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17 - Effect of CT Injection on Dusty Plasma in the STOR-M Tokamak

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The vast majority of power consumed by humanity now (2019) is produced through the burning of some form of fossil fuel. Even if environmental impacts are neglected, this current supply is projected to last on the order of 100 years at the current usage rate. For this reason humanity requires an alternative, safe and reliable high output energy source. For this reason, fusion and related plasma physics research is invaluable. There are however, multiple problems to address with fusion devices at this point. One such problem is fuelling.

In order to successfully fuel an operating fusion device, a mechanism is required which can deliver that fuel to the core/bulk of the generated plasma. A candidate for this type of fuelling is the injection of a Compact Torus (CT). The CT is essentially a self confined ball of plasma (a plasmoid). Utilizing the University of Saskatchewan Tokamak (STOR-M) with the CT injection system, the effects of enhanced plasma confinement and lifetime are to be studied. Utilizing pulsed operation of the CT, repetitive fuelling cycles will be analysed as well. Though, fuelling is one issue, unwanted particles in the plasma is another reality that must be dealt with.

In order to simulate a dirty fusion plasma, machined tungsten dust will be introduced into STOR-M. The effects of the dust in the plasma will be controlled by a separate vacuum chamber. The tungsten dust will be released in STOR-M, both with and without the use of the CT injector. This will allow for quantitative understanding of plasmoid interaction and test the viability of the CT as a fuelling technique. Due to the change in plasma behaviour with CT injection, a non-trivial interaction of the plasma under fuelling is expected even in the presence of the tungsten dust.

References:
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