Proposal on the FLARE Prioritization 2020
CHIPP Executive Board 30/10/2020 V16

NB: This prioritization proposal was adopted by the CHIPP board on 15 October 2020 and pertains to the period 2021 to 2024. The prioritization in Table 2 can be revisited/amended for the FLARE CALL 2022.

Preamble and background:

The long-term nature of particle, astroparticle and astrophysics and astronomy research requires stability of the funding over extended periods of time. Swiss researchers planning to engage in a certain activity often have to pledge a long-term financial commitment in signing (legally non-binding) Memoranda of Understanding with internal organizations or consortia, in the context of resource review bodies (e.g. RRBs for the LHC and long baseline neutrino collaborations), as part of their hardware contribution to constructing the experiment or a specific instrument (e.g. an instrument for the ESO-ELT), or as other deliverable (such as computing resources, data reduction software, etc.) to access membership. These long-term commitments require careful planning. Unlike "regular" SNF funding instruments, the time periods in question may easily span subsequent FLARE funding periods and thus consecutive FLARE proposals can depend on each other in a crucial way.

The SNF funding instrument FLARE (with the funds provided by SERI and the funding scheme administered by SNF) supports the hardware, consumables, operation cost and technical person power needs of the particle physics and astronomy communities since 2013. SNF publishes the boundary conditions of the FLARE instruments in regular FLARE calls. The initial FLARE instrument was funded via the previous targeted allocations for particle physics via FORCE (19.2 MCHF for 2013-2016) plus the targeted allocations for astrophysics and astronomy FINES (2.8 MCHF for 2013-2016) plus a non-targeted increment of 4.5 MCHF to a total budget of 26.5 MCHF. For the 2017-20 period, the FLARE budget was increased to 32 MCHF, and for the 2021-24 period we expect an overall increase to 43.6 MCHF. The communities of CHIPP and CHAPS/SCFA were involved in setting priorities for these funding instruments. Prior to 2017, the particle physics and astronomy communities sent representatives to the steering committee LA FLARE (as was previously done for FORCE). Starting with the budget period 2017-20, the FLARE evaluation panel (consisting of national and international experts in particle physics, astroparticle physics and astronomy) prepares the funding recommendations to the Division 2 SNF research council. The CHIPP and CHAPS chairs can present the community priorities to the FLARE evaluation panel, see below.

With the merger of the FINES and FORCE, and the welcome influx of more funds from SERI that are not a priori allocated for a specific community, FLARE becomes a competitive funding instrument that will require careful community planning of priorities. It is evident that further prioritization discussions and allocations of funds between CHAPS and CHIPP will become more important in the future. Given the difficulty in comparing particle and astroparticle projects on the one hand with astrophysics/astronomy projects on the other in a competitive review, and given that both communities do require a minimum level of support to ensure a credible, high level participation to the major developments in their respective fields, prioritization across communities will continue to provide a challenge.

In the future, we anticipate a stronger role of the SERI roadmap of research infrastructures in the FLARE prioritization process that in turn can be influenced by the community roadmaps currently being prepared. The SERI roadmap of research infrastructure[1] is usually compiled the year prior to the next 4 year budget cycle and can be considered as a prioritization from the SERI point of view that ideally is consistent with the priorities of the respective communities. In this process, dedicated funding lines for research infrastructures in the upcoming ERI dispatch[2] can be prepared. Research infrastructures that already enjoy a dedicated funding line in the ERI dispatch should receive lower priority in the FLARE prioritization.

Concerning the community input to the FLARE panel, the The 2020 FLARE[3] call states:

b) The FLARE panel will additionally consider the following two evaluation criteria:

iv.) the relative long term funding priority of the overall experiment as indicated by the representatives of the Swiss community to which the experiment belongs;
v.) the long-term commitment to the overall experiment of the institutions employing the applicants.

In order to achieve a community supported prioritization for CHIPP projects according to iv), the CHIPP EB with this document proposes some basic guidelines for discussion at the upcoming CHIPP boards that should sharpen the already agreed upon principles in the past and provide some further guidance on our long-term priority setting. Some of these principles have already been pre-discussed with SERI and the CHAPS chair and it is our hope and expectation that similar guidelines could be adopted by the CHAPS community, helping to streamline the overall FLARE funding process. We note that our present thinking is still based on the current whitepapers from 2013 (pillar 3), 2015 (pillar 2) and 2018 (pillar 1) so the respective updates of the whitepapers are not yet taken into account.

