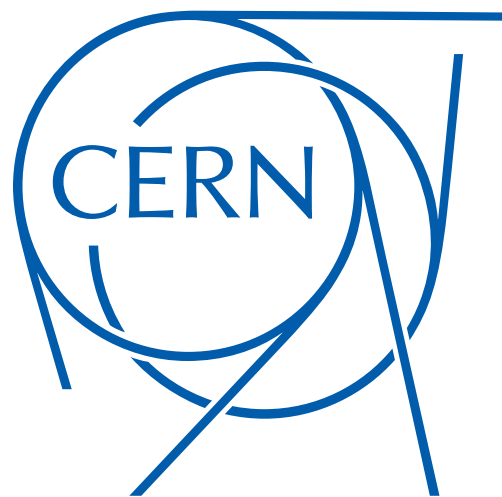


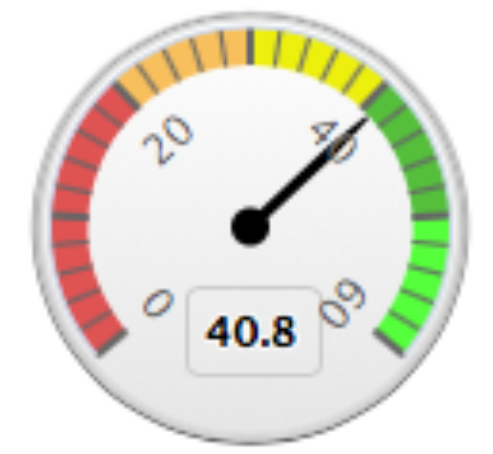
CERN – Status and News

Eckhard Elsen

Director Research and Computing

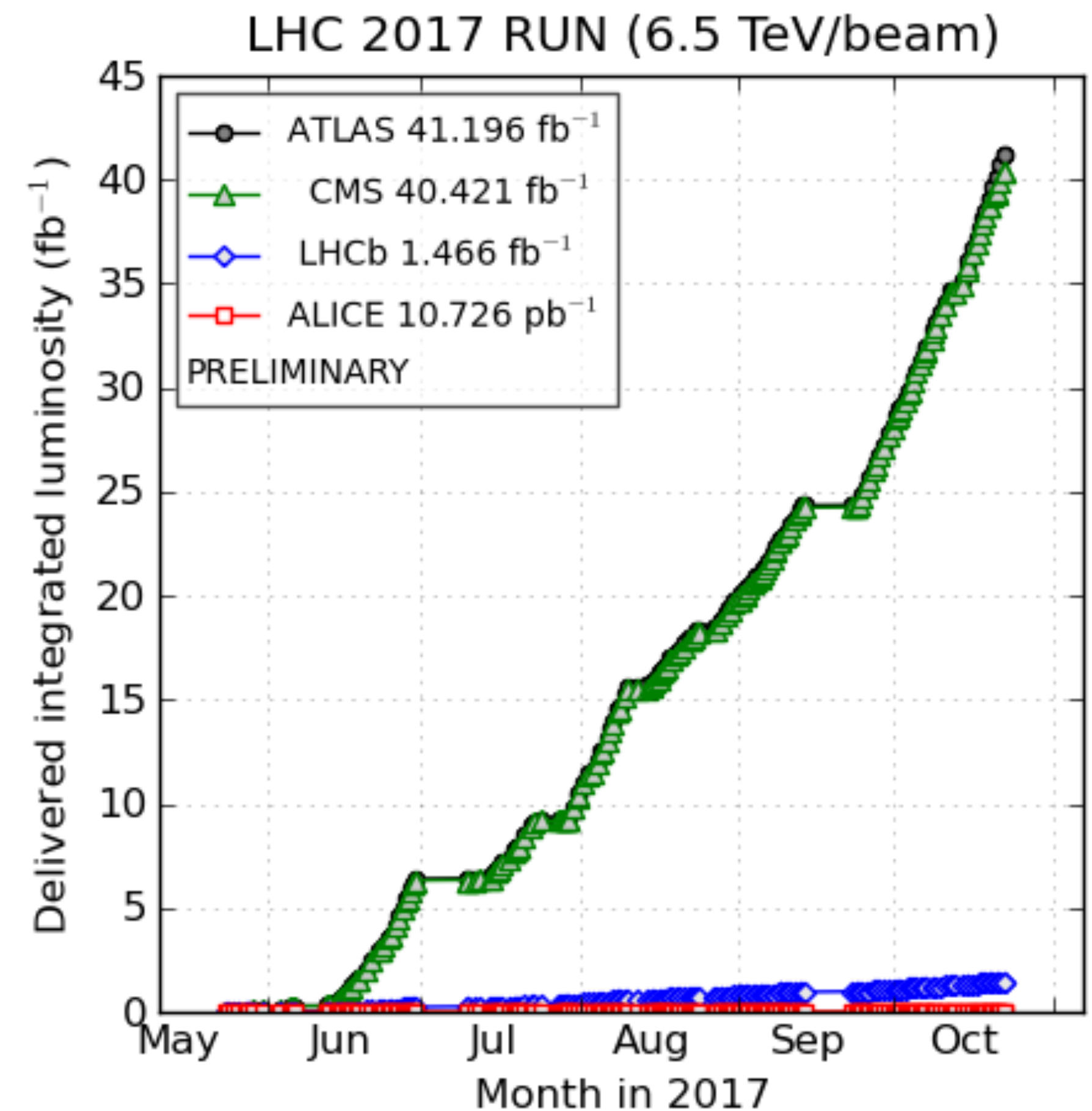


LHC delivers in 2017



- Operation of the LHC and experiments again beyond expectations
- Flexibility of LHC is amazing
 - $\beta^* = 30$ cm
