# The CW Beam Experiment of Window-type RFQ

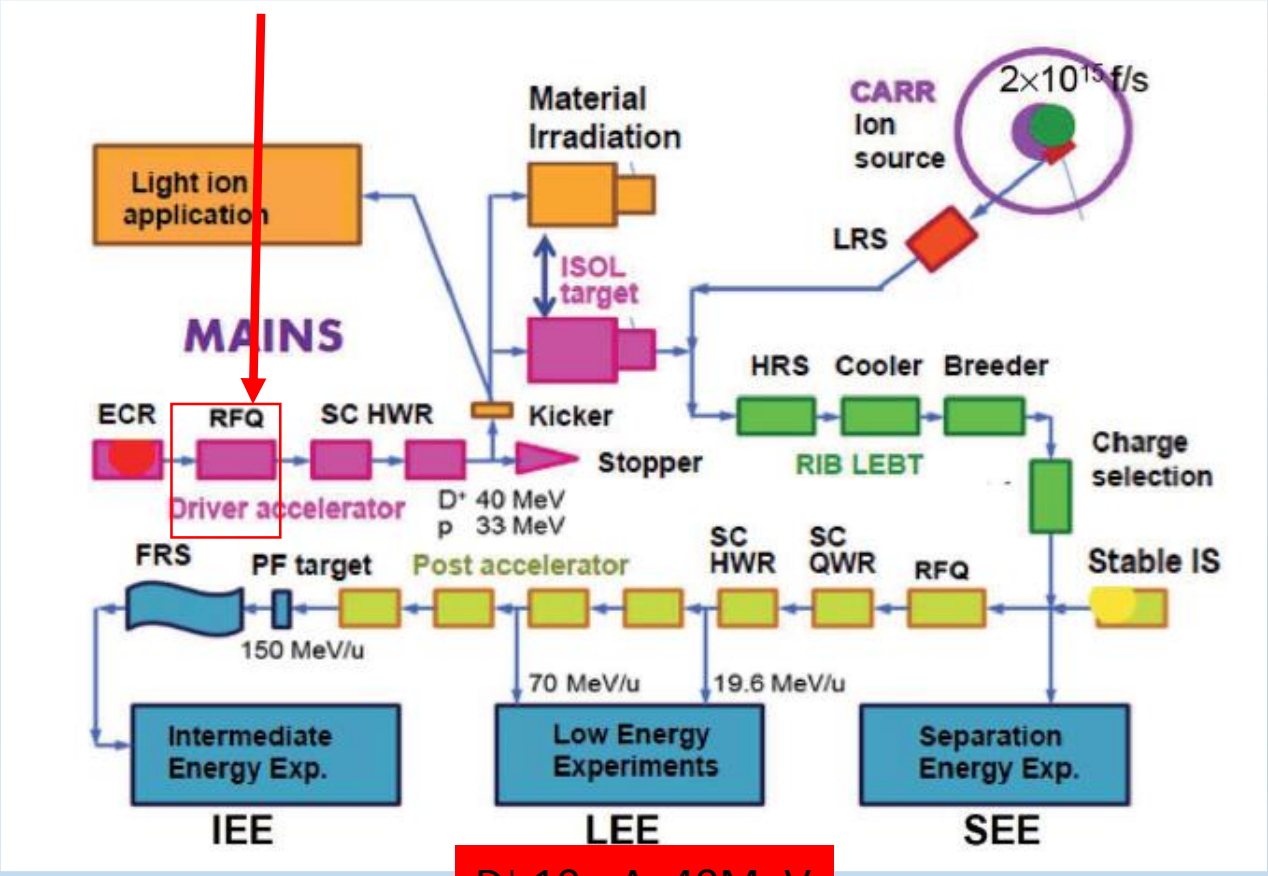
**Zhukun**， Gan Pingping ， Fuqi， Li Haipeng Li， Tan Qiuyun,Liu Shuo, Lu Yuanrong, Gao Shuli, Wangzhi, Guo Zhiyu(Peking university,China)

