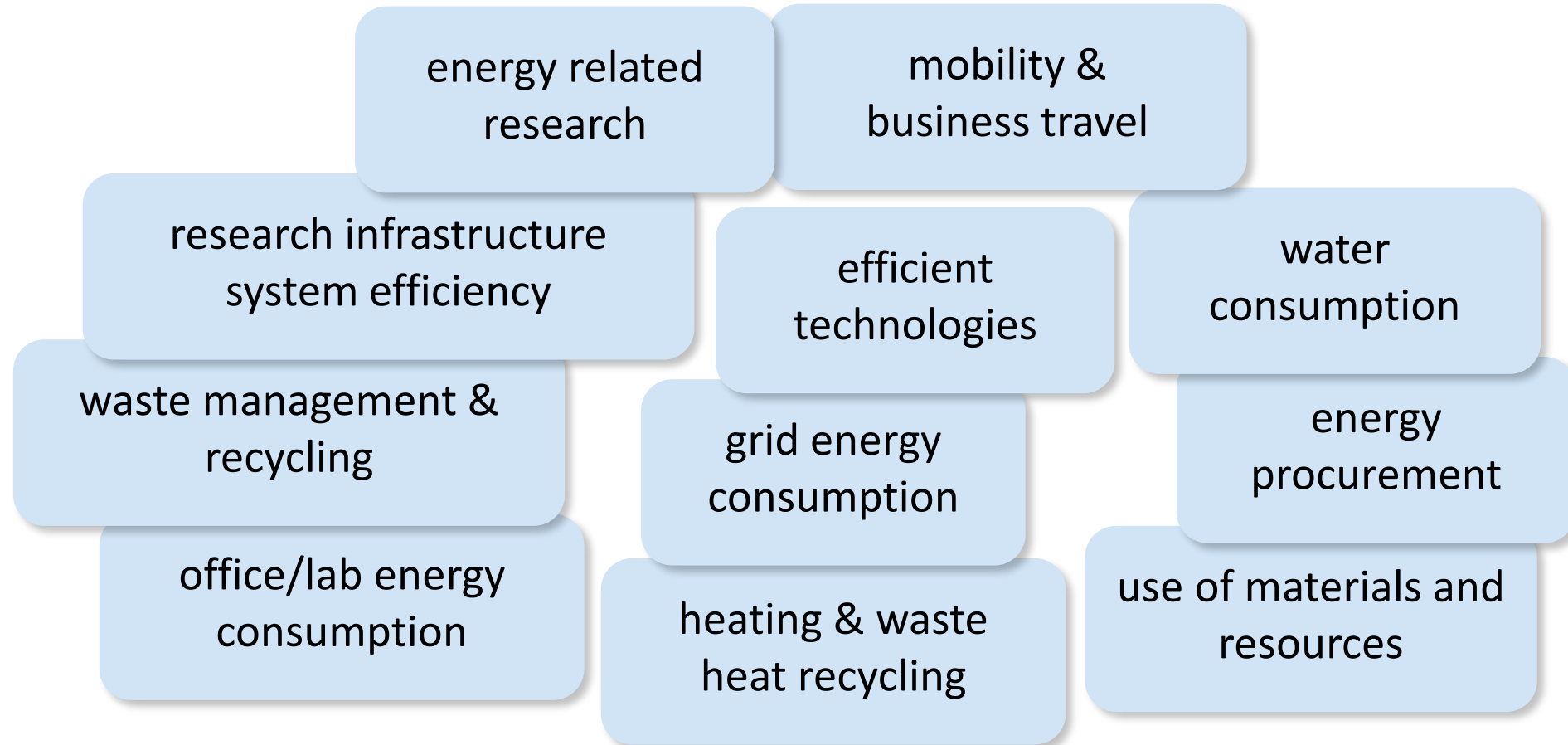




iFAST 1st Period I Review, July 15, 2024

Nuria Catalan Lasheras (CERN), Mike Seidel (PSI/EPFL), Switzerland

Categories of Sustainability for RI's



WP11 Overview

task 1: Sustainable Concepts for RIs: networking, workshops on selected topics
deliverable: report

- 1) System Efficiency of Accelerator Concepts (N.Catalan Lasheras, CERN)
- 2) Key Technologies and Components for High Efficiency (A.SunnesonESS)
- 3) Cross Linking Accelerator R&D with Industrial Approaches (P.Spiller GSI)
- 4) Ecological Concepts (D. Voelker DESY)

task 2: High Efficiency Klystron (N.Catalan Lasheras CERN, THALES, ULANC)

- deliverable: industrial prototype
- replacing klystrons in LHC

task 3: Permanent Combined Function Magnets for Light Sources (B.Shepherd, UKRI, DLS, KYMA, DESY)

