



The ISAC Linear Accelerators at TRIUMF

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ABSTRACT

TRIUMF is Canada's national laboratory for particle and nuclear physics. A high intensity proton beam cyclotron is the main accelerator machine on site. Proton beams are extracted at different energies into different beam lines with a maximum extraction energy of 500 MeV. The ISAC I facility produces and accelerates radioactive beams using the highest energy proton beam from the cyclotron. The radioactive beam is used in both low and high energy experiments. For the high energy experiments the radioactive beam is accelerated up to 1.5 MeV/u with a normal conducting LINAC. The new ISAC II complex will host a superconducting LINAC adding a further 40 MV for beam acceleration. A description of the ISAC I LINAC will be given in this poster including diagnostics and tuning methods. Besides some highlights of the future ISAC II LINAC will be presented.

ISAC at TRIUMF




MEBT

- Stripping Foil
- 35 MHz Buncher
- Chopper: 11.8 MHz and 5.5 MHz




RFQ

- 4-vane Split Ring Structure
- 8 m Long
- 85 kW, 74 kV Peak to Peak
- 35 Mhz
- $A/Q \leq 30$
- $E_{in} = 2 \text{ keV/u}$
- $E_{out} = 153 \text{ keV/u}$



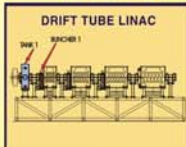
OLIS - LEBT

- Stable/Pilot Beam
- MWS & ISIS Sources
- Energy 2 keV/u
- Electrostatic LEBT
- 11.8 MHz 3-harmonics Buncher



DTL

- Variable Energy DLT
- 5 Accelerating Tanks
- 3 Bunchers
- 105 Mhz
- $3 \leq A/Q \leq 6$
- $E_{in} = 0.15 \text{ MeV/u}$
- $E_{out} = 1.5 \text{ MeV/u}$

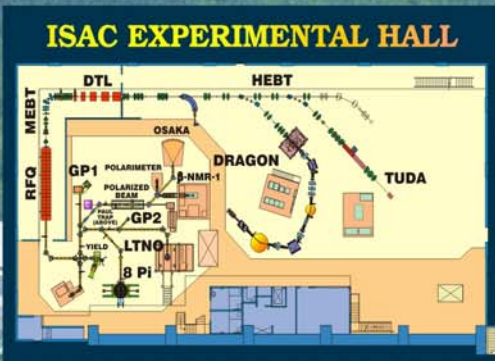


DRIFT TUBE LINAC




HEBT

- Energy measure: Prague Magnet
- Low Beta and High Beta Bunchers



DIAGNOSTICS

- Faraday Cups: Intensity
- Profile Monitors: Profile
- Fast Faraday Cups: Timing
- Prague Magnet: Energy
- Silicon Detector: Low Intensity Detector



TUNING


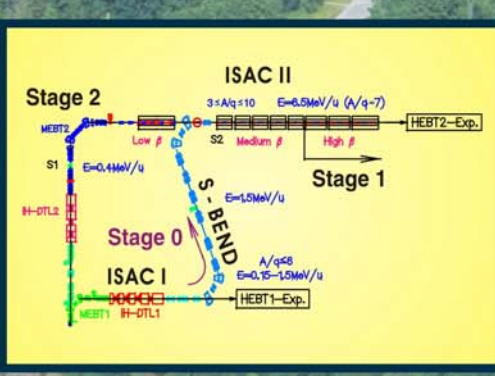
- EPICS Control System
- Set Optics Theoretical Setting
- Set RFQ Voltage
- Set 3-harmonics Buncher
- Set MEBT Buncher
- Set DTL for the Request Energy



- Tuning for Transmission
- 75% through RFQ
- > 95% through the DTL


ISAC II LINAC

- 40 Superconductive Cavities
- Each Cavity gives 1MV at 4 W
- Independently Phased Cavities
- Increase Final Energy by 40MV
- Superconductive Solenoid
- Transport $3 \leq A/Q \leq 6$

EARLY TESTS

- Source of α Particles @ 2.85 MeV
- Unbunched Beam
- In the Clean Room
- LANA Simulations Match Experimental Spectra



VAULT TEST

- $^{24}\text{Mg}^{6+}$ @ 1.5 MeV/u
- Bunched Beam
- In the Vault
- From DTL through the S-BEND
- Real Acceleration

