

# Design of a Beam Switchyard for the ATLAS Multi-user Upgrade

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## Introduction

The Argonne Tandem Linac Accelerator System (ATLAS) is a Nuclear Physics facility at Argonne. It has been a single user facility since its inauguration in 1985. In order to enhance the experimental program at ATLAS and allow more beam time for applications, an upgrade project was recently approved to convert it into a multi-user facility. A beam switchyard for a dedicated material irradiation station at low energy ( $\sim 1$  MeV/u) is required for the upgrade. The main goal of this project is to design a beam switchyard by optimizing the beam optics and the beamline elements while considering the existing space constraints.

## Tools

TRACK and COSY INFINITY were used for the design. TRACK is a code for beam dynamics simulation. It supports multiple features, including electrostatic and magnetic multipoles with fringing fields and radio frequency accelerator components. COSY INFINITY is an arbitrary order beam optics code. The options it supports include analysis of aberration correction and optimization for non-linear effects.

## Methods

Matching conditions were set up in TRACK and COSY, and the outputs were achieved by running their matching algorithms. Manual adjustments were also applied to get the desired output.

## Beam Sharing

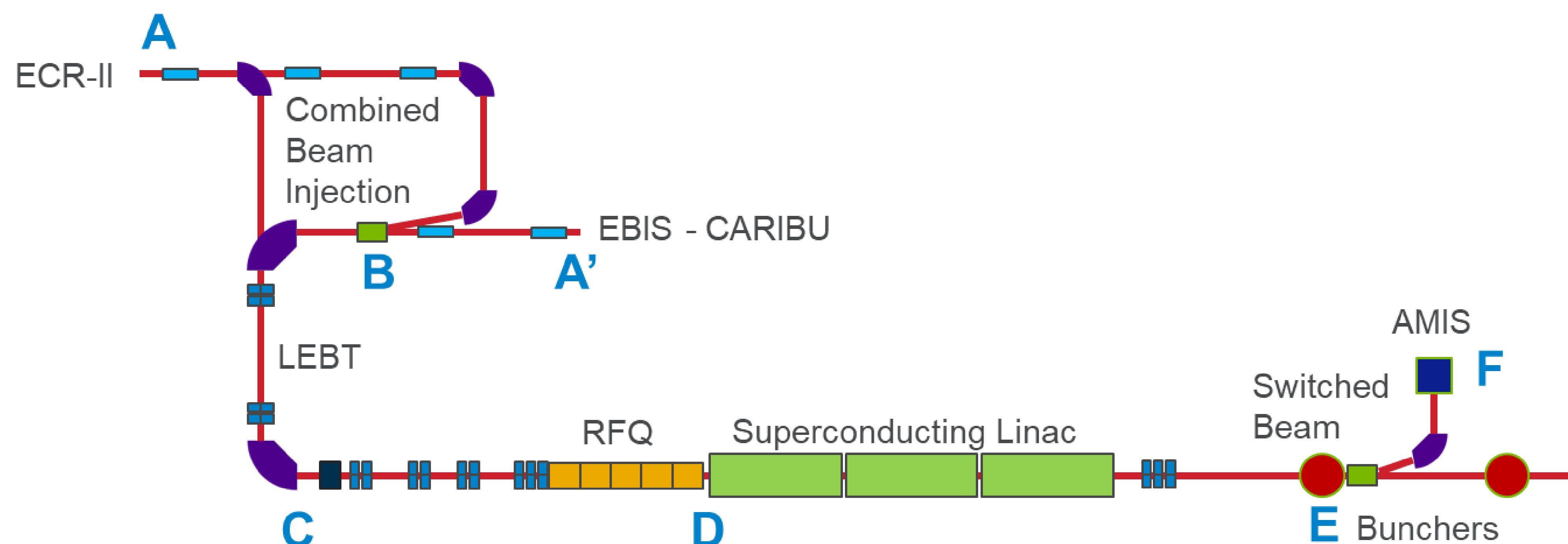
The beam generated by ECR-II is a continuous beam, while the beam generated by EBIS is a pulsed beam. By switching between the two beams before and after the accelerator, two experiments can be carried out simultaneously with almost no loss of beam intensity.

