LINAC4 COMMISSIONING OVERVIEW

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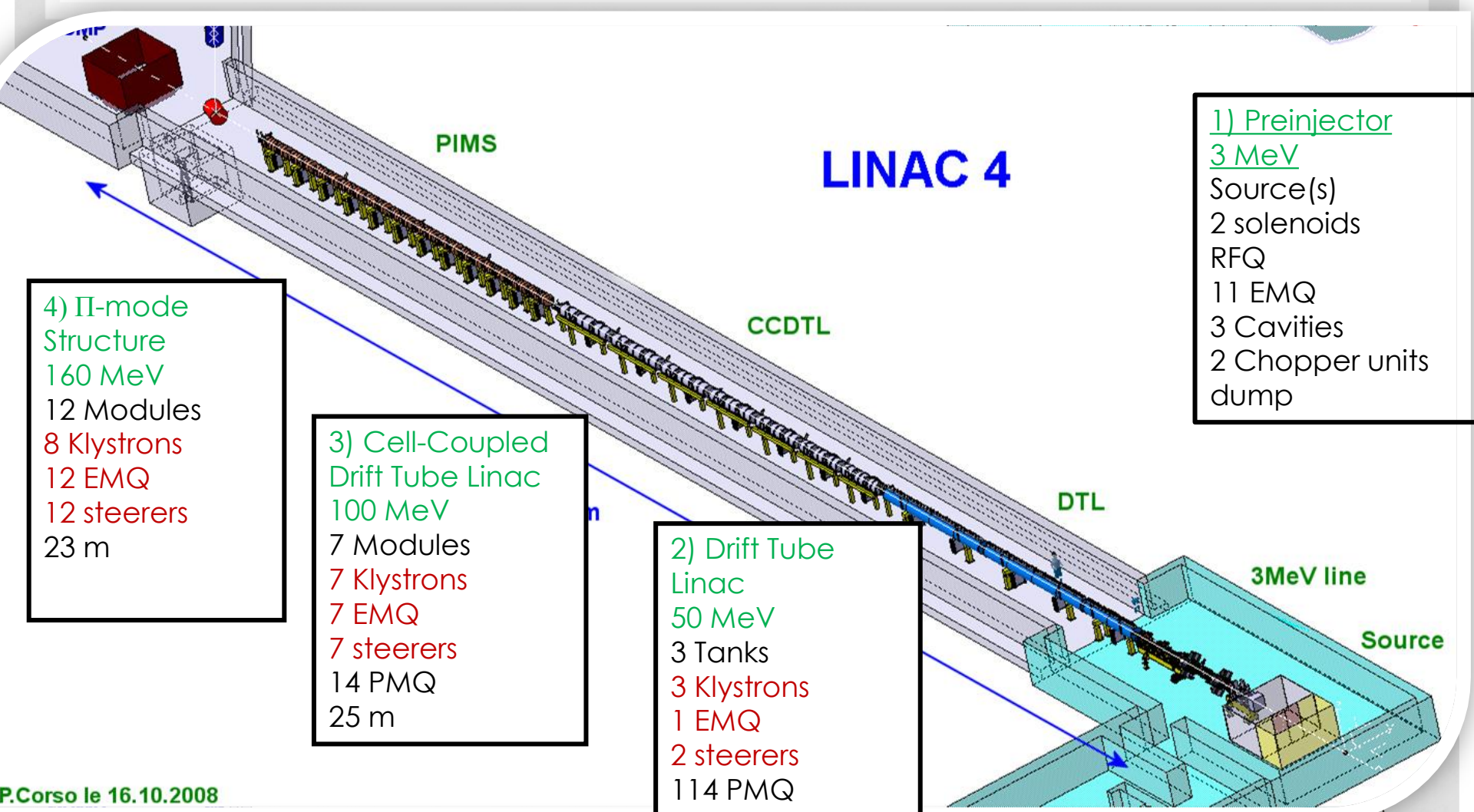
LIU Day – 11th april 2014

