18

# Meeting with ND DAQ Task Force

Aim of the meeting with Asher:

- Start a talk to decide the needs of each sub-detector and start the design of the DAQ;
- estimates of the data rates and requirements for each component of the ND into the DAQ system
- Define the baseline dataflow.

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# DAQ main idea

- Each detector connected to one or more optical fibers and the data are sent from underground to the external lab;
- The communication will be via TCP/IP.
- Each sub-detector has its own number of fibers according to the following classification (rough classification)
  - Low Rate ~10s MB/s
  - High Rate ~100s MB/s

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# SAND DAQ Data Flow

Interaction per spill (650 t)	90
<b>STT + ECAL</b>	
STT mean digit (internal events)	140
mean digit (internal events, 2 PMTs)	30
Num byte / STT digit	6
Num byte / ECAL digit	6
<b>Tot. Data Size</b>	<b>~ 100 kByte/spill</b>
<b>LAr Meniscus (2t) (assuming we read all even for external events)</b>	
Number of channels/ matrix	10 <sup>3</sup>
Total number of matrix	60
nByte per channel	6
<b>Tot Data Size</b>	<b>30 MByte / spill</b>
In case of reading only internal events (in Lar)	< 100 kByte/Spill
Thanks to Guang we have integrated also the data concerning the 3DST detector.	
<b>3DST</b>	
total channels	153600
hits / spill (including ECAL events spilling in 3DST)	2160
Cosmic rate (muons/s)	13.5
bytes / fiber / hit	20
<b>Tot. Data size (beam + cosmics)</b>	<b>0.12 MB/spill</b>
Thanks to Guillaume we have integrated also TPCs data rate.	
<b>TPCs</b>	
total channels	45056
<b>Tot. Data size (extrapolate from T2K)</b>	<b>1 MB/spill</b>

## Ingredients:

- neutrino fluxes;
- interactions/spill in the 650 t;
- MC simulation

we assume that **all the interactions** per spill are then **localized in each sub-detector** → very conservative

Asher asks our needs in terms of calibration runs (LED/Cosmics whatever...) to understand the rates during calibration runs.

**SAND will probably fall in the first classification**

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# Other topics to be discussed

- needs related to **trigger** or trigger logic
- relative **timing** between subdetectors:
  - The planned time resolution is  $\sim 2$  ns for the different part of the subdetector (probably not enough).
  - Lar and MPD is  $\sim 2$  ns synchronization.
- SAND plans for a **test stand** common to others or independent....

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# Desiderata by ND Task Force

Understand which interface we want to set down between SAND-DAQ before the next summer reviews in order to write down a document/roadmap

- Configurations;
- Slow Control;
- Monitor..
- Data Selection
- Which data to store....

Start to speak with electronic people/engineer by the end of this month about:

- ECAL → upgrades needed (main worry is about the problem in integrating old electronics)

Plan to discuss also about:

- Lar meniscus: ASIC/Front-End → **this is still an R&D**
- STT/3DST: postpone until the decision is taken....

# Conclusion

- Near Detector DAQ Task Force is pushing to design the DAQ:
  - Understand which interface we want to set down between SAND-DAQ
  - decide the needs of each sub-detector (relative timing, trigger logic,....)
- Start a collaboration with people directly involved on the electronics to discuss about technical points:
  - to avoid possible difficulties in integration afterward;