Heyuan, Dou Weiping, Wuqi(Institute of Modern Physics,China)

**Linac18. 2018.09.16**

# Introduction

- **RFQ Prototype for BISOL(Beijing Isotope-Separation-On-Line neutron-rich beam facility)**



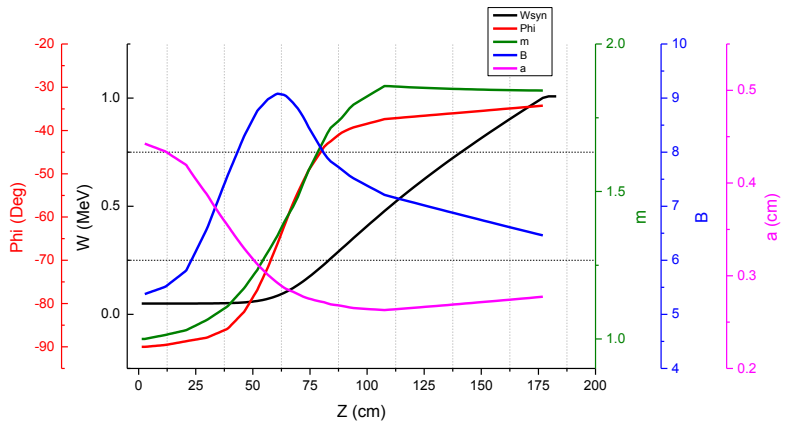

- Basic nuclear science research
- Application of intense neutron beam

**RFQ parameter**

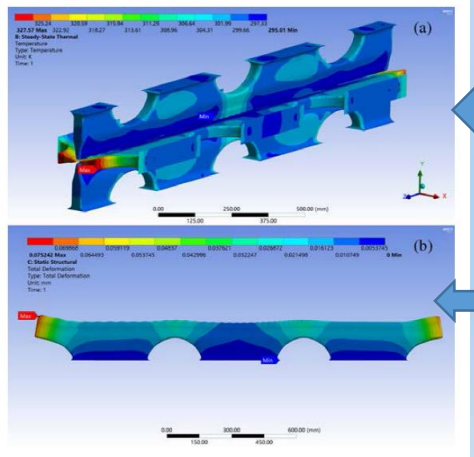
| | |
|---|---|
| Frequency | 162.5MHz |
| Energy | 50keV-1MeV |
| Cavity type | Fourvane with window |
| Beam type | cw |

# RFQ design

**Beam dynamics design, optimized by using matching and equipartition method**



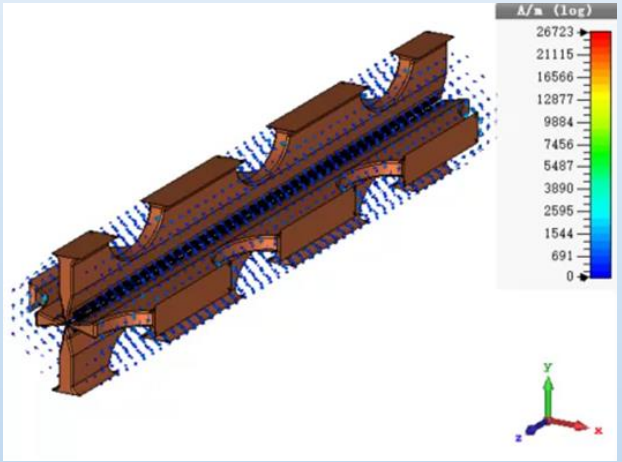

Structure and thermal analysis




Maximal temperature, 326K

Maximal deformation, 75um

Frequency separation is large enough, don't need Pi-mode stabilizing rod or dipole-mode rod

