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Investigating linear Breit-Wheeler pair production at Gemini

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The two-photon (linear) Breit-Wheeler mechanism is the simplest process through which light can be converted into matter. Despite its simplicity only the multi-photon (non-linear) process has yet been measured definitively. The linear process remains elusive as the production threshold of $2m_ec^2 \approx 1\,\mathrm{MeV}$ is comparatively high for two photons and requires two bright sources of gamma- and X-rays housed at the same facility. In addition, competing non-vacuum processes producing electron-positron pairs, such as Bethe-Heitler and Trident, make measuring the linear Breit-Wheeler process in isolation even more challenging. In an experiment performed at the Gemini laser in 2018 we collided $\sim$ 100 MeV gamma rays produced using a laser wakefield accelerator with multi-keV X-rays emitted from a hot plasma with the aim of detecting positrons from the linear Breit-Wheeler process.
We report on the success of the individual components of the setup, including the gamma and X-ray sources, as well as the single particle detectors coupled to a magnetic chicane, and provide an update on the ongoing data analysis.

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