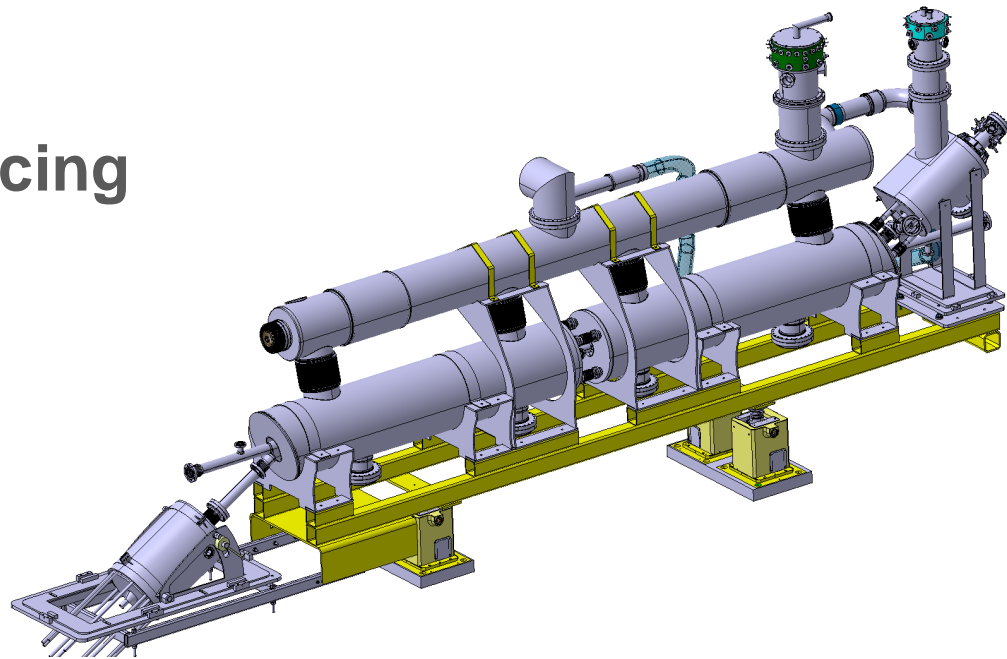
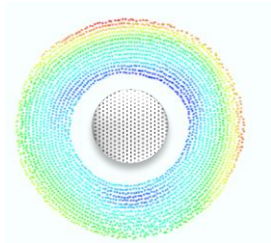