- deliverable: magnet prototype, applicable for Diamond upgrade, PETRA-4
- several advantages of permanent magnets, not just power consumption

Summary of activities in P2

Workshop Superconductivity for Sustainable Energy Systems and Particle Accelerators, 18.-20.10.2023, GSI/Germany,

<https://indico.gsi.de/event/17548/>

Efficient Electrical Power Converters, ESS, Lund/Sweden, April 8-9, 2024:

<https://indico.ess.eu/event/3396/> “iFast2024”

ongoing:

Co-organise the workshop “ESSRI”, Sep 25-27, Madrid/Spain:

<https://agenda.ciemat.es/event/4431/>

Second Workshop on efficient RF Sources, Sep 23-25, Toledo/Spain :

<https://indico.cern.ch/event/1407353/>



18-20 October 2023
GSI



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Beitragsliste
Anmeldung
Teilnehmerliste
Accommodation
How to Get to Lund

Welcome to iFast workshop at ESS facility, 8-9 April 2024

Join Zoom Meeting
<https://ess.eu.zoom.us/j/62450149547?pwd=czRFRW1zR0NURk50NVh2ZmRlMkRlZz09&from=addon>

Following a series of successful workshops on the initiative of the EU HORIZON program, we would like to announce the next Workshop on Efficient Power Converters. The workshop is part of the iFAST WP11 initiative for “Sustainable concepts and technologies”

2nd Workshop on efficient RF Sources



23-25 September 2024, Toledo, Spain

23.-25. Sept. 2024
Parador de Toledo
Europa/Zeitsumme

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Following the successful Workshop on Efficient RF sources organized inside the framework of iFAST, we would like to announce a second workshop to be held in Toledo, Spain on 23-25 September 2024. The workshop is part of the iFAST initiative for “Sustainable concepts and technologies”

The workshop is aimed at displaying the recent advances on energy efficient technology for RF sources mainly used in accelerators. As in previous events, we expect a number of experts from public and private sector to participate in the meeting and the discussions around the efficiency of klystrons, IOTS, Solid state amplifiers and RF systems in general.

Organizing Committee Chairs: Nuria Catalan Lasheras (CERN), Mike Seidel (PSI)

Scientific Committee Chair: Igor Syratchev (CERN)

Processing of Personal Data at CERN: OC11



ESSRI Workshops
Energy for Sustainable
Science at Research
Infrastructures



7th Workshop
Energy for Sustainable Science
at Research Infrastructures
September 25th to 27th, 2024 - Madrid, Spain.

Milestones and Deliverables

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS50	Workshop on energy for sustainable science at research infrastructures, at ESRF	41 - PSI	6	Web site (task 11.1)
MS51	Workshop on efficient RF sources	1 - CERN	13	Web site (task 11.1)
MS52	Workshop on efficient magnet- and RF power supplies	2 - ESS	22	Web site (task 11.1)
MS53	Workshop on sustainable materials and lifecycle management for accelerators	12 - DESY	18	Web site (task 11.1)
MS54	Workshop on industrial approaches for sustainable accelerators	13 - GSI	42	Web site (task 11.1)
MS55	Design review	1 - CERN	12	Web site (task 11.2)
MS56	Magnets constructed and tested	25 - KYMA	25	Magnetic measurements completed (task 11.3)

ESSRI Grenoble, ESRF, J.P. Revol et al
September 2022; Done!

Chateau de Bossey, N.Catalan-Lasheras et al
July 2022, Done!; second workshop in preparation

ESS/Sweden, April 8,9, 2024. A.Sunneson et al; Done!
(delayed due to change of responsible colleague)

DESY, D.Völker, A.Klumpp et al February 2023, Done!

18.-20.10.2023, GSI/Germany P.Spiller et al, Done ahead
of time due to synergy with industrial forum 10/2023

Split in two parts: August 2023 and April 2024

Expected M44 (Nov 2024)

Deliverables related to WP11

D11.1: Sustainable Accelerators Report. <i>Report on strategies to improve sustainability and reduce environmental impact of accelerators.</i>	M45
D11.2: Klystron prototype completed and validated. <i>Report on the construction of the klystron prototype and on the test results.</i>	M36
D11.3: Prototype adjustable PM quadrupole and combined function magnets. <i>Two prototype PM-based magnets – one quadrupole and one combined-function magnet designed, built and measured.</i>	M28

in preparation

Delayed to M45 (see talk by N. Catalan Lasheras)

Delayed to M44 (see talk B.Shepherd)

task 1: relevance of objectives and impact

- Climate change and scarcity of resources are increasingly important concerns, and the present energy crises boosts the relevance of sustainable concepts also for research infrastructures (RI's)
- WP11 of I.FAST focuses on sustainability topics, on networking and two concrete hardware developments
- Presentations, milestone reports and deliverable reports present **documentation for best practices on sustainable solutions** for accelerators; these are **valuable sources for new projects or upgrades**

