Transmission calibration of the Dewar gate valve for XRISM Resolve

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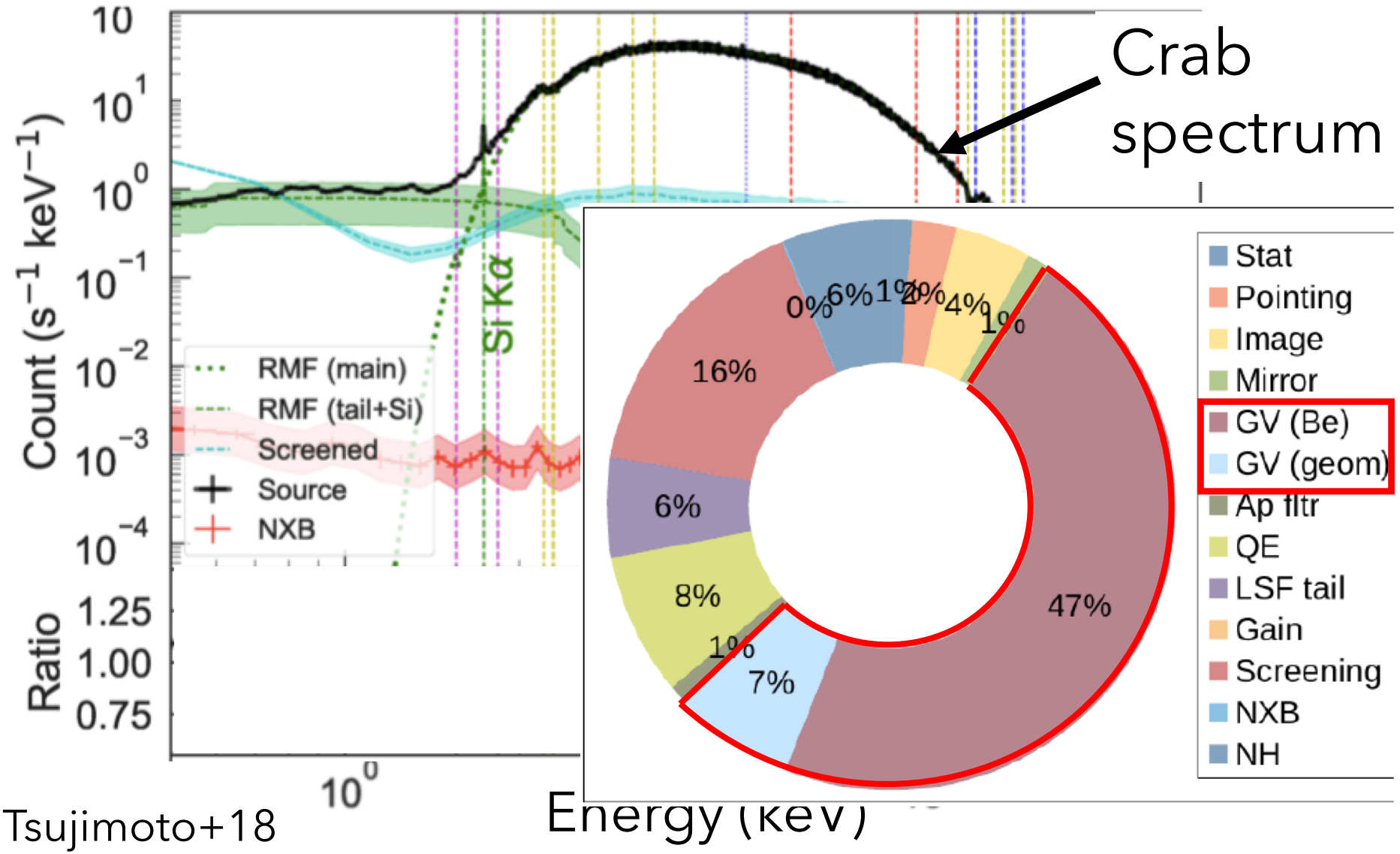
Talk plan

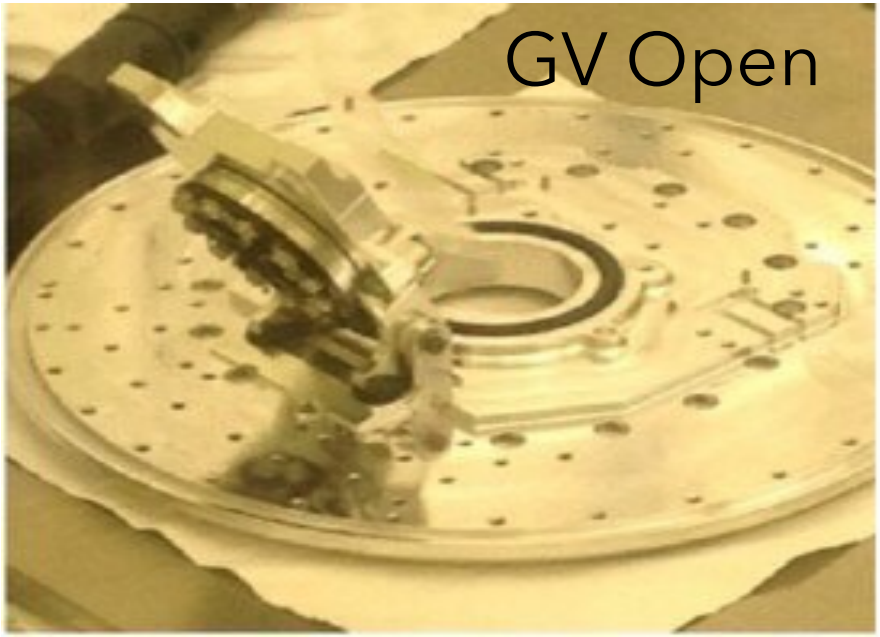
1. Introduction
2. Measurement
   a. Stainless mesh
   b. Be filter
3. Summary

1. Intro: Hitomi/SXS result



Tsujimoto+18

1. Intro: Gate valve (GV)



Roles of GV

1. To keep Dewar vacuum on the ground
2. To protect from initial outgassing in the orbit

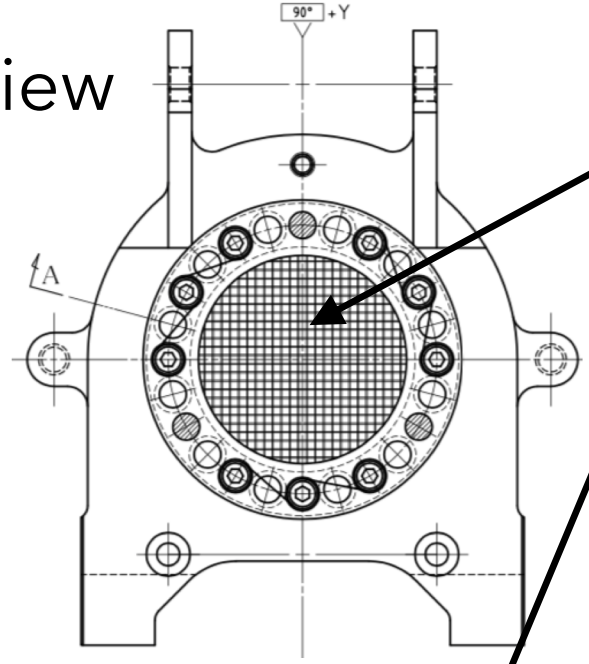
✓ All Hitomi/SXS data were taken through GV.

