Forward Multiparticle Spectrometer for LHC

A new subsystem for CMS Run 4 (HL-LHC)
80– 125m downstream of IR-5 (IR-1 option)

BUY ONE, GET ONE FREE!

Two operational modes:

TODAY

A) Charged and neutral TeV hadron production spectra in p + p, p + O, O + O low pileup short runs.
Read out with full CMS detectors
35 Tm spectrometer magnet D1 (will be) already there!

SMP-HAD 03.20
Guaranteed physics in unexpored phase space

B) Search for new light long-lived decaying neutrals in p + p at high luminosity (LLPs or WILPs)
Independent trigger & read out

YESTERDAY

EXO – LLP 03.27
BSM discovery potential

Steel absorber and 35 Tm sweeping magnet D1 (will be) already there!

Summary

A) HADRON SPECTRA AT LOW PileUp

Terra Incognita : large phase space (in x_F, p_T) unexplored from √s = 63 – 14,000 GeV !

Justification in itself, but …

Need to understand **Strong Interaction** in non-perturbative sector

Details of diffractive dissociation in low mass region.

Important to understand **UHE cosmic rays** : Shower → primary, UHE collisions, muons, ν

Particle ID with **transition radiation** possible (π,K,p) … interesting challenge being developed

B) SEARCH FOR LONG-LIVED BSM PARTICLES at HIGH Luminosity

Different and complementary to other experiments

Both:

Need **special vacuum chamber** with "thin" exit windows. Feasible.

Technology for **tracking, calorimeter, muon** tracking exist

Open & 'accessible' & small so evolution of techniques natural.

It can be done and it should be done!

Next steps ??? (a plan?)

NEED CALCULATIONS!

LS 3 planning for Run 4 2027+ is now firming up
Need to get officially included this year or it may be too late!
LHC will start studies only when CMS officially asks

March 20th presented the Low-lumi hadron spectroscopy to **SMP-HAD** subgroup
Intro (MGA) - Cosmic Ray MC's (Tanguy Pierog, KIT) – TRD status (Mike Cherry, LSU)
March 27th presented the HL LLI search to **EXO-LLI** subgroup.
April 16+17 LHC Forward Physics open meeting (not restricted to CMS)
Thursday 16th: Progress in Transition Radiation Detector development for TeV hadron ID
Friday 17th: Hadron spectra issues:
Machine configuration, beam pipe
Anticipated spectra through D1 – single hadrons, charm D0, antinuclei …
Cosmic ray shower simulation programs
Detector configuration possibilities
Sensitivity to LLI's (M, couplings, lifetimes etc.)
Costs, timescales, effort
Etc.

WRITE DOCUMENT!

Need team of interested contributors. TRD group inside CMS (?) or outside to join.
One document or two? Or one cover with two parts?