Compound transmission from the 7ID Beamline vacuum windows

Eric Dufresne
MHATT-CAT
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Abstract

Find below a graph of the transmission losses due to the 7ID Be windows and commissioning window.

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FIGURES

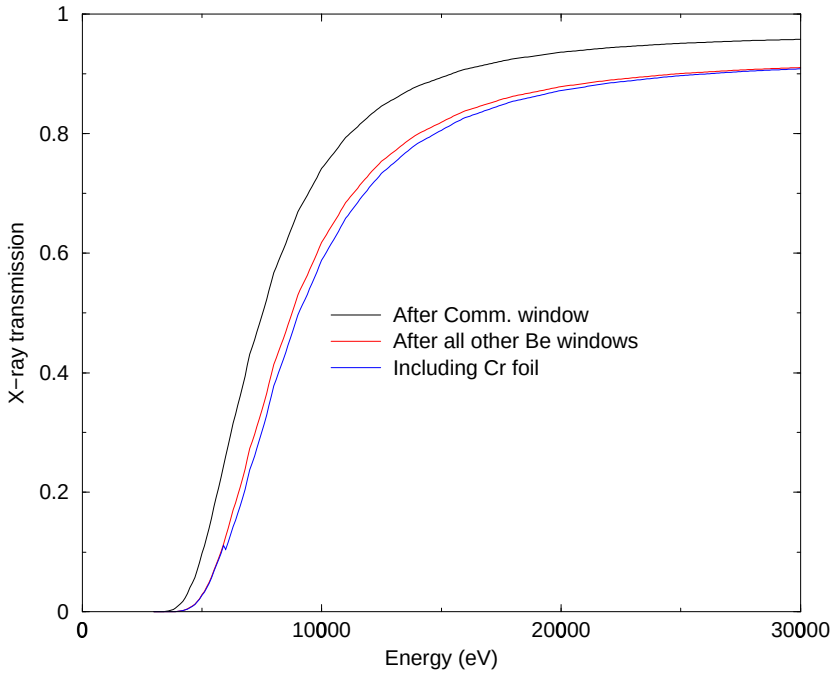

FIG. 1. Total X-ray transmission for all the vacuum windows installed on 7ID.

Several windows on 7ID limit the efficient operation of our beamline to low undulator fundamentals. First, the APS Vacuum and the beamline vacuum are separated by a commissioning window which is made of a carbon filter followed by two unpolished Be windows [1]. The carbon filter is a 127 μm CVD diamond foil ($\rho = 3.514$ g/cm^3) and 250 μm of graphite (I assume here $\rho = 2.25$ g/cm^3). For absorption calculation, this is equivalent to a 448.3 μm thick graphite foil ($\rho = 2.25$ g/cm^3). The carbon absorber is followed by two 254 μm thick Be windows. In the long term, this window can be removed from 7ID-A and replaced by a polished Be window or a differential pumping system.

Each main optical element has also its own separate Be windows which were installed to prevent any major beamline vacuum failures to spread on all the optical components. Thus one 254 μm thick Be window is placed between the first mirror filter tank, and another one is placed after the mirror filter 2 tank. Two similar 254 μm thick Be window are placed before and after the micromono in 7ID-B. At the exit of the 7ID-B hutch, another similar window allows the beam to enter the P5. In 7ID-C, the beam exits the BPM through another 254 μm window. This makes a total of $8 \times 254 = 2032$ μm of Be if one includes the commissioning window Be foils. The BPM has also a 5000 Åfilm of Cr with an edge at 5989 eV.

Fig. 1 shows the transmission after the commissioning window (black) after all the other Be windows (red) and the total transmission including the Cr foil (blue). The transmission at 9.06 keV is 50 %. In the future, we can upgrade our beamline to replace the commissioning window and remove at least 3 additional 254 μm thick Be windows. It would take at least 6 months to complete these changes.

REFERENCES

[1] D. Chu et al., SRI 95, published in Rev. Sci. Instrum 95.