

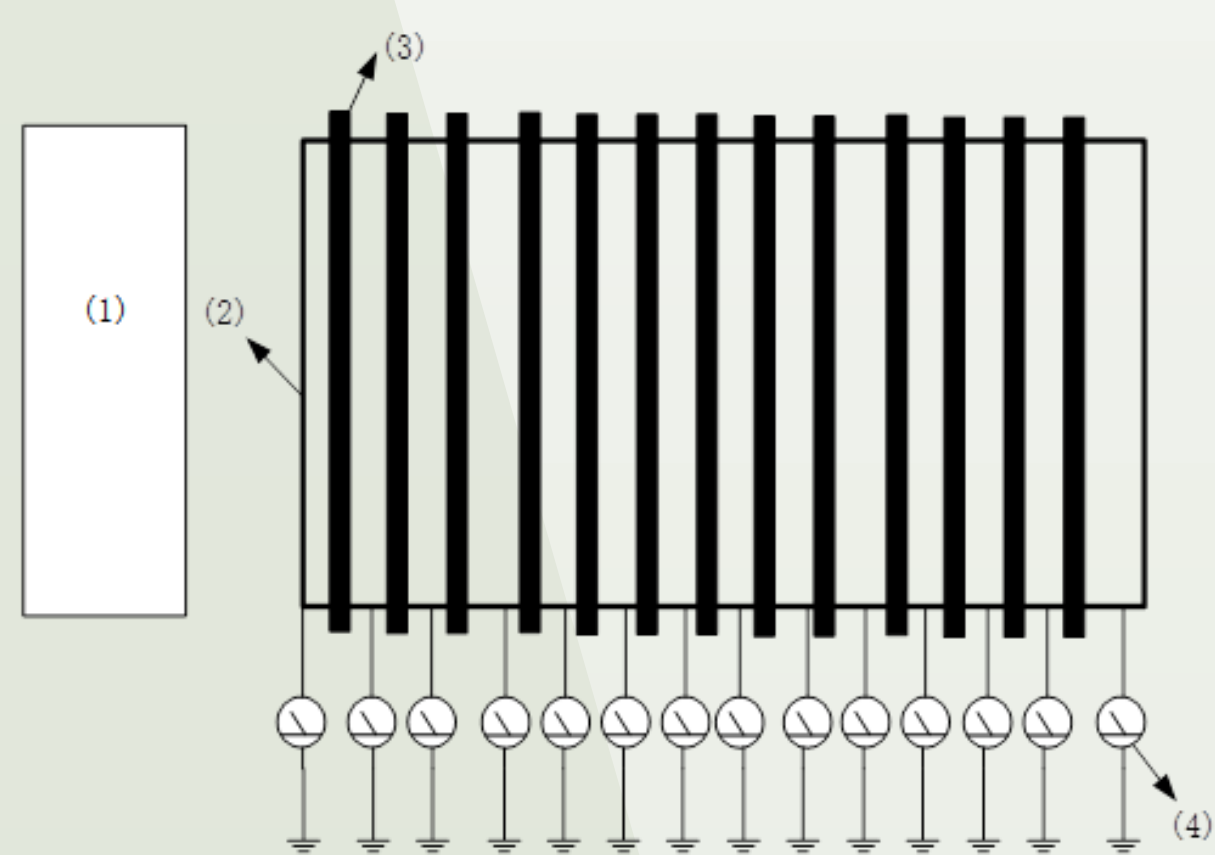
Design of a Multi-layer Faraday cup for Carbon therapy beam monitoring