HEL - outsourcing

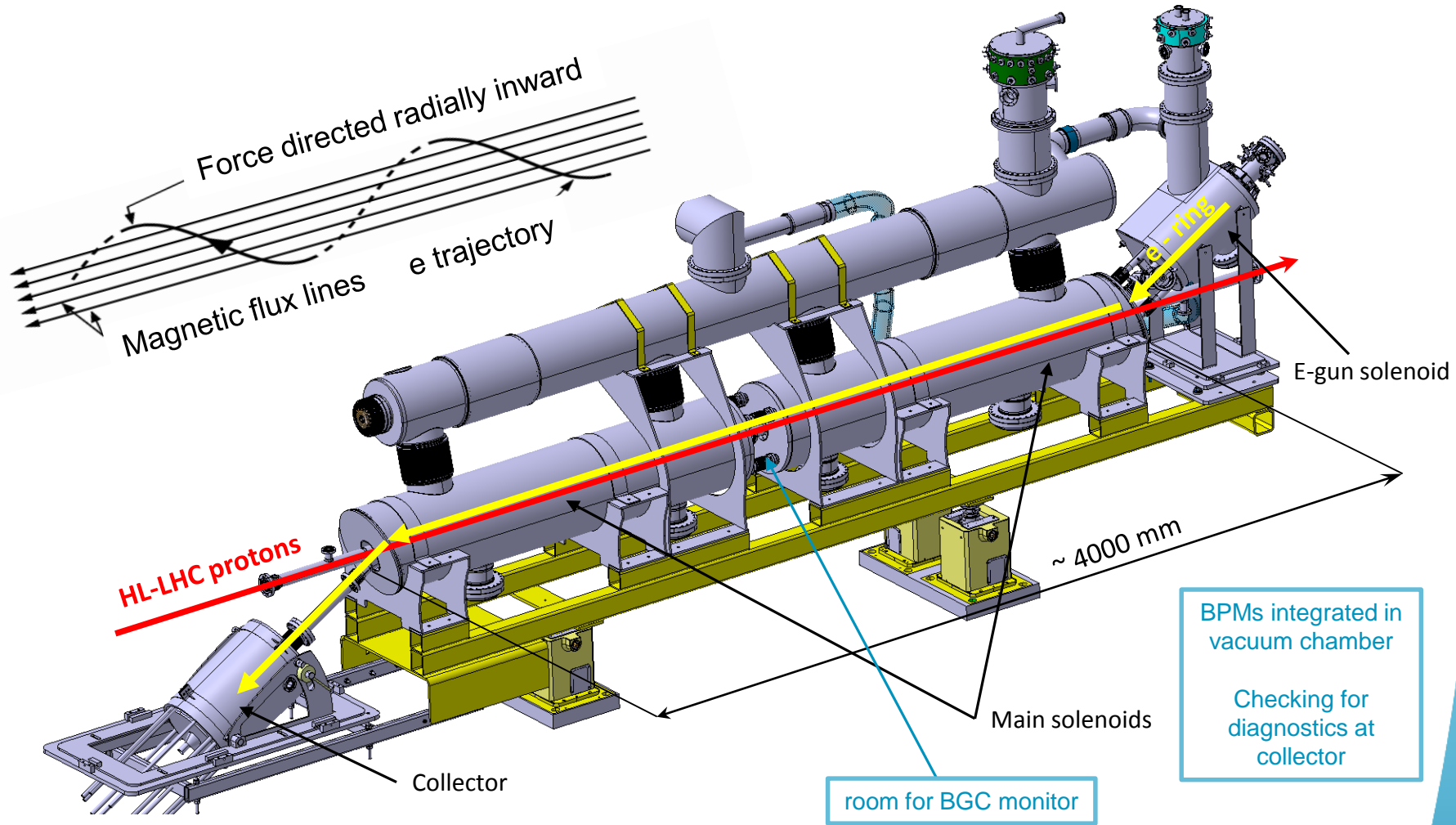


A. Rossi

History

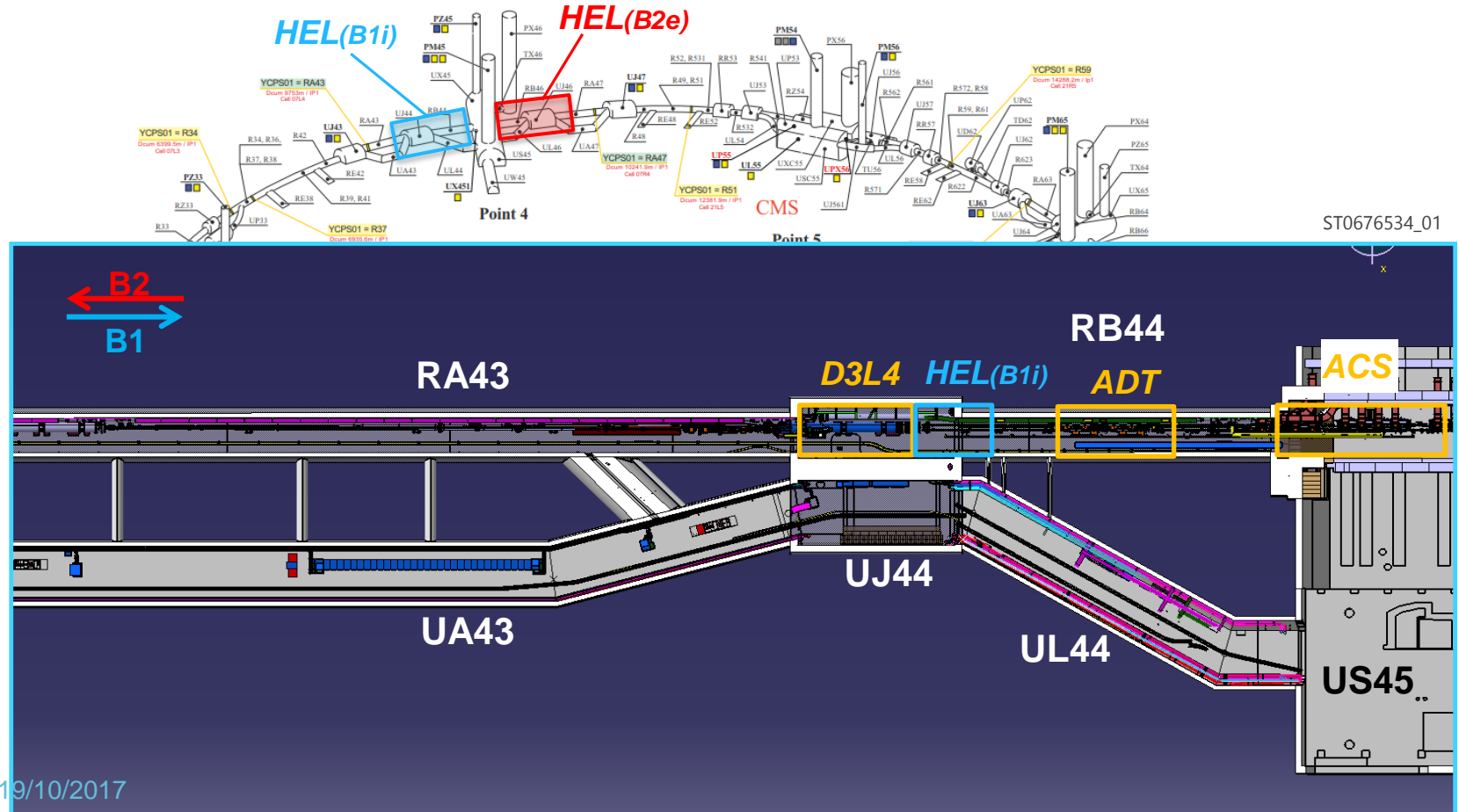
- Currently 'only' considered as an option for the HL-LHC project
- First proposed for LHC in 2006 within CARE HHH [Vladimir Shiltsev]
- Followed up by LHC Collimation team in 2009, both for halo control and in the context of machine protection with Crab Cavities
- Initial LHC operation experience showed sharp loss spikes
 - additional motivation for e-lens as halo cleaner
- Operation experience in RunII no longer featured loss spikes → need for electron-lens?
- Review on the e-lens need for HL-LHC in 2016 @ CERN [chaired by RS]
 - strong recommendation to include e-lens for HL-LHC
 - [≈ 35MJ stored beam energy in HL-LHC beam halo > 3 σ]
- Study on technical design and preparation for integration into the HL-LHC baseline during 2016 and 2017 (encouraging comment from CMAc in 2017)
- Would like to integrate e-lens into HL-LHC baseline by 2018 C&S review
 - Review of the technical readiness of the e-lens design

The system configuration



Electrons are produced by the cathode of an e-gun.
A system of superconducting solenoids cooled at 4.5K generates the magnetic field to tune de size and steer the trajectory of the electron ring.

Location of new HEL in LHC Ring (P4)

