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An H- Surface Plasma Source for the ESS Storage Ring

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H- charge exchange (stripping) injection into the European Spallation Neutron Source (ESS) Storage Ring requires a 90 mA H- ion source that delivers 2.9 ms pulses at 14 Hz repetition rate (duty factor ˜4%) that can be extended to 28 Hz (df 8%). This can be achieved with a magnetron surface plasma H- source (SPS) with active cathode and anode cooling. The Brookhaven National Laboratory (BNL) magnetron SPS can produce an H- beam current of 100 mA with about 2 kW discharge power and can operate up to 0.7 % duty factor (average power 14 W) without active cooling. We describe how active cathode and anode cooling can be applied to the magnetron SPS to increase the average discharge power up to 140 W (df 8%) to satisfy the needs of the ESS. We also describe the use of a short electrostatic LEBT as is used at the Oak Ridge National Laboratory Spallation Neutron Source to improve the beam delivery to the RFQ.

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