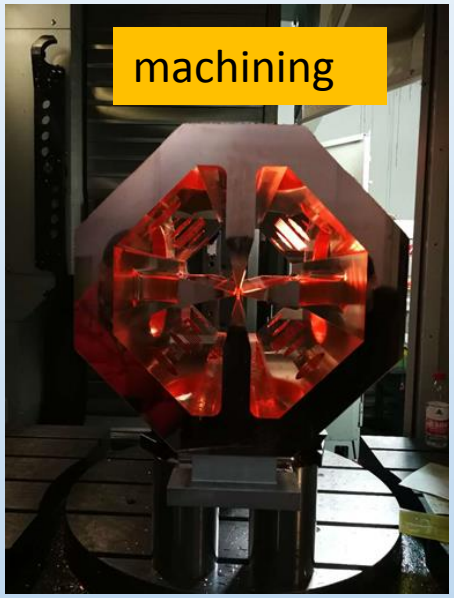


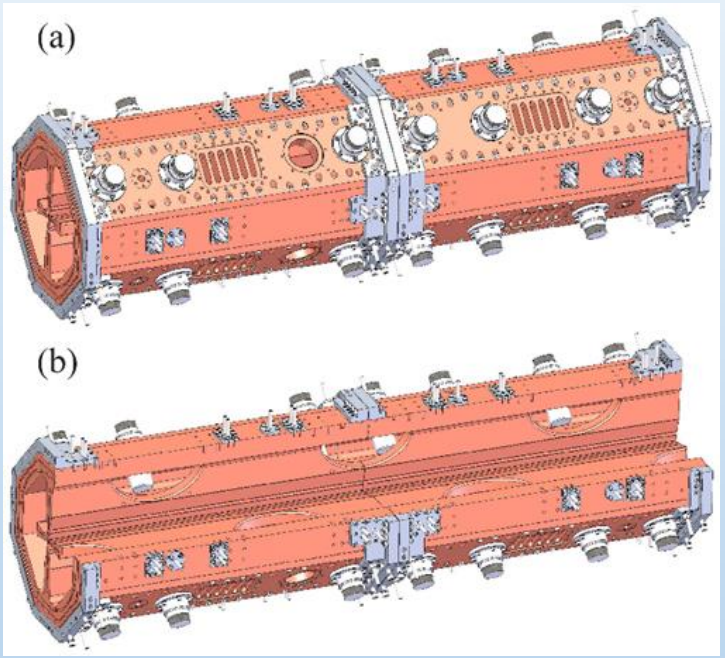

Mode separation: 3.4MHz

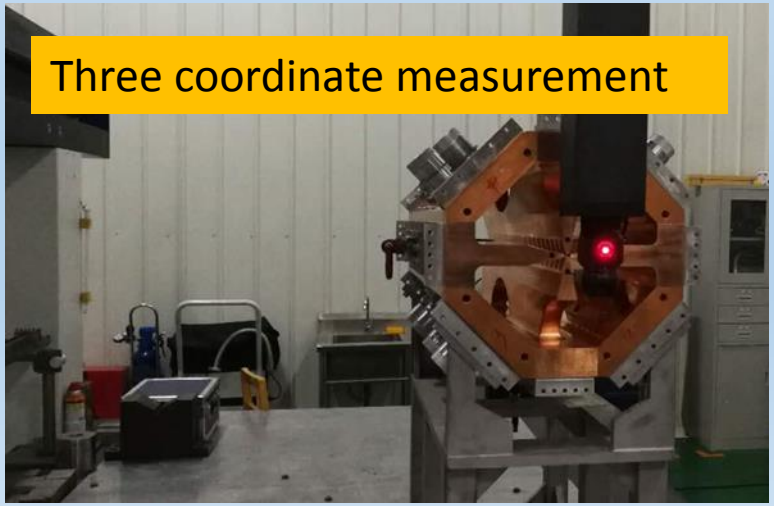
**RFQ parameter**

- Intervane voltage : 60kV
- Vane length: 1.81m
- Kilpatrick coefficient: 1.67
- Average aperture radius :3.88mm
- Transmission efficiency: 98.2%

