Cyclotron Beam Development in 2022

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January 2023

Abstract

In this note, we summarised the outcomes of cyclotron beam development from May 31 to Nov 29 in 2022.

1 Cyclotron

1.1 Longitudinal beam profile measurement

Thomas summarized the measurement in a beam note:https://beamphys.triumf.ca/~tplanche/cyclotron/2021/20211221-acceptance/report/report.pdf. The new measurement last year reduced the noize. Yi-Nong wrote a note on the U-Turn scanning simulation, which could be used to calibrate the phase width of the beam. http://lin12.triumf.ca/text/design_notes/simulated_UTurn_scan.pdf

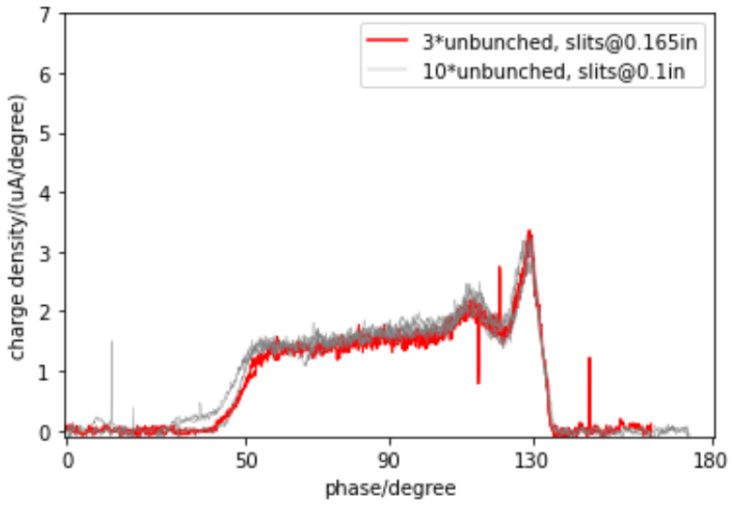

Figure 1: Beam longitudinal profile

1.2 Main Magnet Degaussing

The NMR probe reading suggests that the fancy degaussing method is slightly better than the conventional procedure in overcoming the hysteresis caused by adjusting the main magnet around the production setting.

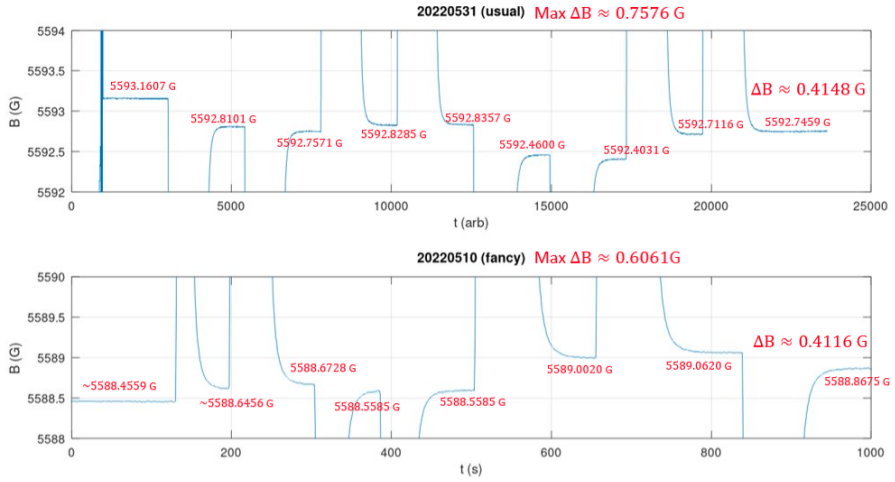

Figure 2: Comparing fancy setting and conventional procedure.

1.3 Spill monitor calibration

We tested the old procedure of the tank spill monitor calibration and updated the documents for the procedure with some detailed setting conditions.

1.4 Coupling resonances

The oscillations persist at the radius where we corrected the B_r first harmonics. Tune measurement and field analysis results suggest that the resonance correction may be sensitive to the cyclotron tunes at these radii.

2 BL4N

Proton beam was extracted from cyclotron to the testing beam dump in BL4N vault section. Probe position parameters are validated and optimized. The new wire scanner successfully measured the horizontal and vertical beam profiles under 20 nA extraction current.

BL4N front end beamline section is validated and calibrated.

