Non-Destructive Beam Monitor Prototype

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Methods

• Obtaining low intensity particle beam current without interfering or modifying it is important
• Beam current readings helps beam facilities improve operation
• A section of the beam pipe with coils can be used to determine the current
• A 3D printed coil holder centers a copper rod that mimics beam
• A removable ferrite piece of the coil holder contains a copper coil in which current from the rod will be induced
• The induced current is then passed through a circuit containing an operational amplifier and read using a picoammeter
• The circuit detects peaks in the current and produces an output that is close to a DC current
• The entire desktop prototype is placed in a metal box in order to reduce external noise that would otherwise interfere with the readings displayed

Experimental Setup

Results

• The current passed through the copper rod induces a current in the copper coil placed around the section mimicking the beam pipe
• This current is read through a circuit board containing an operational amplifier which filters and amplifies this current
• The current is then rectified, read through a picoammeter and displayed in the user interface
• A desktop prototype beam monitor that reads current of a copper rod via induction was developed
• The prototype can input, rectify, and amplify current up to a frequency of 10 MHz and amplitude of 800mV
• The prototype mimics a non-destructive beam profile monitor for irradiation facilities

Future Directions

• Correct for offset in readings
• Number of coil turns and its effects
• 4” aluminum pipe to mimic a beam pipe
• Test using pulsed DC beam using an alkali source

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