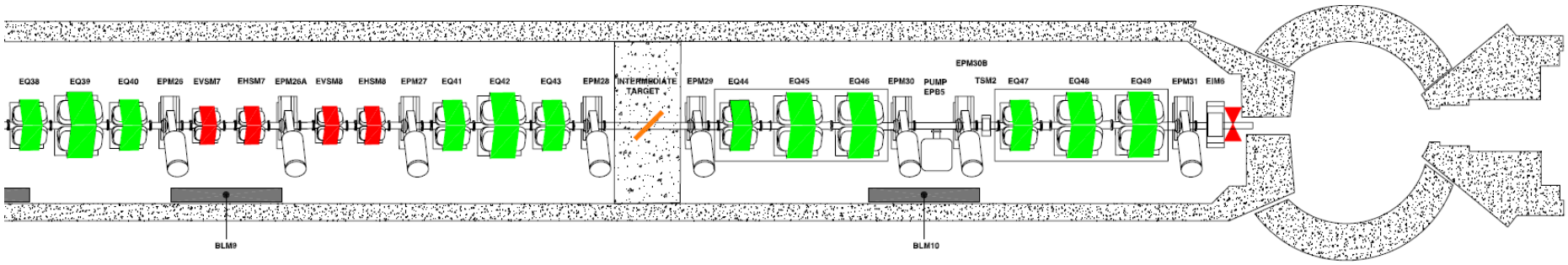


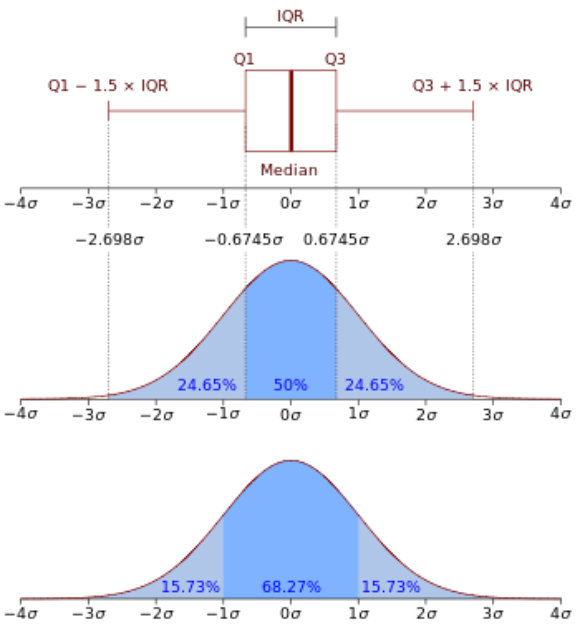
Delivering Beam to ISIS TS1

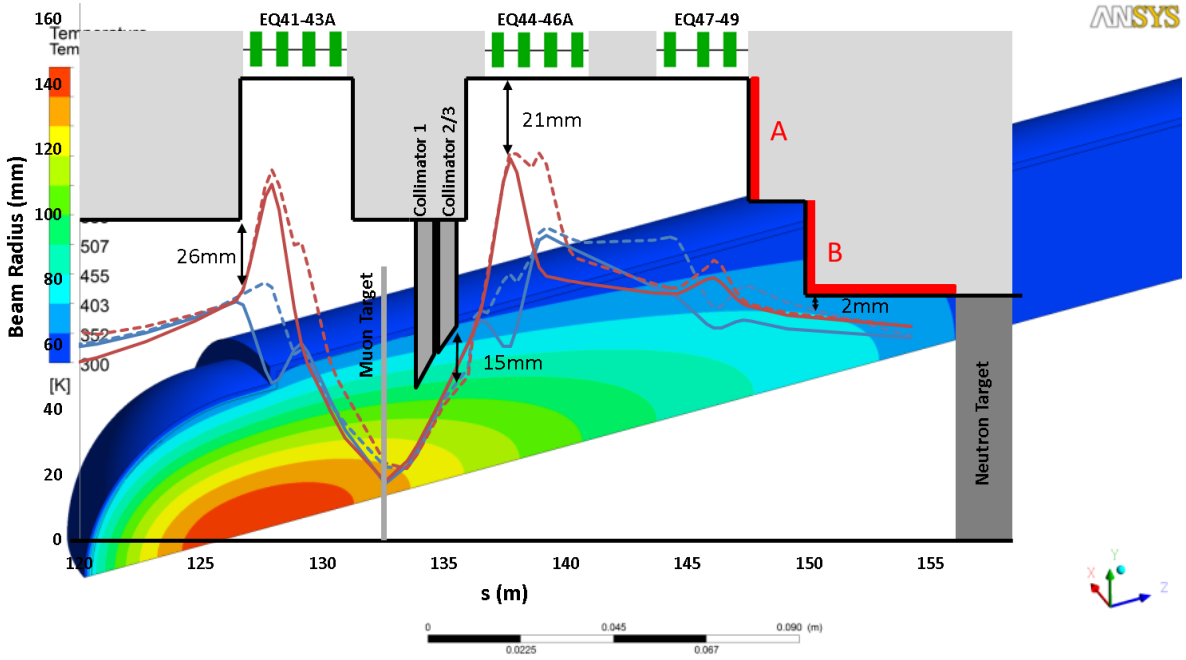
Bryan Jones

ISIS Synchrotron Group

Background

- New better-optimised TS1 design
  - Can we shrink/move the beam?
- Does design allow for sufficient operational flexibility?