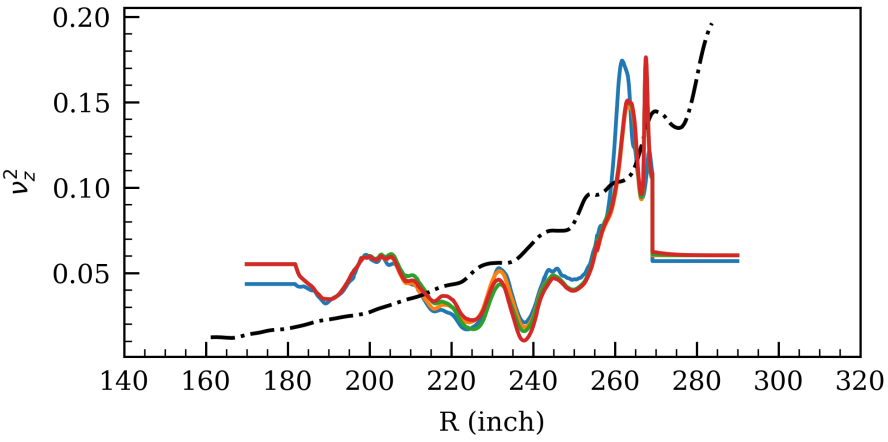

Figure 3: Tune measurement.

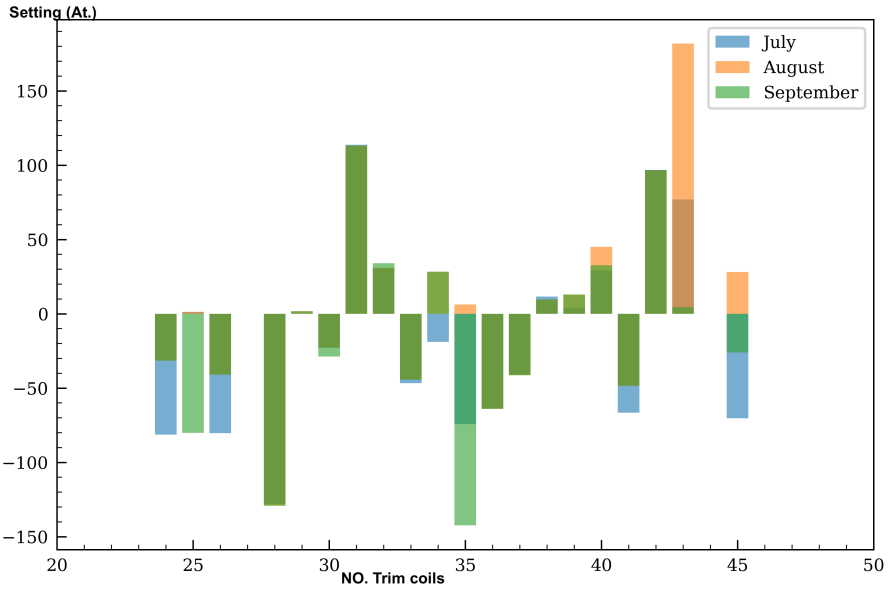

Figure 4: Trim coil settings over time.