# RFQ machining and measurement

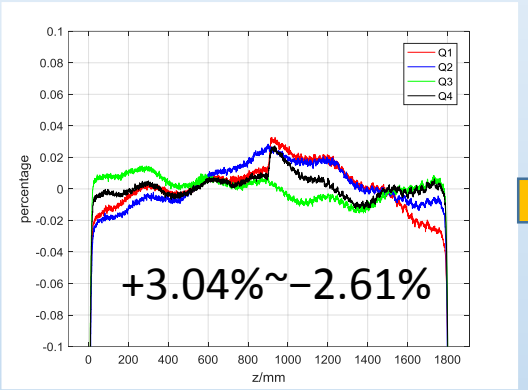



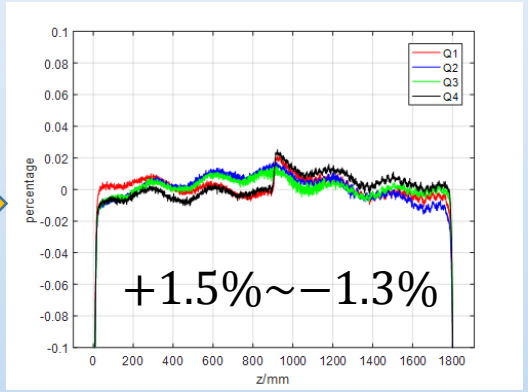




**Element error<20um**
**Assembly error<50um**

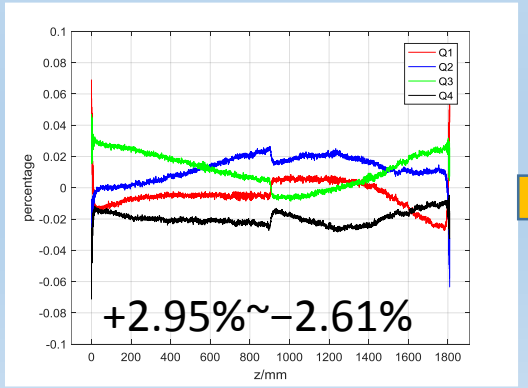
# Field tuning

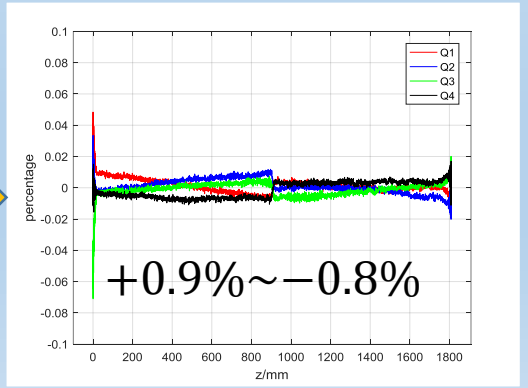
$$\text{unflatness} = \frac{E_{Qk} - \overline{E_{Qk}}}{\overline{E_{Qk}}}$$