K.Tang, R. S. Mao, Z. G. Xu, T. C. Zhao, Z. L. Zhao, K. Zhou

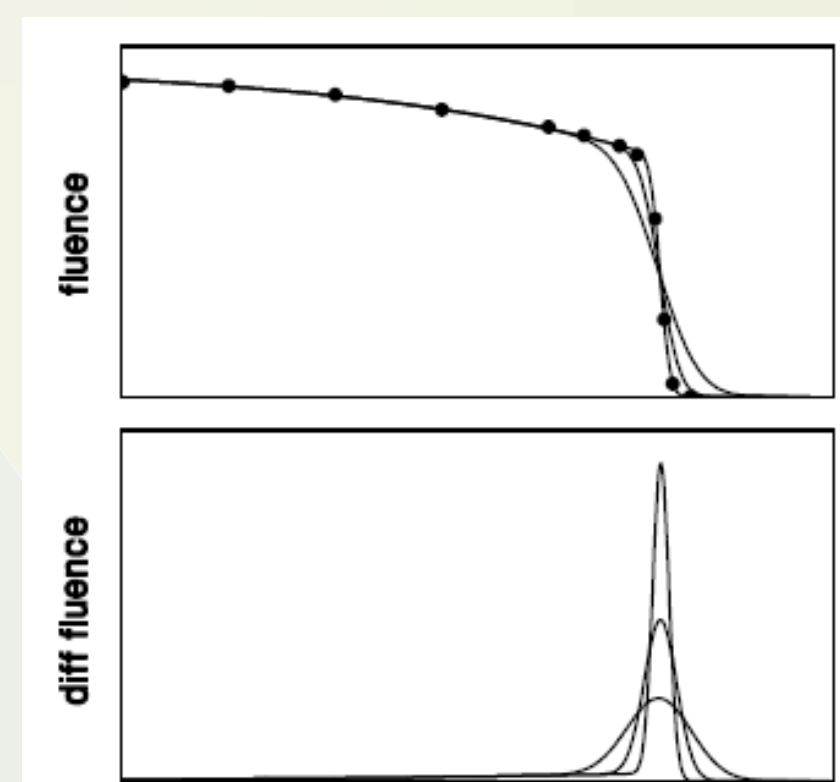
Institute of Modern Physics, Chinese Academy of Sciences (IMP/CAS)

Introduction

- MLFC is a wide used tool for range QA in proton therapy
- It can measure beam range, Bragg peak, beam energy spread and so on
- Measurement can be down less than 1 s
- More portable, cheaper



