DTL Tank #1 Diagnostics Plate

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SNS Diagnostics Review

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Purpose of Diagnostics Plate

Commission DTL Tank #1
Aperture scans
Transmission scans
Phase, energy, and amplitude scans
Emittance measurements
Matching of MEBT into DTL

Full power operation of DTL tank #1
Run for extended time at full beam current and duty cycle (16 kW)

Development of Injector
Ion source, LEBT. RFQ, and MEBT

D Plate must be removed to install DTL tank #2

Overall D-Plate Parameters

- Overall length is about 3 meters.
- Must remove D-Plate to install DTL tank #2.
- Can handle full-power 7.5-MeV beam (16 kW).
- 10-sigma beam stay-clear aperture everywhere.
- Vacuum about 5 x 10^{-6} torr (ok for stripping loss).

7.5-MeV Diagnostics Plate Measurements

Beam profiles

wire scanners

Beam current

DTL-type toroid

Faraday cup, with energy degrader foil.

Beam synchronous phase

DTL type drift tube BPM

Beam energy

Time of flight (no momentum analyzer)

7.5-MeV Diagnostics Plate Meas (cont)

Emittance

slits and collectors

Beam image

view screen

Full beam operation

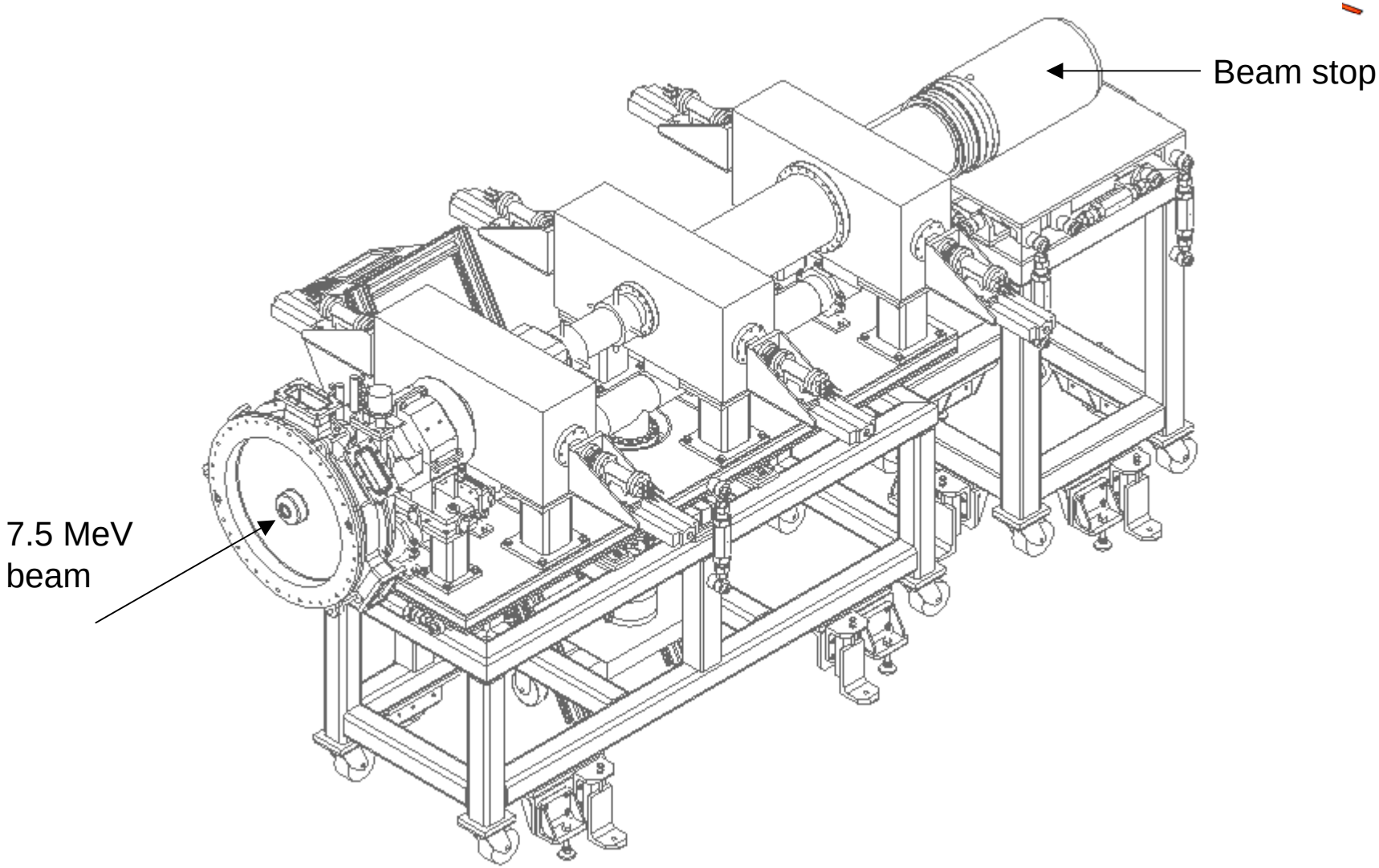
36 mA, 7.5 MeV,1 ms, 60 Hz (16 kW)

Conical nickel beam stop (low activation)

