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Observation and simulation of wave particle interaction in a Traveling Wave Tube upgrade[1] MEIRIELEN CAETANO DE SOUSA, Universidade de Sao Paulo and Aix-Marseille university, DAMIEN F. G. MINENNA, Centre National d'Etudes Spatiales, Aix-Marseille university and Thales AVS, FABRICE DOVEIL, Aix-Marseille university and CNRS, YVES ELSKENS, Aix-Marseille university — Beside telecommunications [Minenna et al., Eur. Phys. J. H 44, 1 (2019)], Traveling Wave Tubes (TWT) are useful to mimic plasma-like wave-particle interaction [Tsunoda et al., Phys. Rev. Lett. 58, 1112 (1987), Doveil et al., Cel. Mech. Dyn. Astr. 102, 255 (2008)]. We use a TWT with a 4 m long helix (diameter 3.4 cm, pitch 1 mm) slow wave structure. At one end, a triode produces an electron beam radially confined by a constant axial magnetic field. Movable probes, capacitively coupled to the helix, launch and monitor waves generated at a few tens of MHz with arbitrary waveform. At the helix other end, a trochoidal analyzer reconstructs the beam energy distribution function. The observed dispersion relation agrees very well with a sheath model also used to estimate the TWT impedance measured by the Kompfner dip method. For sufficiently large beam intensity, growth and saturation of a launched wave is observed. A new symplectic code DIMOHA [Minenna et al., Europhys. Lett. 122, 44002 (2018)] based on an N-body Hamiltonian approach for particles and waves, which has shown big success (computation time divided by 100) for commercial TWTs, is applied to our unconventional TWT. This work also leads to revisit the Abraham-Minkowski dilemma about light momentum.

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