Overview of the main post-accelerator characteristics

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HIE ISOLDE Physics Coordination Group 1st meeting

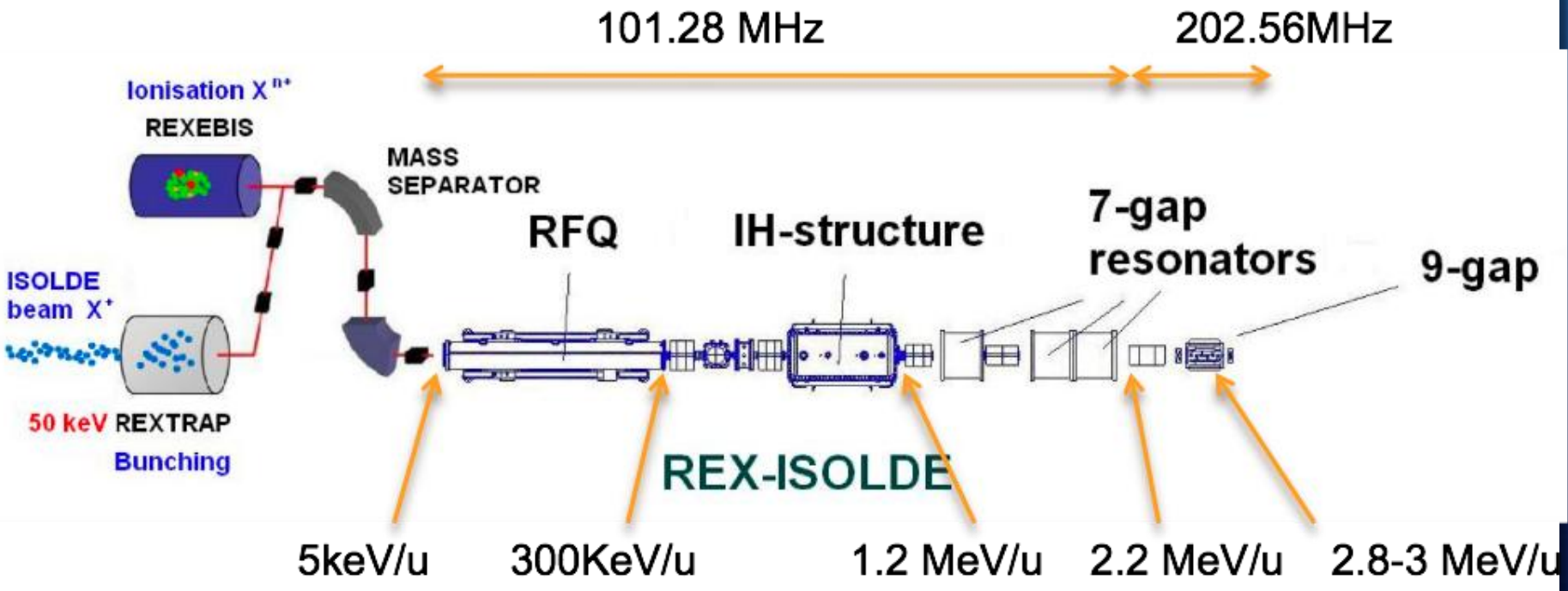
Overview

- Source Characteristics
- NC accelerator Characteristics
- SC accelerator Characteristics
- Beams Parameters @ the linac ejection
- Beam lines layout

Source Characteristics

- EBIS is a "universal" source that operates in pulsed mode; no real CW beam can be expected (possible slow extraction mode)
- Output Energy of the beam is 5 keV/u for the RFQ injection
- Stable beam intensity limited to few 100epA. Difficult operation and long set-up time for optimizing the efficiency and transmission.

