

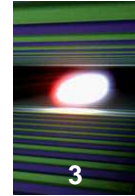
# **XBSD for SASE3 @ XFEL.EU**

M. Izquierdo  
(on behalf of SCS & SQS)

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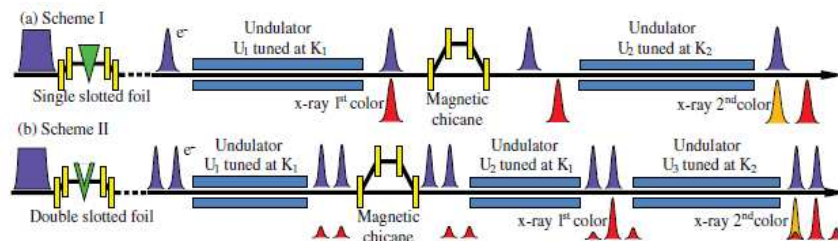
- Motivation
- Soft x-ray implemented schemes
- XBSD
  - Initial considerations
  - Location
  - Technical limitations
  - Delay ranges
  - Conceptual design
  - Using monochromator as a beam splitter
- Parameter wish list



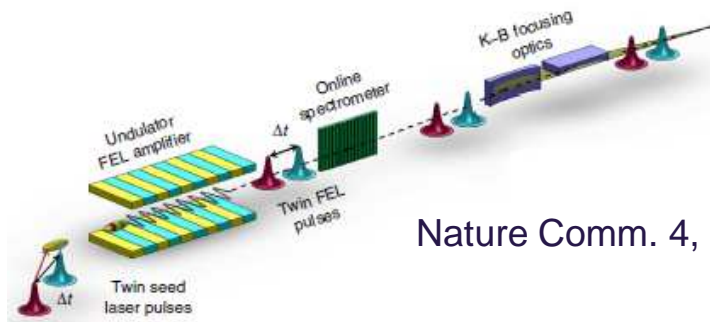
## 2 x-rays photon pulses with controlled delay

Stimulated scattering/ XPCS / Two photon ionization/  
delay holography, ...

### Source

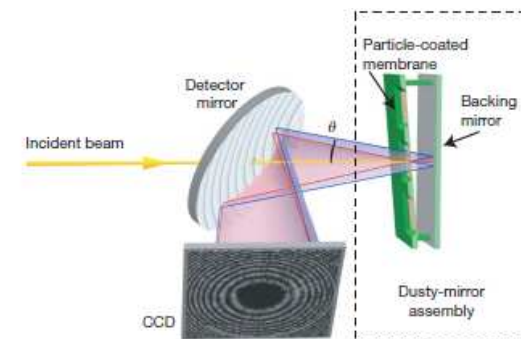


Phys Rev. Lett 110, 134801 (2013)



Nature Comm. 4, 2476 (2013)

### Optics

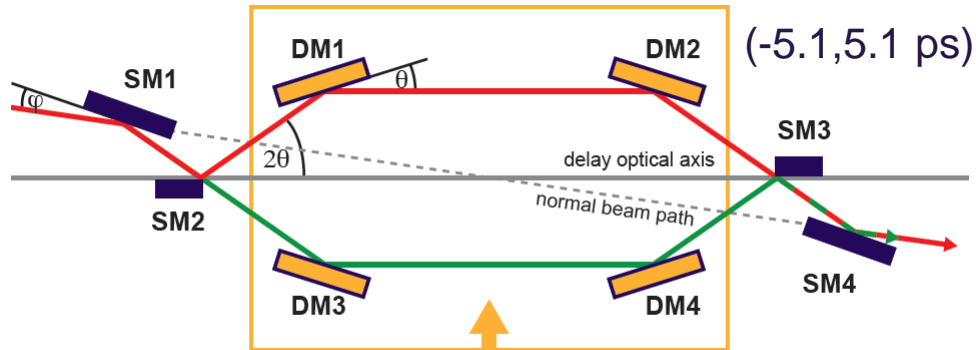


Nature 448, 679 (2007)

