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Reshaping THz Near-Fields for Efficient Particle Acceleration

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Significant developments in accelerator technology will be essential for particle colliders to reach the energies necessary for the next breakthrough in high energy particle physics. THz-frequency structures could provide the gradients needed for next generation particle accelerators with compact, GeV/m-scale devices. One of the most promising THz generation techniques to drive compact structures is optical rectification in lithium niobate using the tilted pulse front method. However, THz accelerator applications using this method are limited by significant losses during transport of THz radiation from the generating nonlinear crystal to the acceleration structure. In addition, the spectral properties of high-field THz sources make it difficult to couple THz radiation into accelerating structures. Constructing an accelerating structure partially out of lithium niobate would allow the integration of THz generation and electron acceleration, and remove the losses due to transport and coupling. In order to design this structure a robust understanding is needed of the THz near-field source properties and how they are affected by changes in the generation setup. We have developed a technique for detailed measurement of the THz near-fields and used it to reconstruct the full temporal 3D THz near-field close to the LN emission face. Analysis of the results from this measurement will inform designs of novel structures for use in THz particle acceleration.

In-person or Virtual?

In-person

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