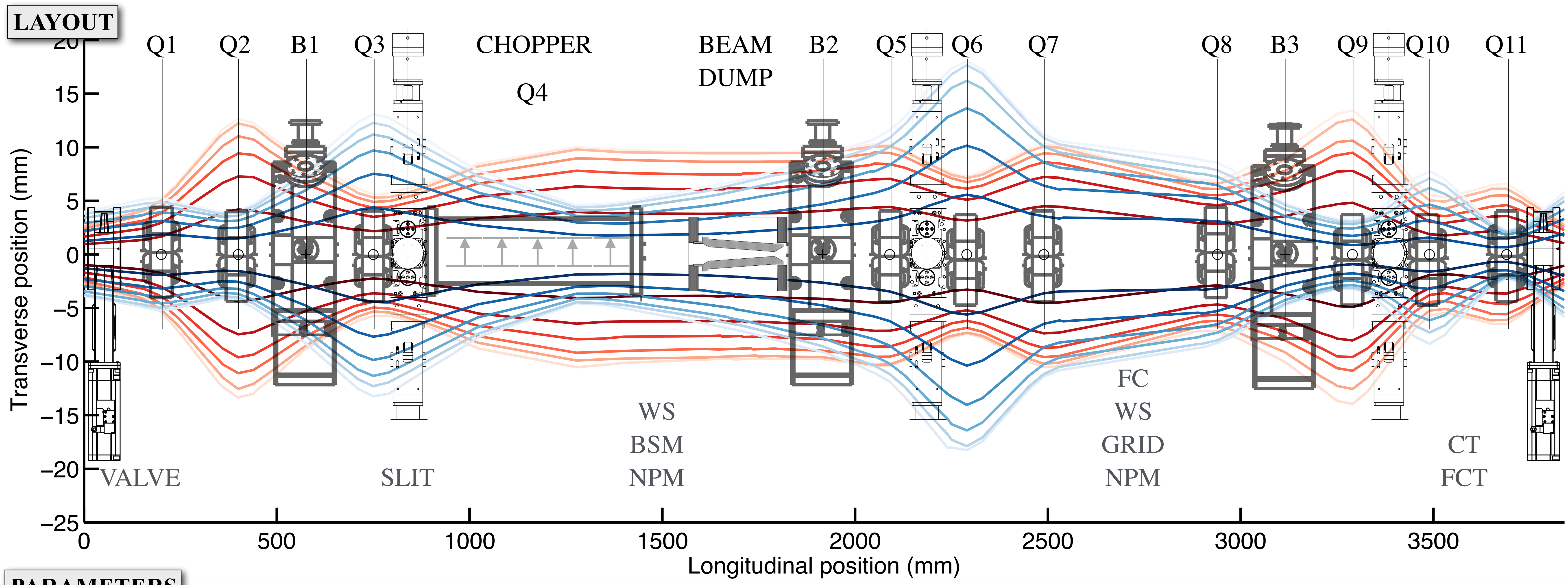
PROGRESS ON ESS MEDIUM ENERGY BEAM TRANSPORT

I. Bustinduy*, J.L. Muñoz, D. Fernandez, O. González, S. Varnasseri, A. Ghiglino, R. Vivanco, F. Sordo, M. Magan, P. Gonzalez, N. Garmendia, L. Muguira, Z. Izaola, I. Madariaga, I. Rueda, ESS-Bilbao, Spain.
A. Ponton, R. Miyamoto, M. Eshraqui, ESS, Sweden

LAYOUT



PARAMETERS

Parameter	Values
Input Energy	3.62 MeV (β =0,0876)
Total Current	62.5 mA
Particle	protons (H^+)
Number de quadrupoles	11
Max quadrupole gradients	33 T/m
Number of *buncher* cavities	3
Frequency	352.2 MHz
Effective Voltage (EoTL)	125-62-146 kV

The considered versatile MEBT is being designed to achieve four main goals:

1.- Match the RFQ output beam characteristics to the DTL input both transversally and longitudinally.

