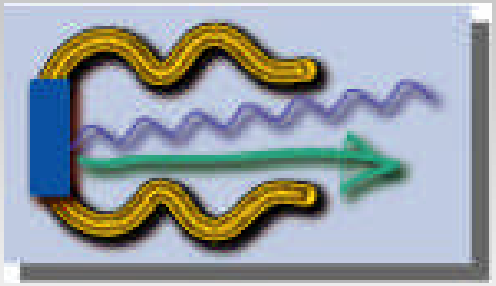


Status dazzler experiment

Andrea Ghigo for INFN

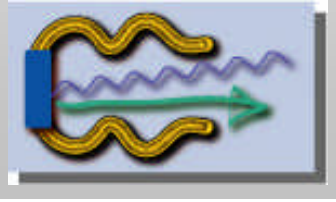
PHIN CARE Collaboration Meeting

DESY 3 November 2004

Outlines

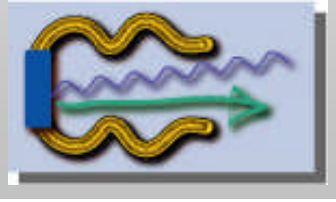
- Standalone Dazzler experiment at Ultras lab @ Milano-politecnico. Status: successfully concluded.

- Integration of the AO filter in an amplified laser for photoinjector application, at DUVFEL @ BNL. Status: incomplete.

