SRG

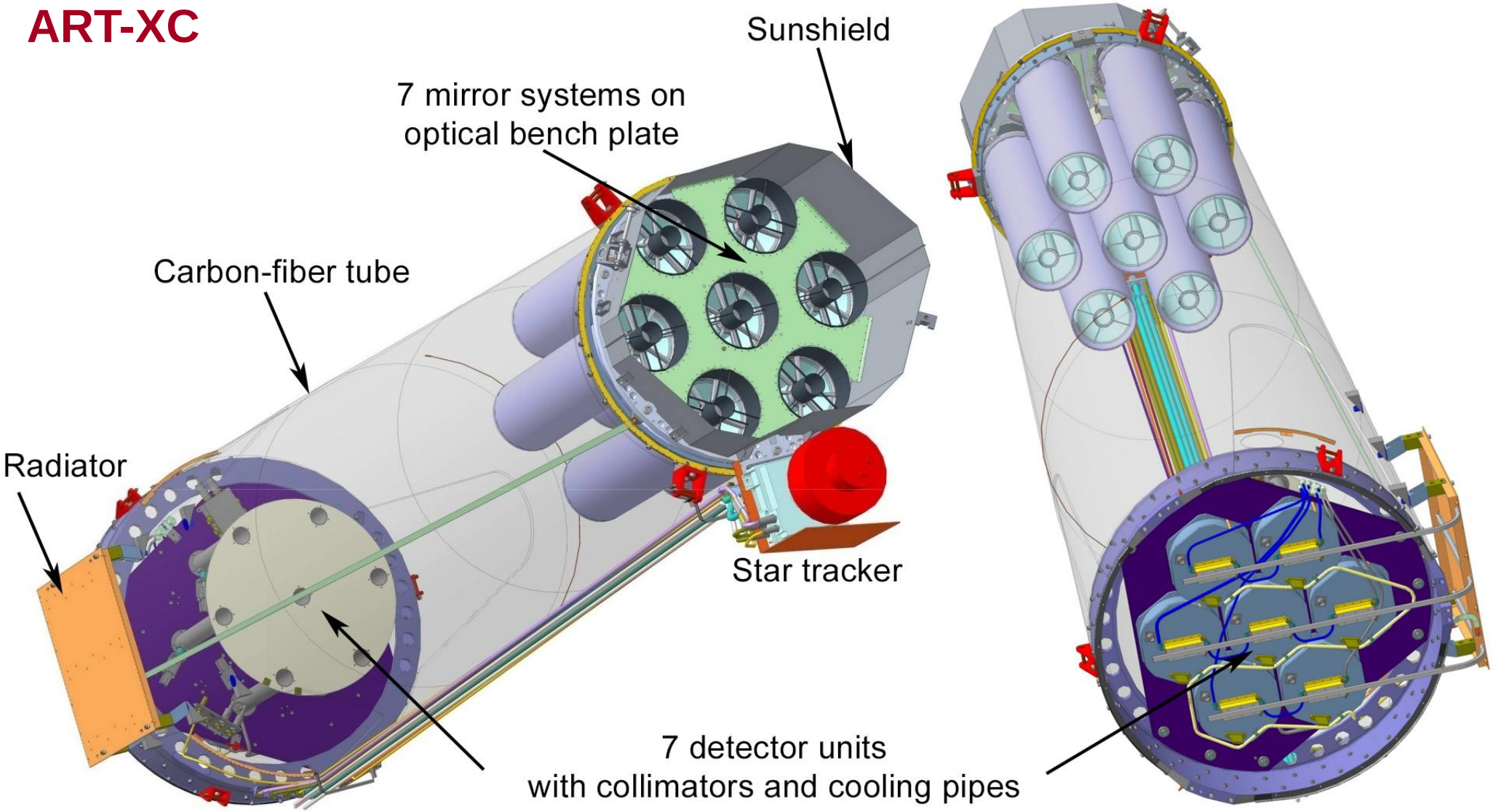
ART-XC/SRG

Mikhail Pavlinsky, IKI, Moscow

Ringberg Castle, October 24, 2018

SRG

ART-XC


Sunshield
7 mirror systems on
optical bench plate
Carbon-fiber tube
Radiator
Star tracker
7 detector units
with collimators and cooling pipes

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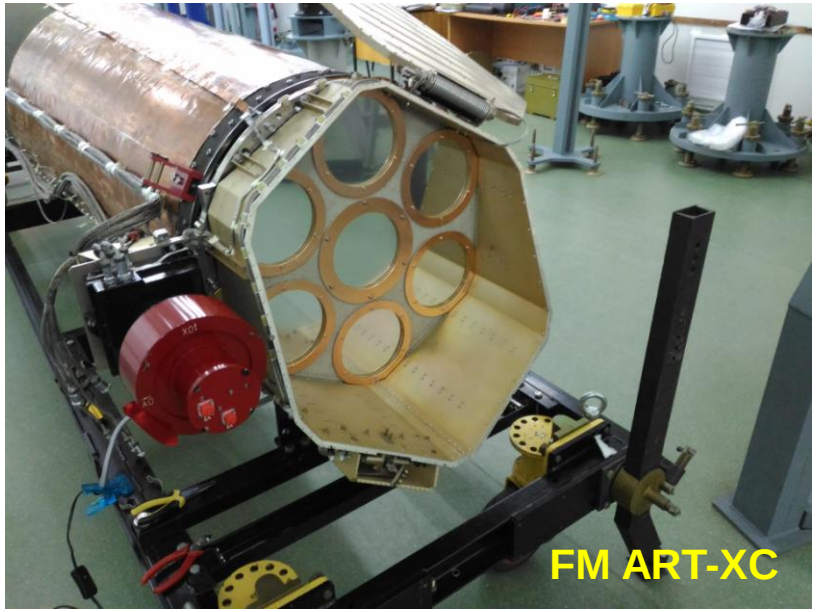

