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3D Self-consistent Modelling of a Matrix Source of Negative Hydrogen Ions

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The study is in the scope of the research on the matrix source [1] of negative hydrogen ions: a matrix of small radius discharges inductively driven by a planar coil. A single-coil driving of the whole matrix is constructively the most proper decision, provided that the same discharge behaviour in the separate discharges of the matrix can be ensured. Recent results [2] obtained for different shapes of zigzag coils driving the matrix have shown that a zigzag coil with an omega-shaped conductor on the bottom of each discharge tube, having similarities with a single coil driving of each discharge, shows up with the highest rf efficiency displayed by high values of the induced current and high rf power deposition into the plasma. This is a result obtained from a 3D model which provides the spatial distribution of the rf field and of the current induced into the plasma, i.e. an electrodynamical description, for given values of the plasma parameters. Since the final decision for the rf driving of the matrix should be based on conclusions for the same spatial distribution of the plasma parameters in the separate discharge tubes, the 3D model from Ref. 2 is extended here to a self-consistent one, with a gas-discharge part within the ambipolar diffusion approximation.

References

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2. A. Demerdzhiev, St. Lishev, Kh. Tarnev, and A. Shivarova, *AIP Conf. Proc*. **1655**, 040011 (2015).