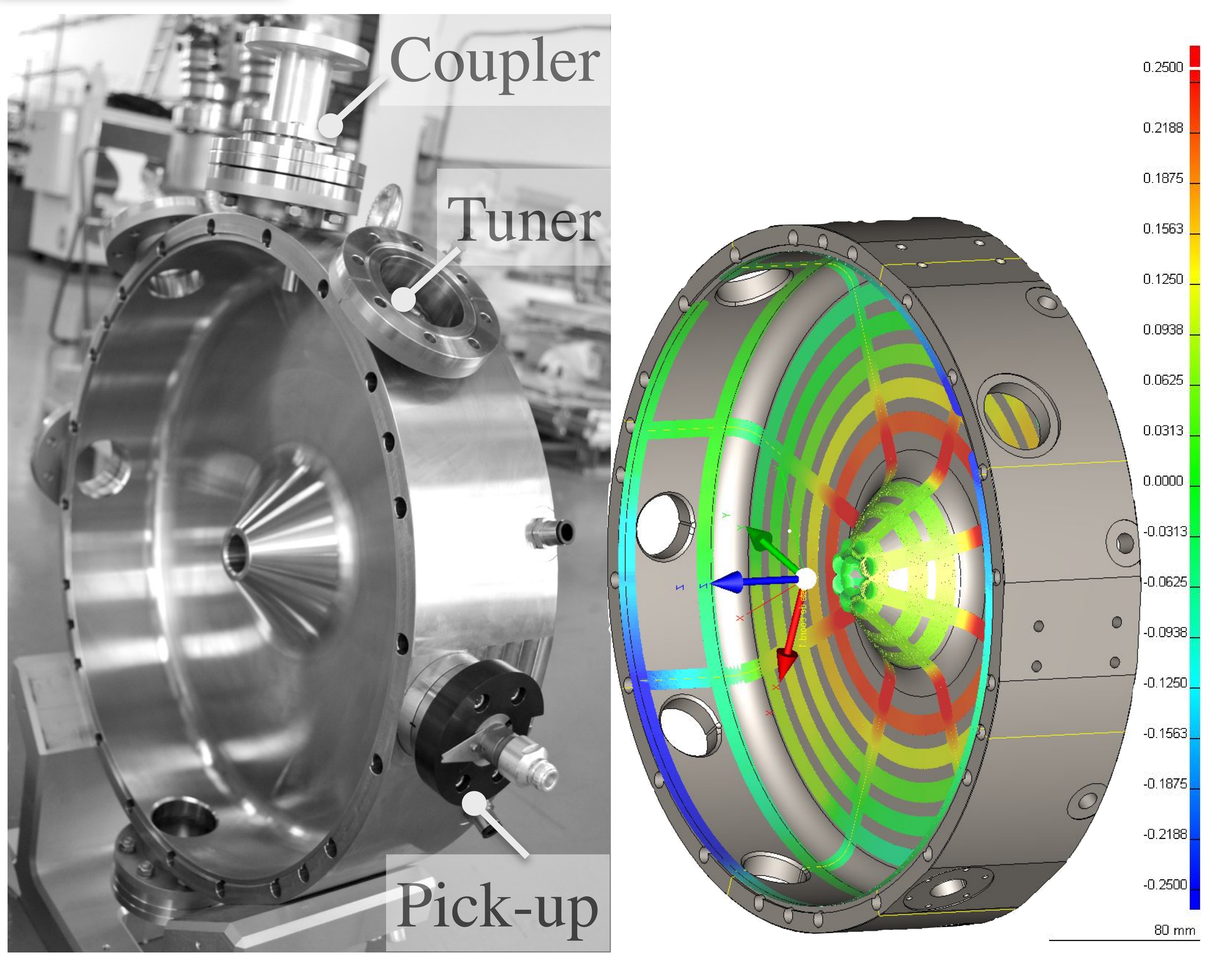
2.- Contain a fast chopper and its correspondent beam dump, that could serve in the commissioning as well as in the ramp up phases.