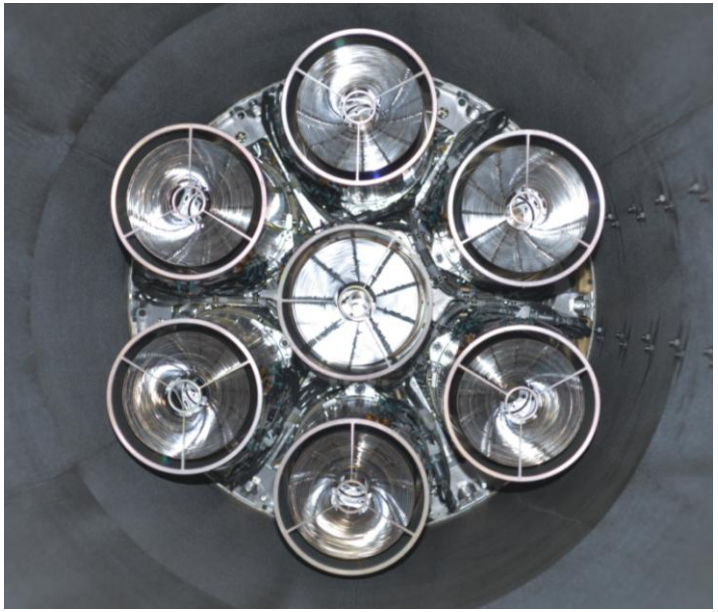

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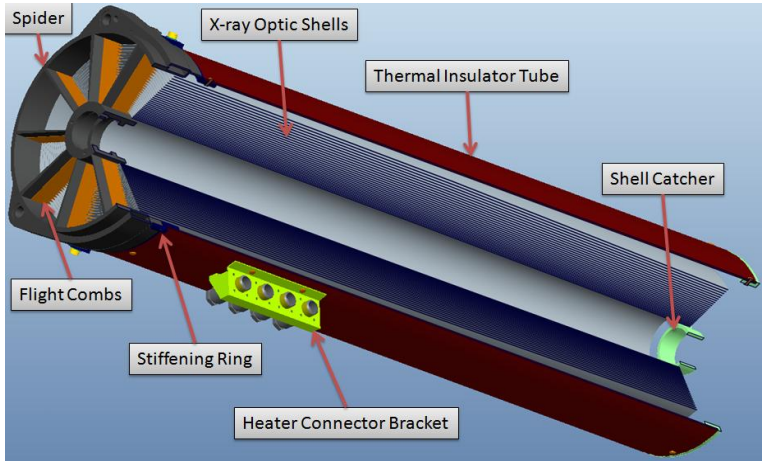
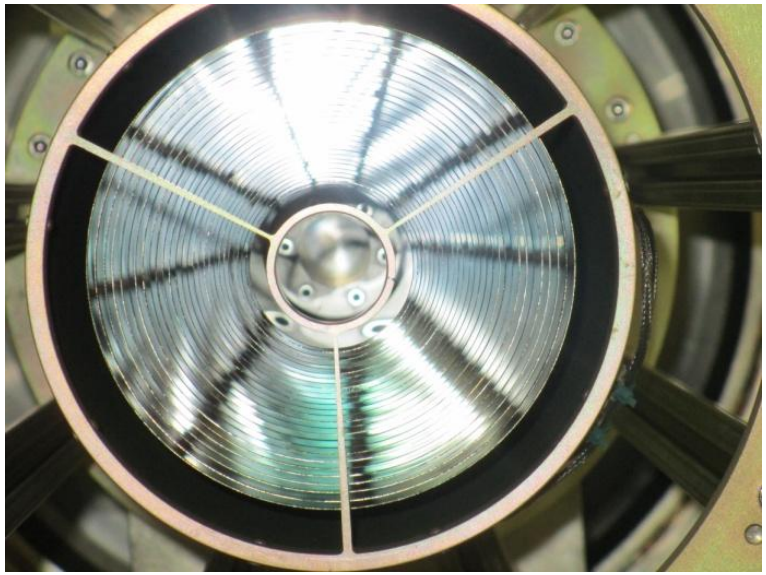
ART-XC: X-ray mirror systems MSFC/NASA

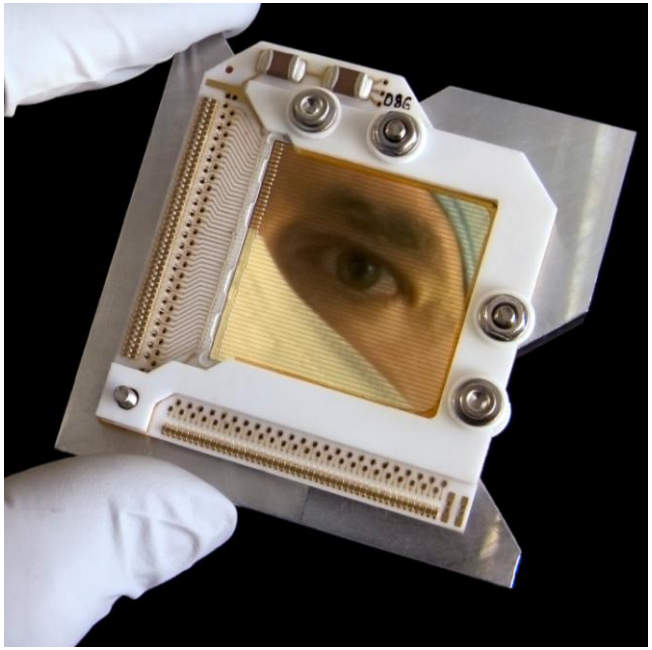
1.	Number of mirror systems	7
2.	Number of nested mirror shells	28
3.	Form of shell	Wolter-I
4.	On-axis angular resolution, HPD	≤35″
5.	Focal length	2700 mm
6.	Length of shell	580 mm
7.	Diameter of mirror shells	49 – 145 mm
8.	Material of shells	Ni/Co
9.	Mirror coating materials	Iridium



