FAST Workflow_v1 Writeup

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July 23rd 2018

1   Overview

The purpose of this document is to easily refer to for understanding what the different parts are to the workflow_v1 bash script. It will explain in brief detail the files it calls and each of their functions. The script in short starts at the beginning of the beam line (8 meters from the photo cathode) and optimizes parameters along the beam as necessary and then runs through the whole beam once more to insure all parameters are optimized correctly.

2   Beam Lines

2.1   injector_cryo.ele

The first file the beam goes through is the injector_cryo.ele file. This file is discussed here. In short this is the file that does not go through the bunch compressor. If the bunch compressor is desired the script can be changed to use injector_BC1_cryo.ele instead.

2.2   cryotoFODOend.ele

The next part of the lattice include from the Cryomodule exit to the end of the Focusing and defocusing optical transport. This file is also discussed in the paper and link described above. It matches the beta functions and makes sure the beam doesn't get unfocused.

2.3   FODO_to_IP.ele

This file describes the beam from the end of the FODO hall to the Inverse Compton Scattering (ICS) Interation point (IP) or ICSIP. There is still some tinkering that needs to be done to ensure that Quads Q507 and Q508 will have enough room in the actual set up. This can be adjusted and easily reconfigured in the .lte files to ensure an optimized quad fit. The file ends at the interaction point so as to optimize for the spot size at the IP mark.

2.4   ICSIP_to_Dump.ele

This file goes from the IP to the high energy dump at the end of the line. There is a dog leg that includes Dipoles D700 and D704 which are taken into account and quads are placed in between and after the dogleg dipoles to correct for dispersion etc. The end optimization is currently switched to make the beta function go to 5000, which was decided to allow the dump to not have such high energy density disposed of in such a small space. This can be changed by changing the optimization's in the ICSIP_to_Dump.ele file.

2.5   track_injector_ICSIP_Dump.ele

This file will take all of the saved parameters and run through the whole beam line from the 8 meter mark to the dump going through the ESD path with the interaction point set up. This ensures that the beam will go through the whole thing without any issues in continuity. There have been some things found that are questionable as to if a piece is missing with the over all run, namely piece d_ACM_EID. I don't think that will be an issue with the continuity of the beam line but I think it will be work double checking.

3   Results

Running the workflow_v1 script will provide a few plots. It will provide the four main section beta plots that it ran thoguh using the twis output data from each run. The script will also output the resulting etax function in the ICSIP_to_Dump dog leg. The script will also make a close up of the interaction point and also do a whole twiss paramaters plot. The close up and twiss parameters plot are displayed below.
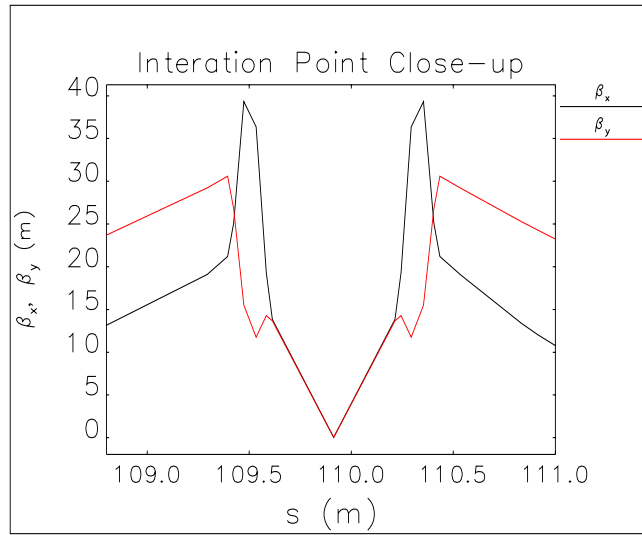
4   Conclusion

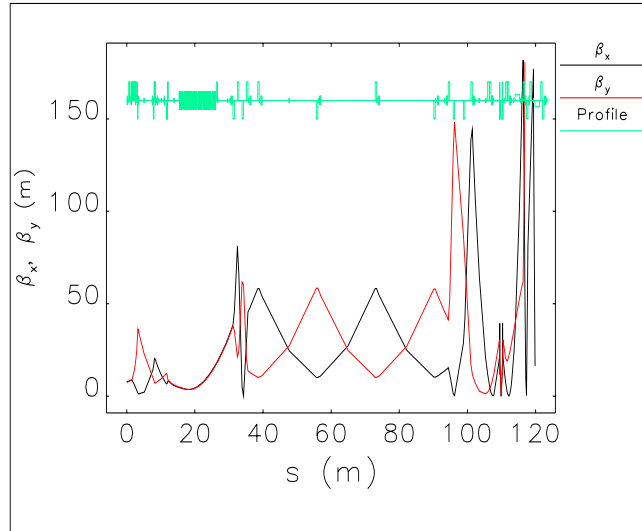Figure 1: Close up of beta functions near the interaction point (IP) of the electron beam.

Figure 2: Beta functions for the whole beam line with a green overlay of the beamline profile.