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H2020- INFORMATION DAY

**Factories of the Future –
FoF-13-2016 Photonics laser-based production**

DG CONNECT, Photonics Unit
European Commission

Christoph.Helmrath@ec.europa.eu / Tanya.Nikolova@ec.europa.eu

- World market of laser-based manufacturing systems
2012: 8 B€
- Expected growth rate (CAGR): **7%** (from 2011 to 2020)
- **EU** market share **2012: 33%** but in **2008: 39%**
due to fierce competition mainly from Asia
- → reverse the decline
- Large economic **leverage** effect in a wide range of industry
e.g. automotive, aerospace, electronics, medical, consumer goods, etc .
medical examples: pace makers, synthetic bones, endoscopes, stents, ...

- Need to keep European technology at the forefront of innovation
- Need to bundle forces on a European level addressing research issues efficiently and effectively

Support in FP7 and H2020 via

- *ICT Photonics programme*
- *Factories of the Future initiative (FoF PPP)*
- *Programme on Nanosciences, Nanotechnologies, Materials and new Production Technologies (NMP)*

Examples of research themes in FP7 and H2020:

■ Lasers for industrial processing:

high peak/average power lasers, widely tuneable lasers, ultra-short pulse lasers, fibres and fibre lasers, diode lasers, component integration, new wavelengths and frequency conversion, remote processing, on-line adaptation of beam properties, process monitoring and related devices, synchronization of sources and devices, multiple beam processing

- Funding \approx 80 M€ Photonics and FoF (FP7 & H2020 2014, 2015)**
(+ projects from NMP)

Examples of projects in FP7:

| Project Acronym | Project Title |
|-------------------|--|
| APPOLO | Hub of Application Laboratories for Equipment Assessment in Laser Based Manufacturing |
| BRIDLE | BRilliant Industrial Diode LasEr |
| HALO | High power Adaptable Laser beams for materials prOcessing |
| IMPROV | Innovative Mid-infrared high Power source for resonant ablation of Organic based photovoltaic devices |
| ISLA | Integrated disruptive componentS for 2um fibre LASers |
| QCOALA | Quality Control of Aluminium Laser-welded Assemblies |
| UV-Marking | Development of new UV laser for customization at industrial level trough high quality marking on different materials |
| LASHARE | Laser equipment Assessment for High impAct innovation in the manufactuRing European industry |
| RLW Navigator | Remote Laser Welding System Navigator for Eco & Resilient Automotive Factories |
| TiSa TD | Ultrafast High-Average Power Ti:Sapphire Thin-Disk Oscillators and Amplifiers (under negotiation) |
| Ultrafast_RAZipol | Ultrafast Lasers with Radial and Azimuthal Polarizations for High-efficiency Micro-machining Applications |
| LIFT | Leadership in Fibre Laser Technology |
| ALPINE | Advanced Lasers for Photovoltaic INdustrial processing Enhancement |
| POLYBRIGHT | Extending the process limits of laser polymer welding with high-brilliance beam sources |

Examples of projects in H2020:

| Project Acronym | Project Title |
|-----------------|---|
| ADALAM | Sensor based adaptive laser micromachining using ultrashort pulse lasers for zero-failure manufacturing |
| COMBILASER | Combination of non-contact, high speed monitoring and non-destructive techniques applicable to LASER Based Manufacturing through a self-learning system |
| MASHES | Multimodal spectral control of laser processing with cognitive abilities |
| RADICLE | Real-time dynamic control system for laser welding |
| HIPERDIAS | High throughPut LasER processing of DIamond and Silicon |
| ultraSURFACE | Ultra Dynamic Optical Systems for High Throughput Laser Surface Processing |

FoF-13-2016 Photonics Laser-based production

a) "From design to piece" – Excellence in laser-based additive industrial manufacturing

- Research and Innovation Actions (RIA)
- Funding 15 million Euro

b) Rapid individualised laser-based production

- Innovation Actions (IA)
- Funding 15 million Euro

a) RIA : Additive industrial manufacturing (laser-based)