LINAC4 LAYOUT AND COMPONENTS



1) Preinjector
3 MeV
Source(s)
2 solenoids
RFQ
11 EMQ
3 Cavities
2 Chopper units
dump

2) Drift Tube Linac
50 MeV
3 Tanks
3 Klystrons
1 EMQ
2 steerers
114 PMQ
19 m

3) Cell-Coupled Drift Tube Linac
100 MeV
7 Modules
7 Klystrons
7 EMQ
7 steerers
14 PMQ
25 m

4) Π-mode Structure
160 MeV
12 Modules
8 Klystrons
12 EMQ
12 steerers
23 m

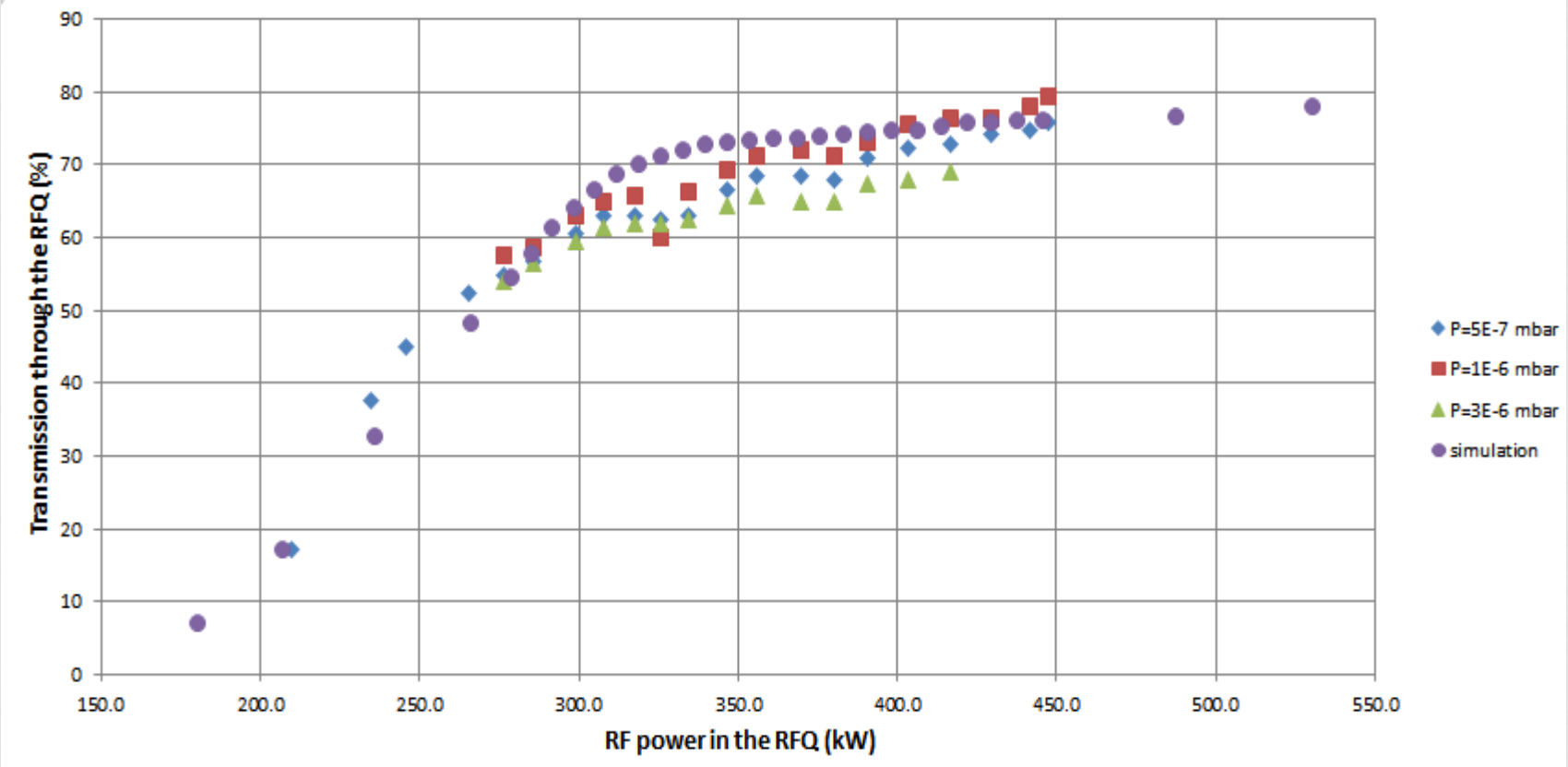
COMMISSIONING STAGES

	Energy	Key issue		Schedule
LINAC4 stand alone	3MeV	RFQ transmission Chopping		Done
	12 MeV	Matching to DTL		Imminent
	30-50 MeV	Transporting in PMQ channel		Dec 2014
