

"Technical Aspects of the Integration of the Optical Replica Synthesizer for the Diagnostics of Ultra-Short Bunches into FLASH at DESY"

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Outline

- Motivations
- Optical Replica Synthesizer (O.R.S.)
- LASER (CPA 2001)
- Fiber laser oscillator – Experimental Set Up
- Results
- Conclusion

Motivations



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A simple method for the determination of the structure of ultrashort relativistic electron bunches

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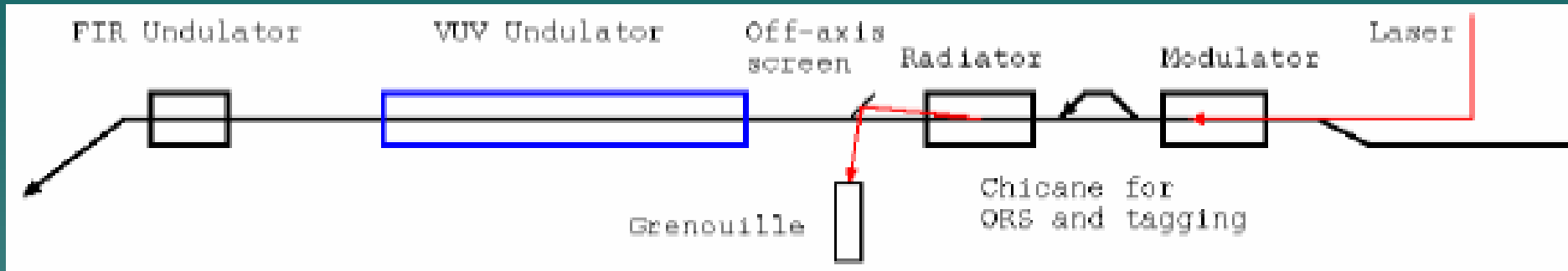
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Available online 2 December 2004

- creates ‘optical copy’ of the electron bunch
- measures longitudinal bunch profile
- slice emittance
- slice energy spread

Optical Replica Synthesizer - ORS

FLASH



- multidisciplinary project
 - accelerator physics
 - ultrafast optics and laser technology
- installation period: april 2007 - june 2007
- operation period: june 2007 - summer 2008
- extension to XFEL... ???

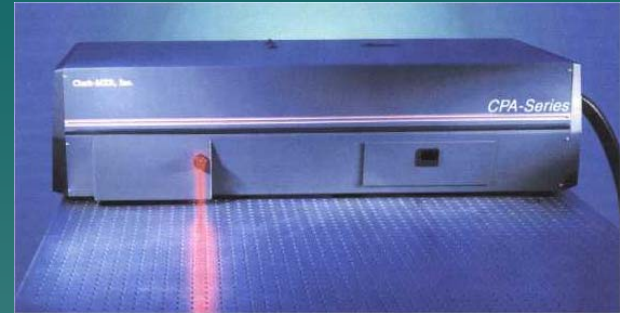
LASER

CPA 2001 Model (Clark MXR, Inc) : Ti: Sapphire

-Wavelength : 800 nm

-Pulse duration : 150 fs

- Pump : YAG Laser operating at 10W of 532nm average power level with a Q-Switch turned on at 1kHz repetition rate.



Top level :

Regenerative
Amplifier

Nd:YAG Pump
Laser

Pulse
Compressor

Bottom Level :

