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Magnetic field generation in finite beam plasma system ATUL KUMAR, CHANDRASEKHAR SHUKLA, BHAVESH PATEL, AMITA DAS, PREDHIMAN KAW[1], Inst for Plasm Res — The magnetic field generation is an important issue in a variety of contexts. In a beam plasma system, it is typically believed that the Weibel destabilization process causes the generation of magnetic fields at the electron skin depth scales. It has recently been shown, however, that a finite transverse size of the beam leads to the generation of the magnetic field at the long scale length of the beam (arXiv.org,1704.00970v1 [physics.plasm-ph], 2017). This has been attributed to a new instability associated with the Finite Boundary Size (FBS) operative in this context. In a realistic situation, the beam in addition to having a finite transverse extent would also have a finite temporal width. Keeping this in view in the present work a finite longitudinal extent of the beam has also been considered. Particle - In - Cell (PIC) simulations using OSIRIS were conducted which illustrates that in this case too the FBS instability is the first one to appear which is followed up by the KH at the edge and the Weibel in the bulk region. The magnetic field power spectrum has been observed to maximize at the longest scale of the beam size, as expected. In addition, we observe the relativistic shock formation, the beam focussing at the front and wake like structures in this case.

[1]This work is dedicated for Prof PK Kaw who passed away on June 18, 2017.

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