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Simultaneous measurement of electron temperature and density by a line pair method in the RFP plasma MASAYUKI WATANABE, S. SHIMIZU, H. OGAWA, T. SHINOHARA, Nihon University — A line-pair-method has been applied for a simultaneous measurement of the electron temperature and density in ATRAS RFP plasma. Three helium spectrum lines (668nm, 706nm, 728nm) were measured during the discharge at the same time and the electron temperature and density is estimated by using a Collision-Radiation model. To get the signal of the helium impurity line from the RFP discharge, the RFP plasma in the hydrogen gas with a few mixed helium gas was formed. In the typical ATRAS RFP discharge of the plasma current of 60kA, the electron temperature was approximately 50-150 eV and the electron density is the order of 10^{18} m^{-3} . During the discharge, the change of the temperature and density are mutually related and this correlation was the almost reverse phase. The periodically change of the temperature and density were also observed. This change synchronizes with a periodically increase of the averaged toroidal magnetic field, which is caused by the toroidal rotation of the increase of the toroidal magnetic field. This rotation, which is deeply related with dynamo effect, makes the plasma energy lose and particles also diffuse toward the plasma edge. As a result, the recycling of the particle and energy are occurred at the same time.

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