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High Intensity Proton Source and LEBT for the European Spallation Source

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At the Istituto Nazionale di Fisica Nucleare –Laboratori Nazionali del Sud (INFN-LNS) the beam commissioning of the high intensity Proton Source (PS-ESS) and the Low Energy Beam Transport line for the European Spallation Source (ESS) has been completed. The official project schedule was satisfied and the packaging for the shipment to Lund is under way. Due to the high flexibility of the magnetic system, and to the innovative approach developed for the commissioning, we were able to test a huge amount of configurations (more than 500 thousands). According to the last update, the source is able to produce stable total current between 40 and 125 mA (90 mA requested), with a proton fraction of up to 87% (75% requested), 99% normalized beam emittance of $1.06 \pi \cdot \text{mm} \cdot \text{mrad}$ at 82 mA ($1.8 \pi \cdot \text{mm} \cdot \text{mrad}$ at 90 mA requested), intrapulse current fluctuation below $\pm 1.5\%$ ($< \pm 2\%$ requested), long term current fluctuation below $\pm 3\%$ ($< \pm 3.5\%$ requested). The optimum source configuration that satisfy all requirements at the same time was identified. The LEBT parameter optimization was focused on the reduction of emittance growth and the satisfaction of nominal Twiss parameters at the RFQ beam interface. Results and used strategy will be shown in details.

Primary authors: CELONA, Luigi (INFN-LNS); Dr NERI, Lorenzo (INFN-LNS)

Co-authors: GAMMINO, Santo; Dr LEONARDI, Ornella (INFN-LNS); Dr TORRISI, Giuseppe (INFN-LNS); CASTRO, Giuseppe; MASCALI, David (INFN-LNS); Dr MIRAGLIA, Andrea (INFN LNS); Dr MAZZAGLIA, Maria (INFN LNS); Mr ALLEGRA, Luciano (INFN-LNS); Mr AMATO, Antonino Salvatore (INFN-LNS); Mr CALABRESE, Giuseppe (INFN-LNS); Mr CARUSO, Antonio (INFN-LNS); Mr CHINES, Francesco (INFN-LNS); Mr GALLO, Giuseppe (INFN-LNS); Mr LONGHITANO, Alberto (INFN-LNS); Mr MANNO, Giovanni (INFN-LNS); Mr MARLETTA, Salvatore (INFN-LNS); Mr MAUGERI, Antonio (INFN-LNS); Mr PASSARELLO, Santi Maria (INFN-LNS); Mr PASTORE, Giuseppe (INFS-LNS); Mr SEMINARA, Angelo (INFN-LNS); Mr SPARTA, Antonino (INFN-LNS); Mr VINCIGUERRA, Salvatore (INFN-LNS)

Presenter: CELONA, Luigi (INFN-LNS)

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