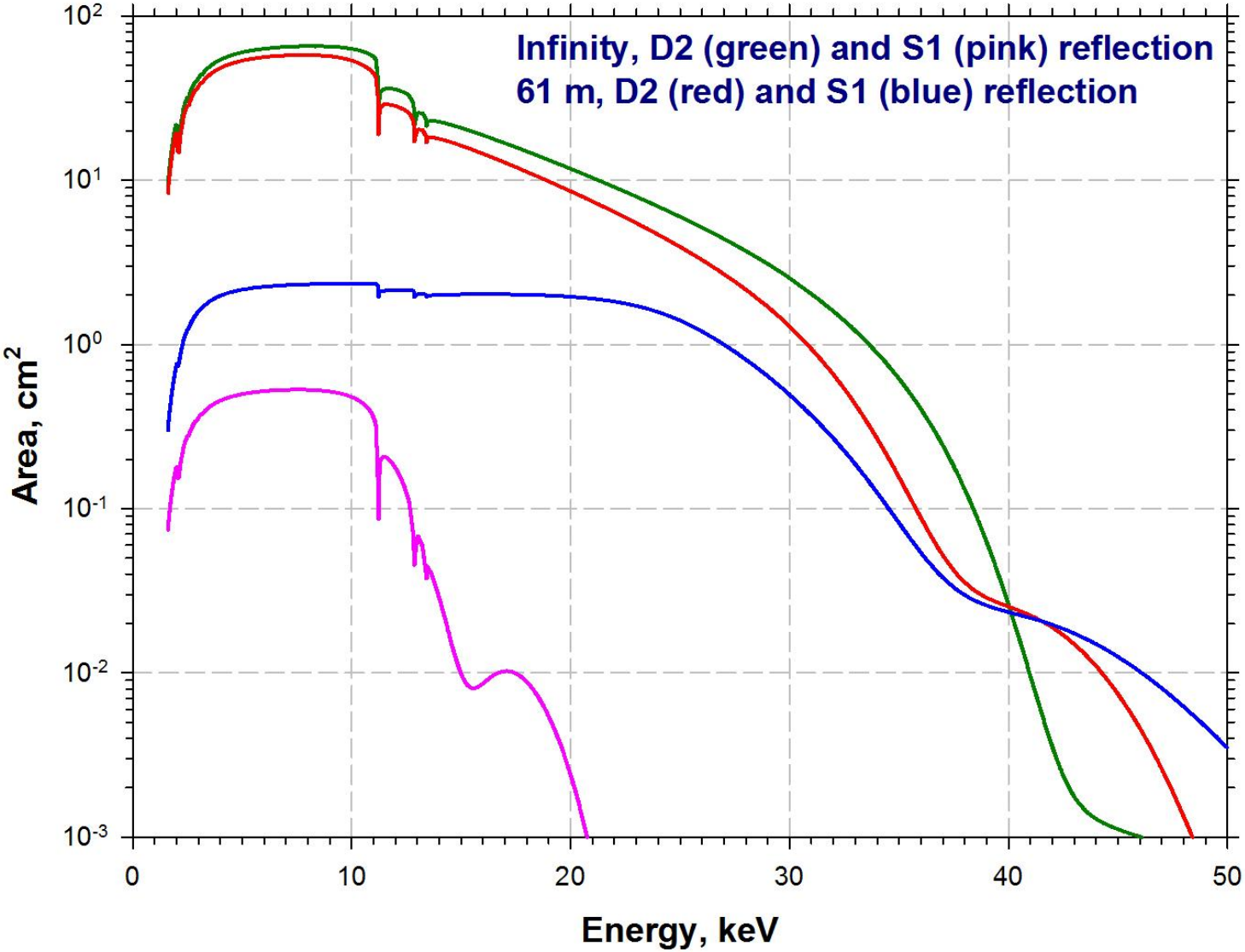


ART-XC: DSSD CdTe detector IKI RAS

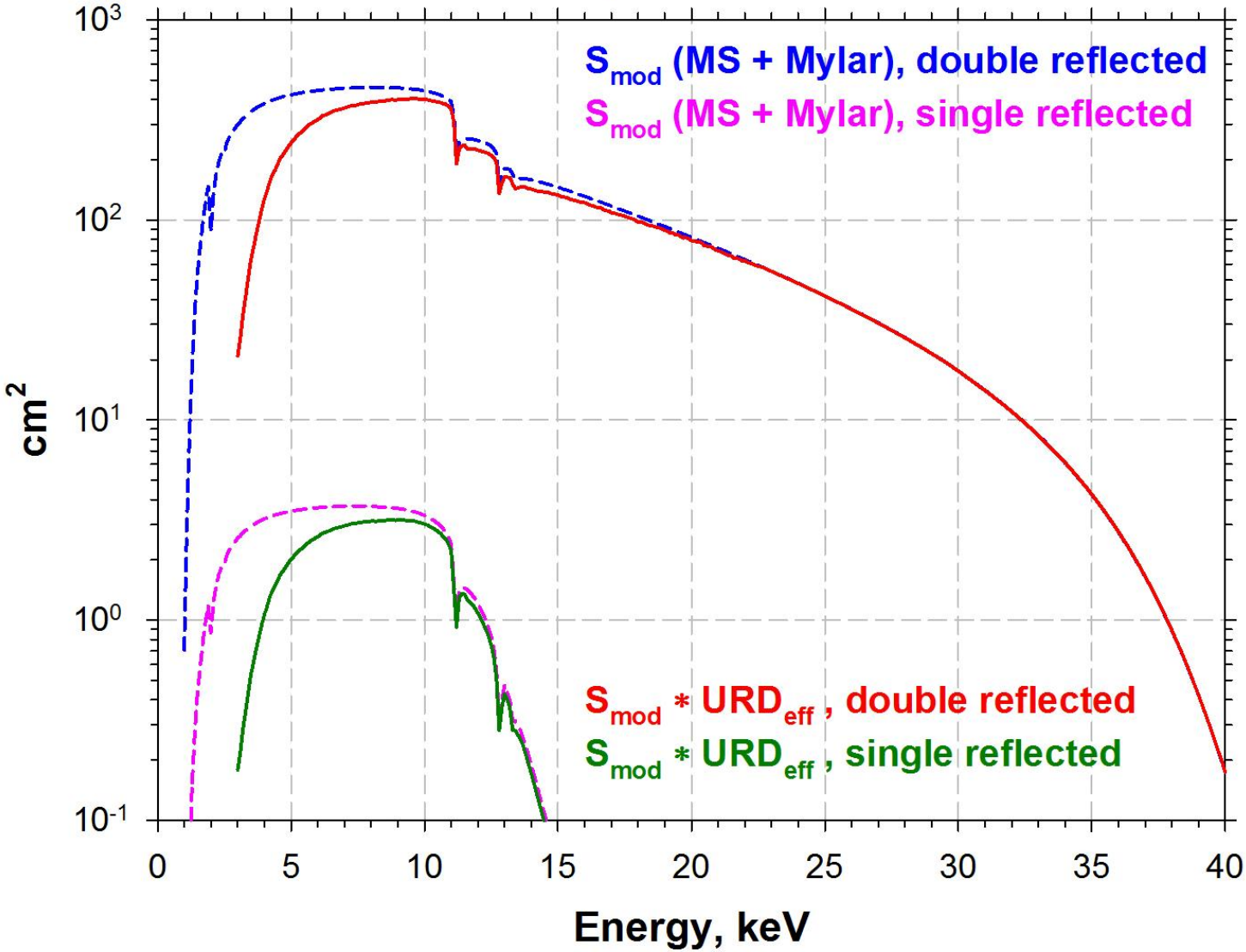
1.	CdTe manufacturer	ACRORAD
2.	Dimensions	$30 \times 30 \times 1$ mm^3
3.	Working area	28.56×28.56 mm^2
4.	Energy range	4 – 100 keV
5.	Number of strips	48×48
6.	Strip pitch	0.595 mm
7.	Be entrance window	∅30 mm × 100 μm
8.	ASIC, 2 pcs.	VA64TA1
9.	Dead time	0.77 ms
10.	Working temperature	– 21° C
11.	Energy resolution	≤8.5% @ 14 keV



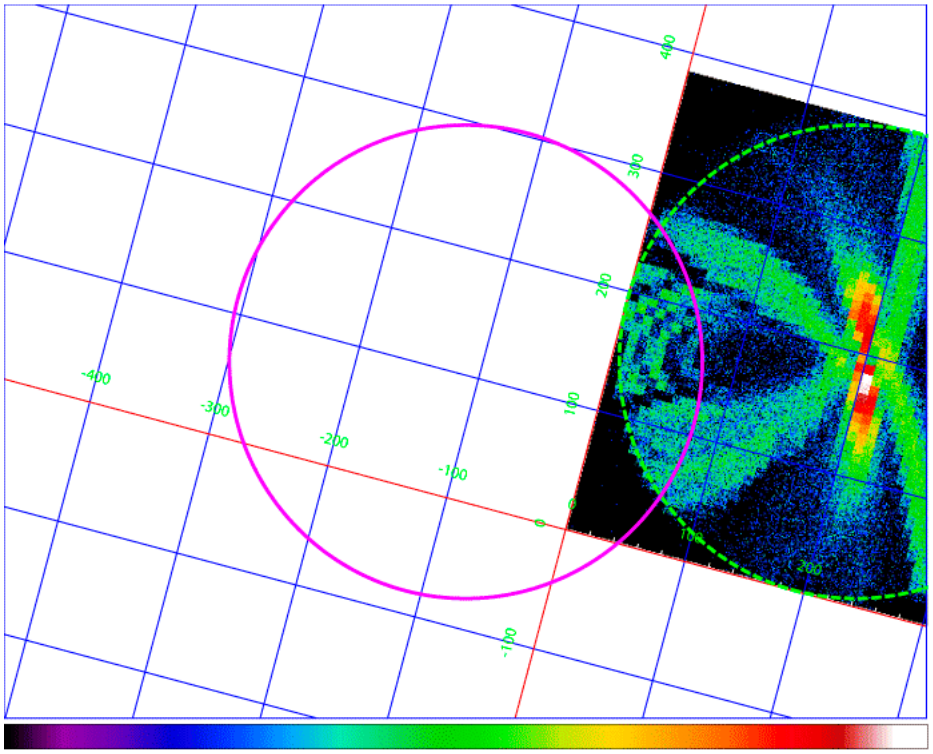
Model mirror system+mylar, effective area on-axis, D=28.56 mm