3.- Serve as a halo scraping section by means of various adjustable blades.

4.- Measure the beam phase and profile between the RFQ and the DTL, along with other beam monitors.

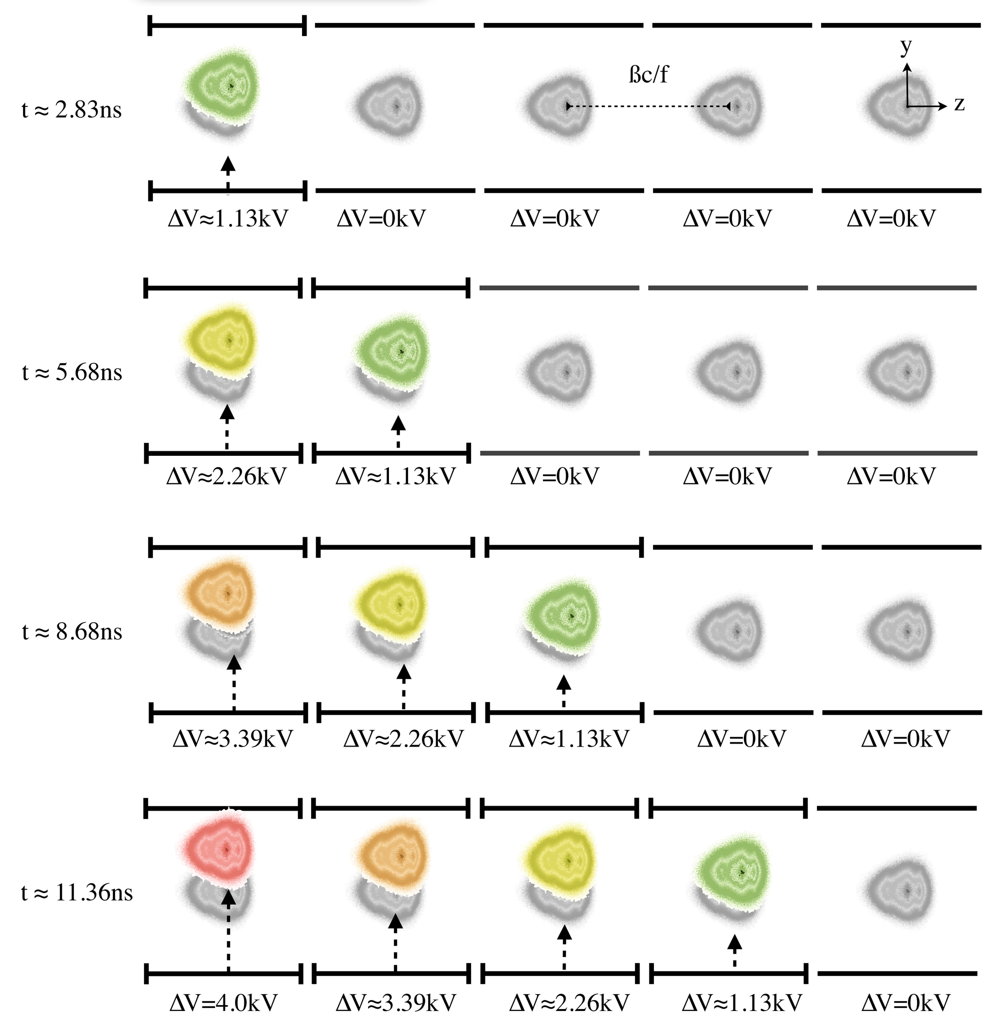
A set of eleven quadrupoles is used to match the beam characteristics transversally, combined with three 352.2 MHz buncher cavities, which are used to adjust the beam in order to fulfill the required longitudinal parameters.

