# LEBT to RFQ separation

P. Savage

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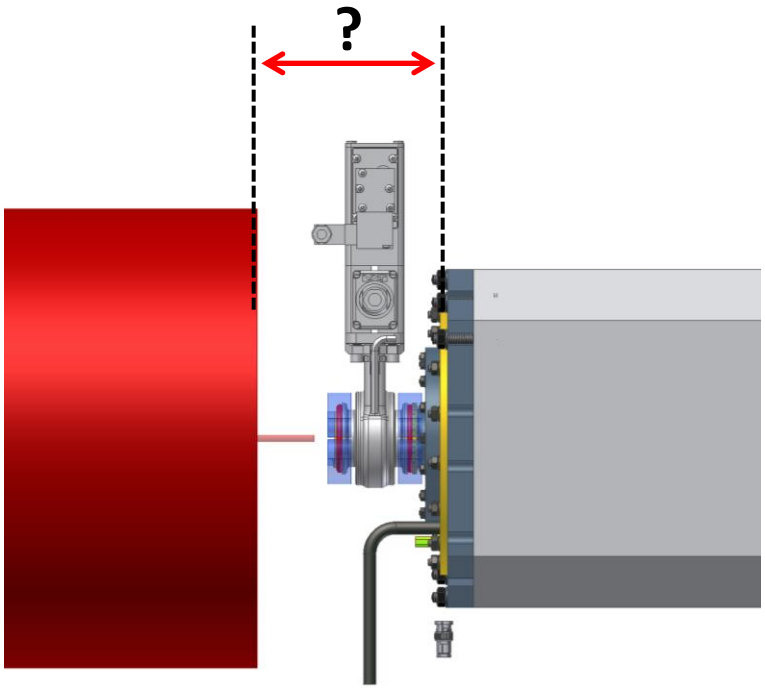
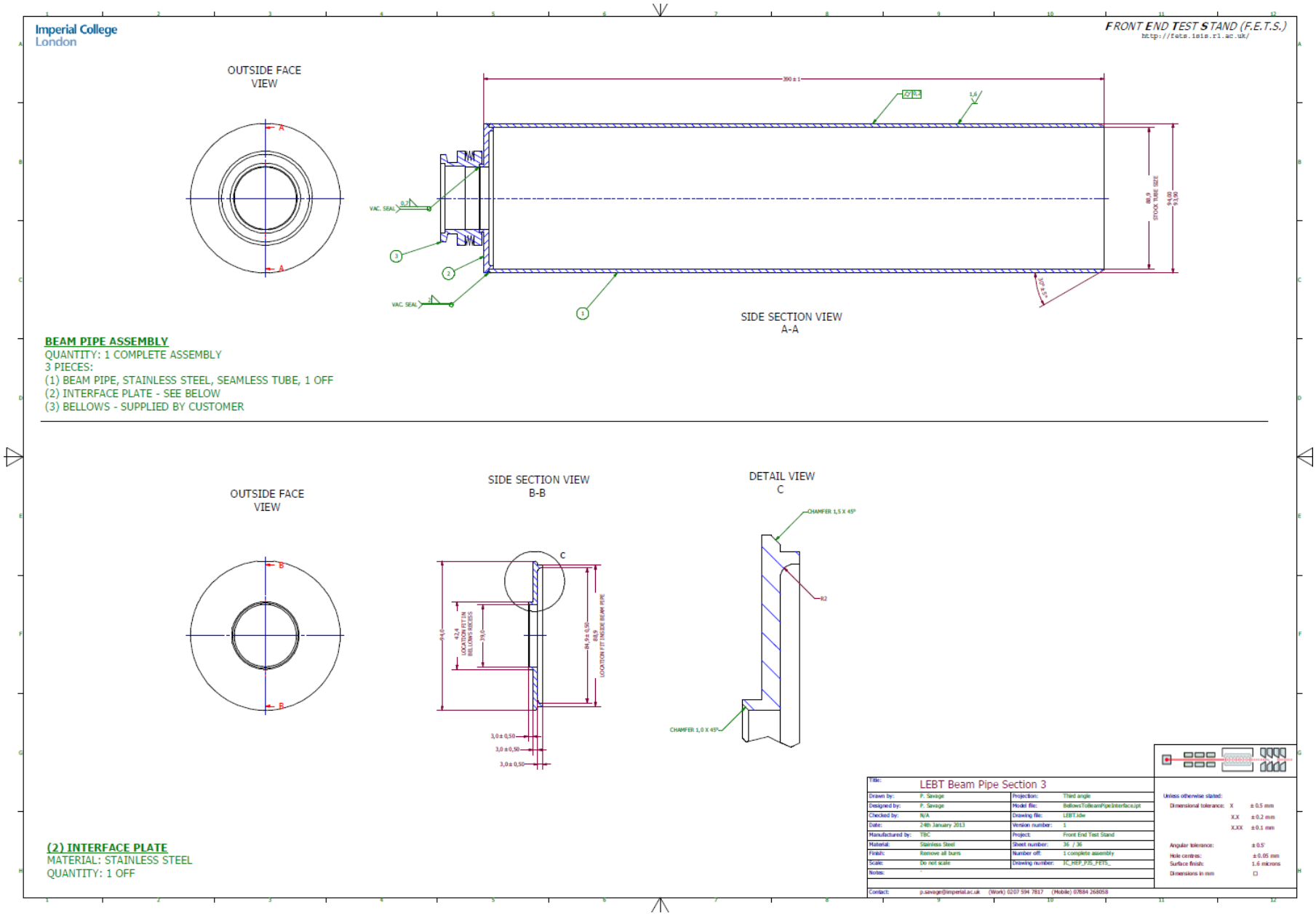
Ammended 4th July 2013



