

# High Luminosity/High Energy LHC

Possible scenarios for machines to run in existing LHC tunnel

• **HL:**  $\sqrt{s} = 14 \text{ TeV}$   $L = 3 \text{ ab}^{-1}$

• **HE:**  $\sqrt{s} = 27 \text{ TeV}$   $L = 15 \text{ ab}^{-1}$

Q: What physics can be done with each of these options?

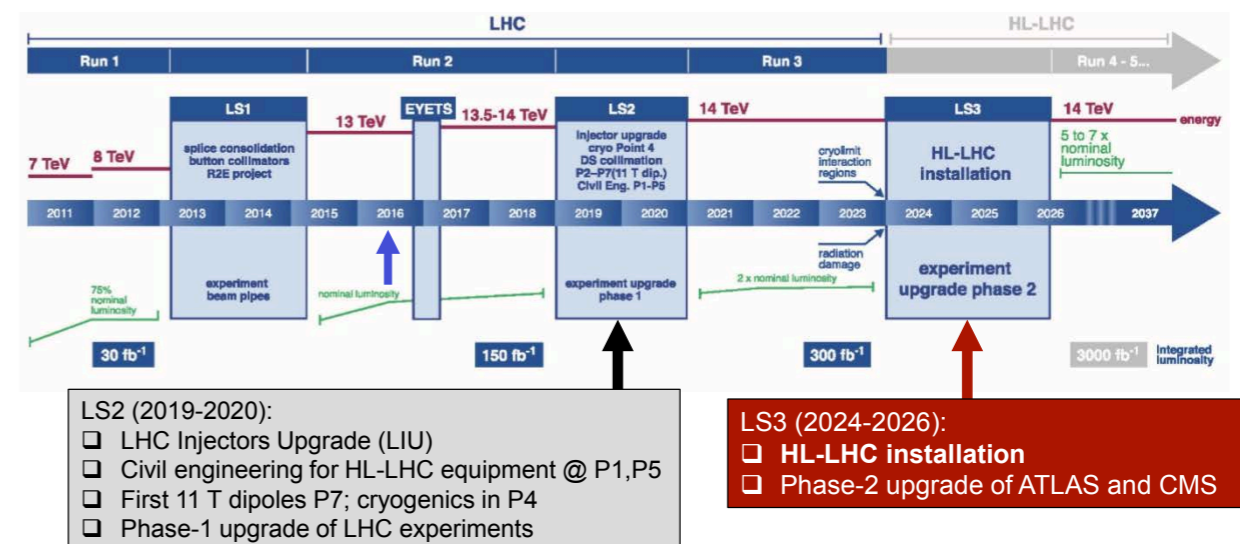
Q: What issues will there be running at these parameters, pile-up, detector performance etc

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Prepare a CERN Yellow Report as input to European Strategy

**FCC** hadron collider parameters (pp)

parameter	FCC-hh	HE-LHC	(HL) LHC
collision energy cms [TeV]	100	27	14
dipole field [T]	16	16	8.3
circumference [km]	100	27	27
beam current [A]	0.5	1.12	(1.12) 0.58
bunch intensity [ $10^{11}$ ]	1 (0.5)	2.2	(2.2) 1.15
bunch spacing [ns]	25 (12.5)	25 (12.5)	25
norm. emittance $\gamma\epsilon_{x,y}$ [ $\mu\text{m}$ ]	2.2 (2.2)	2.5 (1.25)	(2.5) 3.75
IP $\beta^*_{x,y}$ [m]	1.1	0.3	0.25 (0.15) 0.55
luminosity/IP [ $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ ]	5	30	25 (5) 1
peak #events / bunch Xing	170	1000 (500)	800 (400) (135) 27
stored energy / beam [GJ]	8.4	1.4	(0.7) 0.36
SR power / beam [kW]	2400	100	(7.3) 3.6
transv. emit. damping time [h]	1.1	3.6	25.8
initial proton burn off time [h]	17.0	3.4	3.0 (15) 40



# Structure of process to get to Yellow Report

Five working groups formed:

- 1 QCD, EW and top quark physics
- 2 Higgs and EWSB
- 3 BSM ← Patrick Fox, FNAL-TH
- 4 Flavour
- 5 Heavy Ions

- First meeting at CERN Oct 30-Nov 1, 2017
- Parallel WG meetings ongoing
- **FNAL meeting April 4-6, 2018 (for WG 2, 3, 4)**
- CERN meeting June 18-20, 2018
- Ultimate deadline for European Strategy: **Dec 10, 2018**

**For more information, and how to contribute see:**

<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/HLHELHCWorkshop>

# **FNAL meeting (April 4-6, 2018)**

**Meeting at FNAL to facilitate US involvement  
Full schedule of many interesting talks  
Progress reports since last meeting  
Brainstorming new ideas, especially for HE option**

**Please come and participate! (and register)**

**Thoughts/comments? Paddy Fox ([pjfox@fnal.gov](mailto:pjfox@fnal.gov))**