



Linac4

M. Vretenar, 13.5.2009





Linac4 construction site – 5.5.2009



Linac4 tunnel (“cut and cover” excavation) seen from high-energy side.

Final concrete works starting at low-energy side, excavation proceeding at high energy side.

Tunnel level -12 m, length 100 m.

Delivery of tunnel and surface equipment building end of 2010.



PSB and SPL connection area



High-energy side of Linac4 tunnel, with beam dump chamber and connecting tunnel to Linac2 line.



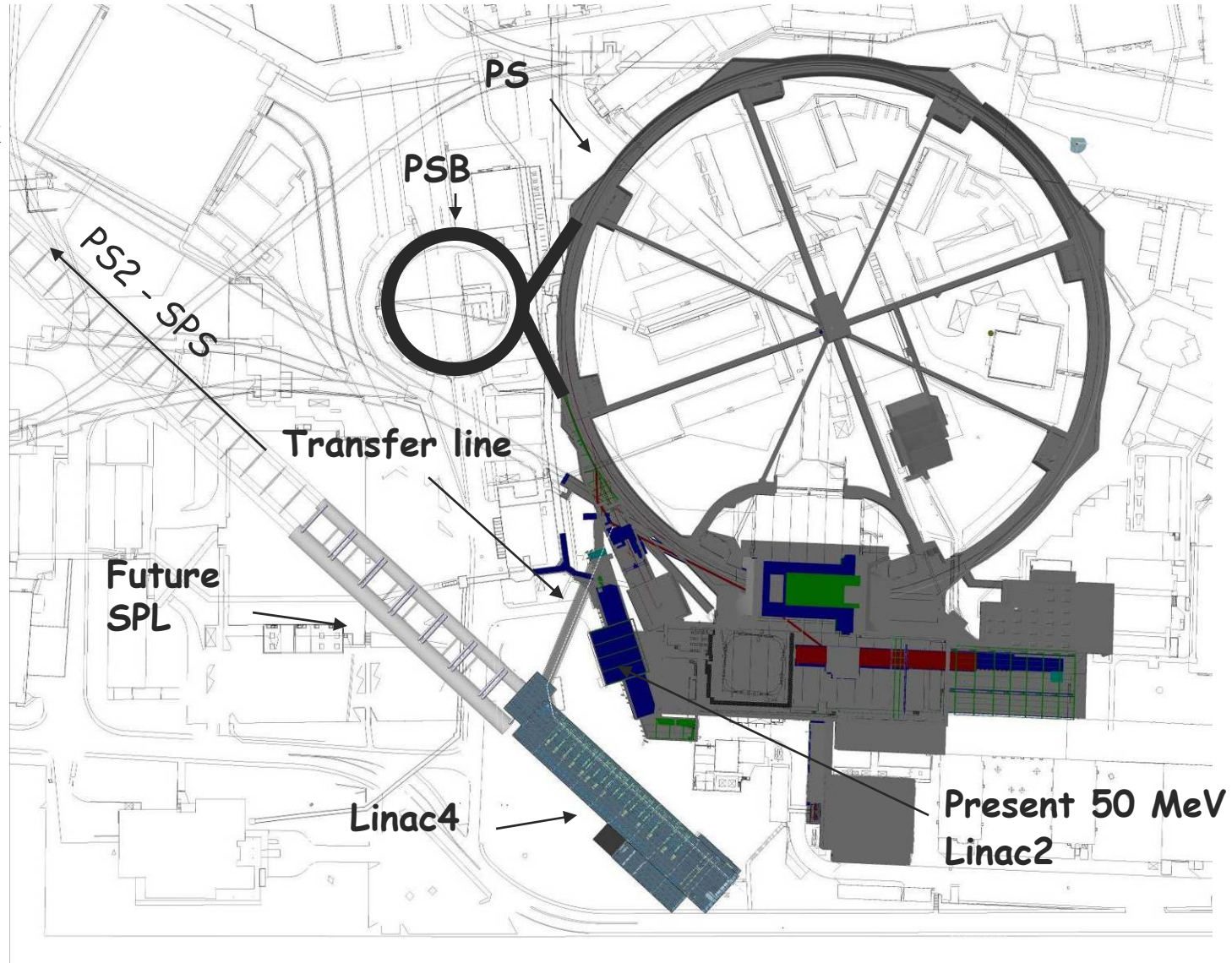
Linac4 on the CERN site



Linac4 location ("Mount Citron"):

- Correct size (~100m x 30m).
- Easy connection to existing Linac2-PSB line.
- Orientation allowing future extension to the SPL.
- Natural (earth) shielding.

