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Simulations of wave generation by electron beams using cylindrical simulation frame

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During peaks of magnetospheric activity, energetic electrons trapped in the inner magnetosphere can precipitate in the lower ionosphere due to electromagnetic wave activity. Such waves can be generated naturally or artificially, for instance, through the emission of plasma beams. In this work, we study waves generated by electron beams emitted parallel to the magnetic field using SMILEI. We take advantage of the rotational symmetry of the problem and use a cylindrical frame, to reduce the simulation to a 2D problem. This computational gain allowed us to investigate the impact of the beam characteristics (such as beam density, frequency, length, etc.) on the wave generation, and the structural evolution of the beam as it exchanges energy with the electromagnetic fields and interacts with the background plasma.

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