✓ All XRISM/Resolve initial data will be taken through GV

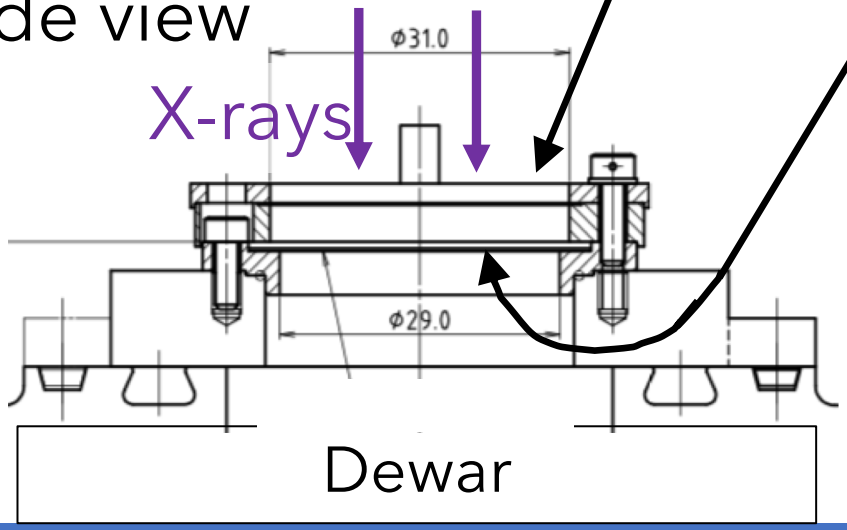
➡ Need to calibrate GV transmission

1. Intro: GV components

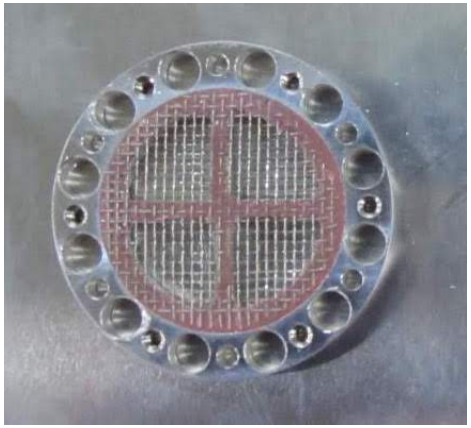
Top view



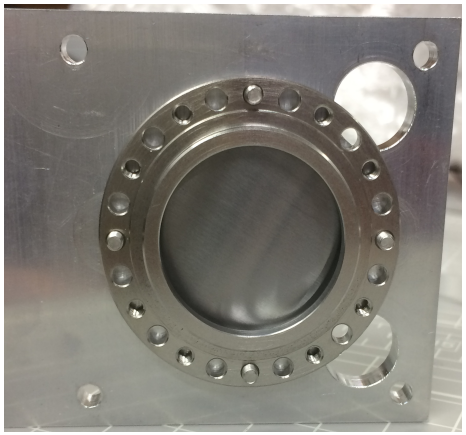
Side view



a. Stainless mesh



b. ~300μm thick Be filter



(Yoshida+17)

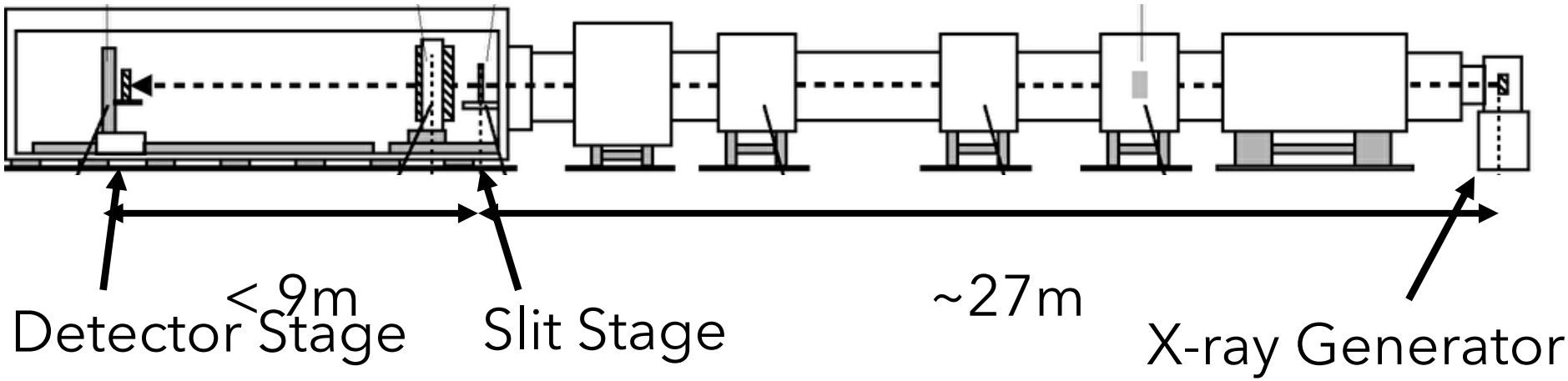
2 Measurement
a. Stainless mesh

2-a. Stainless mesh: Setup

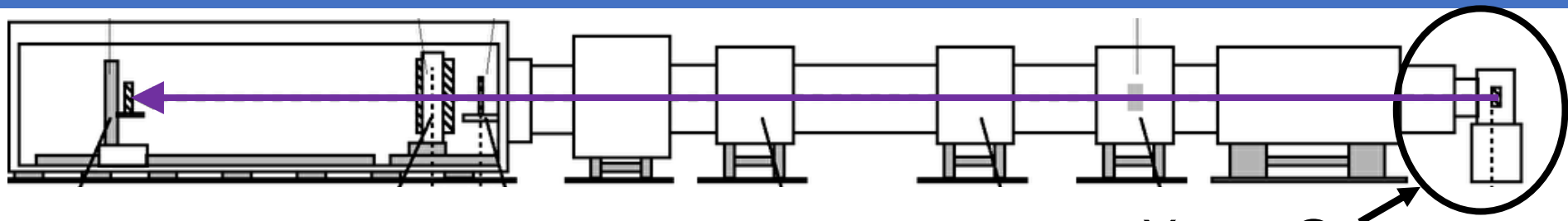
Date: 2019 2/4-19

Place: X-ray Beamline, ISAS/JAXA

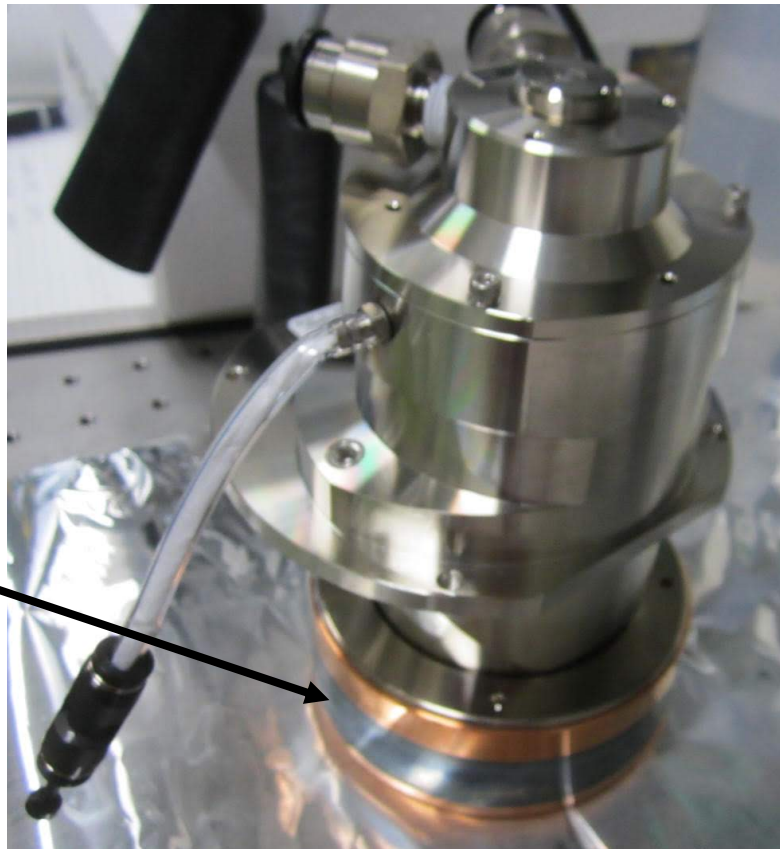
(Iizuka+18)



