Large Volume Metrology in Industry

**WP1 – Innovative measuring systems**

3 new systems:
1. Wide beam FSI from WP1 (traceable gas cell)
2. Absolute tracking interferometer (traceable iodine cell & frequency measurements)
3. Portable Laser diode ADM (traceable frequency measurements)

**WP2 – New traceable ADMs**

3 new approaches/devices:
1. Wide beam ADM:
   - Targets: 100 µm accuracy in 200 m
   - SOA: 100 µm to 300 µm

**IMPACT MATRIX**

**END USER NEED**

- Increased jig and manufacture accuracy
- Improved metrology for fusion systems
- Improved jig and manufacture accuracy

**IMPACT**

- Improved jig and manufacture accuracy
- Improved metrology for fusion systems
- Improved jig and manufacture accuracy

**DISSEMINATION**

- Exploitation
  - Stakeholder steering committee
  - JRP open website
  - 4 Major international conferences
  - 8+ Journal papers
  - Trade magazine articles
  - Good Practice Guide (compensation)
  - NPL Dimensional Training Framework
  - Standards committees:
  - ISO, BS, VDA,VDE, UNI, ASME
  - Metrology committees: EURAMET, CCL

- Knowledge transfer
  - New laser tracker, ADM design, FSI licensed to instrumentation manufacturers;
  - New metrology capability: verification service at partner MG
  - New tools available at NMIs

- Financial
  - JRP critical to laminar flow manufacturing;
  - Safeguards €2.5 billion 2030 orders whilst complying with 2020 regulations
  - Saves money for high value components
  - €10k per day depreciation per aero engine
  - Inspection time reduced
  - Reduced thermal control required

- Social
  - Enables LHCB successor (science jobs)
  - Enables improved beam therapies for cancer
  - Enables LHC successor (science jobs)
  - Maintains European advanced manufacturing advantage
  - Wide uptake of Large Volume Metrology tools, leading to new applications at SMEs

- Environmental
  - Estimated aviation weight benefits:
  - Per plane: 100 kg from JRP science
  - => 1.4 M litres of fuel saved p.a.
  - => 1600 tonnes less CO2 emitted p.a.

**WP3 – 3D refractive index**

3 solutions:
1. Line of sight compensation in tracking interferometer by utilising unused NDI/YAG wavelength
2. Second diode laser compensation in portable ADM
3. 3D camera network: Dense network, Dual wavelength illumination

**WP4 – Multi-component modelling**

Digital model of a real-world aerospace assembly

Model extended to include tolerance stack-up

Hybridisation to accept live dimensional and thermal data

Optimisation for sensor placement

Best practice

**WP5 – Verification and demonstration**

New test facility construction & operation

Intercomparison of new tools and techniques across NMIs

Real-world measurements on site at end user

“...we see the work here leading to a step change of the state of the art for large volume metrology … when working with these systems in non-ideal environment … we see ourselves benefiting from this project through the various programmes of activity within the production, test and R&T domain within Airbus…”

Mark Summers, Head of Manufacturing Research Wing
Richard Burguete, Product Domain Authority – R&T, Airbus