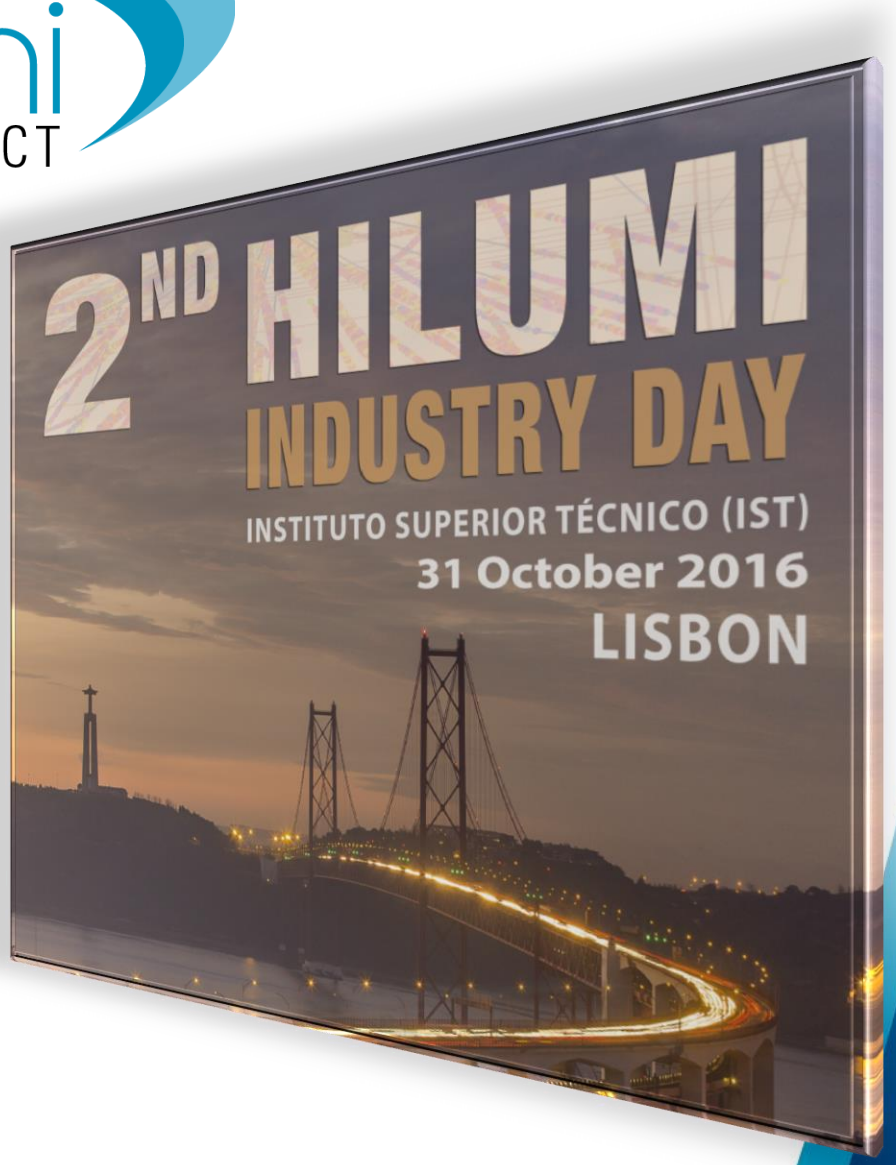
HiLumi
HL-LHC PROJECT

Introduction to the HL-LHC Project



Lucio Rossi – CERN
HL-LHC Project Leader

CERN

Goal of High Luminosity LHC (HL-LHC) as fixed in November 2010

From FP7 HiLumi LHC Design Study application

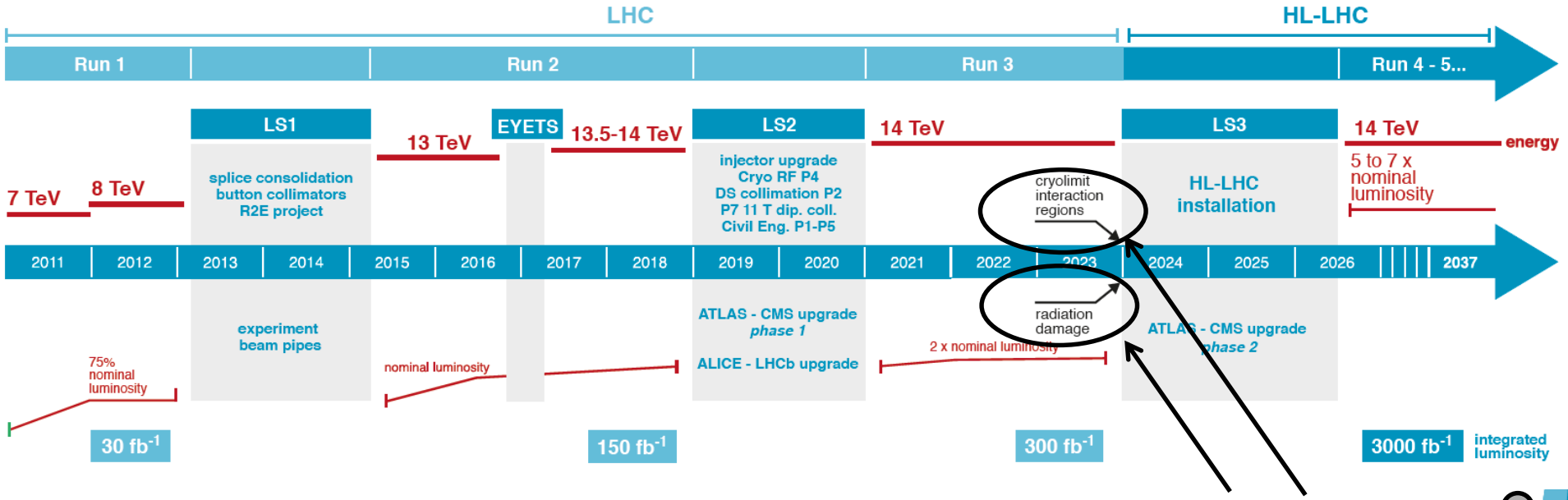
The main objective of HiLumi LHC Design Study is to determine a hardware configuration and a set of beam parameters that will allow the LHC to reach the following targets:

A peak luminosity of L_{peak} = **5×10^{34} $cm^{-2}s^{-1}$ with levelling**, allowing:

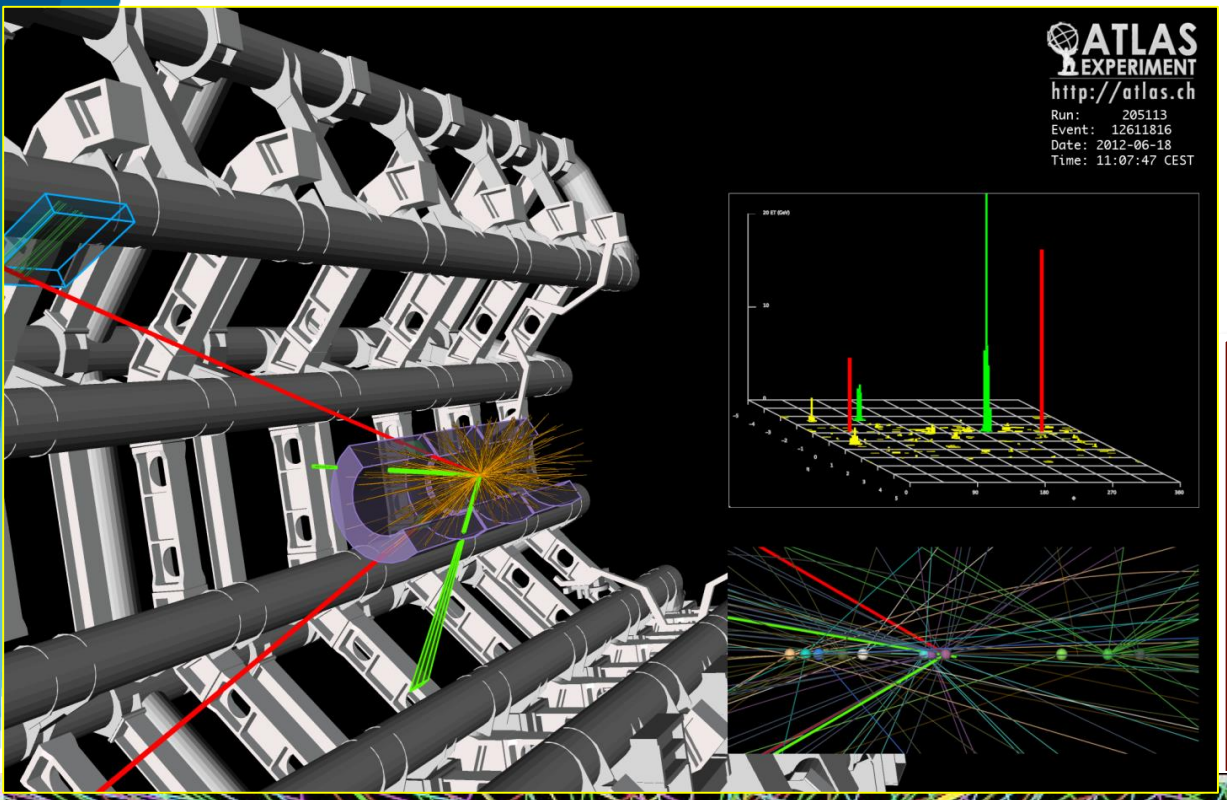
An integrated luminosity of **250 fb^{-1} per year**, enabling the goal of **L_{int} = 3000 fb^{-1}** twelve years after the upgrade.
This luminosity is more than ten times the luminosity reach of the first 10 years of the LHC lifetime.