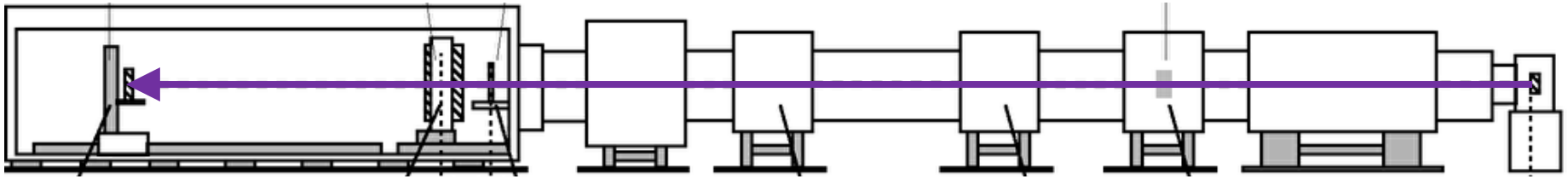
2-a. Stainless mesh: Setup



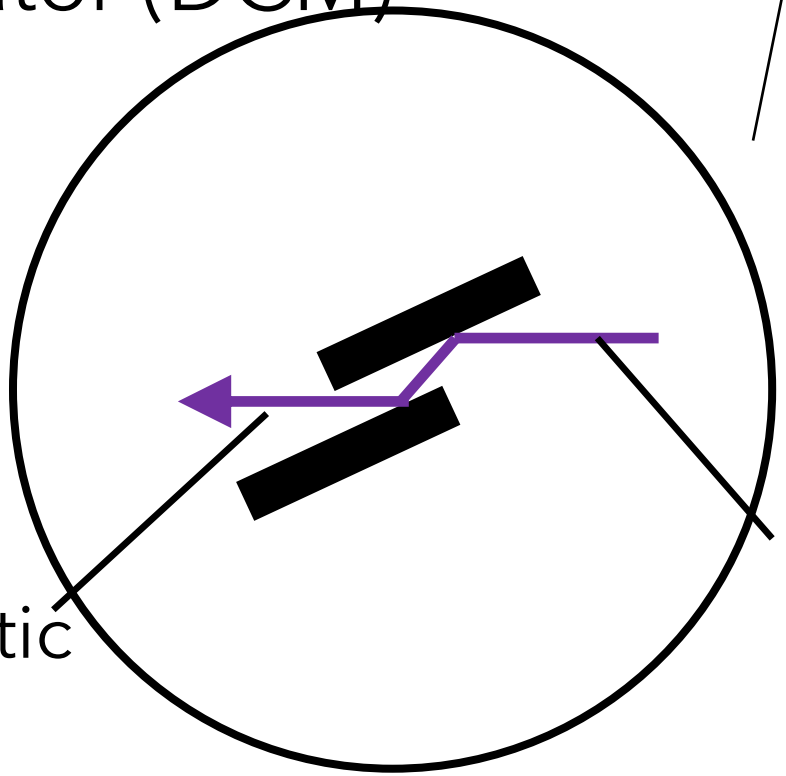
Metal target
(Ti, Cu, Pt, Mo, Ag)



2-a. Stainless mesh: Setup



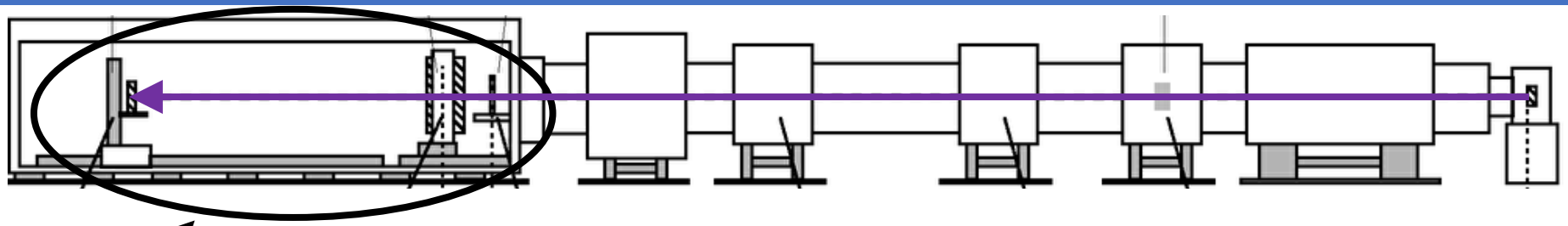
Double Crystal
Monochromator (DCM)