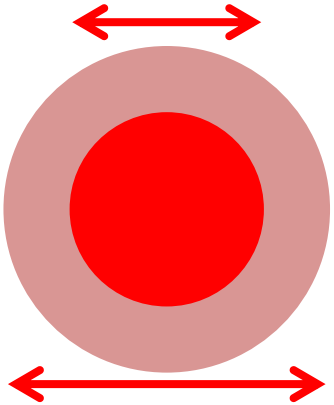
Content

- Definitions
- Design Beam
- Diagnostic systems
- Beam Trips/Warnings
- Scope for Error
- Operational Experience

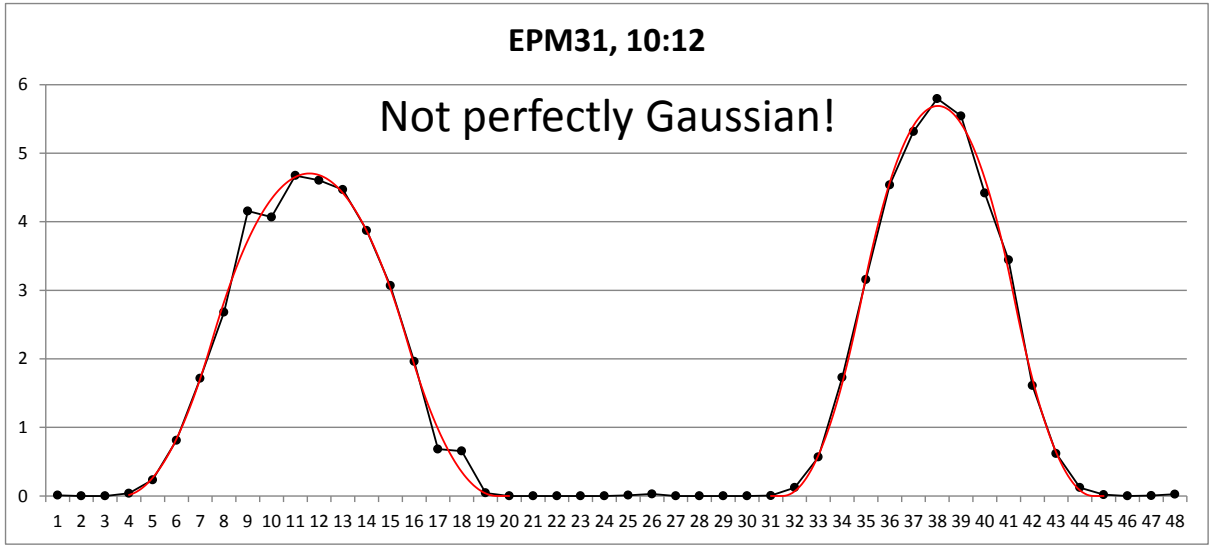
Definitions

- 95% beam widths
  - Calculated from EPB Profile Monitor data
- ‘100%’ beam widths
  - Confirmed by deliberately mis-steering into beam pipe