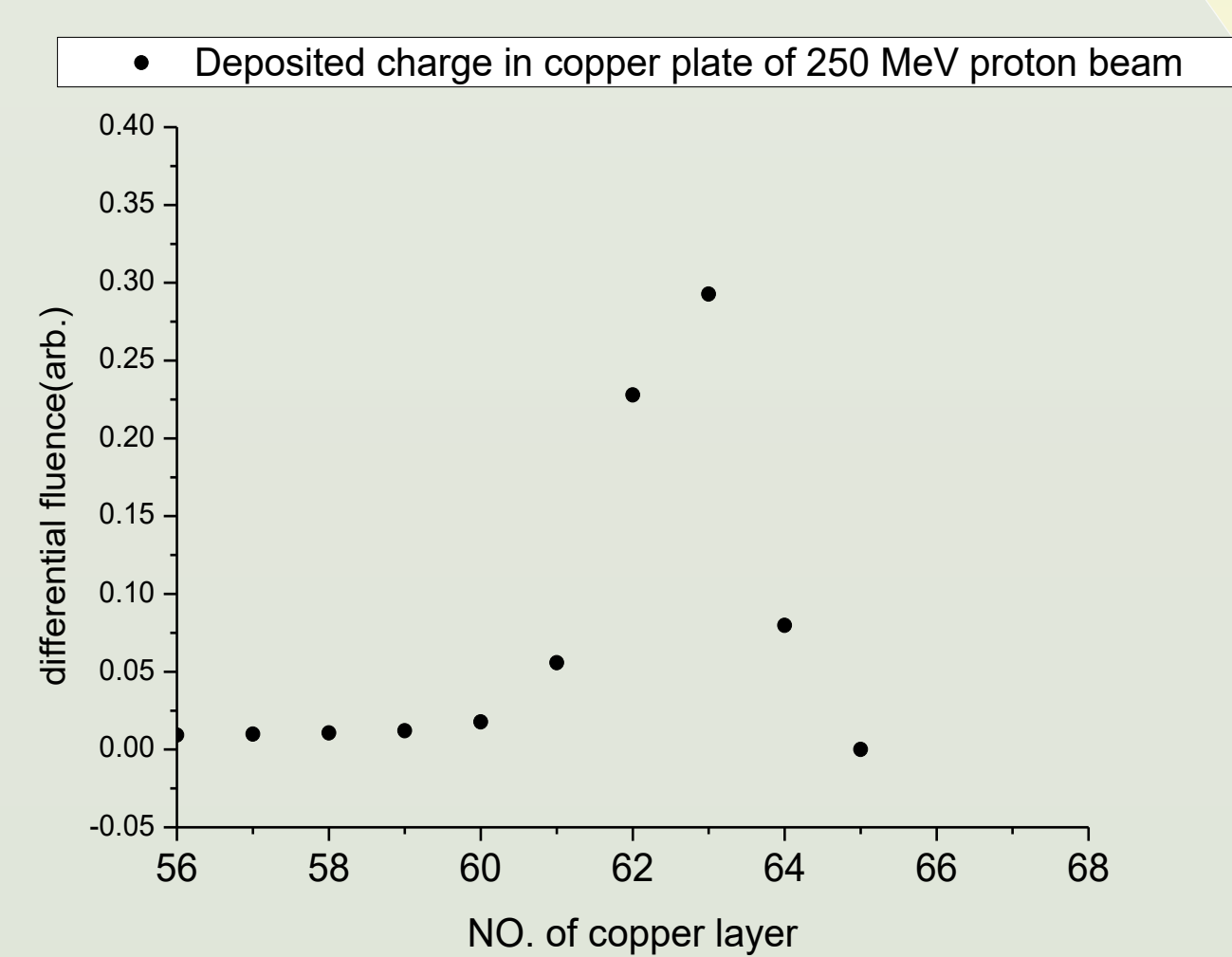
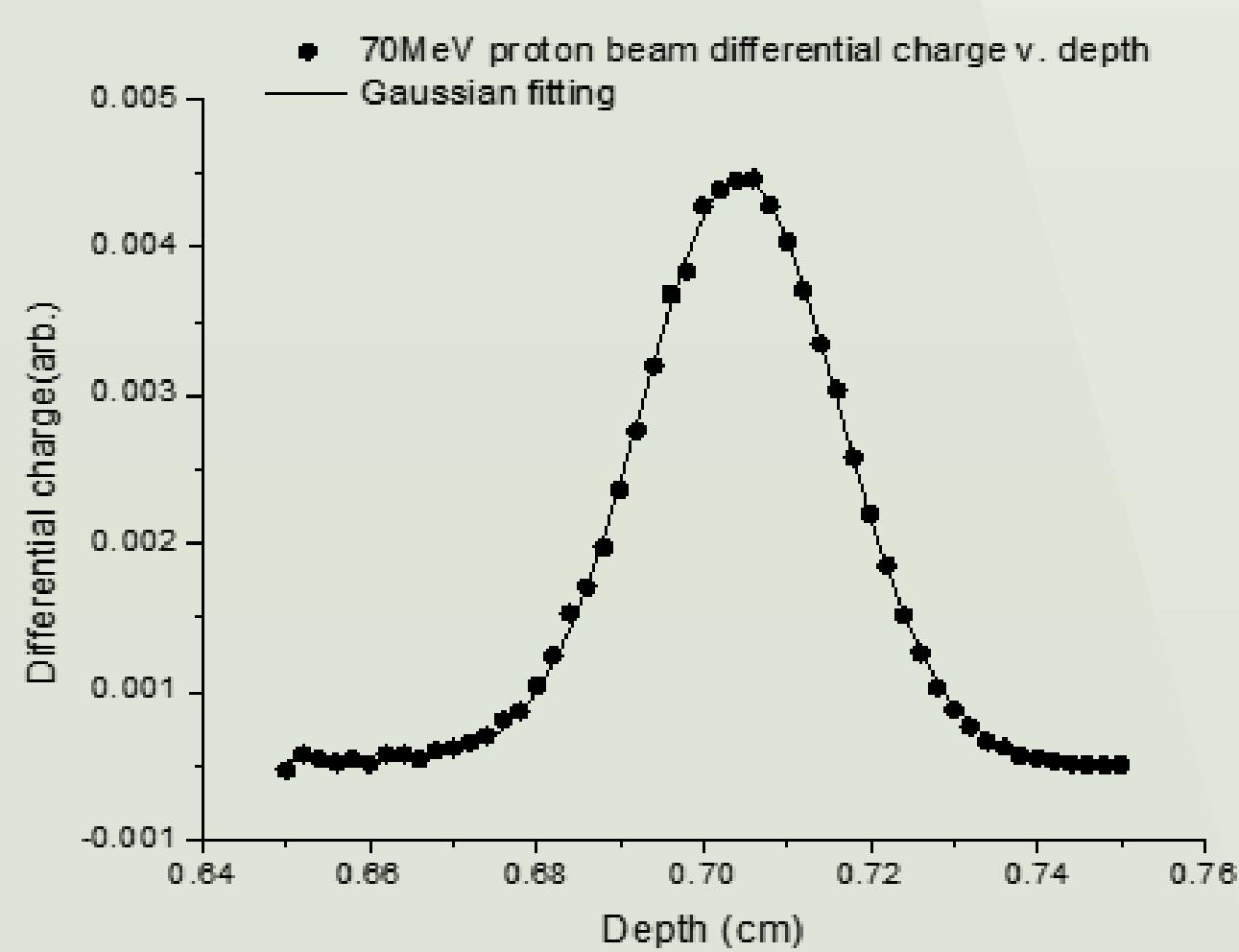
(1) Absorber system, (2) metal plate which collects charge, (3) insulating plate, (4) charge meter