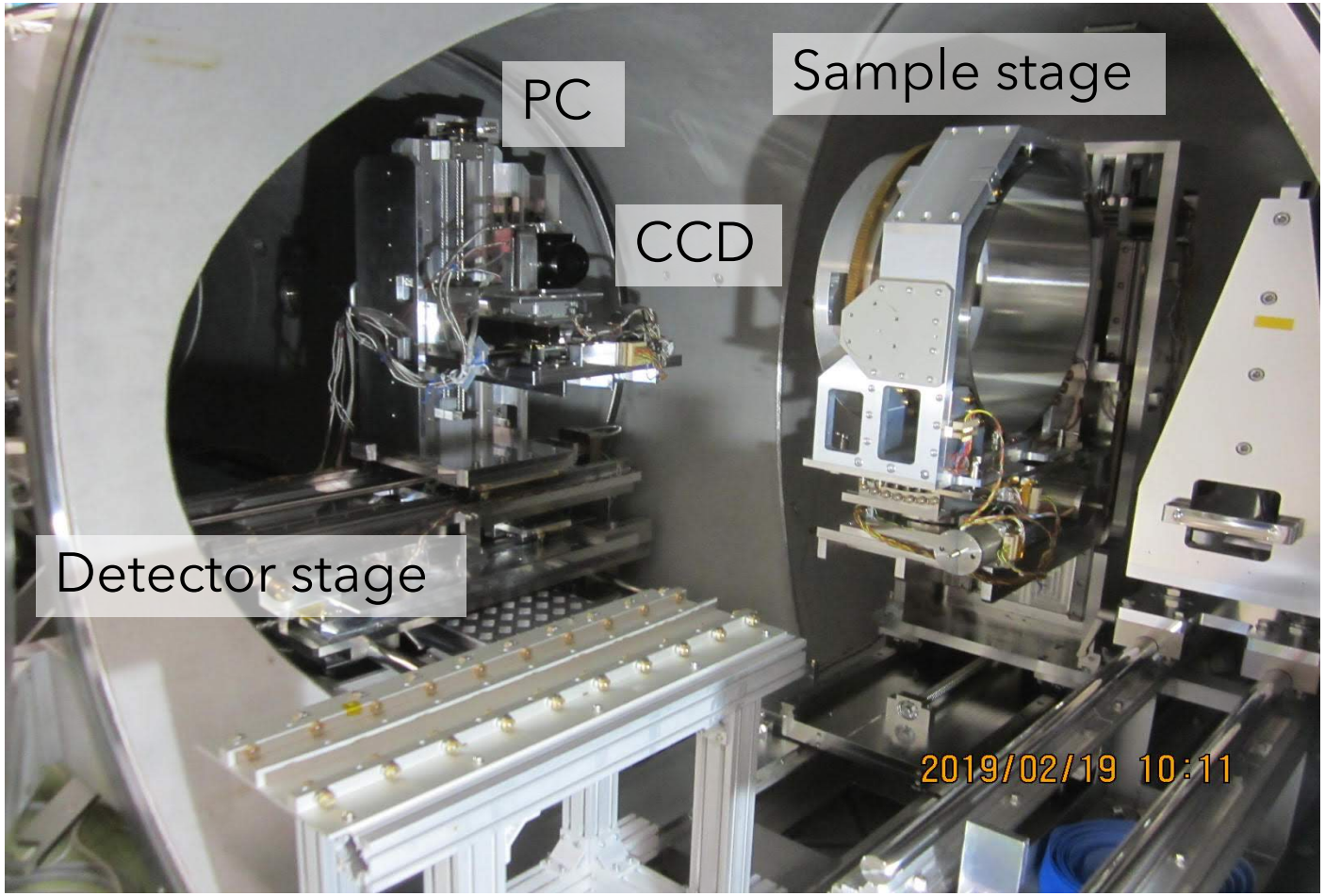
Monochromatic
X-rays

Polychromatic
X-rays

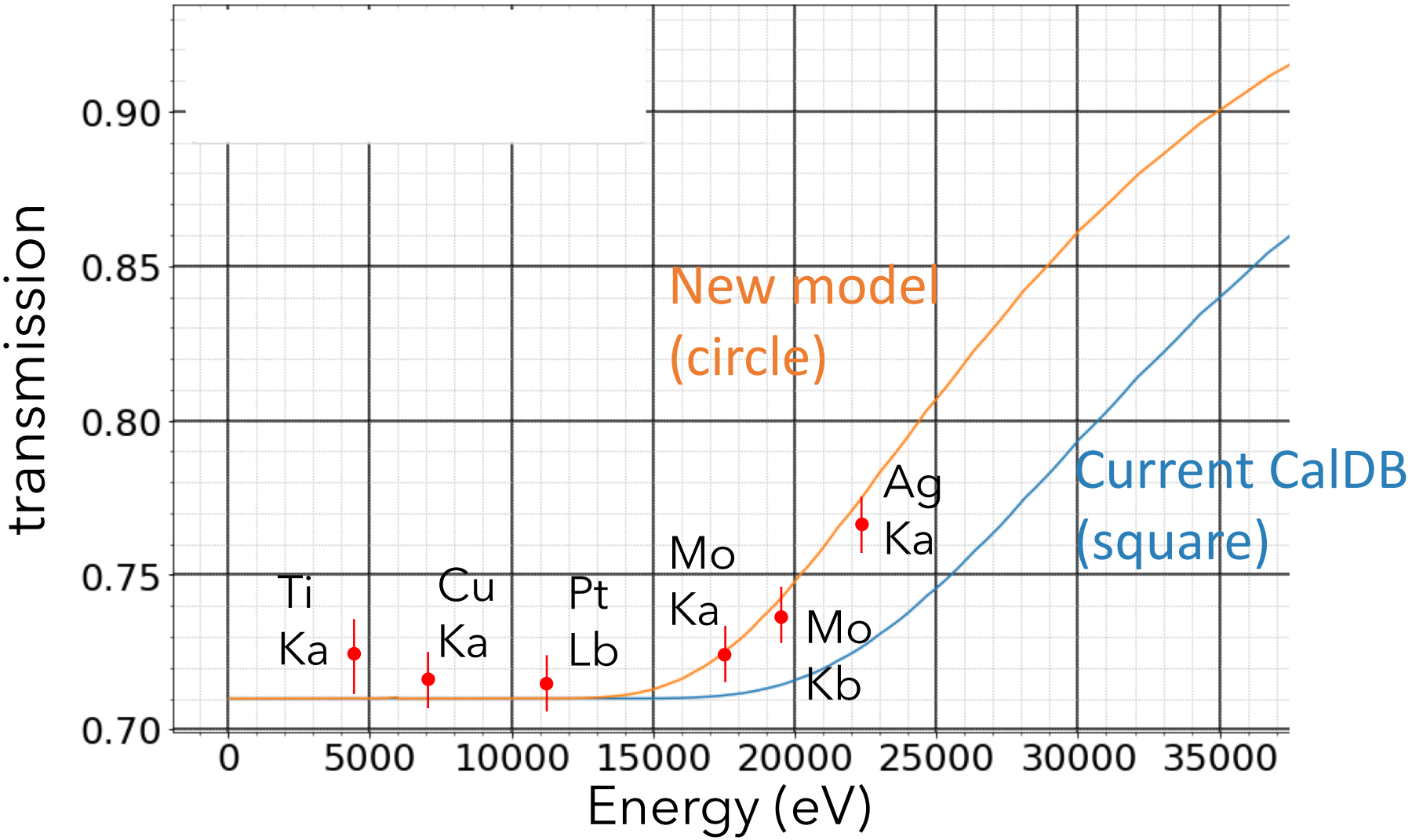
2-a. Stainless mesh: Setup



Measuring Chamber



2-a. Stainless mesh: Result



We shall update SXS CalDB

2 Measurement
b. Be filter

2-b. Be filter: Setup

Date: 2017 2/25-2/27

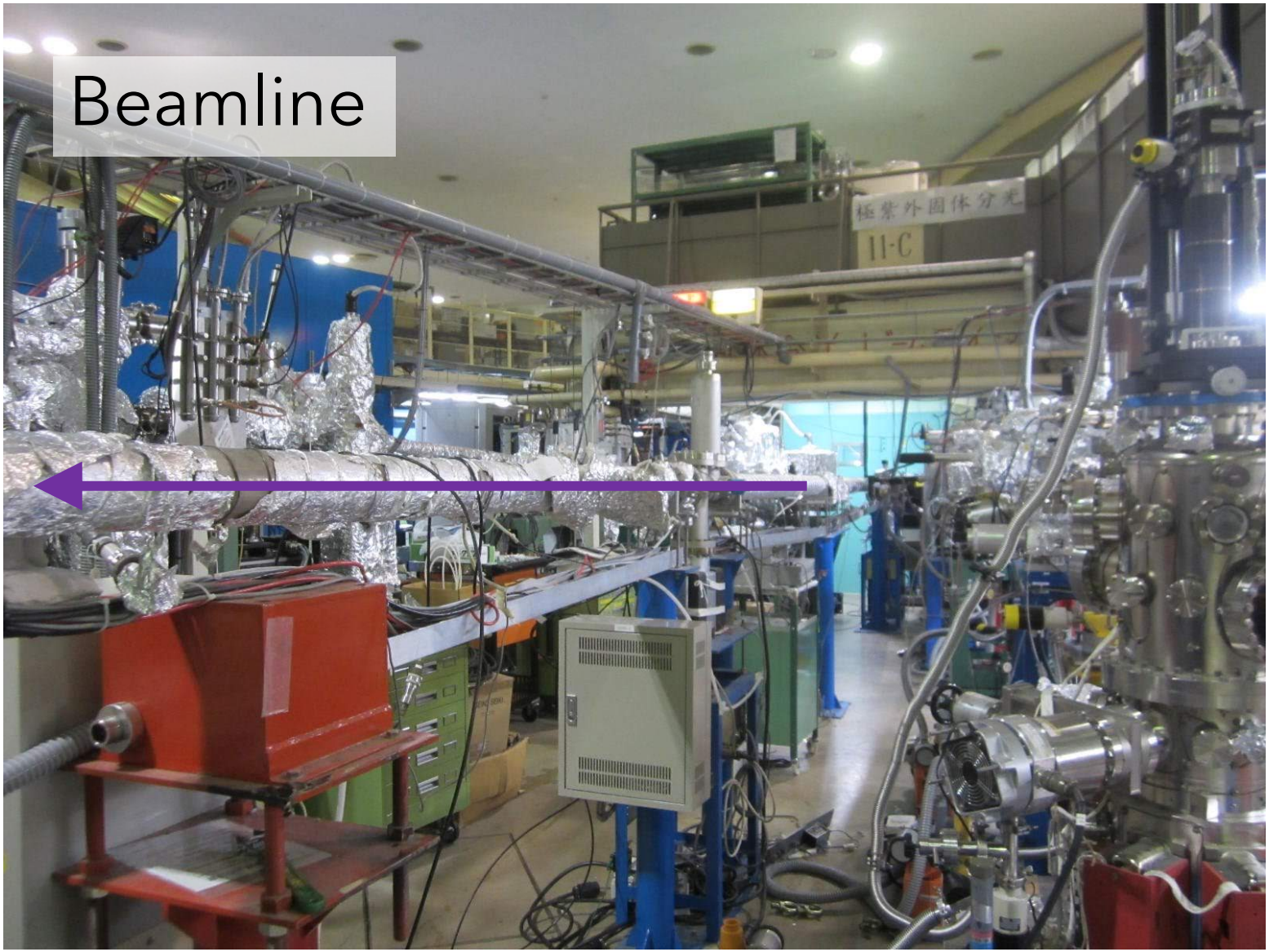
Place: KEK Photon Factory (synchrotron facility)

