

Pillar 1: High energy/ intensity frontier

- Overarching Theme of Pillar 1: **Search for BSM physics**
 - Direct searches at the high energy frontier (SUSY, extra dimensions, Dark Matter)
 - Precision Higgs boson and elucidation of EWSB
 - Indirect searches in flavor physics and low energy/high intensity frontier

- Draft of a new **Pillar 1 Whitepaper** submitted to SWICH workshop (without recommendations)
 - Update of the Whitepaper in preparation for SWICH2 in September including recommendations
 - WP editorial board serves as sounding board to prepare the pillar and CHIPP wide discussion at SWICH2
 - Ambitious task given the community size and diversity, as well as uncertainty on external factors on long term facilities

Status: Pillar 1 Whitepaper

CHIPP Pillar 1 Whitepaper 2018:

Input to the Strategic Workshops in Switzerland

1. The overarching theme of Pillar 1 research activities in Switzerland
2. Current implementation of Pillar 1 research in Switzerland
3. Potential future facilities as drivers for Pillar 1 research
4. Appraisal of the current implementation
5. Strategic recommendations
6. Outlook



DRAFT PRESENTED TO THE
SECOND SWICH WORKSHOP 13-14 SEPTEMBER 2018

August 27, 2018

Next WP Editor meeting: September 4

Plan to submit to CHIPP board soon after as basis for discussion at SWICH2

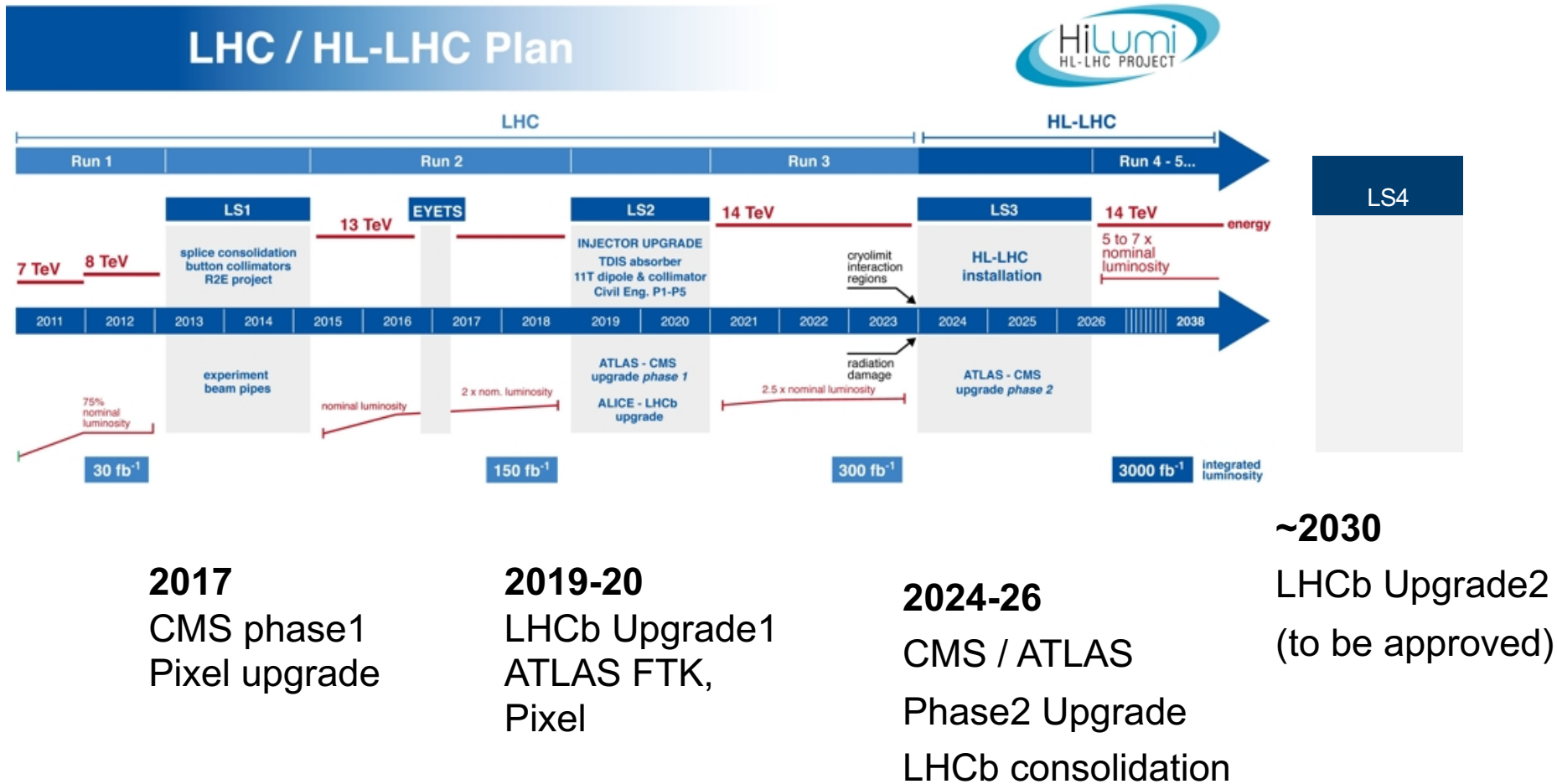
(A) near term [2019-2024] /current plus next ERI/FLARE period

