General Consideration and Detector Design

Define a R&D road map:

- It is not immediate, but the first step can be the paper we are planning "*Promising Technologies and R&D for the Future Muon Collider Detectors*"

Towards Detector design

- Understand the Beam-Induced Background at "low" (3 TeV) and "high" (10+ TeV) energy.

- Do we need to re-design a detector from scratch going to high energy?

- Use tools already developed for HL-LHC and FCC to study the appropriate detector configurations:
    - Are they good enough? Is full simulation needed to take into account BIB?
    - Should we use new fast simulation methods? GAN for calorimeter?

- Forward detector ⇒ dedicated detector/experiment, muon detector? Roman pots? Brand new ideas?

Sub-Detectors Technologies

Discussed:
- Tracker: all Silicon.
- Calorimeter: technology to be identified, several of them are promising.
- Muon detector: gas-based and micro-pattern, to be understood the best in 10 years.

Current R&D for HL-LHC and other future accelerators are well suited also for muon collider. In particular, we need to pursue:
- Time resolution in the range of tens of picoseconds.
- High granularity.
- Investigation of new materials/gas.

We will:
- Perform systematic study of BIB occupancy in various detector regions with updated samples.
- Propose list of physics benchmarks to guide the choice of specific detector technologies

All of these should be presented and analyzed in the document.

Front-end, DAQ and Trigger

Here we expect major technology improvements in the next ten years, difficult to make predictions.

Main points discussed
- Technology choice usually has to be taken 5 years in advance respect to the usage.
- Logic in front-end versus read out full event: some data "cleaning" seems needed anyway.
- Front-end with AI/ML may be exploitable for data reduction with no signal loss.
- Investigate silicon photonics.

Discussion continues in the group meetings:
MUONCOLLIDER-PHYSICS-DETECTOR
MUONCOLLIDER-FACILITY