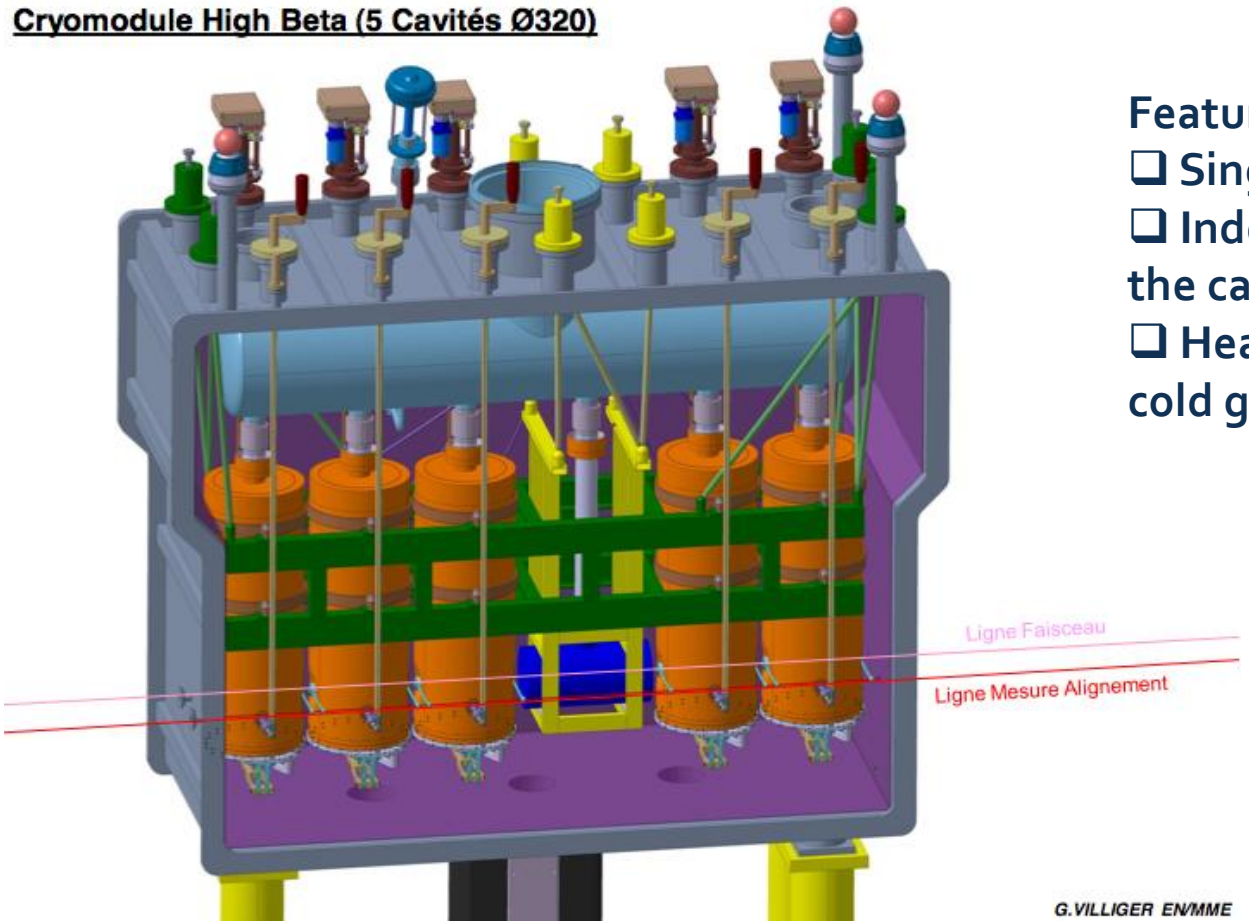
REX-ISOLDE Post accelerator



NC accelerator Characteristics

- RFQ, rebuncher and IH cavity allows to deliver beam up to 1.2 MeV/u. A/q limited by IH structure up to 4.5 and 2.5 (for lower values the cavities are not stable); beam frequency is 101.28 MHz, so microbuch period is 10 ns; total longitudinal emittance ~2 π keV/u*ns, total normalized transverse emittance ~0.6 π mm*mrad
- Energy boosted up to 2.8-3MeV/u by means of three 7-gaps cavity and a second IH-structure
- Energy variability possible only within certain ranges by detuning the cavities
- Transmission around 85%

