

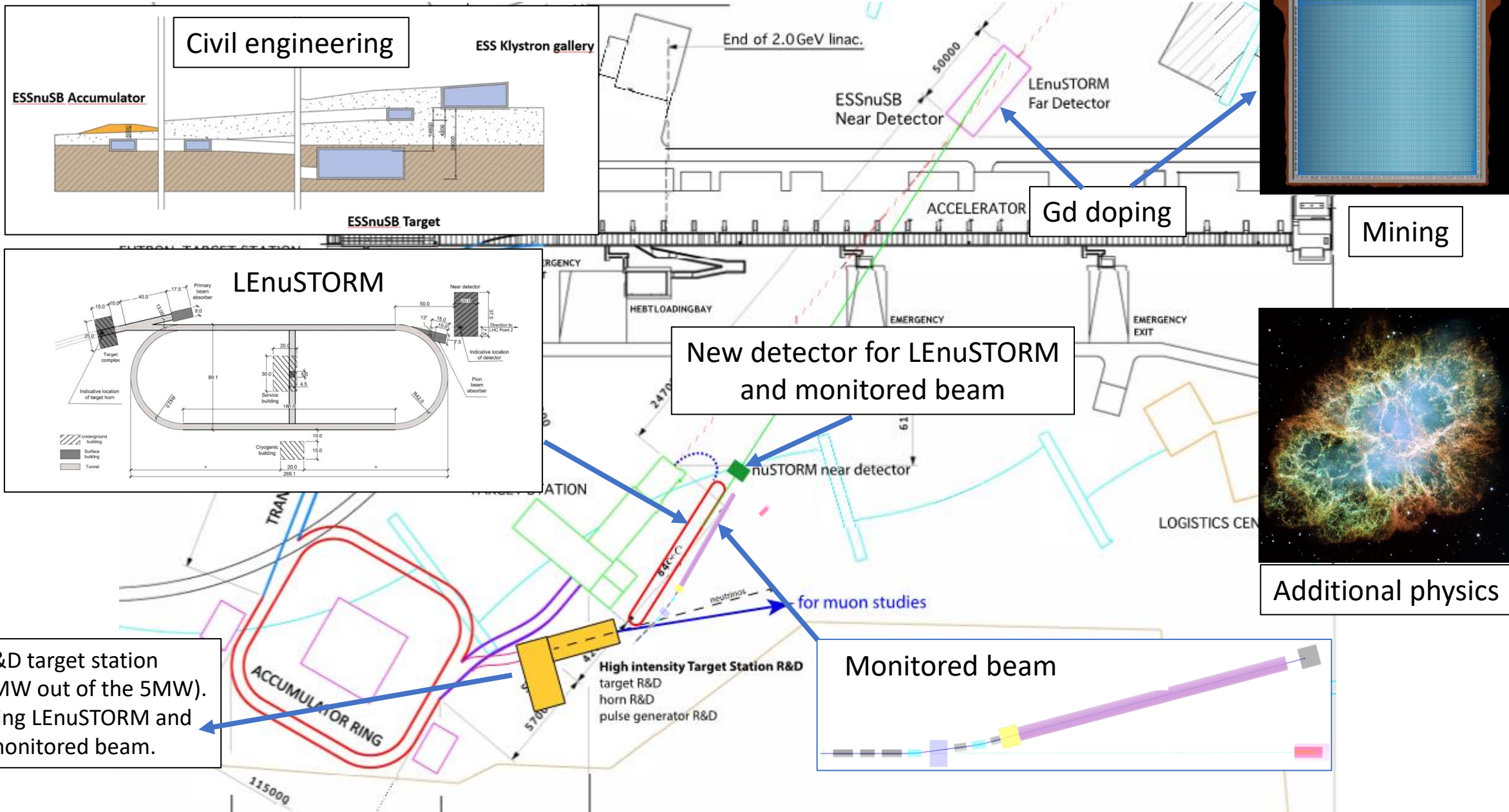
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Some initial thoughts towards the design of the Low Energy neutrino Monitored Beam and LEnuSTORM Near Detector – Lemon-D

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Possible LEMON-D design features

production

$$\pi^- \rightarrow \mu^- + \bar{\nu}_\mu$$

$$\pi^+ \rightarrow \mu^+ + \nu_\mu$$

$$\mu^- \rightarrow e^- + \bar{\nu}_e + \nu_\mu$$

$$\mu^+ \rightarrow e^+ + \nu_e + \bar{\nu}_\mu$$

detection

$$\nu_\mu + n \rightarrow \mu^- + p$$

$$\bar{\nu}_\mu + p \rightarrow \mu^+ + n$$

- Option 1: water target
Interleaved with active detector elements (iron sheets + Picosec Micromegas detectors)
- Option 2: Water Cherenkov detector doped with Gd. Instrumented with Picosec Micromegas detectors (to be investigated)
- ν / $\bar{\nu}$ -bar discrimination
 μ^+ and μ^- tagging
 e^+ and e^- tagging
Magnet ? Magnetized sheet ? Water Cherenkov ?
- Good timing: the hadron dump of LEMNB beam will be instrumented and each muon detected will be synchronized with the detection of its neutrino partner from the π -decay.
- Good energy and momentum resolution (how good to be determined).
Magnet ? Magnetized sheet ? Range measurement ?
- Cosmic ray protection/discrimination

Initial LEMON-D parameters

Lemon-D	Location	Lemon hall				
Lemon-D	Target material	water				
Lemon-D	Target mass	1	1	4	t	
Lemon-D	Distance from sources (LEnuSTORM and LEMNB)	50	30	80	m	Distance from the downstream part of the LEnuSTORM straight section and downstream part of LEMNB decay tunnel
Lemon-D	$\nu / \bar{\nu}$ discrimination	yes				
Lemon-D	Detector technology	Magnetized iron, water target tracker – ask G&S				Gd doped WC as a fallback