



**High
Luminosity
LHC**

Short recap of recent changes to baseline

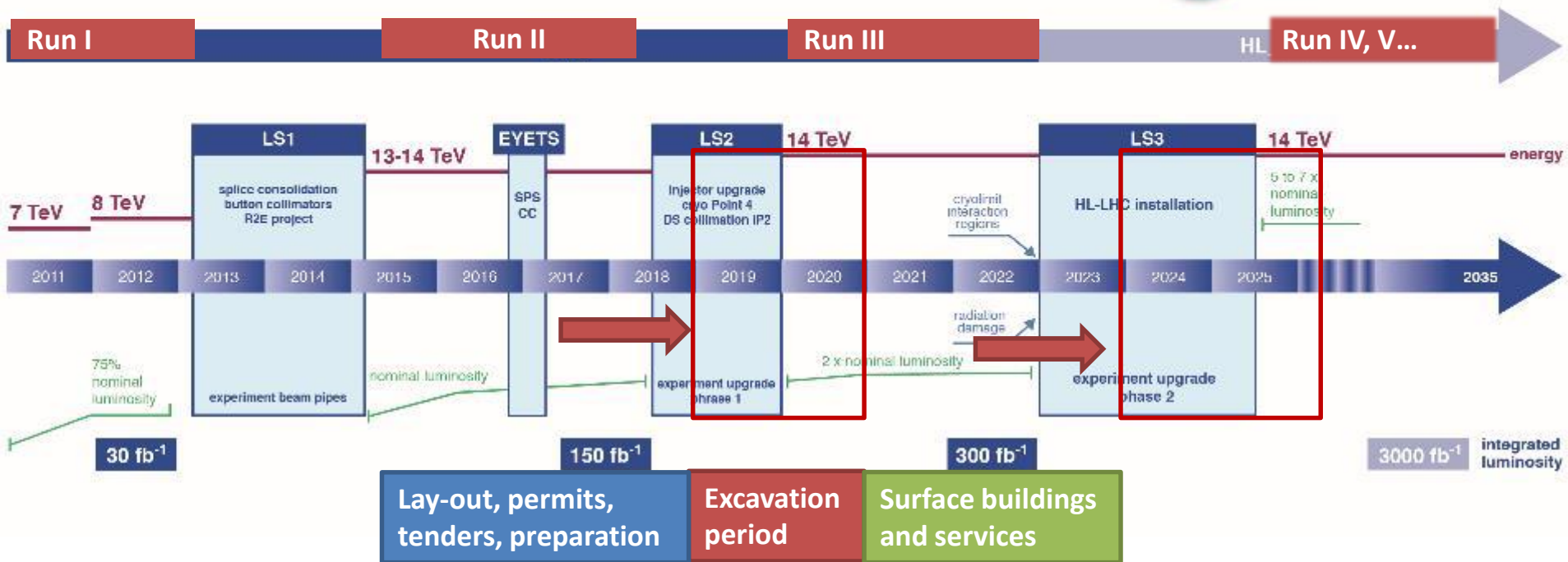
Lucio Rossi @ 16th PLC



The HiLumi LHC Design Study is included in the High Luminosity LHC project and is partly funded by the European Commission within the Framework Programme 7 Capacities Specific Programme, Grant Agreement 284404.



LHC / HL-LHC Plan



Civil engineer works for HL-LHC

The change of planning has not been repercutated in each WP and general planning. Time to do it from NOW to September. New budget approved in September (hopefully)



High Luminosity LHC (HL-LHC) goals

The main objective of HiLumi LHC Design Study is to determine a hardware configuration and a set of beam parameters that will allow the LHC to reach the following targets:

A peak luminosity of **$5 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ with levelling**, allowing:

An integrated luminosity of **250 fb^{-1} per year**, enabling the goal of **3000 fb^{-1}** .

This luminosity is more than ten times the luminosity reach of the first 10 years of the LHC lifetime.

