Heat, spectrum, angular distribution

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X-ray det. mtg.

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Heat load on optics

	CesrTA D Line		SuperKEKB LER	SuperKEKB HER
E (GeV)	5.3		4	7
ρ (m)	31.65		31.74	106
Critical energy (keV)	10.3		4.4	7.1
Zero-degree Power Density (kW/mr^2/A)	2.36		0.56	2.8
Linear Power Density (kW/mr/A)	0.345		0.112	0.313
Distance from source to optics box (m)	4.549		9.39	10.27
Aperture width (mm)	2.38		0.5	0.5
Current (A)	0.200	0.243	3.6	2.6
Zero-degree Power Density (W/mm^2)	**23**	**28**	**23**	**69**
Linear Power Density (W/mm)	**15**	**18**	**43**	**79**
Total Linear Power over Aperture Width (W)	**36**	**43**	**21**	**40**
Burn test results	**Si mask OK Dia. mask OK**	**Si mask NG Dia mask OK**		

CesrTA burn test sets safe limits on incident power.
Will need to filter out 1/3 of HER power before it hits optics.
Extra 1.4 cm of Be upstream of optics will work.

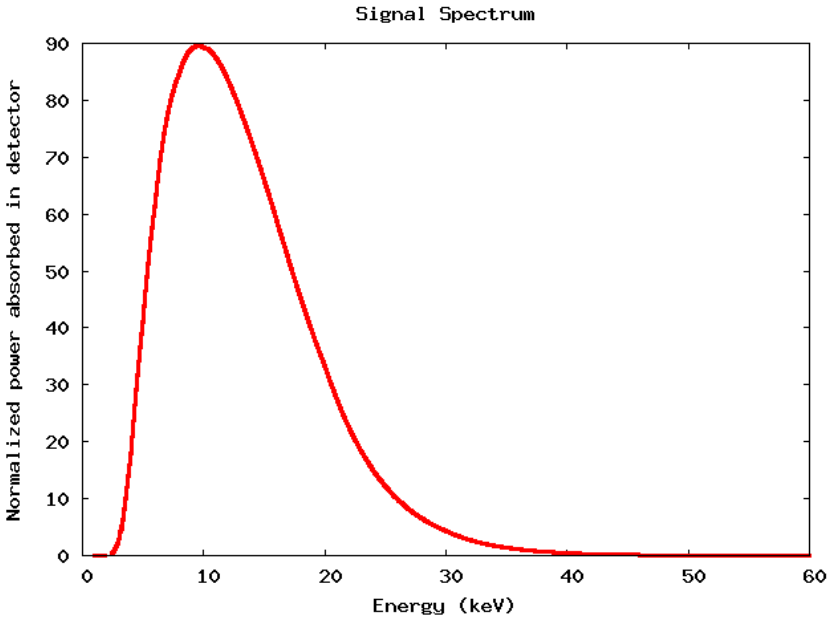
Heat load on detector

	SuperKEKB LER	SuperKEKB HER	Filtered HER (to protect optics)
E (GeV)	4	7	
ρ (m)	31.74	106	
Critical energy (keV)	4.4	7.1	
Zero-degree Power Density (kW/mr^2/A)	0.56	2.8	
Linear Power Density (kW/mr/A)	0.112	0.313	
Distance from source to detector (m)	40.70	42.55	
Detector width (mm)	0.1	0.1	
Beam Current (A)	3.6	2.6	
Air path length (cm)	**10**	**10**	
Be window+filter thickness (cm)	**0.02**	**0.02**	**1.42**
Peak Power Density absorbed in detector (W/mm^2)	**0.7**	**2.8**	**1.0**
Linear Power Density absorbed in detector (W/mm) (Horizontal axis)	**6**	**13**	**5**
Integrated absorbed linear power over 0.1 mm detector width (W)	**0.6**	**1.3**	**0.5**

