Summary of specifications of FXE, MID and HED

	FXE (SASE1)	MID (SASE2)	HED (SASE2)	Comments
X-ray parameters				
Photon energy	4.5 – 22 keV	5 – 24 keV	5 – 24 keV	5 – 7 keV & 18 – 24 keV possible but need discussion
Pulse energy (SASE)	3 mJ (< 9 keV) 1.5 mJ(<12keV) 0.8mJ(<20keV)	2 mJ (< 9 keV) 1 mJ (<12keV) 0.5mJ(<24keV)	2 mJ (< 9 keV) 1 mJ (<12keV) 0.5mJ(<24keV)	
Pulse duration	< 100 fs	< 100 fs	< 100 fs	Shorter duration possible with reduced pulse energy
Self-seeding	No	Yes	Yes	Only 7 – 18 keV possible Energy typically < 1 mJ
Number of pulses per train	1 - 352	1 - 352	1 - 352 (2250)	352 pulses per train is the AGIPD storage limit Up to 2250 pulses using full RF window with ~30% less pulse energy (spatial operation mode)
Repetition rate in pulse train	2.2 MHz	2.2 MHz	2.2 MHz	1.1 MHz and less also possible. 4.5 MHz upon special request
Train repetition rate	10 Hz	10 Hz	10 Hz	
Bandwidth (SASE)	~10^{-3}	~10^{-3}	~10^{-3}	~10^{-4} by self-seeding ~10^{-4} by Si(111) monochromator ~$6x10^{-5}$ by Si(220) monochromator (MID)
Si 111 mono	Yes		Yes*	Need discussion with instrument scientists
Beamsize on sample	8 - 200 µm	0.3 - 2000 µm	≤ 1 - 300 µm	Via Be lenses
Two colour mode	No	Yes	Yes	With self-seeding (>= 0.1 mJ) 6 - 10 keV, 0 - 0.5 ps separation
Sample environment				
Environment	Air, He, Vacuum	Air, Vacuum	Air, Vacuum	
	Goniometers in air and helium; fast scanner in vac. chamber	Hexapod, Huber stage, fast scanner (in-air or in-vacuum)	Hexapod, fast scanner (EUCALL frame 10x10 cm)	
Vacuum chamber size	Small	Medium	Large	
Sample type	Solid, liquid	Solid, liquid	Solid, (liquid)	
Detectors				
Large area 2D detector Q-coverage	LPD 1Mpx (MHz)	AGIPD 1 Mpx (MHz) 7e-3 - 0.1 1/ Å	VAREX XRD 4343CT (10Hz)	HED VAREX only at IC2 chamber

Small area 2D detector	JUNGFRAU 1M & 500K (~100 kHz)	JUNGFRAU, ePix100 x 2	JUNGFRAU x 4 (10Hz) ePix100 x 2 (10Hz) AGIPD 0.25 Mpx (MHz)	
1D detector	Gotthard 2 (MHz)		–	
Detector environment				
Sample-detector distance		AGIPD 0.25 to 8 m 2θ = 15-50°	0.25 - 6 m (JF or ePix)	
Possible techniques	XRD, WAXS, XES, XAS	(GI)SAXS, WAXS, XPCS	XRD, (GI)SAXS, XES, XAS	
Q-coverage	Large	Large	Small (IC1)	
PP laser				
Wavelength	800 and 1030 nm			Second (third) harmonics available upon request
Pulse energy	1 mJ at 800 nm (@282 kHz) or >20mJ at 1030nm SHG and THG possible with reduced energy			
Pulse duration	15, 50 fs FWHM at 800 nm 0.9 ps or 400 ps at 1030 nm			
Repetition reate	200 kHz up to 4.5 MHz (with reduced pulse energy)			Fully synchronized with X-ray
TOPAS (tunable wavelength UV-IR)	Yes	No	No	
Other excitation sources				
ReLaX 100 TW	–	–	3 J, 30 fs, 800 nm, 10Hz	
DiPOLE	–	–	40 J, 10 ns, 515 nm, 10 Hz	
Pulsed magnetic field	No	Yes	Under commissioning (60T)	
X-ray diagnostics				
Timing tool	Available for some expt. geometries	Yes	Yes	
Other special capabilities				
	Cryo blower	X-ray split and delay line		MID: 7 - 10 keV, 10 - 800 ps delay
	von Hamos and Johan spectrometers			