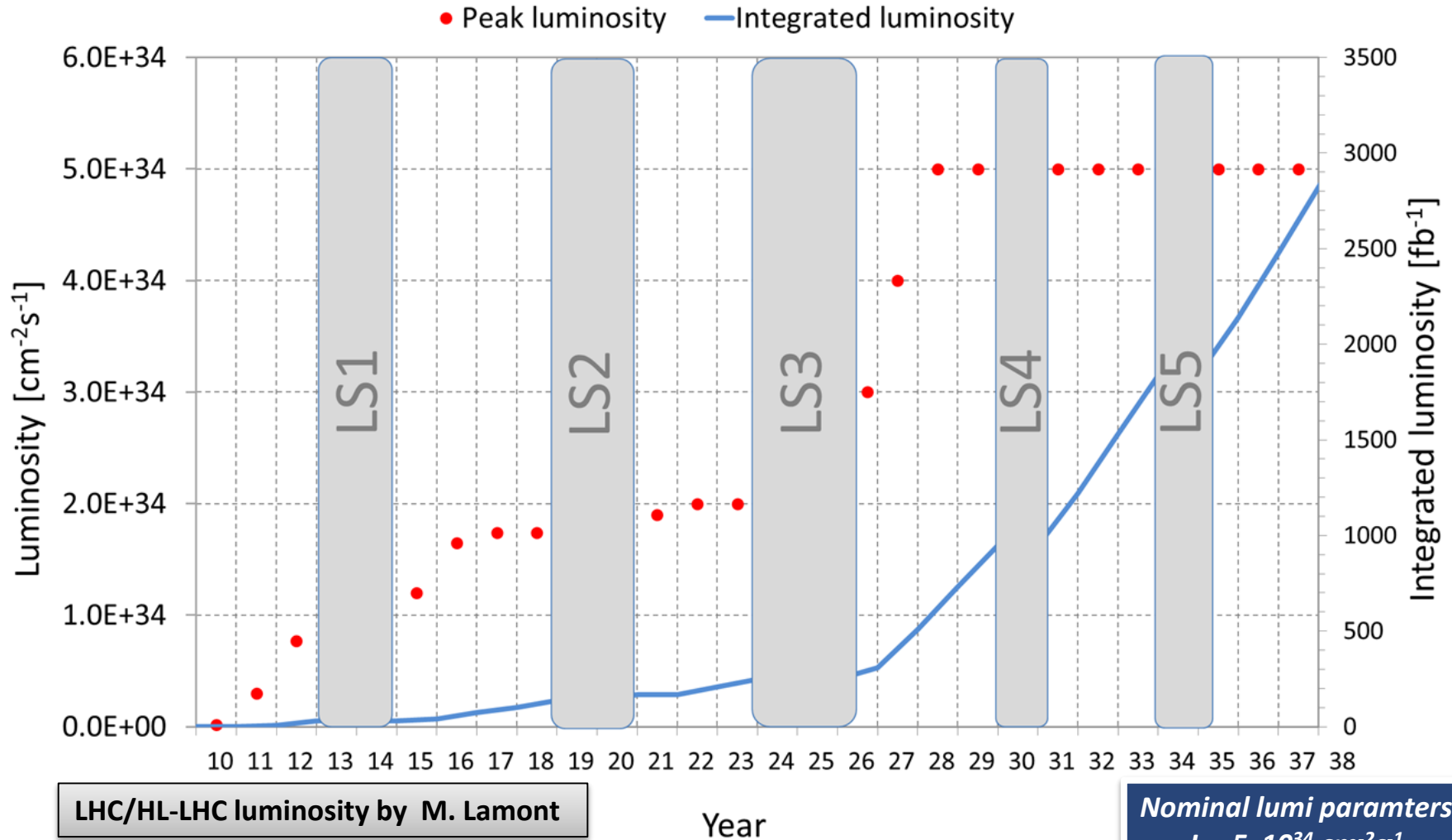
Concept of ultimate performance (Oct.2013, ECFA & RLIUP) under study:

$$L_{\text{peak}} \cong 7.5 \cdot 10^{34} \text{ cm}^{-2}\text{s}^{-1} \text{ and } \text{Int. L} \sim 4000 \text{ fb}^{-1}$$

