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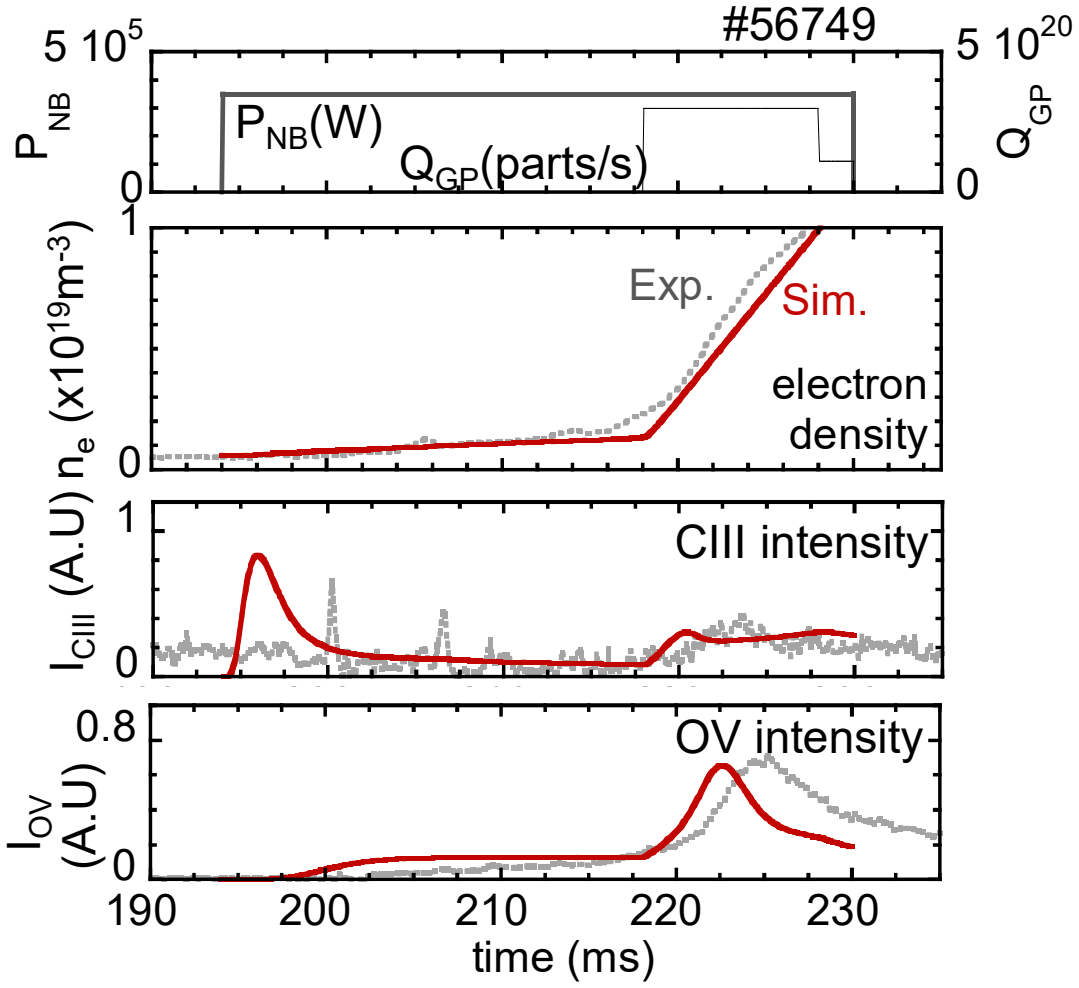
Study of NBI plasma start-up assisted by seed-plasma generation using non-resonant microwave heating in Heliotron J

Pre-ionization method using non-resonant 2.45 GHz microwave ($P_{2.45GHz}$ < 20 kW) enables us to achieve NBI plasma start-up in helical systems even in low P_{NB} (~0.3MW) and without ω_{ce} conditions.



Three essential mechanisms

1. **Production of high energy electrons by stochastic acceleration**
2. **Formed seed plasma with n_e of 10^{17}~10^{18}m^{-3} in non-resonant heating**
3. **Fast ions in early phase of NBI heats electrons overcoming power loss (ionization, conduction), resulting rapid burn-through of low Z impurity.**