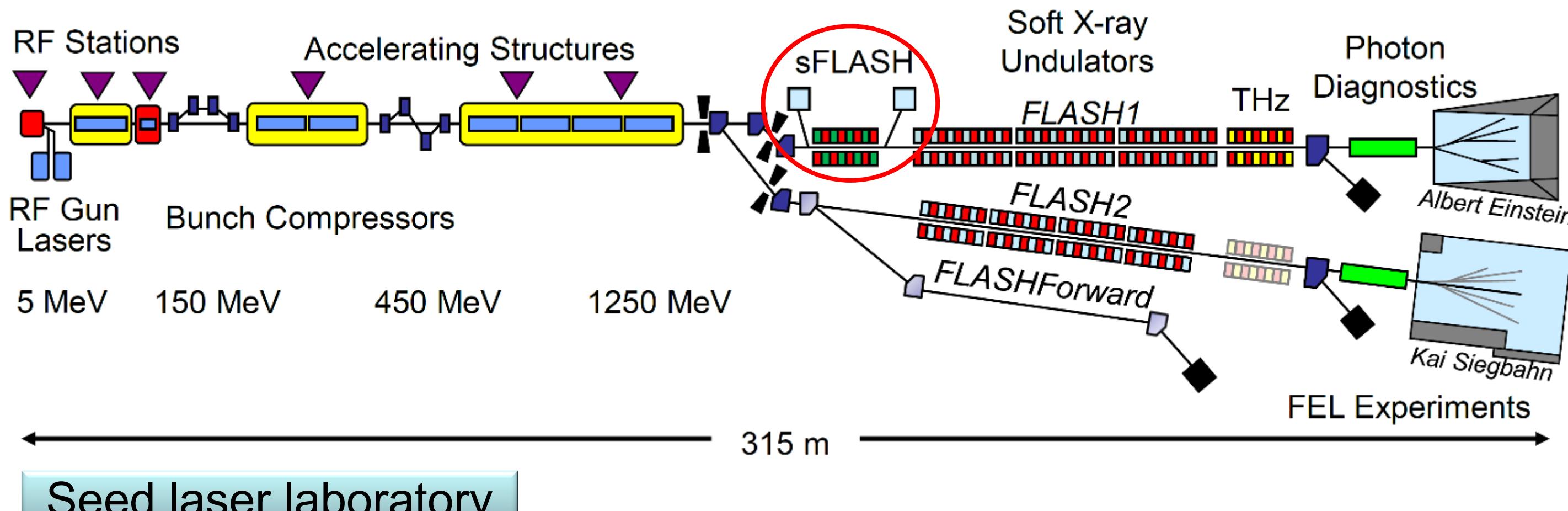


# Status of the Seeding Development at sFLASH.

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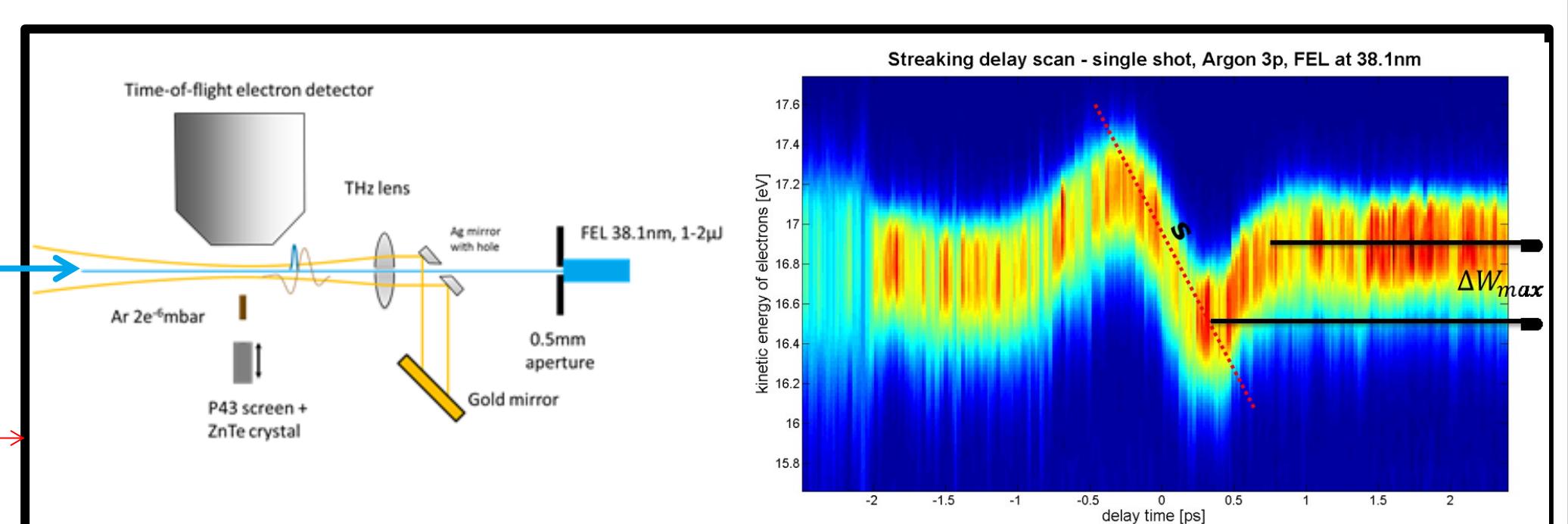