BUNCHER



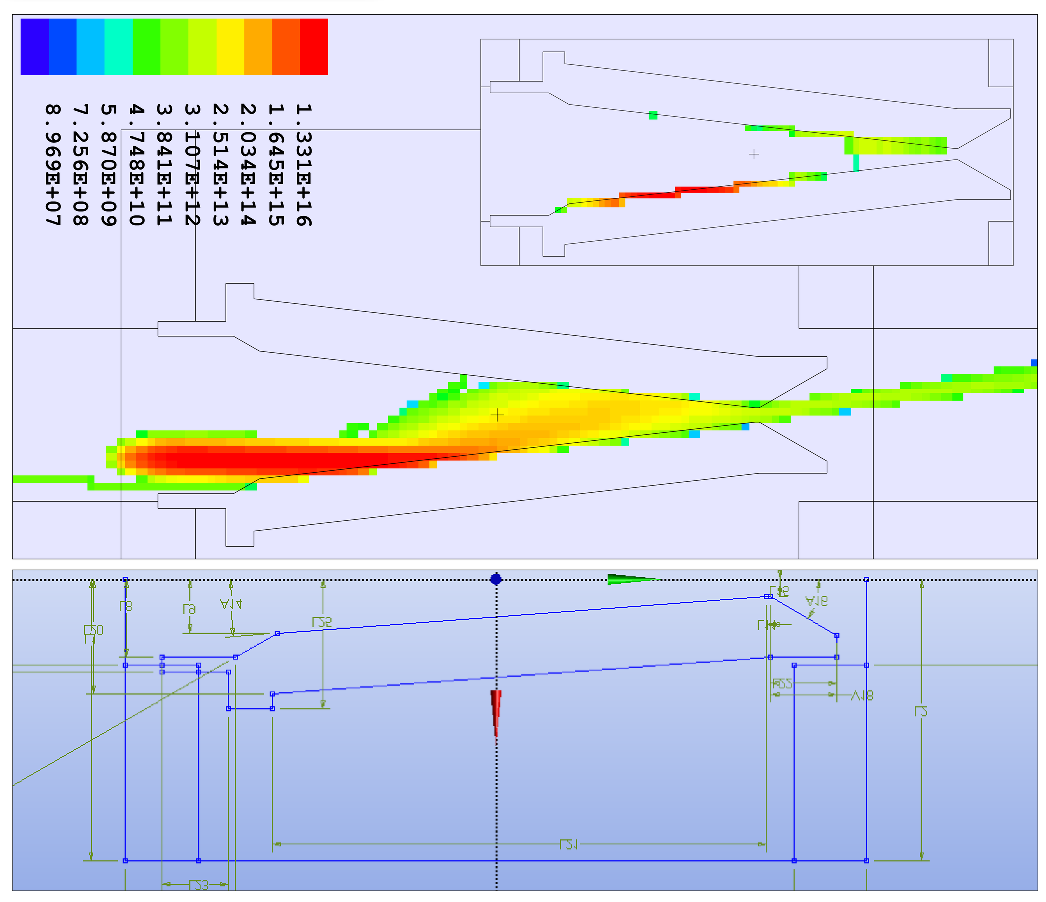
Left: Picture of the *SS* buncher prototype after machining. **Right:** 3D metrology corresponding to Body part of the machined Al buncher cavity. Colorbar scale represents measured deviation respect to drawings values (mm).