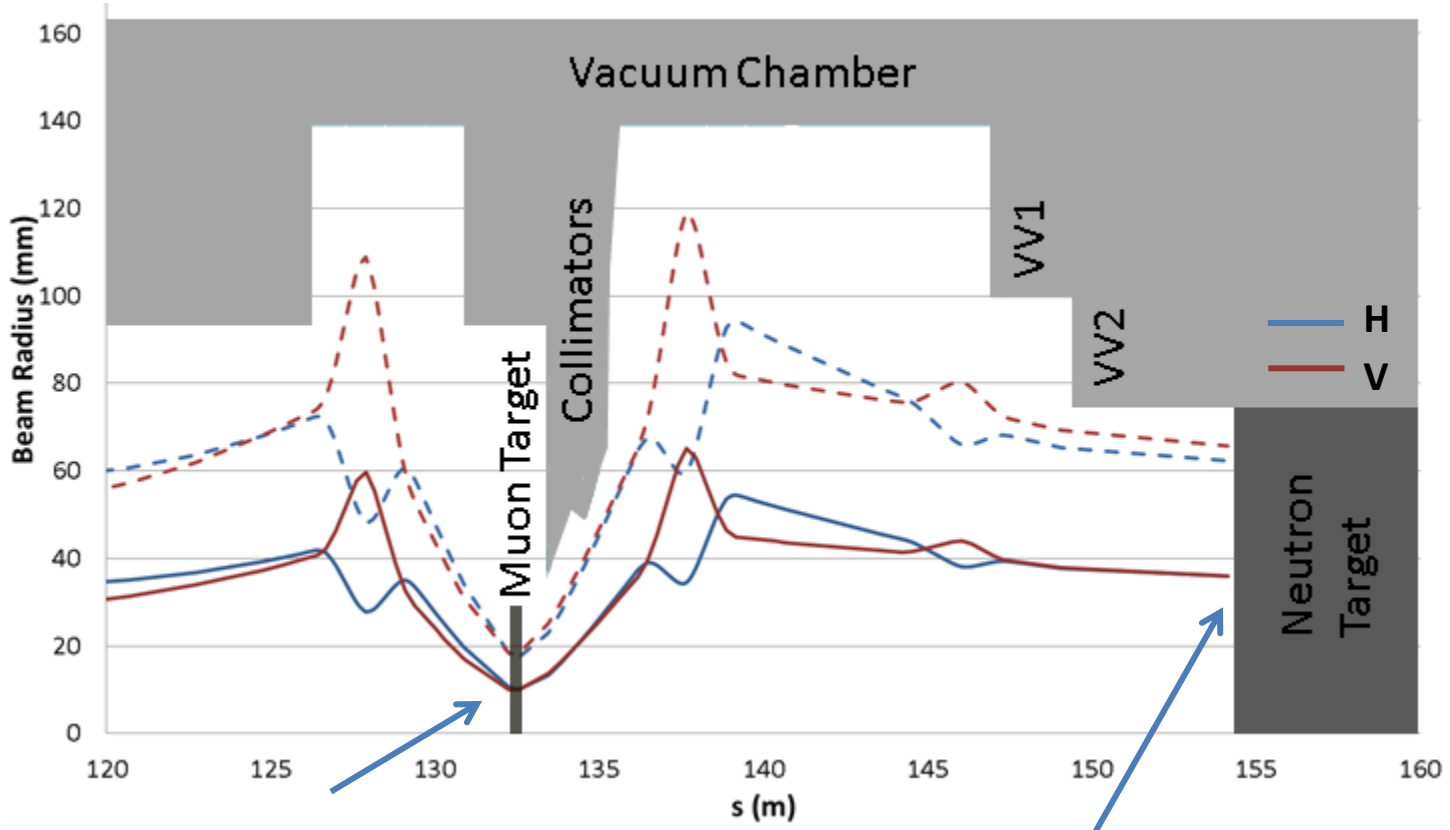
10mm 95% width



17mm 100% width



Design Beam Optic

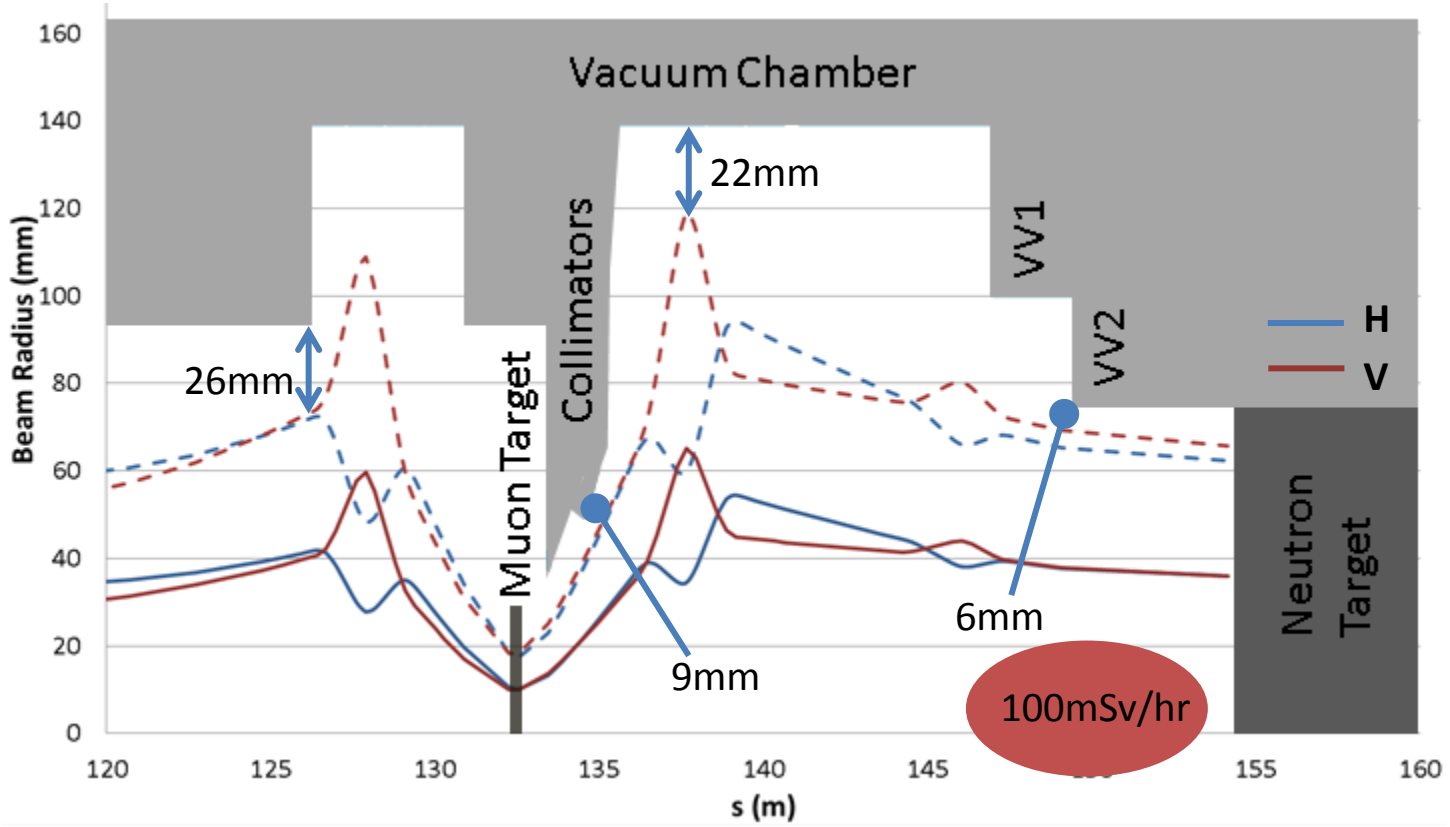


95% Radii = 10mm

95% Radii = 36mm

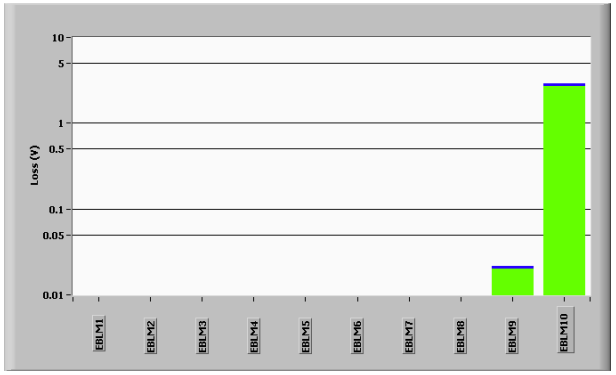
Design Beam Clearance