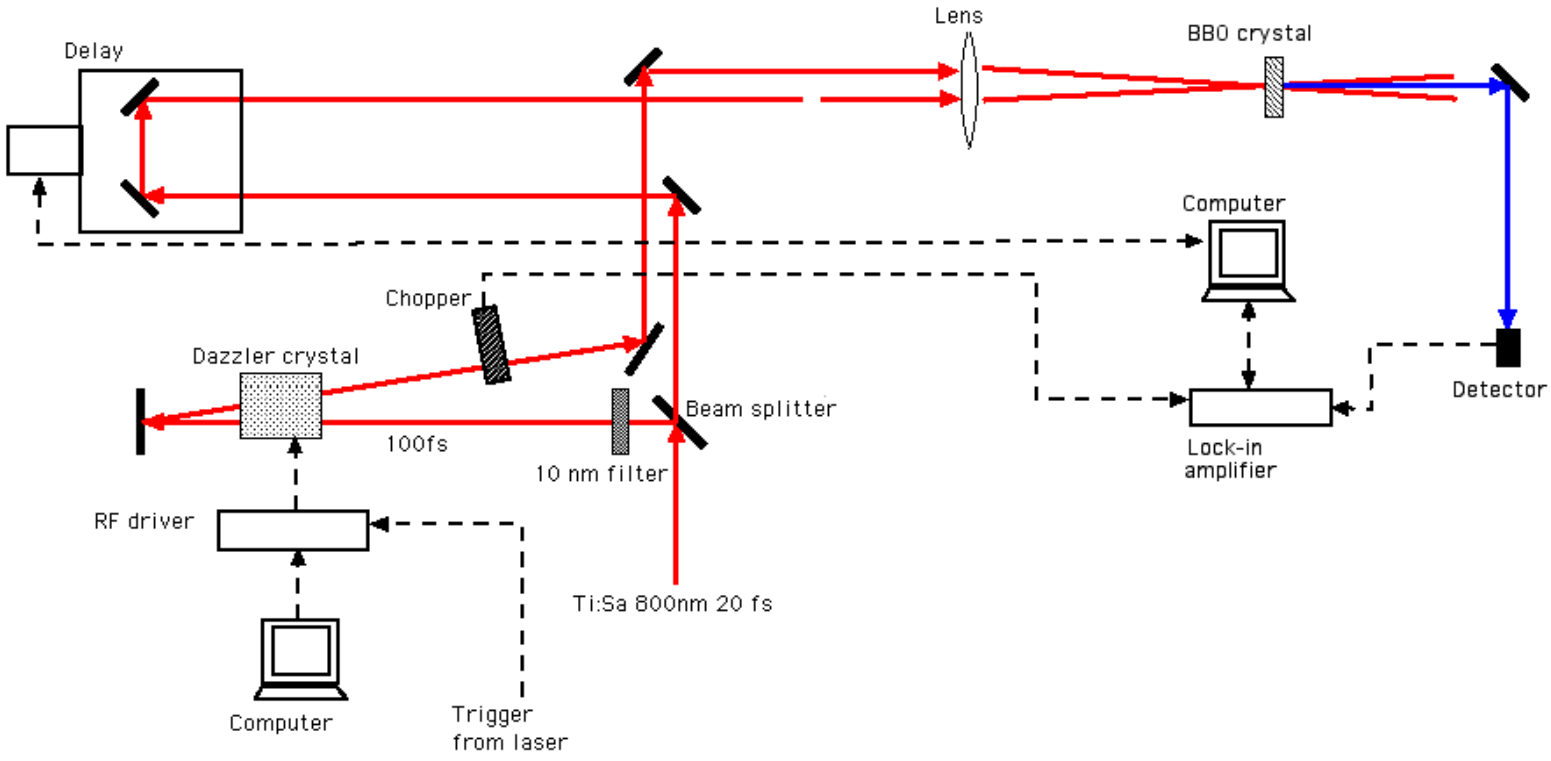


Experiment @ Mi-politecnico

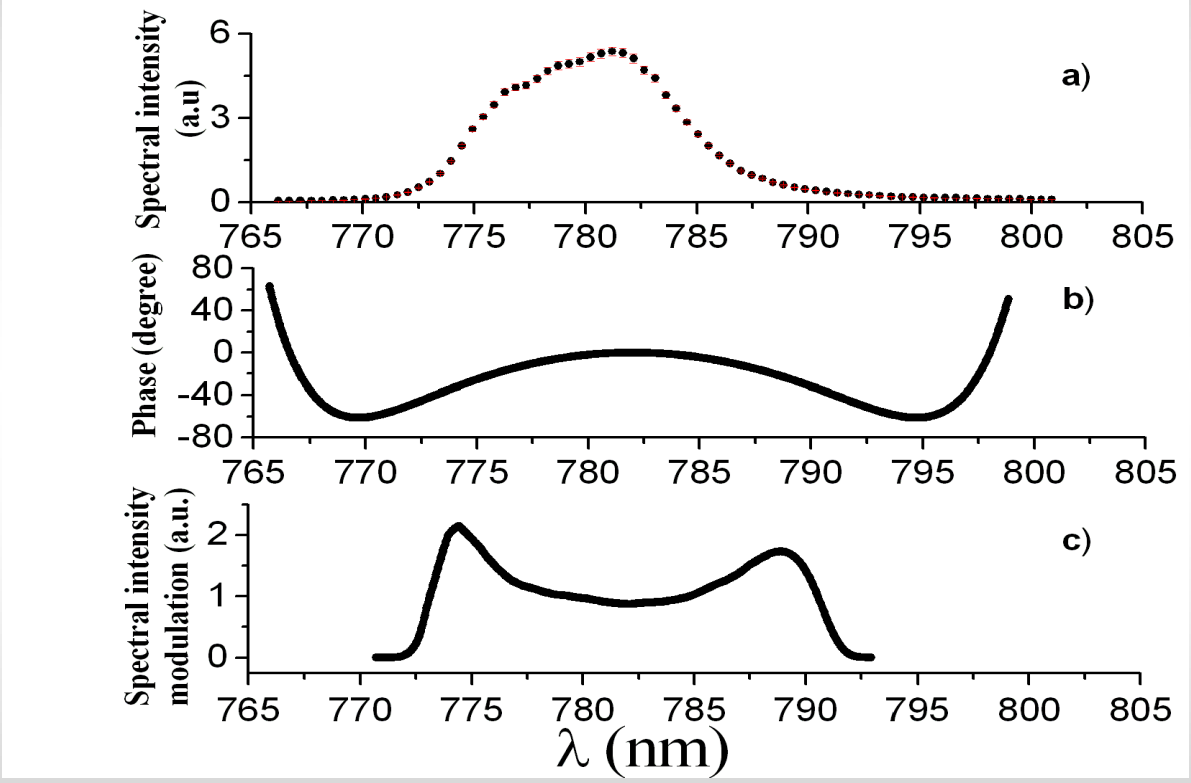
- **The AO filter was installed downstream the ultra-fast laser system.**
- **Development of the software for the calculation of the optimal Dazzler filter function and non-automatic feedback from the measurements.**
- **Dazzler's configuration for pulse up to 10 ps**
  - **Double passes.**
  - **Single passage + external dispersion .**