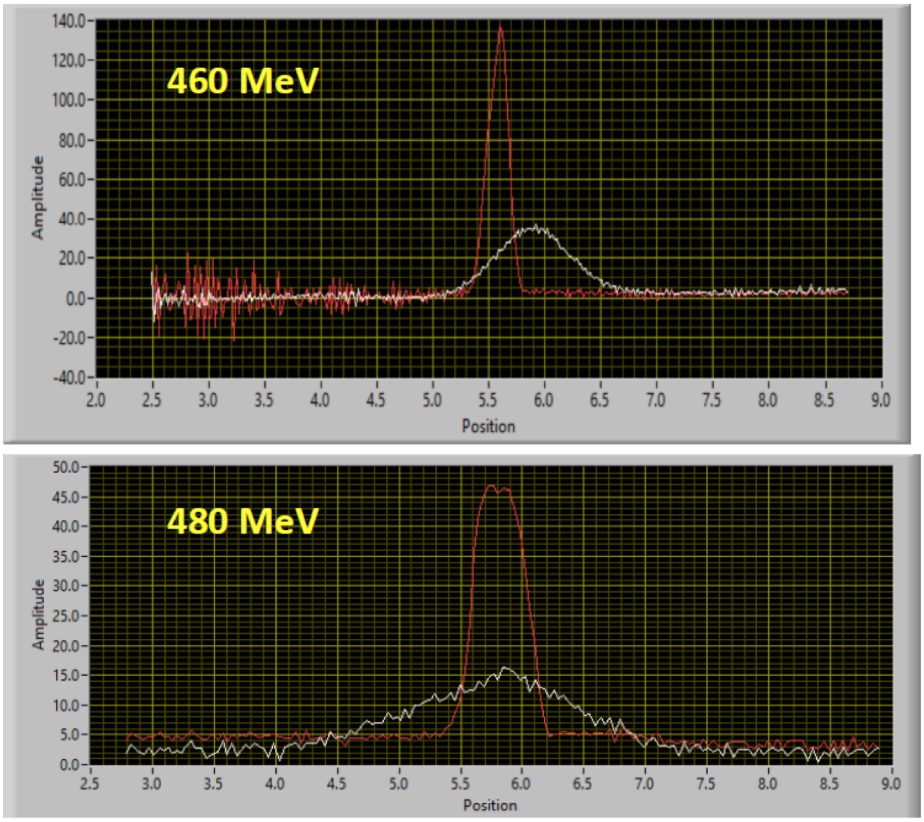

Figure 5: Beam extraction at 460 MeV and 480 MeV.

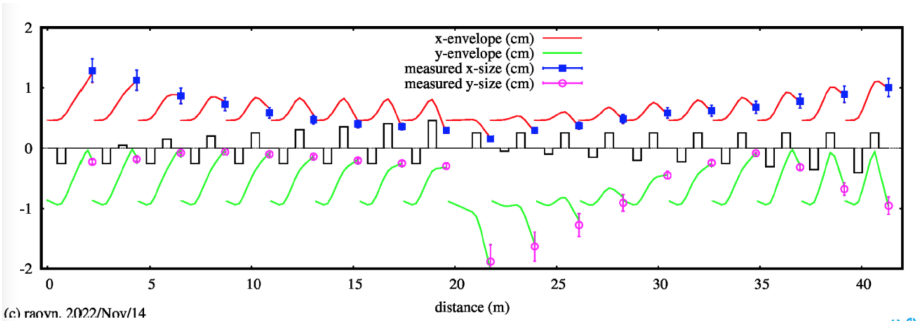

Figure 6: Using the beam size measurement results with different Q1 and Q2 settings, the initial beam condition is calibrated. The TRANSOPTR model is also validated by the measurement.

3 BL2A

3.1 Long period pulse beam irradiation

Target irradiation with single shot pulse and multiple shot pulse by the CCS pulser on and off controlling script.

3.2 New BL2A rastering tune

Thomas worked out a new rastering tune. The new tune gave us 2 independent knobs to adjust the vertical and horizontal beam size. To achieve a 4*4 mm beam, we need a stronger power supply for Q14.

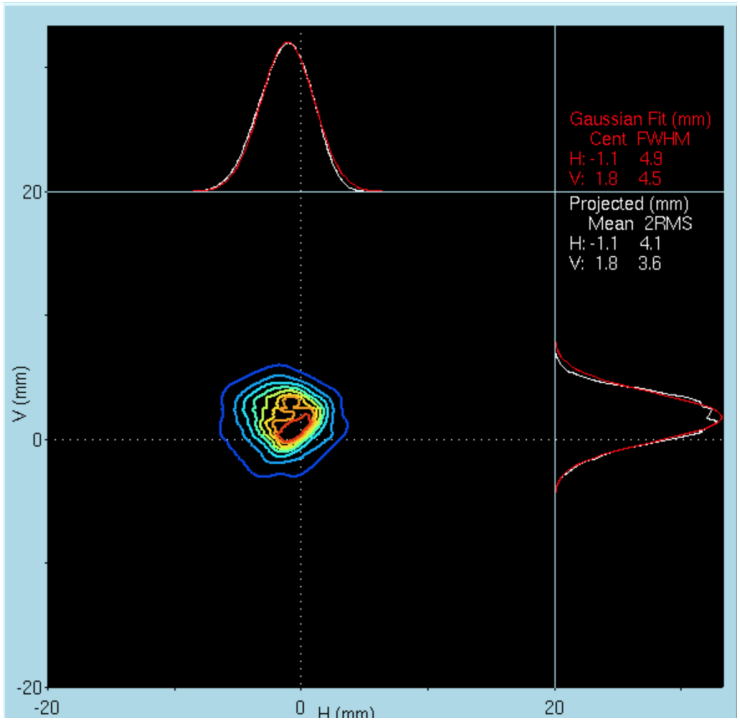

Figure 7: The beam size in horizontal and vertical directions could be adjusted independently under the new tune.

4 BL2C

No activity for this beamline.

5 BL1A

M20 high yields testing with the 10 cm T2 target.

6 Ion Source and Injection Line

6.1 Filament digital controller

Tested and deployed a new digital control system for the I1 filament power supply. The filament stability loop can maintain stability automatically if the filament or arc current drops.

6.2 ISIS BPM

Tested the BPM with unbunched beam.