## sFLASH seeding experiment @ FLASH



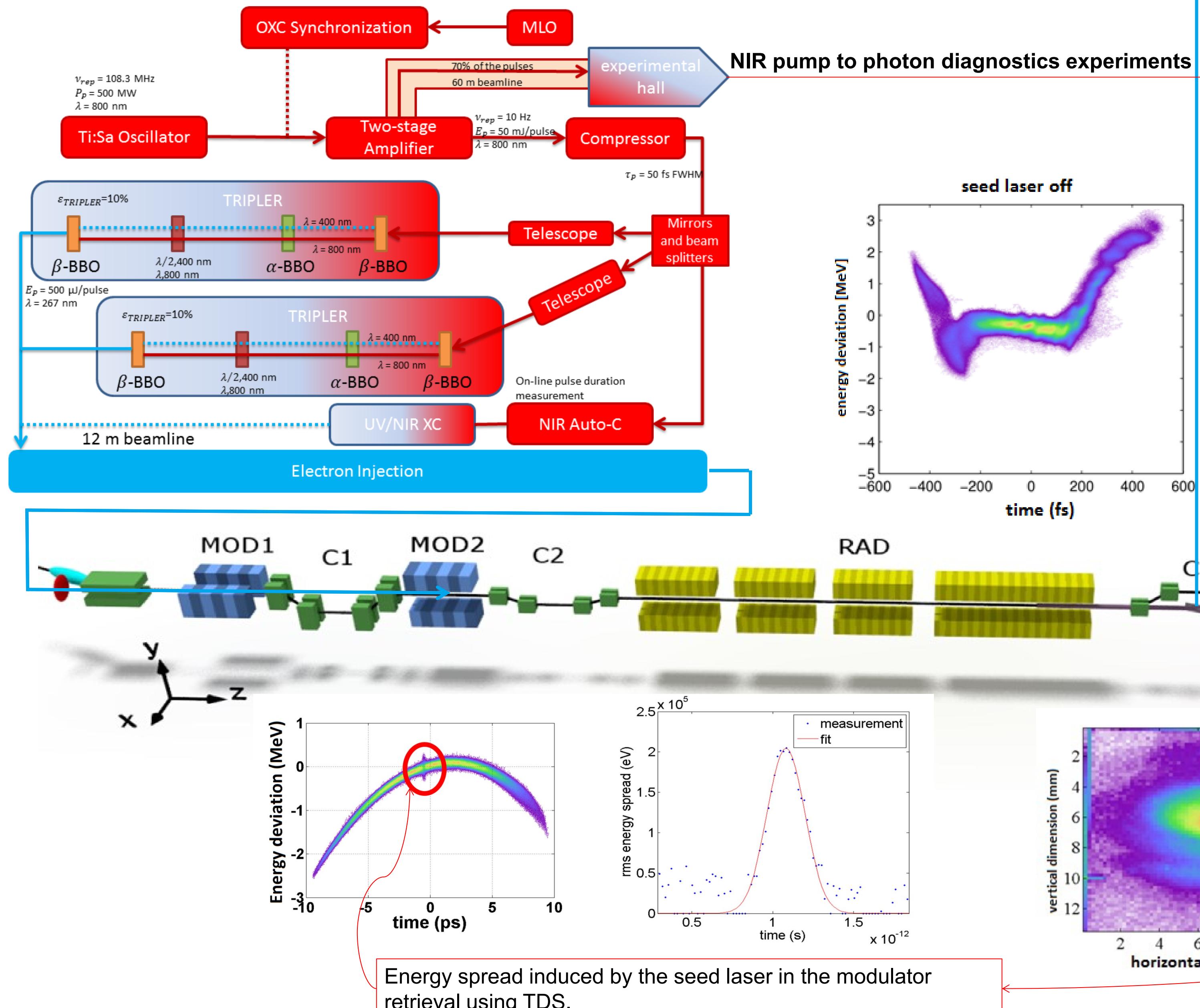
## Experimental hutch

Pump and probe experiments:  
 using NIR from seed laser lab and FEL pulse

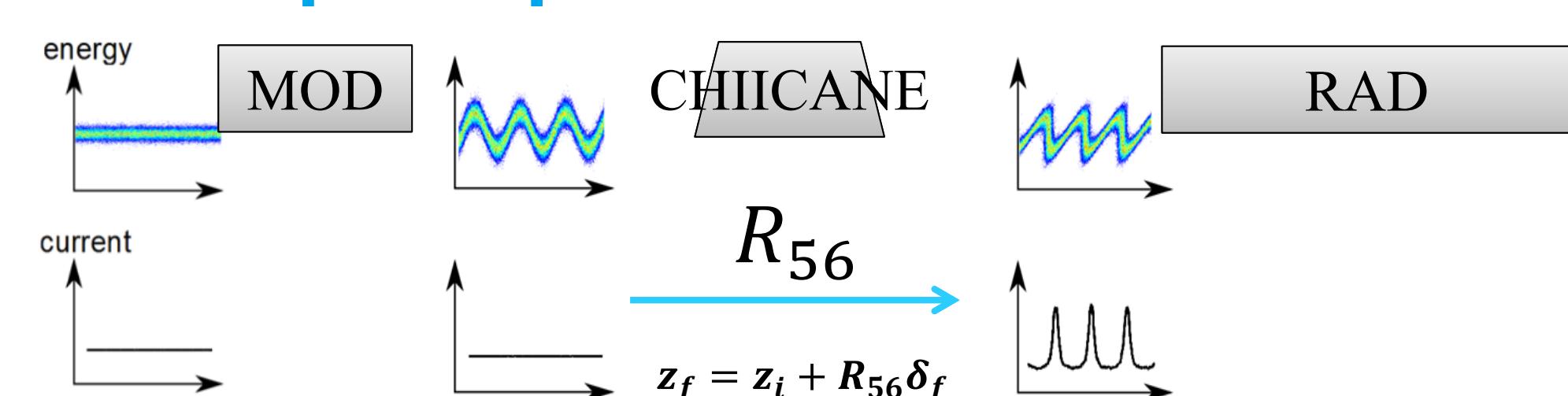


THz streaking → temporal profile of the FEL pulse

## Seed laser laboratory



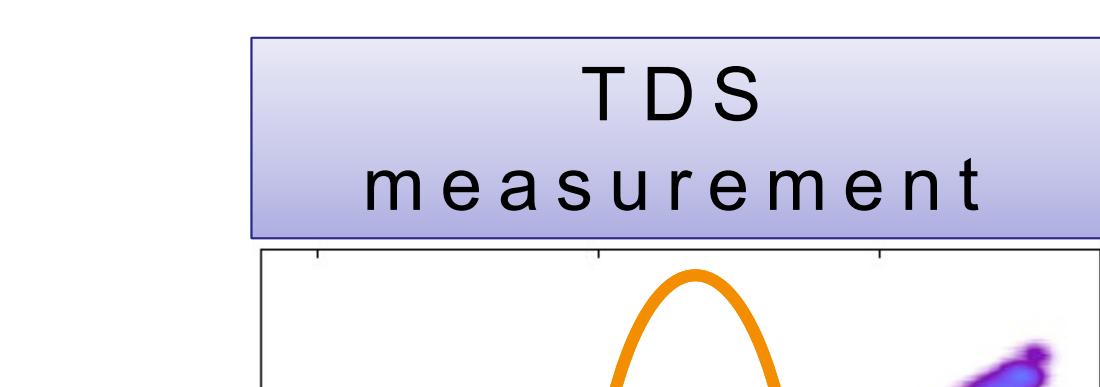