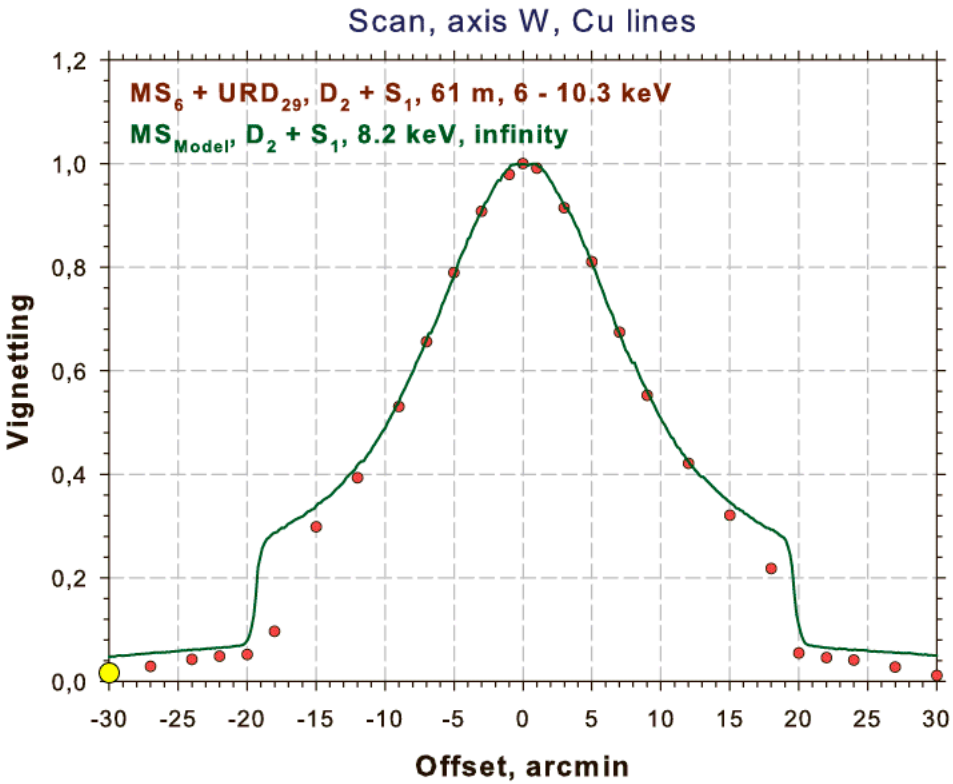


ART-XC telescope on-axis effective area

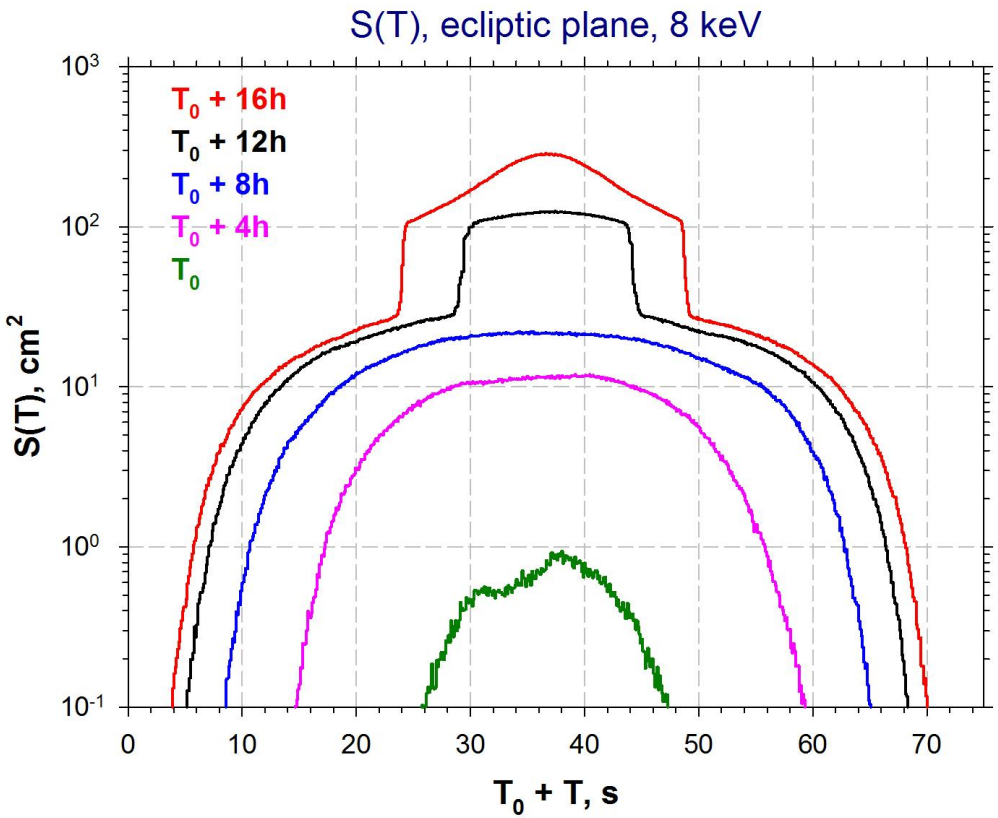


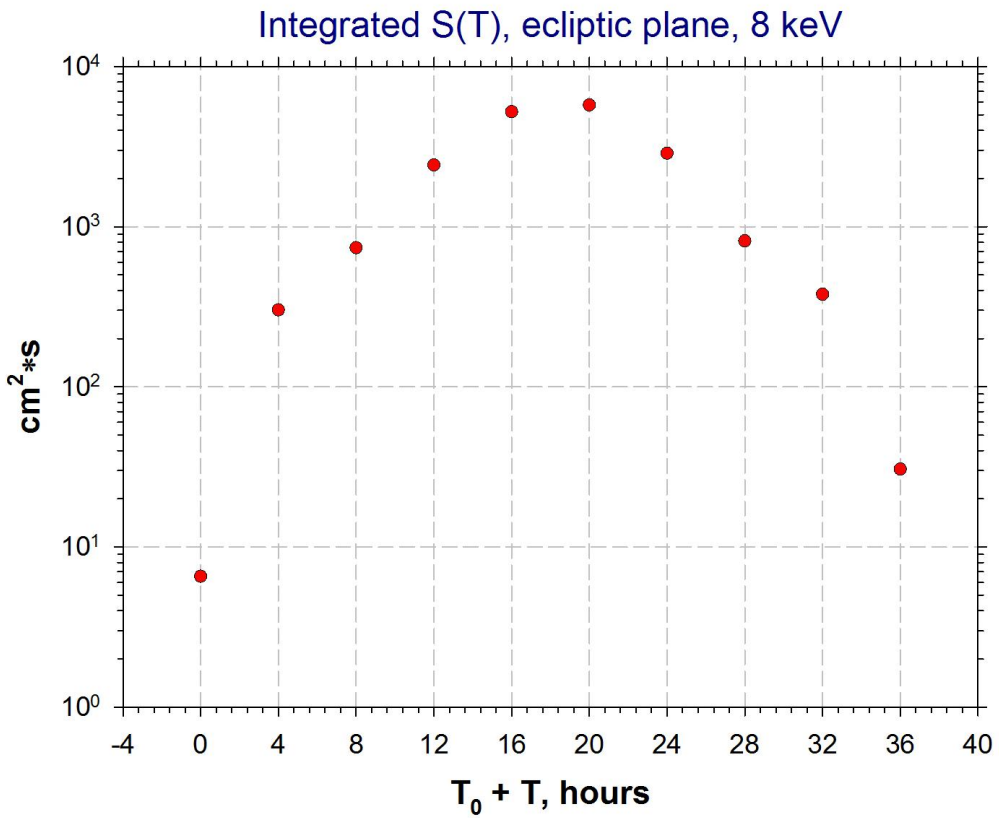
ART-XC: S_1 + D_2 vignetting function, Cu lines