### Split and delay lines

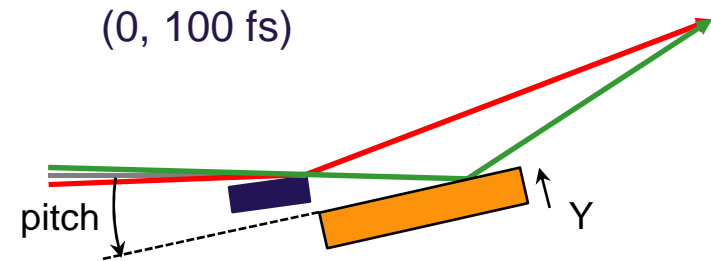


## FLASH



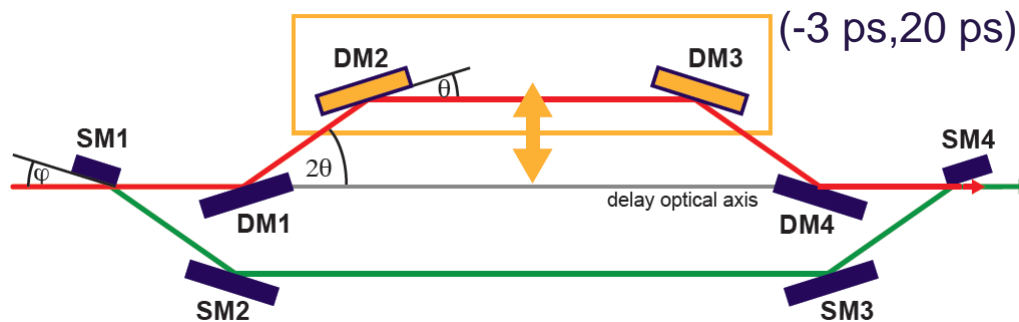
Rev. Sci. Inst. **81**, 043107 (2010)

## LCLS



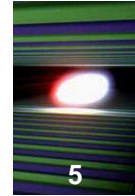
Proc. SPIE 8504, 850409 (2012)

