Meeting:	3rd Consortium Meeting - Aachen

Date:	27 & 28 March 2017

Recorder:	Emma Bowden (KITE)

Attendees:	Marwan Abdou-Ahmed (USTUTT)	David Bruneel (LASEA)
	Jan-Philipp Negel (USTUTT)	Jose Ramos (LASEA)
	Clemens Hönninger (AMP)	Benoit Beaudou (GLO)
	Noemie Dury (C4L)	William Scalbert (E6)
	Michael Moeller (AMO)	Andrew Whitehead (E6)
	Martin Lustfeld (BOSCH)	Emma Bowden (KITE)
	Gerhard Kunz (BOSCH)	James Clayton (KITE)
	Fetah Benabid (XLIM)	

No	Action Description	Owner
1	Send detailed system setup pictures to Fetah in relation to scanner burning issue (with a video if possible)	Noémie Dury
2	Distribute the INS form to all partners, with an explanation for its use	James Clayton
3	Distribute details of the TresClean consortium to all partners for consideration in relation to a joint workshop	James Clayton
4	Establish whether XLIM will be able to host a CM / workshop	Fetah Benabid
5	Send SQUADRON & PESTEL analysis spreadsheets to partners	James Clayton
	Complete SQUADRON & PESTEL analysis and return to KITE	ALL
6	Resend logins for the website members area	Emma Bowden

WP1 Update – Presented by Martin Lustfeld (BOSCH)

WP1 is now complete

Task 1.2: Process & System Specifications

- Parameter ranges have been identified
- Agreement achieved on design specifications for all HIEPRDIAS processes

Task 1.3: Assessment & Validation of Technical Progress

- Comprehensive set of KPIs defined
- Measurement system identified

Task 1.4: Interface requirements

- Identified system interfaces for each partner
- Interface requirements from each end-user have been specified

Deliverables & Milestones

- All deliverables submitted
- All milestones achieved

WP2 Update – Presented by BOSCH, LASEA, E6

Task 2.1 Fundamental process development 3D Si processing

BOSCH

- Tests have been conducted on three systems, including a burst-capable laser (Lumentum PicoBlade)
- Some jump-time losses have occurred due to vectorial scanning – a better system may be available
- High power leads to a high thermal load, this would require fast scanning (which leads to more jump-time losses with vectorial scanning)
- Better quality results were achieved using burst-mode
- Thermal loading issues occurred even at low powers

- This led to the formation of holes and loss of reflectivity and surface cracks at 30 W
- Surface roughness for 400fs does not reach requirements
- A larger spot size may reduce jumps

LASEA

- LASEA have not yet tested a burst pulse laser
- Their next investigations will be with a 50 microns spot size at 20 kHz

C4L

- C4L need to do further experimentation for full process development and to make samples.

E6

- Further assessment of squares to establish best overlap
- There is no need to have high energy per pulse to achieve a good ablation rate
- Thermal effects need to be quantified and scaled – it should be possible to take an average temperature of the workpiece

Deliverables & Milestones

- No Deliverables or milestones due until January 2018 – no delays anticipated at this stage

Remark: MAA insisted on fact that he would like to see more progresses from C4L and E6 (as Bosch has provided)

WP3 Update – Presented by Clemens Hönninger (AMP)

- The first 50W laser has been delivered to USTUTT
- The laser does not have burst mode enabled but this could be done with a software update
  - USTUTT have agreed that they would like this to be done
- Work has started on the 200W laser
- Short pulse duration has been demonstrated (~400fs)
- Results are before compression
- 2 modulation methods are being developed, both are compatible with burst mode
- In the off phase, there is a risk of stored energy, this requires the addition of a 'safe mode'
  - The applications should still be able to work around the safe mode
- Further testing will continue with the 200W laser
- The modulation concepts will be refined and the best match for end-user requirements established

Deliverables & Milestones

- D3.1 & 3.2 submitted
- Next deliverables D3.3 & 3.4 due October 2017 – no delays anticipated at this stage
- MS8 achieved, MS23 due October 2017 – no delays anticipated at this stage

WP4 Update – Presented by Fetah Benabid (XLIM), with AMO & USTUTT

Task 4.2 – Development of an optimization of a lithography process for the fabrication of pulse compression gratings

- Spin coating tool - Gyrset
- Some early mechanical problems have now been resolved, the problems meant that the spin coating was not available for the first fabrication run (which was done using standard equipment)
- Results indicate that a longer processing time give a more homogenous coating
- The photoresist layer is a vital, functional requirement

Task 4.3 - Development and optimization of an etching process for the fabrication of optical components

- The etch process for the tantalum pentoxide top layer is being optimised
- Thick pentoxide layers reduce backside cooling and leaves a better profile
- Additional depth gives accepted variance in parameters
- All gratings have been received from AMO
  - 3 or 4 were suitable for use in the compressor
  - 2 have been used for laser induced demonstration

Task 4.4 - Fabrication and characterization of photonic microcell (PMC) module for fiber-delivery of ultra-short high power pulse

- XLIM & GLO have collaborated on the development of the Beam Delivery System
    - They presented the work at Photonics West
- The BDS allows the beam profile to remain stable even during movement of the cable
- The BDS uses a Kagomé lattice – this results in some roughness which causes scattering
- The effects of torsion are not yet tested, although BOSCH confirmed this should not be an issue with their application
- Linear polarisation allows the beam to move with the plane
- C4L, BOSCH & E6 confirmed that they use circular beam polarisation, it may be possible to change the polarization later in the system if required

Deliverables & Milestones

- D4.1 & 4.2 submitted
- D4.3 due July 2017
- All milestones so far achieved, next MS18 due in April 2017

Remark: MAA pointed out that fiber beam delivery modules have to be provided to partners to validate the project goals.

