2018 Test Beam Plan for HERD Prototype at CERN SPS

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Objective of 3rd beam test at 2018

- ▶ Solve the problems found at 2nd beam test
 - upgrade the IsCMOS
 - upgrade the encapsulation method of crystals
- Upgrade CALO prototype from 250 to 500 LYSO crystals, 5*5*20(5*10*10) array, corresponding 52(26) X0 longitudinal, 2.8(1.4) λ longitudinal
 - proton response up to 400 GeV under longitudinal full scale geometry
- TRD response
 - by charged pion beam from 20-200 GeV/c
 - verify the feasibility and performance

Preliminary beam time schedule

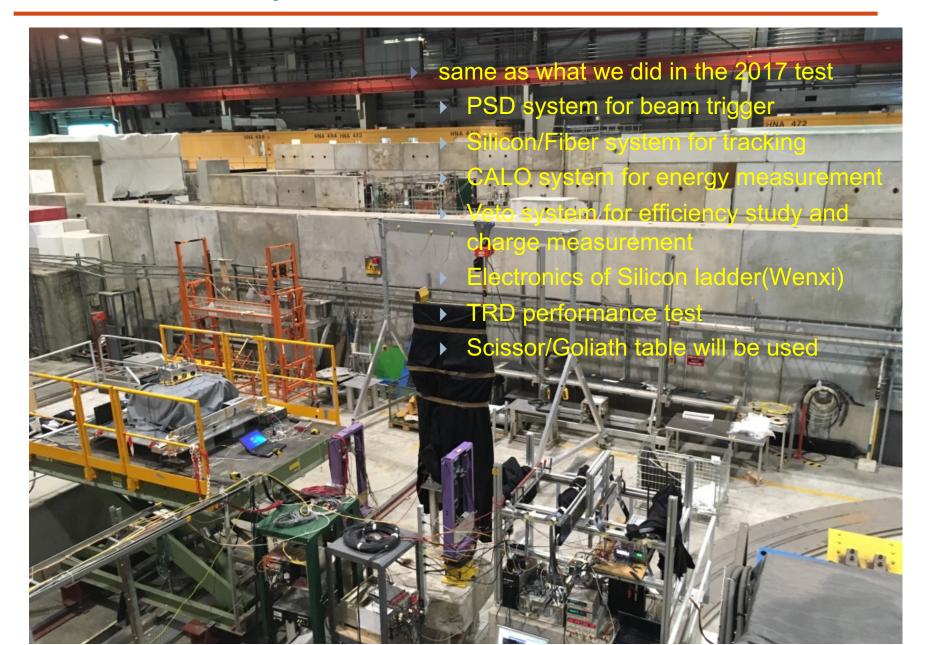
Beam time TBD, probably re-arranged soon

- 1. Current individual proton and ion run
 - 26th Sep. to 3rd Oct., H2, proton run
 - 19th Nov. to 25th Nov. H4, ion run
- 2. Expected continuous run
 - 05th Nov. to 12th Nov. H2, proton run
 - 12th Nov. to 19th Nov. H2, ion run
 - NA61 is also competing for this time slot

Beam requirement

- Particle type: electron, proton, charged pion; fragmented ions
- Particle momentum: several grid from 20 to 400 GeV
 - proton: primary proton 400, 200 GeV/c
 - electron: 250, 200, 150, 100, 50, 20 GeV/c
 - charged pion: 180, 120, 100, 60, 40 GeV/c
- Beam intensity: ~ 2000 particles / spill
- Beam size: 1cm * 1cm

Hardware requirement



Transformation of CALO prototype

- ▶ Two identical 5*5*10 prototype
- "Stacked" layout from beam direction(5*5*20) at the first few(3-4) days
 - MIP Calibration
 - response with primary proton beam
- Then transformed to "Parallel" layout (5*10*10) manually
 - scan with electron beam

Trigger and Synchronization

- Global trigger provided by Scintillators
- Prompt veto signal feedback by IsCMOS
- All systems synchronized by the event number
 - electromagnetic interference from scissor table!

Summary

- The 2018 test beam will be the last chance for the functional and performance verification of HERD prototype
 - 2 years long shutdown of beam facilities starting from 2019 (LHC LS2)
 - ▶ LHC LS3, 30 months starting from 2024
 - Next beam window for us is between 2021 and 2023, and might be last chance before launching

We have pleasant collaboration in the past two beam tests, and I whish we'll make the 2018 test success again