	100 MeV	Setting the RF phases		Mar 2015
	160 MeV - DUMP	Final energy		End 2015
	160 MeV	Reliability + sector tst		2016
Connection to PSB	160 MeV –LBE LBS			T0+8months

FOUR IMPORTANT RESULTS

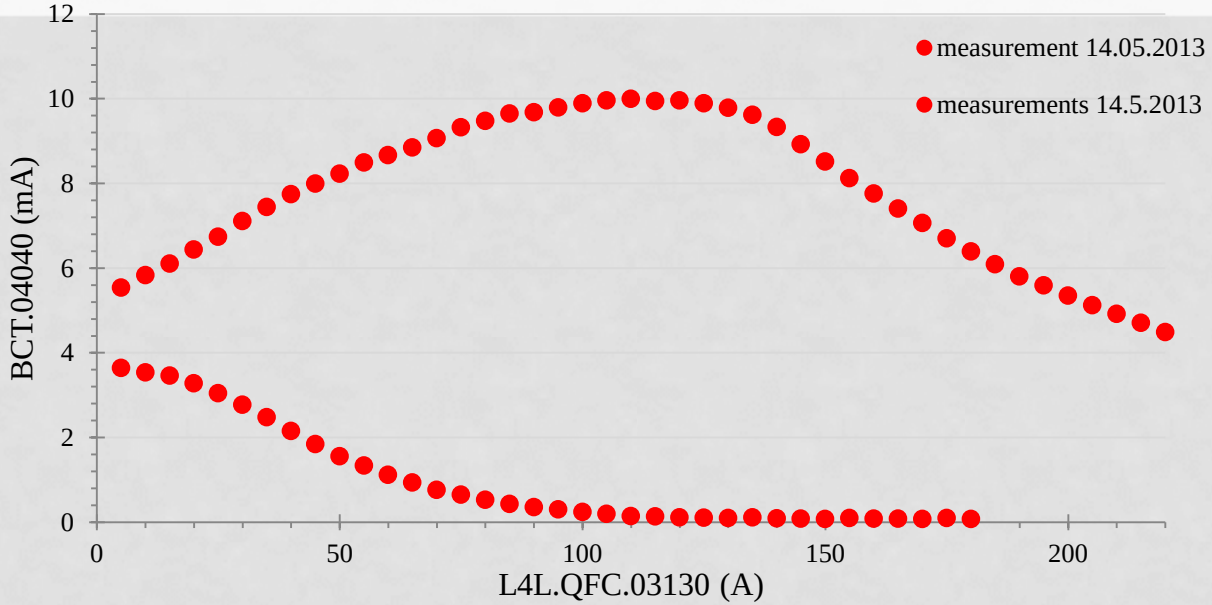
- The RFQ behaves as expected and we can reproduce the transmission curve. The mechanics, RF and the dynamics design are validated
- The integrated chopper dynamics (premiere) works and the chopper rise/fall time is adequate
- The through-beam emittance is the same as the chopper-off emittance
- The through-beam can be matched to the DTL (and soon the DTL will tell us how well)