Market of AM in 2012: 1.7 B€ (materials, systems and services) (Roland Berger consulting)
Expected Growth: 2018: 4,5 B€ 2023: 7,7 B€ CAGR ~ 14,7%

Challenges

- **Huge potential, advantages over conventional manufacturing:**
highly flexible & customisable process, freedom of design, e.g. geometry, material composition, intrinsic properties Complexity Digital Photonic
for FREE Production
- Currently used prototyping and smaller markets, e.g. medical applications, rapid prototyping, repair
- **HOWEVER:** AM is not yet competitive on a larger scale
- Problems include: production speed and costs

a) RIA (ctd): Additive industrial manufacturing (laser-based)

Challenges:

- **→ need to:**

- **increase productivity**
- **bring AM a **significant** step further towards **industrial** manufacturing**

by better **mastering all stages of the production process
AND their interaction**

Note: complementing the topic FOF-1-2016

a) RIA (ctd) : Additive industrial manufacturing (laser-based)

Scope:

- From design to final work piece: Laser based additive industrial manufacturing of metallic materials
- all process chain steps may be addressed (e.g. CAD, modelling, additive process, different materials in a single work piece, process control, QA, combination additive/subtractive, surface finish, etc)
- → significantly improve the overall performance in terms of speed and costs whilst producing high quality work pieces

- at least two important steps and the links between them
- laser based process
- metallic materials

MUST

- address standardisation as appropriate
- be driven by concrete business cases
- contain outline of business case and industrial exploitation strategy
- include relevant partners of the value chain in the proposal

Should



Photonics support to manufacturing in H2020: call topic FoF-13-2016



a) RIA (ctd) : Additive industrial manufacturing (laser-based)

Expected impacts:

- Reinforced **industrial leadership** in laser-based Additive Manufacturing
- **Substantially improved production speed, improved productivity and substantially reduced costs** of laser-based Additive Manufacturing

Funding:

- **2-4 million Euro per project (other amounts possible)**

Budget available:

- **15 million Euro**

b) Innovation actions:

Rapid individualised laser-based production

Challenge:

- **Laser based manufacturing:**
 - backbone of modern production processes
 - highly accurate mass production
 - wide range of products, industries
 - highly flexible
- **Problem: Changes of lots require interventions, down times**
- **Trend to individualisation requires:**
 - a high degree of digitization
 - highly autonomous and automated tools and systems to reduce production time and costs

**pilot
facilities**

b) Innovation actions (ctd) : **Rapid individualised laser-based production**

Scope:

- Development and set-up of **highly flexible high throughput pilot facilities** on the basis of **existing laser-based production processes**
- Validation in **real settings**
- **Advances needed in a number of aspects** (eg intelligent networking and machine cooperation, data handling, modelling, work piece handling, beam delivery, integration of different processes, monitoring, process control etc.)

- **Industry driven**
- Include the **key stakeholders running the pilot facility**

MUST

- Outline **business case and industrial exploitation strategy**

Should



Photonics support to manufacturing in H2020: call topic FoF-13-2016



b) Innovation actions (ctd):

Rapid individualised laser-based production

Expected impacts:

- **More efficient, more flexible and higher throughput of individualised laser-based production.**
- **Improved competitiveness and strengthened Europe's market position of laser-based manufacturing industry (equipment and suppliers) and the end-user industry.**

Funding:

- **2-4 million Euro per project (other amounts possible)**

Budget available:

- **15 million Euro**

➤ National Contact Points

http://ec.europa.eu/research/participants/portal/desktop/en/support/national_contact_points.html

➤ Participant Portal

<http://ec.europa.eu/research/participants/portal/desktop/en/home.html>

➤ Horizon 2020

<http://ec.europa.eu/programmes/horizon2020/en/>

➤ Photonics21 and Photonics Public Private Partnership:



<http://www.photonics21.org>