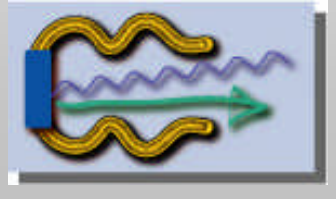


Cross correlation measurement setup: double passes configuration



Optimized Dazzler spectral transfer function

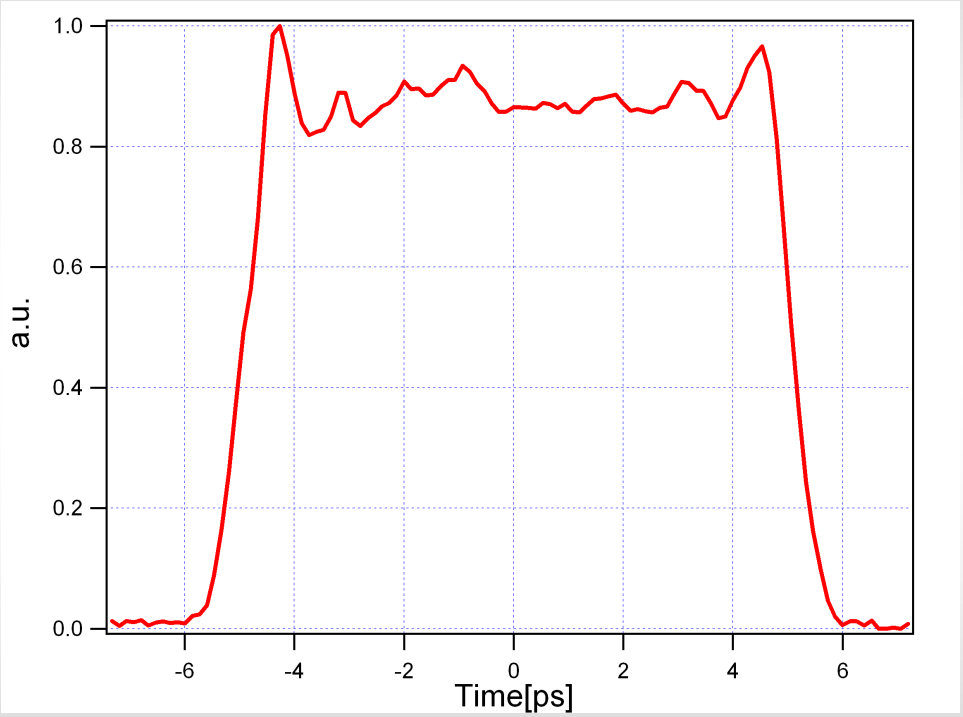




Main results

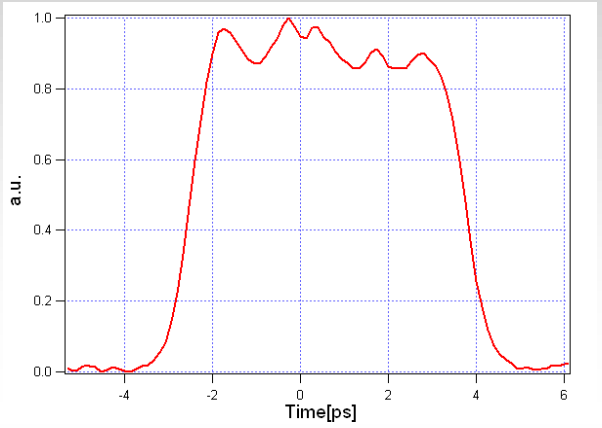
Flat top pulse:
-10 ps,
-rise time <0.8ps
-ripples< 20%.

The Dazzler is able to produce arbitrary and very reproducible temporal profiles



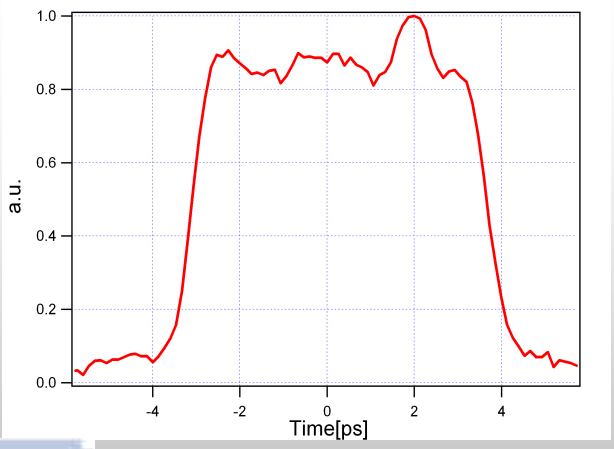
Single passage +60 cm SF57: output temporal profiles

- The shaped pulse is smoother than the 2 passages results, but still in the rise-time requirements.