WP5 update – Presented by Marwan Abdou-Ahmed

Task 5.2 Assembly and characterization of a Yb:YAG thin-disk multipass amplifier

- The optical and mechanical parts designed in task 5.1 have been ordered and assembled
- Some testing has taken place over the last 2 weeks (single pass)
    - Maximum pulse energy (1.25 MHz): 484 µJ
    - 330 fs pulse duration of seed laser
    - Measured pulse duration at 600 W power: 393 fs
    - Peak Power: 1.1 GW
- Reproducible behaviour after time-breaks (no realignment required after 11 days' break)
- Thanks to very good thermo-mechanical properties of the designed components, the system is very stable

Task 5.5 Demonstration of a 1 kW, sub-1ps laser system

- Work still needs to be completed on the 200W laser which will be used as seed to achieve the 1kW output power
- Preliminary results (double pass)
    - 50 W Seed Power, 330 fs pulses, 1.25 MHz
    - Measured output power in double-pass: 1056 W
    - Maximum pulse energy (1.25 MHz): 845 µJ
    - Deliverable 1 kW (but with 200 W seed power in a later stage of the project)
- Implementation of pulse picking to be completed
- A further meeting may be required with USTUTT, LASEA & AMP to discuss the control, and safety issue of the different sub-systems, as well as the communication electronic schemes which will be implemented.

Deliverables & Milestones

- D5.1 submitted
- All work is on schedule

WP6 Update – Presented by Noémie Dury (C4L) & David Bruneel (LASEA)

- The interface specifications have broadly been agreed
- Case studies are now necessary to refine and check further
- LASEA are purchasing an IntelliScan system
- Size of beam 5mm after scan head and focussing (10mm on entry)
- Focus shift at one power level is constant
- Reflective varioscan is a consideration for very long focal lengths – it may be necessary to increase the beam size before using varioscan
- The optics shall handle 1 kW, 1 mJ with pulse durations down to 1 ps
- To handle the high average power the beam should exhibit a large diameter (>10mm)

- A silica lens may not be suitable
- Use of a single crystal diamond lens may be possible – but only if it is available in a large enough size (E6 are currently developing this, separately to the HIPERDIAS project)

Deliverables & Milestones

Action: Noémie will send detailed system setup pictures to Fetah in relation to scanner burning issue (with a video if possible)

WP8 Update – Presented by James Clayton (KITE)

- James is currently working with Matter PR (from Photonics 21) to promote the project
  - There is concern from Marwan that they previously requested excessive levels of detail for articles on the project
  - James will try to work with them to reach agreement
- There was a discussion around the project training workshop / seminar, which is due to take place
- There was general agreement in principle to working with another suitable project (possibly TresClean) and putting on a joint workshop
- The workshop will be aligned with the next consortium meeting (due October / November 2017) it may be possible for XLIM to host the meeting – Fetah will enquire
- Work was started on the SQUADRON analysis and the a PESTEL analysis, it was decided that these would be sent to partners for completion

Deliverables & Milestones

Action: James will distribute the INS form to all partners, with an explanation for its use
Action: James will distribute details of the TresClean consortium to all partners for consideration in relation to a joint workshop
Action: Fetah to establish whether XLIM will be able to host a CM / workshop
Action: James to send SQUADRON™ & PESTEL analysis spreadsheets to partners – ALL partners to complete and return to KITE
Action: Emma will resend logins for the website members area

WP9 Update – Emma Bowden (KITE)

- The current focus is on completion of the 1st Periodic report – some partner inputs are still missing information
- The GA amendment for XLIM is progressing and the PO has advised that she is pushing to have it completed before the periodic report deadline
- The 1st review meeting will take place in Brussels on 7th June, a full-day rehearsal meeting will take place on 6th June – all partners are required to attend

Deliverables & Milestones

Assessment of main risks

- Achieving required ablation rate for diamond polishing system may be challenging
- Questions on the performance of the final optics and whether it can handle the required power level
  - It may be necessary to use reflective optics
- With a long plume (as is used) there is a risk of foreign bodies entering the system
  - An exhaust system may not be sufficient
  - A cross jet and exhaust system used in combination should resolve any problems

Management Board Meeting – Chaired by Marwan Abdou-Ahmed

1. Deliverable 6.2

USTUTT are responsible for D6.2, yet have only a small part to contribute. It was agreed that internally C4L would write this deliverable report and USTUTT would contribute information

2. User profile case studies

It may be possible to exploit the jump times to optimise the processing strategy, if a pulse on demand laser is used then this may be possible. It would be necessary to define scenarios for a pulse sequence in order to assess this.

3. Safety

A discussion on safety solutions will need to take place at a future technical meeting when user requirements are fully understood. Definitions for the fiber can be set following the technical meeting.

4. AMP laser control updates

In order to fully integrate the laser controls it will be necessary to update the software. The sequence order for the safety controls will need to be established – which system is the master / slave

5. Laser & amplifier compatibility

It will be necessary to define the coupling / interface between the laser and the amplifier to ensure compatibility

6. Technical meetings

Two face-to-face technical meetings will take place:

The first, to be organised by C4L, will take place in early May – AMP, GLO, XLIM & USTUTT will attend

The second will be organised by USTUTT – LASEA, BOSCH, AMP, GLO and XLIM will attend

Scientific & technical Board Meeting – chaired by Clemens Hönninger

Updates on previous items and addition of new items – see STBoard presentation for full details

Technology Transfer Panel – chaired by Marwan Abdou-Ahmed and Andrew Whitehead

1. Use of the IP notification form needs to be implemented – James already has an action to distribute this
2. Partners are already protecting their own IP – licensing agreements may need to be put in place between partners
3. No issues foreseen at this stage