Report from CERN

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107th Plenary ECFA meeting, Nov 19-20, 2020

Some news since 106th PECFA meeting in July 2020

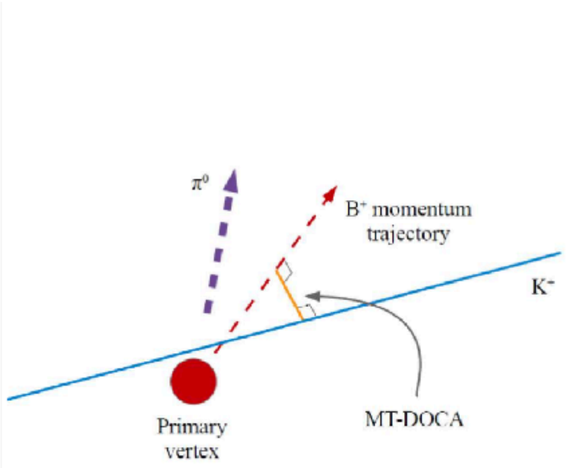
- Rich physics harvest from LHC experiments continues
- LS2 activities on accelerator essentially concluded - machine cooling down
- Phase 1 upgrades proceeding remarkably well - yet, ATLAS NSW and LHCb…
  Phase 2 upgrade making good progress; P2UG identifies scheduling risks
- Revised LS2 schedule confirmed - plan to restart LHC in Feb 2022 with both ATLAS NSWs. Feasibility of schedule will be verified in March 2021
- Medium-Term Plan for the period 2021-2025 has been approved by CERN Council - contains the first elements of the implementation of the ESPPU

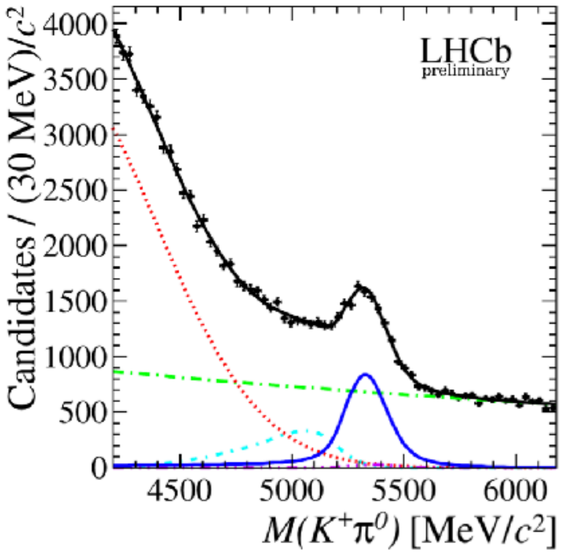
LHCb: CP violation in $B^+ \to K^+\pi^0$

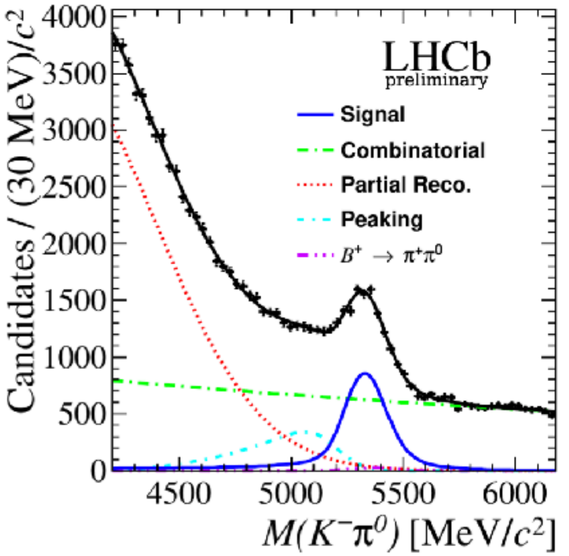
only one example!

- Expect $A_{CP}(B^0 \to K^+\pi^-) = A_{CP}(B^+ \to K^+\pi^0)$ from isospin symmetry
- LHCb: $A_{CP}(B^+ \to K^+\pi^0) = 0.025 \pm 0.015 \pm 0.006 \pm 0.003$
  hence 8.8σ difference to isospin symmetry

