

RFQ Output Beam Characterization

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Abstract: Procedure regarding measurement of the time and energy spread of beams from the ISAC-RFQ.

1 Introduction

This document outlines the procedure to characterize the longitudinal output beam properties for the ISAC-RFQ and MEBT Bunch Rotator RF cavity. Using the fast Faraday cup MEBT:FFC5, the time spread of the beam can be measured together with the MEBT oscilloscope. The energy spread of the beam can be measured at the Prague magnet Harp detector, recalling that the distance between two adjacent wires is 0.1% $\Delta E/E$.

This procedure is meant to take roughly 10 minutes and is intended to be minimally disruptive, while acquiring important information about the configuration of the ISAC linac. For information on how to use the fast Faraday cup MEBT:FFC5, please see the RIB Operations Manual, **Section 3.7.2.5 / Document-76739** on DocuShare. The Prague magnet energy reading is also described in **Section 3.7.2** of the same document.

2 Procedure

Each of the measurements below assume the MEBT rebuncher, along with each DTL RF cavity, are off. Beam at RFQ $E/A = 0.153$ MeV/u has been tuned to the prague magnet per the procedure in **Section 3.7.2** of the RIB Operations Manual. If the A/q of the beam requires a stripping foil, ensure the foil is in place and in good condition. You may choose to adjust the x-axis of the MEBT scope by right clicking anywhere on the signal display and selecting **Adjust scale params**, then setting x limits which render the time-peak clear. Use cursors A,B,C,D to more accurately measure the time width if desired, by toggling the **Cursor Enable** buttons.

At each step of this measurement, please include in the e-log a screengrab of both the MEBT oscilloscope page, showing the time spectrum, and a screengrab of the Prague harp page.

1. With the bunch rotator off, measure the time spread of the beam at MEBT:FFC5 and then measure the energy spread at the Prague magnet.
2. Repeat the measurement from step 1, but with the bunch rotator turned on and the amplitude set to produce a time focus at MEBT:FFC5 (minimum time spread), per the procedure in **Section 3.7.2.5**.
3. Finally, measure the time and energy spread with the bunch rotator amplitude set to 70, if possible. If unstable, set the amplitude as low as possible. **If you are unable to lower the amplitude from step 2, please note this in the e-log entry.**

If you are unable to acquire any signal on MEBT:FFC5, for example due to insufficient beam intensity, please note this in the e-log, along with the beam current at MEBT:FC5. Make an e-log entry noting the results that you measured for the three sets of measurements above. Please also include a savetune.