Ultimate performance established 2015-2016: with same hardware and same beam parameters: use of **engineering margins:**
$L_{peak\ ult} \cong 7.5\ 10^{34}$ $cm^{-2}s^{-1}$ and **Ultimate Integrated $L_{int\ ult} \sim 4000$ fb^{-1}**
LHC should not be the limit, would Physics require more…

LHC / HL-LHC Plan



Technical limits to lumi increase (Machine & Experiments)



More luminosity ⇒ higher the collision rate

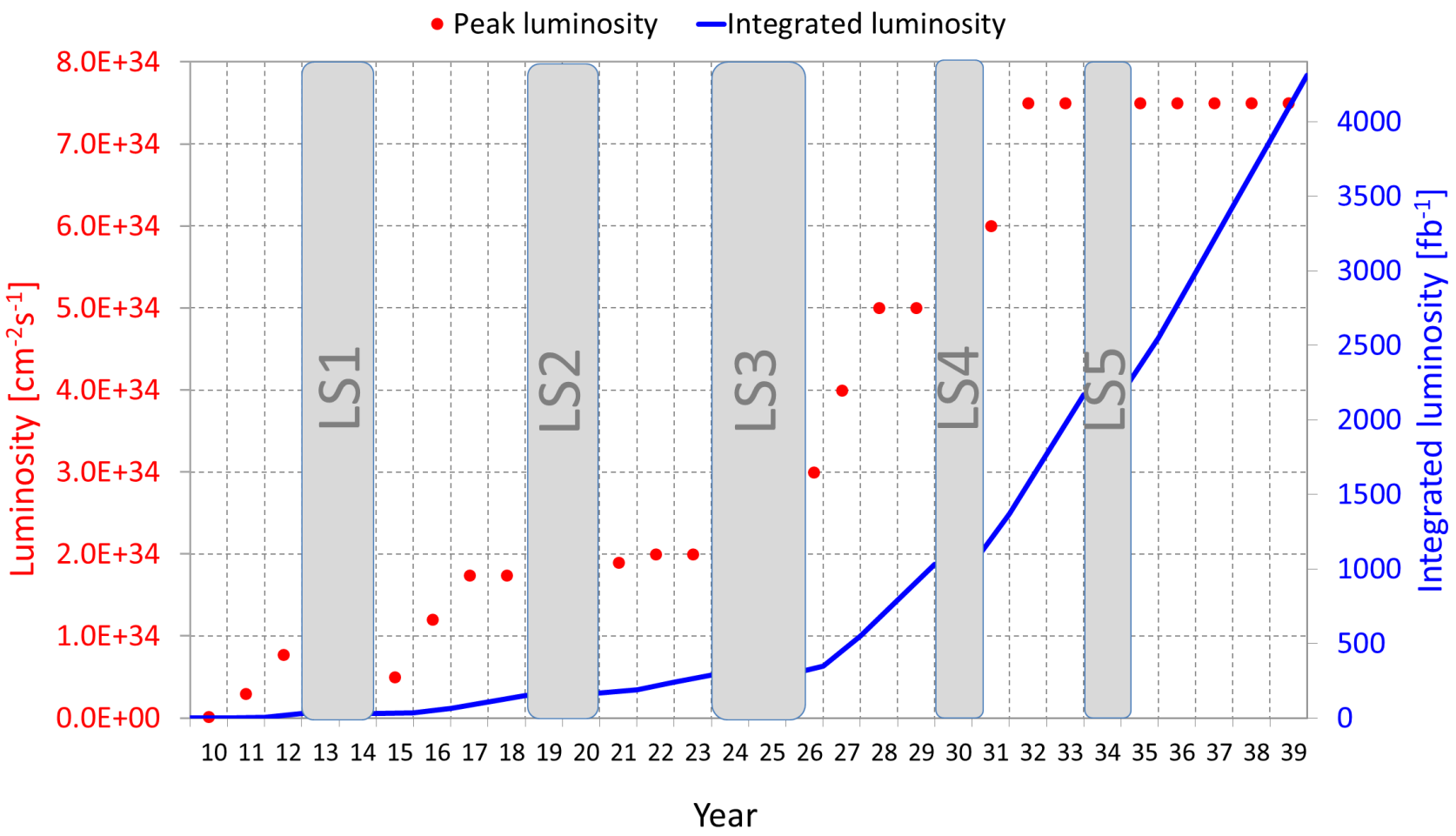
Higgs: the needle in thee haystack

Picture repeated 40 millions times each second

Z→ μμ

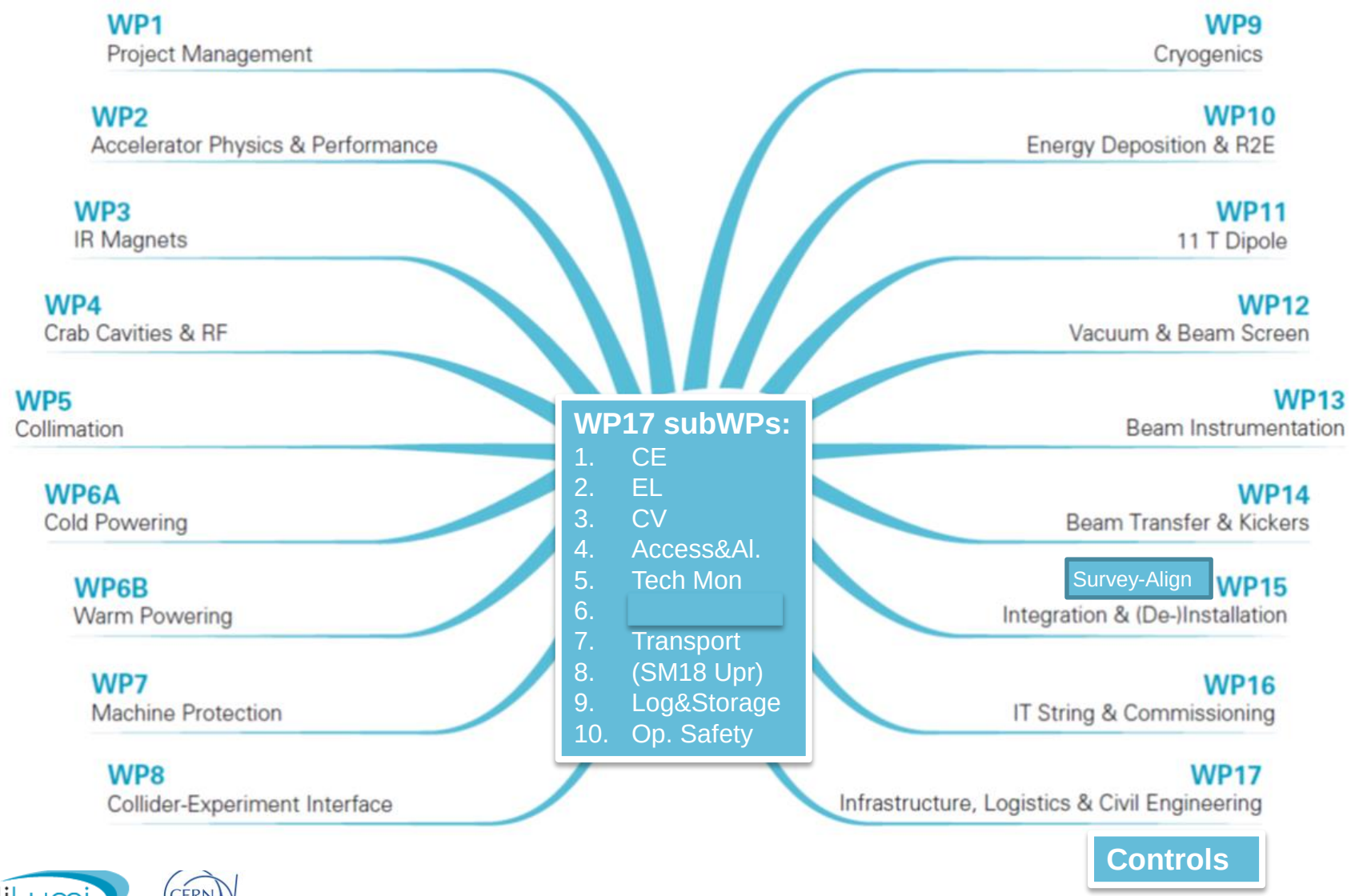
Z→ μμ event from 2012 data with 25 reconstructed vertices