6.5GeV

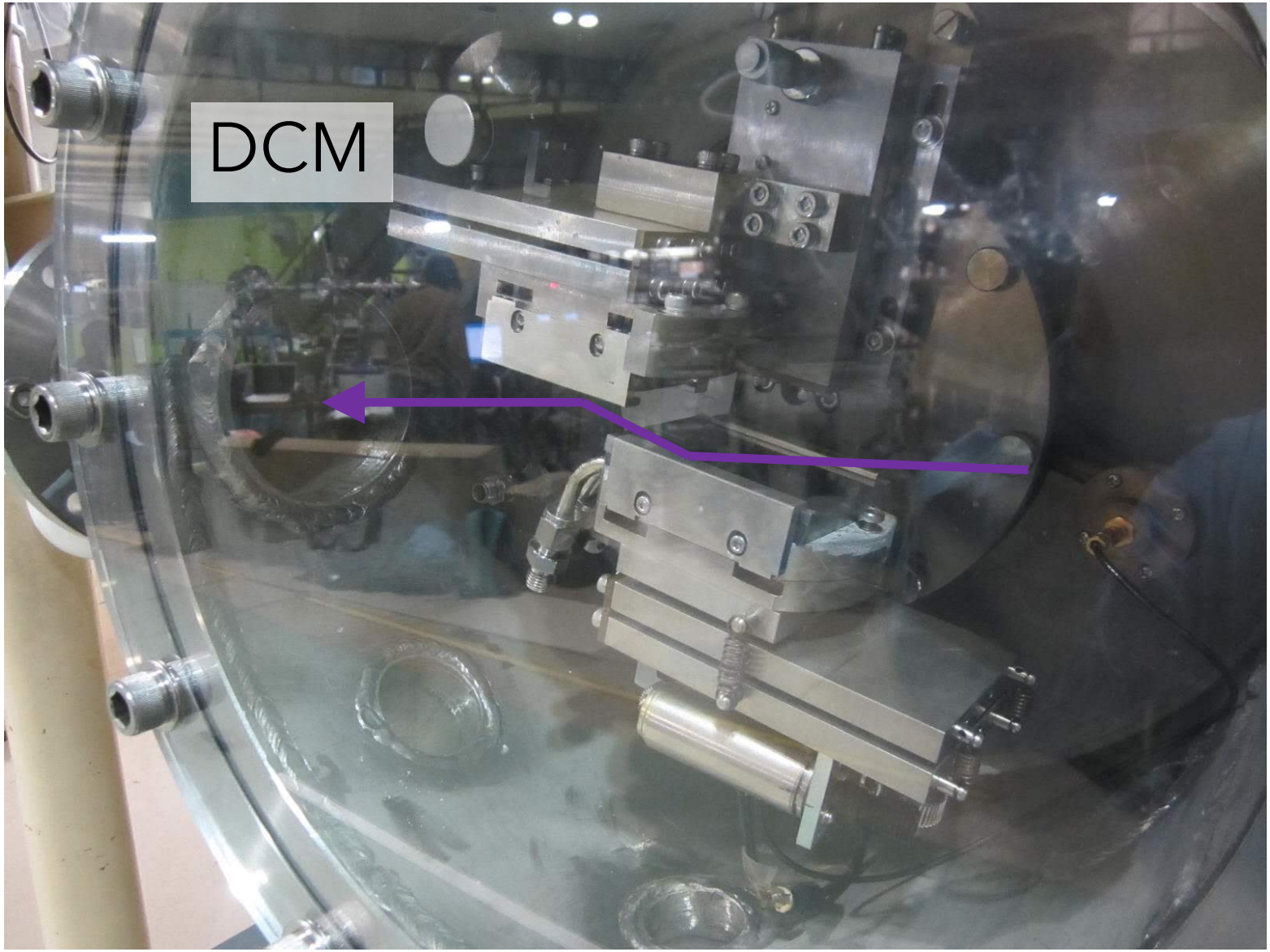
2.5GeV

(KEK HP)