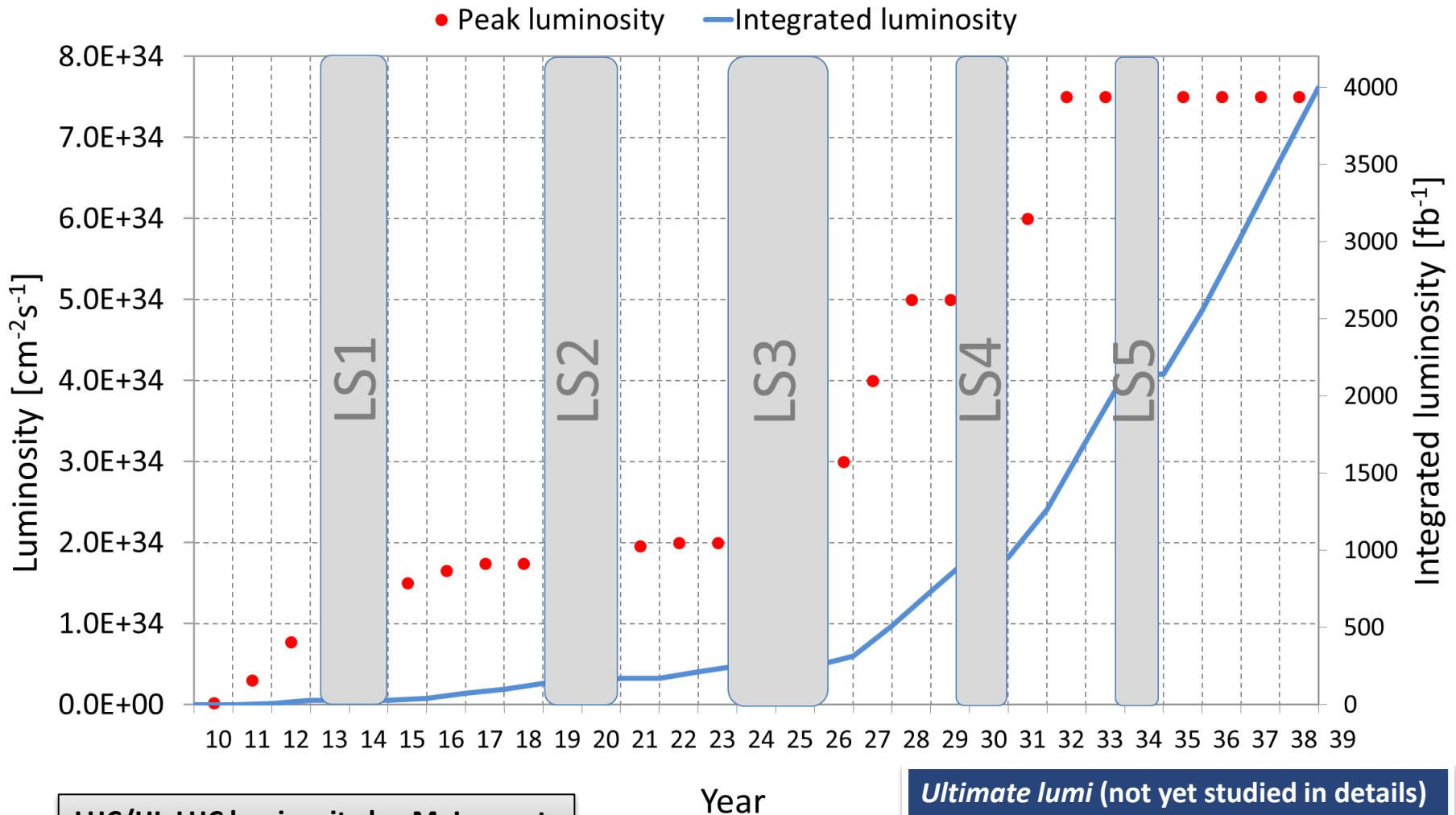
LHC should not be the limit, would Physics require more...

Nominal upgrade parameters

3000 fb⁻¹ would be reached in 2038



Ultimate performance: 4000+ fb⁻¹ by 2038



LHC/HL-LHC luminosity by M. Lamont

Ultimate lumi (not yet studied in details)

- $L = 5 \rightarrow 7-7.5 \cdot 10^{34} \text{ cm}^{-2}\text{s}^{-1}$
- $\text{Int. } L = 3000 \rightarrow 4000 \text{ fb}^{-1}$
- $\text{Pile up } \mu \sim 200$

Hardware baseline modification IR - 1

- $L^* = 23$ m (unchanged \Rightarrow VCX WG Ilias & Co.; possibility for 22.7 m)
 - ATLAS has some reservation, see HL Coord. Group n.13
- TAXS: aperture of 54 mm
 - enlargement is under discussion
- IT Quads: the 5% change of length and decrease of current is baseline since PLC14: $G = 132.6$ T/m; $L_m = 4.2+4.2$ m (Q1,Q3) $L_m = 7.15$ m (Q2)
 - Reduction Q1 W-should thickness is under discussion

