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SAFEST: a compact C-band linear accelerator for VHEE-FLASH radiotherapy

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FLASH Radiotherapy is a revolutionary new technique in the cancer cure. Several pre-clinical studies have demonstrated that treatment with electron radiation delivered with mean dose rates above 100Gy/s, an ultra-high instantaneous dose rate $> 106\text{Gy/s}$, and total irradiation time $< 100\text{ms}$, significantly decreases the toxicity in the healthy tissue while keeping the same efficacy in cancer treatment.

Although recent studies shed some light on the biological mechanisms and on the effects of FLASH electron beams on tissues and organs of small animals, more research investigation is necessary before the FLASH technique can be translated into clinical applications. Researchers also aim to explore the radio-therapeutic effects of high-dose beams delivered at Very High Electron Energy (VHEE), in the range 50-250 MeV, suitable for treating deep-seated tumors.

We describe the project SAFEST, carried out at La Sapienza University in collaboration with INFN for the realization of a compact C-band electron linac VHEE at the energy of 60-150 MeV, able to deliver the high current up to 200mA and the very high dose rates required by the FLASH regime, and suitable for a hospital environment.

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Footnotes

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Yes

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