

# **How to Find Valid Parameters for the Modelling of H<sup>-</sup> and D<sup>-</sup> Ion Extraction with nIGUN<sup>(C)</sup>**

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A dedicated interactive computer program nSHEATH has been written in order to facilitate the exploration of self-consistent solutions in the (at least) 9-D parameter space for the inverted plasma sheath. In the transition from the quasi-neutral plasma to the unneutralised acceleration space of ion sources 2 major failures can occur, if the parameters are not correctly chosen:

- 1) A virtual cathode situation may develop producing a potential maximum inside the sheath
- 2) The equation for the key parameter  $n_i/n$  has no solution. This parameter expresses the density of the major positive ion density in terms of the density of negative ions inside the plasma.

The program displays the entry parameters, allows to change one of them at a time and performs a numerical integration through the sheath. The output is a graphical display of the densities through the sheath and a history list of parameter changes. The entry parameters can be selected for either a cesiated source or for a source without cesium. The maximum number of different thermal positive ions is arbitrary and set at present to a limit of 10.

The physics for the mathematical modelling has been fully described in the proceedings of PNNIB-2004 in Kiev [1]. nSHEATH as well as the ion extraction simulation program nIGUN are based on this model and the final output of nSHEATH consists of a file, which contains the important input part for running nIGUN with the found parameters.

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nSHEATH is available without charge from the author  
nIGUN<sup>(C)</sup> is commercially available through [www.egun-igun.com](http://www.egun-igun.com)

## **References**

- [1] R. Becker, Mathematical Formulation and Numerical Modelling of the Extraction of H<sup>-</sup> ions, AIP **CP763** (2005) 194

**Topic:** 1 or 5

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