Scattering of radio frequency waves by turbulent cylindrical filaments in the plasma edge and radiation pressure on these filaments (*)

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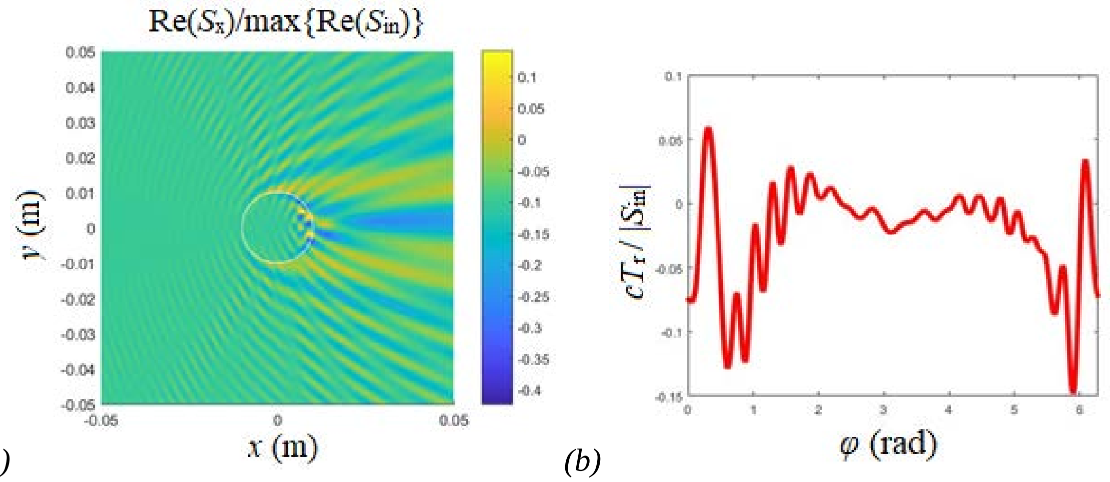
Radio frequency waves (RF) are scattered by filamentary structures which exist in the edge region of a tokamak plasma [1-5]. The waves are reflected, refracted, and diffracted leading to a change in their spectral properties. The spatial profile of the launched power gets fragmented and part of the launched power can be coupled to an unwanted cold plasma wave. Consequently, the efficiency of heating and current drive by RF waves in the core plasma can be negatively impacted. The scattering depends on the frequency and the wavelength of the launched RF wave, the size of the turbulent structure, the density of the ambient plasma, and the density inside the filament. We will present results on studies of wave scattering by RF waves in three different frequency regimes – lower hybrid waves, helicon waves, and ion cyclotron waves. While the filamentary structures scatter RF waves, they can also be affected by the radiation pressure of the waves. The filamentary structures can be pulled towards the RF source or pushed away depending on a variety of plasma and wave parameters. We will present results on RF scattering and on the RF induced radiation pressure in the three different frequency regimes.



(a) *(b)*

Figure 1: *Slow lower hybrid wave propagation in Alcator C-Mod type parameters: f* = 4.6 GHz, *ambient electron density* = 2×10^{19} m^{-3}, density inside the filament = 2.25×10^{19} m^{-3}, ambient magnetic field = 4.5 T, *radius of the filament = 0.01* m*; (a) Poynting vector in the forward direction (the wave is incident from the left and the filament boundary is the white circle) and (b) normalized radial stress*

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