ART-XC: survey mode – one circle (36 hours), 8 keV





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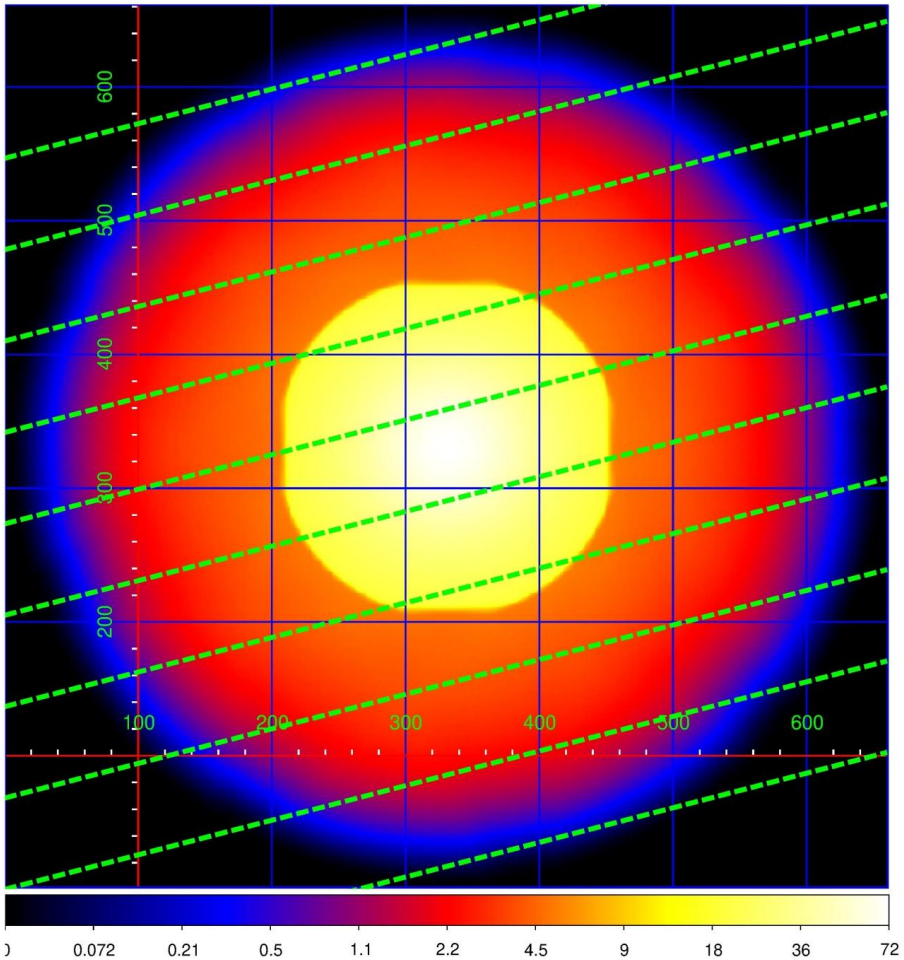