Luminosity profile: ULTIMATE

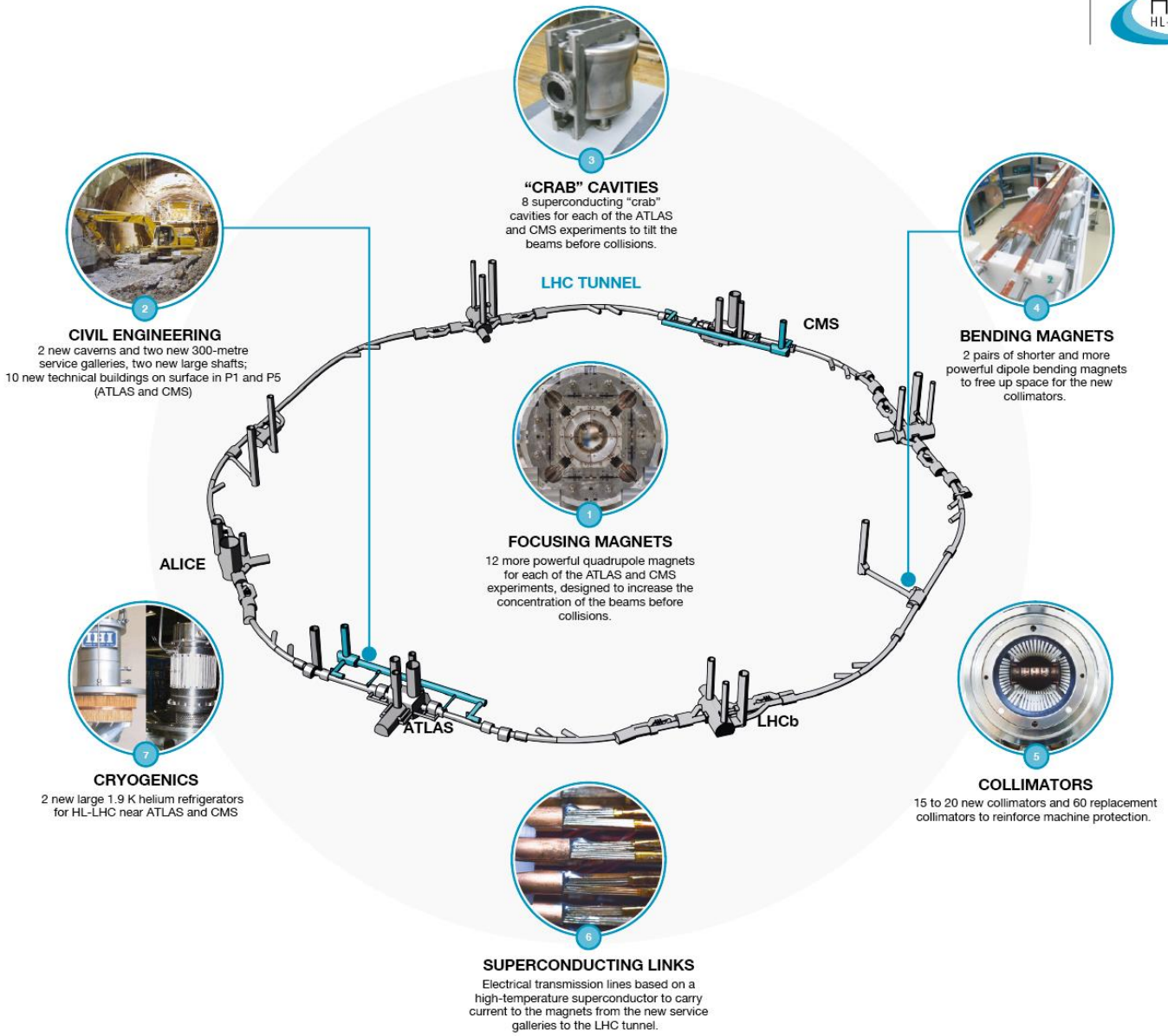


After LS4, proton physics days increase from standard 160 days to 200 and after LS5 to 220