2-b. Be filter: Setup



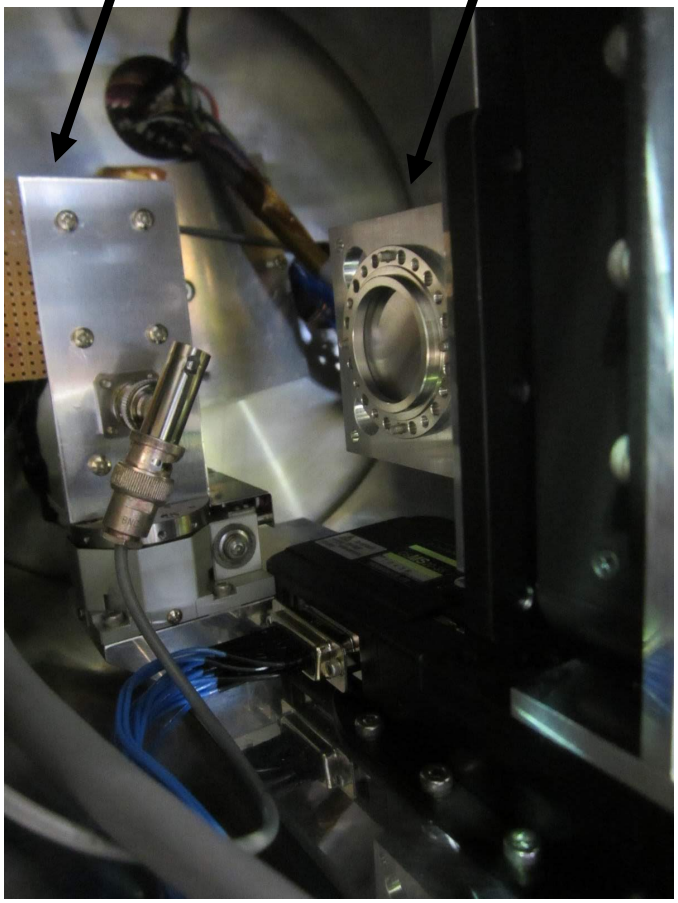
2-b. Be filter: Setup

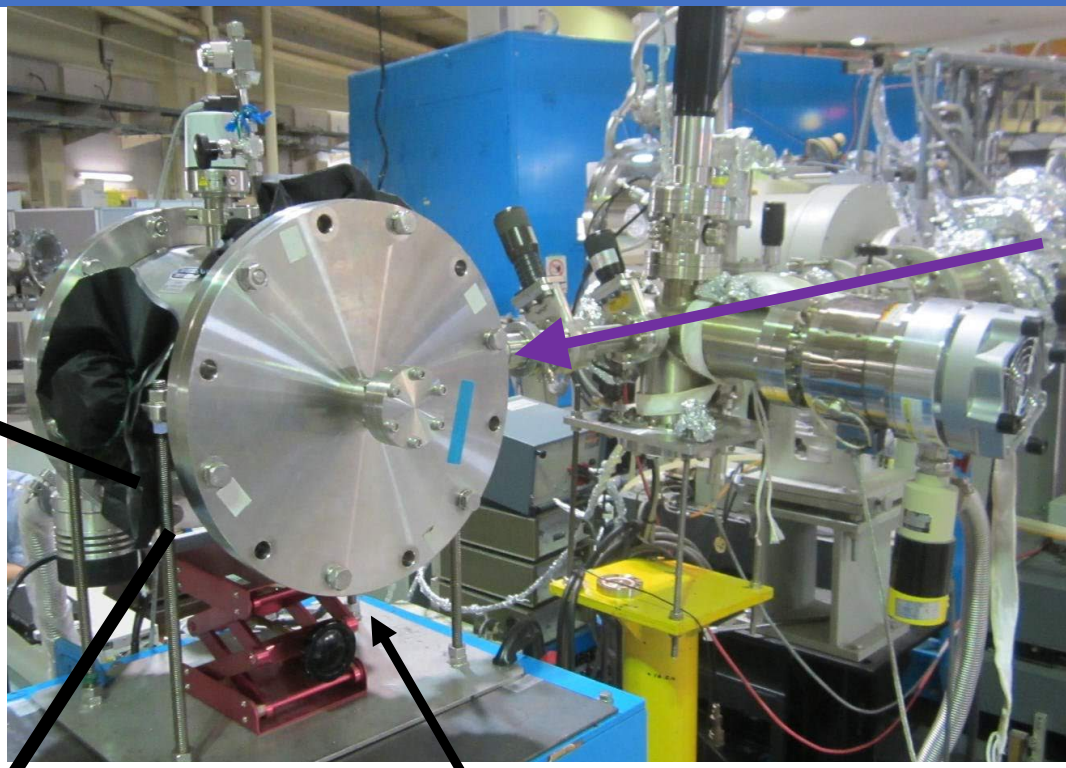


2-b. Be filter: Setup

Detector

Be filter

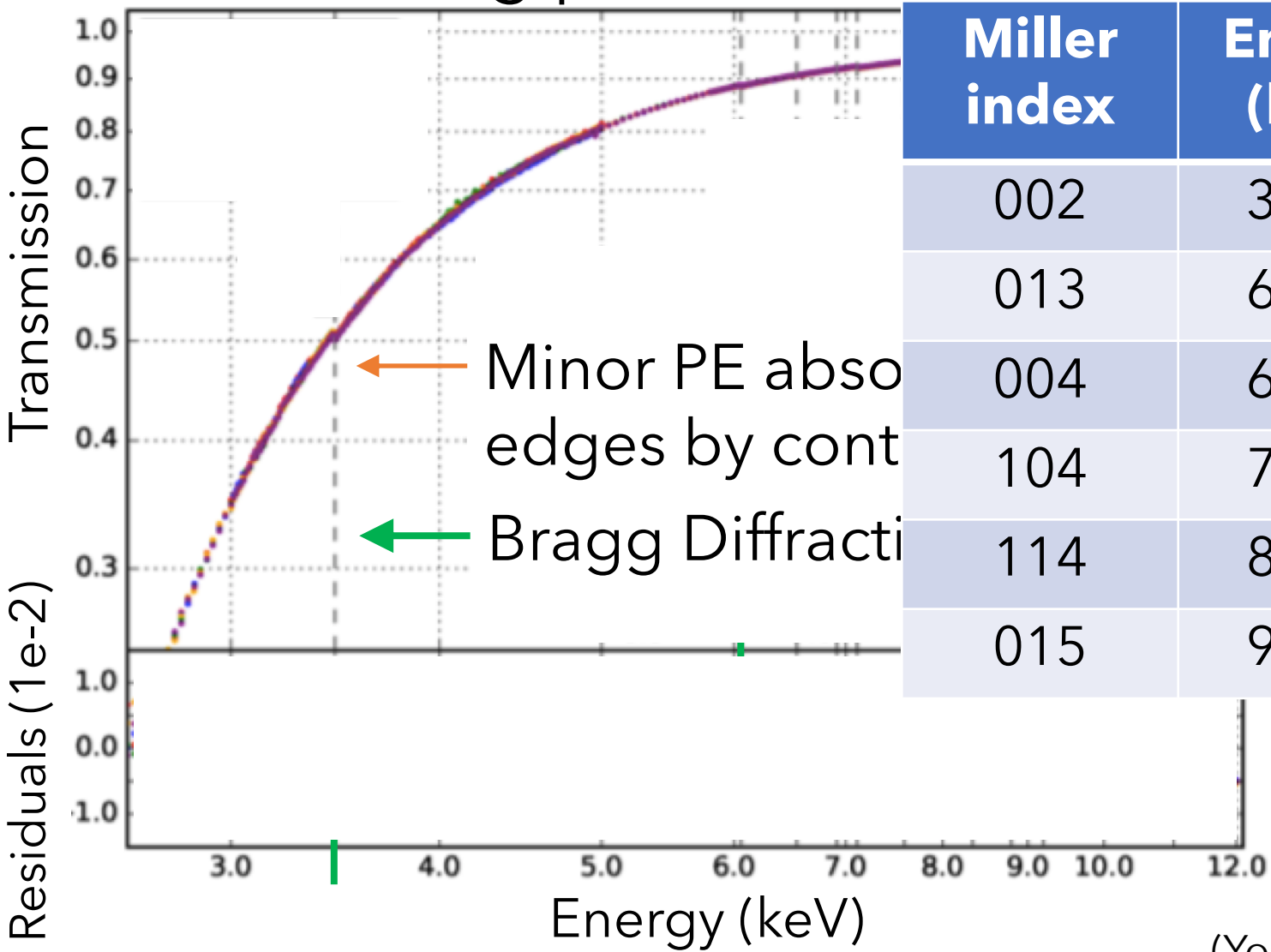




Chamber

2-b. Be filter: Result

✓ Model assuming pure Be PE absorption



Miller index	Energy (keV)
002	3.460
013	6.057
004	6.915
104	7.590
114	8.790
015	9.193