## HGHG principle



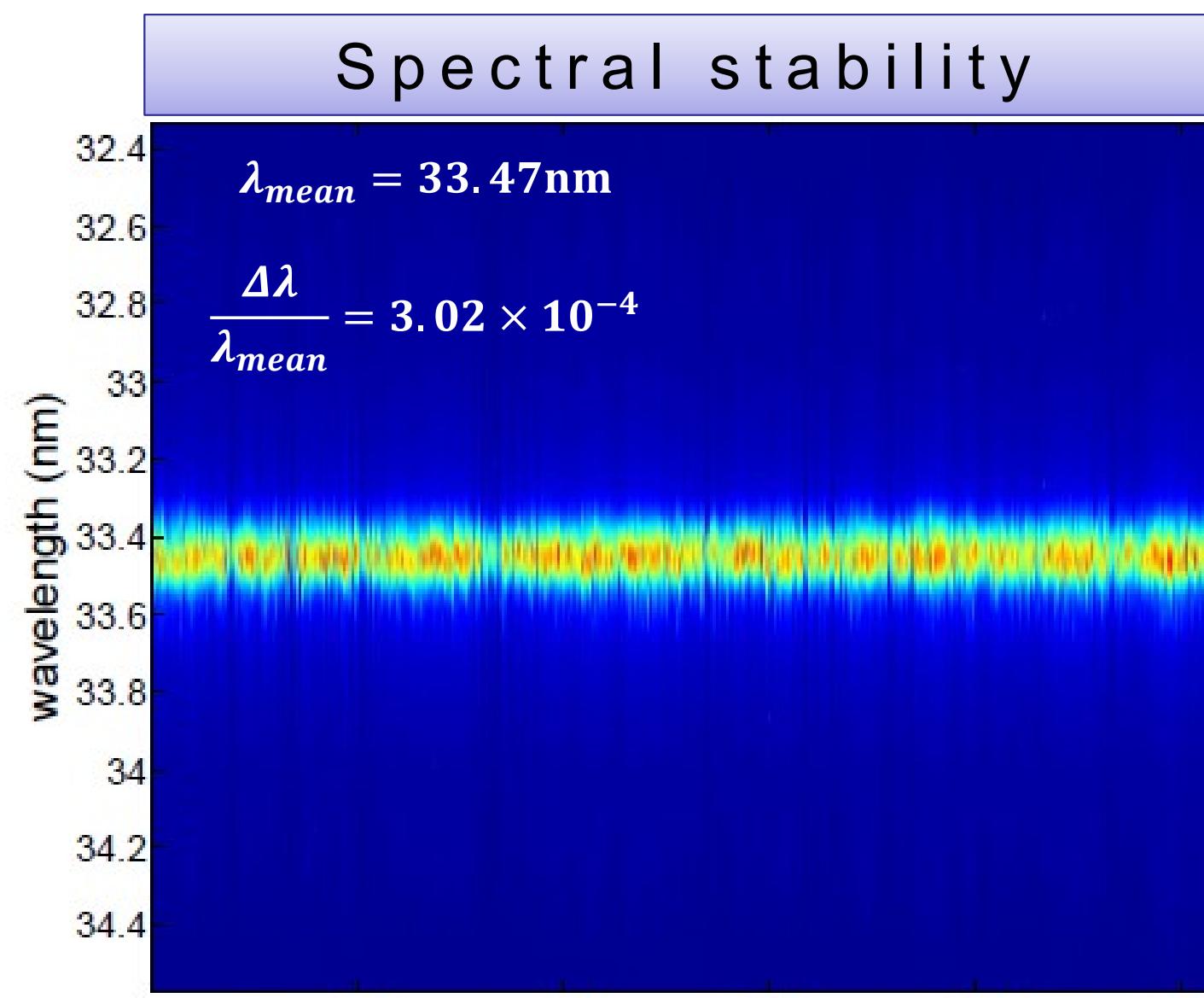
## Experimental parameters

	Parameter	Value
Modulator	period length $\lambda_{mod}$	0.2 m
	undulator periods $N_u^{mod}$	5
	$K_{mod}$	2.77
Radiator	period length $\lambda_{rad}$	31.4 mm
	undulator periods $N_u^{mod}$	318
	$K_{rad}$	2.61
Chicanes	$R_{56}$ C1	Not used
	$R_{56}$ C2	50-200 $\mu$ m
	$R_{56}$ C3	190 $\mu$ m
Electron Beam	energy	680-700 MeV
	typ. peak current	550-700 A
	charge	0.4 nC
	bunch length (FWHM)	>500 fs
	beamsize (rms)	~100 $\mu$ m
Seed Beam	wavelength	267 nm
	NIR pulse length (FWHM)	~50 fs
	UV pulse length (FWHM)	250-280 fs
	UV waist $w_0$	~660 $\mu$ m