## Acknowledgments

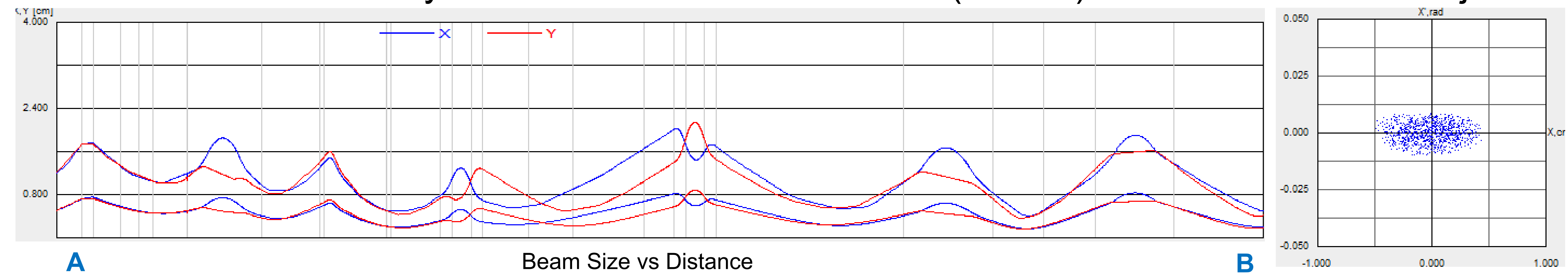
The author would like to thank Dr. Jerry Nolen, Dr. Brahim Mustapha, and the Lee Teng Internship Program for their support.

## Results

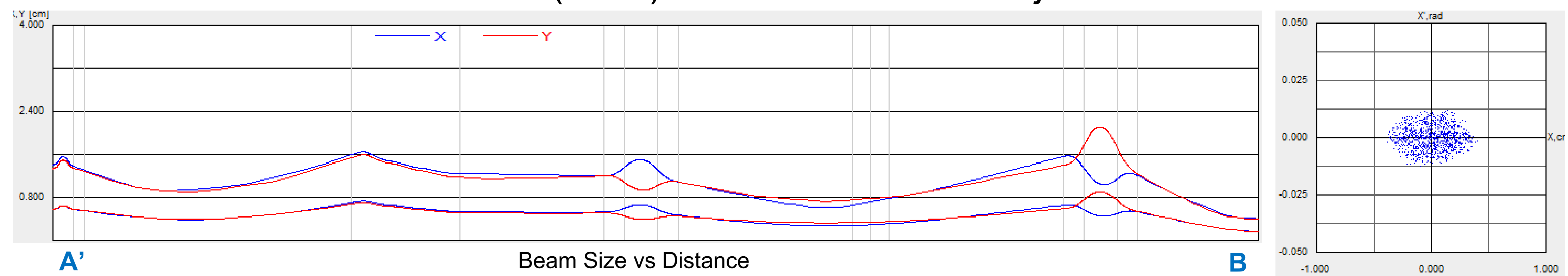
Complete beamline layout:



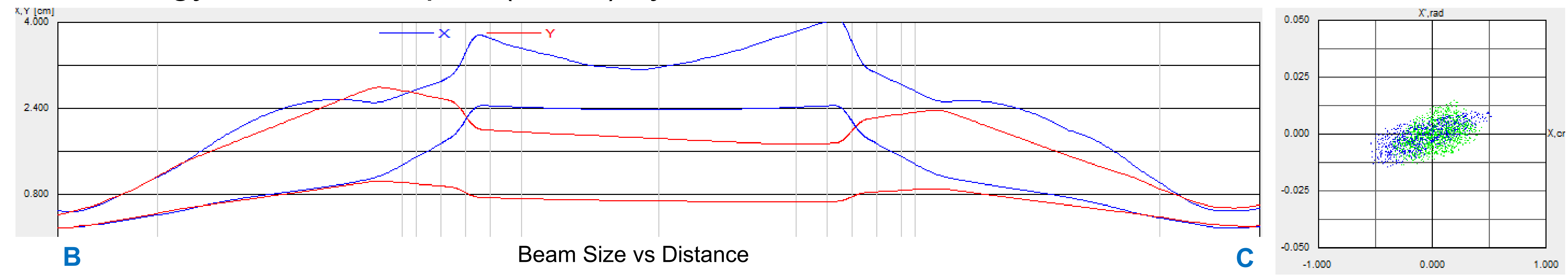
From 14 GHz Electron Cyclotron Resonance ion source (ECR-II) to Combined Beam Injection:



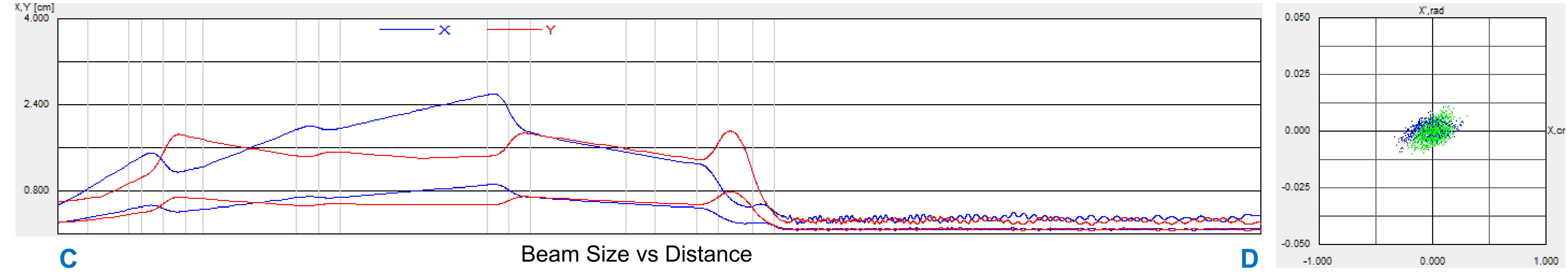
From Electron Beam ion source (EBIS) to Combined Beam Injection:



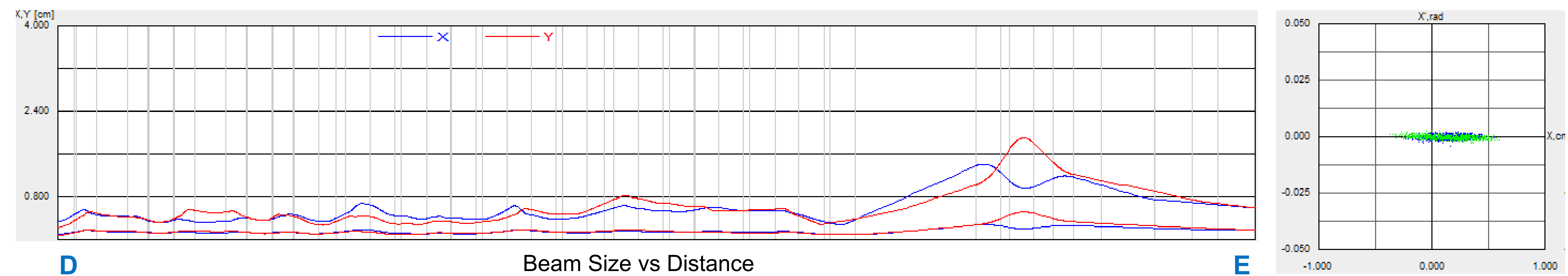
Low Energy Beam Transport (LEBT) system:



Radio-Frequency Quadrupole (RFQ):



Superconducting Linac:



Switched Beam to ATLAS Material Irradiation Station (AMIS):