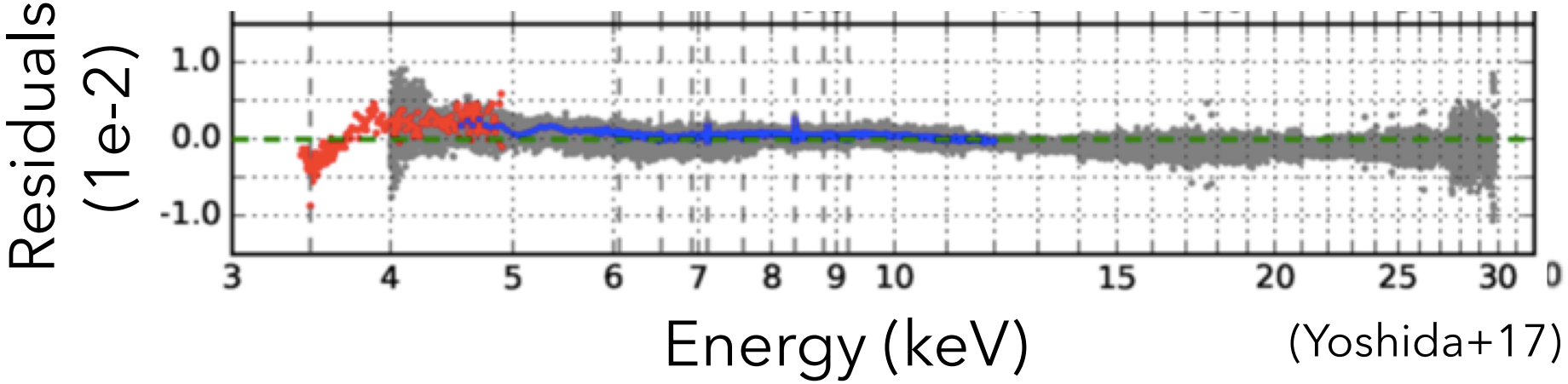
(Yoshida+17)

2-b. Be filter: Model

✓ Model including minor PE abs. and BDFs

$$T(E) = T_{\mathrm{P.E.}}^{(\mathrm{Be})}(E)\, T_{\mathrm{P.E.}}^{(\mathrm{minor})}(E) \prod_{i}^{6} BDF(E)$$

- Crystal
- Atomic



(Yoshida+17)

➡ Considering BDFs is essential

3. Summary & Future

Measured transmission of two components of GV

a. Stainless mesh

Current CalDB has been something wrong

We shall update CalDB of Hitomi/SXS

b. Be filter

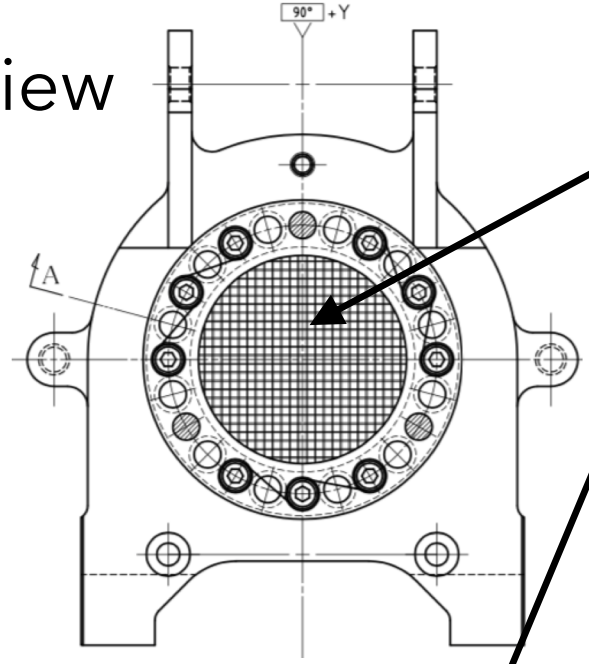
We found considering BDFs is essential for microcalorimeter calibration

References

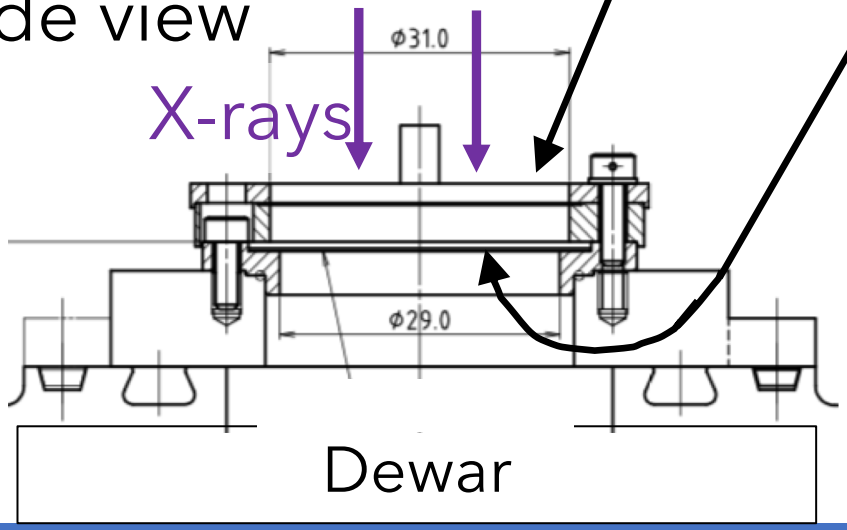
- Tsujimoto et al. (2018), PASJ
- Yoshida et al. (2017), Proc. of SPIE
- Hoshino et al. (2017), Proc. of SPIE
- Eckart et al. (2016), SXS Cal. Report Document