1) General Principles of Prioritization:

FLARE proposals in general must answer to the high scientific standards and the attribution of funds should always be guided by scientific peer review of the proposed work, as overseen by the FLARE panel.

(i) Precedence of scientific peer review and "fair share projects"
We believe that a very important overarching spirit of the FLARE instrument should be the one of an "enabling culture" (Ermöglichungskultur) towards Swiss researchers engaged in the field of particle physics, astroparticle physics, and ground-based astrophysics and astronomy to contribute (at least) a "fair share" [4] towards the design, construction, operation or upgrade of an experimental effort. This is important to preserve the unique breadth and diversity of high-

[1] See https://www.sbfi.admin.ch/sbfi/en/home/research-and-innovation/research-and-innovation-in-switzerland/swiss-roadmap-for-research-infrastructures.html
[2] https://www.sbfi.admin.ch/sbfi/de/home/bfi-politik/bfi-2021-2024.html
[3] See 2020 FLARE call http://www.snf.ch/SiteCollectionDocuments/FLARE_Call_2020.pdf
[4] a possible metric for "fair share" contribution of Swiss researchers could be defined via the fraction of Swiss PhD scientists involved in a project.

quality research in Switzerland. It is furthermore expected that "fair share" projects do not create an undue opportunity cost for other projects due to shorter term and/or moderate size. The overall goal would be to make sure that PIs would not have to fear that their work could not be supported by FLARE due to lack of funds even if the scientific peer review turned out to be very positive. A fair share effort on the other hand should not commit large amounts of available funds for a long period of time. A small amount for "blue sky R&D" that is not directly related to an existing international collaboration or experiment should be also eligible for "fair share" FLARE funding and thus help prepare the inception of such an experiment (for example R&D for detector development for FCC).

(ii) Flagship projects

The community should also be empowered to collectively agree on "flagship projects" that could potentially enjoy higher than fair share funding level if well-argued and identified as a higher priority by the respective community. Flagship projects should also fulfil further considerations, such as the central role the project plays in the global strategy of the field, and be embedded in the strategy of an international organization such as CERN (or ESO) or of a national laboratory (e.g. of the US and Japan), and having passed at least a conceptional or technical design review. We generally also assume that the required larger request on resources by flagship projects is backed up by the interest of more than one research groups from various institutions or organizations in Switzerland, and it would be highly desirable for long term commitments if such interest was backed up by a corresponding appropriate long term commitment of the supporting institutions, if necessary beyond the tenure of the current PIs. A flagship project could also be a project with established Swiss intellectual and/or technical leadership, or that makes excellent use of existing research infrastructure in Switzerland (as e.g. PSI). In evaluating flagship proposals, it should always be noted whether the requested amount is commensurate with the community support, available personnel, and required skillsets to perform the proposed work. Modest upgrades of running experiments should have high priority if the upgrade ensures improved and prolonged data taking, especially if the experiment enjoyed flagship status.

With the requirement that fair share efforts should be made possible (previous section), it is clear that endowing a project with "flagship status" should be done with caution as to not deplete the funding scheme by too many super-large projects. It should also be clear that embarking in new flagship efforts will result in long-term commitment of substantial resources that may create an opportunity cost, so the bar for such new flagships should be especially high and usually should accompany the phasing out of some of the previous flagship projects. Even with flagship projects, scientific peer review of the "a posteriori" submitted proposal should take precedence of the "a priori" prioritization. A flagship project thus has the potentiality to receive more than fair share funding, but this should by no means be an automatism.

Table 2 summarizes properties that should characterize flagship projects.

(iii) *Other high priority projects from the communities ("Uncuttables")*

There are some financial obligations of the Swiss research community towards a research infrastructure that are "deterministic" in nature (i.e. can be computed via first principles) and considered close to legally binding in character such that Switzerland would have to pay these obligations to the research institution with little latitude in the amount. In particle physics, such

an obligation exists with the M&O(A) and M&O(B) per capita payments for PhD scientists to perform research at the LHC experiments. In similar fashion, the contributions to the LHC TIER2 computing are also "pledged" to the LHC computing RRB of CERN in order to enable the data analysis of large data sets of the LHC experiments. In astrophysics and astronomy there is presently no example of such commitments. In the future though, a national buy-in to large international projects such as e.g. the Large Synoptic Survey Telescope (LSST) giving access to the associated data to the whole Swiss astronomical community might be discussed.