Project structure



HiLumi LHC landmarks



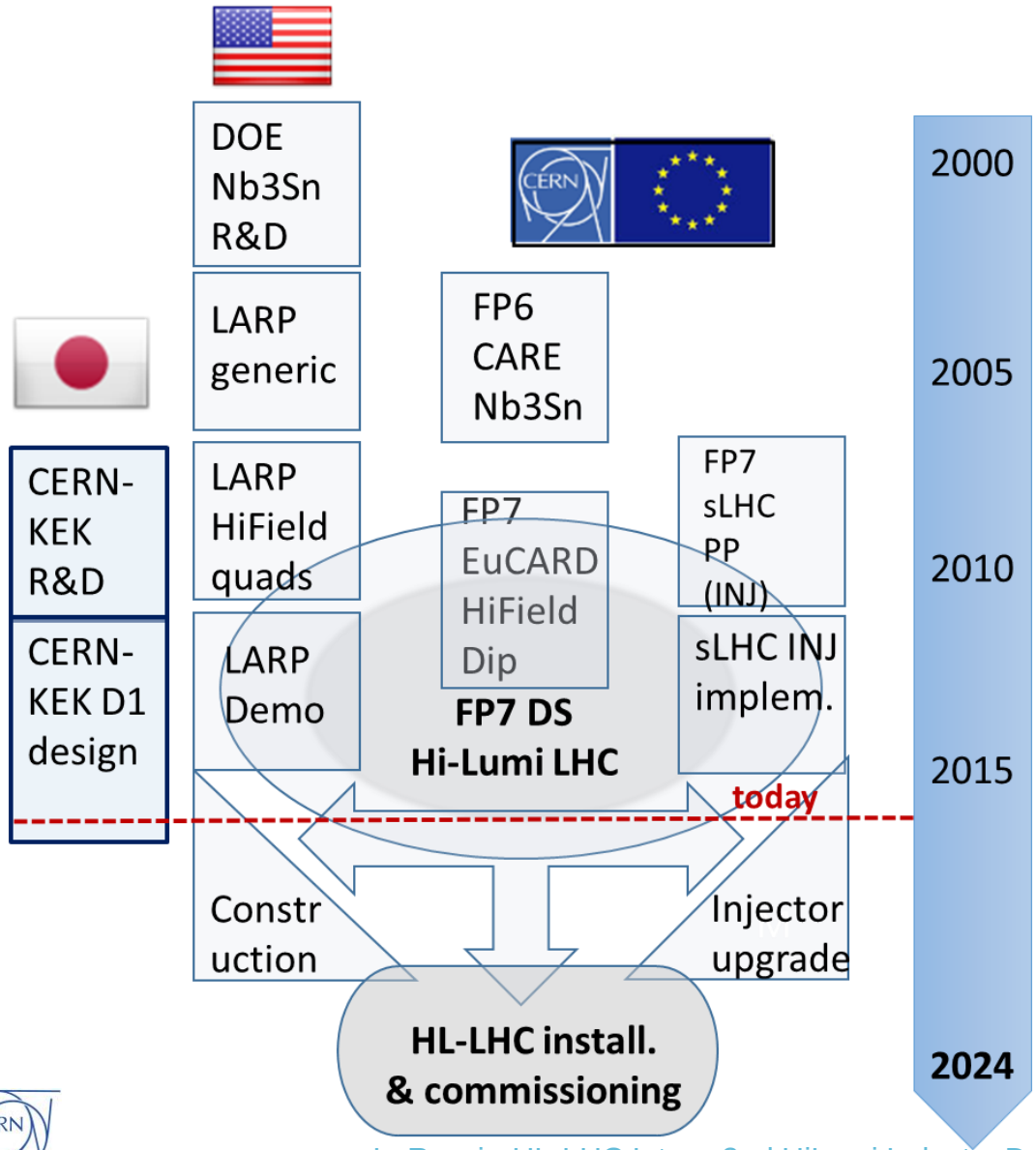
HL-LHC main milestones

- 2010 : High Luminosity LHC Design Study established & application for EU funds
- 2011: approval and start of the EU co-funded FP7-HiLumi LHC Design Study with 20 Institutions
- 2013: Approval by EU HEP strategy of HiLumi as main project for the next decade; Kick off meeting in Daresbury of HL-LHC as construction project; P5 subpanel (USA) also put HL-LHC as next main project
- 2015: 1st C&S Review 1, end of the FP7-Design Study and insertion of the full funding profile in the CERN budget till 2026 (approved formally till 2020);
- 2015 Oct : end of FP7 design phase issue of first TDR-V0

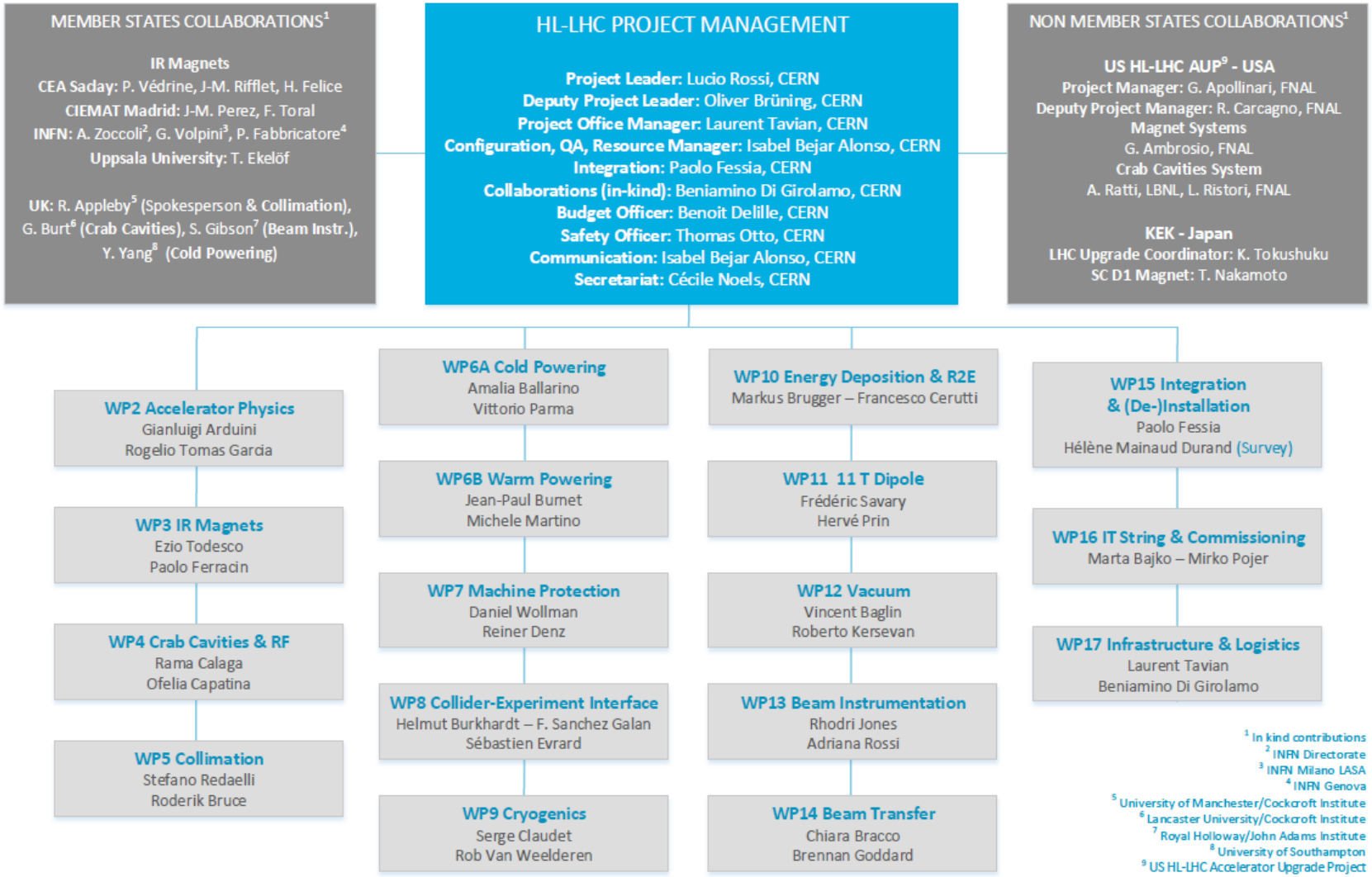
The HiLumi LHC Design Study (a sub-system of HL-LHC) is cofunded by the European Commission within the Framework Programme 7 Capacities Specific Programme, Grant Agreement 284404

- 2016 (June Council): formal approval of the entire HL-LHC project; HL declared an ESFRI landmark
- 2016 June-August: re-baseline of the project

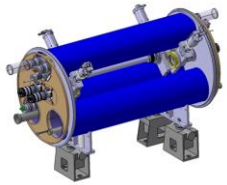
HiLumi & Collaborations: the long route

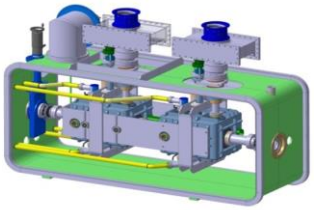


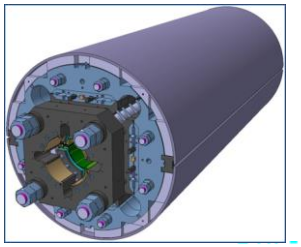
High Luminosity LHC Project

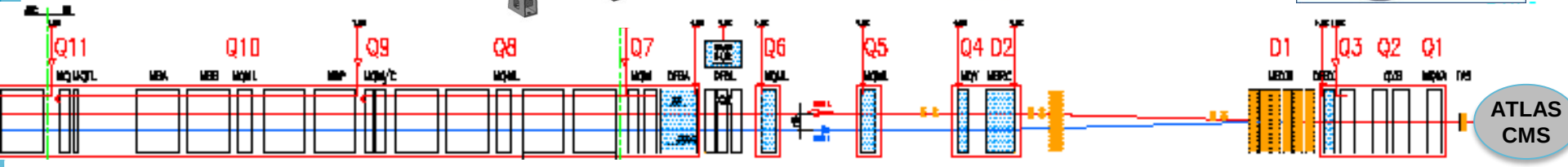


The largest HEP accelerator in construction









Dispersion Suppressor (DS) in P7

Modifications
1. In IP2: new DS collim. in C.Cryost.
2. In IP7 new DS collimation with 11 T

Cryogenics, Protection, Interface, Vacuum, Diagnostics, Inj/Extr… extension of infrastr.

