IJClab – IN2P3 contributions:

Areas of expertise:

• **Positron-based muon source:** LEMMA option

• **Machine Detector Interface:** muon beam-beam collision studies (GuineaPig) (to be consolidated)
Positron-based Muon Source: Low EMittance Muon Accelerator (LEMMA)

- Main contribution is expected on the R&D of the high intensity positron source for LEMMA
- Work in collaboration with other institutes (INFN…)
- Identify the main parameters: drive beam, targets, capture section, etc.
- Define directions in which the specific R&D should be pursued in order to mitigate the critical issues
- Provide realistic set of parameters for the conceptual design.

Strategy to be explored in I-FAST WP5.1 MUon colliders STrategy network (MUST)
Conventional positron source: bremsstrahlung and pair conversion

Energy deposition in target => Heating
Inhomogeneous energy deposition => Peak Energy Deposition Density (PEDD)
=> mechanical stresses => target failure!

Very difficult to realize for the future colliders due to the target thermal and mechanical stresses issues

- SLC e+ source: ~7e10 e+/bunch & 1 bunch/train & 120 Hz => ~0.08e14 e+/s
- CLIC (380 GeV) e+ source: ~6e9 e+/bunch & 352 bunch/train & 50 Hz => ~1.1e14 e+/s
- ILC (250 GeV) e+ source: ~2e10 e+/bunch & 1312 bunch/train & 5 Hz => ~1.3e14 e+/s
- LHeC (ERL) e+ source: ~2e9 e+/bunch & 2e7 bunches/s (CW operation) => ~440e14 e+/s
- FCC-ee e+ source: ~4e10 e+/bunch in the collider & 3 kHz => ~0.06e14 e+/s @ Injector

Better solution: Two-stage process to generate the positron beam

First stage: γ-ray generation
Second stage: e-/e+ and γ-ray beams are separated and the latter is sent to the target-converter

The γ-rays can be generated by the following methods:
- Radiation from helical undulator
- Channeling radiation
- Compton scattering

LEMA: ~1e16 e+/s to be defined based on the adopted baseline

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