

BPM vs Beam position on target from beam scan for FY19 run

Goal:

Use two BPMs to monitor a beam position and angle.

Beam Line Configuration and Beam Scan Result:

The beam line configuration is shown in Figure 1. Two bpm's are located at the station 121 and TGT. The beam position on two bpm's are aligned by the hadron monitor scan. Then, the beam position on the target is measured by using a thermocouple sensor.

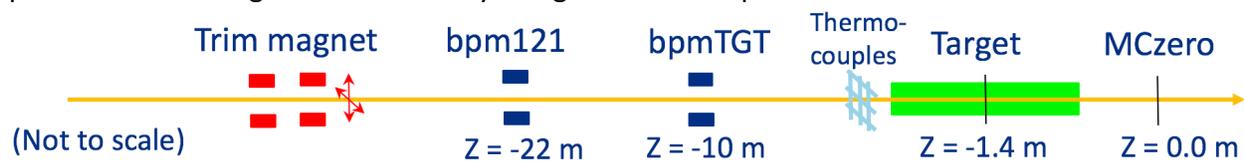


Figure 1: Beam line configuration.

Figure 2 shows the observed hadron monitor signal. From this, we found that the hadron monitor center is (16.019, -20.558, 709000) mm on the BPM coordinate system. Error of analysis is typically 0.5 mm.

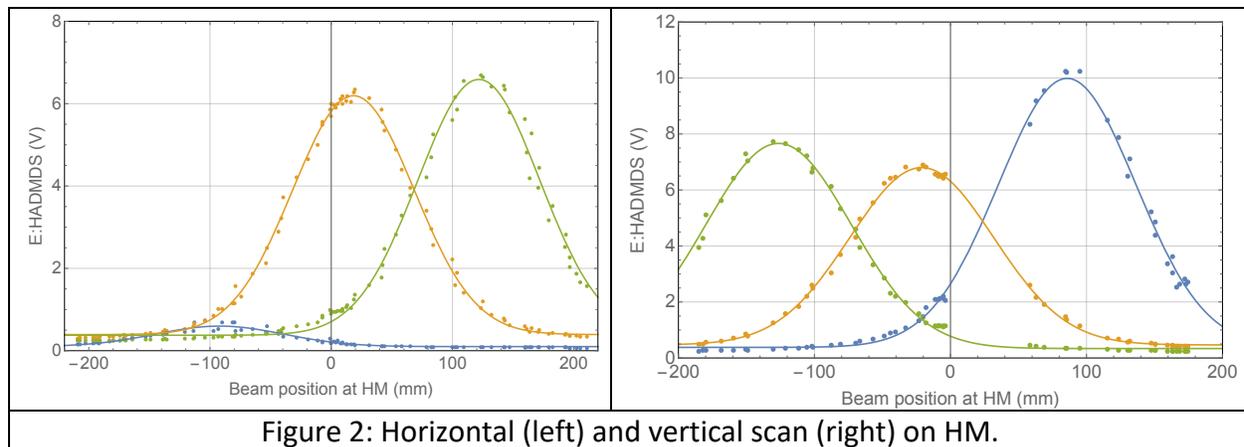
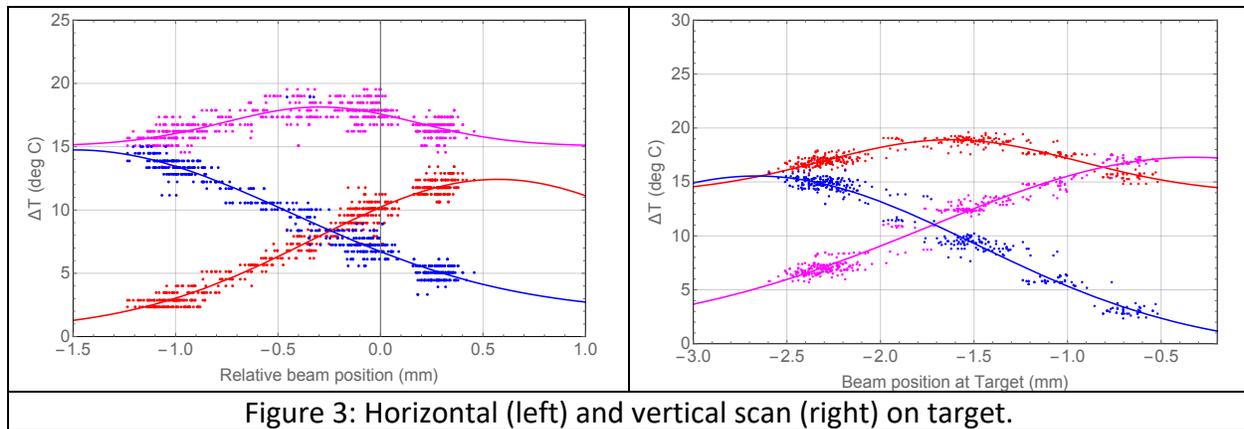