Output pulses

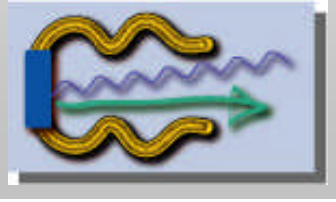
- Max duration was 7.5 ps. To lengthen the pulse up to 10 ps a larger external chirp was required.



Dazzler Tests @BNL

- **The experiment is directed toward the production of the flat top pulse after the CPA and UV-conversion. Hopefully generate flat top photoelectrons and emittance measurements.**

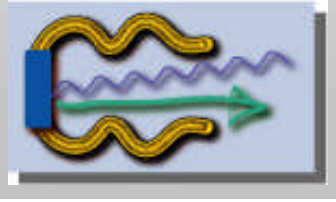
- **The Dazzler has been used in single passage configuration, before the amplifier. External dispersion is added by off-balance the stretcher-compressor.**



DUV-FEL laser system specs

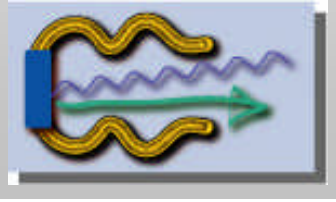
- **Amplified Ti:Sa with 10 nm FWHM**
- **The laser is use to drive the photocathode and to seed the HGHG experiment**

- **The laser is composed by.**
  - **Tsunami oscillator and related pump**
  - **Regenerative + 2 multipass amplifiers and pumps**
  - **Two compressors**
  - **BBO-BBO UV generator**