- LEBT beam pipe section 3 is being manufactured now and is due for completion before end March 2013.
- The RFQ to LEBT separation can have a range of 51mm.
- The range is provided by the repositioning of the LEBT beam pipe section 3 within the LEBT drift vessel.
- There is an additional +/- 5mm provided by the wee bellows upstream of the vacuum valve.
- Consider the 'RFQ entrance' to be at the end of the radial matcher.
- The RFQ cannot be positioned any closer to the LEBT than the position 1 shown.
- The RFQ can be as far away as you like, we just need to manufacture a longer beam pipe.
- The position range is 51mm.




# LEBT beam pipe section 3 Engineering drawing

The next two slides illustrate the position of the focussed beam with respect to the RFQ for the following cases:

**Position 1:** Beam pipe section 3 fully inserted

- Maximum current in solenoid 3
- Nominal Current in solenoid 3

**Position 2:** Beam pipe section 3 fully retracted

- Maximum current in solenoid 3
- Nominal Current in solenoid 3

**Position 1:** Beam pipe section 3 fully **inserted** into the drift vessel.

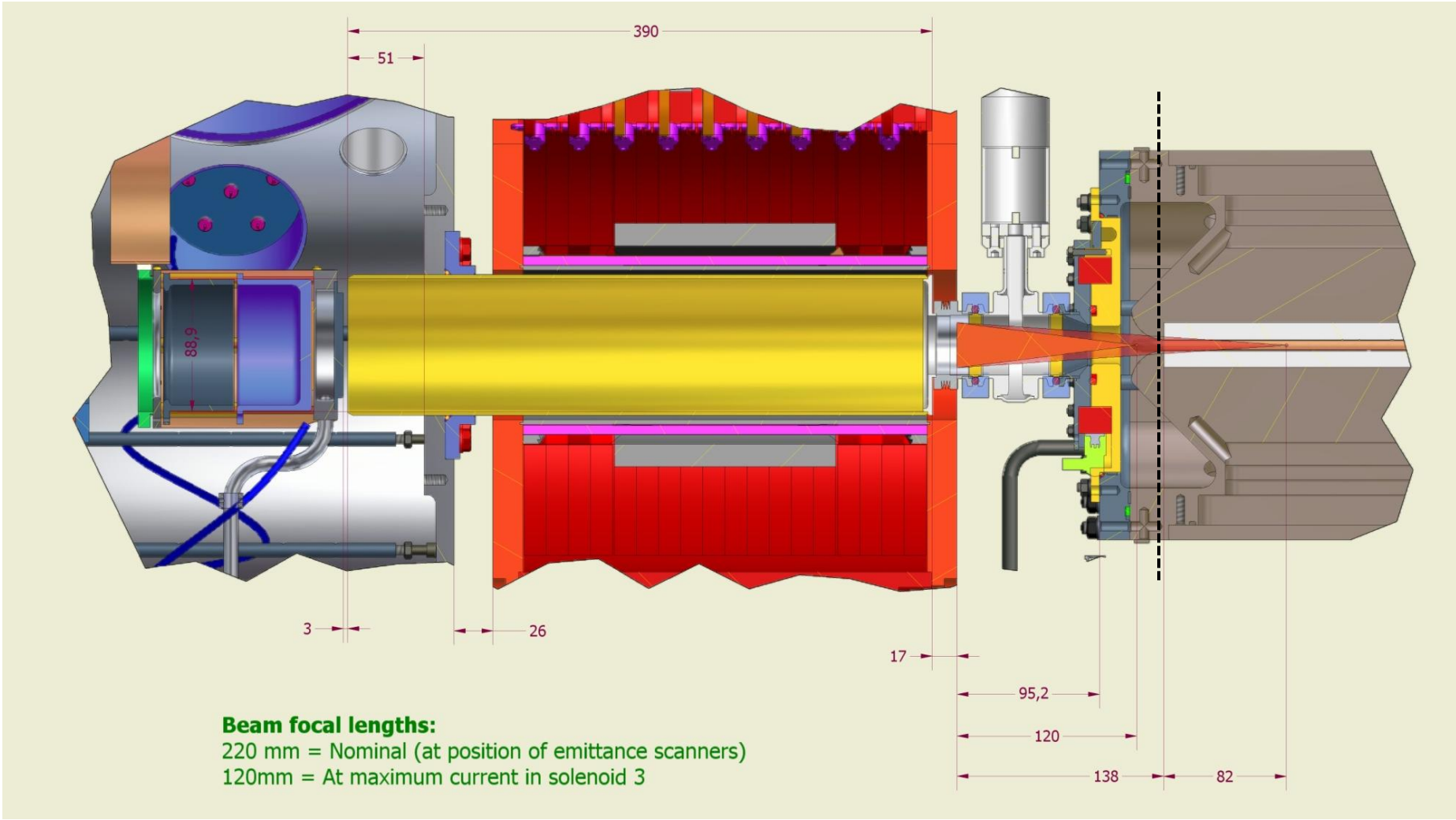
Beam pipe section 3 is 390mm long (not including the bellows at the downstream end)

In this position the LEBT to RFQ separation = 95mm

At **maximum** current in solenoid 3 (focal length = 120mm) the beam focus is at 18mm Upstream of the RFQ entrance.

At **nominal** current in solenoid 3 (focal length = 220mm) the beam focus is at 82mm DOWNstream of the RFQ entrance.

The RFQ entrance is at the end of the radial matching section which is denoted by the dotted line.



**Position 2:** Beam pipe section 3 fully **retracted** from the drift vessel.

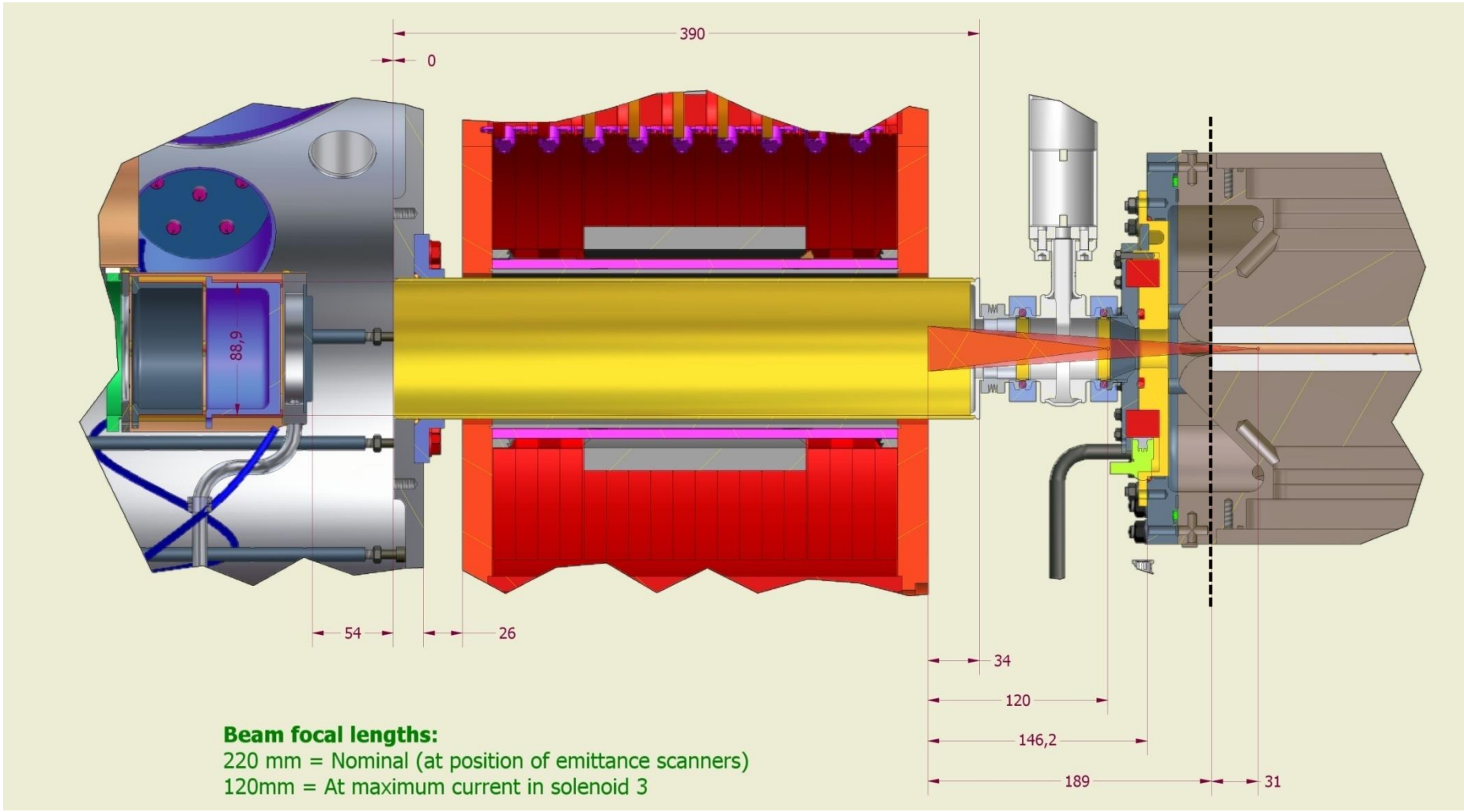
Beam pipe section 3 is 390mm long (not including the bellows at the downstream end)