Linac4 because the 4th ion linac to be built at CERN





Linac4: a staged approach



👉 *Linac4 is designed for 3 different stages in its lifetime:*

	Injector to PS Booster / PS	Injector to SPL / PS2	Injector to High-Power SPL	
	<i>2014 – 2020</i>	<i>2020 - ...</i>	<i>?</i>	
Beam energy	160			MeV
RF frequency	352.2			MHz
Rep. frequency	1.1	2	50	Hz
Pulse length	0.4	1.2	1.2	ms
Beam current	40	20	40	mA
Duty cycle	0.08	0.24	6	%
	<i>In construction</i> →	<i>Only minor modifications</i> →	<i>Major upgrade</i>	

Factor 2 in $\beta\gamma^2$ →
same space charge
expected in PSB
with 2 x intensity

LEP RF frequency:
reuse some RF
equipment

Linac4 (for PSB) + LHC IR upgrade =
LHC upgrade (sLHC) Phase 1

Higher energy injection in PSB, H^- →
Increased beam brightness, potential
for LHC luminosity above nominal

sLHC
Phase 2

Accelerating structures, RF sources and shielding
dimensioned for high duty in the initial construction
(minimum additional cost).

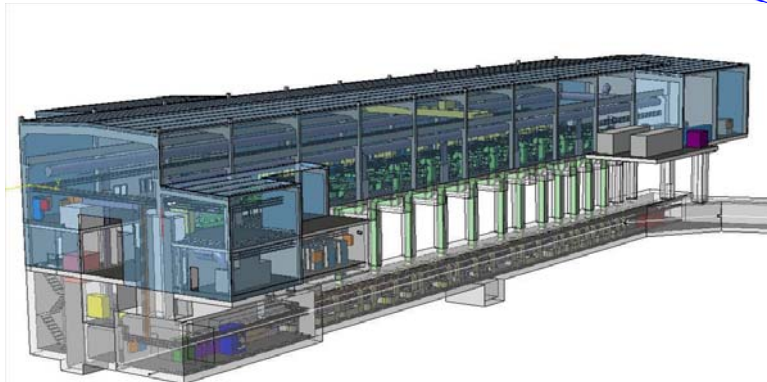
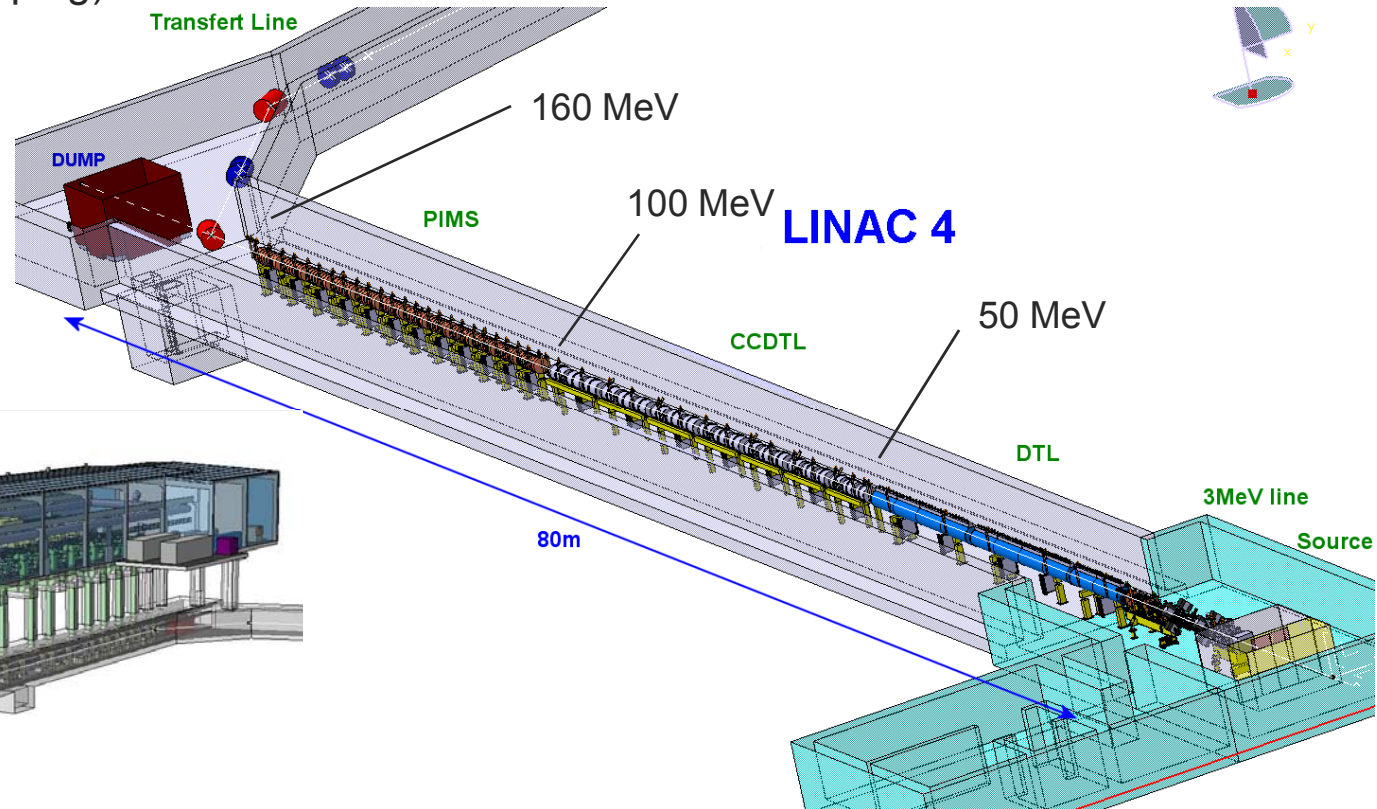
High cost items (electrical & cooling infrastructure,
power supplies, electronics) to be upgraded if high
beam power programme approved