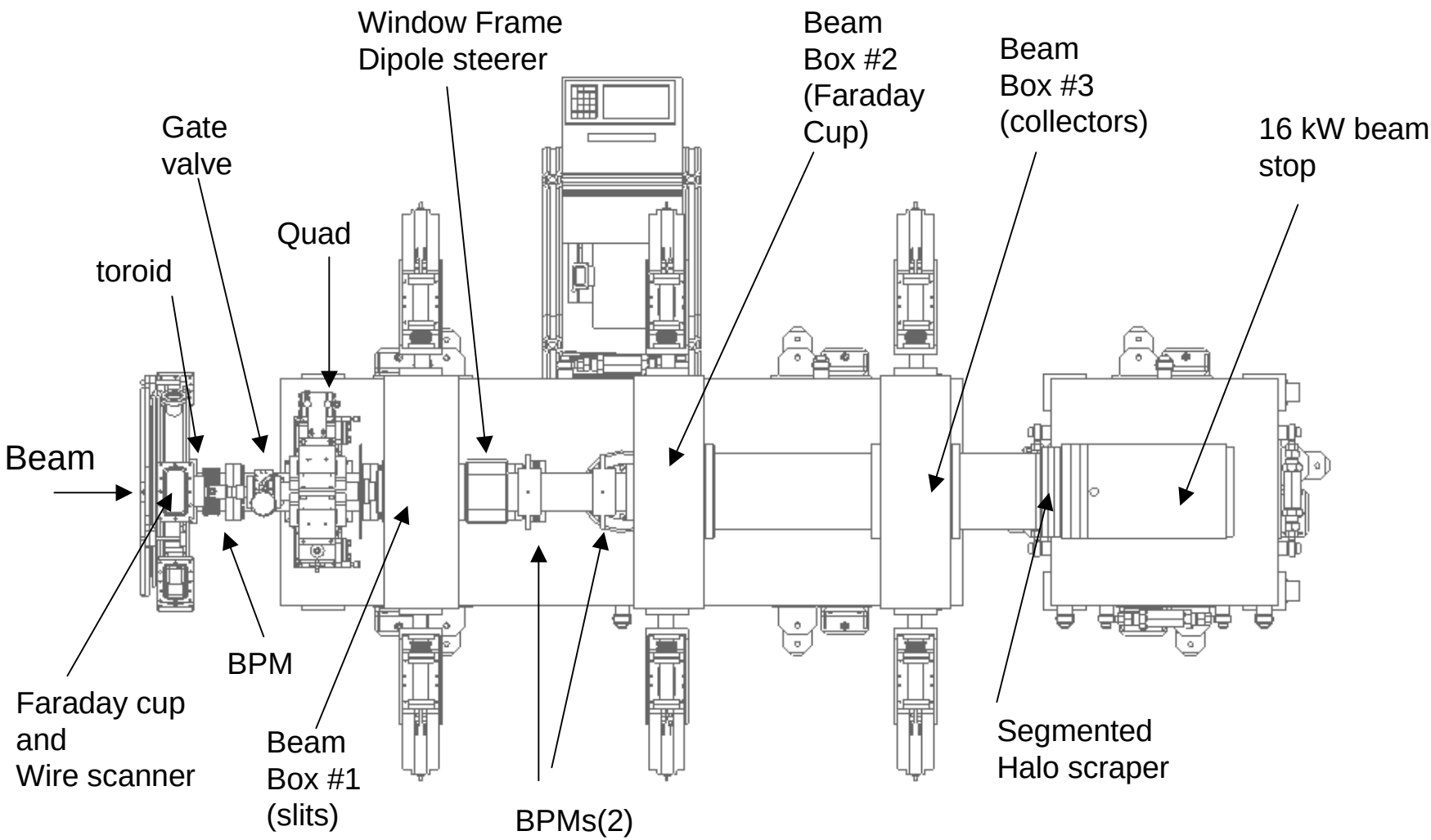
Halo

Segmented halo scraper (fixed aperture)

Diagnostics Plate Isometric View



Diagnostics Plate Top View



Diagnostic Plate Hardware

Energy degrader and Faraday cup (low duty cycle)

- Permanent intertank diagnostic
- Used for aperture scans only

Wire scanner (low duty cycle)

- permanent intertank diagnostic
- very low duty cycle

Beam current toroid

- DTL style, endwall geometry

BPM

- DTL drift tube design (805 MHz)
- Use for synchronous phase measurements

Quadrupole

- For optimizing beam profile for slit and collector meas.

Diagnostic Plate Hardware (cont)

X and y slits (low duty cycle)
For emittance scans

Wire scanner (low duty cycle)
For wire profiles

Window frame dipole magnet
For steering beam into beam stop

BPMs (2)
For time of flight, steering

Energy degrader and Faraday cup
Intermediate beam power runs

View Screen (low duty cycle)
View beam profiles

Diagnostic Plate Hardware (cont)

X and y collectors

for slit & collector emittance meas.

Segmented halo scraper

8-segment halo scraper

determine extent of halo

Center beam on beam stop

16-kW beam stop

Conical profile

Full beam power

36 mA, 1 ms, 60 Hz at 7.5 MeV (16 kW)

300 watts/cm^2 max effective power density

nickel material (low activation)

Schedule and Summary

Schedule

Installation in tunnel 08/02

Summary

- Lots of diagnostics on D-Plate.
- Tests some permanent linac diagnostics.
- No show stoppers.