 - $\sim 2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ peak luminosity despite of current limitations; 8b4e scheme to circumvent e-cloud
- Experiments cope with pile-up of 60 ± 6 ; levelling scheme
- Heavy load on computing

...more than anticipated



(2017-10-23 06:31 including fill 6317; scripts by C. Barschel)

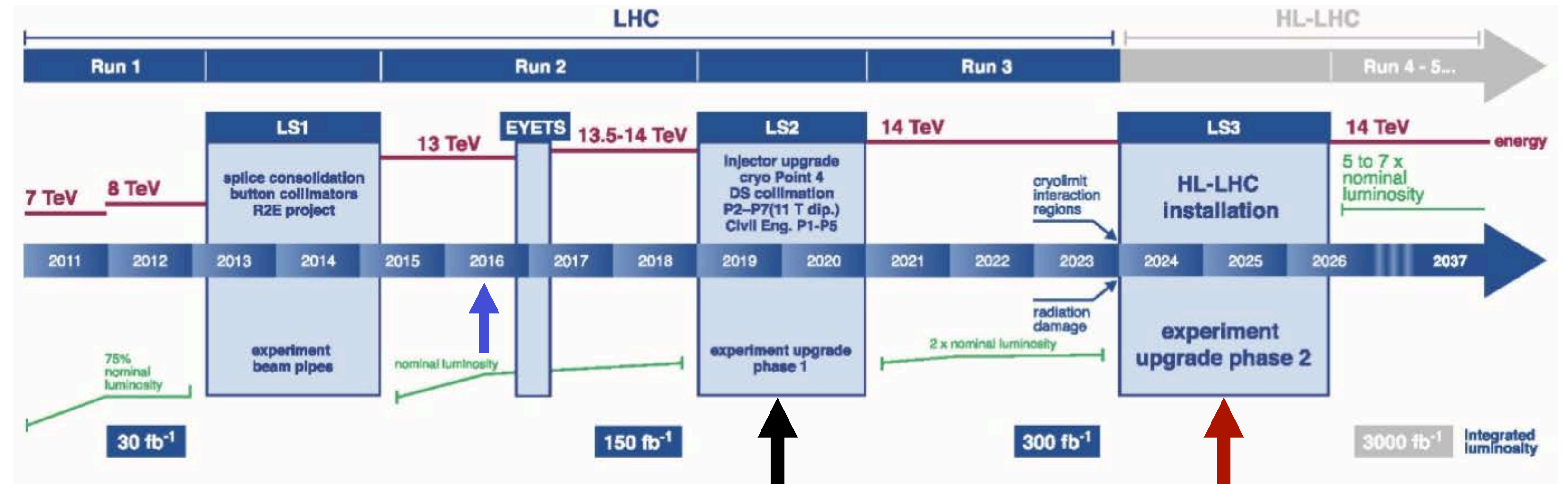
LHC and HL-LHC

- LHC

- 300 fb⁻¹ by 2023
- 30 fb⁻¹ Run 1
- ~40 fb⁻¹(2015/16)
- ...