Matching Section (MS)

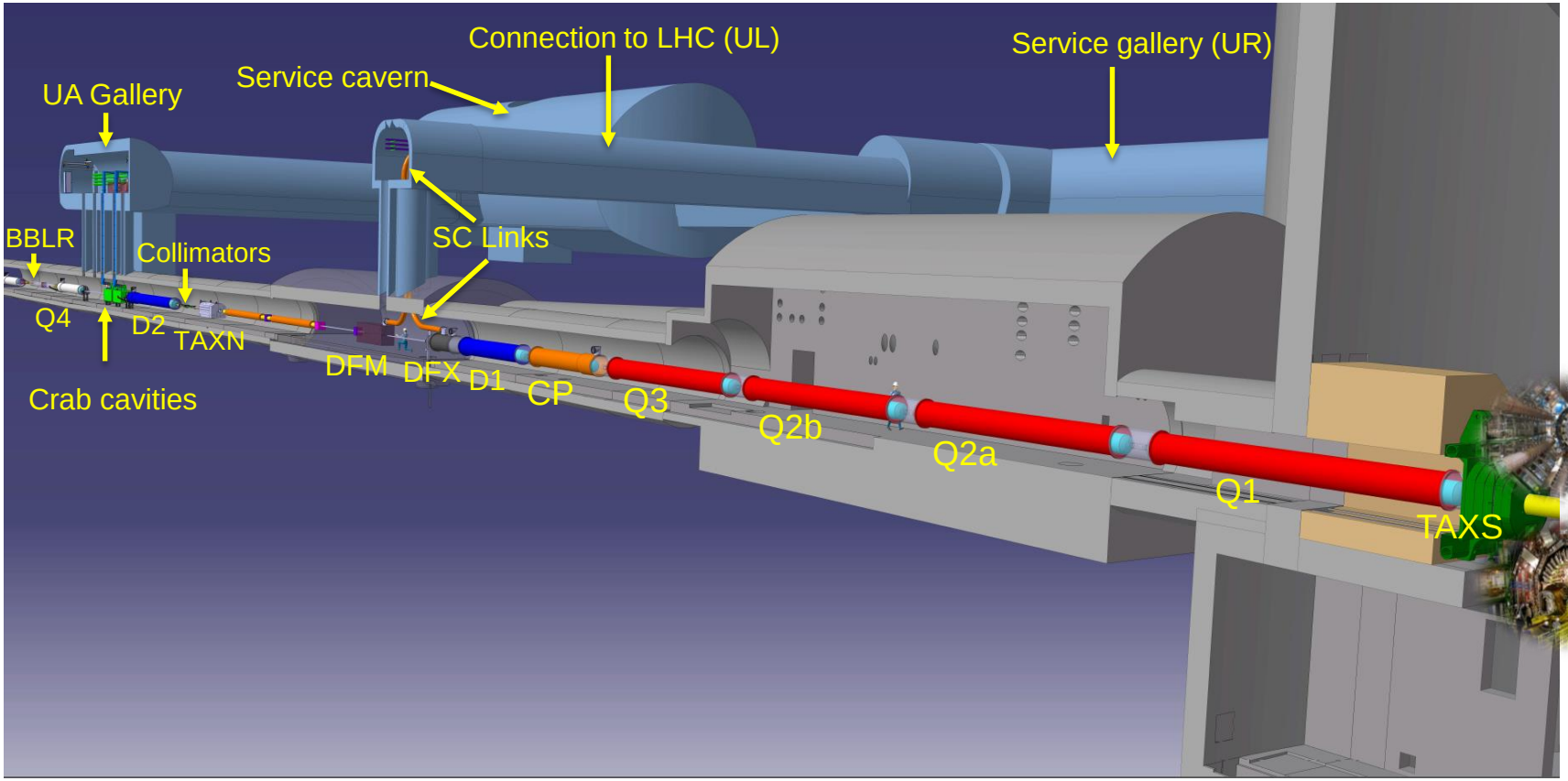
Change/new lay-out
1. TAXN
2. D2
3. CC
4. Q4
5. Correctors
6. Q5
7. Q5@1.9K in P6
8. New collimators

Interaction Region (ITR)

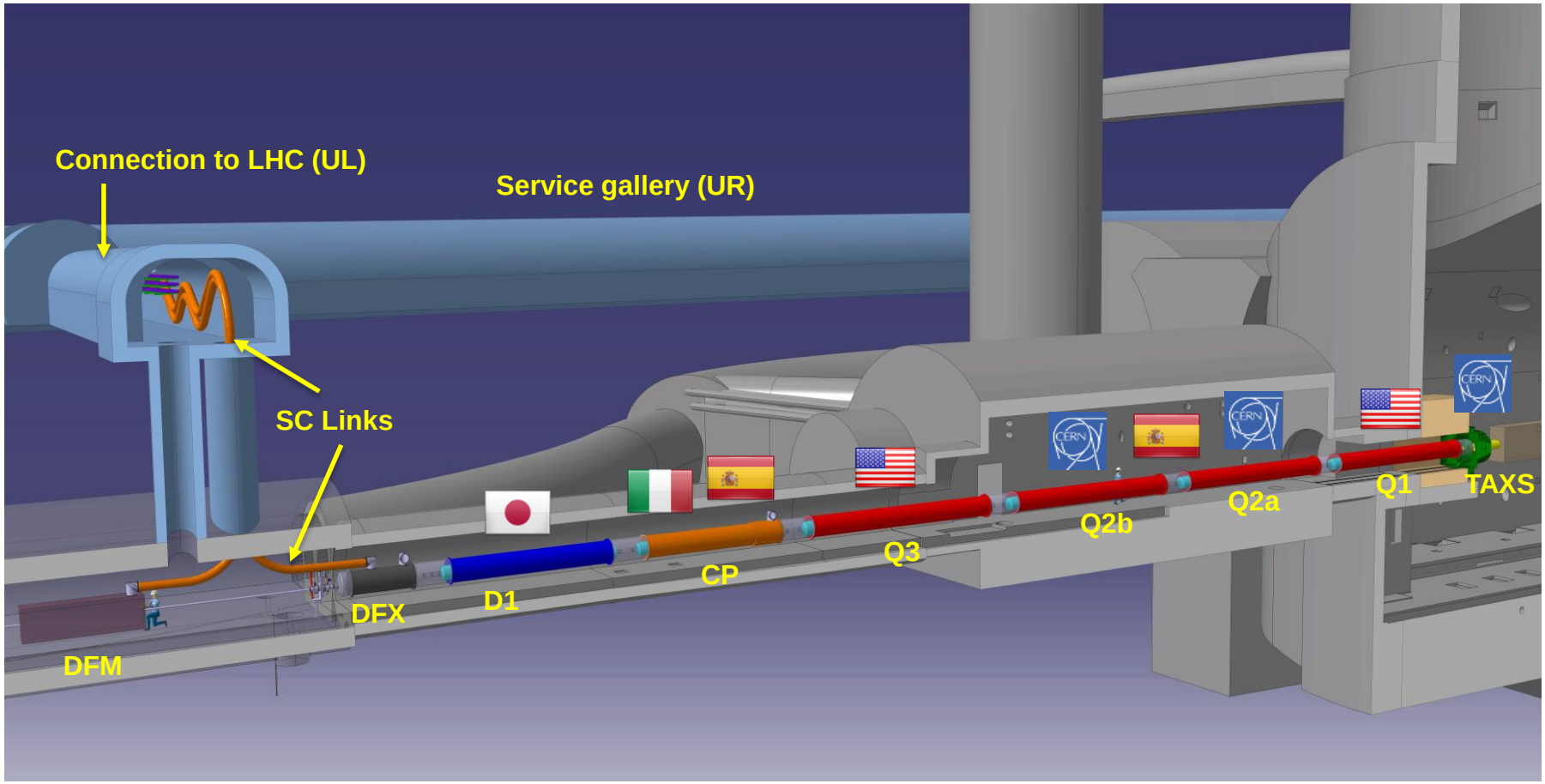
Complete change and new lay-out
1. TAXS
2. Q1-Q2a-Q2b-Q3
3. D1
4. All Correctors Magnets
5. Heavy shielding (W)

> 1.2 km of LHC !!

