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# Real-Time Beam Monitoring Based on Cherenkov Effect for FLASH Radiotherapy

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In 2021, cancer was the second leading cause of death in the European Union, representing more than 20% of the total number of fatalities, according to Eurostat. Even though there are several treatment options, such as chemotherapy, surgery, and radiotherapy, there is no single, fully effective treatment.
Radiotherapy (RT) is one of the most used therapies worldwide, accounting for more than 50% of prescribed therapies. However, it induces several undesirable side effects, such as nausea and skin irritation, which affect the patient's quality of life. But what if we could minimize them?
In 2014, researchers used high dose rates to deliver the radiation in less than a second to mice and concluded that they could achieve the same results on tumour control while sparing the healthy tissue –the so-called FLASH Effect. This resulted in a new and promising field of research, FLASH Radiotherapy, called by some the Holy Graal of cancer treatment. However, the full implementation of FLASH in the clinic poses several challenges for physicists, since it requires unprecedented beam currents to achieve FLASH dose rates and fast beam monitoring. This thesis has the bold purpose of addressing this last limitation using a Cherenkov-based detector, thus bringing FLASH one step closer to transforming cancer treatment and tackling one of modern medicine's most formidable challenges.

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