Design goal is 20mm clearance everywhere

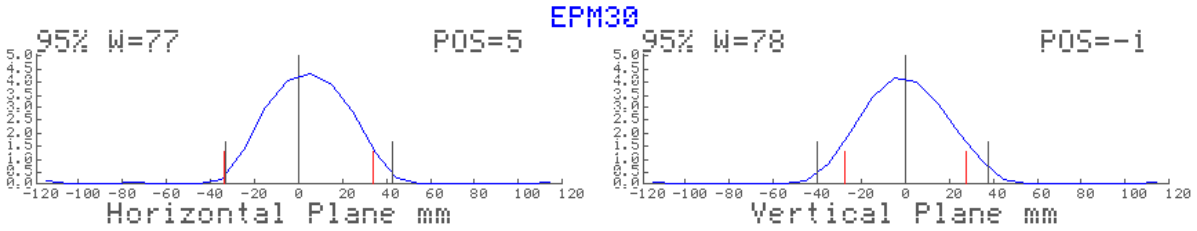


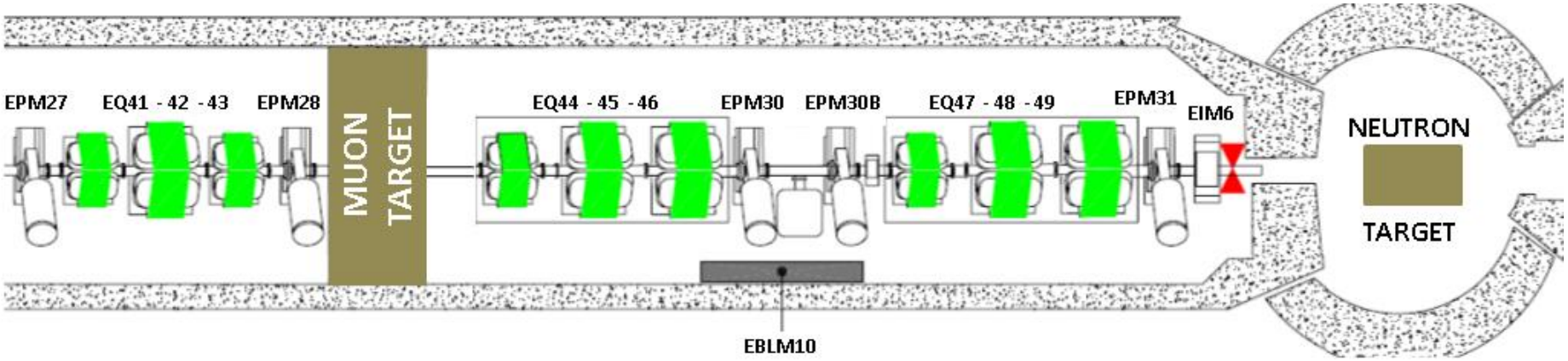
Diagnostics

- 5 Profile Monitors (Harp type)
- 1 Beam Loss Monitor
- 1 Intensity Monitor



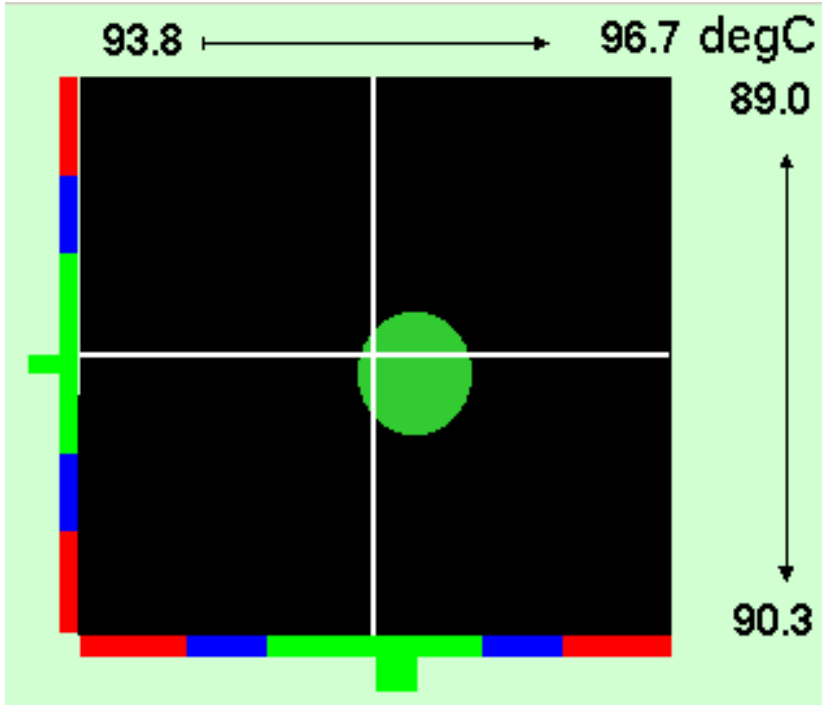
EIM5:	2.49E+13 ppp	100.0% Trans