SrF Fiber
Oscillator

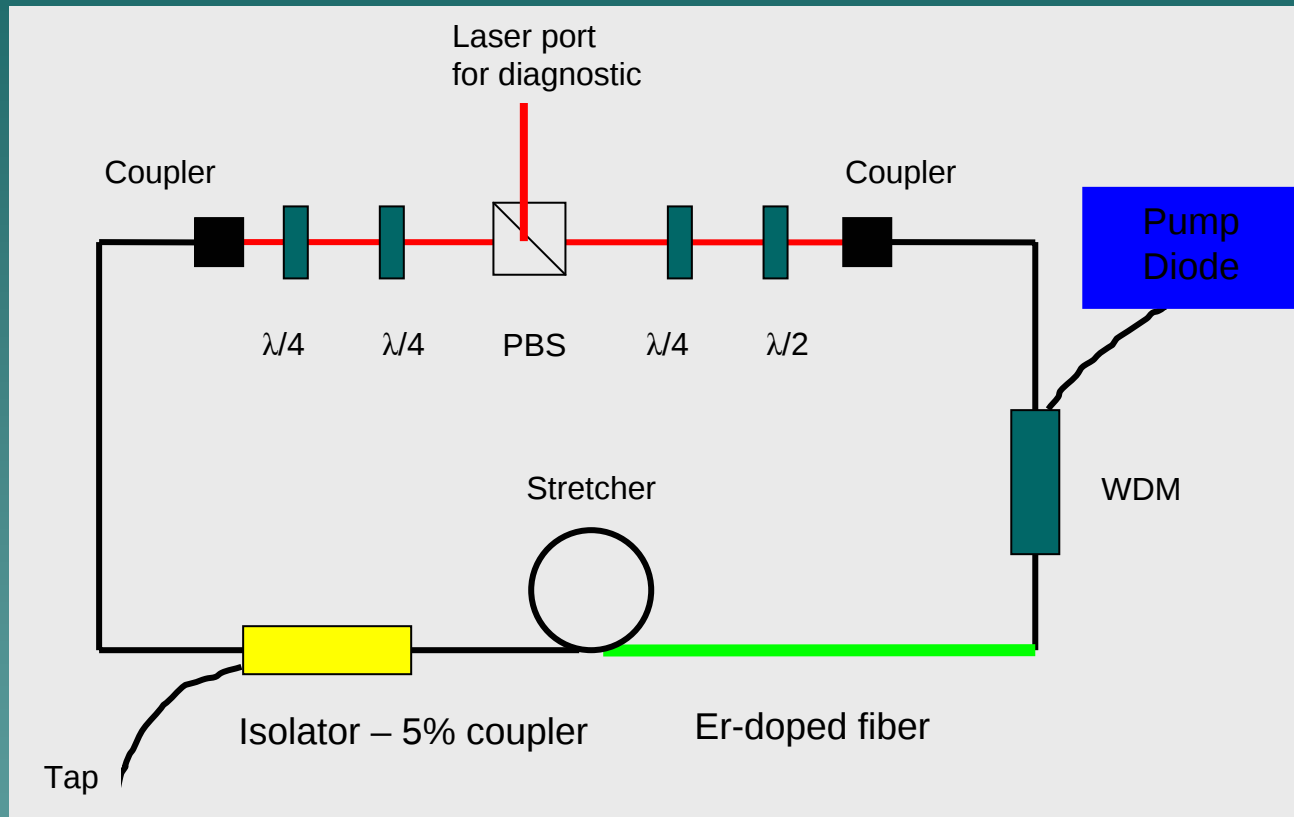
Diode Laser

Pulse
Stretcher

→ SrF oscillator can't be synchronized to RF system: need of a fiber laser oscillator

LASER

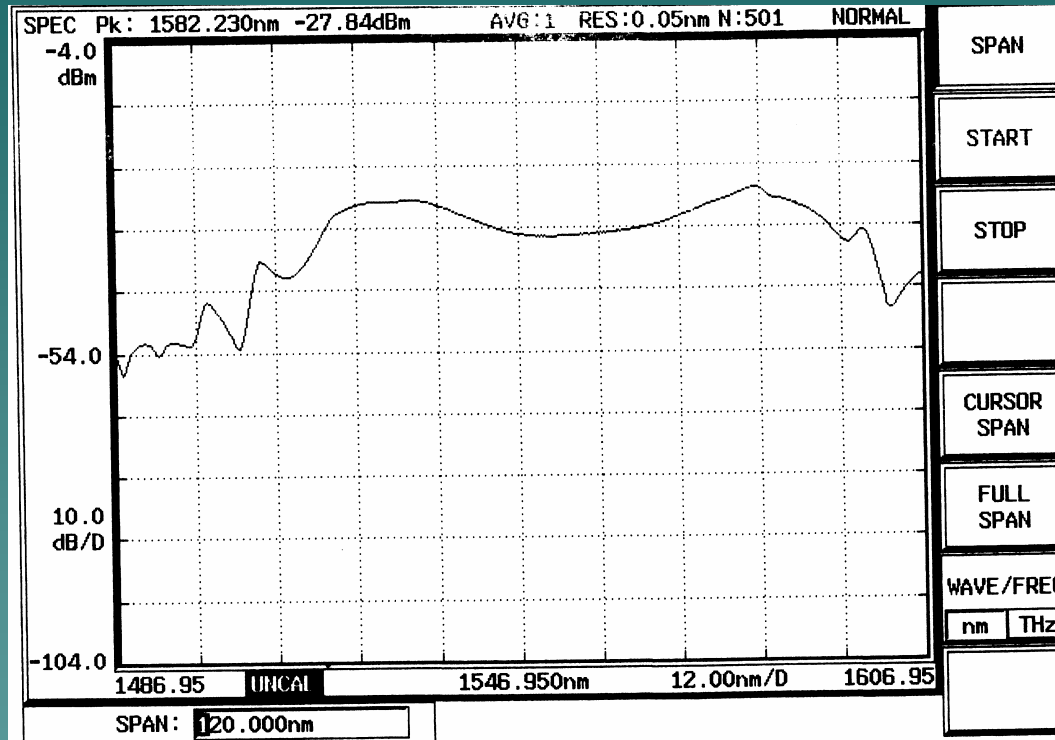
- Fiber Laser Oscillator : Mode Locked Erbium doped fiber Laser