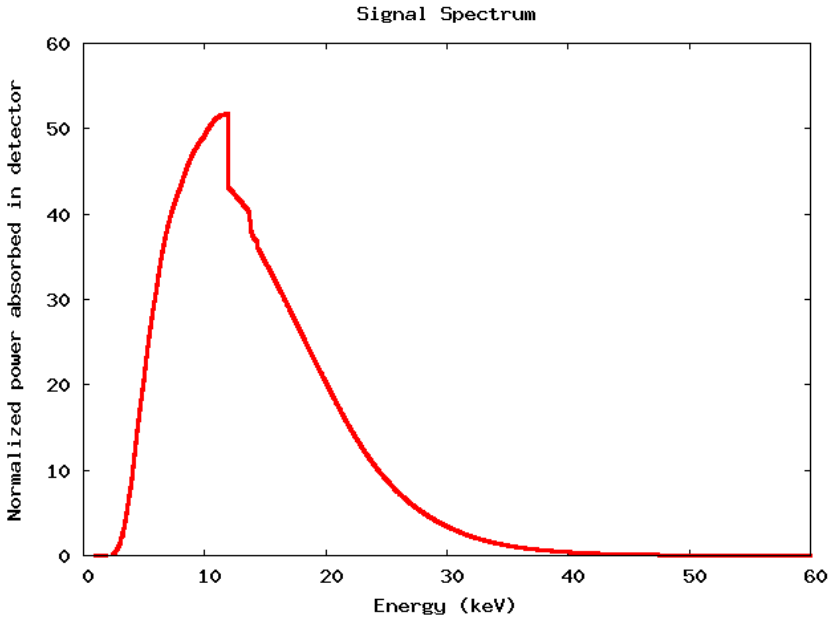
Should design to be able to absorb a watt total, with peak power density of 2 W/mm^2

Spectrum: LER (200 um Be, 10 cm Air)

No mask in beam (pinhole operation)

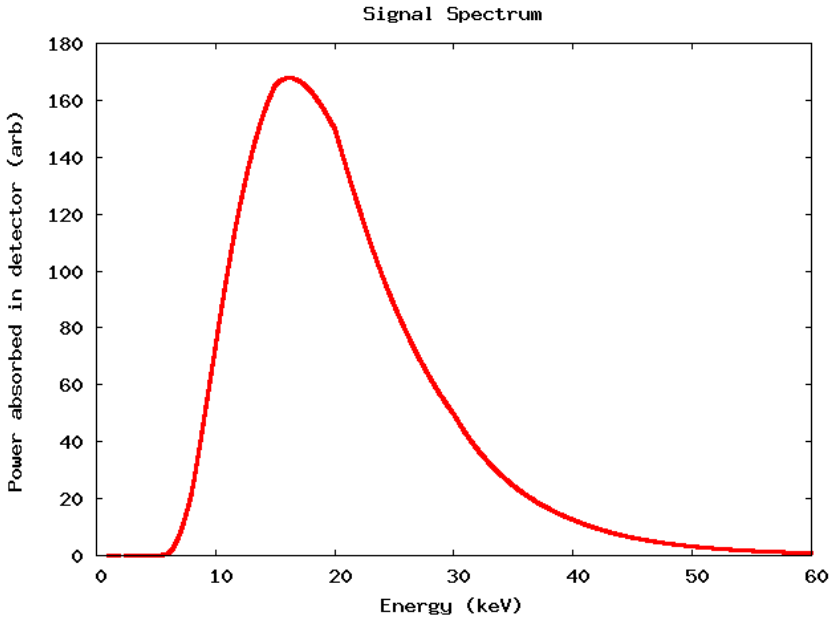


10 um Au/500 um Dia CA mask in beam:

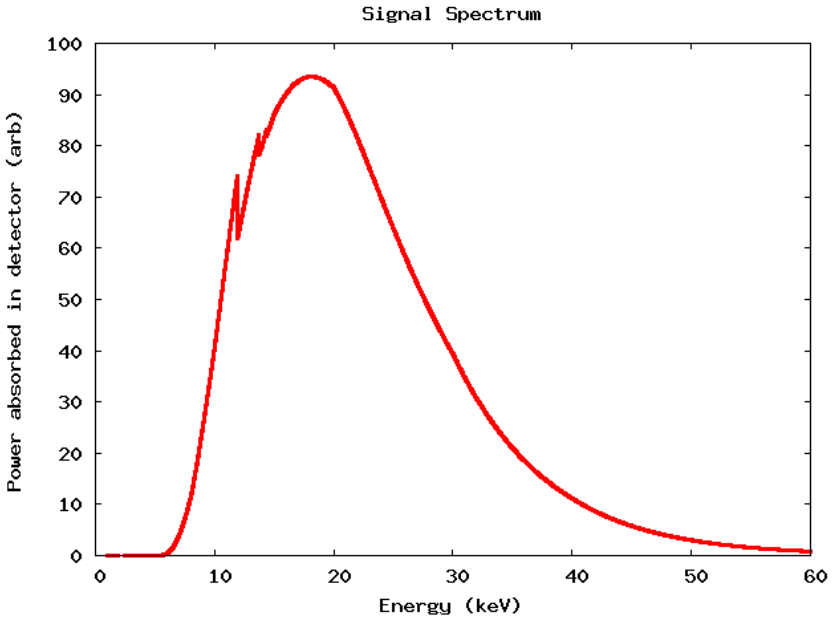


Spectrum: HER (1.42 cm Be, 10 cm Air)

