Abstract Submitted
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High Time Resolution Axial Density Analysis in AWAKE Helicon Plasmas[1] MICHAEL ZEPP, UW Madison, Dept. of Engineering Physics, Madison, WI, USA, BIRGER BUTTENSCHN, Max Plank Institute for Plasma Physics, Greifswald, Germany, JONATHAN GREEN, OLIVER SCHMITZ, UW Madison, Dept. of Engineering Physics, Madison, WI, USA, ALBAN SUBLET, CERN, Geneva, Switzerland — A high density plasma ($n_e \approx 10^{21} m^{-3}$) is needed to achieve Wakefield acceleration of electrons from an axial electric field in the GV/m range. Helicon plasma test cells have been constructed at IPP-Greifswald and UW-Madison to test their viability in this application. It has been shown at the IPP test cell, which has been moved to CERN for further studies, that sufficient densities are transiently achievable during 5 ms pulses. It is still necessary to determine the axial density homogeneity, which is required to stay within 0.25% for Wakefield applications. A laser induced florescence technique which pumps the 668.614 nm argon ion line is being developed to measure the axial density homogeneity on sub-millisecond timescales. The technique involves splitting a single-mode laser into four wavelength shifted beams using acousto-optic modulators. This allows the velocity distribution function to be sampled at four points simultaneously at high temporal resolution. This is a significant advantage over traditional wavelength scanning techniques that can require >100s to acquire the velocity distribution function.

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