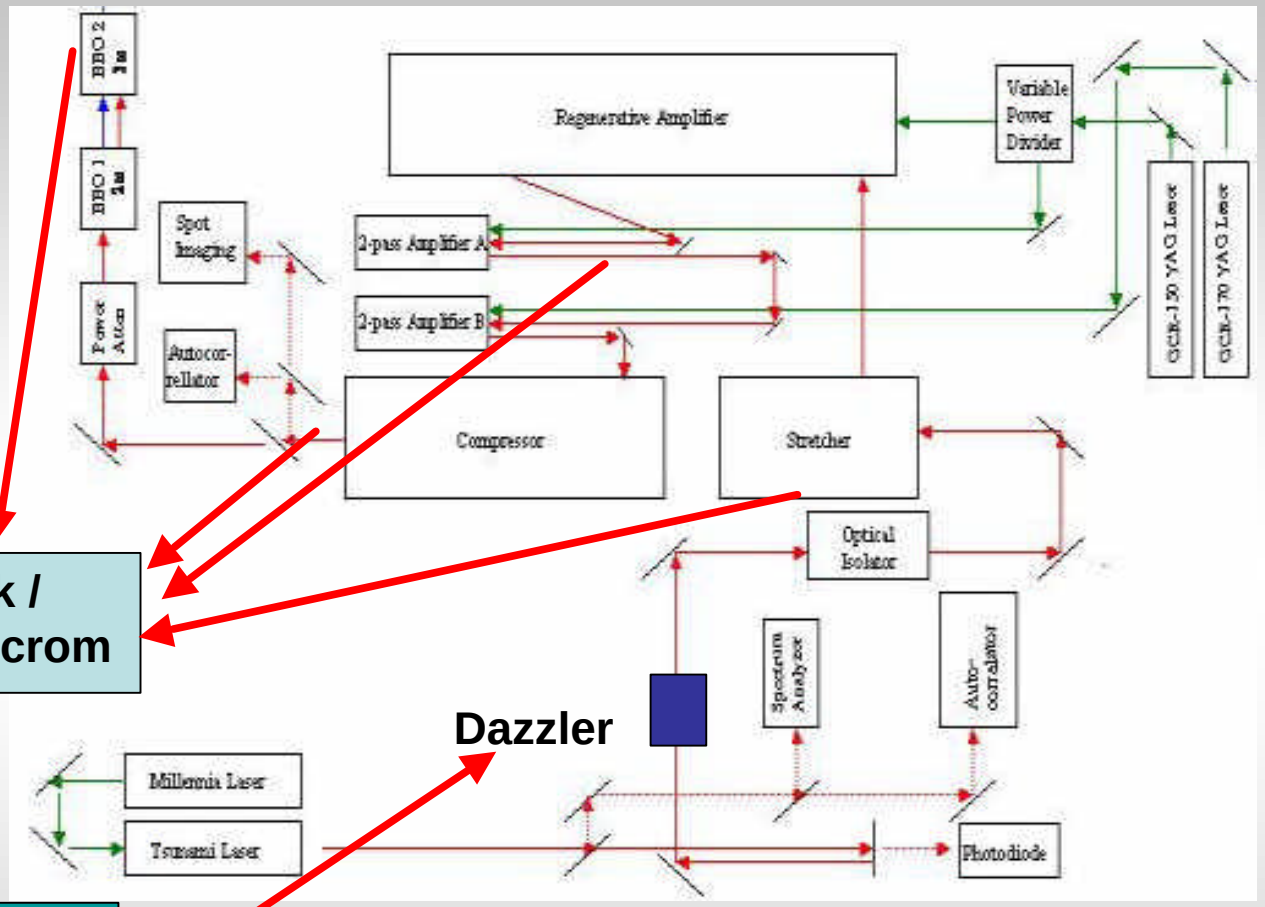


DUV-FEL laser system 2

- **Laser beam time and frequency domain diagnostics for the Dazzler experiment:**
  - **ps streak camera for single shot low resolution measurement**
  - **uv multishot cross-correlator for high resolution (150 fs) multishots diagnostic**
  - **Mono-chromator UV-IR**