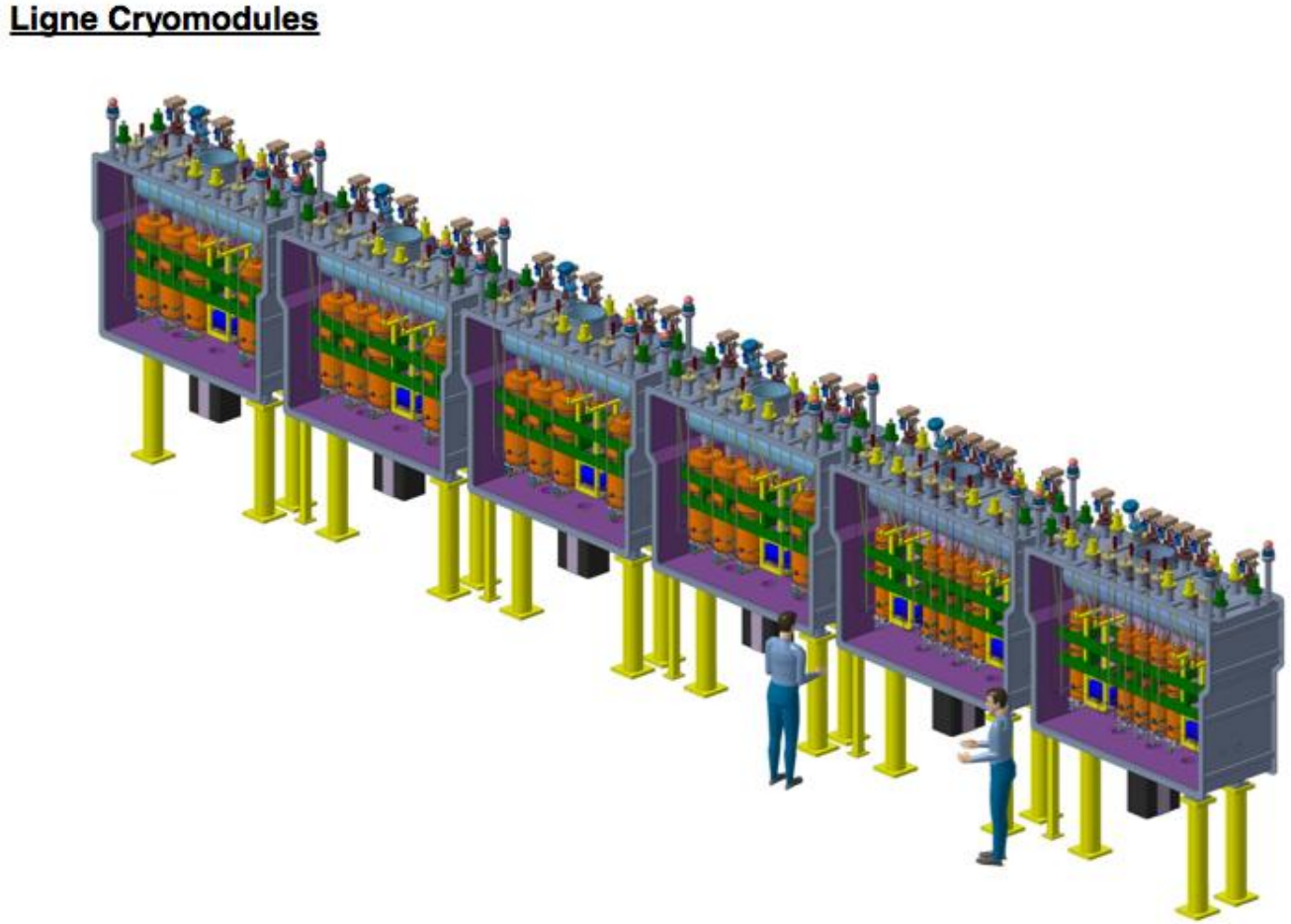
Cryomodule design



Features:

- ❑ Single vacuum cryostat
- ❑ Independent alignment of the cavities w.r.t. solenoid
- ❑ Heat shield cooled by He cold gas