Energy 8 keV

Area 100′ ×100′

FOV D_2, yellow ∅38.3′ or 0.31 deg^2

FOV S_1 ∅96′ or 2 deg^2

Total time ~ 470/Cos(θ), s

Time FOV D_2 ~87/Cos(θ), s

Total ⇒ 2.15×10^4 /Cos(θ), cm^2 s

S_1 ⇒ 8.615×10^3 /Cos(θ), cm^2 s

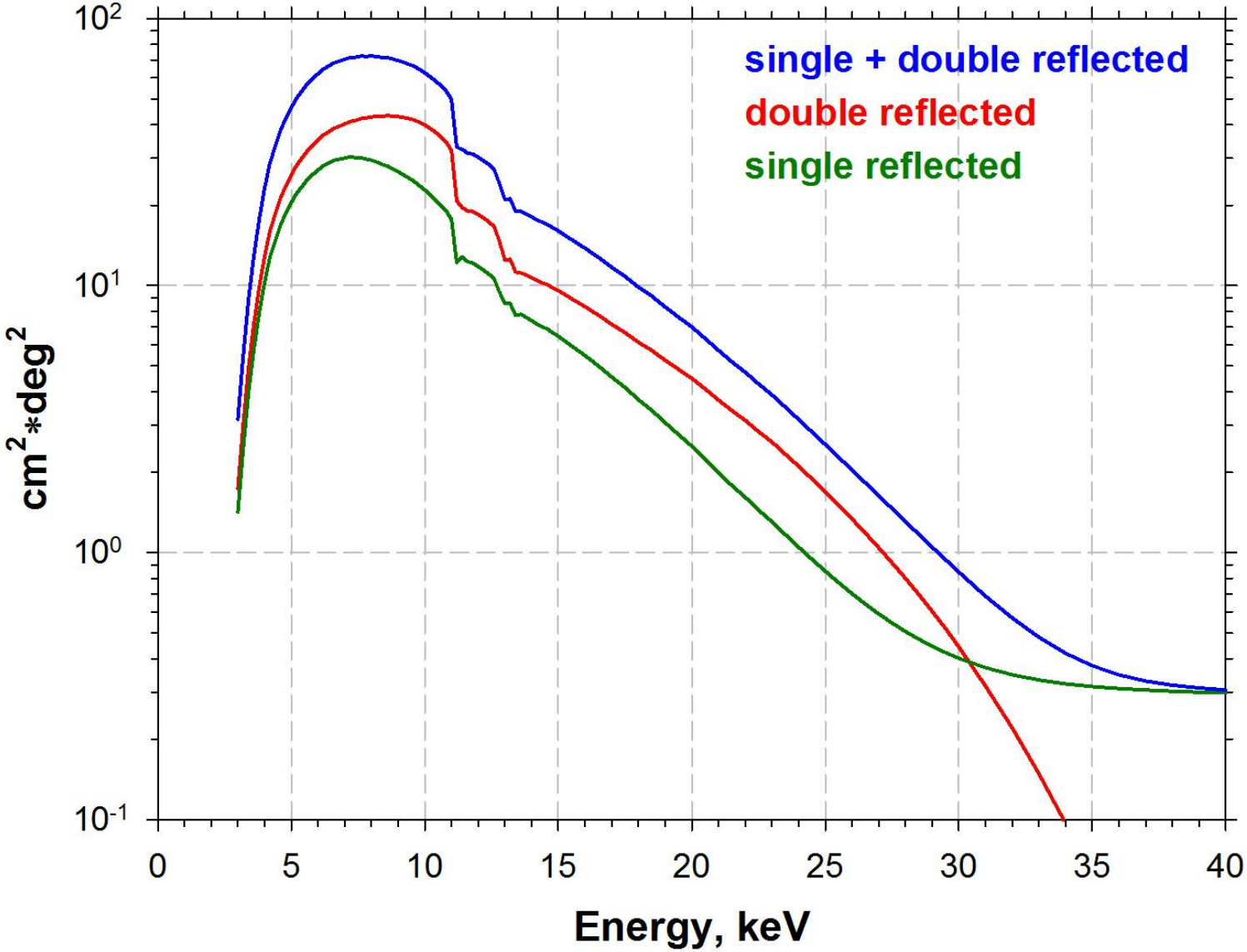
D_2 ⇒ 1.29×10^4 /Cos(θ), cm^2 s

BKG ⇒ 0.005 cts s^{-1} cm^{-2} keV^{-1} ⇒ ~830 cts

CXB ⇒ ~35 cts, ~0.86 σ, FOV = 2 deg^2

Source like Crab ⇒ 1.83×10^4 cts, ~450σ

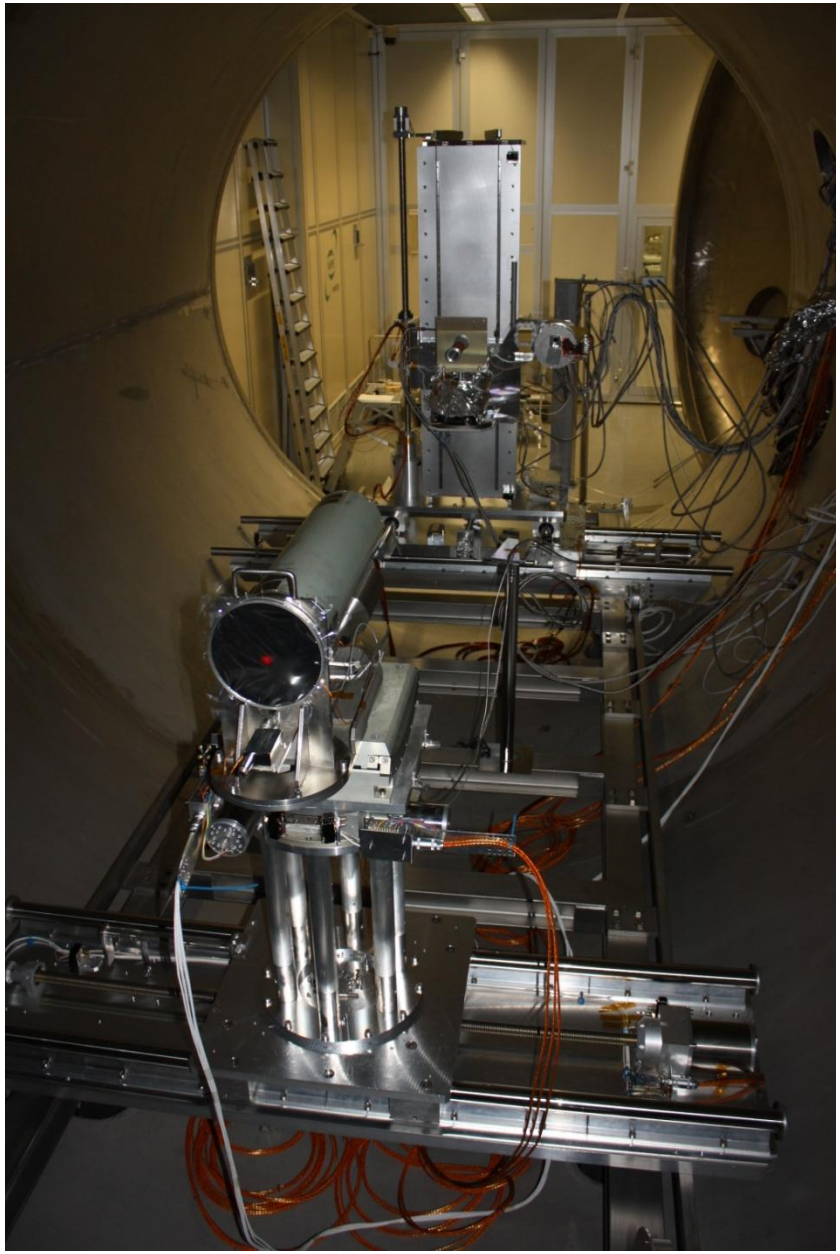
Grasp of ART-XC telescope

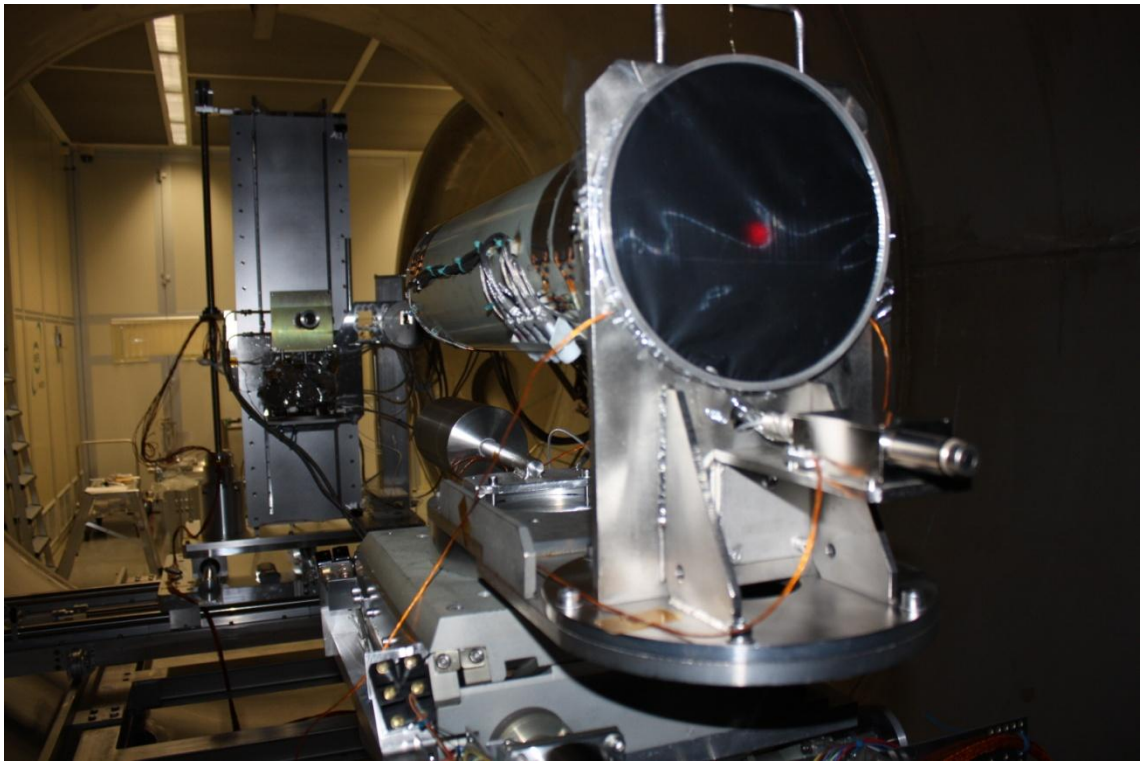


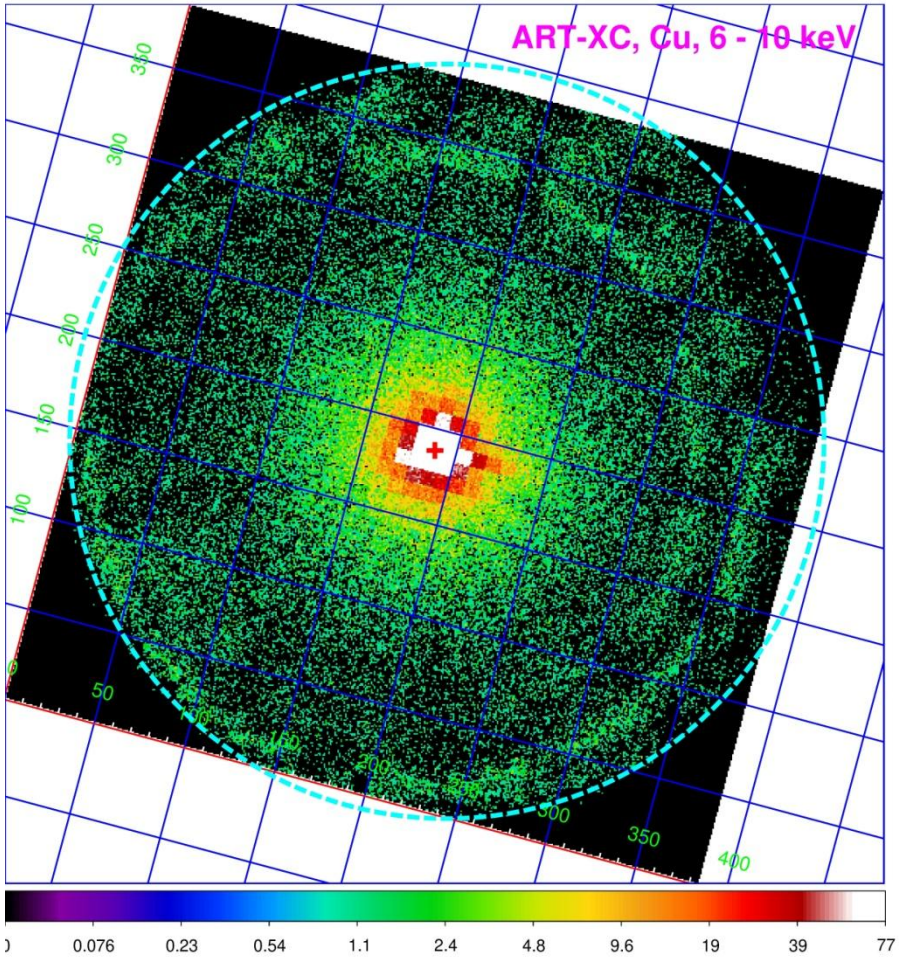
Summary

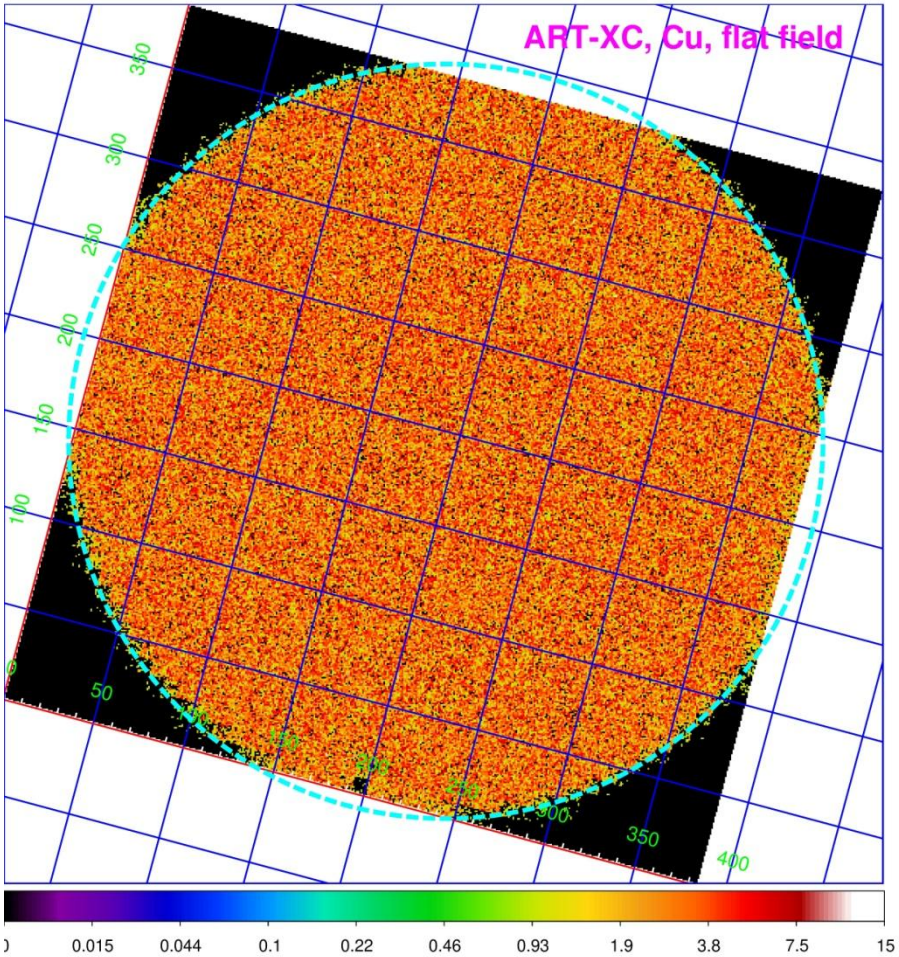
1.	Energy range	4 – 30 keV
2.	FOV D_2	0.31 deg^2
3.	FOV $S_1 + D_2$	2 deg^2
4.	HPD over FOV D_2	~1′
5.	On-axis effective area $S_1 + D_2$	410±16 cm^2 at 9.6 keV
6.	Grasp D_2	44 cm^2 deg^2 at 8.6 keV
7.	Grasp $S_1 + D_2$	74 cm^2 deg^2 at 7.6 keV
8.	Time resolution	~20 μs
9.	Dead time	0.77 ms (one detector)
10.	Energy resolution	≤8.5% at 14 keV
11.	BKG on the Earth	$\leq 5 \times 10^{-4}$ cts s^{-1} cm^{-2} keV^{-1} , 4 – 30 keV
12.	Survey, 4y	$(2 – 20) \times 10^{-13}$ erg s^{-1} cm^{-2} keV^{-1}, ($F_{2\text{-}10keV}$, $E^{-1.8}$)
13.	Confusion limit	2×10^{-14} erg s^{-1} cm^{-2} keV^{-1}, ($F_{2\text{-}10keV}$, $E^{-1.8}$)