## FERMI



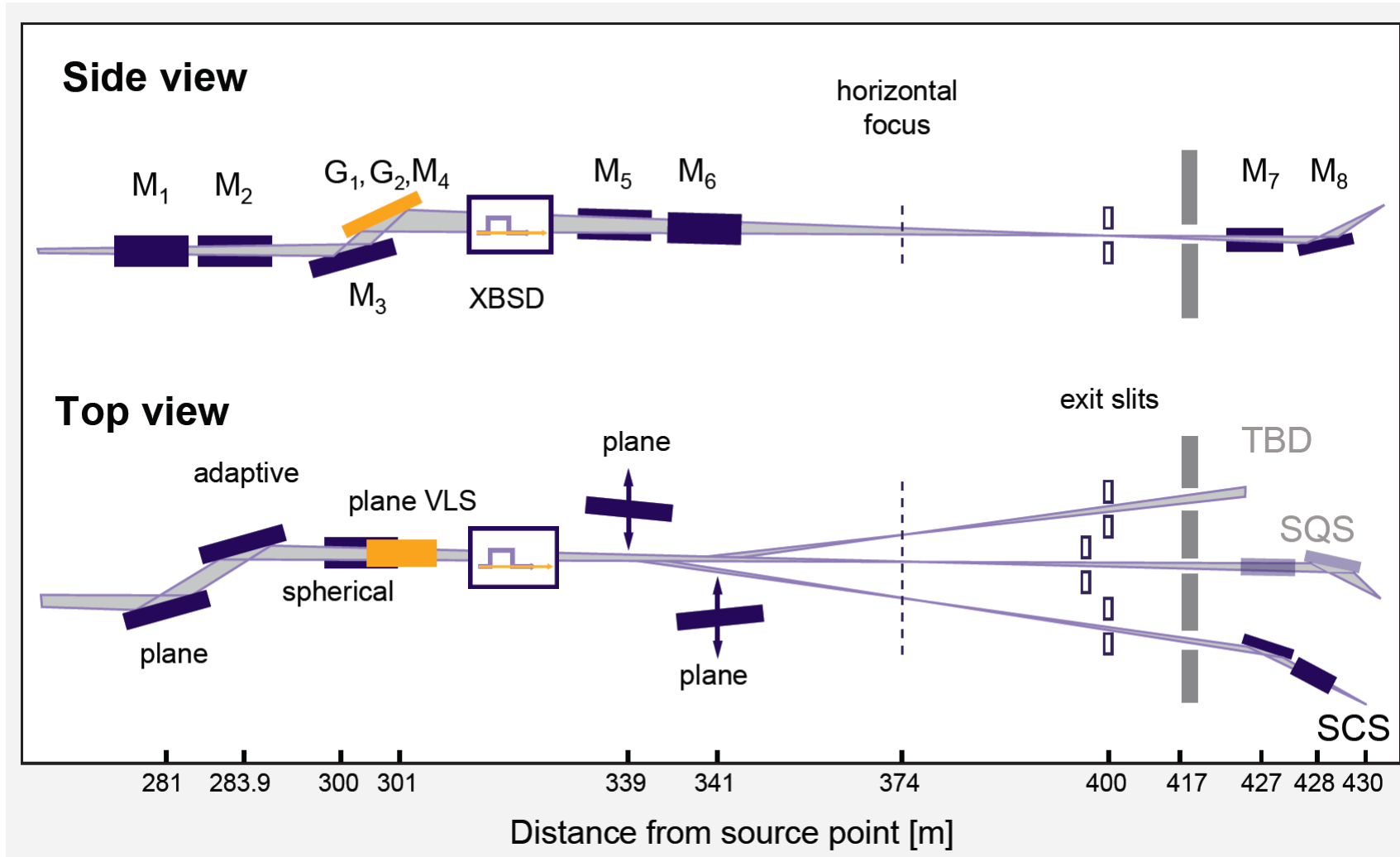
Optics Express **16**, 