The HIE-ISOLDE SC linac

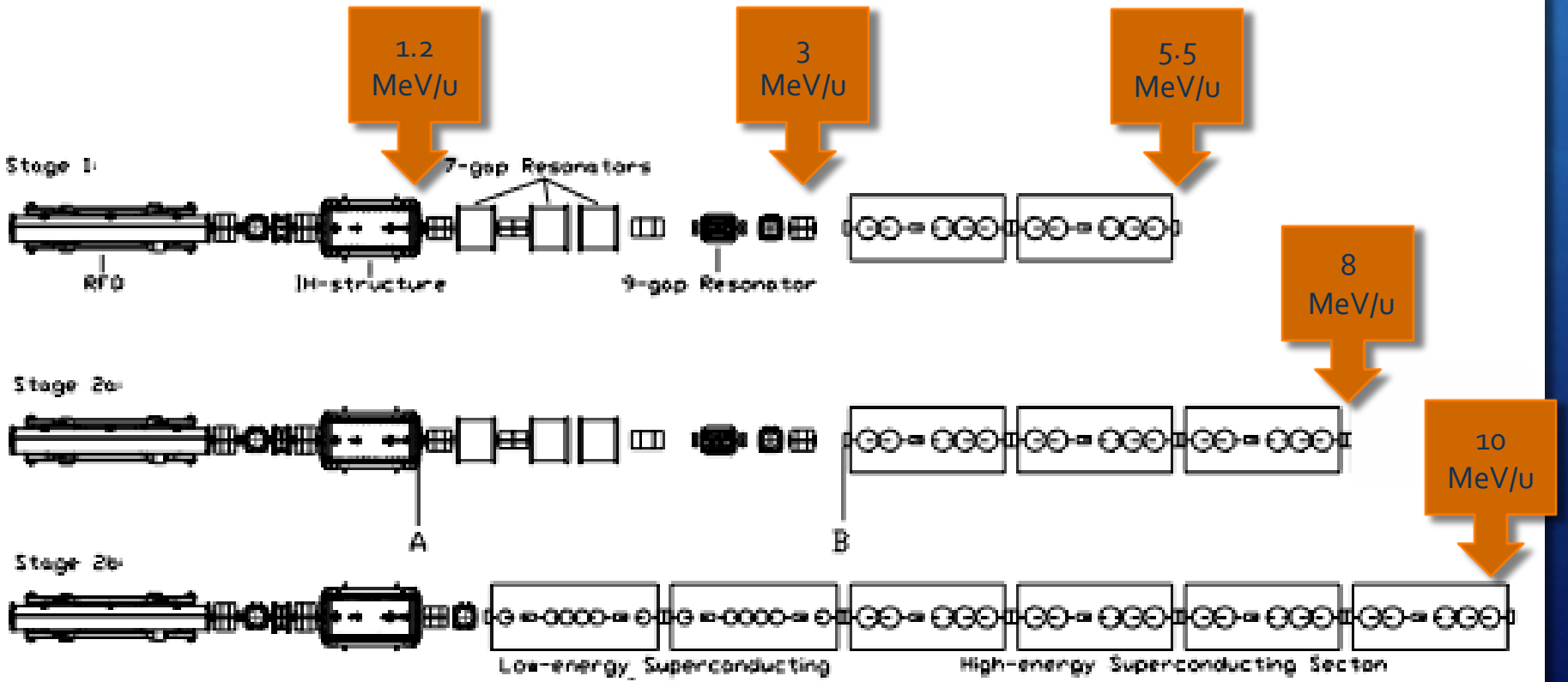


SC accelerator Characteristics

- 32 SC cavities provides full energy variability between 1.2 and 10 MeV/u
- Possibility to decelerate beam down to 700 keV/u and to accelerate up to more then 16MeV/u for A/q=2.5
- Transmission >98% and emittance growth limited to 5 to 10% in the transverse and longitudinal plane
- Focussing done with SC solenoids (Nb3Sn) (Not appropriate for polarized beams). Solenoids are the limiting factor in terms of A/q