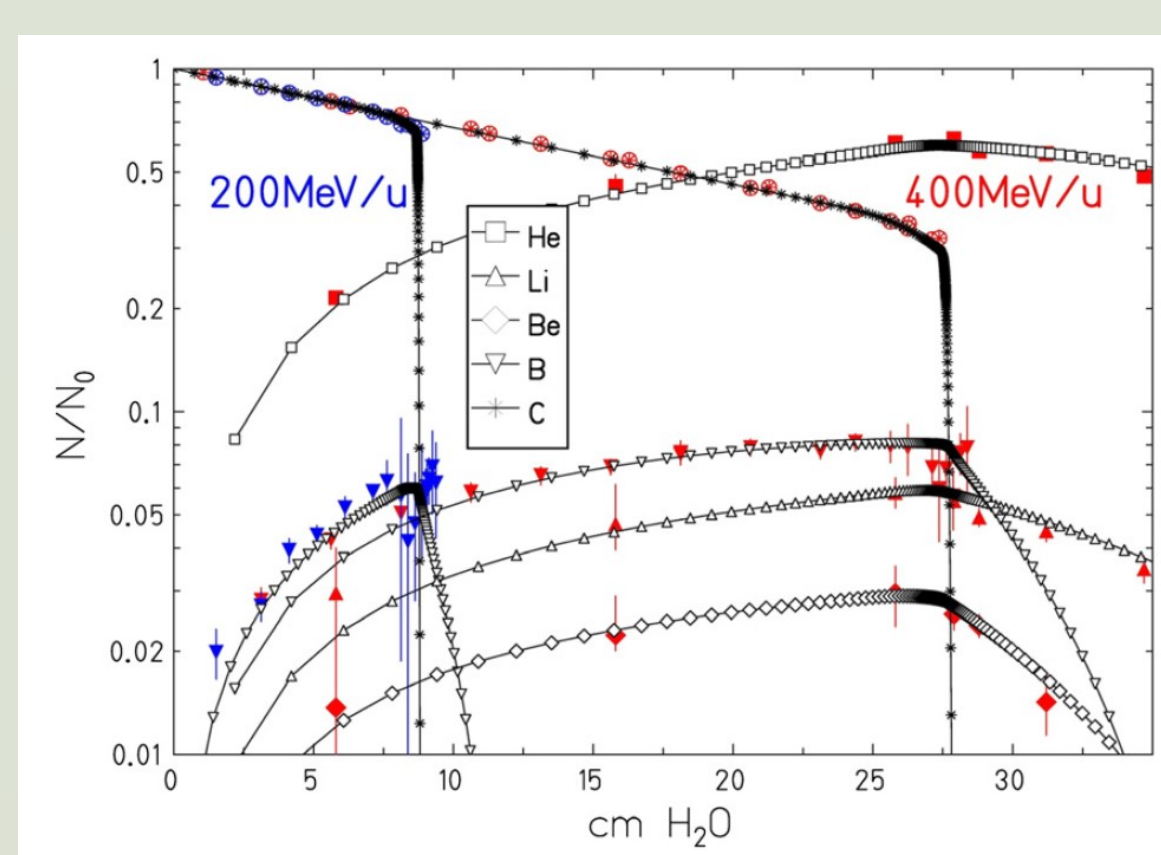
Refer to 2001 Gottschalk B
Beam fluence & differential fluence with different energy spread

