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***Developments from fast scanned proton therapy towards FLASH therapy at PSI***

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The evolution from scattering to spot-scanning technology boosted the clinical application of proton therapy and ultimately helped to broadly establish this form of radiotherapy about 15 years ago. The spot-scanning approach is more flexible and helps to further spare the healthy tissue. PSI has been at the forefront of these developments and has made important contributions to the further development of irradiation technology.

In recent years, radiobiological experiments have shown that irradiation at ultra-high dose rates has an additional protective effect on healthy tissue. The so-called FLASH effect, originally explored with electrons, is now being investigated with other beams such as protons. However, the dose rates required are orders of magnitude higher than those used in clinical practice.

We will discuss the main aspects of the development of scanning technology and report on the upgrade of a proton beamline for FLASH experiments at the Center for Proton Therapy. This includes technical changes to the beamline hardware, challenges in dosimetry and different beam delivery options. The results of the first biological experiments will be reported, as well as the implementation of a randomised FLASH study with the first animal patients.