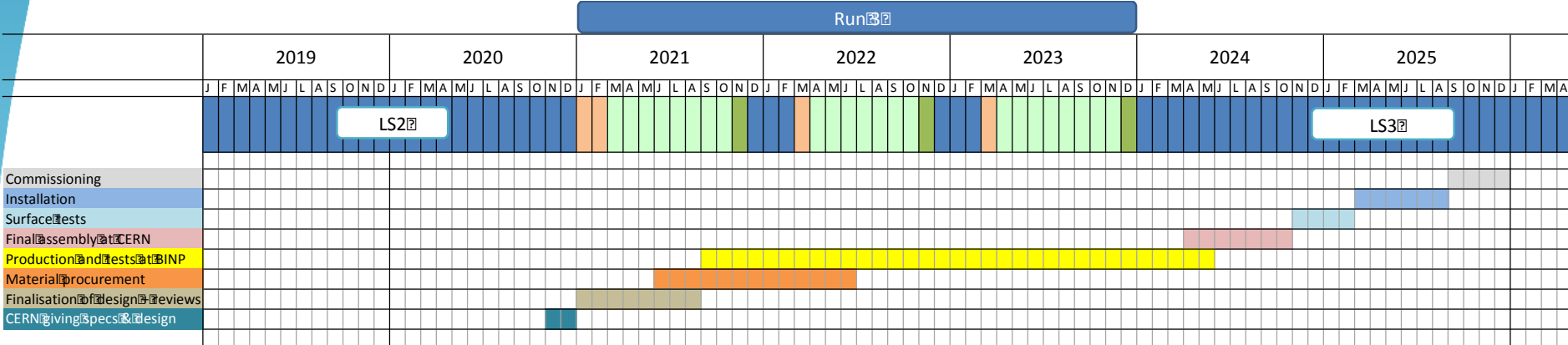


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19/10/2017

M. Gonzalez de la Aleja, Paolo Fessia

Schedule



- Assuming we want to operate the HEL in Run IV
- Assuming HEL built as in-kind

Budget:

- ➔ Develop cost estimates for each of the main HEL systems [bottom up]
- ➔ Identify items that could **[must]** be earmarked as in-kind contributions
- ➔ Preparation of discussions at Cost & Schedule Review March 2018

System	Cost [kCHF] for 2 units	Cost [kCHF] spares	TOTAL	Material [kCHF]	Personel [kCHF]	CERN personel	Availability of Staff @ CERN	Option for Inkind?	Order proposed	
Magnets systems (solenoid, correctors, cryostats, leads)	x100	x00	x800	x800	0	5.1 PY (>30 PY)	YES NO	YES	11	
Supports and feet	x00	0	x00	x00	0	?	YES	YES	9	
Beam instrumentation: gas jet monitor	x00	x0	x50	x50	0	1.5PY	YES	YES	9	
Gun and collector	x40	x0	x70	x70	0	?	YES	YES	8	
Beam instrumentation: BPM, BLM	x20	x0	x50	x50	0	1PY	YES	YES	4	
Vacuum systems	x90	x40	x30	x30	200	0.1PY	YES	YES	4	
Power converters (with HV cables)	Recovered from LHC							NO	3	
Anode Electron beam modulators	x40	x20	x60	x60	0	3PY	YES	NO	3	
Energy extraction system and protection	x00	x0	x20	x20	0	?		NO	3	
Cabling, integration, transport, cooling, alignment	x00	0	x00	x00	0	?		NO	2	
Cryogenics system	From 2M to 1.2 (or so)M after reorganizing installation schedule							NO	1	
Powering Interlock Controllers	x0	x0	x0	x0	0	0.3PY	YES	NO	0	
Validation and Test Station Operation	0	0	x00	0	300	2PY	YES	NO	0	
TOTALS	≈ 8000	≈ 1	CERN contribution reduced by ~ 1.2 to 1.4M							

➔ Order proposed for outsourcing or production via 'in-kind' contributions:
high number = well suited for in-kind; low number = should be done by CERN

➔ CERN Staff availability: Not yet in MTP but can be integrated under certain assumptions and prioritization

Budget:

- Ball Park estimate of ca. 10MCHF using a bottom-up approach
- Human resources for key systems available at CERN assuming a full external production for the magnet system and certain assumptions in the schedule [e.g. no overlap with activities during LS2 for Cryo and modulators]
- > half the material budget could come as in-kind contribution
-
- Strong wish to have it produced at BINP, but assembled at CERN (including magnets into cryostat) to ensure alignment requirements (fundings not yet in budget break-down, but personnel should come mainly from BINP)