1 single track



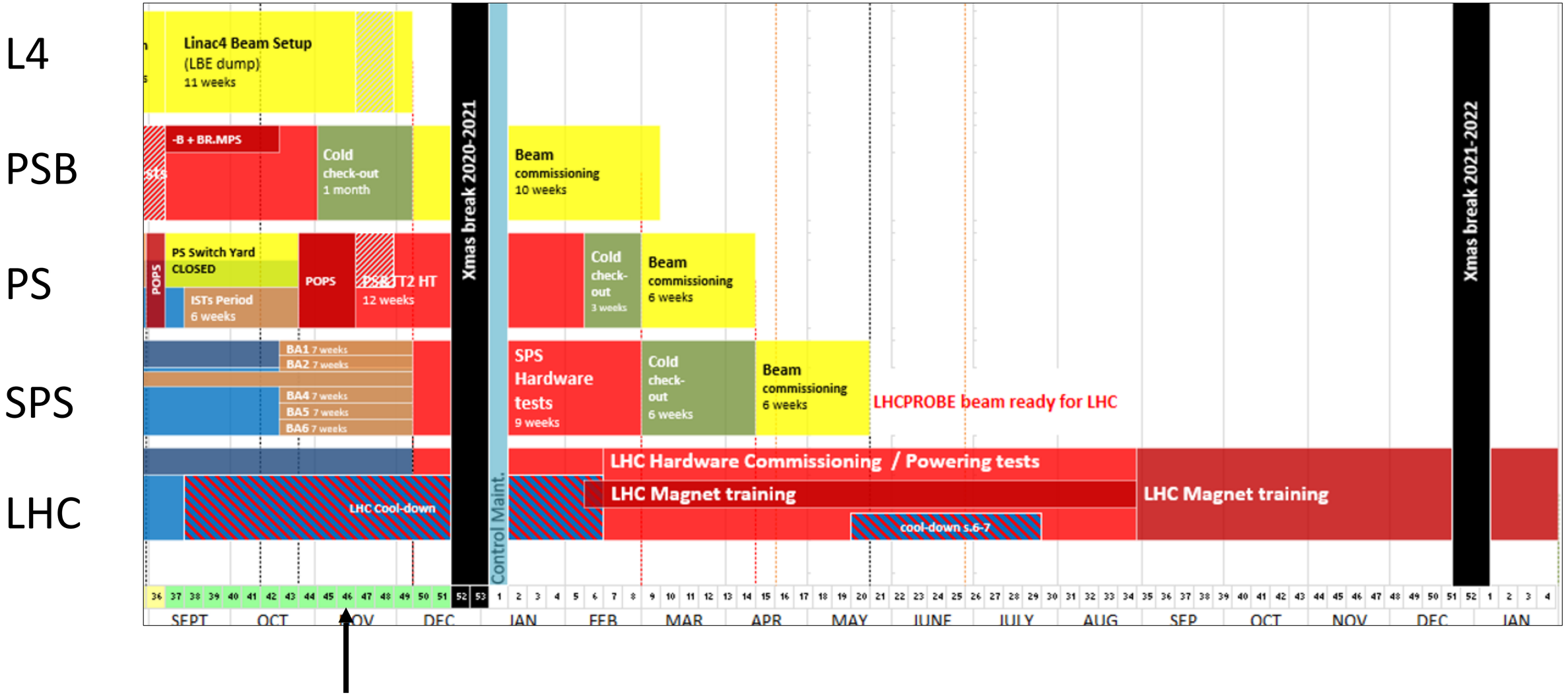




LHC proceeding from shutdown to operation

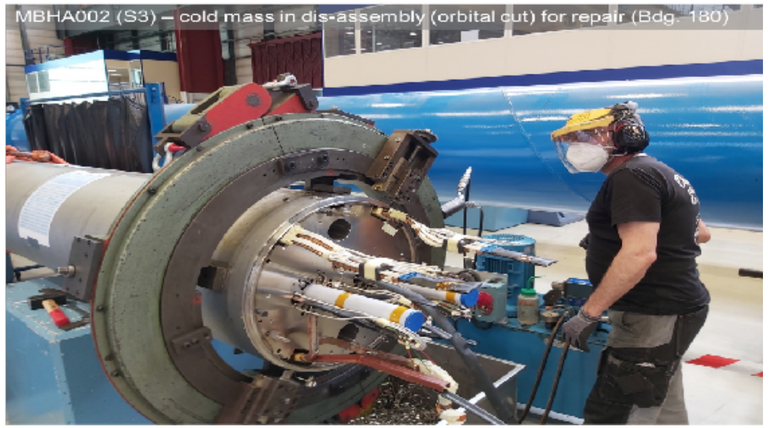
Picture taken on the occasion of the last Pressure Test in the LHC