CHOPPER



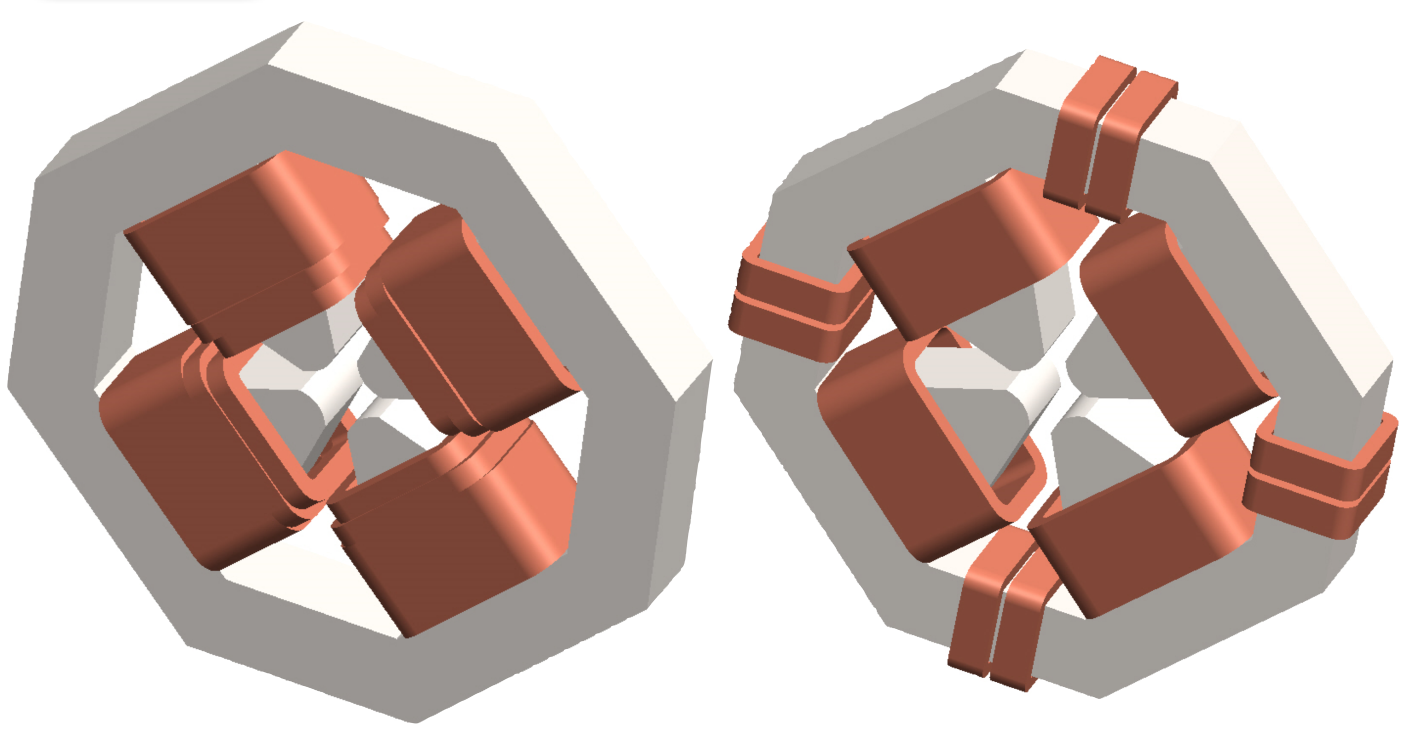
Length of each sector is determined by distance between bunches. ~ βc/f. In our case, *length≤ 74.31mm.*

BEAM-DUMP



The required *kicker* should be able to deflect a 20μs fraction of the beam for a 14 Hz repetition rate for a 10 ns rise time. In a worst case scenario, machine protection system also expects a 1 ms train of bunches to be deflected against the beam dump.