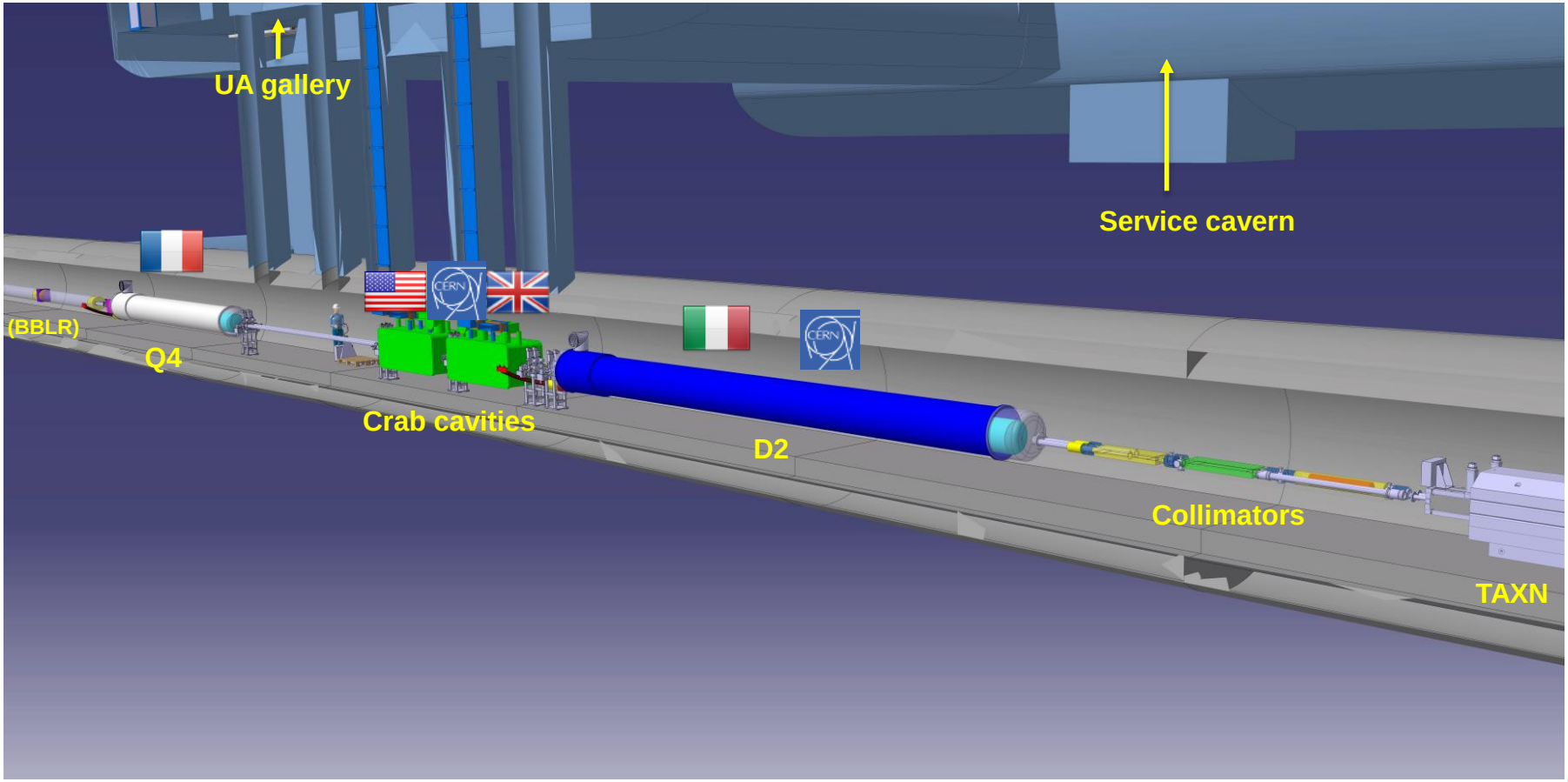
The Insertion Region (till Q4)



The Inner Triplet region with in-kinds

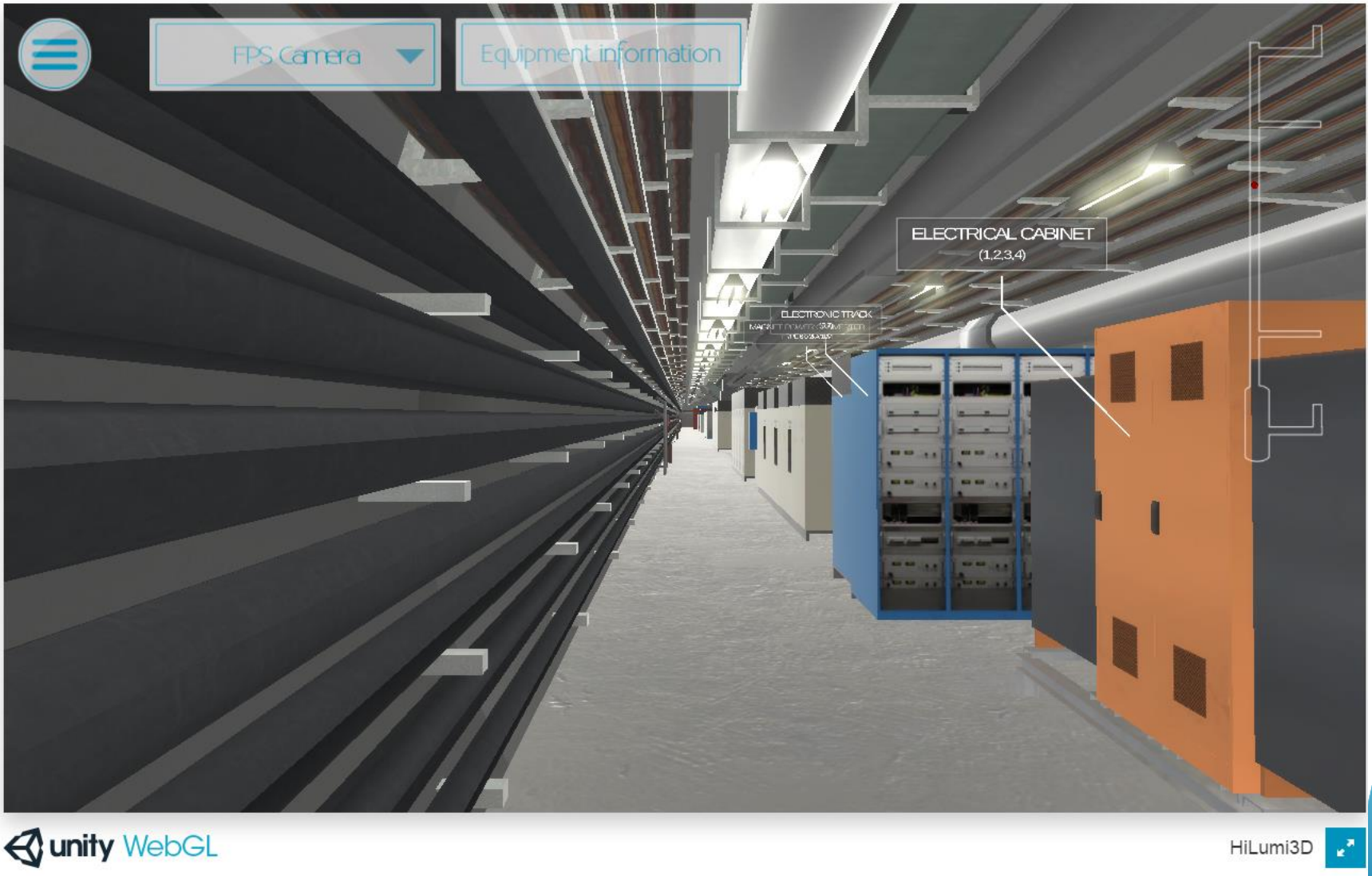


The MS region with in-kinds



How it could look like in point 5 (after HL)