Linac4 layout



- Linac4 is a **normal-conducting H⁻ linac at 160 MeV** energy, made of 4 types of 352 MHz accelerating structures, matched to the increasing beam energy. A beam chopper at low energy allows modulating the linac beam pulse to minimise losses in the ring. A beam dump at linac end allows setting-up of the beam, will be displaced when connecting to the SPL.
- The Linac4 project includes important modifications to the **PSB injection region** (higher injection energy, H⁻ stripping).



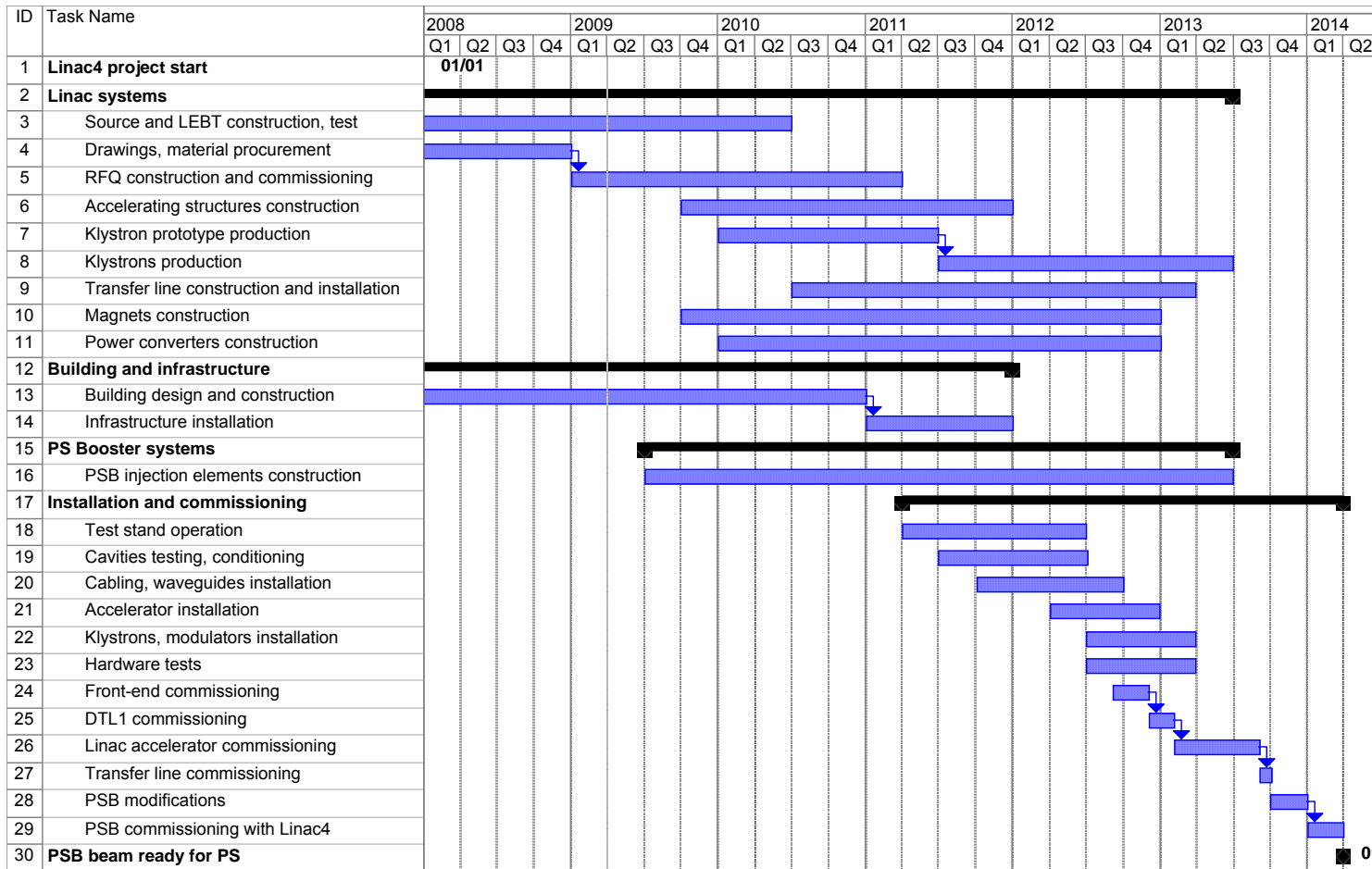
Linac4 tunnel and surface equipment building