Theory & Simulation

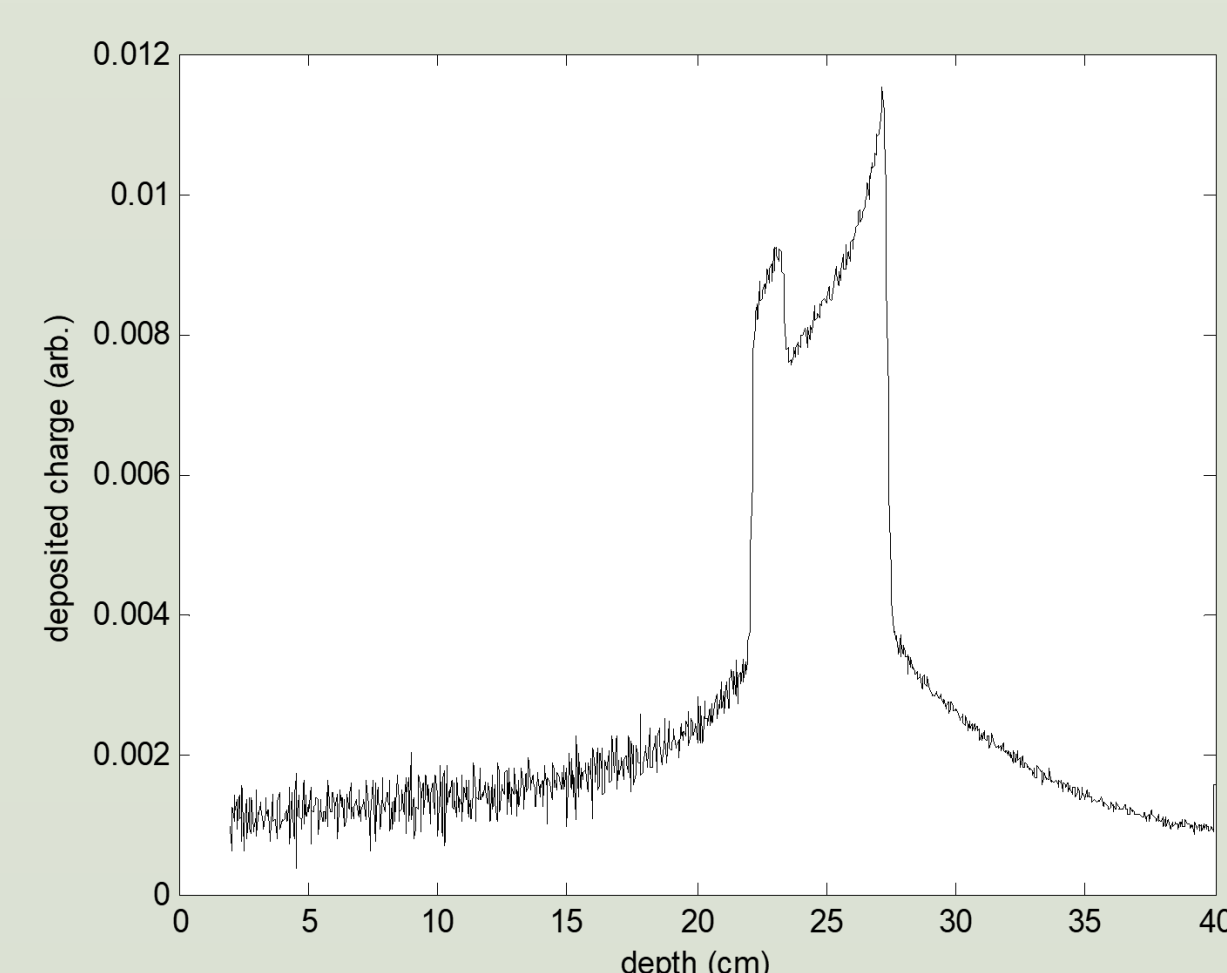
- The differential charge distribution as a function of depth in copper of a 70 MeV proton beam is simulated by Fluka.
- Beam range given by the fitting result is 7.04 mm, which is consistent with NIST result 7.09 mm.
- We can use the maximum position of the differential fluence distribution or deposited charge distribution as the beam range.