On the new HL-LHC infrastructures

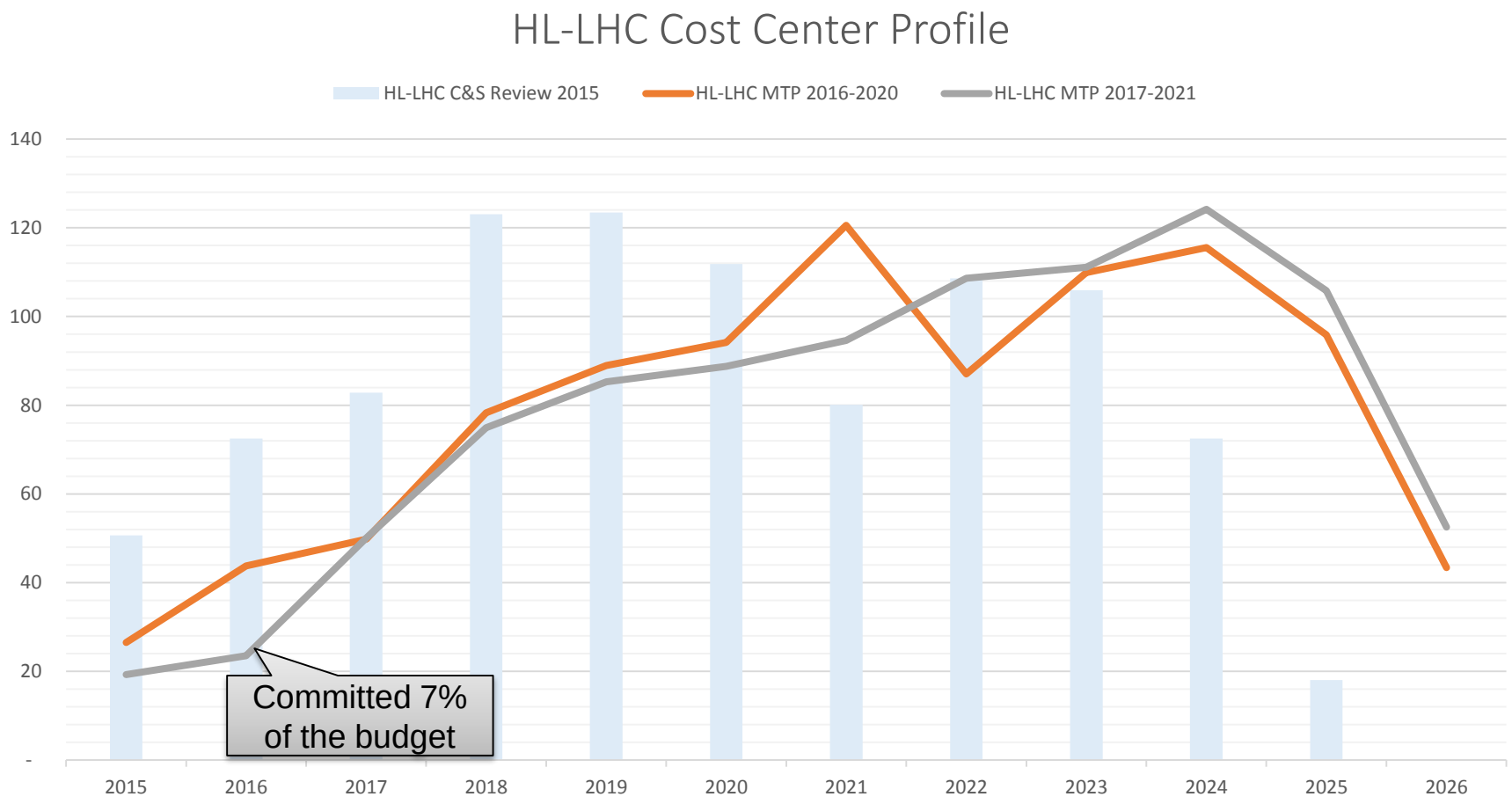


Schematic time plan

HL-LHC Plan

Detailed general plan

HL-LHC Budget (CtC) : 950 MCHF (2015 CHF)

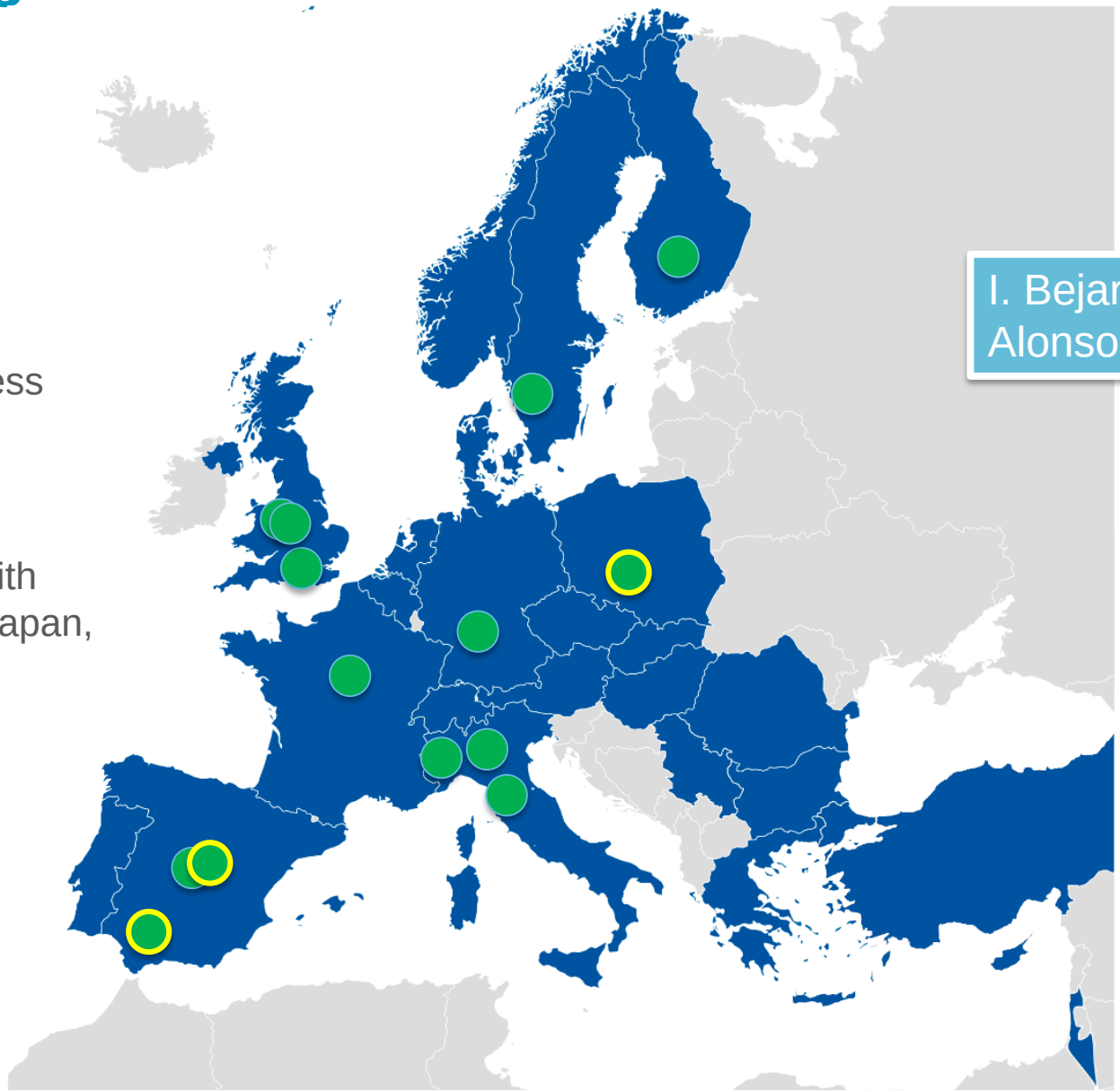


Big drivers:
Magnet Systems, C.E., RFCC, Cryo, Coll., T.I.

Increasing number of in kind contributions

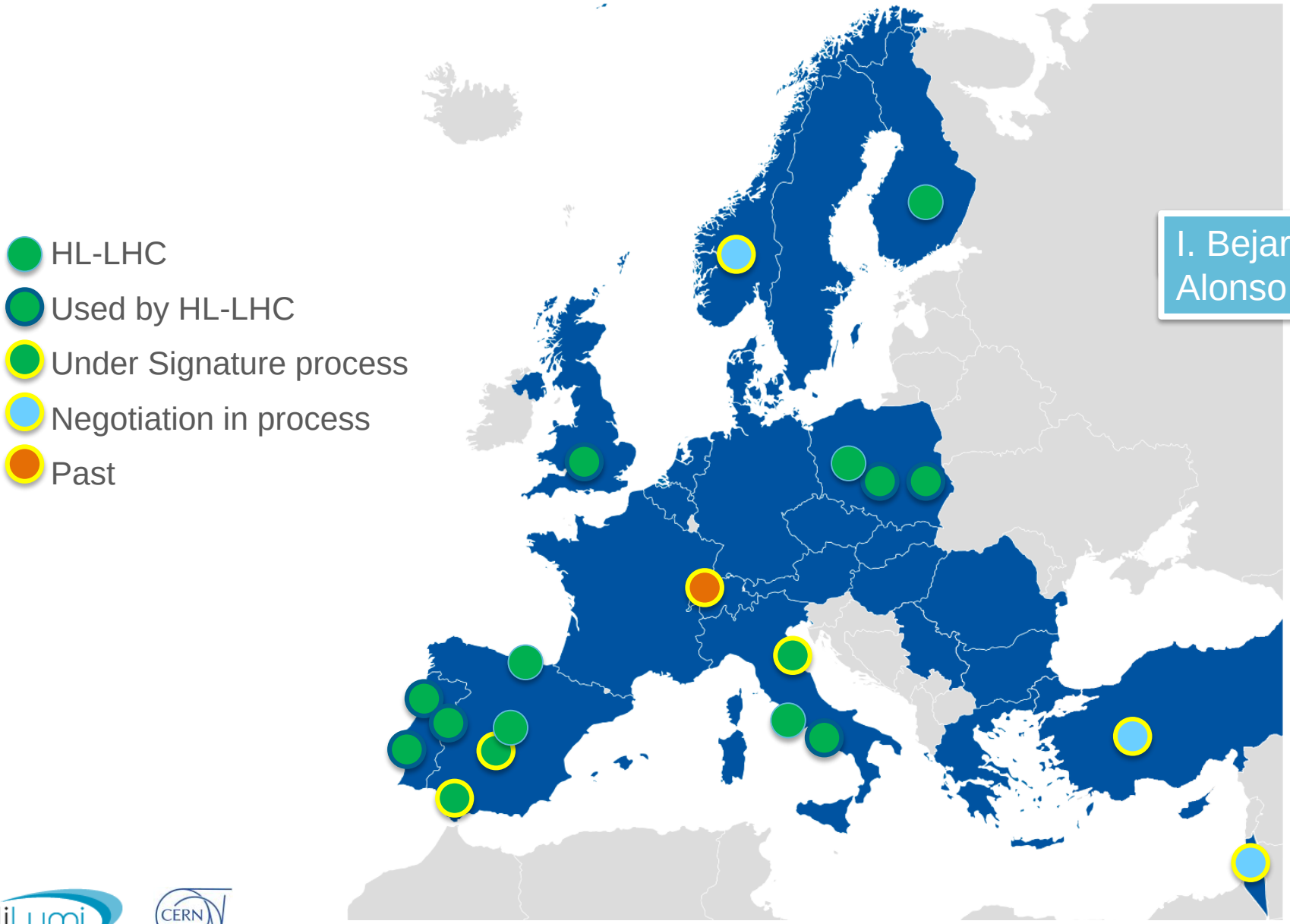
- HL-LHC
- Negotiation in process
- Past