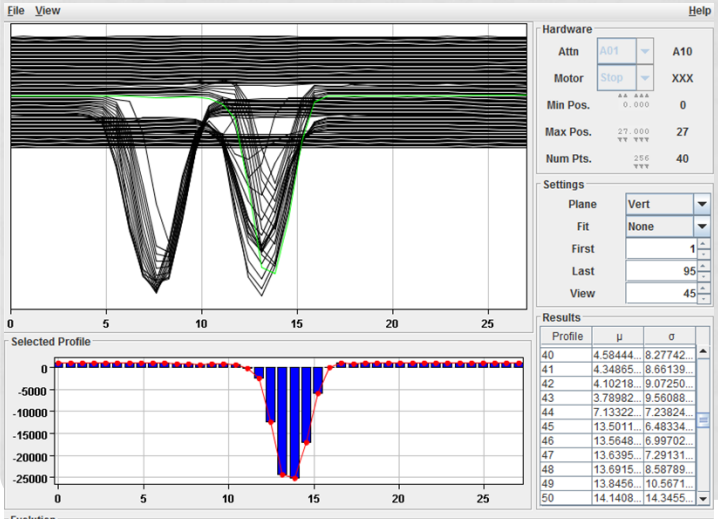
1-RFQ TRANSMISSION

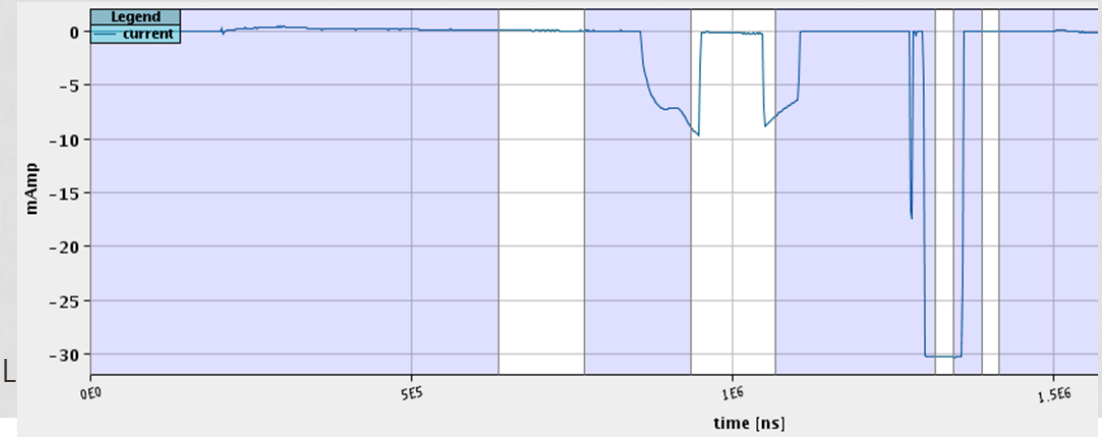


RFQ Transmission vs. RF power for different pressure in the LEBT (neutralisation)