During the near-term future, the exploitation of the LHC as flagship infrastructure for Pillar 1 research should continue to be the highest priority, including the LHC experiment operations and the ATLAS/CMS phase-2 upgrades. The recent flavour anomalies reported by LHCb underline the intertwined and complementary relationship of LHCb, ATLAS and CMS in the search for BSM physics, the mainstay of Pillar 1 research activities. The important role of LHCb in the Pillar 1 experimental portfolio should be maintained and the recently approved Upgrade1 to extend LHCb's lifetime up to and including Run IV (50 fb^{-1}) should be supported as integral part of the LHC program. Even in this financially constrained environment, it is important for the diversity and future of the Pillar 1 community to enable smaller scale activities within the FLARE programme, such as R&D and construction of a flagship experiment operating at the low-energy frontier at PSI as well as basic accelerator and magnet R&D. A sustained effort in the latter area is of crucial importance in order to render the ambitious long-term goals after 2035 realistic and compelling.

NB: - CHART2 Initiative of SERI an ETH domain for accelerator R&D crucial

- Consensus still needs to be built on number of flagship experiments at the low energy frontier

LHC Experiment Upgrade Timeline



(B) midterm [2025-2035] /phase 2 to end of LHC program

The midterm period will be still dominated by the continued exploitation of the LHC programme up to its end. After the completion of the ATLAS/CMS phase-2 upgrades, some financial degrees of freedom should become available for the envisioned LHCb Upgrade2 in LS4 (2029) as well as the upgrade of a low-energy frontier flagship experiment operating at the envisioned HiMB facility at PSI. We expect that on this timescale, the future of the “physics beyond collider” programme will have become more concrete and support of the Swiss involvement in SHiP should be feasible.

(C) long term vision – Scenarios beyond 2035

In the time period after 2035, a new flagship facility needs to be within reach to carry the field forward beyond the LHC. Apart from scientific questions to be addressed in this period, technological, sociological and even political considerations come into play and “muddle the water”. It seems uncontroversial that a precision survey of the mechanism of electroweak symmetry breaking to fully exploit the sensitivity of Higgs boson properties to BSM physics requires a lepton collider of some kind. Such a facility should then preferably also allow, besides the Higgs boson sector exploration, precision electroweak measurements of the W , Z and top, perhaps as an upgrade path. In terms of direct searches for BSM, the 100 TeV energy range seems within reach assuming however a bold magnet R&D that allows to push the field strength by more than a factor of two. Since at the current time of writing, the fate of a possible ILC programme in Japan is unclear, an important external factor beyond control of the Swiss community, we restrict our analysis to a number of possible scenarios. In all of these scenarios, it is implied that a $\mu\mu$ collider option could be added to whatever tunnel remains after completion of the previous circular hadron collider programme.

(A) near term [2019-2024] /current plus next ERI/FLARE period

1. M&O and computing costs for the LHC experiments (as “uncuttable”).
2. Construction of the ATLAS and CMS phase 2 upgrades (LS3), completion of LHCb Upgrade1 (LS2), LHCb consolidations (LS3) and R&D for LHCb Upgrade2.
3. Support for accelerator R&D towards FCC (expected to be funded by CHART2).
4. Design and construction of a flagship experiment at the low-energy frontier at PSI.
5. Funding of smaller experiments and generic detector¹ and accelerator R&D efforts.

(B) midterm [2025-2035] /phase 2 to end of LHC program

1. M&O and computing costs for the LHC experiments (as “uncuttable”).
2. Completion of the ATLAS/CMS phase-2 upgrades and LHCb consolidations (LS3), R&D and construction of the LHCb Upgrade2 (LS4), if approved.
3. Continued support for accelerator R&D towards FCC (expected to be funded by CHART2)
4. Upgrade of the low-energy frontier flagship experiment, potentially at HiMB if approved; and support of a Swiss involvement in SHiP, if approved.
5. Funding of smaller experiments and generic detector² and accelerator R&D efforts.

¹outside of the targeted R&D for future experiments

²outside of the targeted R&D for future experiments

(C) long term vision – Scenarios beyond 2035

5.3.1 no ILC in Japan, FCC-ee/FCC-hh at CERN [2a]

5.3.2 no ILC in Japan, HE-LHC [2b]

5.3.3 no ILC in Japan, CLIC (i.e. energy frontier goes to CLIC) [2c]

5.3.4 ILC in Japan, FCC-hh [1a]

5.3.5 ILC in Japan, HE-LHC [1b]

A muon collider option after the last circular hadron collider stage is implied

- Update of the Pillar1 WP by Sept 5th or so including recommendations
- Community input welcome to the WP editors after distribution
- Consensus on priorities hopefully achieved at the SWICH2