Mock-ups to Predict Beam Axis Displacements of Cavities and Solenoids in PIP-II SSR2 Cryomodule
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Introduction

PIP-II is Fermilab’s planned high-intensity proton beam facility. Cryomodules house the 5 different types of superconducting accelerating cavities needed for the PIP-II linear accelerator. SSR2 (Single Spoke Resonator Type-2) cavities are housed in their respective cryomodules, along with focusing lens solenoids. These cryomodule string components’ alignment is studied as acceptable beam deflection, offset, and defocusing, which may otherwise cause beam loss.

Mock-ups

To study the alignment of the cavities and solenoids mock-ups were designed using the actual adjustment kits for each component along with aluminum extrusions to hold BCAM targets and an aluminum target bar to represent the beam axis.

Conclusions and Future Work

The next step in the process is to use the mock-ups to develop a mathematical model that will give the approximate adjustment parameters to achieve a desired beam axis position, as well as relate the position of the beam axis to the positions of the BCAM targets. This can be used to align the components during the assembly of the cryomodule.

References

1) Silvia Zorzetti, ALIGNMENT MONITORING SYSTEM FOR THE PIP-II CRYOMODULES, Tech. rep, Fermi National Accelerator Lab. (FNAL), Batavia, IL (United States), 2020;
2) Jacopo Bernardini, COMPUTER VISION TECHNIQUES USED TO MONITOR THE ALIGNMENT OF CAVITIES AND SOLENOIDS IN THE PIP-II PROTOTYPE SSR1 CRYOMODULE, Tech. rep, Fermi National Accelerator Lab. (FNAL), Batavia, IL (United States), 2021;
3) Valeri Lebedev, The PIP II reference design report, Tech. rep, Fermi National Accelerator Lab. (FNAL), Batavia, IL (United States), 2015;