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|                      | Proposal Code : PDF – FT_0007                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Title                | Alternate scheme of pre-ionization to assist Ohmic driven plasma current start-up in SST-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Abstract             | <p>Electron Cyclotron Resonance (ECR) assisted pre-ionization is usually preferred to obtain the successful plasma current startup in a superconducting tokamak during the Ohmic operation. In case of any operational difficulties for the ECR system, the tokamak operator may look for an alternate scheme to produce plasma breakdown which can assist the Ohmic current drive in the tokamak.</p> <p>Any method to increase the initial free electron density is beneficial in achieving the faster and more reliable breakdown. For example, electrons generated by placing a hot tungsten filament behind the limiter and then guided towards the tokamak vessel centre may be one of the simpler schemes. However, the frequent damage of filament would need replacement of filament – a clear disadvantage for the reliable tokamak operation</p> <p>The proposed method is based on Electron Drift Injection (EDI). In this system, a hot tungsten cathode is applied to emit the electrons; A pair of parallel electric plates (one has the flat surface, the other one is in concave-shaped, with voltage bias provide a drift electric field ED which is perpendicular to the toroidal magnetic field <math>B_T</math> ; allows to form the orthogonal electric and magnetic fields. The concave-shaped plate is biased more negative than the cathode so that an electrostatic well is formed and the motion of the emitted electrons in the parallel (toroidal) direction is trapped by this electrostatic well. This electrostatic well interrupts the emitted electrons moving along the magnetic field line (in the parallel direction) so as to enhance the injection efficiency and depth.</p> <p>In this proposed work, the candidate would design and develop an EDI system and test it on a linear plasma device (such as APPEL) or toroidal plasma device (BETA or ADITYA-U)</p> |
| Research Focus Areas | Proposed work is aligned with the core activities related to tokamak start-up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Qualifications       | Ph.D. in Physical or Engineering Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Desired Experience   | <p>Hands-on experience in Basic Plasma or tokamak experiment is desirable</p> <p>Working knowledge in diagnostics, electronics and instrumentation also desirable</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Other remarks        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |