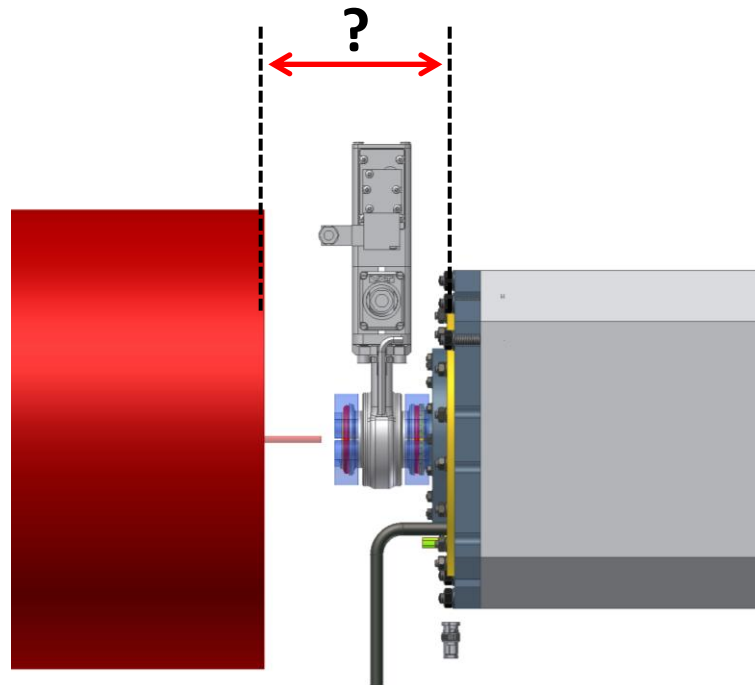


LEBT to RFQ separation

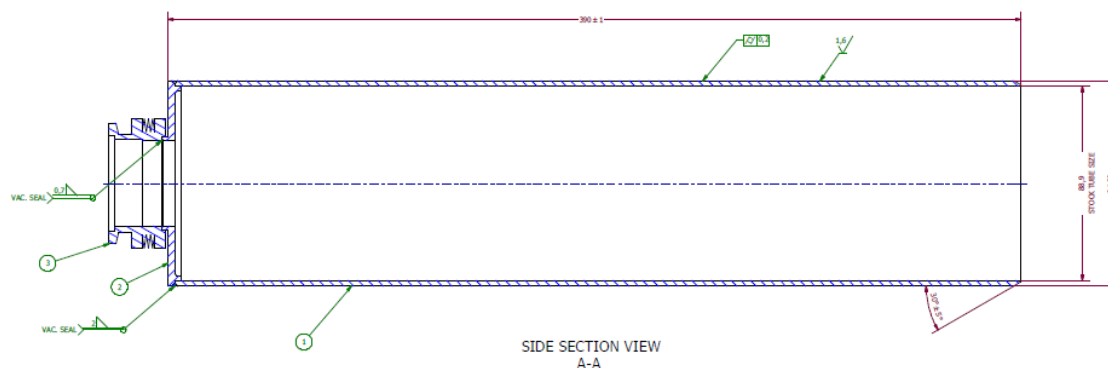
P. Savage

25th February 2013

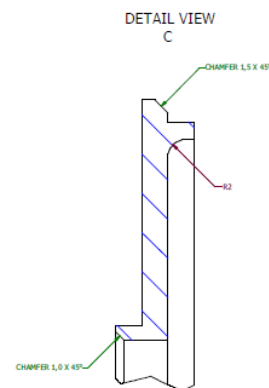
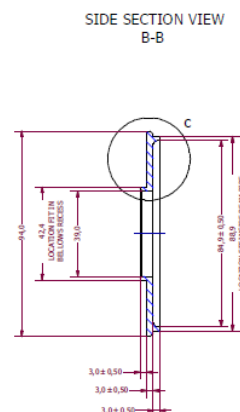
Ammended 4th July 2013



- 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.



(1) BEAM PIPE, STAINLESS STEEL, SEAMLESS TUBE, 1 OFF
(2) INTERFACE PLATE - SEE BELOW
(3) BELLOWS - SUPPLIED BY CUSTOMER



Title: LEBT Beam Pipe Section 3		
Drawn by: P. Seage	Projection: Third Angle	
Designed by: P. Seage	Model file: Solves\LEBTPipe\LEBTPipe.rvt	
Checked by: N/A	Drawing file: LEBT.rxd	
Date: 24th January 2013	Version number: 1	
Manufactured by: TSC	Project: Front End Test Stand	
Material: Stainless Steel	Sheet number: 26 / 36	
Finish: Remove all burrs	Number off: 1 complete assembly	
Scale: Do not scale	Drawing name: H_PEP_FTS_FTS.rvt	
Notes:		
Comments: www.autodesk.com/uk www.autodesk.com/uk www.autodesk.com/uk		

Unless otherwise stated:	
Dimensional tolerance:	X ± 0.5 mm
	XX ± 0.2 mm
	XXX ± 0.1 mm
Angular tolerance:	± 0.5°
Hole centres:	± 0.05 mm
Surface finish:	1.6 microns
Dimensions in mm	□

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.

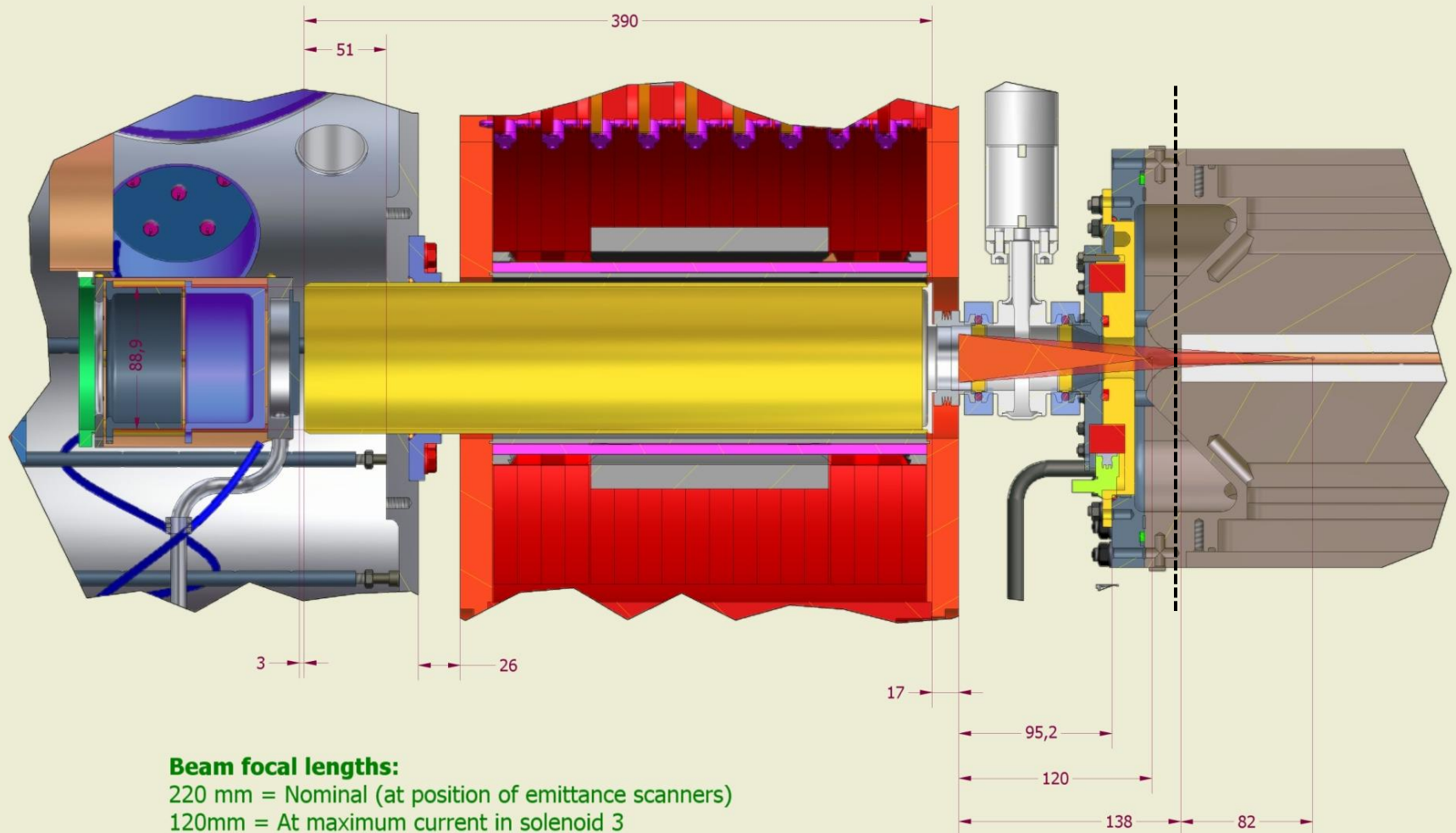
Beam pipe section 3 is 390mm long (not including the bellows at the downstream end)

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.

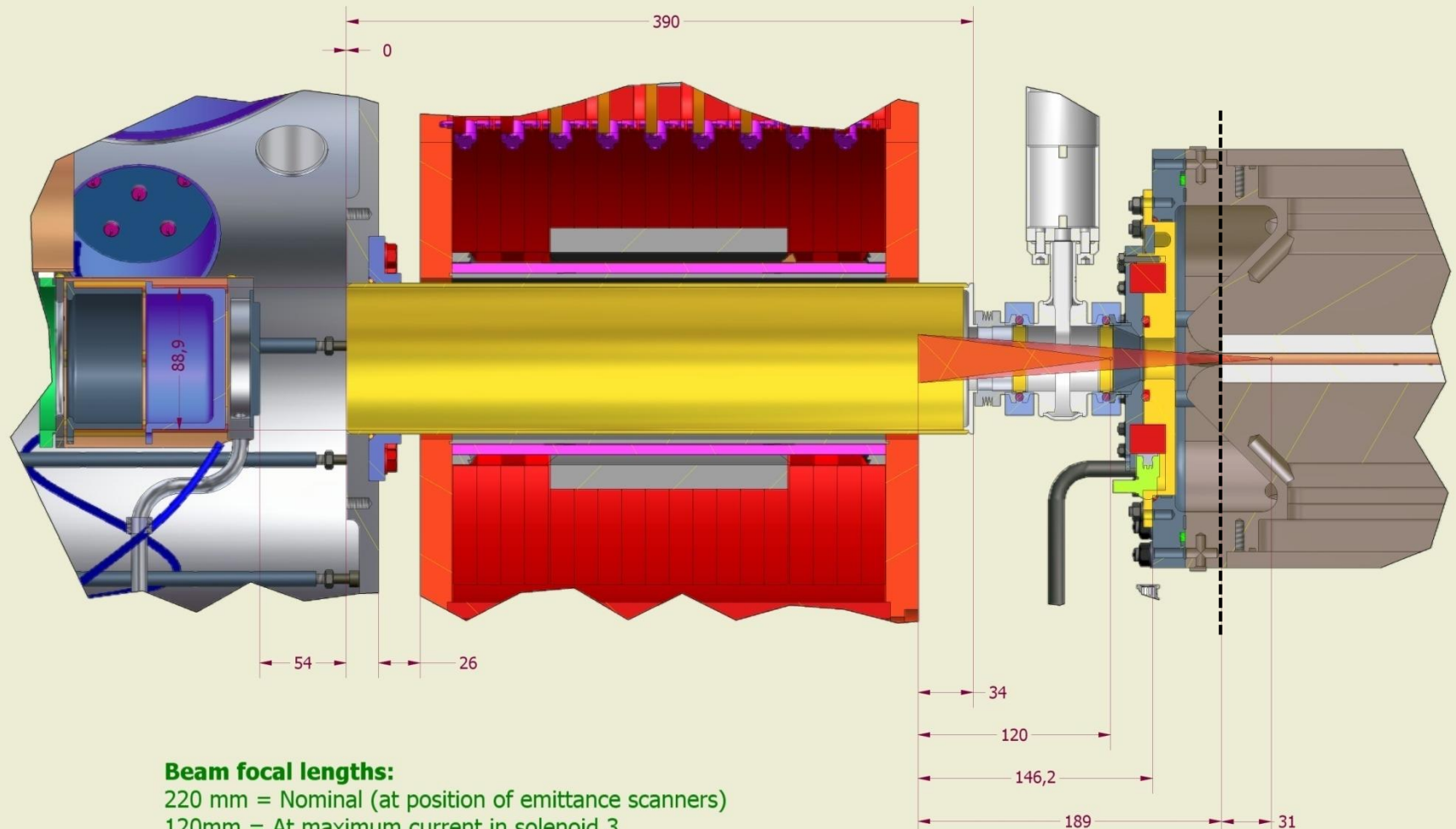
Beam pipe section 3 is 390mm long (not including the bellows at the downstream end)

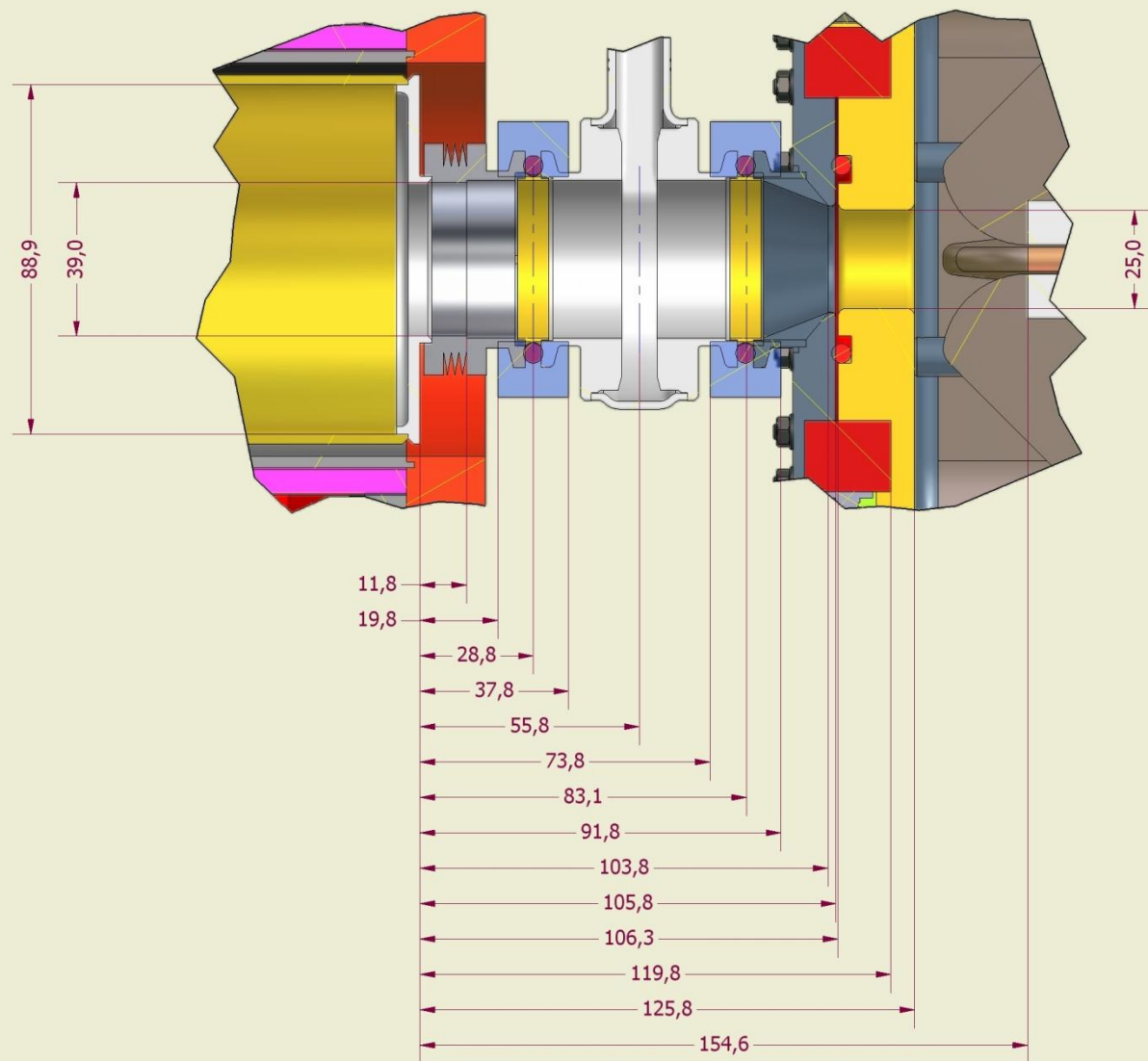
In this position the LEBT to RFQ separation = 146mm

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

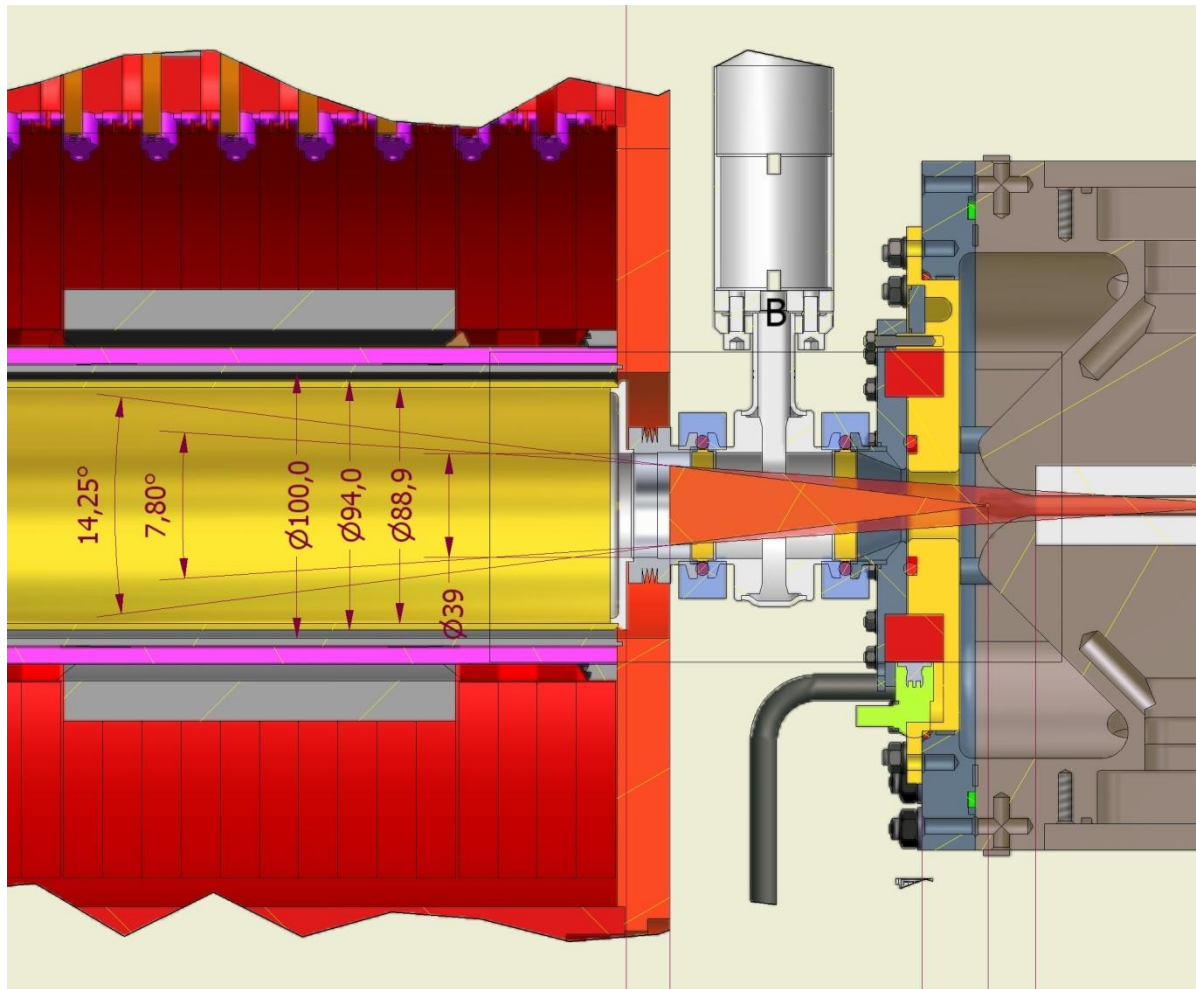
At **nominal** current in solenoid 3 (focal length = 220mm) the beam focus is at 31mm DOWNstream of the RFQ entrance.

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 = $14,25^\circ / 2 = 7,12^\circ = 2 \text{ (Pi)} \times 7,12/360 = \mathbf{124 \text{ mrad}}$

At **minimum** current, beam cone (half) angle = $7,80^\circ / 2 = 3,90^\circ = 2 \text{ (Pi)} \times 3,90/360 = \mathbf{68 \text{ mrad}}$

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