EARLY STAGE RESEARCHER

Mikayel Musheghyan

PROJECT: *Generation of mid-IR CEP-stabilized pulses (Workpackage 3)*

Host institution: FEMTOLASERS

Supervisors: Dr. Andreas Assion, Dr. Salvatore Stagira, Dr. Thierry Ruchon

Start date: 01/02/2016

General info: After acquiring Master's degree at Technical University of Munich (prof. Kienberger group), during which the work was performed on the products of FEMTOLASERS, the PhD was undertaken in the sphere of ultrafast laser physics in collaboration with FEMTOLASERS in the framework of MEDEA Horizon 2020 project.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 641789

CURRICULUM VITAE

- Born in: 12/01/1993
- Place of Birth: Yerevan, Republic of Armenia
- Bachelor Studies: 2009 - 2013 at Yerevan State University
- Master Studies: 2013 - 2015 at Technical University of Munich
- PhD Studies: 2016 – present at Spectra-Physics Vienna

- Scholarships:
  - Nominal scholarship after G. Sahakyan of the Faculty of Physics of Yerevan State University September 2012 – June 2013.
  - German Academic Exchange Service (DAAD) Scholarship for Master's Degree Studies 2013 – 2015.
  - Marie Skłodowska-Curie Scholarship in MEDEA Horizon 2020 Project.

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SCIENTIFIC SCOPE OF THE PROJECT

- **Combination of Ti-sapphire and Optical Parametric Chirped Pulse Amplification (OPCPA) technologies.**
  - Development of sub-15 fs ultra broadband Ti-sapphire amplifier.
  - Development of a new grating stretcher for the aforementioned amplifier.
  - Investigation of the generation of mid-infrared seed pulses.
  - Amplification stages of mid-IR seed pulses pumped with sub-15 fs amplifier output.
- **Development of a few-cycle CEP-stable mid-infrared pulse source.**
  - Development of f-to-2f interferometer for the mid-infrared range.
  - Investigation of the CEP-stability of the mid-IR pulse.

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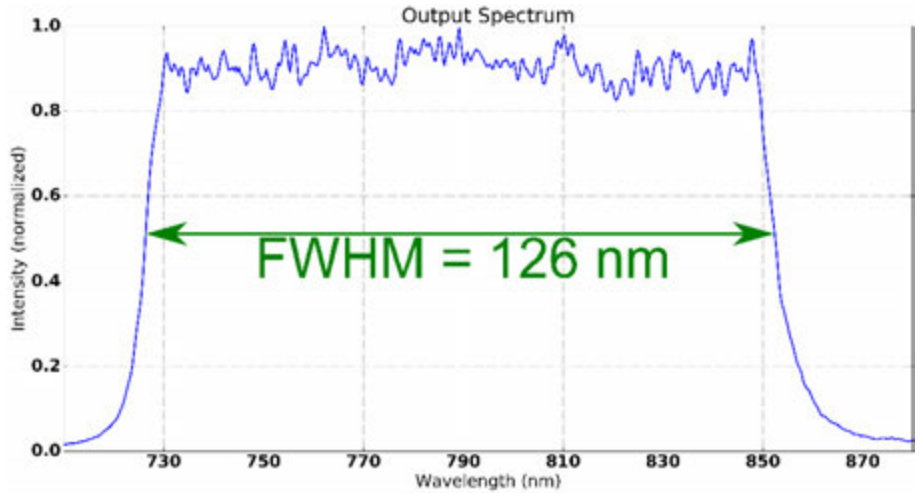
SCIENTIFIC ACTIVITIES AND GOALS IN PROGRESS

Progress so far

- Proof of principle: ultra broadband (FWHM > 100nm) Ti-sapphire amplifier.
- Investigations of (N)OPA design: pump/seed considerations, crystal selection, phasematching type.
- Investigations of intrinsic CEP-stability at 1800 nm.



Current goals

- New grating stretcher design integration. Pulse energy scaling.
- Maximisation of pulse bandwidth by filter design modification.

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SCIENTIFIC ACTIVITIES AND GOALS IN PROGRESS

- **Goals for 2017**
  - Tests of different OPA/NOPA/OPCPA designs and crystals.
    - Crystals ordered and simulation OPA performed 2016.
    - Set up seeding part (DFG) to generate idler at 4 µm.
    - Set up first amplification stage (collinear).
    - Comparison of silmulations with experimental results.
    - Re-design the first stage and design the second stage OPA.
  - Optimisation of ultra broadband amplifier output – pulse duration, energy.
    - Further development of Ti-sapphire amplfiier with new Gauss-filter design towards 12 fs
    - Pulse energy scaling up to 3 - 4 mJ.

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SECONDMENTS, OUTREACH ACTIVITIES AND SOFT SKILLS TRAINING

- **Secondments:**
  - None taken so far.
  - Two planned for 2017 (**POLIMI-** approx. May, **CEA** – approx. February 2018)
- **Outreach Activities:**
  - Two finished. (school *«De La Salle»* and school *«Europäische Mittelschule»).*
  - Third outreach activity started (*«Science Pool Vienna»*), student workshop planned in February.
- **Soft Skills Training:**
  - Sales process in industry.
  - Knowledge of enterprises and surroundings.

Photo from Photonics Explorer Kit Workshop with students at school «De La Salle».

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CAREER DEVELOPMENT PLAN AND FUTURE ACTIVITIES

- **Scientific Goals:**
  - Development of an ultra broadband (FWHM > 100nm) Ti-sapphire amplifier
    - Filter designs.
    - Pulse energy scaling (grating stretcher).
  - Development of a few-cycle CEP-stable mid-infrared pulse source.
    - Tests of different (N)OPA schemes: crystals, collinear/non-collinear, pulse duration, efficiency.
    - Development of pulse characterization equipment for mid-IR.
    - CEP stability.
- **Planned Future Activities:**
  - Secondments (**POLIMI** and **CEA** in 2017-early 2018).
  - Two Outreach Activities (one already in process).
  - Soft Skills Training (further training regarding topics in industry, academic writing etc.).

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Thank you for your attention!

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