Simulations and design of a compact beamline for Inverse Compton Scattering at the University of Melbourne X-lab

Scott David Williams\textsuperscript{a}, Presenting Author\textsuperscript{a}, Roger Rassool\textsuperscript{a}, Suzie L Sheehy\textsuperscript{ab}, Geoffrey N. Taylor\textsuperscript{a}, Matteo Volpi\textsuperscript{a} and Rohan Dowd\textsuperscript{b}

\textsuperscript{a}School of Physics, The University of Melbourne, Melbourne, Victoria 3010, Australia

\textsuperscript{b}Australian Synchrotron - ANSTO (AS - ANSTO), Clayton, Victoria, Australia

As the re-development of the University of Melbourne X-band Laboratory for Accelerators and Beams (X-LAB) nears completion, so does the conceptual design of a compact beamline utilising X-band linear accelerating structures based there. It is expected that one of the future applications of the beamline will include the use as a low emittance beam source for an Inverse Compton Scattering (ICS) X-ray light source.

This beamline simulated will be composed of an initial accelerating section, two high gradient X-band linear accelerating structures operating at an average gradient of 70 MV m\(^{-1}\), and a quadrupole focusing array optimised for the smallest possible transverse beam size at an ICS interaction point. Although original designs utilised an S-band RF photogun as the initial section, we were motivated to also consider an alternative layout where the initial section is composed of a DC photogun and S-band accelerating structure similar to those used by the Australian Synchrotron group.

We will present simulation results of the beam dynamics and phase space characteristics throughout the length of the beamline, as well as ICS X-ray photon production for an idealised nominal laser source.