19909 (2008)

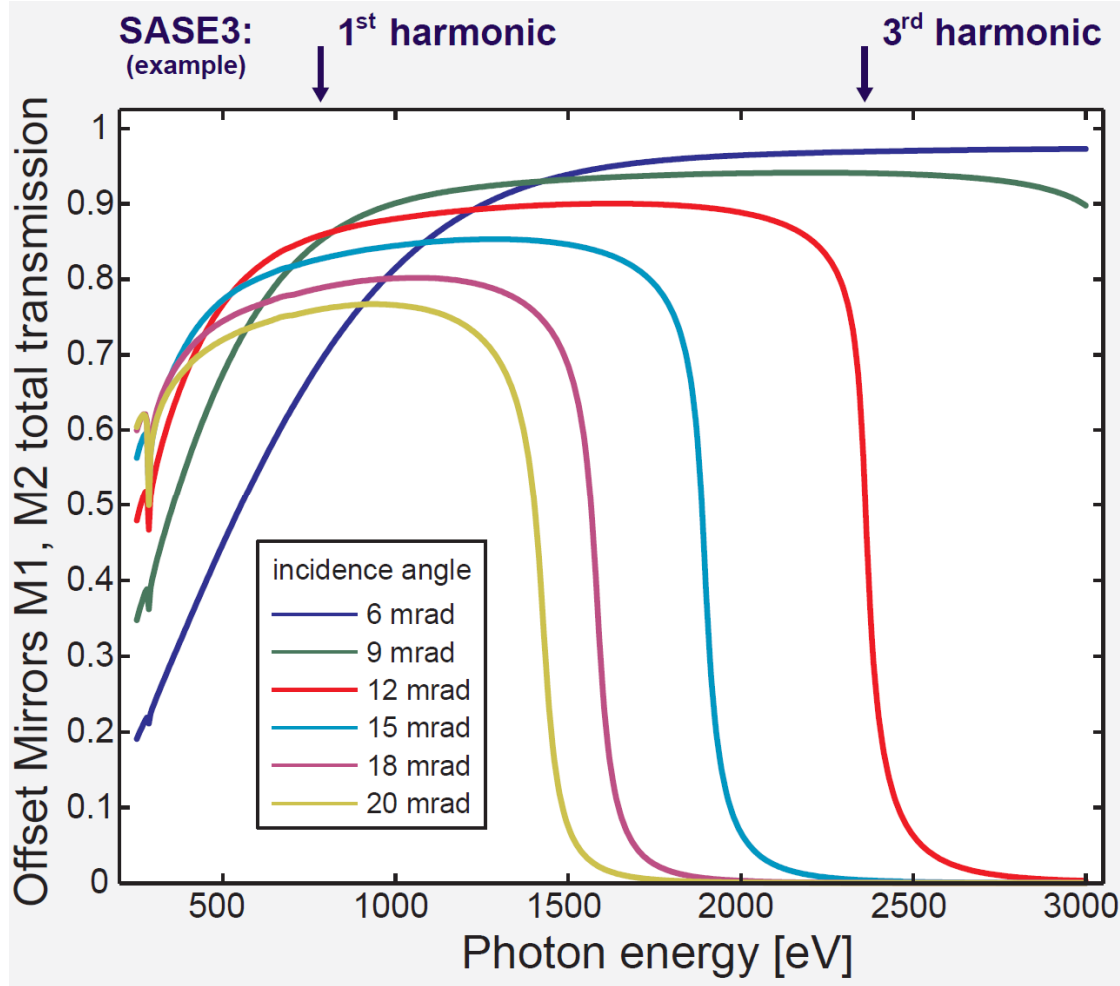
Talk (N. Mahne)