Schematics of the experiment layout



CPA distortions

800 nm
9 nJ
100 fsec

Ti:Sapph Oscillator

Dazzler

5 nJ
200-400 psec

Stretcher

25 mJ
170-350 psec

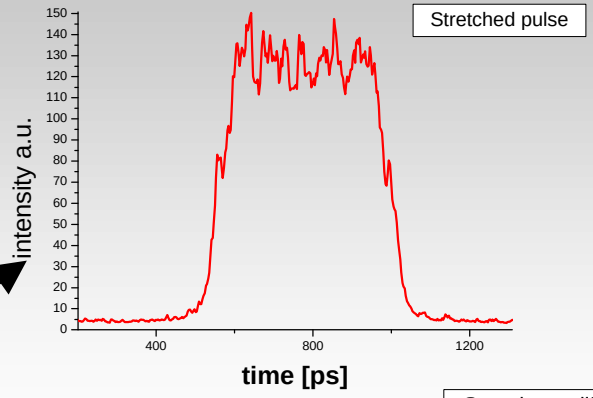
bypass

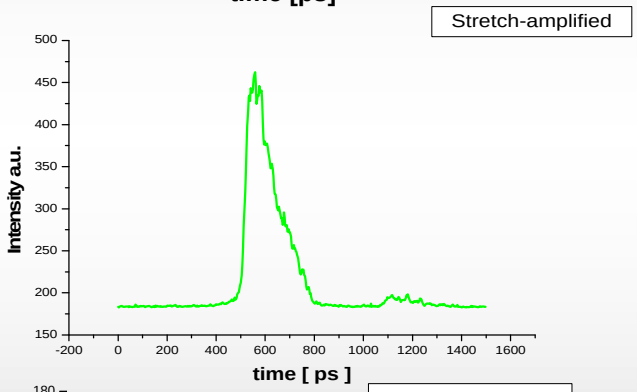
15 mJ
0.1 - 30 psec

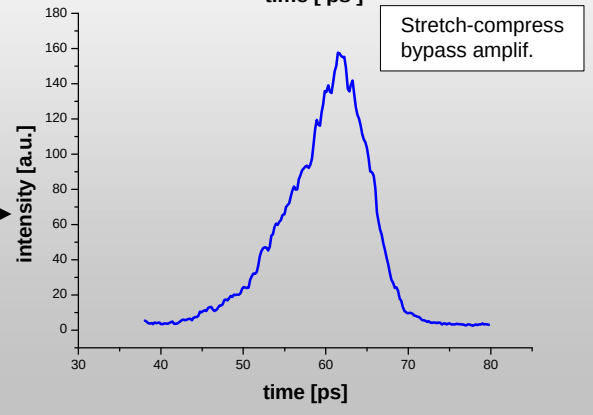
Compressor

266 nm
1.8 mJ

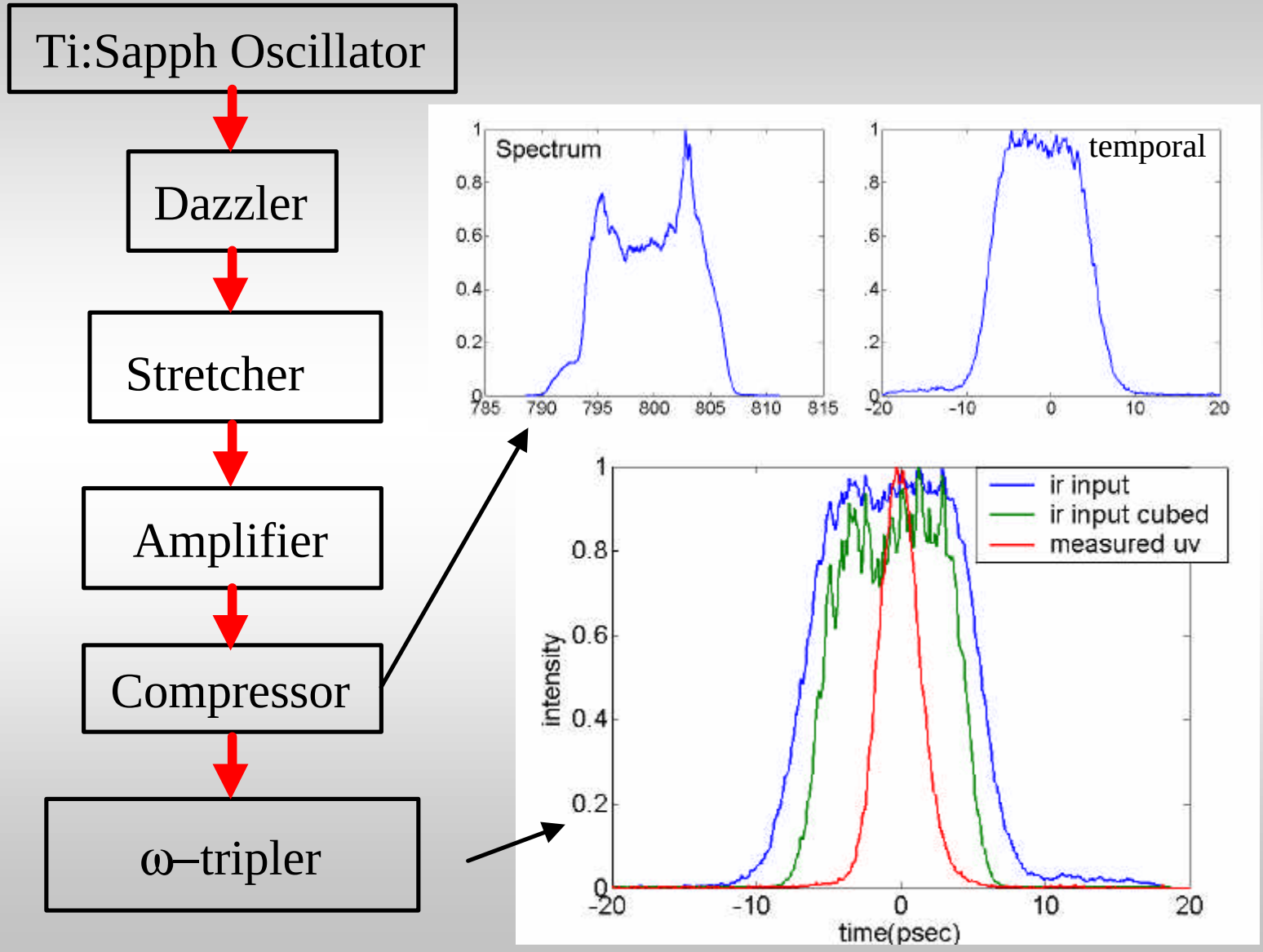
ω–tripler



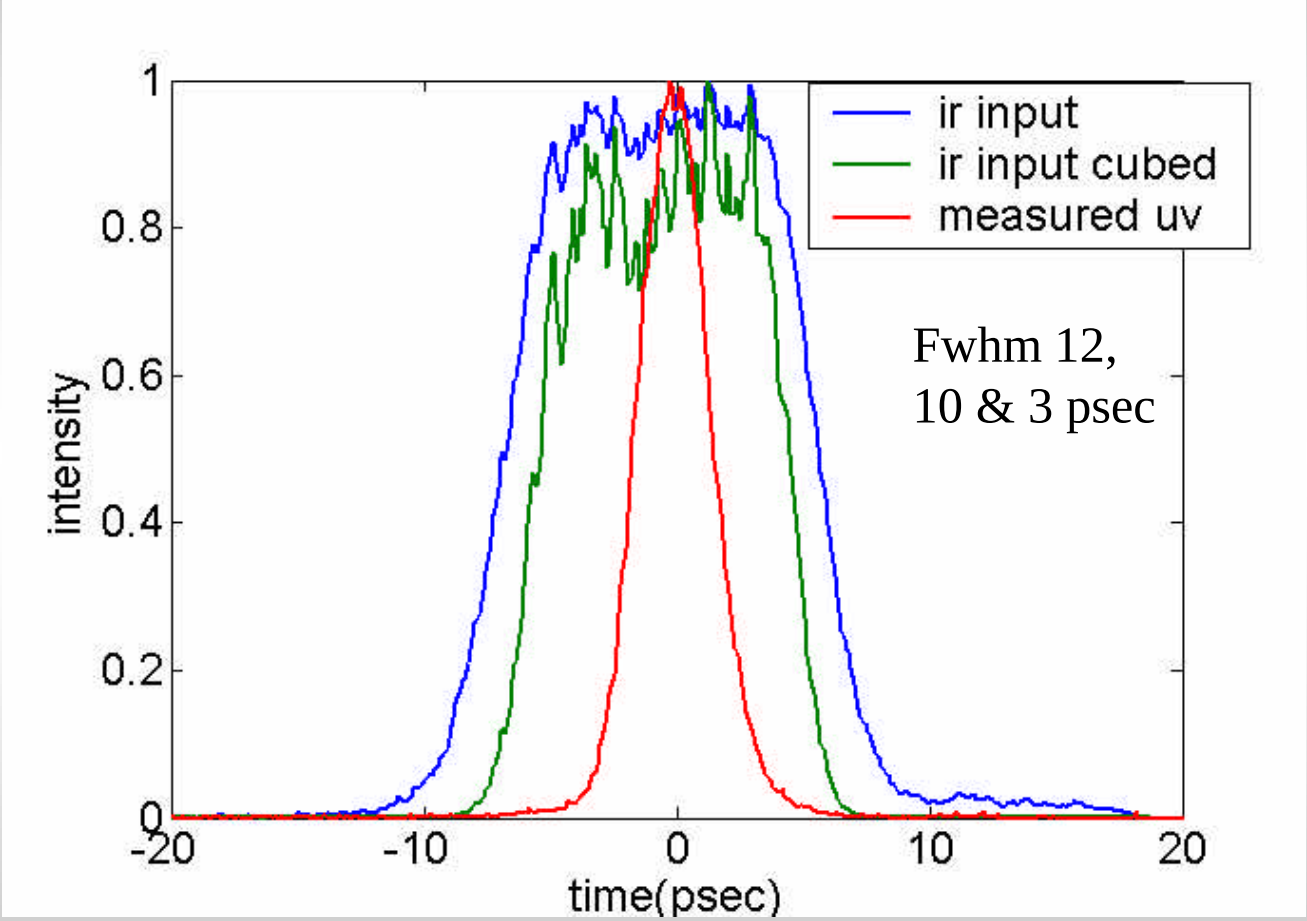




Distortion partial compesation

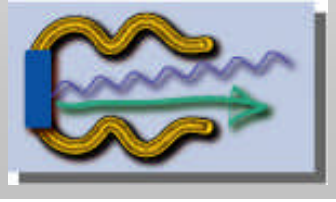


THG distortions: streak camera measurement and expected profiles



Third Harmonic Generator

- **The UV pulse is 3 times shorter than the input, and the time profile is Gaussian.**
- **The 400 nm spectrum and the 266 nm shows deep “absorption lines” also for Gaussian input.**
- **The THG consists of two BBO with thickness of 0.5 and 0.25 mm.**
- **Saturation effects? Crystal or coatings damages?**



Next steps

- **Simulations to understand the UV distorsion.**
- **New crystal with the same thickness are available for new tests.**
- **optimization to find global minimum.**
- **The DUVFEL accelerator will restart on the second week in November for tests on the e-beam.**