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Tunable monochromatic gamma ray source design using Inverse Compton Scattering at Daresbury Laboratory

Monday 8 May 2023 16:30 (2 hours)

Inverse Compton Scattering (ICS) is an ideal source of tunable monochromatic gamma rays. These gammas have uses for Nuclear Resonance Fluorescence, and production of novel medical radioisotopes. The gamma energy can be tuned by changing the electron energy. An ICS source can be made quasi-monochromatic by using low energy spread electron and laser beams, and using a collimator.

Currently ICS gammas are only available from large synchrotron driven electron sources. These sources suffer from a smaller flux in the desired bandwidth than ERLs or linacs. A new planned gamma source is under consideration as part of the proposed UK-XFEL project, this would involve part of the XFEL linac being enabled for an energy recovery mode.

A demonstrator experiment to support the UK-XFEL project is being discussed for the upgraded CLARA facility at Daresbury Laboratory. The experiment will scatter Ti:Sapphire laser pulses at 800 nm off 250 MeV electrons. The gammas will be collimated. This experiment will characterise the source to determine the bandwidth and flux of the source. The maximum energy of the gamma photons in this experiment is 1.48 MeV and the bandwidth of the collimated source is 3.2%.

In this work I will present simulations of the planned experiment, showing the scattered gamma energy, bandwidth and tunability of the source.

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Footnotes

I have read and accept the Privacy Policy Statement

Yes

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