NPL National Physical Laboratory

LUMINAR

LUMINAR workshop
18-19 May 2016

Scene setting

Introduction to LUMINAR

what, why, when, who, how

LUMINAR project

- Official title: Large Volume Metrology in Industry
- Collaboration: National Metrology Institutes, Universities and Industry
- Co-funded by: NMIs and European Metrology Research Programme
- Duration: 1 June 2013 – 31 May 2016

NMIs
1. NPL (UK)
2. CNAM (FR)
3. GUM (PL)
4. INRIM (IT)
5. PTB (DE)

Universities
1. University of Bath
2. University College London
3. Karlsruhe Institute of Technology

Unfunded partners
1. AIRBUS
2. AMRC & Nuclear AMRC
3. SIOS

Project goals

L **L**arge volume

U **U**nified

M **M**etrology for

I **I**ndustry

N **N**ovel

A **A**pplications &

R **R**esearch

Project goals

L
U
M
I
N
A
R

Large volume

Unified

Metrology

GOAL 1 (*aspirational*)
Combine & unify research efforts across available NMIs & universities to tackle fundamental issues

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Large volume

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LUMINAR

Industry

Novel

Applications &

Research

LUMINAR

GOAL 2 (*contractual*)
Develop range of new devices & techniques…

GOAL 3 (*transformational*)
… that must be shown to work *in situ*

GOAL 4 (*sustainable*)
…and can be easily used or readily *commercialised*

Industry

Novel

Applications &

Research

2012: challenges coming from end users (1/2)

- Novel technology solutions with **cost** and **performance** between **photogrammetry & laser trackers**, ideally operating within **10 m x 10 m x 10 m** volume to **50 µm** accuracy.
- Show how absolute distance meters (**ADMs**) can be made directly **traceable to the SI**, for example, through the use of quantum reference standards.
- **Reference algorithms/software** for the analysis of 3D networks of points/point cloud data that are robust, fast, verified, and provide metrologically sound outputs with rigorous **uncertainties**.

