

Non-Destructive Beam Monitor Prototype



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Introduction

- 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

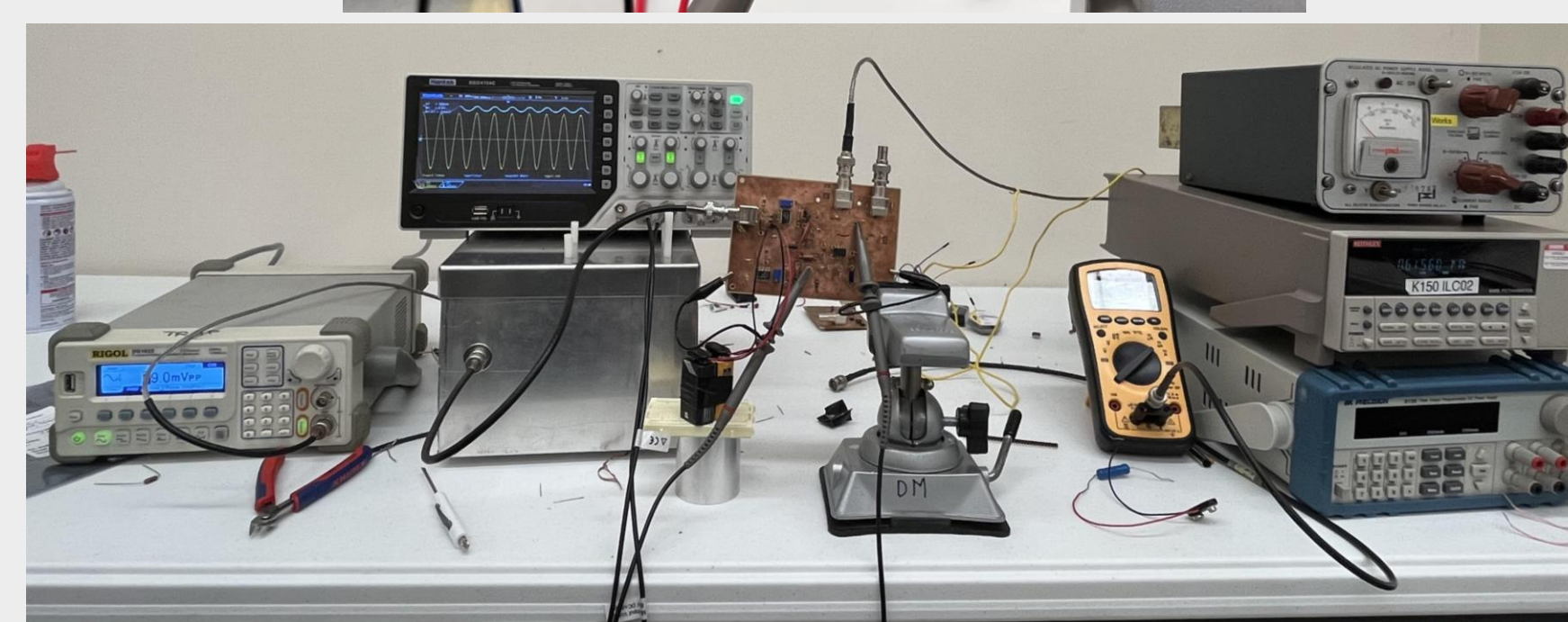
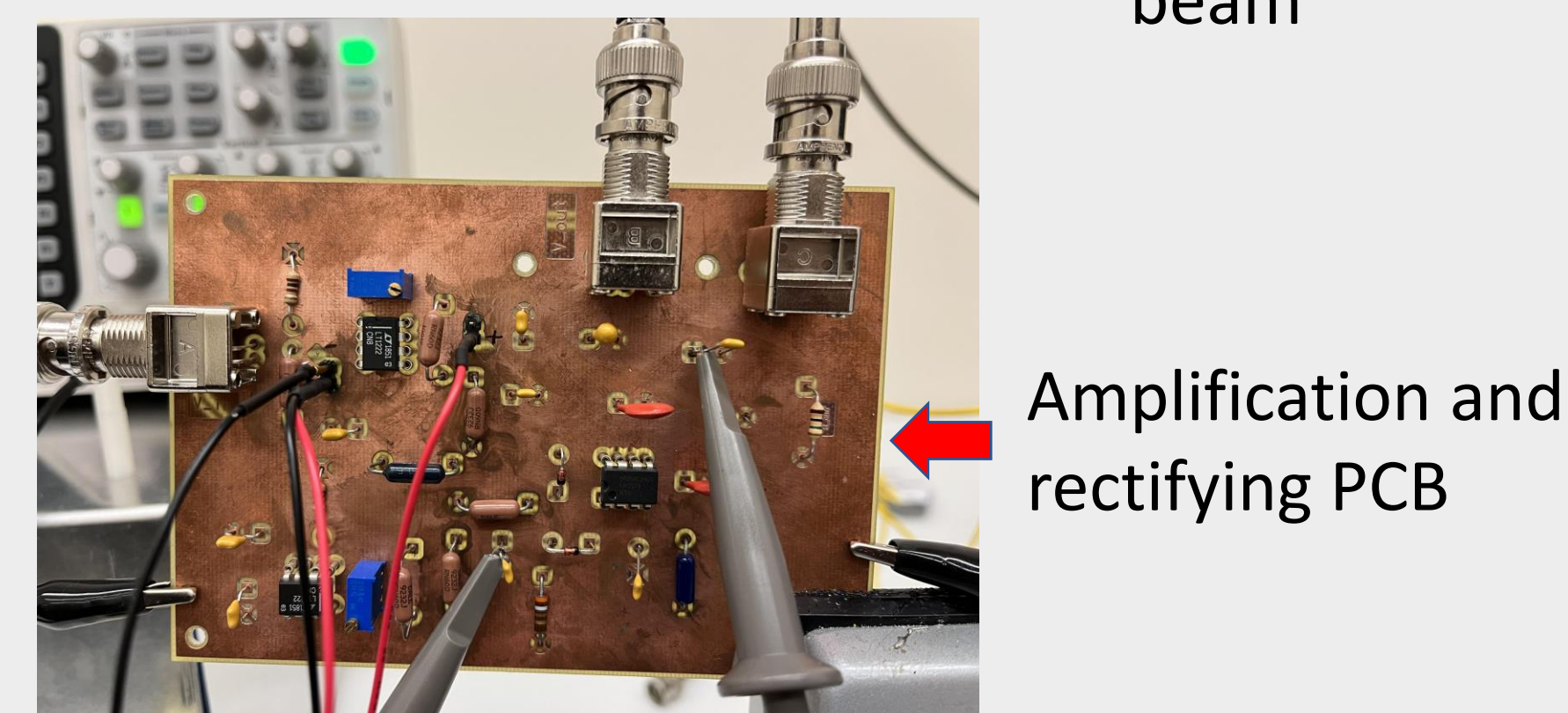
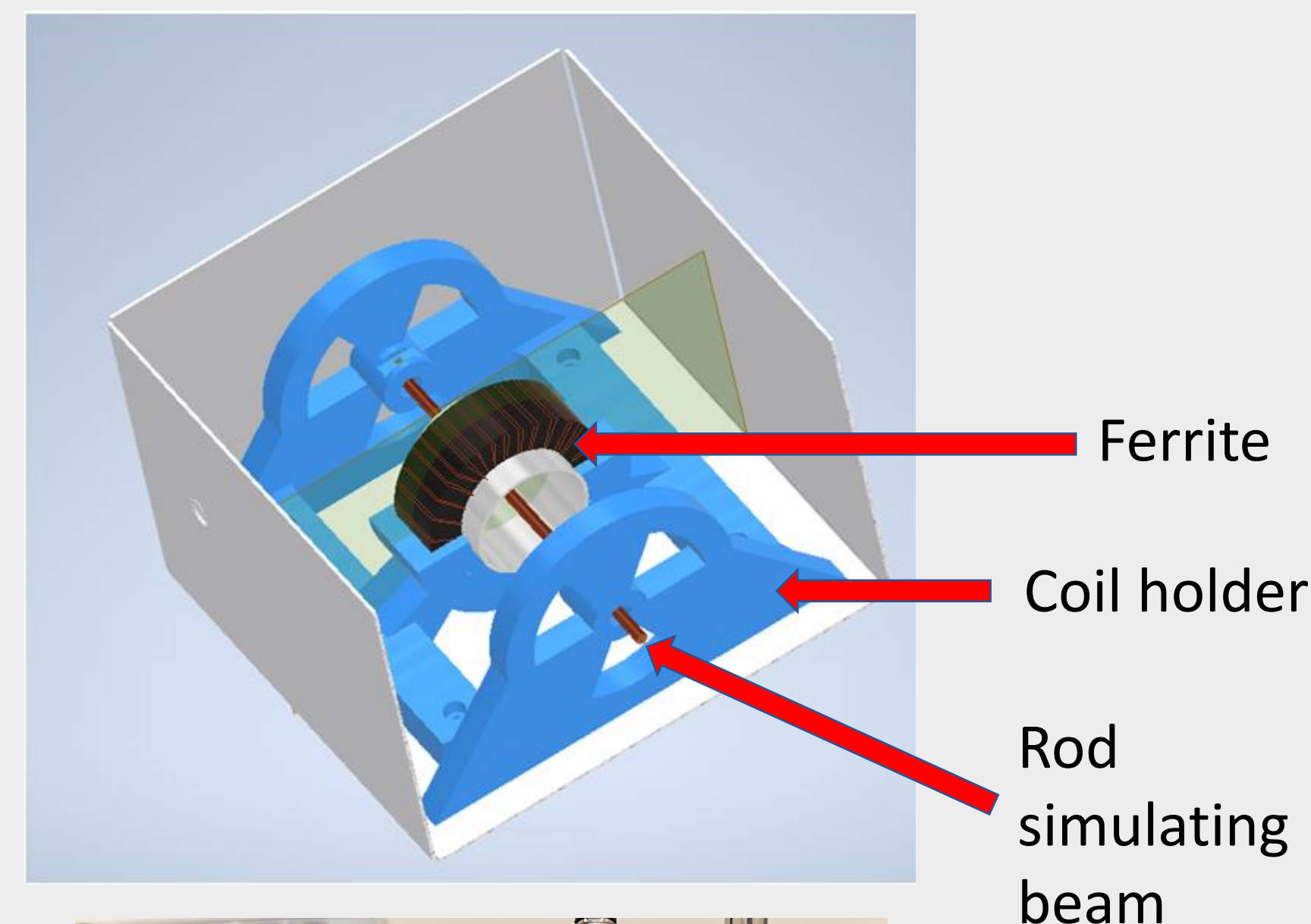
Methods

