

Concepts for < 10 fs Diagnostics

- ▶ TDC — demonstrated @ SLAC; resolution: 1 fs. Budget $\sim 10^7$ measures also of pulse length & profile
- ▶ TEC (time-to-energy converter) — needs very long beamline (available @ SLAC) will be tried @ MAX4
- ▶ Frequency domain — extend existing concepts to the optical domain
Keep an eye on the transverse dimensions
 - ▶ Spectrometer
- ▶ Cross-correlation with optical laser in BBO — phase matching, crystal bandwidth
- ▶ Incoherent correlation length
- ▶ Streak camera?
- ▶ THz wakefield

ENGINE

Facility	E/GeV	Δt	Q/pC	e^{-RMS} τ/fs	γ τ/fs	$\Delta s/m$	t/y
SwissFEL	5.8	28ns, 10ms	200	25	21	2	2016
			10	2	2.1		
			20	22	15		
			10	0.3	0.06		
XFEL.EU	2.5/17.5	222ns/100ms	20	5	3.5	5	2016
			100	12	8		
			1000	80	5.7		
			100	100	100		
SPF	3	10ms	75	12	5	0.1	2014
MAX4FEL	5	10ms	10... 100	<10	<10	∞	2020
FFWD	1...5	100ms	1	6	—	3	2016
FLUTE	0.042	100ms	3000	270	—	9	2015
							2014