Linac4 Master Plan



New Masterplan (04/2009), after the delay by 1 year of all sLHC projects:

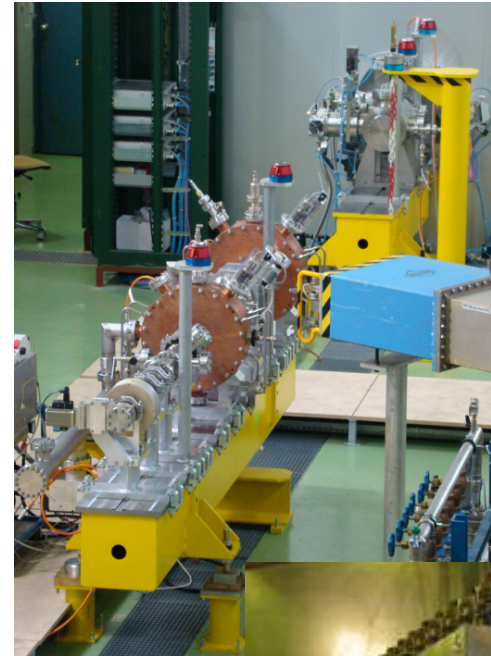


project duration: 6 years

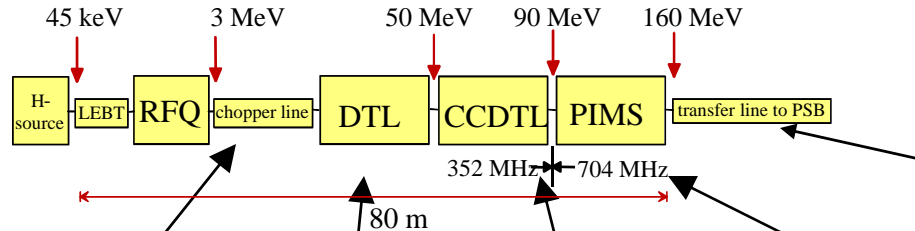
MILESTONES:

- ✓ Building delivery: December 2010
- ✓ Infrastructure installation: 2011
- ✓ Machine and equipment installation: 2012
- ✓ Linac commissioning: 2013
- ✓ PSB modifications: shut-down 2013/14.
- ✓ Beam from PSB: April 2014.

- 3 MeV Test stand for Linac4 Front-end (Bld. 152):
 - Infrastructure completed.
 - Prototype modulator and LEP klystron under test.
 - Ion source completed, first plasma mid-June.
 - Chopper line completed.
 - RFQ in construction at CERN Workshop.
- Prototypes of accelerating structures tested (CCDTL), under test (DTL), in construction (PIMS). Construction of DTL and CCDTL start in 2009, material being procured.
- Started preparation of large contracts (klystrons, modulators, magnets,...).
- Setting up network of international collaborations to contribute to Linac4 construction (France in-kind, Russia-EU, India, Poland, ...) – see next slide.

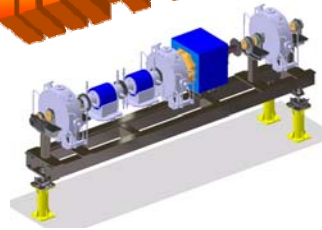


Notwithstanding the additional year given to the project, important activities are progressing slowly because of lack of manpower and low priority.



Transfer line vacuum chambers and supports from Pakistan, **AGREED**

HIPPI



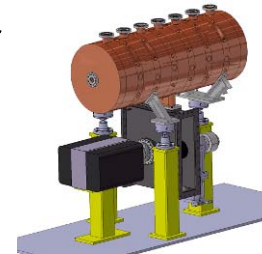
Discussions with Saudi Arabia (DTL tanks) and ESS-Bilbao (drift tubes)



ISTC #3888

ISTC Project (Russia-EU) for CCDTL

APPROVED



Collaboration agreement with Poland to build the PIMS structure, **in preparation.**



Chopper line in a EU Joint Research Activity **COMPLETED**

Tuners, couplers, waveguides from India, **in preparation**



French in-kind contribution: RFQ design & test, RF amplifiers, modulators - **being signed**



US contribution: Laser Profile monitor (+ extension), **under discussion...**

