
General plan and target for Task 9.3

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Introduction

- There is fixed plan
 - I will present some ideas what such a facility could do and how it could work
 - I need input from you (“the community”) on your needs, wishes, hopes etc. so that we can give this project the right direction
 - What measurement capabilities would be useful
 - Which measurement systems
 - What loads
 - What prototypes do you want to characterize
 - How would you like to access the facility? For what time? How often?

What we wrote

Task 9.3 Low mass mechanical structures (CSIC-IFIC, UOXF)

Setup a distributed facility to characterise low mass mechanical structures

Setup a distributed facility that will provide mechanisms to both probe the system under test in different ways (vibrations, thermal/humidity, etc.) and to characterise the system with high-resolution instruments:

- High-resolution probes to measure deformation, vibration and displacements over large surfaces will be used, preferably via non-contact methods such as ESPI, video, survey, etc.
- High-resolution thermal imaging together with procedures and software for analysis will be provided.
- Load or “stimuli generators” for characterisation will be available: shaker table, power pulsing, heaters and cooling systems and environmental chambers.

A first step is a survey of the required capabilities of such a facility as well as the definition of the priorities. Subsequently the facility will be setup at the different sites. To a large extent, the equipment is available at different institutions in the UK (UOXF, STFC-RAL and UNILIV). This equipment needs to be setup and tailored such that access for external users is convenient and efficient.

Define standards for characterisation and qualification of test structures

Most of the equipment that will be made available as a result of the above activity is not easy to setup and use. The result of this activity should be a series of procedures and techniques to perform and interpret the mechanical and thermal measurements. This will be particularly important when trying to characterise full systems rather than the small test structures that serve to validate the procedures and simulations.

Build test structures to validate the procedures, techniques and FEA models

Produce mechanical prototypes of structures with very thin sensitive areas with integrated support or very thin sensors with their associated low mass, stiff support.

Provide a library for FEA models

This task will provide a set of FEA models that will have to be validated with the corresponding measurements on the devices provided by the activity above and determine the level of extrapolation that can be achieved with such models.

What we wrote – deliverables

D9.5 : Advanced Mechanical facility [14]

Definition of facility requirements: Identification of parameters characterizing the performance of support structures and identification of experimental techniques which make these parameters accessible, prioritization of the need by the international community for these measurements at a central facility. (Task 9.3)

D9.6 : Common test structures [24]

Identification of test structure designs which allow discriminating measurements of relevant structural performance parameter, prediction of performance by FEA, production of test structures and benchmarking results of these structures with the facility. (Task 9.3)

D9.7 : Standard procedures for qualification and characterisation [46]

Setup of measurement facilities, operation of the facility, evaluation of measurement hardware and procedures, development of definition of standard measurement procedures at the Advanced Mechanical facility. (Task 9.3)

What we wrote - milestones

MS8	Advanced Mechanical Distributed facility requirements (Report outlining the range of measurement setups and their capabilities to be installed within the Advanced Mechanical Distributed Facility, Task 9.3)	36 - UOXF	9	Agenda, attendance list on Indico
MS99	Advanced Mechanical Distributed facility ready (Report listing experimental setups within the Facility, and their performance as demonstrated with realistic prototypes, Task 9.3)	36 - UOXF	46	Report to StCom

Equipment and capabilities – short reminder

- Cooling plants
 - Fluorocarbon (100W @ -25°), CO₂ blow-off (300W @ -35°), CO₂ TRACI (100W+ @ -30°C)
- Cold chambers
 - Oxford cold room (Internal dimensions: 7.9×3.5×2m³, used to -7°C)
 - Liverpool Cold Room (Internal dimensions: 3.5×3×2m³, down to -25°C)
- Thermal imaging systems
 - InfraTec Varioscan VS3011, FLIR
- Deformation tracking
 - Electronic Speckle Pattern Interferometry (ESPI): large area, sub-μm, limited range, dynamic (allows for modal analysis)
 - Frequency scanning interferometry (FSI): discrete (32 lines-of-sight), absolute distance measurement with sub-μm precision, dynamic (funding for this system has been requested)
 - V-Stars video survey system: discrete (few 100 points), absolute position measurement with ~5 μm precision, static
 - Capacitive displacement sensor system: discrete (currently 5), displacement measurement with sub-μm precision
- Shaker table for low vibration levels (order 10⁻⁷g_n²/Hz) – under development
- Materials testing
 - DMA, DSC, Thermogravimetric analysis, FTIR, Servo-Hydraulic Testing Machine⁶

Next steps

- The bulk of the allocated funds is intended to fund a post-doc
 - With Oxford overheads the funds will fund approximately 2y
 - We are actively seeking funding to extend this to the full 4 years
 - First try through consolidated grant (low probability) – done, will know in September
 - Next try: PRD (Project Research and Development scheme) – submit by end July, decision November
 - Investigating other funding opportunities
 - All will be made with a case for generic silicon tracker mechanics R&D
 - Plan to hire this autumn
 - Help with identifying good candidates (physicists or mechanical engineers) would be appreciated
- On a slightly longer timescale have next WP9 meeting to define requirements for facility
 - This is a milestone and deliverable
- Immediate questions:
 - How can we best assess the requirements of the community?
 - Survey?
 - Can we have a first iteration by the WP9 kick-off meeting end of June?
 - Is there already concrete interest in using the facility?
 - How will the access be scheduled?

Further material

WP9 budget

Tasks (all costs in €)	Person - months	Personnel direct costs	Travel direct costs	Equipment and consumables	Other direct costs	Sub-contracting costs	Material direct costs	Total direct costs	Total indirect costs**	Total costs (direct + indirect)	EC requested funding
Task 9.1	8.00	66,000.00	12,000.00	0.00	0.00	0.00	12,000.00	78,000.00	19,500.00	97,500.00	16,000.00
Task 9.2	52.00	324,117.73	12,000.00	100,000.00	0.00	0.00	112,000.00	436,117.73	109,029.43	545,147.16	273,000.00
Task 9.3	58.00	357,000.00	12,000.00	45,000.00	12,000.00	0.00	69,000.00	426,000.00	106,500.00	532,500.00	228,000.00
Total	118.00	747,117.73	36,000.00	145,000.00	12,000.00	0.00	193,000.00	940,117.73	235,029.43	1,175,147.16	517,000.00
Fixed target for EC funding (negotiation)											517,000.00
Checking the condition											OK

Beneficiary short name*	Person - months	Personnel direct costs	Travel direct costs	Equipment and consumables	Other direct costs	Sub-contracting costs	Material direct costs	Total direct costs	Total indirect costs**	Total costs (direct + indirect)	EC requested funding
CERN	26.00	200,600.00	8,000.00	20,000.00	0.00	0.00	28,000.00	228,600.00	57,150.00	285,750.00	102,000.00
CNRS	18.00	109,517.73	4,000.00	30,000.00	0.00	0.00	34,000.00	143,517.73	35,879.43	179,397.16	125,000.00
CSIC	22.00	99,000.00	8,000.00	75,000.00	0.00	0.00	83,000.00	182,000.00	45,500.00	227,500.00	92,000.00
UOXF	52.00	338,000.00	16,000.00	20,000.00	12,000.00	0.00	48,000.00	386,000.00	96,500.00	482,500.00	198,000.00
Total	118.00	747,117.73	36,000.00	145,000.00	12,000.00	0.00	193,000.00	940,117.73	235,029.43	1,175,147.16	517,000.00