- HL-LHC

- ~3000 fb⁻¹
by ~2035
- levelled luminosity



LS2 (2019-2020):

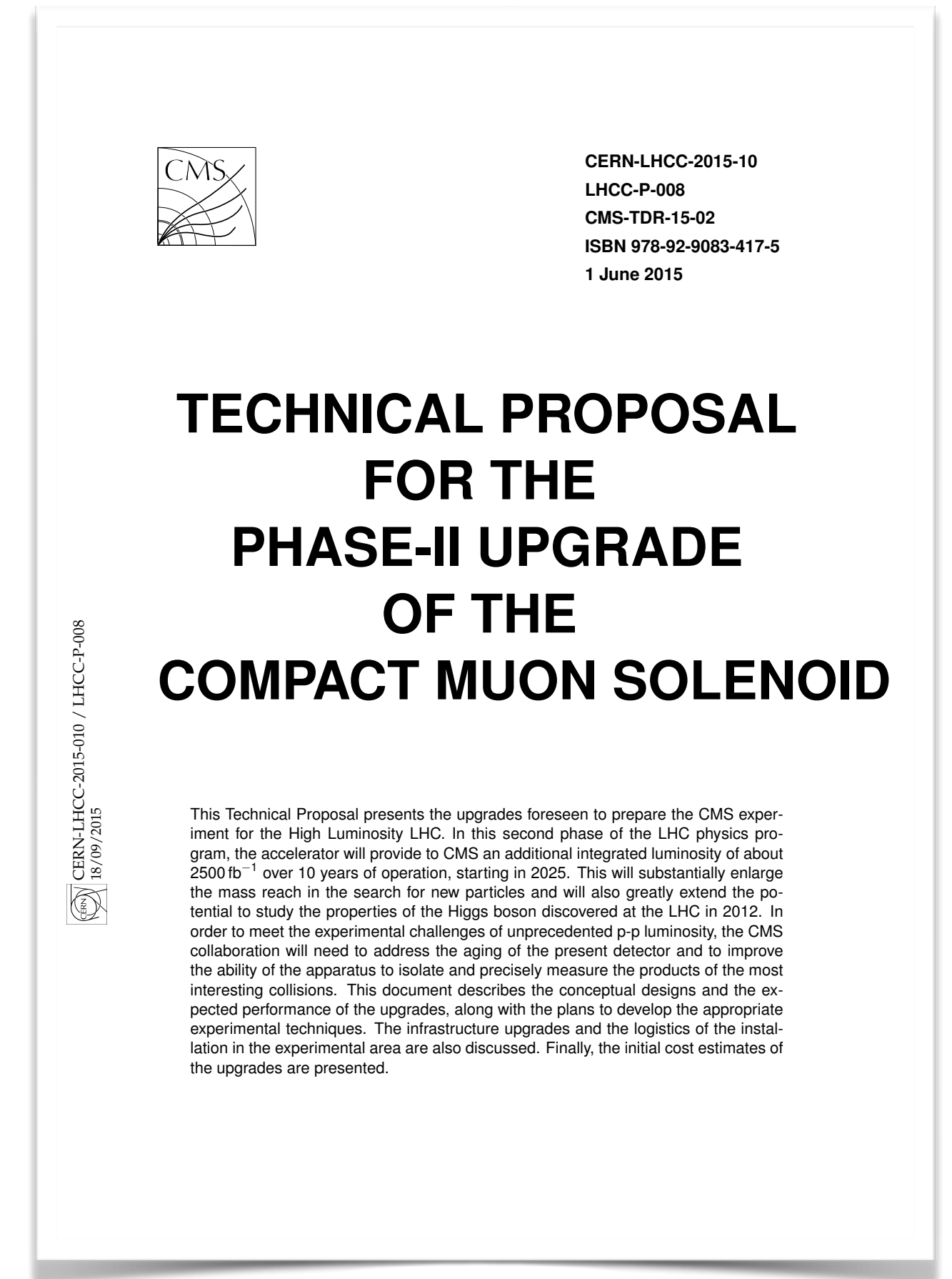
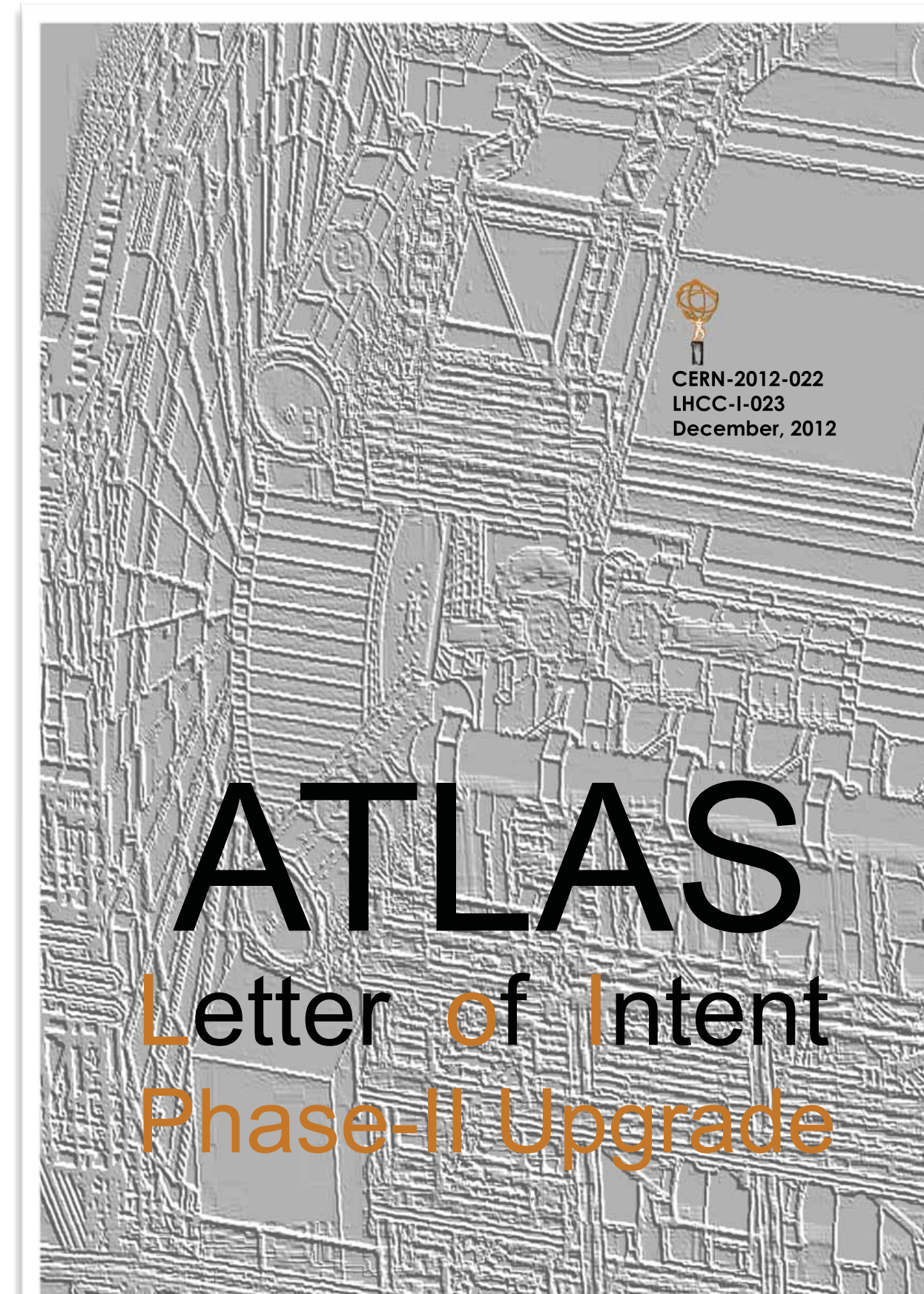
- ❑ LHC Injectors Upgrade (LIU)
- ❑ Civil engineering for HL-LHC equipment @ P1,P5
- ❑ First 11 T dipoles P7; cryogenics in P4
- ❑ Phase-1 upgrade of LHC experiments

