Review of Scientific Instruments, vol.83, no.10, pp.103302-1-103302-5, October, 2012.

Temperature peaking at beginning of breakdown in 2.45 GHz pulsed off-resonance electron cyclotron resonance ion source hydrogen plasma

O.D. Cortázar; A.M. Megia Macías; A. Vizcaíno de Julián

Abstract-

An experimental study of temperature and density evolution during breakdown in off-resonance ECR hydrogen plasma is presented. Under square 2.45 GHz microwave excitation pulses with a frequency of 50 Hz and relative high microwave power, unexpected transient temperature peaks that reach 18 eV during 20 μs are reported at very beginning of plasma breakdown. Decays of such peaks reach final stable temperatures of 5 eV at flat top microwave excitation pulse. Evidence of interplay between incoming power and duty cycle giving different kind of plasma parameters evolutions engaged to microwave coupling times is observed. Under relative high power conditions where short microwave coupling times are recorded, high temperature peaks are measured. However, for lower incoming powers and longer coupling times, temperature evolves gradually to a higher final temperature without peaking. On the other hand, the early instant where temperature peaks are observed also suggest a possible connection with preglow processes during breakdown in ECRIS plasmas.

Index Terms-

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Citation:
Cortázar, O.D.; Megia-Macías, A.; Vizcaíno-de-Julián, A. "Temperature peaking at

beginning of breakdown in 2.45 GHz pulsed off-resonance electron cyclotron resonance ion source hydrogen plasma", Review of Scientific Instruments, vol.83, no.10, pp.103302-1-103302-5, October, 2012.