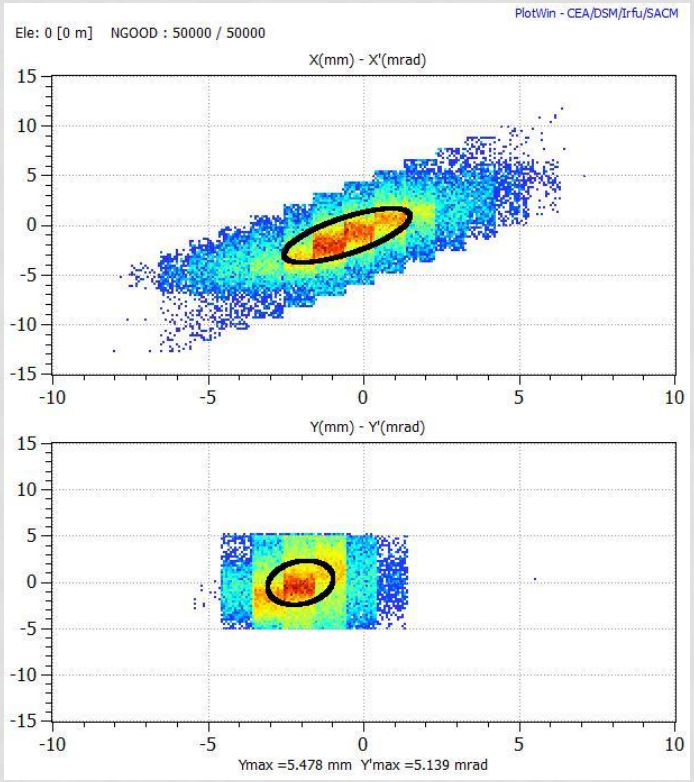
2-BEAM CHOPPING

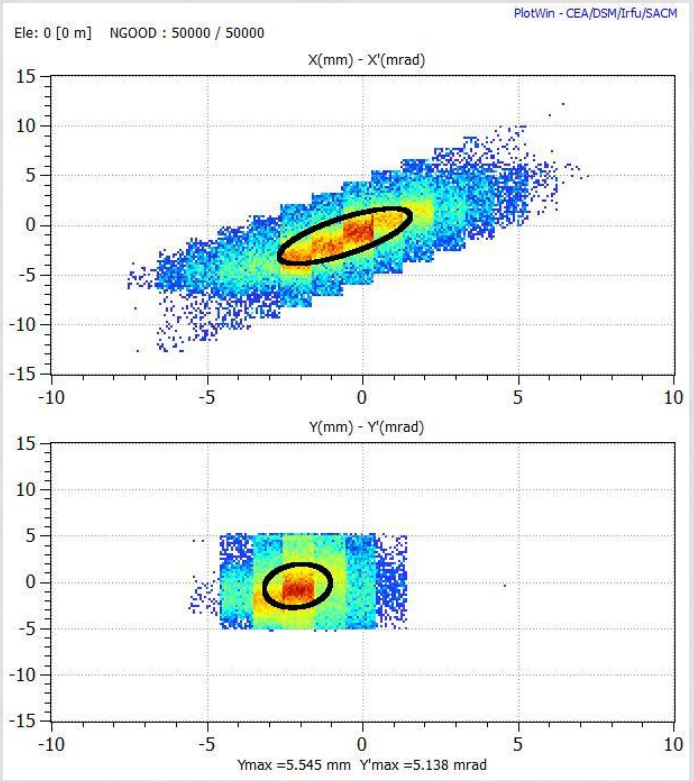






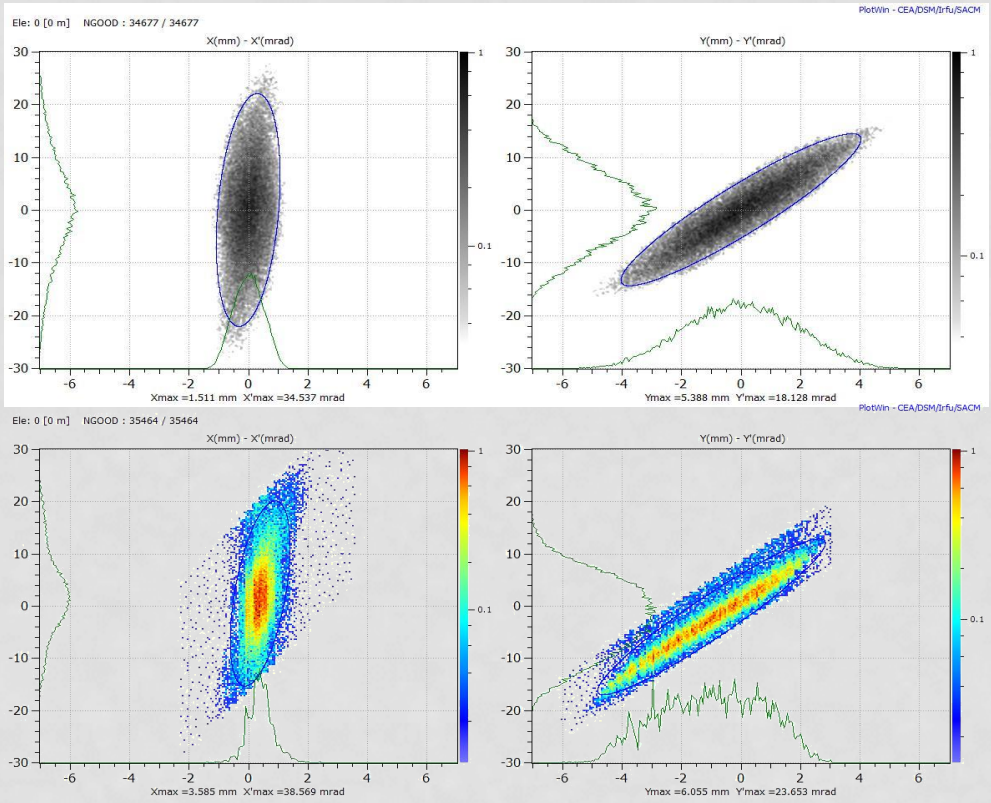
3-EMITTANCE OF THE THROUGH BEAM

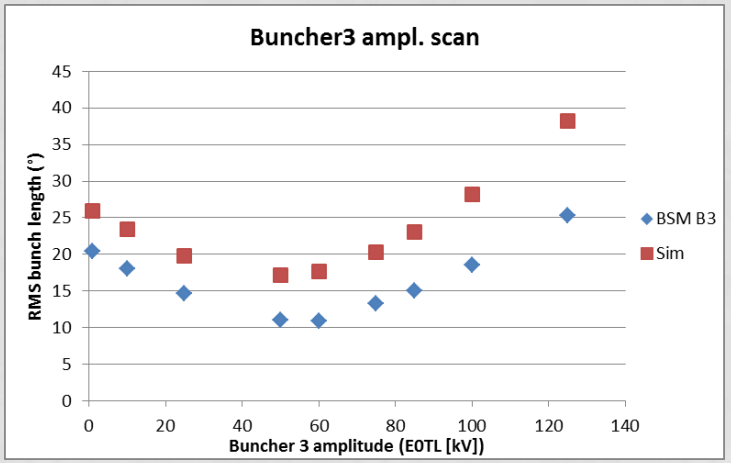




Emittance measured with chopper off (left) and with chopper on (right) downstream the inline dump

4-MATCHING TO THE DTL





95% transmission.
As predicted by the simulation codes (TraceWin and Travel)

IN SUMMARY

What has been done

- The LEBT, RFQ , and chopper line have been commissioned in their final set-up.
- The model have been fine-tuned and are an excellent guide to commissioning endeavours.
- So far so good….

What needs to be done

- The final source needs to be installed (Jacques).
- The DTL, CCDTL, PIMS and transfer line need to be installed and commissioned.
- A reliability run is planned for 2016

NOMINAL BEAM AT PSB

Intensity	40 mA
Transverse	E= 0.3-0.4 pi mm mrad norm rms Alpha= 0 Beta x = 5,2.5,10 m Beta y = 4,2,8 m Dispersion = 0 or 1.2 m
Longitudinal	±100 keV rms energy spread (100-800 KeV possible) 160 MeV ± 1.2 MeV (dynamically over 20 µsec)
Chopped	1 µsec for the distributor rise time 1 MHz frequency of the PSB as low as just letting few µbunches (50 nsec)