The simulation result show that the Bragg peak is at 27.35 mm. Deposited charge as a function of depth was also simulated. The maximum of the curve is at 27.34 mm which is equal to the Bragg peak.



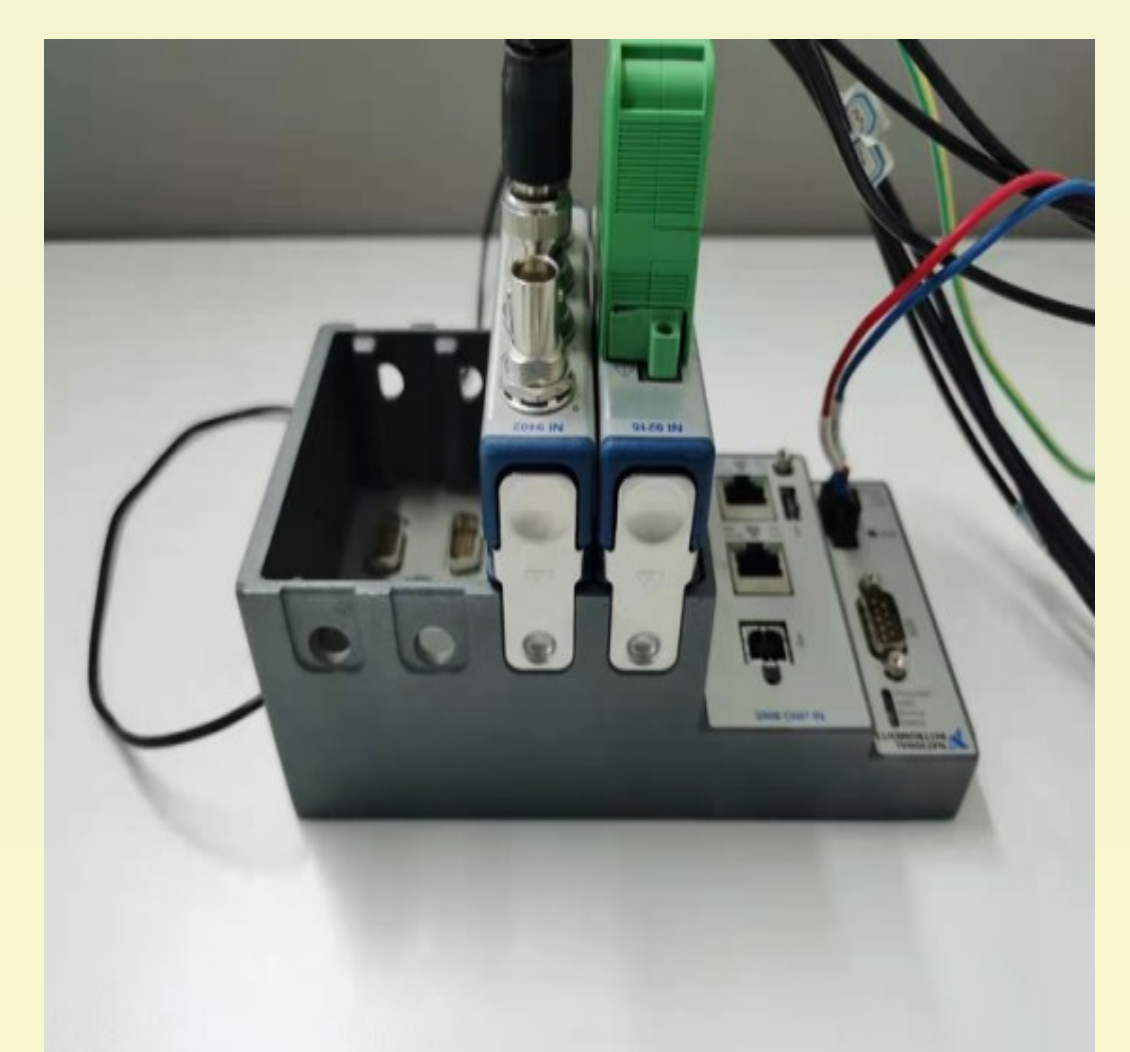
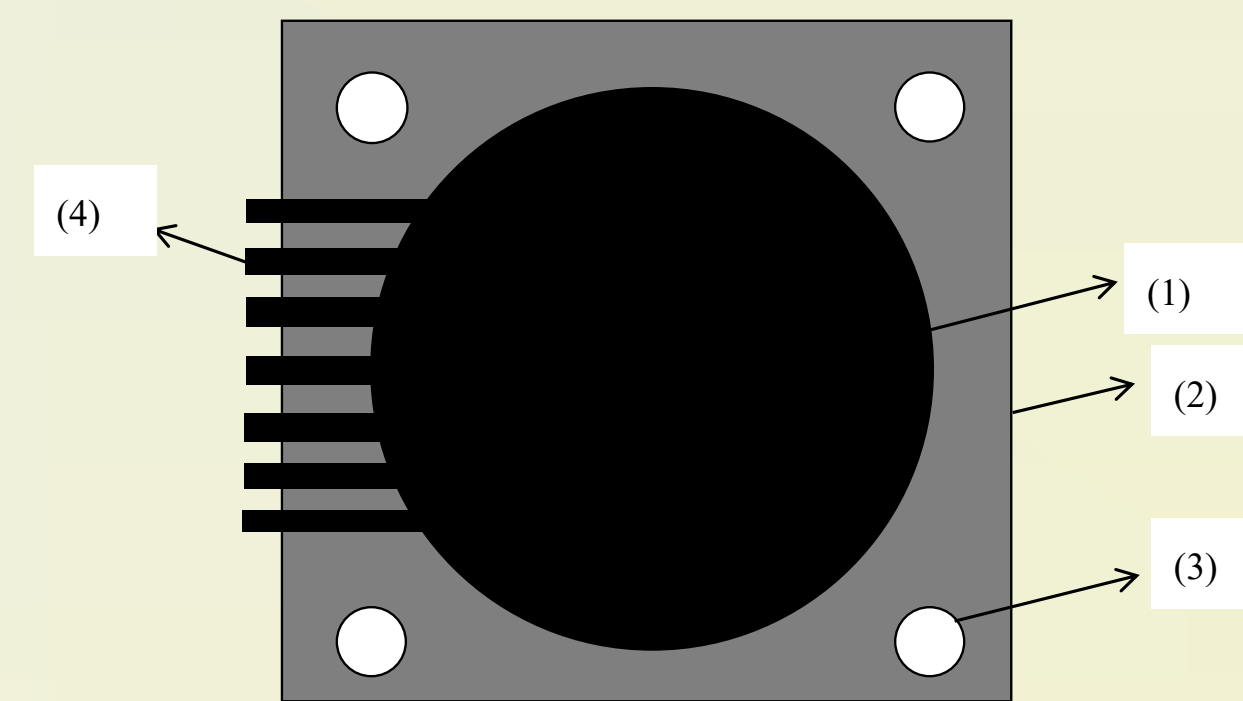
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Electronics

The beam diagnostic system consists of a 128 channel electronics, a high speed digital I/O module NI 9402, a digital acquisition card NI 9215 and a controller NI cRIO 9064.

By using Keithley 6221 current source, we calibrate the electronics response at 0.2 nA ~ 2 nA with step 0.2 nA. The calibration coefficient was obtained.



Reference

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Contact

IBIC 2021

International Beam Instrumentation Conference