Schedule of Accelerators



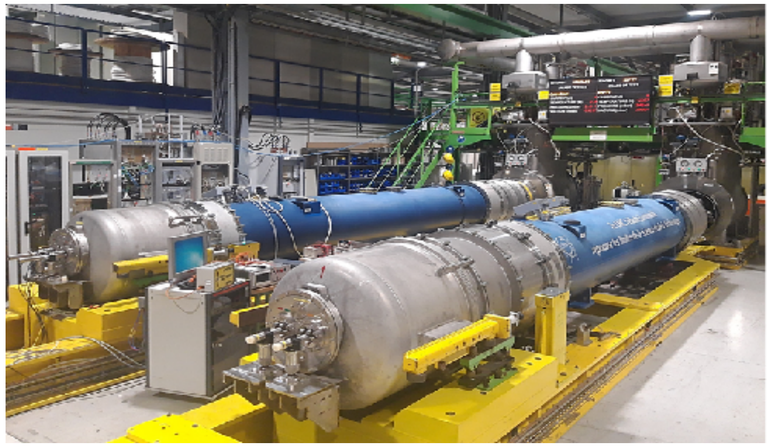
Test of Nb_3Sn magnets

S1 successfully qualified

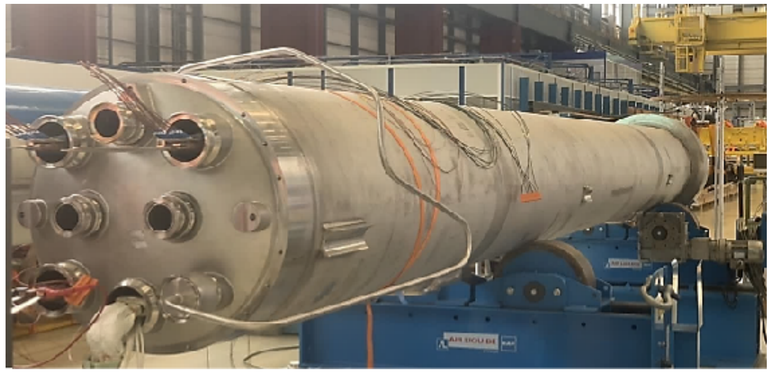


S3 preparing for coil replacement

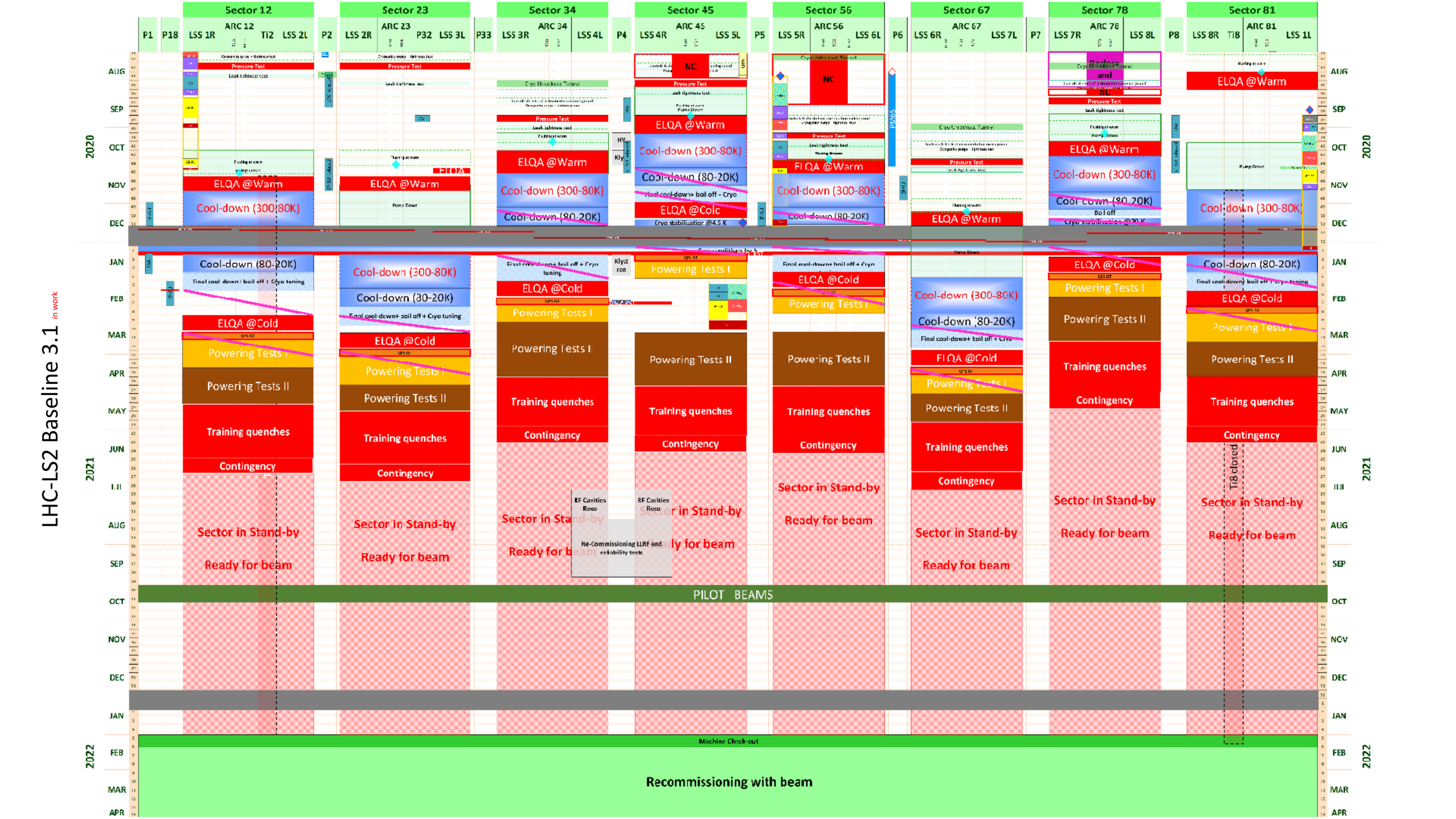
Magnets reached nominal field; operation not deemed sufficiently stable for installation in Run 3



S2 & S4 @ SM18, cool down for tests

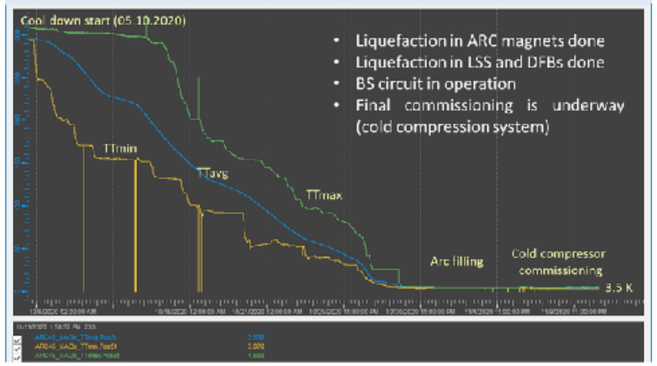


S5 under construction in LMF

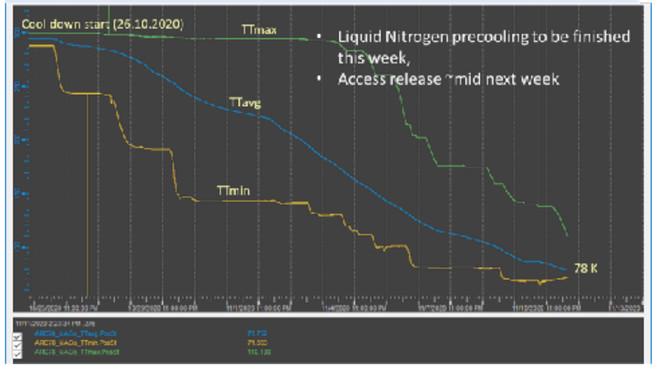

LHC-LS2 Baseline 3.1 in work
Sector 12
Sector 23
Sector 34
Sector 45
Sector 56
Sector 67
Sector 78
Sector 81
P1 P18 LSS 1R ARC 12 Ti2 LSS 2L P2 LSS 2R ARC 23 P32 LSS 3L P33 LSS 3R ARC 34 LSS 4L P4 LSS 4R ARC 45 LSS 5L P5 LSS 5R ARC 56 LSS 6L P6 LSS 6R ARC 67 LSS 7L P7 LSS 7R ARC 78 LSS 8L P8 LSS 8R Ti8 ARC 81 LSS 1L
2020
2021
2022
AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR
Pressure Test
Leak tightness test
ELQA @Warm
Cool-down (300-80K)
Cool-down (80-20K)
Final cool-down+ boil off + Cryo tuning
ELQA @Cold
Powering Tests I
Powering Tests II
Training quenches
Contingency
Sector in Stand-by
Ready for beam
NC
Cryo stabilisation @4.5 K
Re-Commissioning LLRF and reliability tests
RF Cavities Reco
PILOT BEAMS
Machine Check-out
Recommissioning with beam
Ti8 closed