Figure 3 shows the observed thermocouple sensor signal. From this, we found that the target center is (-0.395, -1.541, -1400) mm on the BPM coordinate system. Error of analysis is typically 0.05 mm.



Estimate Beam Position at bpm121 and bpmTGT:

The linear formula of the beam center in the BPM coordinate system is,

$$\text{Horizontal: } X = 0.00002311 Z - 0.36265 \text{ mm,}$$

$$\text{Vertical: } Y = -0.00002677 Z - 1.5785 \text{ mm.}$$

Since the slope is so small that the beam center at the bpm121 and bpmTGT are almost the same.

Other beam element position on the BPM coordinate system:

Horn 1 neck: (-0.52, -1.544, 820) mm

Horn 1 DS fin: (-0.023, -0.704, 3343) mm

Horn 2 US fin: (0.976, -1.942, 19760) mm

Horn 2 DS fin: (, , 23760) mm

Error of those measurements is typically 0.1 mm.

ACNET channel list:

For X-hair scan:

E:TRTGT (Toroid)

E:H1ALM (Ion chamber near H1 DS fin)

E:H2ALM (Ion chamber near H2 DS fin)

E:HADINT (Integrated HM signal)

E:HADMDS[176] (Signal from the HM central pad)

E:HP121 (Horizontal bpm at bpm121)

E:VP121 (Vertical bpm at bpm121)

E:HPTGT (Horizontal bpm at bpmTGT)

E:VPTGT (Vertical bpm at bpmTGT)

For hadron monitor scan:

Vertical scan

E:HADMDS[155] (HM pixel 155)

E:HADMDS[162] (HM pixel 162)

E:HADMDS[169] (HM pixel 169)

E:HADMDS[176] (HM pixel 176)

E:HADMDS[183] (HM pixel 183)
E:HADMDS[197] (HM pixel 197)
E:TRTGT (Toroid)
E:HP121 (Horizontal bpm at bpm121)
E:VP121 (Vertical bpm at bpm121)
E:HPTGT (Horizontal bpm at bpmTGT)
E:VPTGT (Vertical bpm at bpmTGT)
Horizontal scan
E:HADMDS[173] (HM pixel 173)
E:HADMDS[174] (HM pixel 174)
E:HADMDS[175] (HM pixel 175)
E:HADMDS[176] (HM pixel 176)
E:HADMDS[177] (HM pixel 177)
E:HADMDS[178] (HM pixel 178)
E:TRTGT (Toroid)
E:HP121 (Horizontal bpm at bpm121)
E:VP121 (Vertical bpm at bpm121)
E:HPTGT (Horizontal bpm at bpmTGT)
E:VPTGT (Vertical bpm at bpmTGT)

For PT scan:

Vertical scan

E:TRTGT (Toroid)
E:HP121 (Horizontal bpm at bpm121)
E:VP121 (Vertical bpm at bpm121)
E:HPTGT (Horizontal bpm at bpmTGT)
E:VPTGT (Vertical bpm at bpmTGT)
E:TGTT1 (TVPT central wire)
E:TGTT2 (TVPT upper wire)
E:TGTT3 (TVPT lower wire)
E:TGTT4 (TVPT heat sink)

Horizontal scan

E:TRTGT (Toroid)
E:HP121 (Horizontal bpm at bpm121)
E:VP121 (Vertical bpm at bpm121)
E:HPTGT (Horizontal bpm at bpmTGT)
E:VPTGT (Vertical bpm at bpmTGT)
E:THPTTW (THPT beam-right wire)
E:THPTCW (THPT central wire)
E:THPTBW (THPT beam-left wire)
E:THPTHS (THPT heat sink)