No mask in beam (pinhole operation)

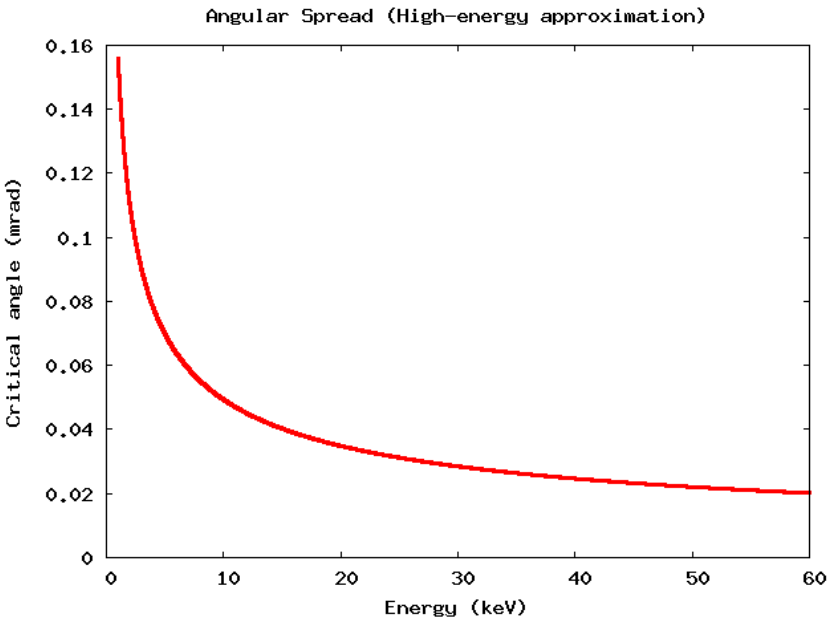


10 um Au/500 um Dia CA mask in beam:



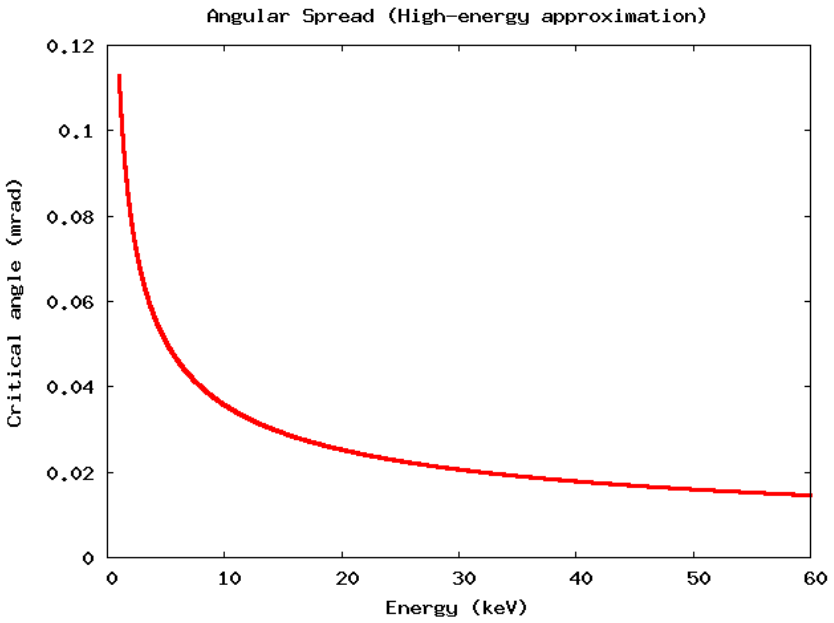
Angular spread as function of

LER



At 12 keV and distance of 40.7 m, critical angle corresponds to ~2 mm

HER



At 18 keV and distance of 42.55 m, critical angle corresponds to ~1 mm