2) FLARE Prioritization recommendations for CHIPP projects in 2021-24

In applying the general principles above and adopting them to the specific situation of the upcoming 2021-24 funding period and taking into account guidance from SERI that the CHIPP EB received on the role of the long baseline neutrino experiments in this particular funding period, the CHIPP EB recommends the following prioritization presented in Table 1. With the expected total amount of FLARE 2021-2024 of 43.6 MCHF and estimating a baseline from the previous allocation of CHIPP projects of 26 MCHF and claiming 50% of the increase of funding (i.e. 5.8 MCHF) for CHIPP projects, the CHIPP community requests sum up to 35.7 MCHF which would be 112% of this baseline.

Table 1:DRAFT FLARE Prioritization 2021-24:

Uncuttables (7.5 MCHF)		
LHC M&O	3820 kCHF	
LHC computing HW + FTE operations	3652 kCHF	
Scientific Flagship projects: (22.4 MCHF)		
ATLAS	5268 kCHF	Large community, central role in ESPP, leading contributions of CH community, CERN related.
CMS	5100 kCHF	Large community, central role in ESPP, leading contributions o CH community, CERN related
LHCb	3800 kCHF	Large community, central role in ESPP, leading contributions o CH community, CERN related.
Mu3e /HiMB	1000 kCHF	central role of PSI (HiMB), significant contributions of CH community
T2K and T2K upgrade/HyperK	1650 kCHF[5]	T2K: return on investment, modest upgrade, international an technical leadership of CH community, HyperK: SER infrastructure roadmap
DUNE	4200 kCHF[6]	international and technical leadership of CH community, SER infrastructure roadmap
DARWIN	1350 kCHF	central role in ESPP, leading contribution of CH community
LHC computing development for Phase 2	0 kCHF	Future priority to be started in 2025-28

[5] The T2K/HyperK PIs wish to keep the project tables together for now, for the period 2021-24 the main contribution will be largely for T2K.

[6] This is in agreement with present Swiss contributions, as presented in the 2015 pillar 2 whitepaper, which in turn defined the contents of the 2019 SERI roadmap, where long baseline neutrino facilities are prioritized. The 2015 whitepaper states: "*Pending the approval of the DUNE LoI, where a detailed contribution will be presented, we envision at present an approximate investment of 1 MCHF/year from FLARE during a total period of 10 years. SERI large infrastructure money could well contribute to funding".*

Fair Share Projects (5.8 MCHF)		Total hardware Investment/core + Operation cost 2021-24 (column BE)	CH Investment + Operations cost 2021-24 (column BF)	Comment
Damic	500 kCHF	4100 kCHF	555 kCHF	Construction
FASER	1710 kCHF	2354 kCHF	1341 kCHF	Extension/Upgrade
GBar	300 kCHF	2150 kCHF	185 kCHF	Operation /tech support
LEGEND	1250 kCHF	9500 kCHF	962 kCHF	Construction
LST (CTA)/Magic Camera R&D	1450 kCHF	R&D	R&D 350 kCHF	
n2EDM	615 kCHF	3400 kCHF	1410 kCHF	Completion of construction and exploitation
SHiP	No request			
Icecube[7]	No request			

Table 2: properties of Flagship projects

(i) Centrality to the field, how topical are the scientific questions addressed by the experiment
(ii) Several CHIPP Board members involved as a rule. Exceptions possible if strong justification
(iii) Flagship efforts should have some level of maturity, e.g. established costing (i.e. cost matrix) and usually a CDR or TDR at least in preparation.
(iv) Long term commitment by the sponsoring institution(s)
(v) Centrality within the CH landscape, i.e. PSI or CERN
(vi) Established scientific or technological leadership of CH community
(vii) Modest upgrades of running experiments should have high priority if the upgrade ensures improved and prolonged data taking.

[7] The PI removed the request on 24.8.2020