EIM6:	2.42E+13 ppp	97.1% Muon
Overall Efficiency T1		91.8%

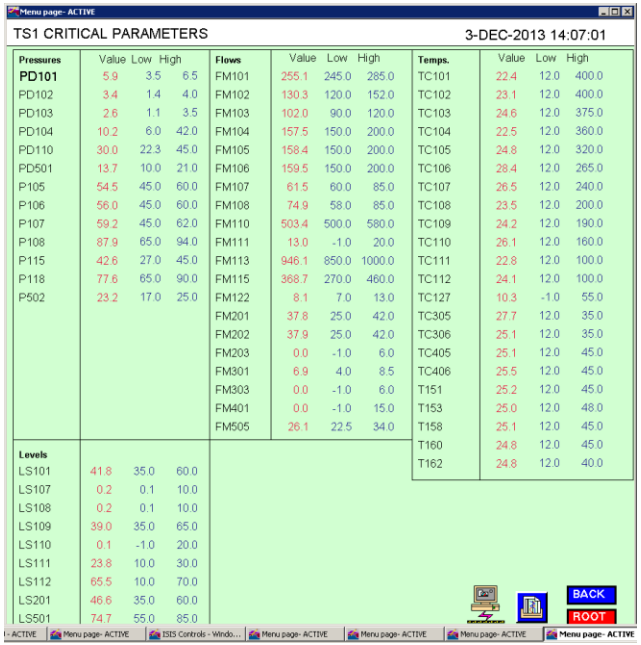




Diagnostics

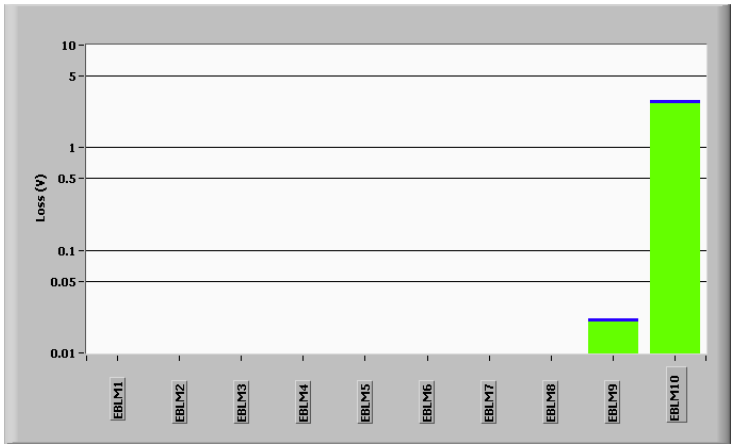
- Halo monitor
  - Eight thermocouples
  - Relative measurement
  - Does calibration hold?