LHC Cool down

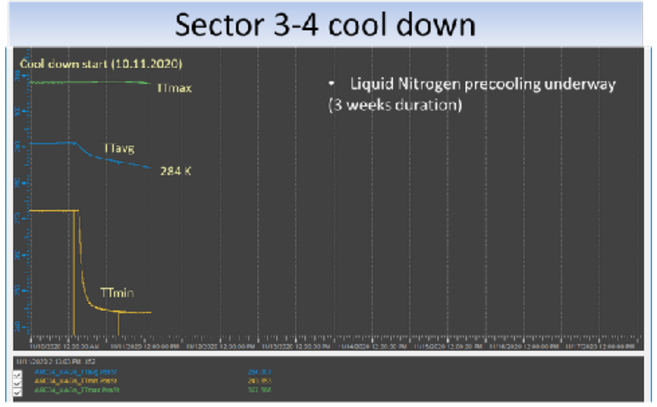
Sector 4-5 cool down



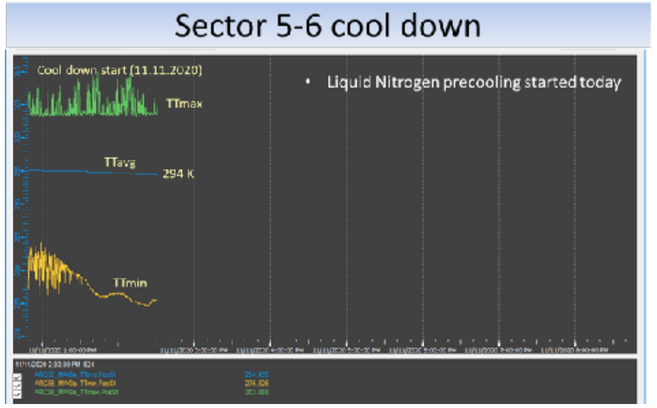
Sector 7-8 cool down



Sector 3-4 cool down

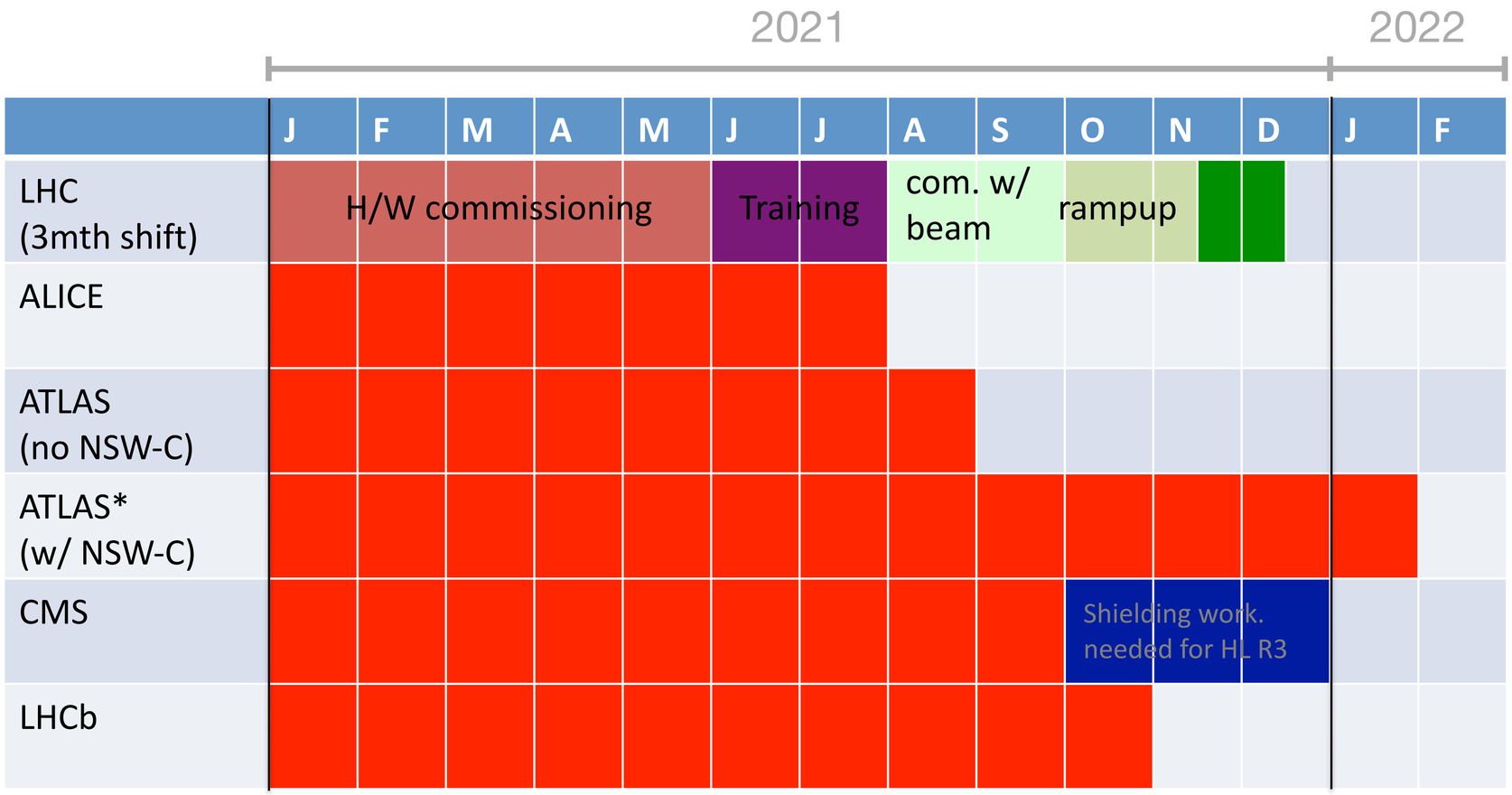


Sector 5-6 cool down



95% of He could be recovered;
