



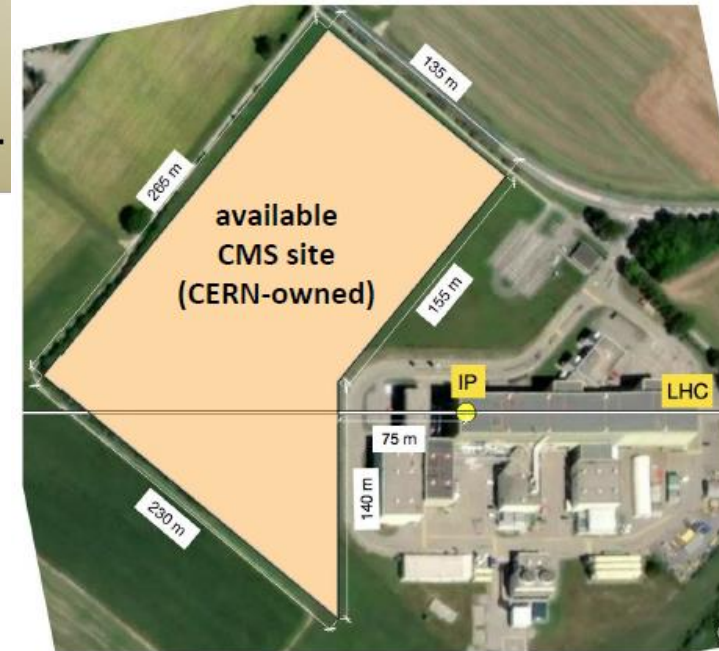
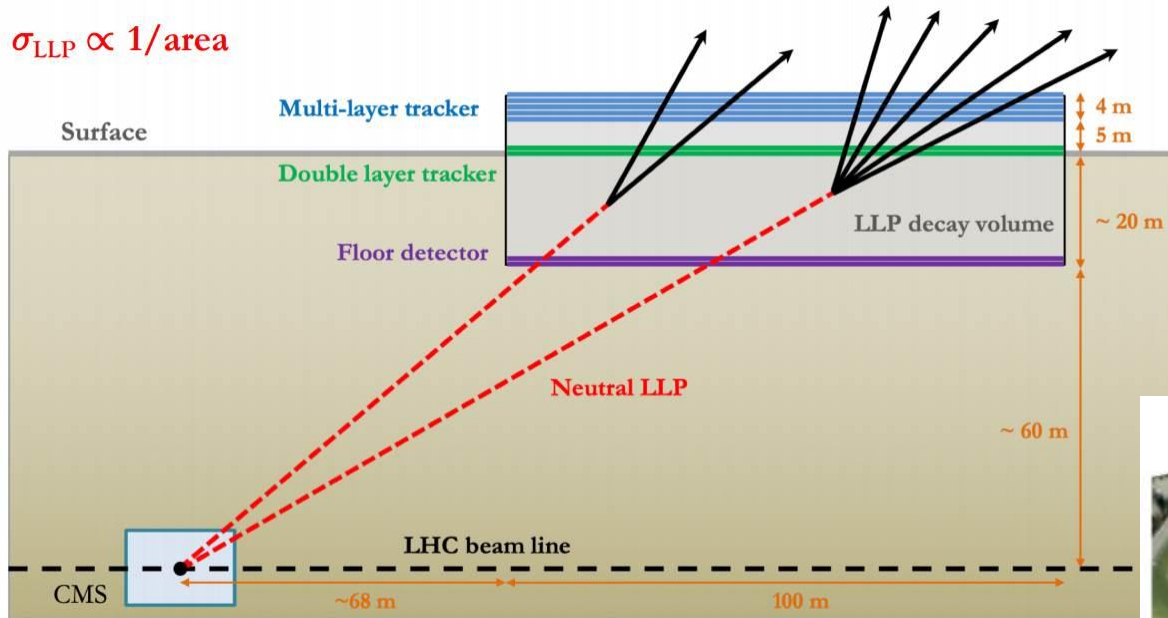
Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