Hardware baseline modification IR - 2

- Q4 aperture: 90 mm each.
 - Reduction is under discussion and likely – **coupling with operating current strong reduction**
 - D2 aperture may also be rediscussed, but less likely.
- TAXN: fixed aperture TAXN and a new TCLX (collimator-like) in tungsten; PLC14 (variable aperture TAXN has been dropped)
- Crab Cavity: 4/side-IP remain the baseline, no doubt! Installation staging (**2/side-IP in LS3 and 2 in TS after LS3**) is baseline now.
 - **Review the SPS test plan** in view of fabrication delay and new place (SPS BA6)

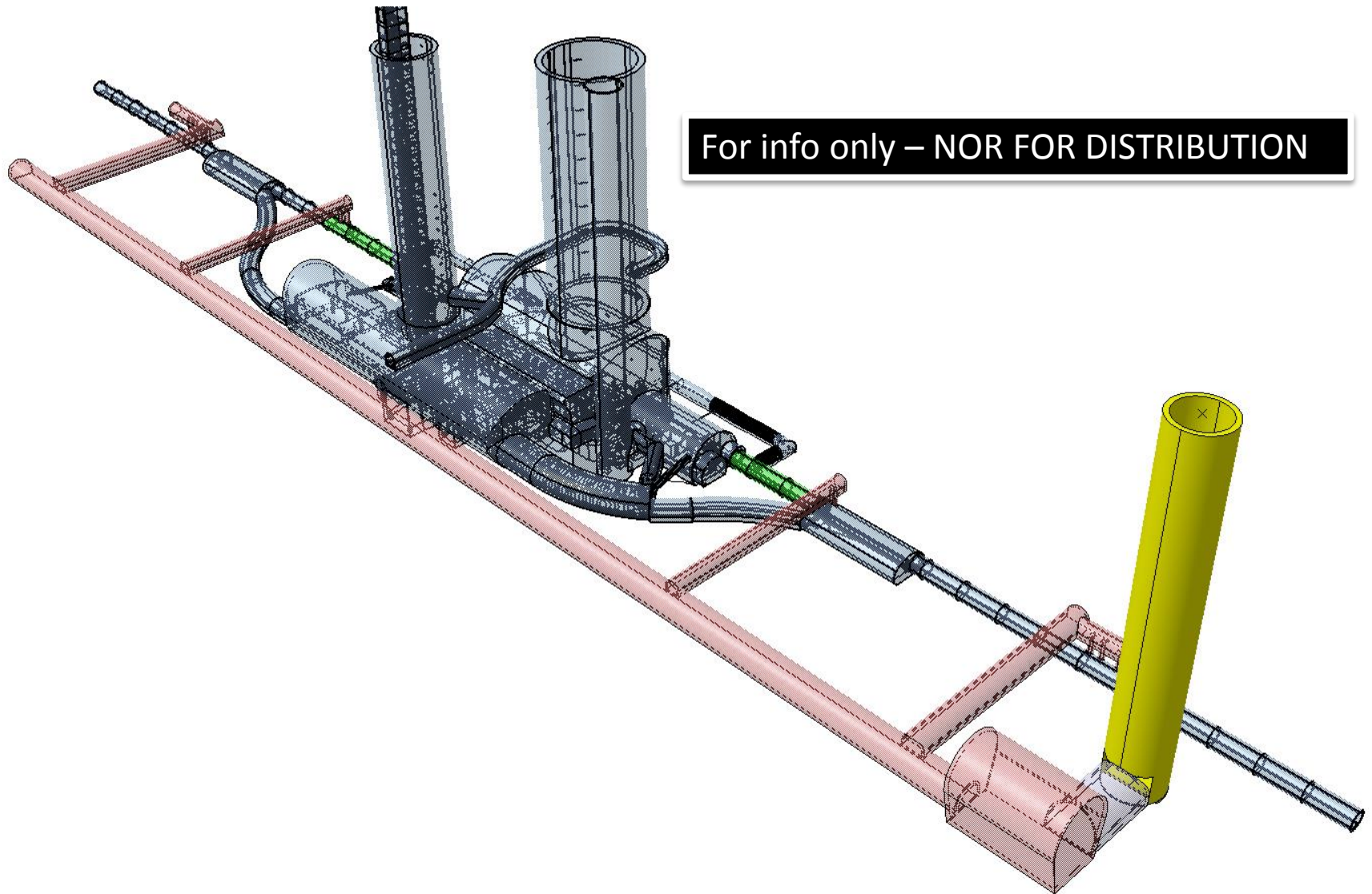
Change outside the Insertion regions

- 11 T for ions:
 - Removed from baseline for installation in LS2. We count on the bump for IP2. **To be clarified if collimators inside the connection cryostat are really necessary**
 - WP11/WP5 teams will manufacture TWO 15 m long units (11 T + collimator in by-pass) and decision when to install and where (IR2, first install in IR7 between LS1 and LS3?) **will be taken later, after the 2015 ion run**. We profit of the same desing ion/proton