- 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 output is read by a picoammeter and a computer executing a C# program filters the received data and displays it on a graphical user interface
- The entire desktop prototype is placed in a metal box in order to reduce external noise that would otherwise interfere with the readings displayed

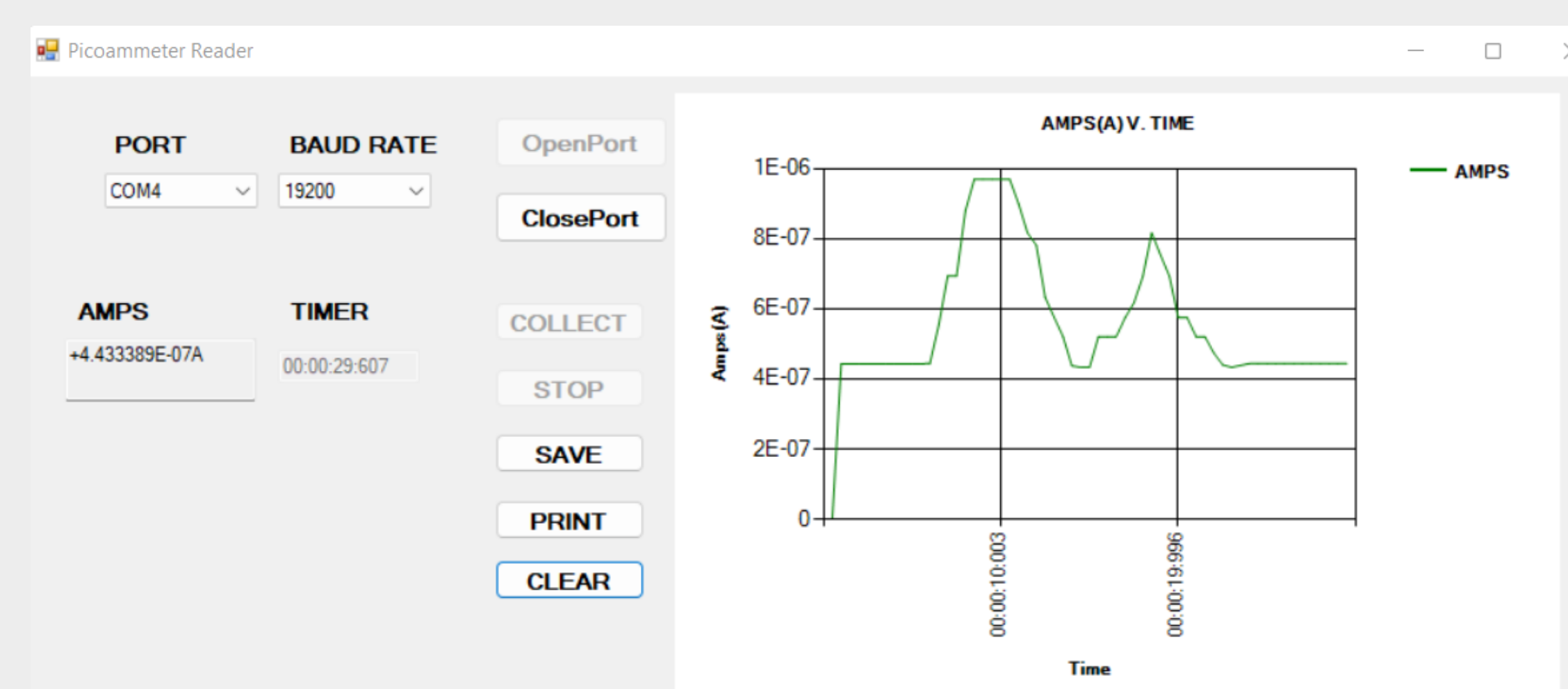
Acknowledgements

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Experimental Setup

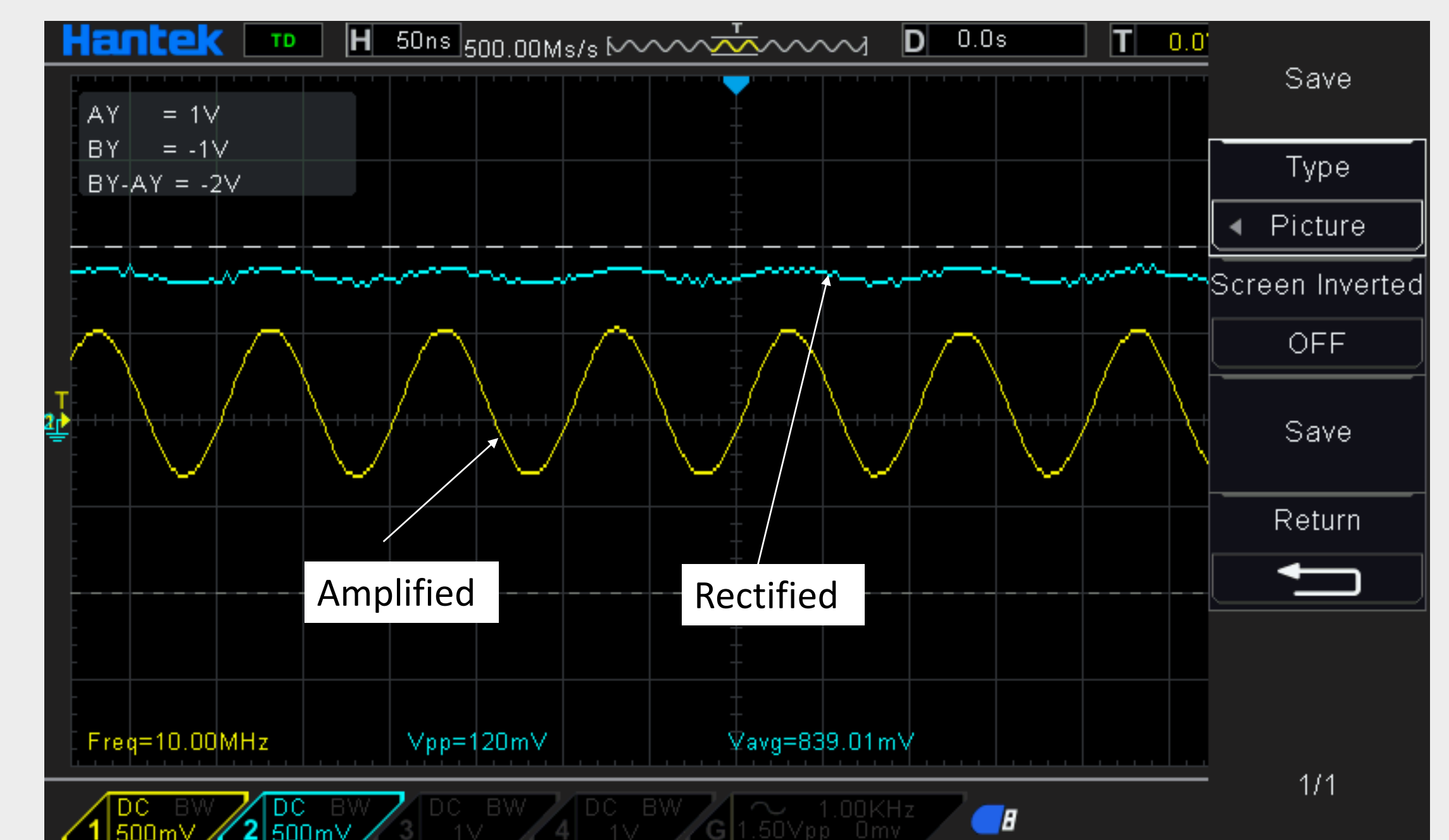


Results



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

References

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