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## A bright future for new innovative and excellent opportunities for science at FLASH

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The FLASH2020+ project will open up new excellent opportunities for science on the highest level. The FLASH facility will not only produce soft x-ray SASE photon beams at full MHz repetition rate in a burst mode in FLASH2, but will also provide in FLASH1 several thousand fully coherent pulses per second using the HGHG and EEHG external seeding schemes. New types of experiments are enabled by major modifications to the linear accelerator and the FLASH1 FEL beamline. Within a 9 month shutdown ended August 2022, a 60 m stretch of the linac has been renewed featuring new acceleration modules adding an additional 100 MeV energy to the electron beam and a significant improvement in RF-stability, fast orbit correctors, a laser heater which allows to smoothen current ripples and variable bunch compression sections. During commissioning first user experiments have demonstrated the increased control, stability, and quality of the FLASH electron beams. The improved beam quality is a prerequisite for the completely new multi bunch externally seeded FEL beamline in 2025. The seeded photon wavelength will span a range of 60 to 4 nm with emerging pulses being uniquely stable and reproducible in phase space. Exploiting the 1 MHz repetition rate available from the accelerator and the seed laser system, an unprecedented average photon flux at full polarization control will be made available to experiments, and will thus attract new high level science groups around the world.

### Funding Agency

### Footnotes

### I have read and accept the Privacy Policy Statement

Yes

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