only 3 more trucks to come

Summary by Experiment of Cavern Closure after LS2 as of June 8



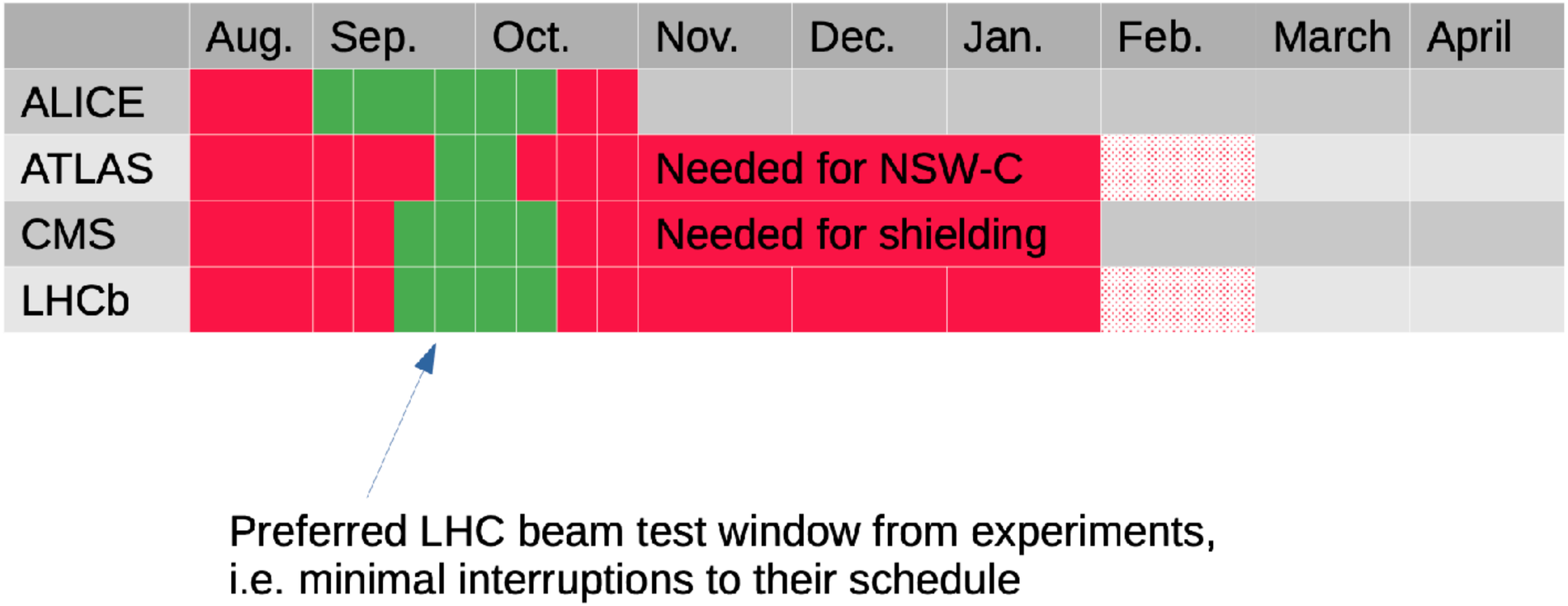
Baseline should yield ~190 fb^{-1} in Run 3

Baseline

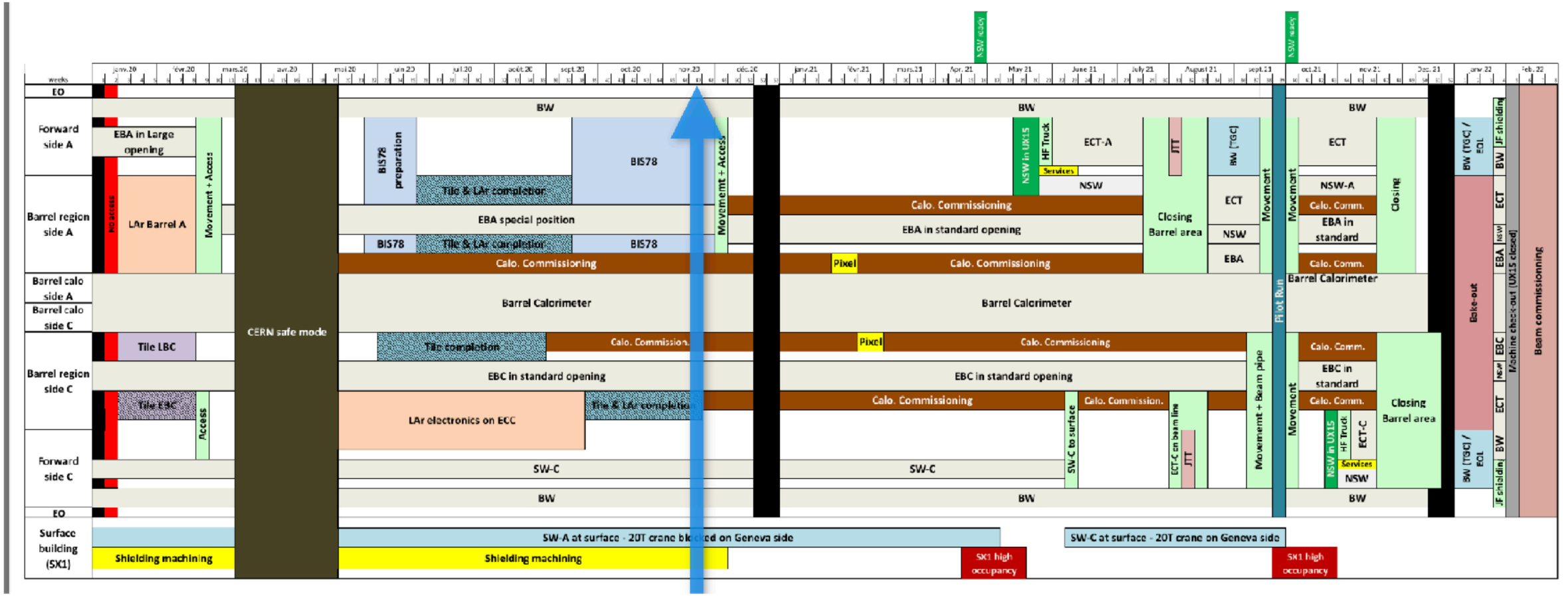
Fallback option
(no NSW-C)

