Dual Readout Calorimetry

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RD52 – Dual Readout R&D: Where are we ?

- Investigated some possible ways both homogeneus (crystals) and sampling (either pb+fibers or cu+fibers)
- For a summary, please, look at the slides (in attachment) shown by G. Gaudio @ FCC detector design meeting of Sep. 19th 2016
- Now working with small (~10 cm x 10 cm) cu+fiber module
- Trying SiPM readout (each fiber → one SiPM), 2016:
  - Saturation (dynamic range i.e. granularity too limited)
  - Fiber-to-fiber light leakage (scintillation light covering cherenkov light)

Open Issues:

- 1) Are SiPM.s (maybe with the analog sum of ~4 SiPM for digitization) the solution to get rid of the fiber forest ?
- 2) Can SiPM-to-SiPM light leakage be eliminated by distributing and coupling the SiPM over 2 different plans ?
- 3) Can the production of grooved copper be industrialized at affordable costs ?
- 4) May clear fibers for Cherenkov light detection be rad hard enough and give appropriate light yield ?
- 5) May, a copper em+had fiber calorimeter, provide the required resolutions (~10%/√E for e.m. showers, ~40%/√E for had. Showers) ?
  - ***benchmark channel: resolution of H→WW and H→ZZ 4-jet decays***
- 6) how to implement a projective geometry ?
- 7) ...

What do we plan to step forward ?

- Short term plan (2017), ***to be discussed and approved:***
  - Increase SiPM granularity by 4 (2-time smaller pixels)
  - Couple cherenkov and scintillation fibers at two different plans (staggered SiPM geometry)
  - Start working on simulations (both for RD52 and a full-size detector)

- Middle term plans (2018-2020), ***to be discussed and approved:***
  - Italy: build a collaboration and present a proposal for INFN R&D focused at detectors for future accelerators, in particular for e+e- colliders.
  - Identify synergies with Chinese and CERN efforts on FCCee detectors for:
    - designing and building larger size prototypes
    - (Geant-4) simulations
    - a.o.b.

In practice

- Small Italian workshop in Como next week (March 30-31)
  - Want to discuss both RD52 and middle-term plans
  - Put together a small (3-4) group of people to start working on simulations (in Pavia we already started playing with Seh Wook's code)

- The workshop is open to external contributions:
  - Hope to have one or two talks from you addressing the present status of your planning for:
    - the global view for the full detector
    - some details on both e.m. and hadronic calorimetry
    - simulations

- Anyway we need your input and collaboration for a proper simulation of geometry, material, magnetic field …