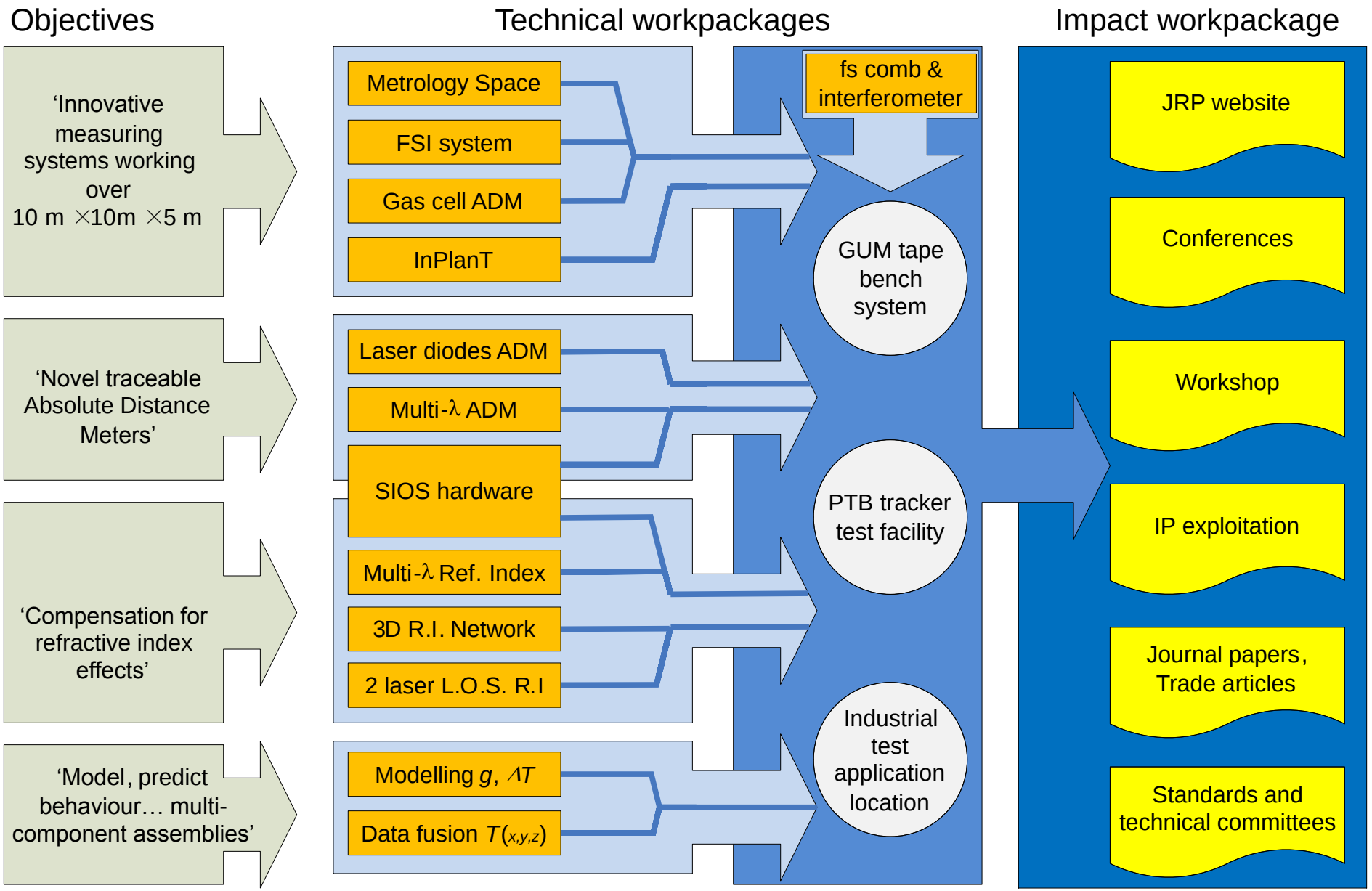
2012: challenges coming from end users (2/2)

- Understand and predict the behaviour of **multi-component assemblies** in varying **industrial environments**, *e.g*. target of 5 m structures; 5 °C temperature deviation (temporal and spatial).
- **On-line** compensation for **refractive index effects** in ambient air in industrial environments ideally to 10^{-7}, over typical factory spatial volumes (*e.g.* 10 m x 10 m x 5 m).
- Better understanding and methods for **performance verification** of LVM tools bringing **traceability** through rigorous uncertainty evaluation, including the use of **Virtual instruments.**
- Understand the **dynamic behaviour** of LVM tools and provide new methods/tools which can be used to improve the dynamics of time consuming processes.

Prioritised objectives (funding limited)

- To develop **innovative measuring systems** which bridge the gap between photogrammetry and laser trackers, working over volumes of 10 m × 10 m × 5 m, to a target accuracy of 50 µm.
- To develop **novel absolute distance meters** which are intrinsically **traceable** to the SI and which operate over tens of metres range.
- To develop methods to provide **on-line compensation for refractive index effects** in ambient air in industrial environments, targeting 10^{-7} accuracy over a volume of approximately 10 m × 10 m × 5 m.
- To model, understand and predict the behaviour of multi-component **assemblies** (up to 5 m dimension) **in non-ideal environments** (5 °C temperature deviation).

Project workflow



Workshop aims

- Present the results of the 3 years of research from LUMINAR
  - Overview of new hardware, software, knowledge
  - Results of testing & inter-comparison in several locations
- Hear about challenges from various end users of LVM
  - Confirm/add to the list of remaining challenges
- Invite uptake of the project outputs by researchers, commercial organisations
  - Networking opportunity between researchers, vendors and users
- Outline of ideas for future collaborative research

Any questions ?

Department for Business Innovation & Skills

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European Metrology Research Programme

Programme of EURAMET

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