QUADS

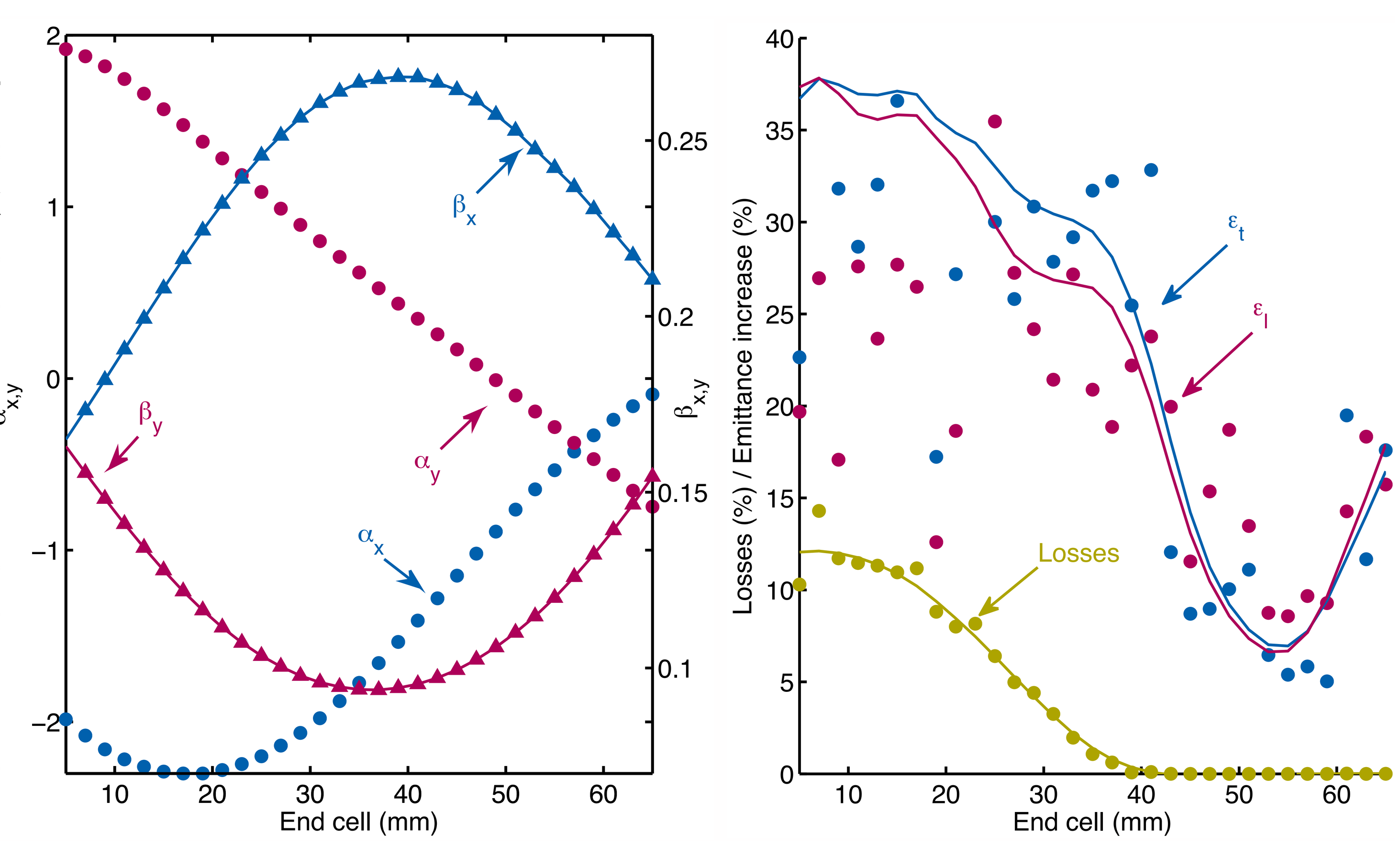


Left: Steerer Coils In (SCI). **Right:** Steerer Coils Out (SCO). Coils are represented in Copper color. The fiducial points must be designed with enough space to hold one sphere support at a time at the magnet top sector.
Following specifications:
ø41 mm aperture, ∫B = 2.5 T with 100 mm maximum physical size (length) and ~15 G.m deflection for the steerers.

BEAM DYNAMICS

In order to improve MEBT performance, a systematic approach was conducted to seek best input beam. 2 different sets of potential RFQ outputs were used as input of the ESS warm linac. MEBT elements were used to match the beam to the required DTL periodic solution, and different beam parameters were evaluated at the end of the warm linac section.

Lower values of α are desirable as input for this lattice



Left: Generated inputs from RFQ. **Right:** Output parameters at the end of ESS warm linac.

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