1. Intro: GV components

Top view



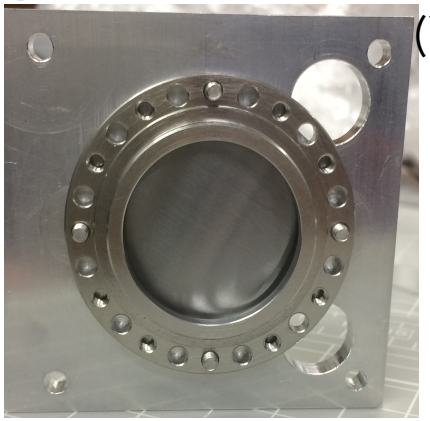
Side view



a. Stainless mesh

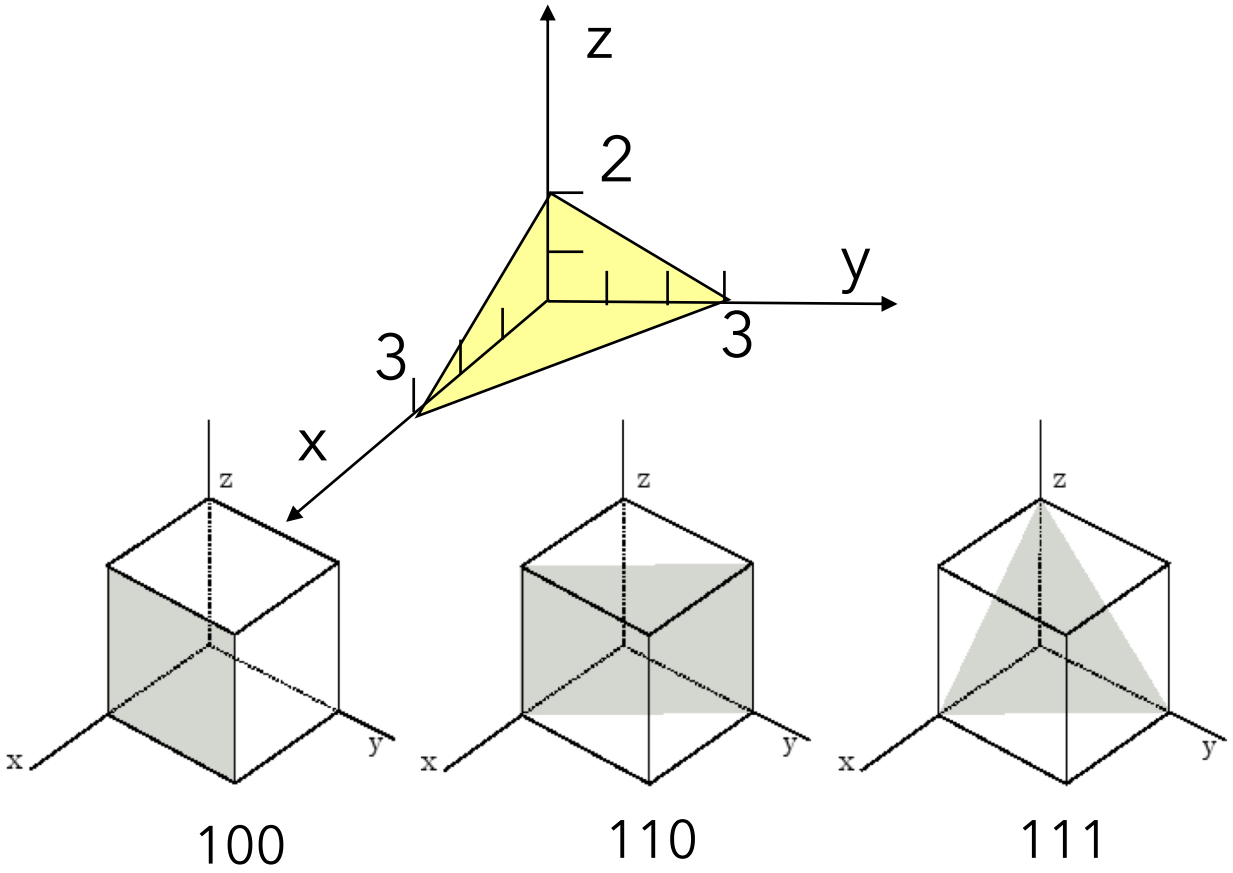
No significant difference

b. ~300μm thick Be filter



(Yoshida+17)

10% uncertainty for thickness

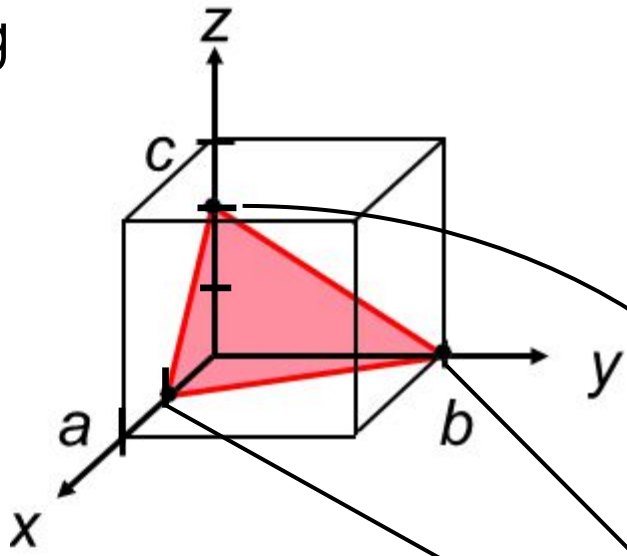

z
2
y
3
3
x
z
x
y
z
x
y
z
x
y
100
110
111

2-b. Be filter: Model

BDF energy is determined by *Miller indices*

Describes planes in crystal lattice

e.g



How to find the Miller indices

1. Determine the intercepts (1/2, 1, 2/3)
2. Take the reciprocals (2, 1, 3/2)
3. Make these integers (4 2 3)

×2

Miller index	Energy (keV)
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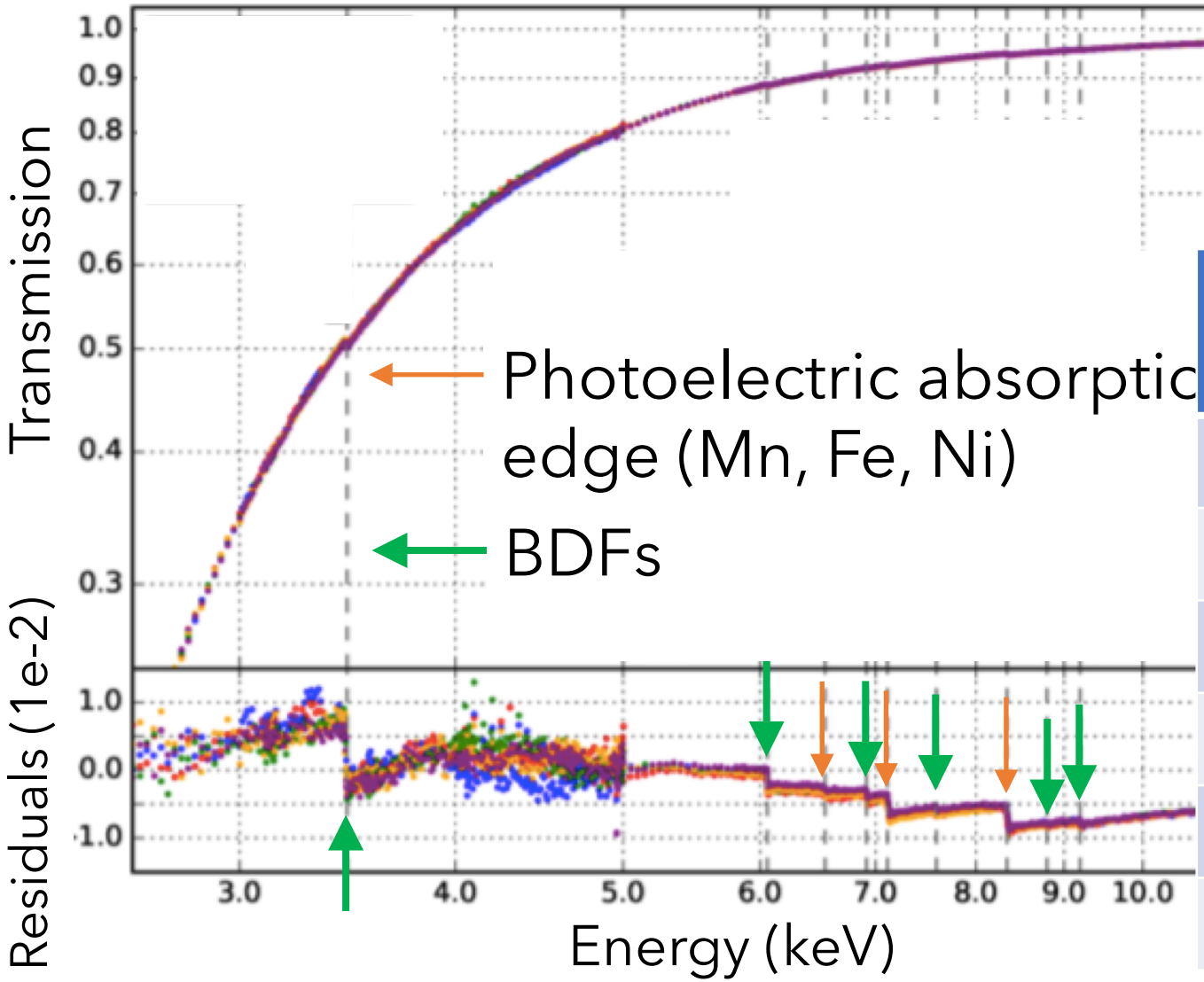
2-b. Be filter: model



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