Scintillator Extrusions for Mega-Detectors: Mathusla

Jim Freeman

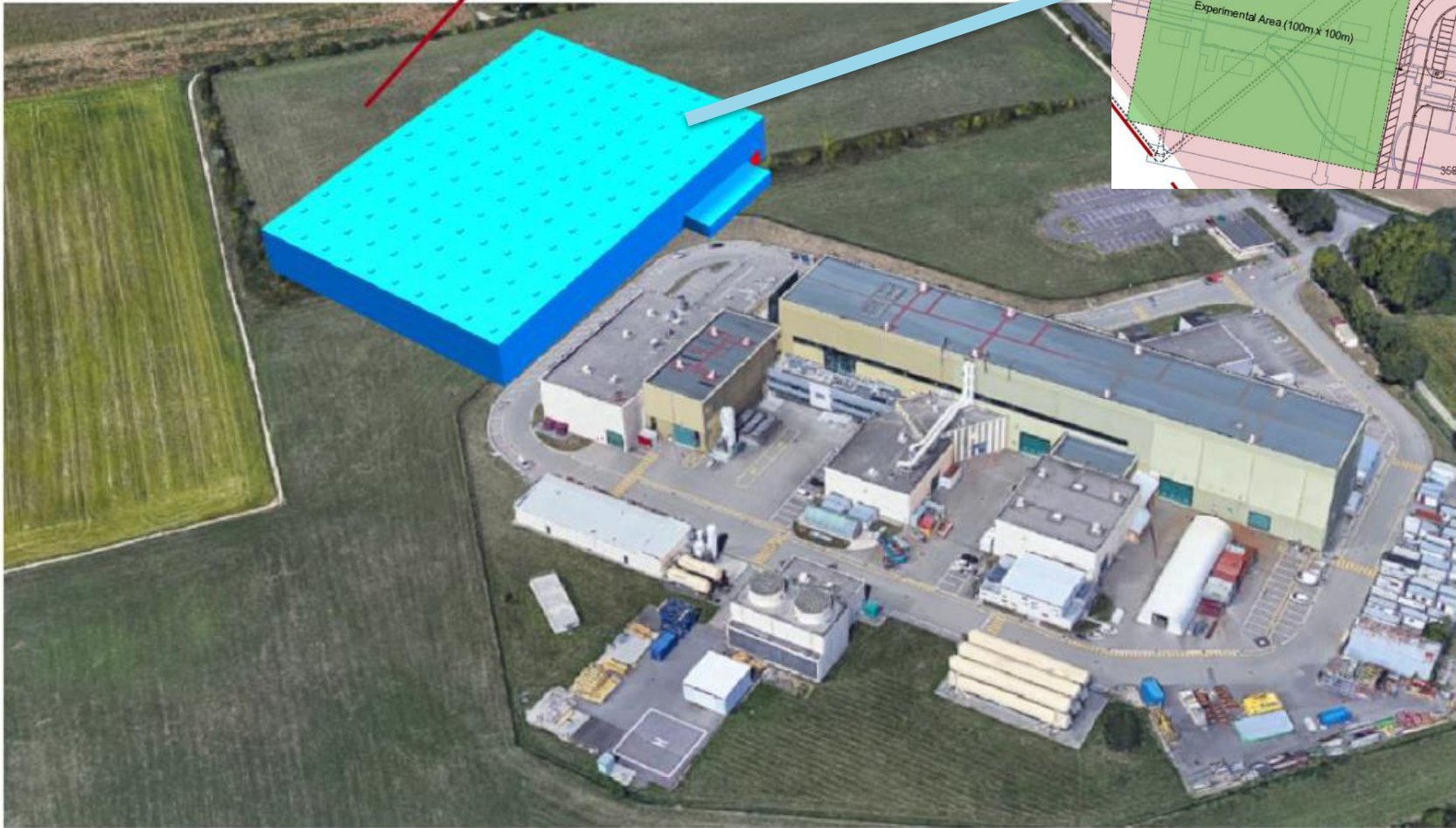
A Long-lived Particle Detector for HL-LHC