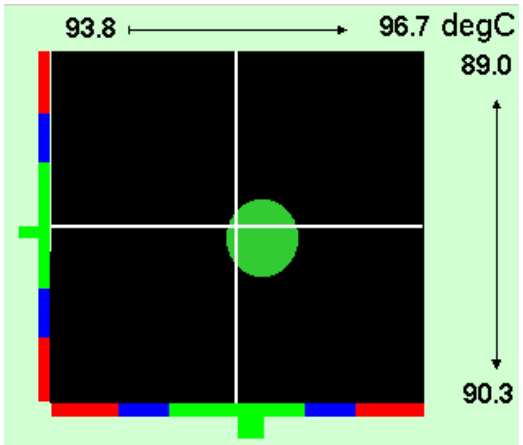




Setup Procedure

- EPMs used to check beam alignment and widths
  - ± 5mm is acceptable
- Minor adjustments to optimise
  - EBLM9,10 loss levels
  - Halo monitor temperatures





Beam Protection System

- Beam Loss

  >6 V on EBLM10, normal operation = 3.0±0.5 V

- Beam Intensity

  >1.5×10^{12} particles lost between start/end EPB

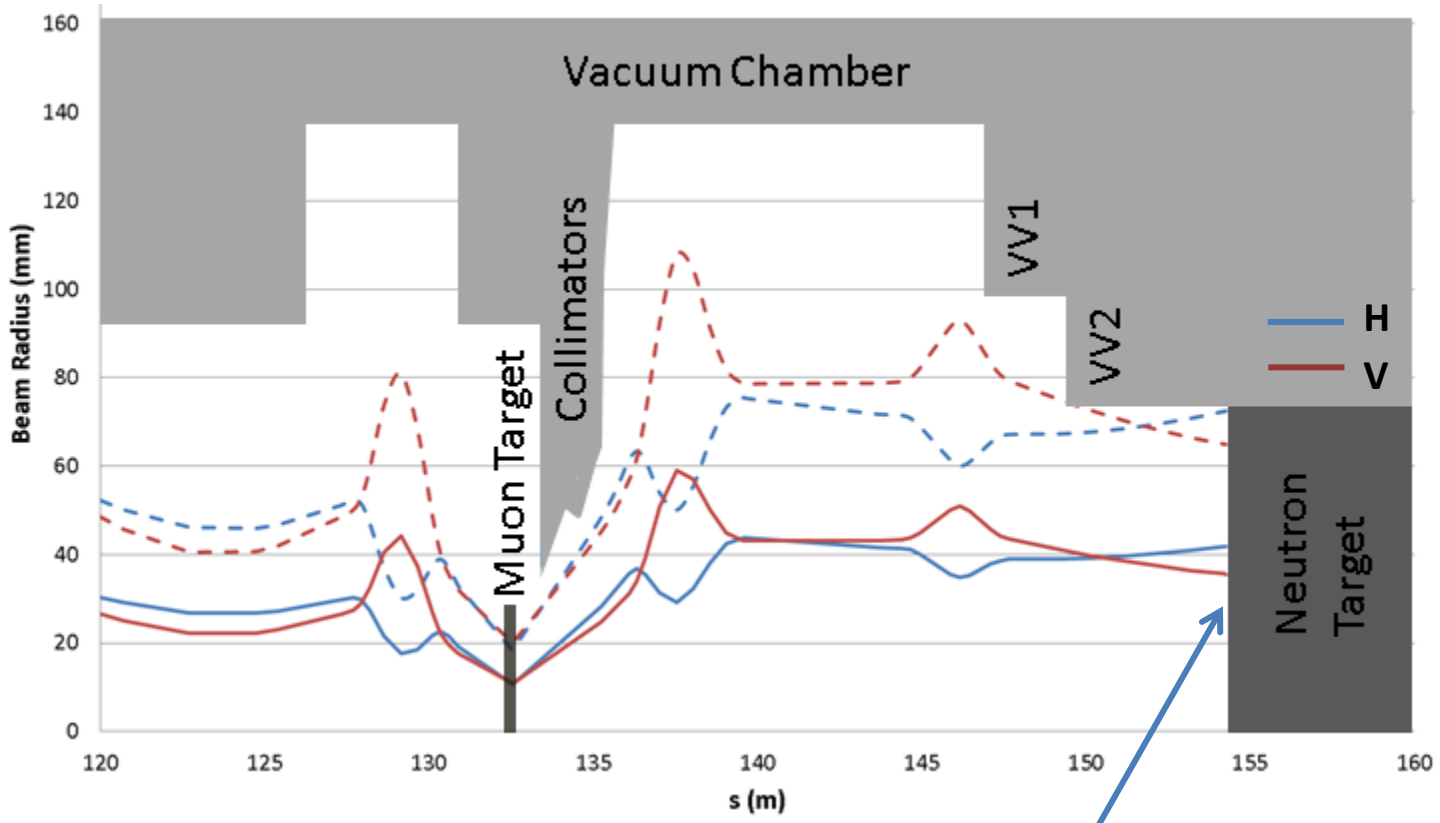
- Halo Monitor

  Any one >140°C **or** left-right/top-bottom difference >14°C

1 event = beam inhibited for 2 seconds
2 events in 10s = beam off and first beam stop inserted

