Contribution ID: **29** Type: **Poster presentation**

Preliminary Design of a Hybrid Ion Source for 7Li^{3+} Generation

Monday, 16 October 2017 18:45 (15 minutes)

The p(7Li,n)7Be reaction can be used to produce forward neutron beam based on the principle of inverse kinematics, which is useful to reduce the background of the measurement of prompt fission gamma;-ray emission from fast neutron induced fission of ^{235}U and 238U. A hybrid 7Li3^{+} ion source is going to be adopted to produce 10 emu;A beam for this experiment. Previously a high B field 2.45 GHz ECR (Electron Cyclotron Resonance) ion source has been built at Peking University (PKU). Oxygen gas was used in the preliminary experiment. About 273 emu;A O3^{+} and 446 emu;A O2^{+} were produced with the high B source. This indicates the feasibility of producing high charge state ions with lower frequency and high B field. Recently, a tandem-type hybrid ion source with the combination of a 2.45 GHz ECR ion source and a hot surface ionization source was proposed for Li3^{+} ion generation. An oven will be used to produce lithium vapor and the surface ionization source converts the lithium atoms into Li^{+} ions. Then Li^{+} will be striped into Li3^{+} in ECR region. The configuration of magnetic field is min-B and the radial magnets are designed in a novel fixing structure, which effectively protect the radial magnets from heating. Details will be presented in the paper.

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Session Classification: Poster Session 1

Track Classification: Production of highly charged ion beams