$$\sigma_{\text{LLP}} \propto 1/\text{area}$$

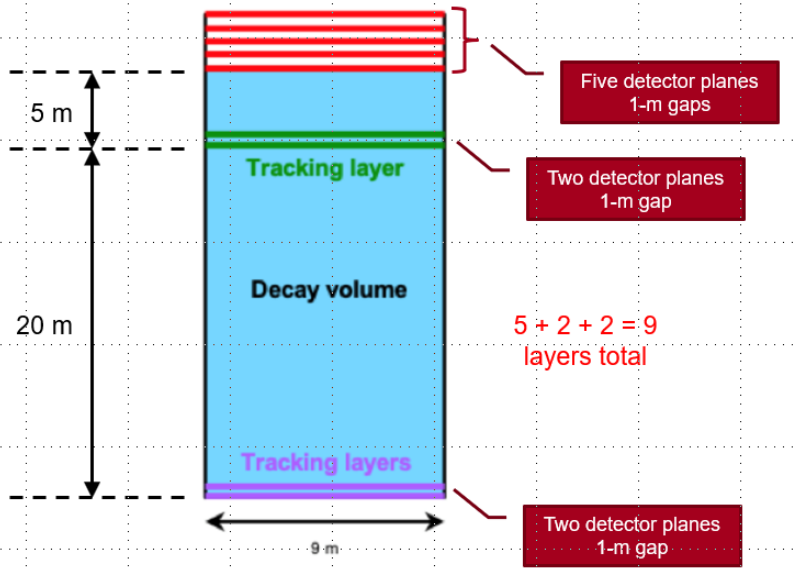


Site will be at P5 above CMS collision point

Concept of Mathusla Hall 100mX130m

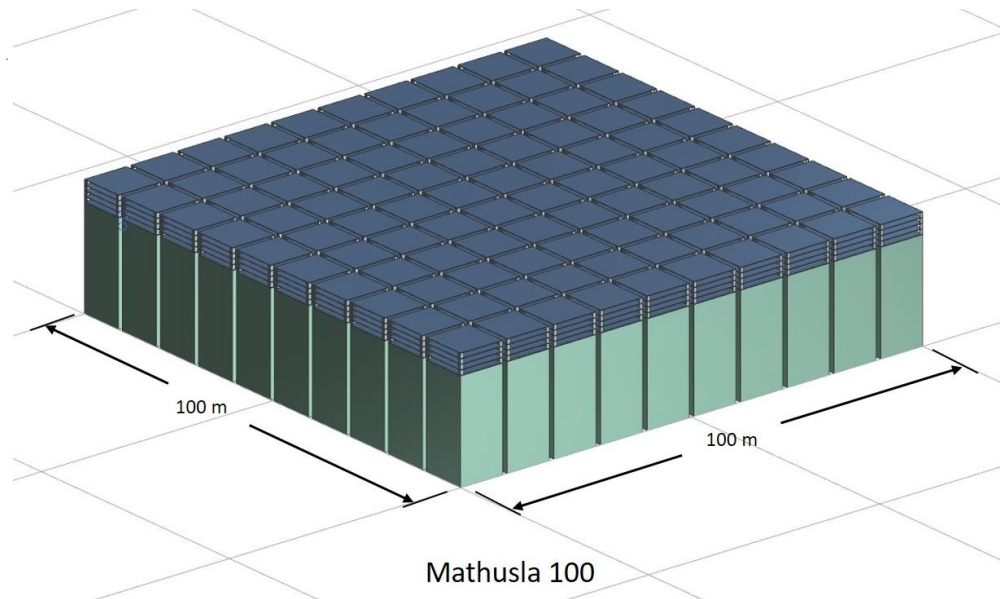


Module side view



Each module has 9 layers of scintillator. Scintillators 4.5cm X 2cm X 4.5m extrusions.

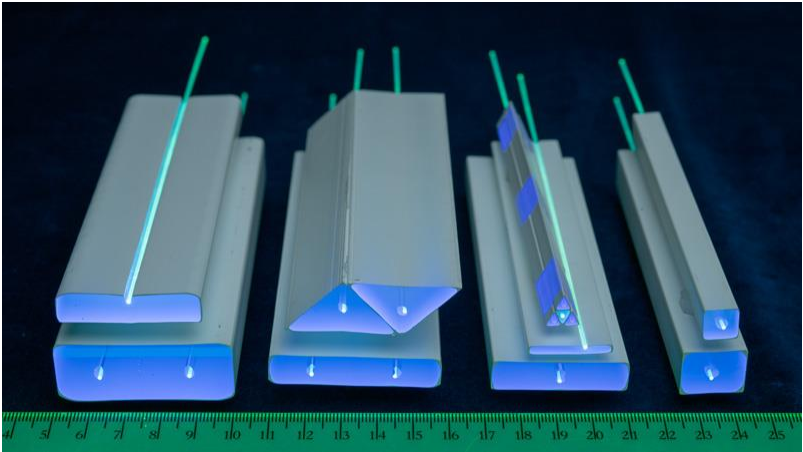
“Mathusla 100” has 100 modules. Each module largely independent. Can operate installed modules while completing the rest.



Fermilab Extrusion Facility



Extrusions will be made at Fermilab NICADD Facility in Lab 5



Baseline: Modules with 9 planes of scintillator.

Extruded scintillator bars with wavelength-shifting fibers coupled to SIPMs.

~ 2000 tons of scintillator (depending on choice of extrusion thickness...)

Extrusion 4.5m long by 4.5cm by 2cm. WLS fiber runs the length, SIPM readout on each end.

Issues:

- Optimize production/QC with robotics

- Improve light-yield/timing by:

 - Choice of SIPM

 - Choice of Fiber

 - Reflector on extrusion

 - Geometry of extrusion

 - Front end electronics / signal shaping

- Goal of timing <1ns, hopefully ~500ps rms