Scope for Error

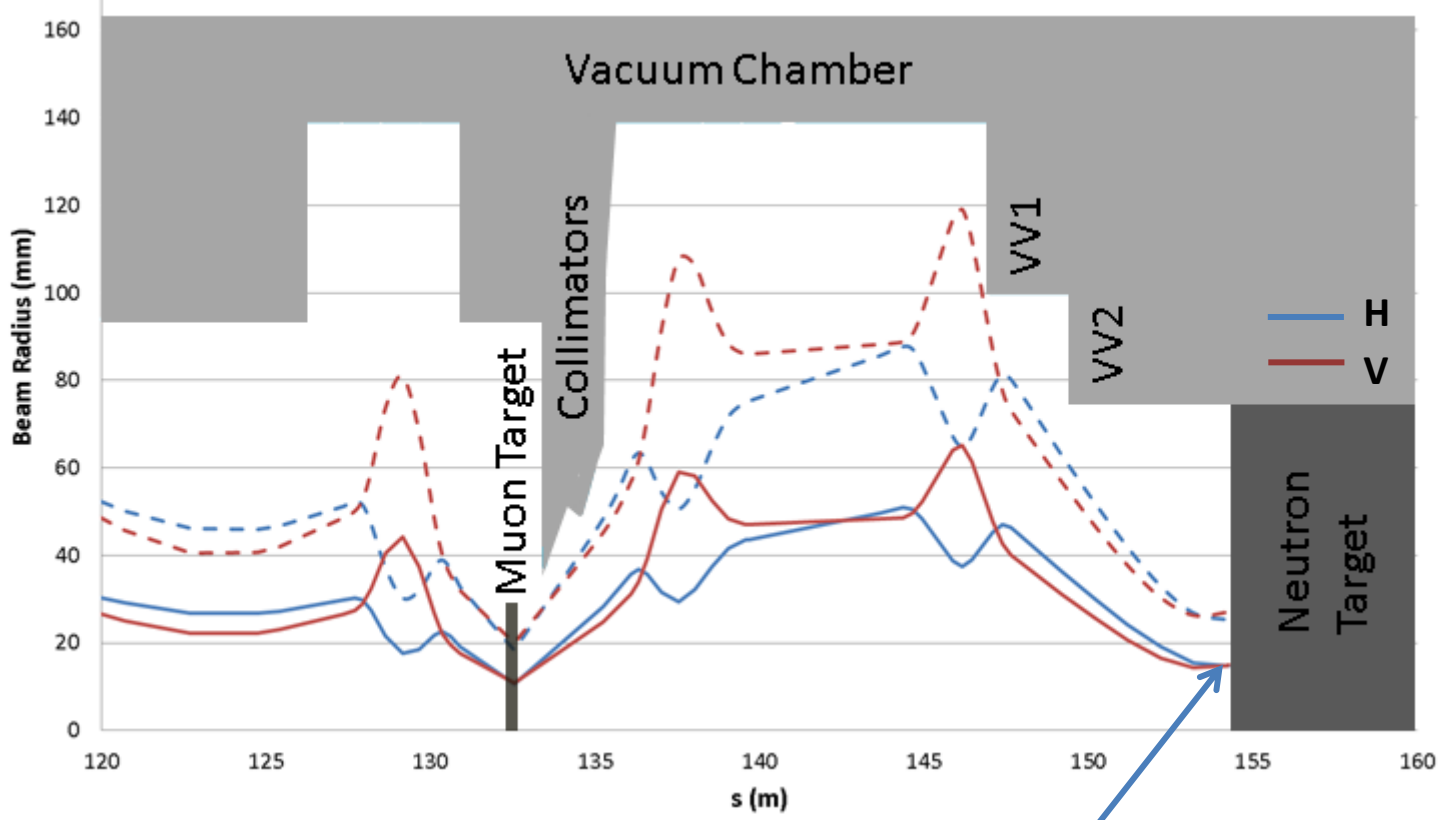
Under Focussed Beam



95% Radii = 42 x 38mm

Scope for Error

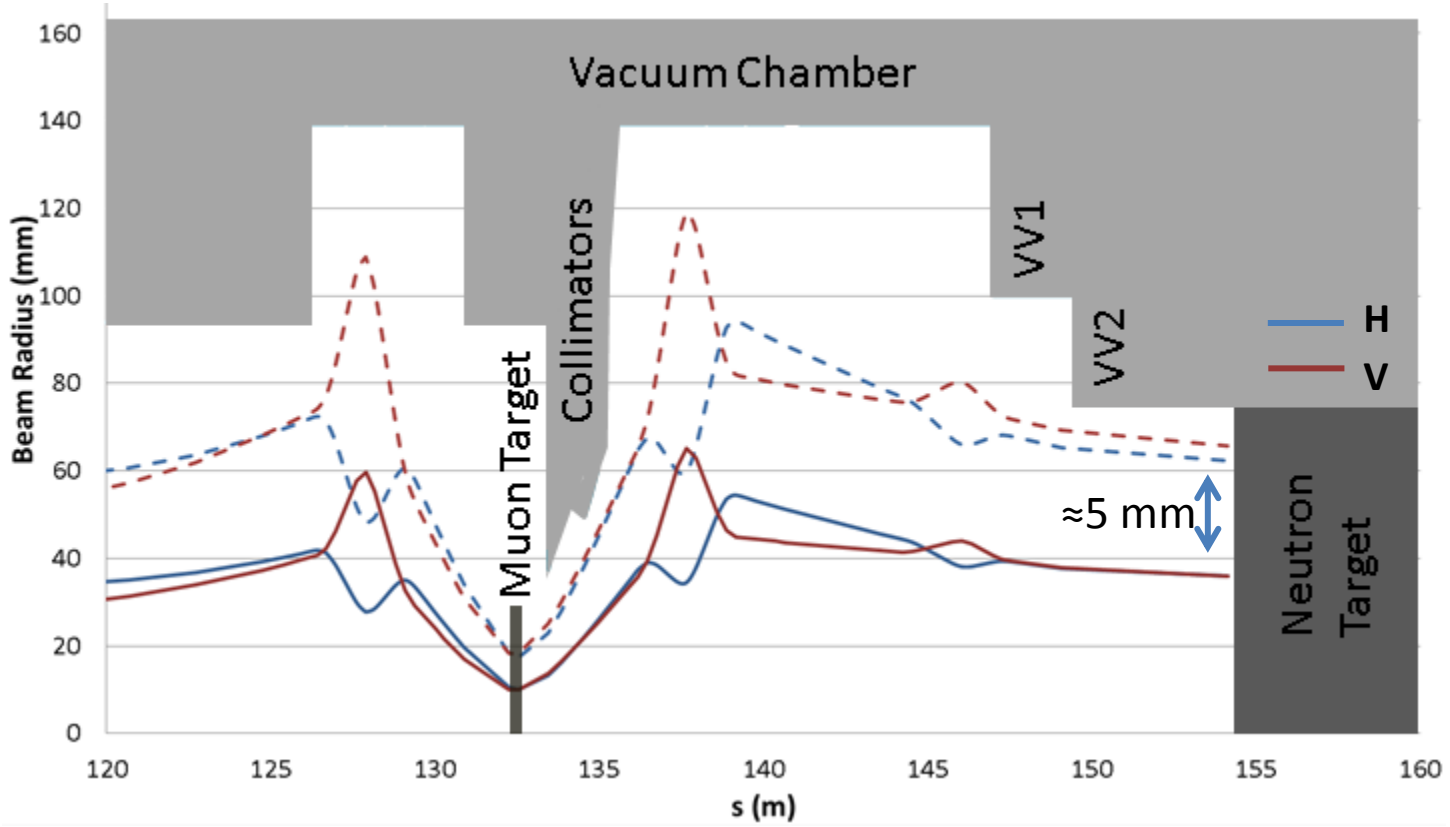
Over Focussed Beam



95% Radii = 15mm

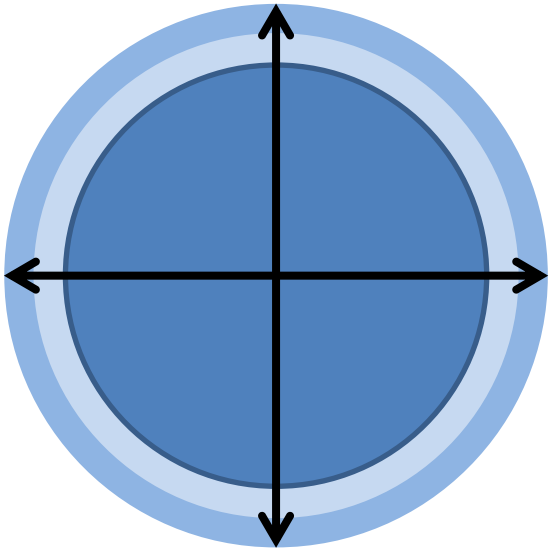
Scope for Error

Mis-steered Beam



Operational Experience

- Summary
  - Estimate setup with beam at target face
    - ± 5 mm error on 95% width
    - ± 5 mm error on centroid position
  - Possibility of greater error within BPS limits (15 - 42 mm radius)
  - Stable to ± 2mm during operation



Conclusion

- Beam is not perfect…
- Finite number and accuracy of diagnostics
- Finite stability of components
  - Must allow margin of error for continuous operation