Summary of COVID-19 impact – schedule adopted Oct 23, 2020

- Still significant uncertainties from COVID-19 impact
- November 2021 restart no longer looks feasible

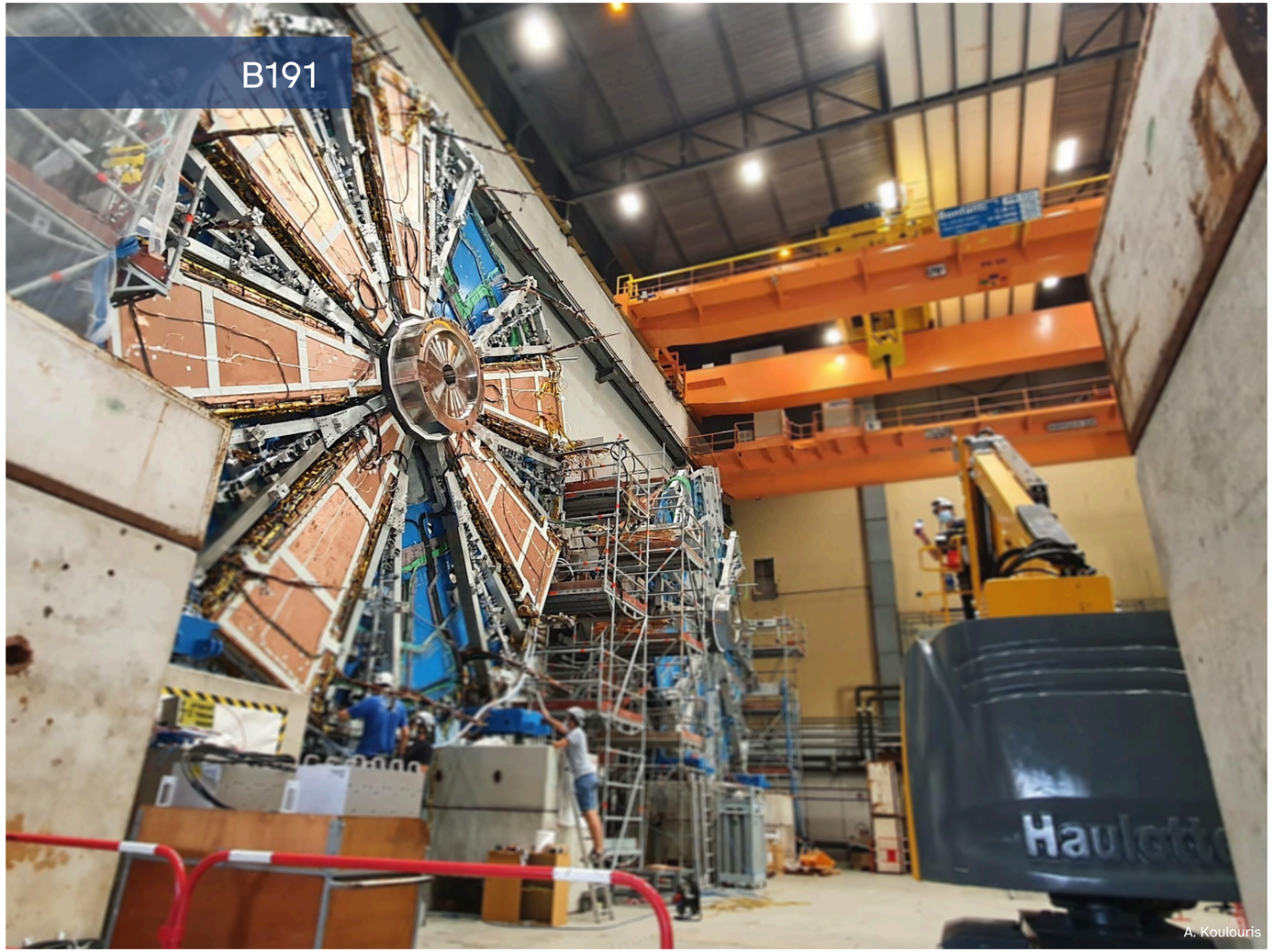


LS2 Schedule in ATLAS cavern



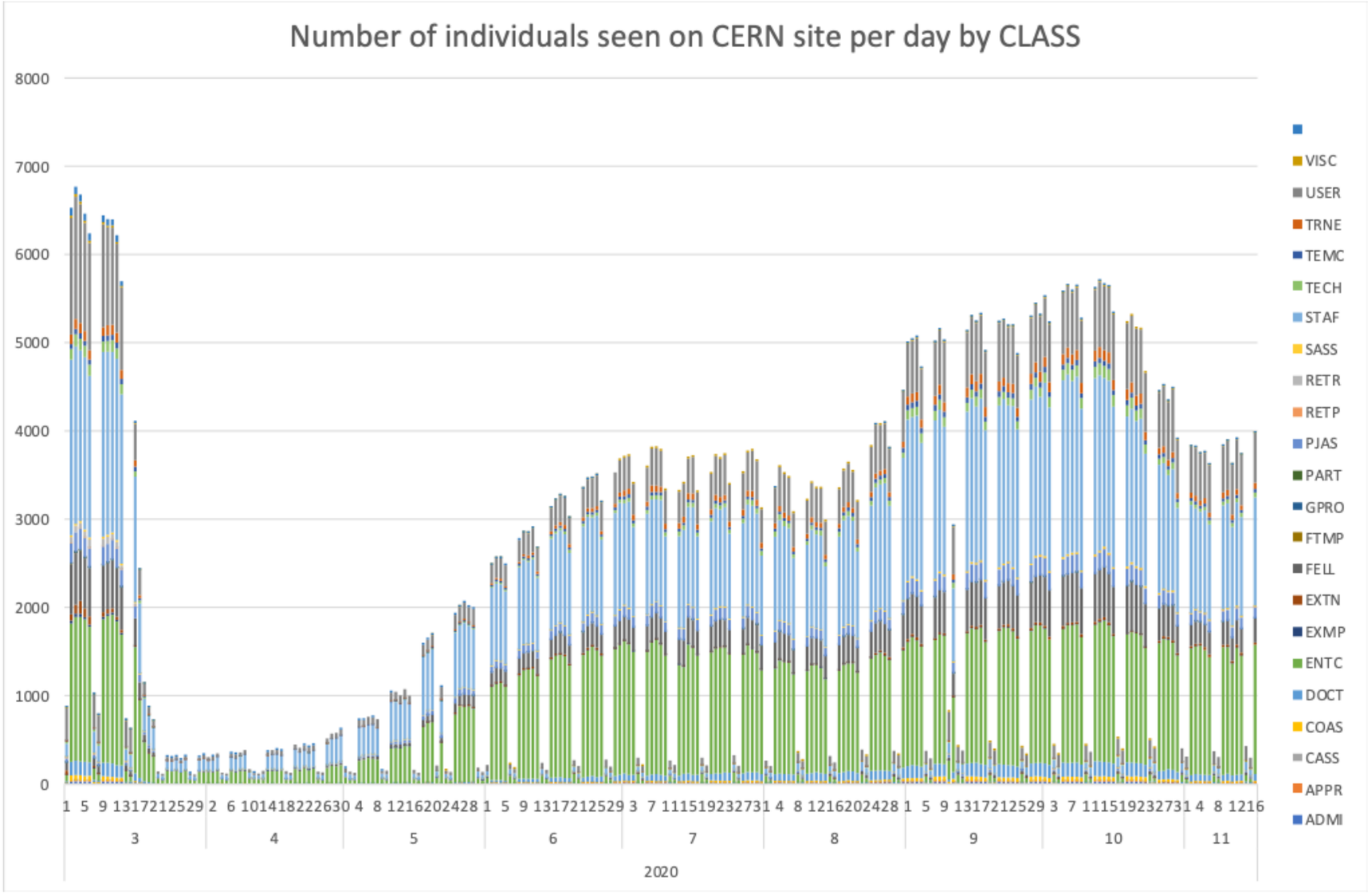
Construction of ATLAS NSW

- Components for NSW-A available
  - Source of elm-noise has been identified and can be remedied with Faraday cage
  - very likely to be installed
- NSW-C
  - uncertainties for delivery due to COVID-19



People present at CERN in times of pandemic

- Currently
  - emphasise teleworking
  - LS2 work continues (possibly at lower pace because of sanitary restrictions)



Implementation of Strategy (in MTP)

2020 ESPP update: scientific priorities

FG at Council in Sep 2020

- Full exploitation of LHC physics potential → successful completion of the high-luminosity upgrade of accelerators and experiments
- e^+e^- Higgs factory as the highest-priority next collider
- Increased R&D on accelerator technologies: high-field superconducting magnets, high-gradient accelerating structures, plasma wakefield, muon colliders, ERL, etc.
- Investigation of the technical and financial feasibility of a future ≥ 100 TeV hadron collider at CERN, with e^+e^- Higgs and electroweak factory as a possible first stage.
  → to be completed by next Strategy update (~ 2026)
- Support to long-baseline neutrino projects in US and Japan
  → in particular, successful implementation of DUNE at LBNF
- Support to high-impact scientific diversity programme complementary to high-E colliders (role of national labs emphasised, as well as participation in experiments outside Europe)
- Theory, detector R&D, SW and computing

Preliminary implementation in this MTP → to be completed and refined in future MTPs

Summary of first implementation of ESPP update

FG at Council in Sep 2020

- Full exploitation of LHC physics potential → successful completion of the high-luminosity upgrade of accelerators and experiments → progressing well, according to (revised) schedule, 27.5 M allocated to cover slightly increased cost-to-completion

- e^+e^- Higgs factory as the highest-priority next collider → support for FCC-ee and CLIC continues

- Increased R&D on accelerator technologies: high-field superconducting magnets, high-gradient accelerating structures, plasma wakefield, muon colliders, ERL, etc.
  → magnet programme significantly strengthened; effort started on muon colliders; etc.