A. Winter et al. , Nuclear Instruments and Methods in Physics Research A 557 (2006)

LASER

Results:

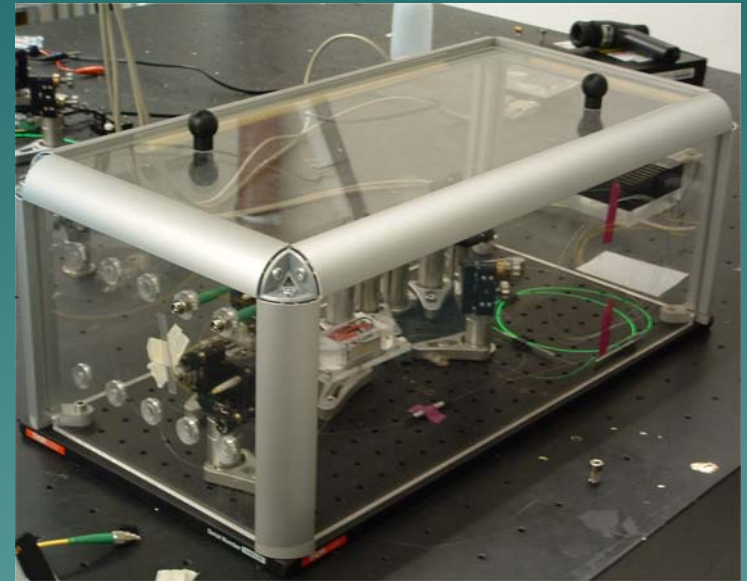
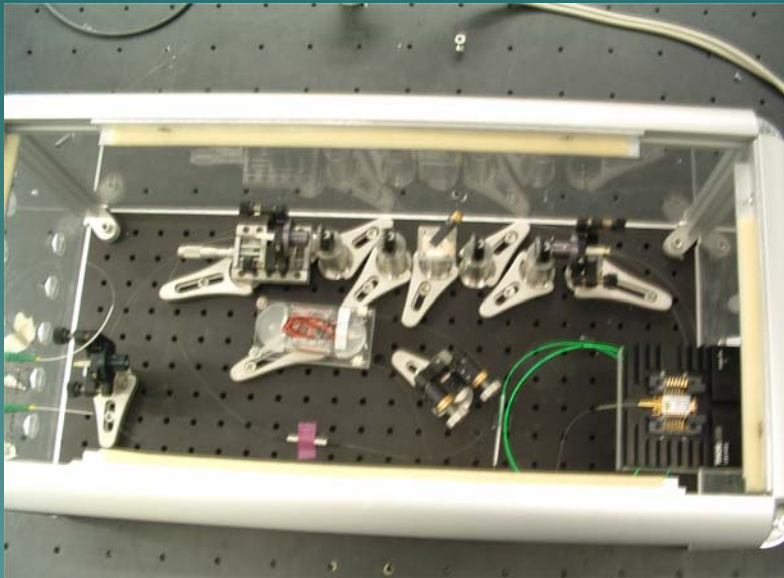


Characteristics of the laser :

- . Output power : 35 mW
- . Wavelength : 1550 nm
- . Pulse duration (before compression) : 530 fs
- . Pulse energy : < 1nJ
- . Mode locked

LASER

Results:



Work Plan

- magnets (Scanditronix)
- laser : Oscillator, SHG, adaptation to the CPA
- beam transport seed laser + injection
- beam transport radiator beam + ejection
- frequency resolved optical gating
- interfacing DESY operating system
- ...