HIE-ISOLDE LINAC - layout

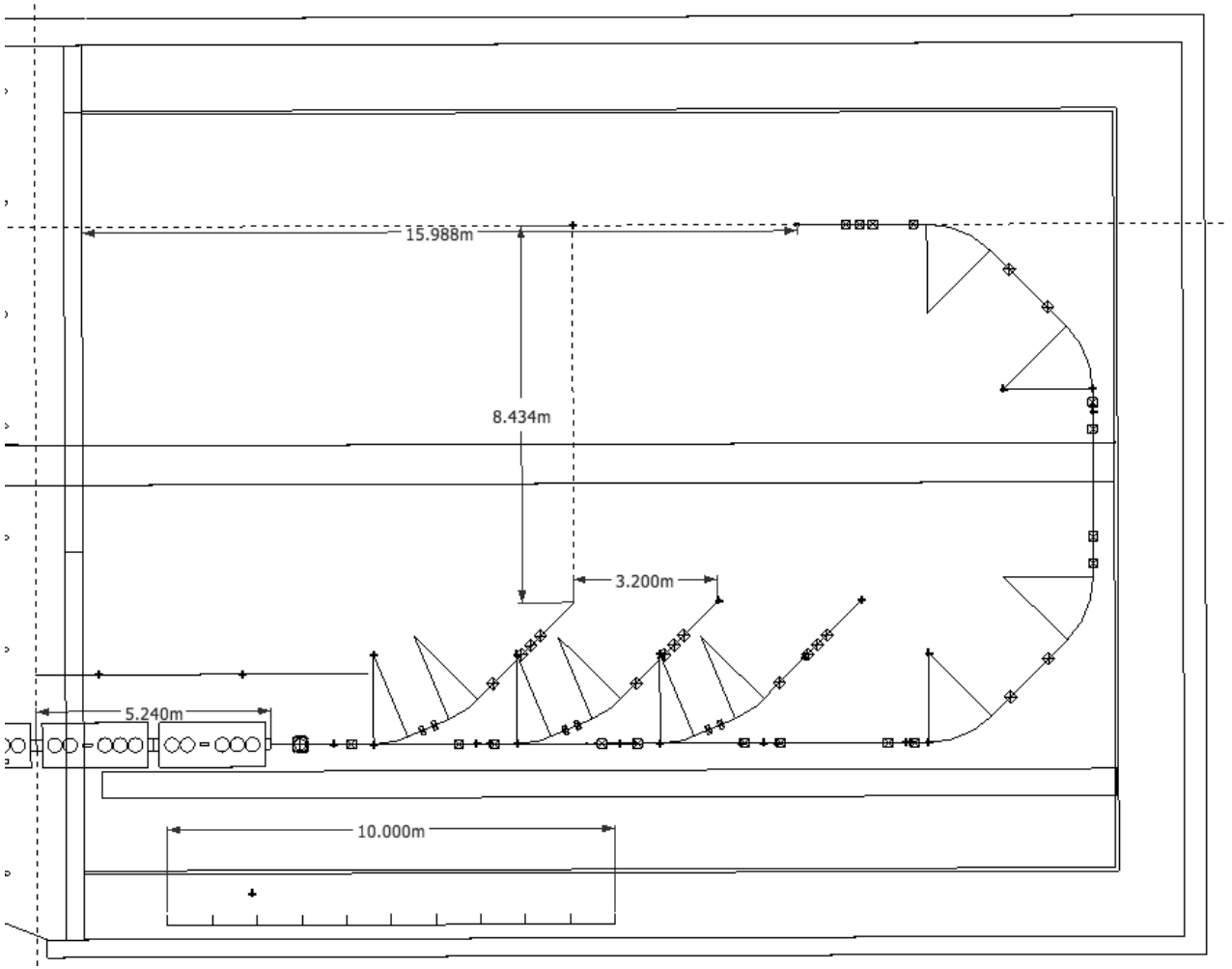
3 stages installation



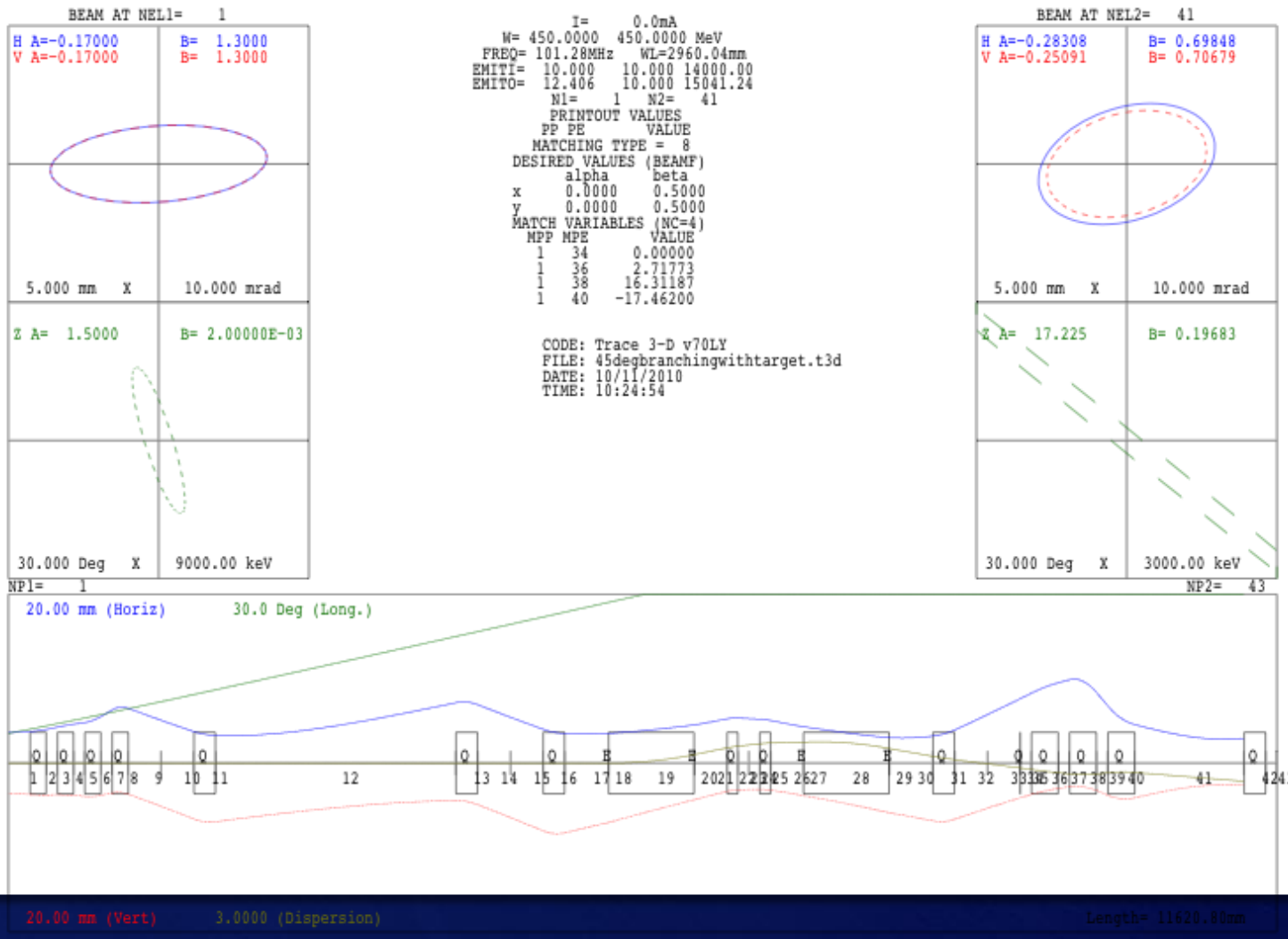
Beam Parameters @ linac ejection

Parameters	Value	Units
Transverse emittance	0.6	Pi mm mrad
Longitudinal emittance	2	Pi keV/u ns
Transmission	>99	%
Emittance growth	<10	%
Energy	0.7 to 16	MeV/u

Beam lines layout



Optics design



Information needed

- Position of the experiments and space requirements
- Specifics Beam properties requests, like energy spread, bunch length, spot dimensions and beam divergence
- Technical requirements: vacuum, cryogenics, alignment, x-ray background
- Stable beam requirements
- Different micro-bunch structure (now period is 10ns, need to go to 100ns?)