ART-XC – eROSITA cross calibration tests at PANTER facility 15 – 25 October 2018

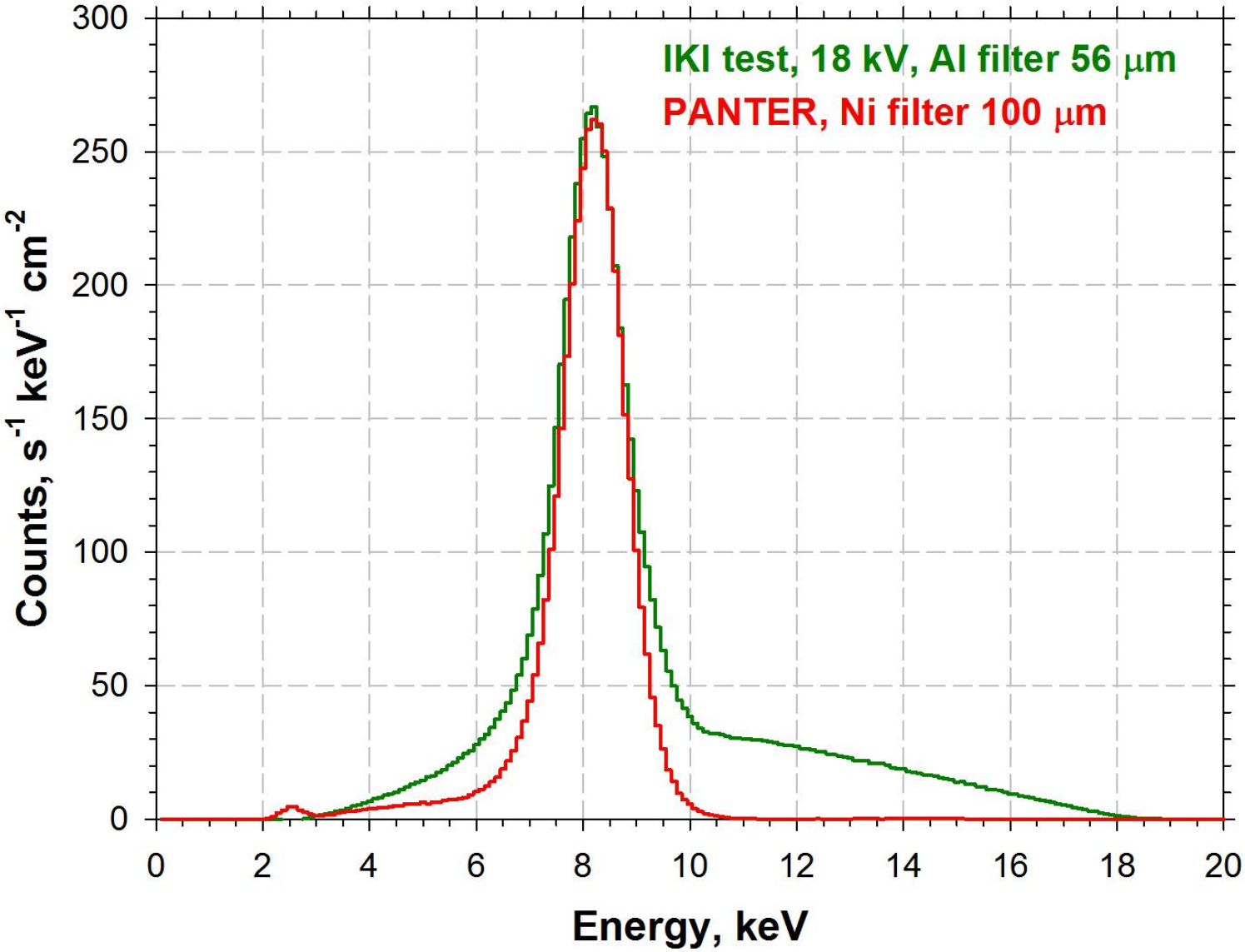


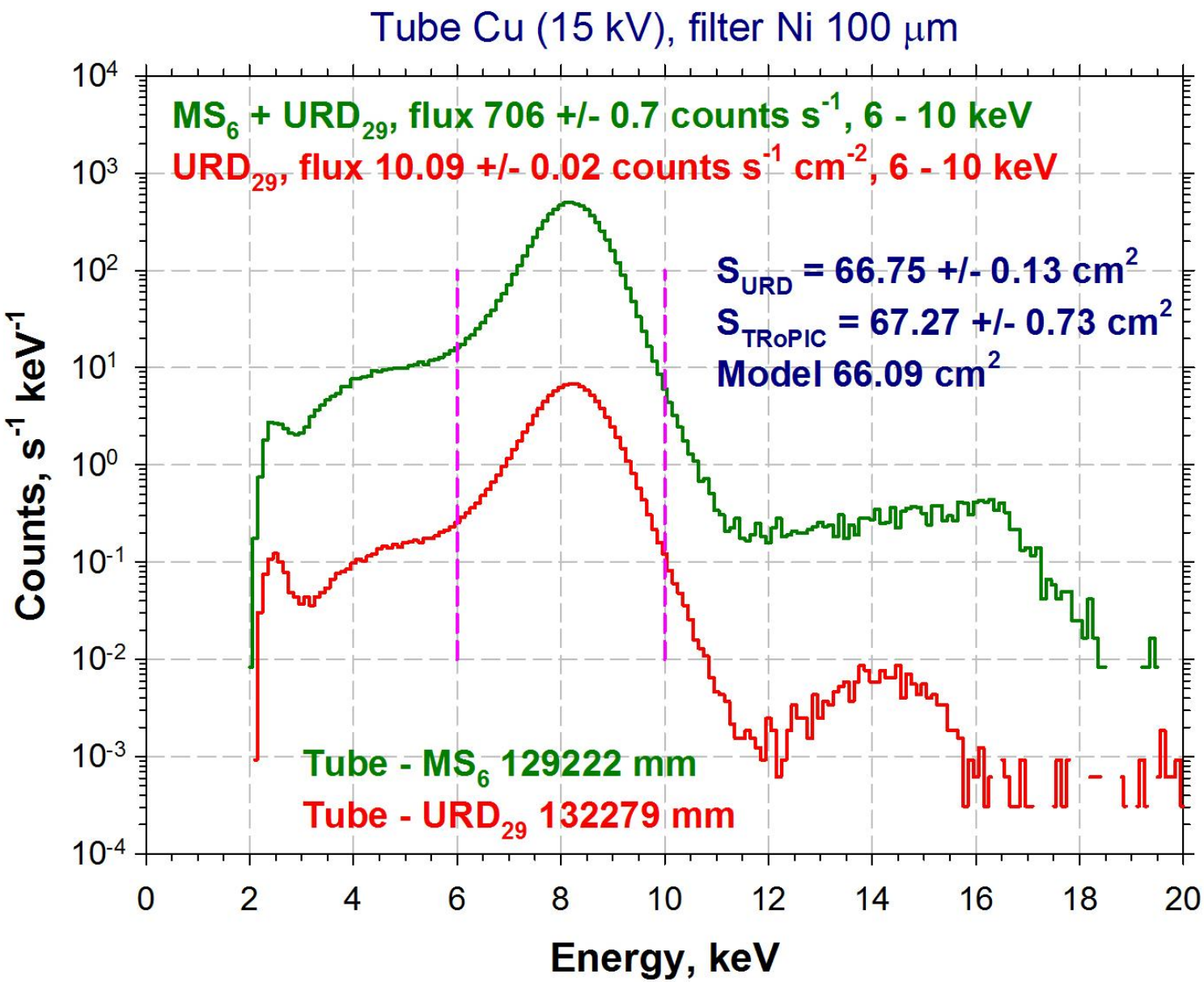



ART-XC, Cu, 6 - 10 keV
0.076
0.23
0.54
1.1
2.4
4.8
9.6
19
39
77

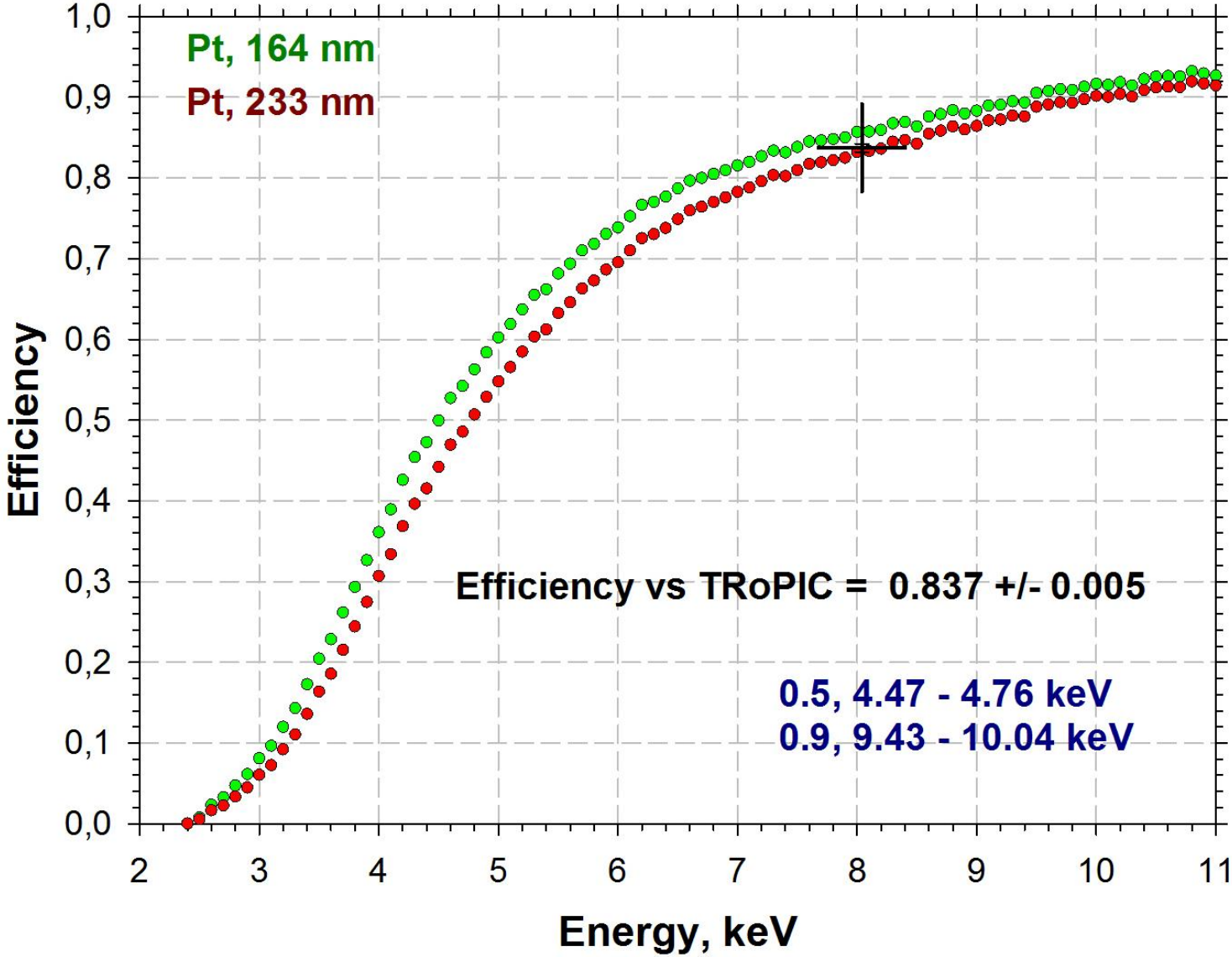

ART-XC, Cu, flat field
0.015
0.044
0.1
0.22
0.46
0.93
1.9
3.8
7.5
15

PANTER tests, URD_{29}, Tube Cu (15 kV)




Tube Cu (15 kV), filter Ni 100 μm
MS6 + URD29, flux 706 +/- 0.7 counts s-1, 6 - 10 keV
URD29, flux 10.09 +/- 0.02 counts s-1 cm-2, 6 - 10 keV
SURD = 66.75 +/- 0.13 cm2
STRoPIC = 67.27 +/- 0.73 cm2
Model 66.09 cm2
Tube - MS6 129222 mm
Tube - URD29 132279 mm
Counts, s-1 keV-1
Energy, keV

URD_{29} efficiency



Thanks for your attention