- Usable by all 3 beamlines of SASE3
- Delays up to 10 ps → Asymmetric configuration
- Energies up to 1.5 KeV (SCS)
- High transmission
- Monochromator → beam splitter (0<sup>th</sup> - 1<sup>st</sup>-order)
- 0<sup>th</sup>-order x-ray pump/ 1<sup>st</sup>-order x-ray probe
- Recombination of beams on vertical exit slit →  $\lambda$  control
- Integrate self-seeding schemes (see S. Serkez talk)

# XBSD location



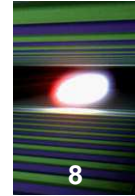


$$L_{\text{delay}} \sim \frac{\Delta}{2 \cdot \theta^2}$$

$\Delta = 0.3 \text{ mm/ps}$      $\theta: [20-10 \text{ mrad}]$



**3.75-15 m (10 ps)**

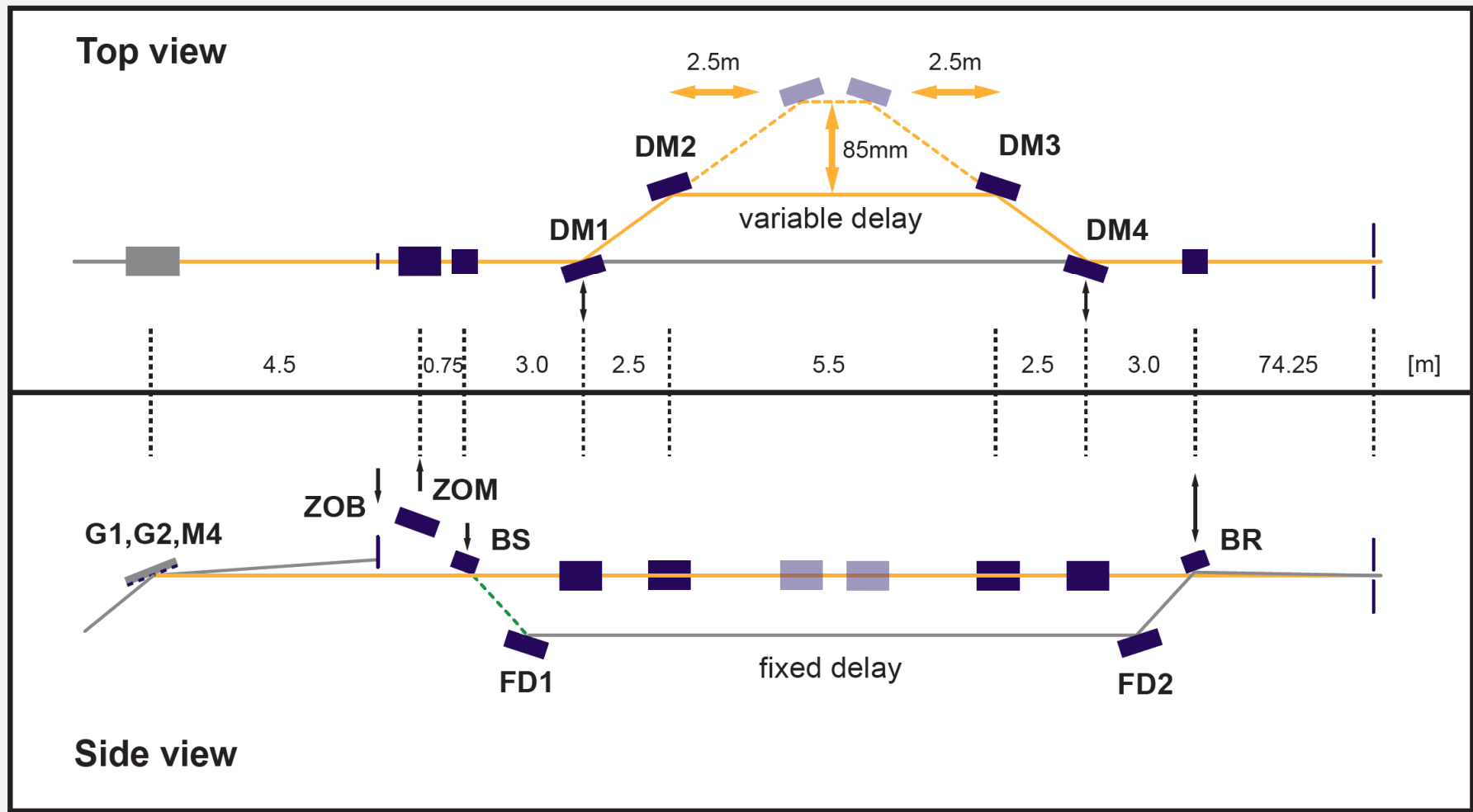


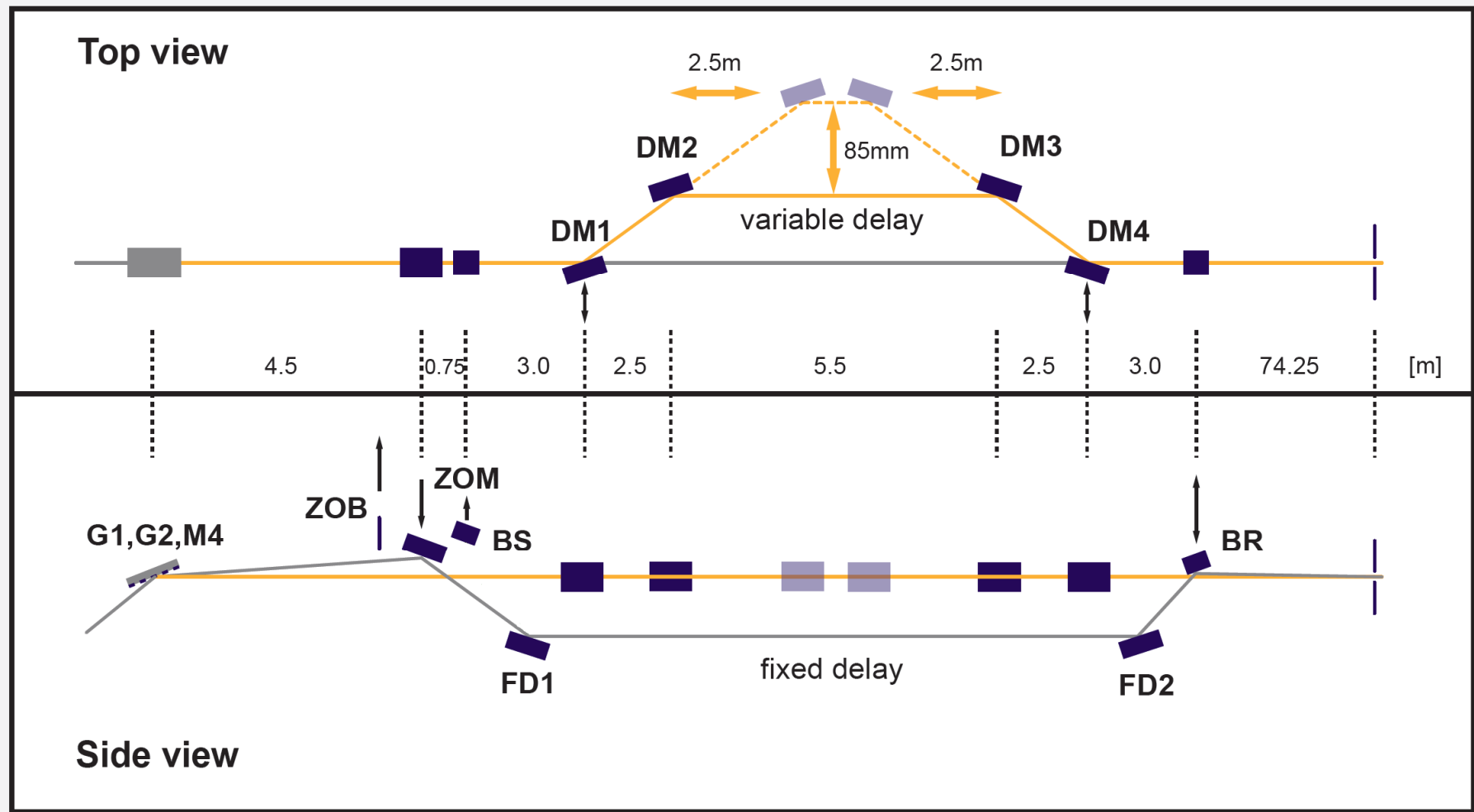
Time delay range [ps]	Incident angle $\theta$ [mrad]	Transmission
-0.7 – +2.6	10	0.8
-2.6 – +10.6	20	0.5 below 1.5 keV and $\ll$ 0.1 above 1.5 keV
-6.0 – +24.0	30	$\sim$ 0.1 below 1.5 keV
-11 – +42	40	$<$ 0.1 below 1.5 keV

Metallic coatings?