LS3 (2024-2026):

- ❑ **HL-LHC installation**
- ❑ Phase-2 upgrade of ATLAS and CMS

ATLAS and CMS Phase II Upgrades

- Plans have been outlined in Lol and Technical Proposal
- Scoping Documents have been provided in addition



Experiments

- Each major detector component will provide its own TDR
 - TDRs are not arriving at the same time
 - TDRs to be examined by LHCC
 - Cost matrix and Total sum monitored by UCG
- Try to optimise and profit from synergies in technical development

Money Matrix

- Continuously updated and maintained by experiments
- Current status has recently been shared with DRC and LHCC/UCG chairs in confidentiality
 - original cost frame maintained
 - timing detectors (10-14 MCHF in addition) will be scrutinised in November LHCC
- encouraging involvement of funding agencies
 - distribution being optimised

Money Matrix – Engagement of Funding Agencies

ATLAS

Funding	TDAQ	Inner TracKer (ITk)	LAr Calorimeter	Tile Calorimeter	Muon Spectrometer	Unallocated
Argentina	●					
Armenia						
Australia	●	●				
Austria						
Azerbaijan						
Belarus						
Brazil						
Canada		●	●			
Chile						
Colombia						
China NSFC+MSTC		●			●	
Czech Republic	●	●		●		
Denmark	●	●				
France IN2P3	●	●	●	●		●
France CEA		●	●		●	
Georgia						
Germany BMBF	●	●	●	●	●	
Germany DESY		●				
Germany MPI	●	●	●		●	
Greece					●	
Hong Kong		●			●	
Israel						●
Italy	●	●	●	●	●	
Japan	●	●			●	
Morocco						
Netherlands	●	●			●	
Norway		●				
Poland	●	●				
Portugal	●			●		
Romania	●			●		
Russia		●	●	●	●	
JINR			●	●		
Serbia						
Slovak Republic						●
Slovenia		●				
South Africa		●		●		
Spain		●		●		
Sweden	●	●		●		
Switzerland	●	●				
Taipei					●	
Turkey					●	
United Kingdom	●	●				
US DOE HEP	●	●	●			
US NSF HEP	●		●	●	●	
CERN	●	●	●	●	●	

CMS

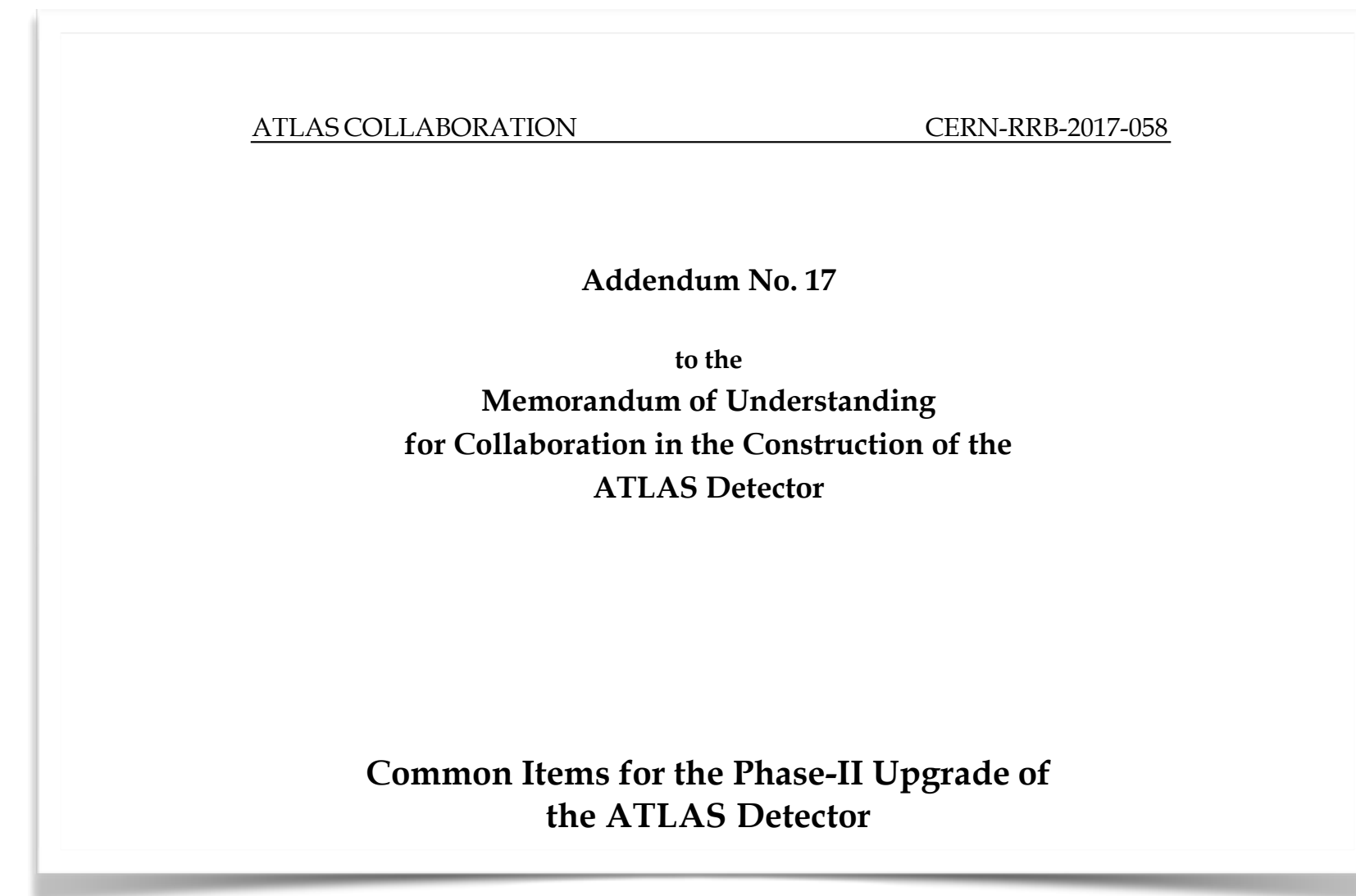
Funding	EC-CALO	ECAL Barrel	HCAL Barrel	Muons	Tracker	MIP-TD	BRIL	L1 Trigger	DAQ/HLT
Austria	●				●				
Belgium FNRS					●				
Belgium FWO					●				
Brazil					●				
Bulgaria				●					
China	●			●				●	
Colombia				●					
Croatia	●								
Egypt				●					
Estonia								●	
Finland				●	●	●			
France-CEA	●	●							
France-IN2P3	●	●		●	●				
Germany BMBF				●	●				
Germany Helmholtz					●				●
Greece	●				●			●	
Hungary				●	●	●	●		
India	●		●	●	●			●	
Iran				●					
Italy		●		●	●	●			
Korea				●					
Lithuania									●
Malaysia	●								
Mexico				●					
New Zealand							●		
Pakistan				●	●				
Poland								●	
Portugal	●	●				●			
RDMS-DMS-Russia	●								
Spain				●	●				
Switzerland		●			●	●			
Taipei	●								
Thailand	●								
Turkey	●								
United Kingdom	●	●			●			●	
USA-DOE-NP									●
USA-DOE-NSF	●	●	●	●	●	●		●	●
CERN	●	●		●	●		●	●	●

The engagements cover the overall need to within a few per cent; detector activities well covered.

