

Modulation of the parameters of a weakly Debye plasma by means of a current pulse

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MODULATION OF THE PARAMETERS OF A WEAKLY DEBYE PLASMA BY MEANS OF A CURRENT PULSE

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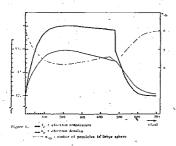
Study of the time-relaxation of the plasma parameters n_e and T_e , during and after a current pulse can provide useful insight in the excitation-ionization equilibrium and in the transport properties of the plasma.

We used an atmospheric cascaded arc in argon (\emptyset = 8 mm) operating at 80 amperes. Accurate values for T_e , n_e and n_a were determined in the stationary state by the source function method 1 and by Ashby-Jephcott interferometry (2 lasers : 0.63 μ m and 3.39 μ m) 2 .

By the application of a current pulse (150 Amps; 500 μ s; 10% droop; 3 μ s rise and fall times), the plasma is forced temporary in a different stationary state. Using the same diagnostics we evaluated the time-evolution of T_e and n_e ; see figure 1. We observe a substantial increase in n_e (factor 2.5) and a 15% increase in T_e ; also the corresponding enhancement of continuum and Ar II line radiation has been observed.

Conclusions: 1. By current modulation, measurements at high current densities can easily be performed with good accuracy.

- 2. Large radiation enhancement can be attained.
- By negative modulation (and/or afterglow) the number of particles in the Debye sphere can be reduced.
- 1. J. Leclair, D. Schram, Proc. 13th ICPIG, Berlin 1977, p. 483.
- 2. V. Helbig, private communication (to be published).



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