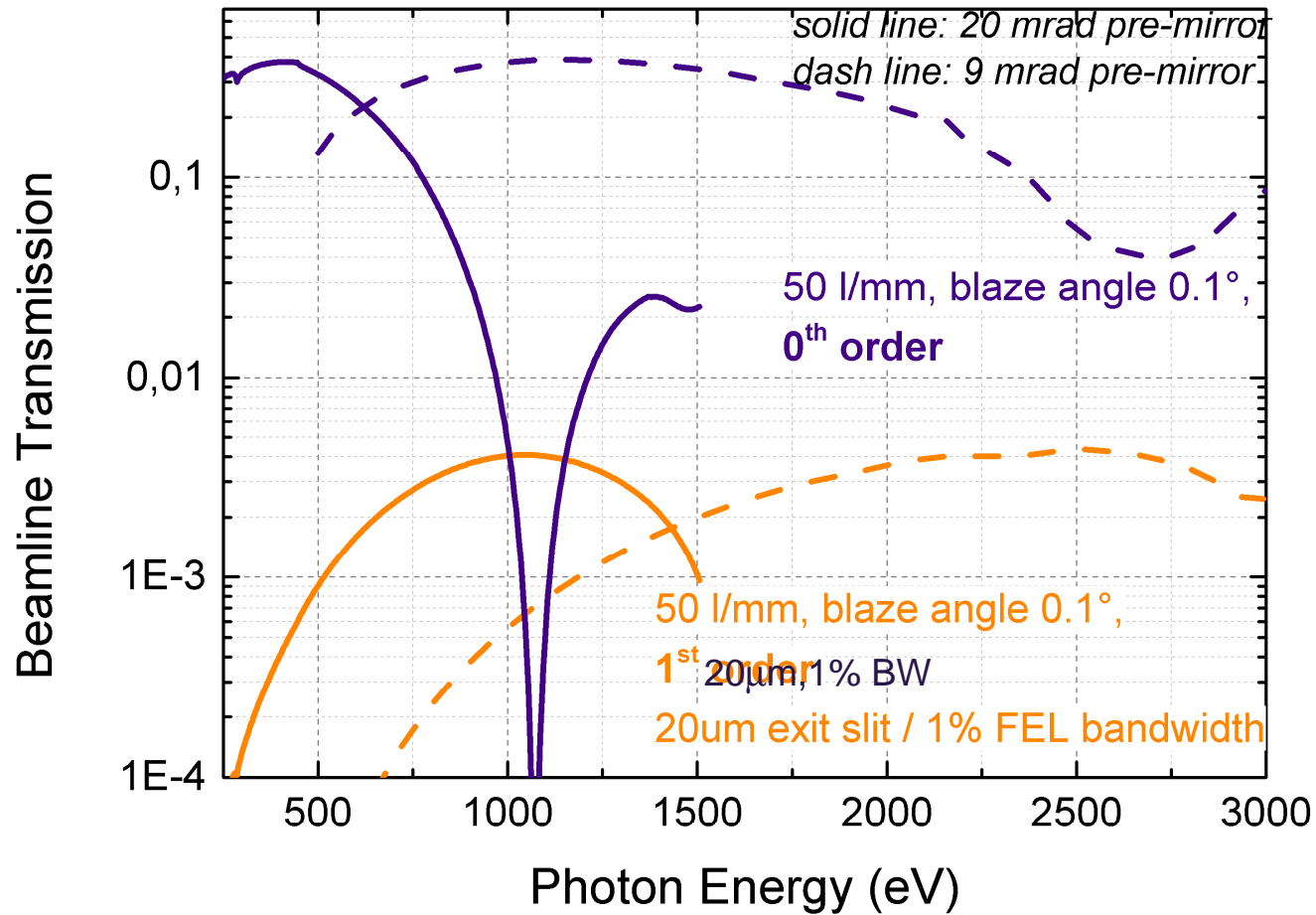
# XBSD conceptual design



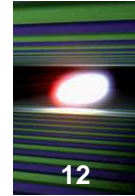




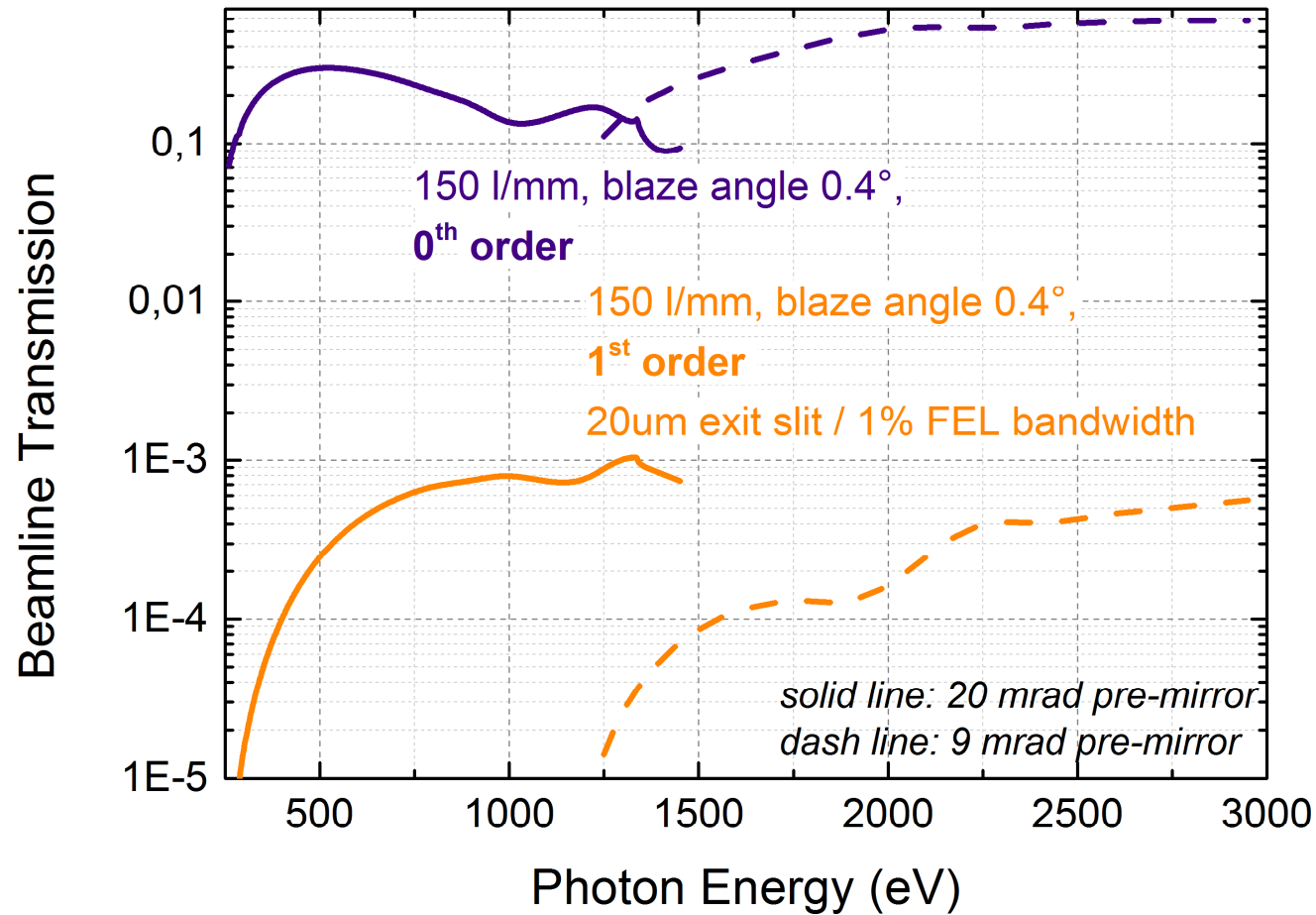
## Monochromator transmission



Natalia Guerasimova

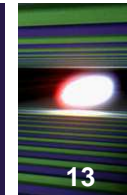


## Monochromator transmission



Natalia Guerasimova

# Parameters Wish List



	Day 0 (SCS)	Day 0 (SQS)	Nice to have
Experimental techniques	Stimulated scattering	1D-XUV, eTOF, REMI	
<b>Source properties</b>			
Energy range	<1.5 KeV	270 – 3000 eV	
Pulse duration	< 10 fs	2 – 20 fs	
bandwidth	SASE	SASE	seeded
<b>Device properties</b>			
Maximum Temporal delay	1 ps	1 ps	
Pulse intensity ratio	variable	1:1 or 1:100 (2c)	
2 Colors	Within bandwidth	1 <sup>st</sup> – 3 <sup>rd</sup>	
Symmetric delay around t=0	Simplest concept	No	
Spatial separation behind sample	Yes	No	
Add your suggestions			