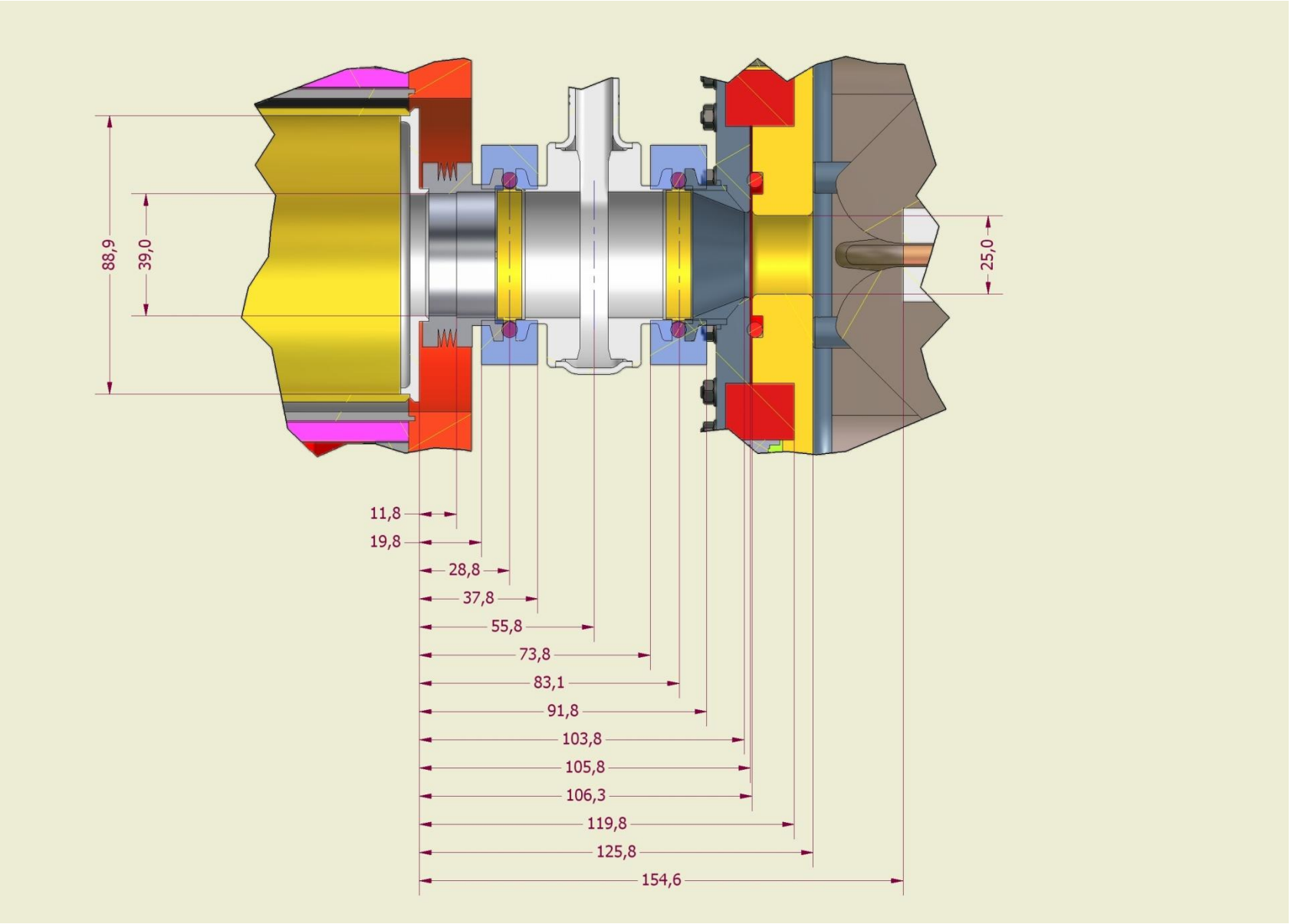
In this position the LEBT to RFQ separation = 146mm

At **maximum** current in solenoid 3 (focal length = 120mm) the beam focus is at 69mm Upstream of the RFQ entrance.

