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Microwave driven space-charge compensation with optical diagnostics and feedback

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A system is being developed for the maintenance of a space-charge neutralising plasma from the residual gas within the LEBT of the Front End Test Stand (FETS) at UKRI-STFC Rutherford Appleton Laboratory. Space-charge neutralisation will occur when an ion beam is allowed to collide with and ionise a background gas with pressure greater than 10^{-4} Torr in the presence of a solenoid fringe field, neutralisation can mitigate excess beam loss and reduce the need for beam chopping. To maintain a low density plasma between pulses, S-Band (3.4 GHz) microwaves will be injected into a LEBT cavity situated between solenoids. In order to provide sufficient microwave power to the cavity a two stage amplification system will be employed, with each stage providing a gain of 10 dB. A novel high-speed, low light-level optical diagnostics system based on Silicon Photomultiplier MPPC's will be used in combination with a directional coupler for forward and reverse RF power measurement to provide feedback about the state of the plasma within the cavity. An overview of the design of this system will be presented along with preliminary test results.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

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