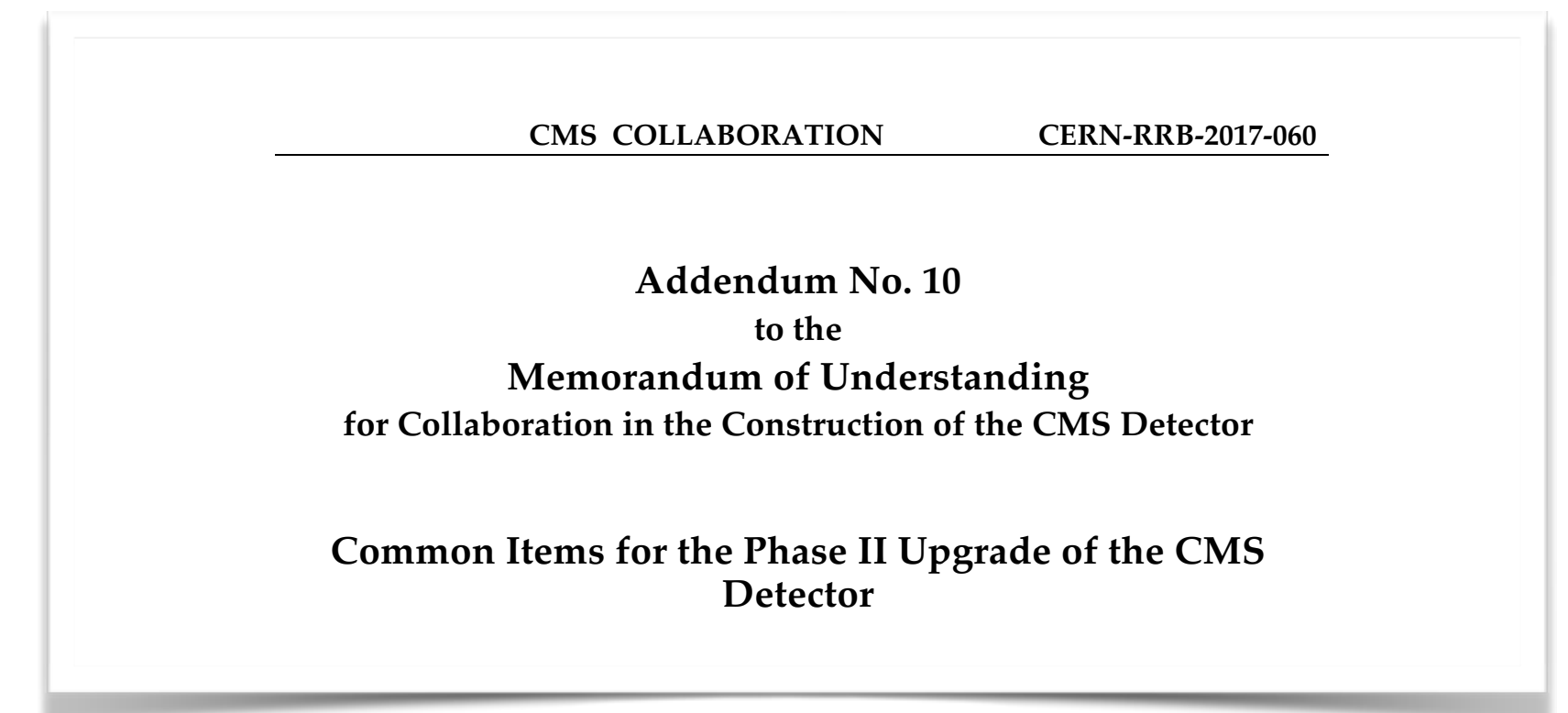
Common Fund for HL-LHC – Status of Discussion

- Single MoU to describe Common Fund capped at a fraction $O(10\%) \sim 25$ MCHF
 - spread evenly over construction period
- Updated individually with TDRs for each component
- Sharing according to PhD or equivalent
- Separate budgeting from M&O but similar accounting methods
- Common Cost have been spelled out in Scoping Document and have been refined
- ready for approval

*recent updates due to
late input*



*same
principle*



Extension of Construction Phase of the LHC Experiments

- The Phase I upgrades of the LHC experiments have been considered as part of the construction phase for the original 300 fb⁻¹ programme of the LHC
- With the approval of the High-Luminosity LHC in 2016 (3000 fb⁻¹ programme) this construction phase must be extended to include Long Shutdown 3 (2025++)
 - Existing construction MoUs typically cover the time until *end of 2018, end of Long Shutdown 2* etc
- Suggest to modify these MoU
 - *until completion of Long Shutdown 3 (currently scheduled for 2026)*

Composition of Scrutiny Group 2017

- **TOURAMANIS, Christos (Chair till 31.12.2017)**
- HAHN, Ferdinand (Scientific Secretary)
- GOLDSTEIN, Joel (Bristol, UK)
- CHRISTIE, William B. (BNL, US)
- PÖSCHL, Roman (Orsay, FR)
- CONVERY, Mary (Fermilab, US)
- LUBRANO, Pasquale (Perugia, IT)
- SIMON, Frank (MPI Munich, DE) (Chair from 1.1.2018)
- VASSEUR, Georges (CEA/IRFU, FR)
- DANIELSSON, Hans (CERN, EP)
- MOLL, Michael (CERN EP)
- CAMPBELL, Michael (CERN EP)
- **STAPNES, Steinar (CERN, EP)**
- PRODON, Sylvie (CERN, FAP)
- **(beyond 4 years)**

Conclusion

- TDRs are being presented in 2017 and 2018
 - LHCC / UCG work is very well supported (including cross-refereeing)
 - CERN management is kept fully informed
- Proposal to update duration of construction MoU to include LS3
- Common Fund for HL-LHC ready for approval