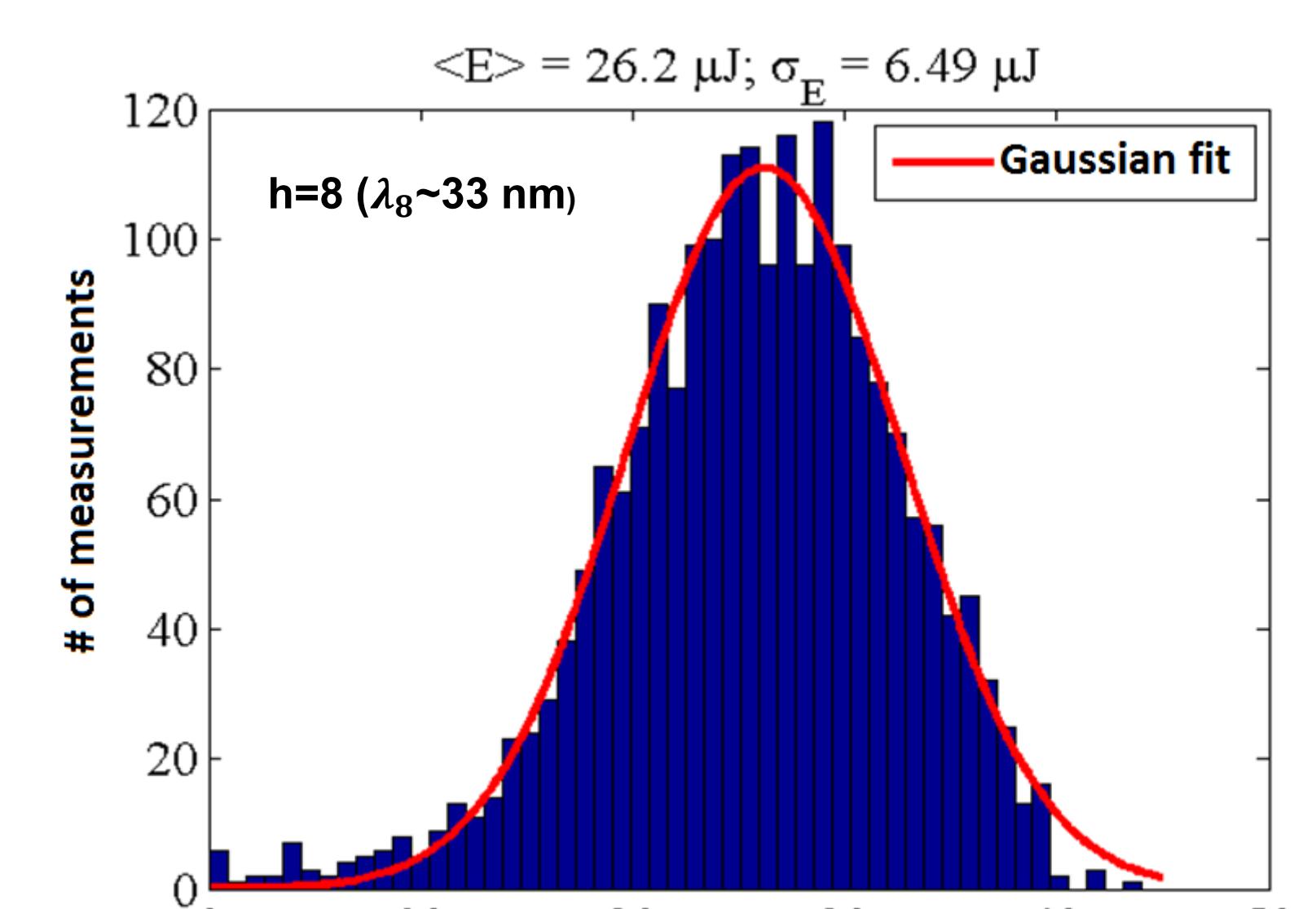
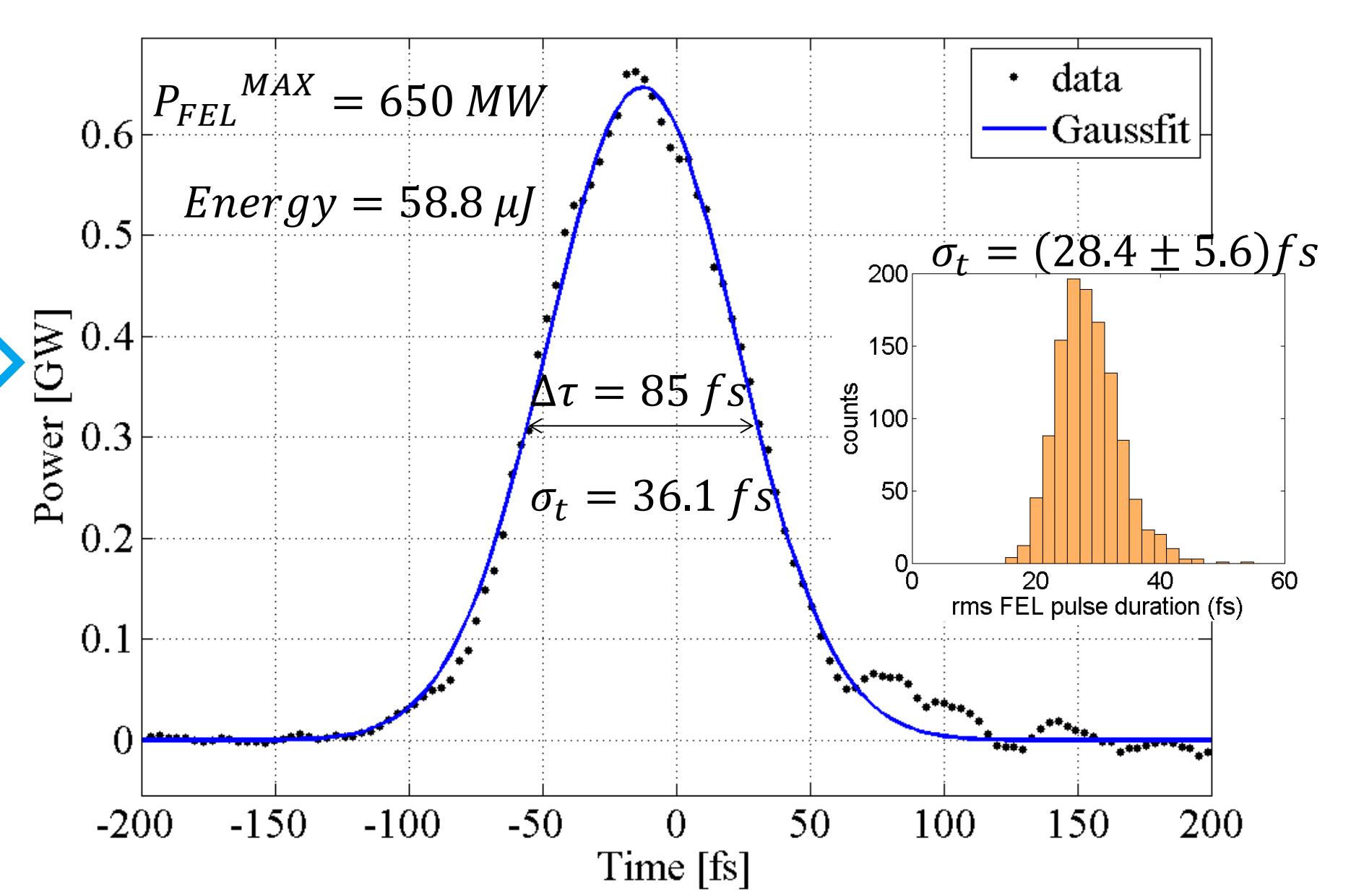
## Performance of HGHG seeded FEL at sFLASH