- Four more 15 m long units (11 T + collimator) to be ready by LS3; may be of modified design. If IP2 do not need definitively, this may be reduced to two units.

General lay-out

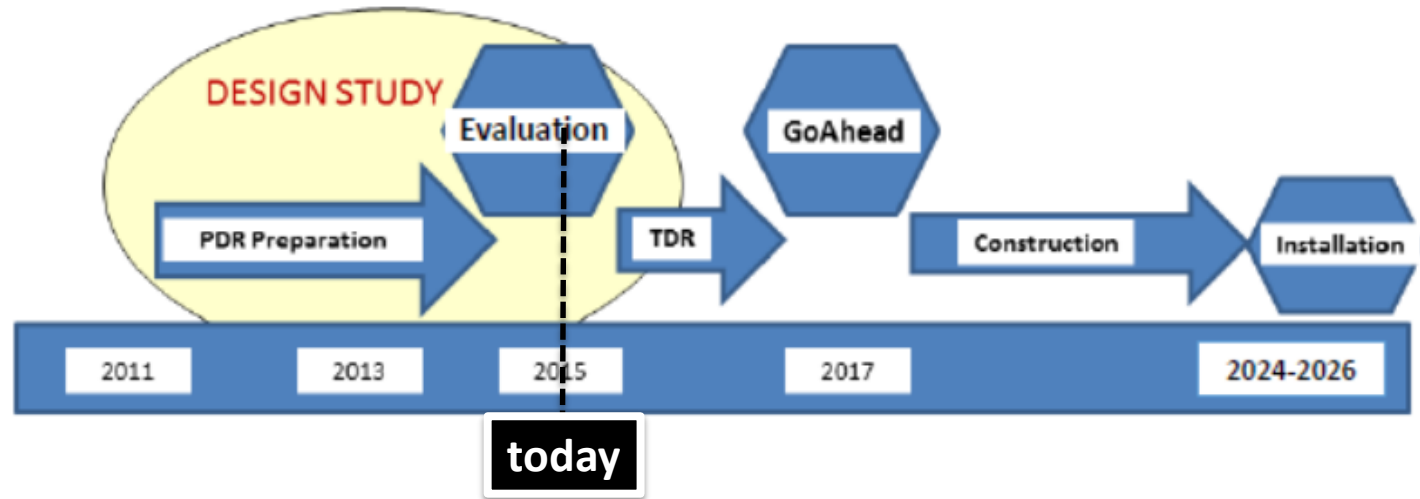
- In PLC15 we confirmed the **new C.E. baseline, with underground tunnel to host the EPCs and DFHs;**
- The **double deck layout** has also been endorsed in the last TC.
- Isabel Bejar has prepared two documents for French and Suisse authorities to describe the works underground and on surface.
- Integration has made a first space allocation (but more miracle and space multiplication is needed... or more continence...)

Underground facilities P5



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Implementation plan (short form)



- Pivotal decision: CERN MTP of September 2015 with full HL_LHC CtC (**40% MTP + 60% LTP**)
- TDR_v0 by October: incremental to PDR!
- Next C&S review October 2016 !
- Cryo, Collimators, Diagnostics, etc. starts in LS2 (2019-20)
- Proof of main hardware by 2016; Prototypes by 2017
- Start construction 2017/18 from IT, CC, other main hardware
- IT String test (integration) in 2021-23; Main Installation 2024-26