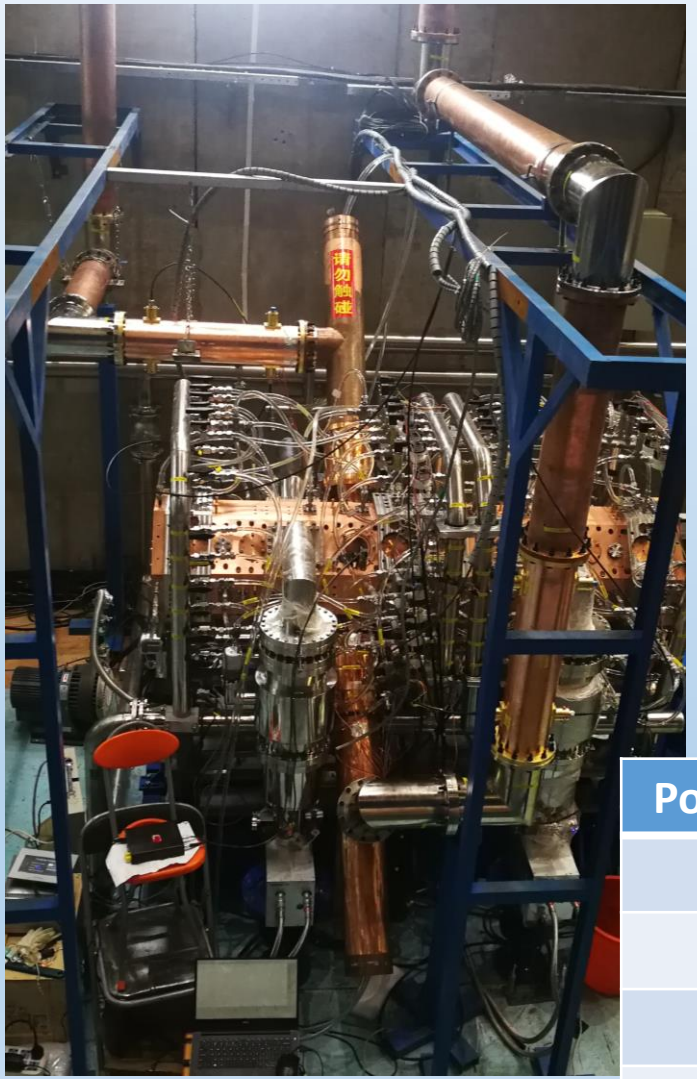



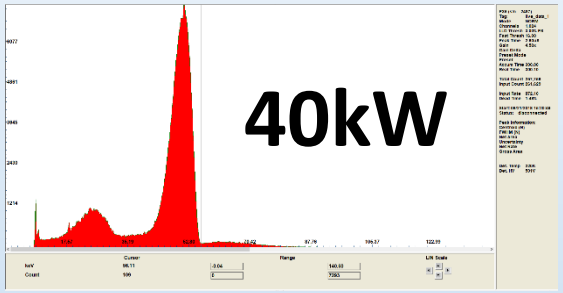

$$\text{asymmetry} = \frac{E_{Qk} - \overline{E_k}}{\overline{E_k}}$$

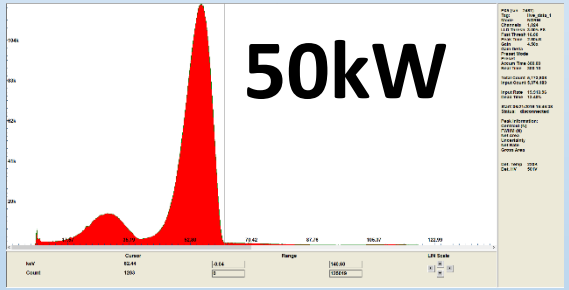


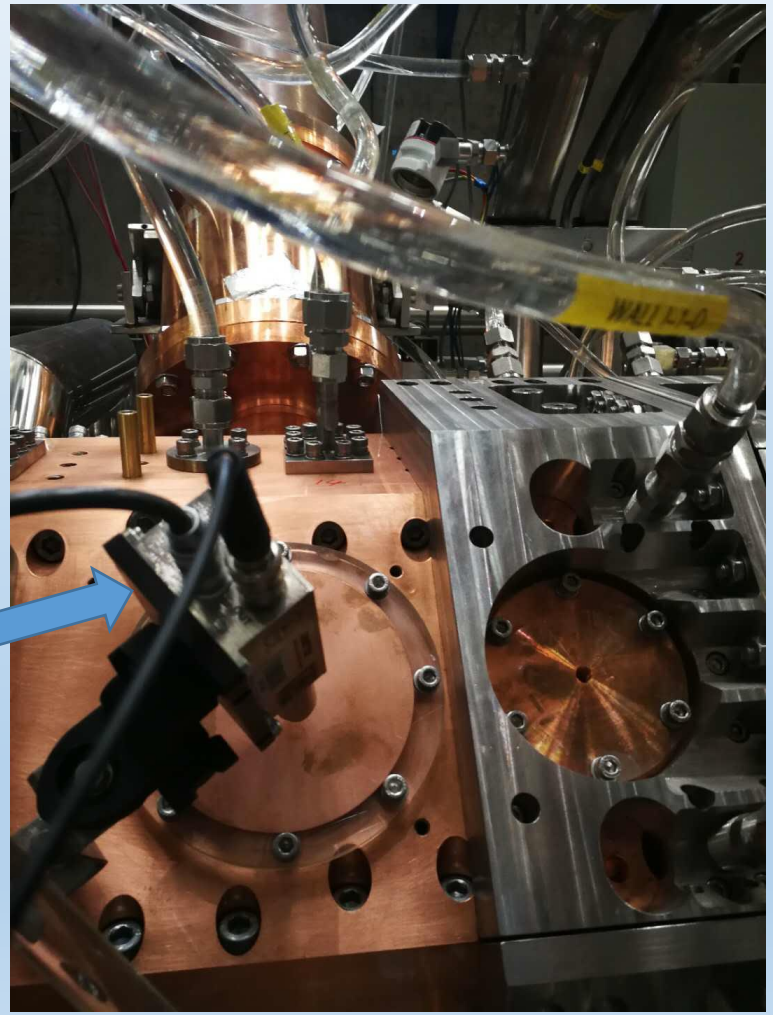



