"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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• Motivations

• Optical Replica Synthesizer (O.R.S.)

• LASER (CPA 2001)

• Fiber laser oscillator – Experimental Set Up

• Results

• Conclusion
Motivations

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

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• creates ‘optical copy’ of the electron bunch
• measures longitudinal bunch profile
• slice emittance
• slice energy spread
• multidisciplinary project
  - accelerator physics
  - ultrafast optics and laser technology

• installation period: april 2007 - june 2007
• operation period: june 2007 - summer 2008
• extension to XFEL… ???
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 :__

- SErF Fiber Oscillator
- Diode Laser
- Pulse Stretcher

SErF oscillator can’t be synchronized to RF system: need of a fiber laser oscillator
FEL Conference – Berlin 2006

LASER

- Fiber Laser Oscillator : Mode Locked Erbium doped fiber Laser

Results:

Characteristics of the laser:

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

• ...

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