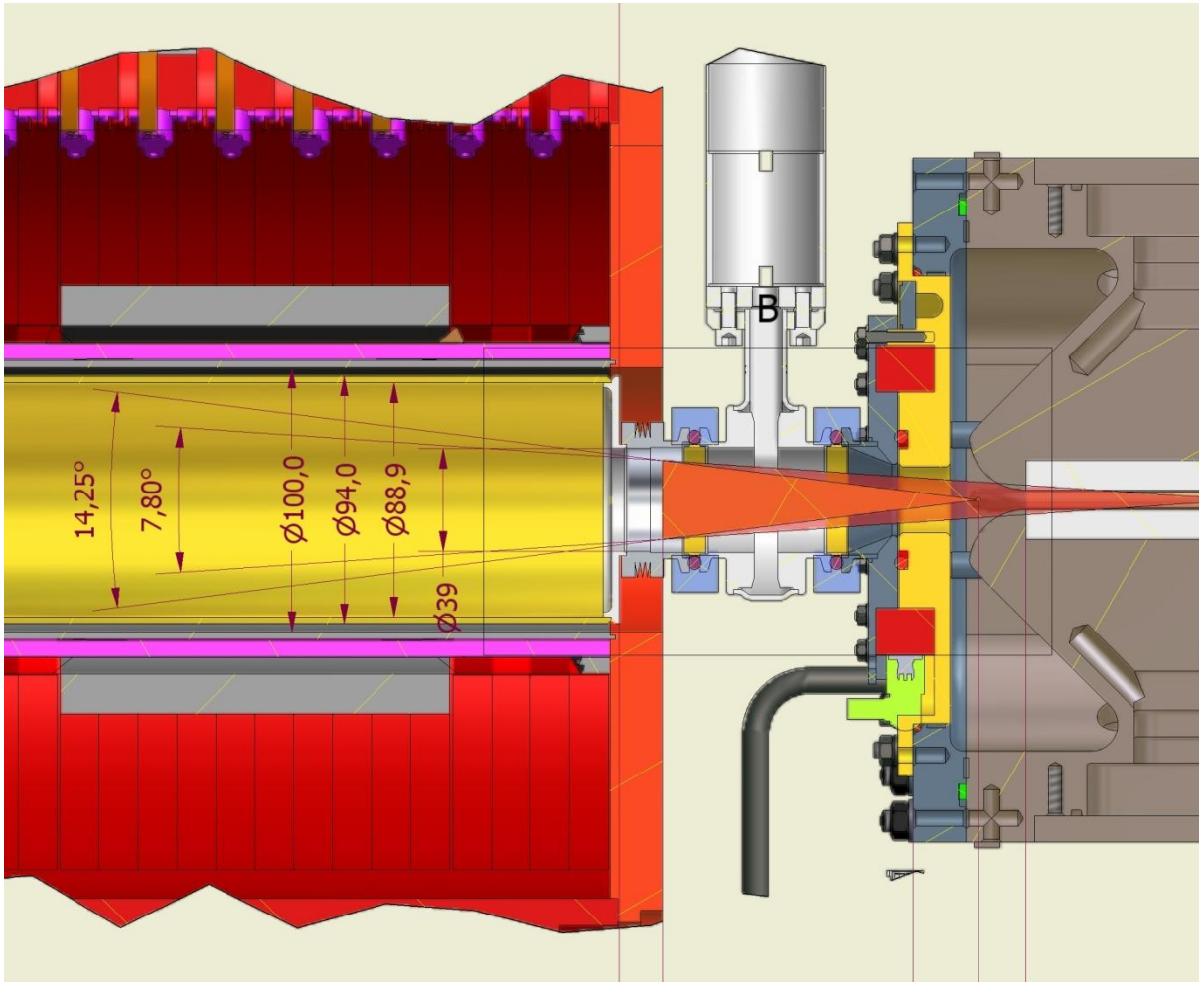
At **nominal** current in solenoid 3 (focal length = 220mm) the beam focus is at 31mm DOWNstream of the RFQ entrance.

The RFQ entrance is at the end of the radial matching section which is denoted by the dotted line.






Dimensions in LEBT to RFQ interface region




## Diameters:

Bellows ID = 39mm
LEBT Beam pipe ID = 88,9mm
LEBT Beam pipe OD = 94,0mm
LEBT Solenoid ID = 100,0mm

At maximum current, beam cone (half) angle = $14{,}25^0$ /2 = $7{,}12^0$ = 2 (Pi) x 7,12/360 = 124 mrad
At minimum current, beam cone (half) angle = $7{,}80^0$ /2 = $3{,}90^0$ = 2 (Pi) x 3,90/360 = 68 mrad

Solenoid 3 should be capable of producing any beam angle between 68mrad and 124mrad.