- Investigation of the technical and financial feasibility of a future ≥ 100 TeV hadron collider at CERN, with e^+e^- Higgs and electroweak factory as a possible first stage.
  → to be completed by next Strategy update (~ 2026)
  → resources secured for high-priority items

- Support to long-baseline neutrino projects in US and Japan
  → in particular, successful implementation of DUNE at LBNF
  → continued support to Neutrino Platform

- Support to high-impact scientific diversity programme complementary to high-E colliders (role of national labs emphasised, as well as participation in experiments outside Europe)
  → budget for Physics Beyond Colliders increased by ~ 3

- Theory, detector R&D, SW and computing
  → support continues, new initiatives launched

FCCIS - Future Circular Collider Innovation Study

Plenary

Convener: Joachim Mnich (Deutsches Elektronen-Synchrotron (DE))

08:45 **Welcome address**

Speaker: Jorgen D'Hondt (Vrije Universiteit Brussel (BE))

FCC-week-intro-9N... FCC-week-intro-9N... FCC-week-intro-9N...

09:00 **Host states address**

Speaker: Anne-Isabelle Etienvre (Université Paris-Saclay (FR))

09:15 **Host State address**

Speaker: Prof. Guenther Dissertori (ETH Zurich (CH))

09:30 **Update of the European Strategy** ¶

Speaker: Ursula Bassler (Centre National de la Recherche Scientifique (FR))

FCC European Strat...

10:00 **CERN vision and goals until next strategy update**

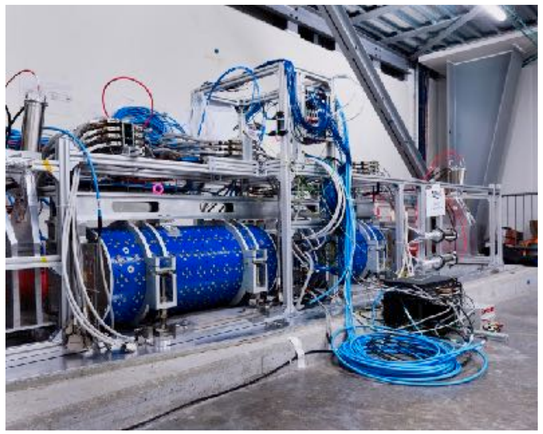
Speaker: Fabiola Gianotti (CERN)

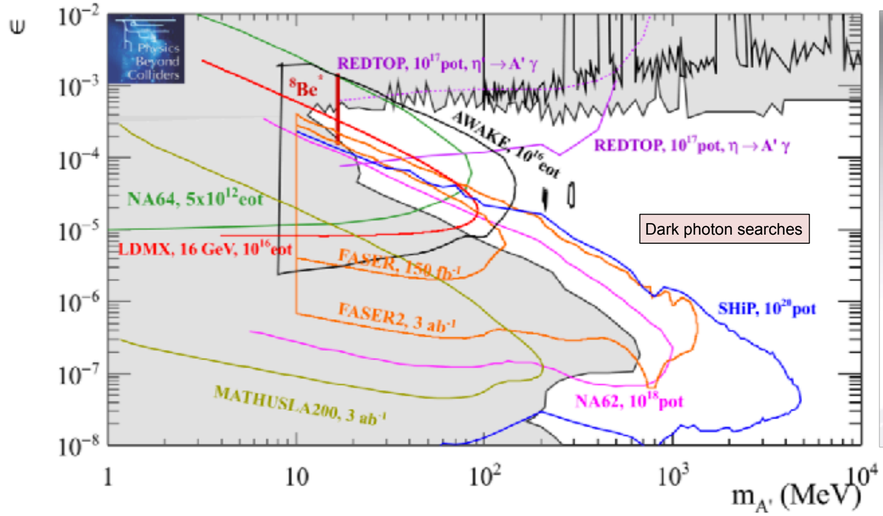
FCC-2020.pdf FCC-2020.pptx

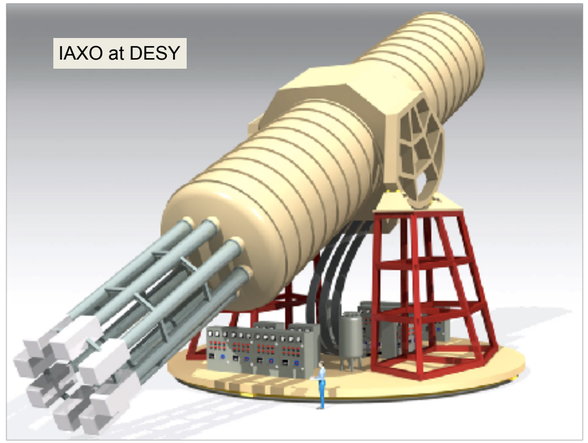
Scientific diversity programme

- ESPP supports high-impact scientific diversity programme complementary to high-E colliders (role of national labs emphasised, as well as participation in experiments outside Europe)
- Since 2016: CERN has hosted Physics Beyond Colliders Study group. Unique role in promoting and channelling new research initiatives at CERN and European labs.
  - Several experiments examined by PBC now being carried out as SPS comes online again
  - CERN budget for PBC activities increased from 1 MCHF/year to 3 MCHF/year.
  - Will also allows continuation of key R&D for beam dump facility at SPS North Area. Can start construction after next ESPPU if project recommended and then approved by Council

FASER's trench in LHC tunnel, 480 m downstream of IP1
→ detector installation in LS2







CERN Infrastructure

Site Renovation

- Council encouraged investments in site infrastructure
  - agreed to deferred payment of an old loan (under more favourable interest rates)
  - consolidation in many areas
- During the period 2021-2027 two buildings will be constructed…

Bldg: 777
Prévessin

Bldg: 140
Meyrin

Thank you