# High power test





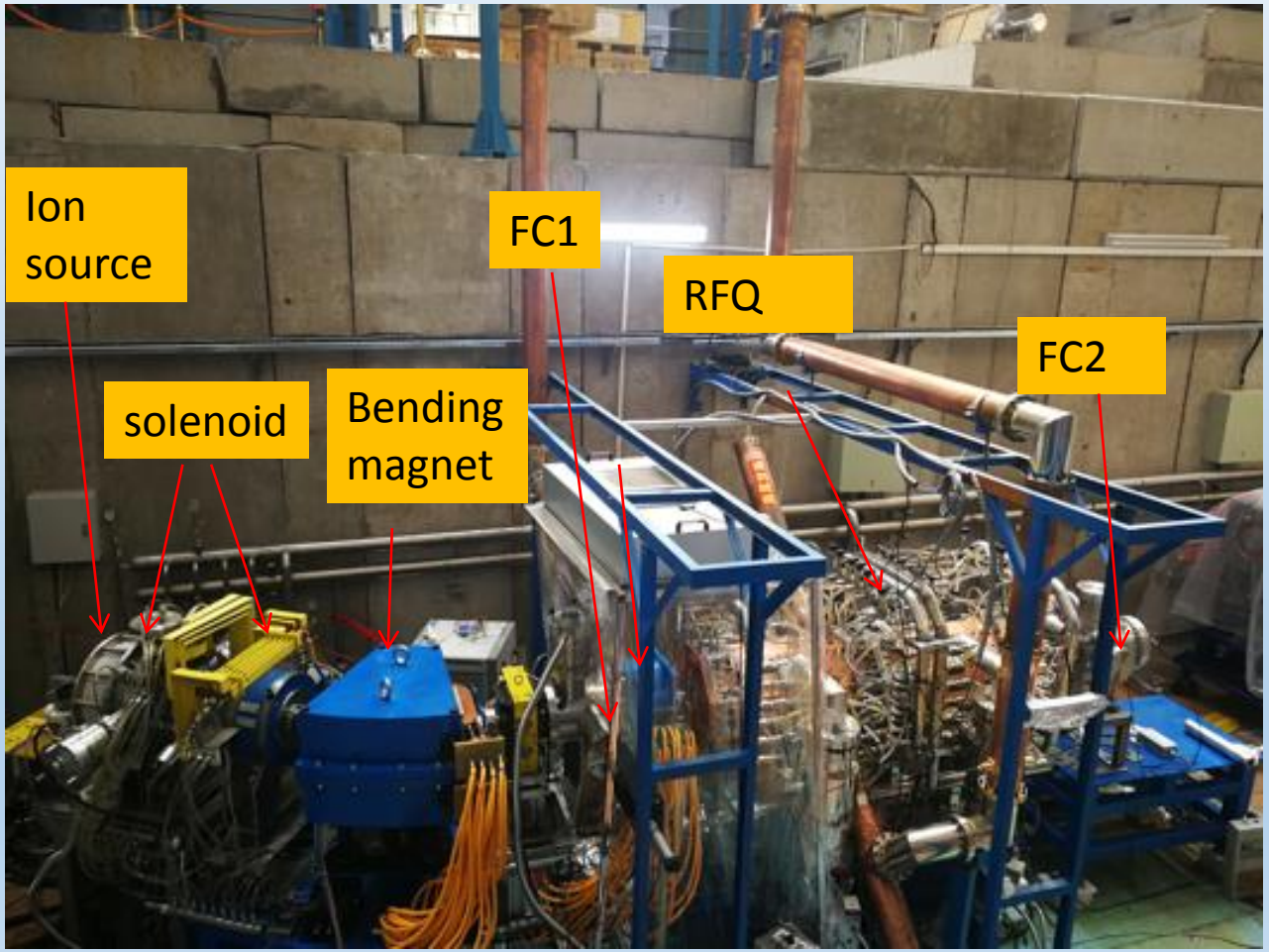



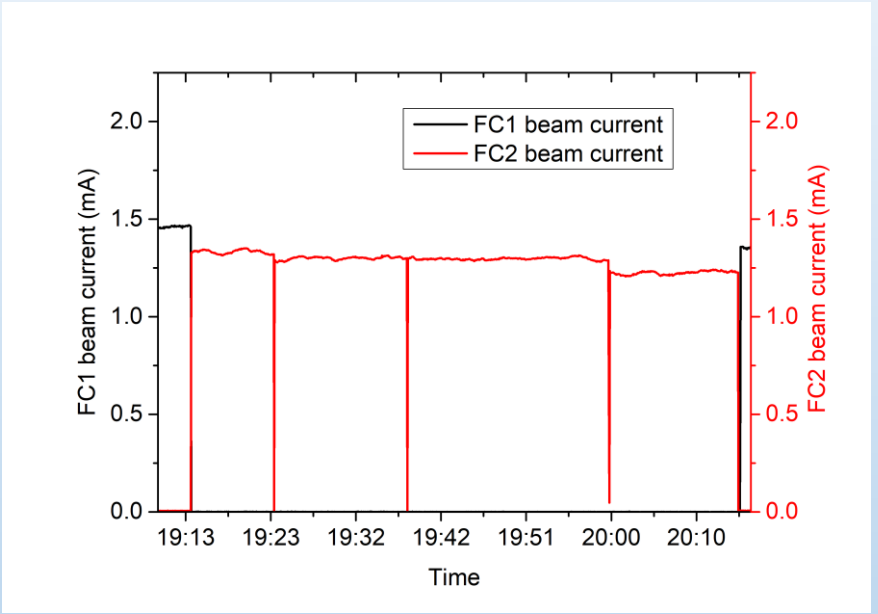



CdTe detector

| Power(kW) | Intervane voltage(kV) |
|---|---|
| 40 | 55.66 |
| 45 | 58.89 |
| 48 | 60.74 |
| 50 | 61.95 |

# Beam experiment




- **The beam transmission efficiency: >90%**
- **The beam energy : 1.05MeV±0.2MeV**
- **Maximum CW beam current: 1.8mA**

**POSTER ID: TUPO015**

**Thank you for your attention!**