Increase of slice energy spread and energy drop reveals FEL lasing: thus successful HGHG lasing.



Consecutive single-shot FEL spectra at the 8th harmonic of the seed laser.



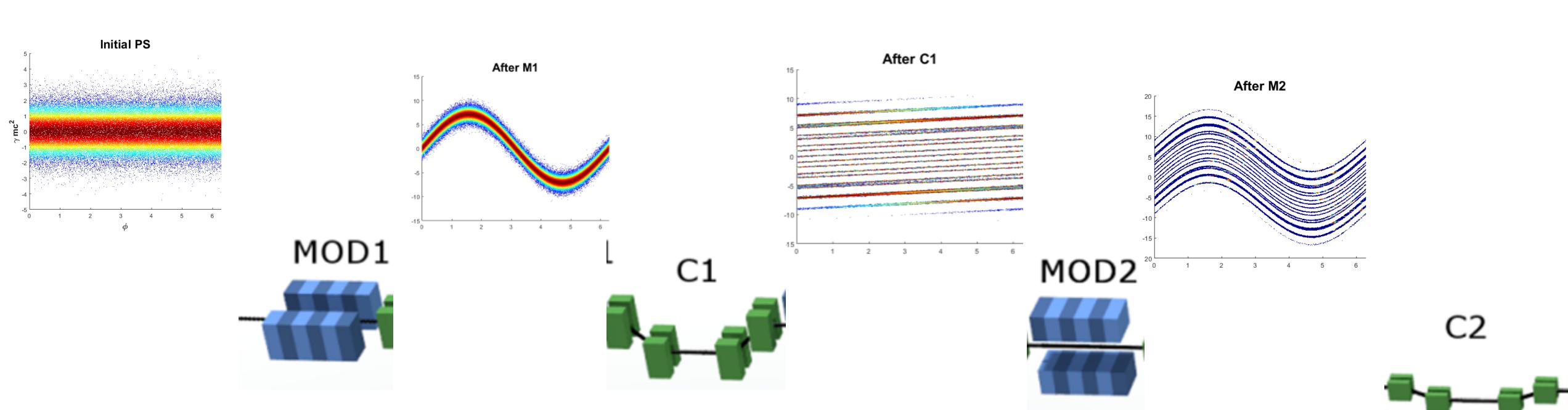
## Outlook

### HGHG experiment:

- Characterization of the seeded FEL:
- XUV-autocorrelation for FEL characterization,
- Optimization of THz streaking for temporal characterization,
- Impact of a chirped seed on the FEL pulse.

### EEHG experiment:

- First demonstration of EEHG at sFLASH with the existing setup,
- Modification of the sFLASH setup to improve EEHG performance.



## Summary

- Successful operation of UV-seeded FEL up to the 9th harmonic at FLASH,
- Non-destructive extraction of FEL pulse power profile from electron bunch,
- THz streaking at sFLASH.

## Acknowledgments

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