Under discussion with Canada, Georgia, Japan, Russia, USA



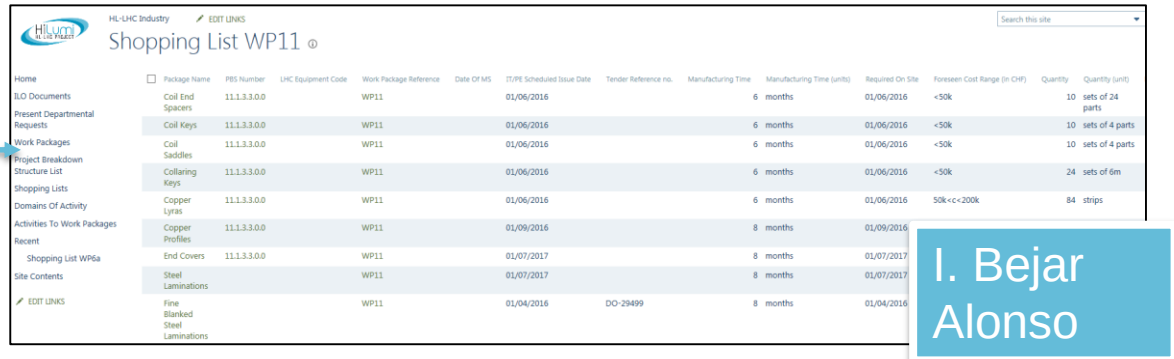
I. Bejar Alonso

Diversification of MPAs



Update of Make or Buy Plan

- Additional information in the Shopping Lists within the procurement plans provided to the ILOs and uploaded into the Industry website
  https://espace.cern.ch/HiLumi-Procurement/SitePages/Shopping%20Lists.aspx



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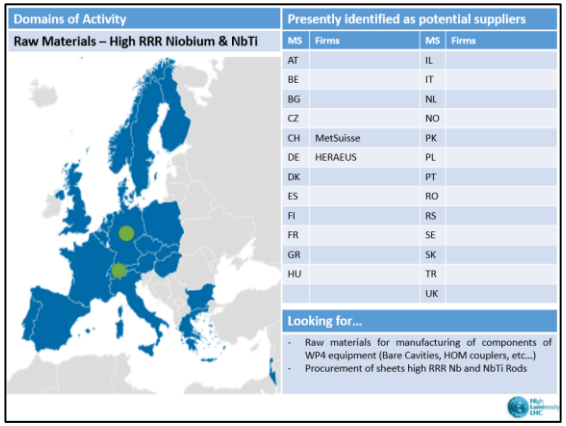
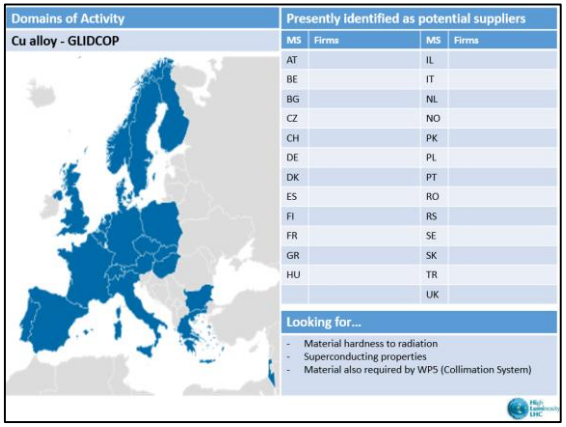
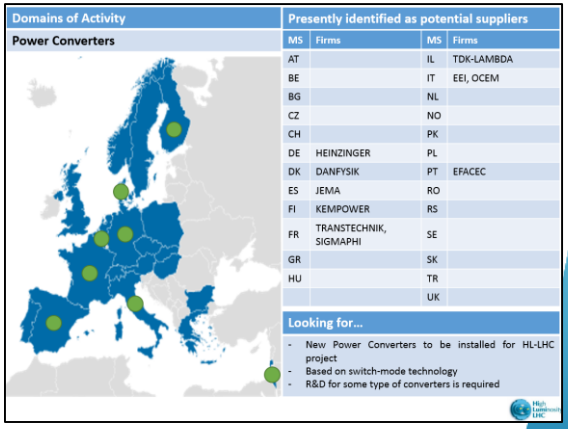
- Identification of main Domains of Activity and those areas for which would be required to seek new/more suppliers (Brochures on EDMS: CERN-0000151340)

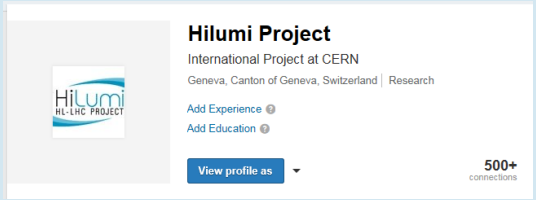






Communicating

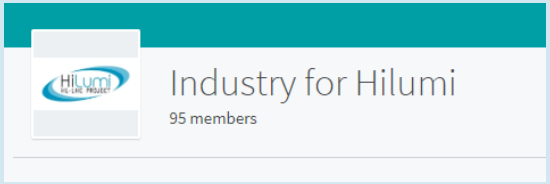
Collaborators

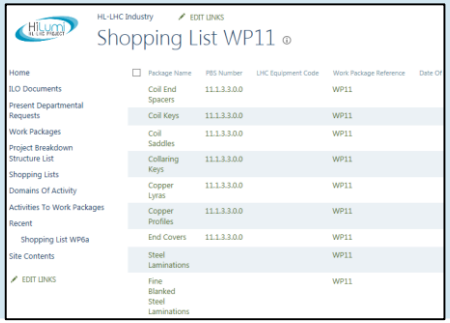


symmetry
dimensions of particle physics

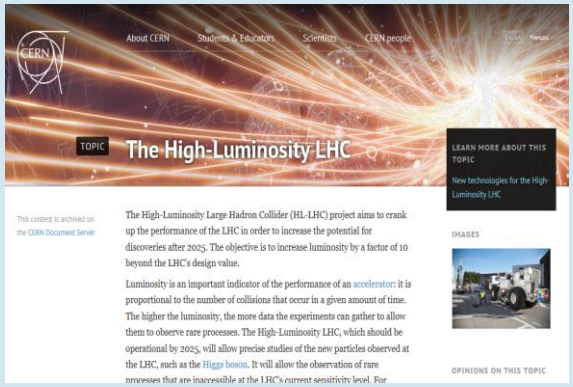
Accelerating NEWS

Industry





Public



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Thanks all WP leaders, PO office members and to all speakers for the terrific works in preparing this review!

Thanks to Depts and Groups for supporting the project!

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