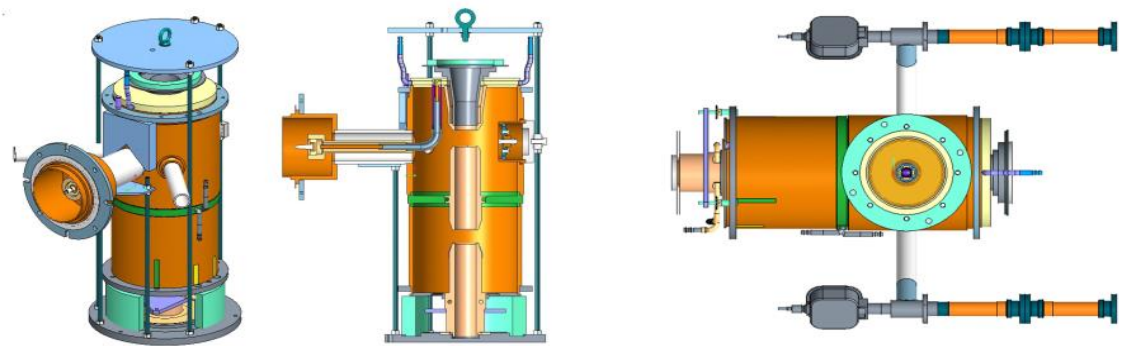
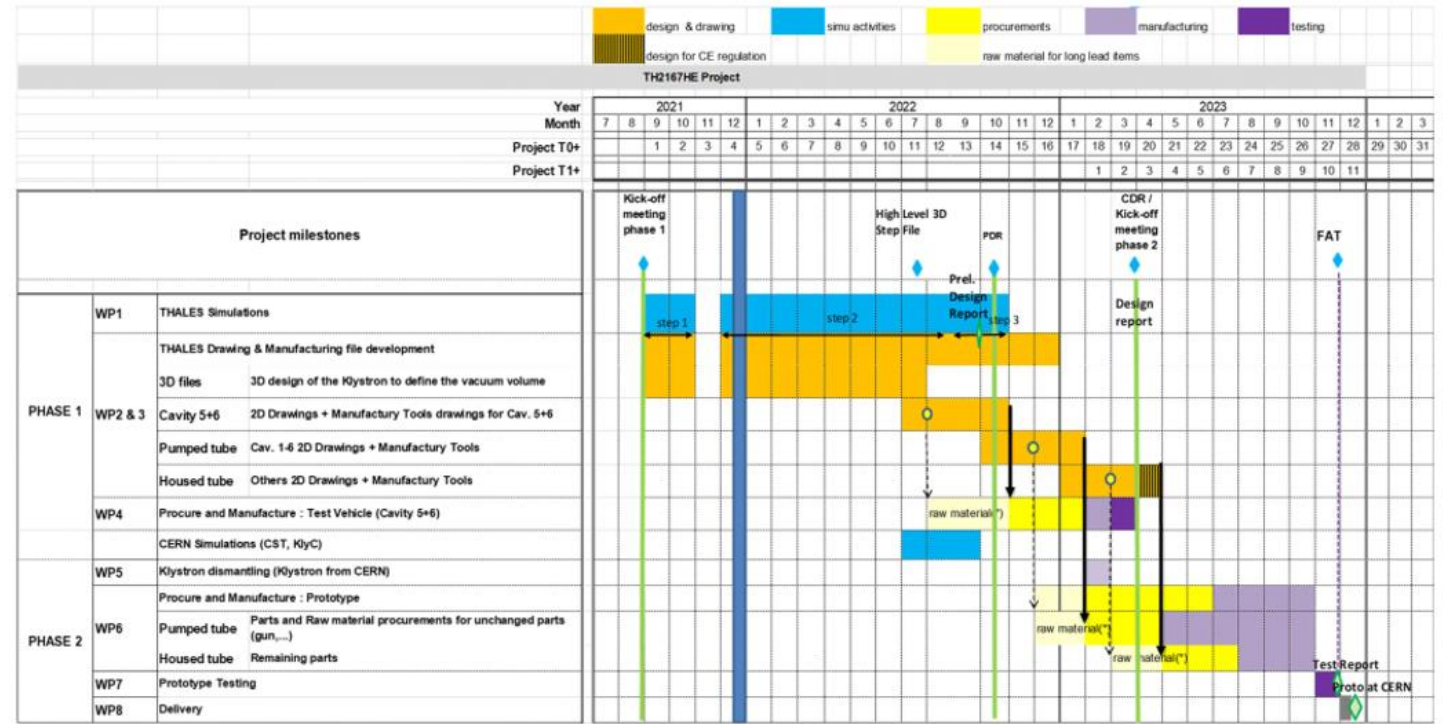
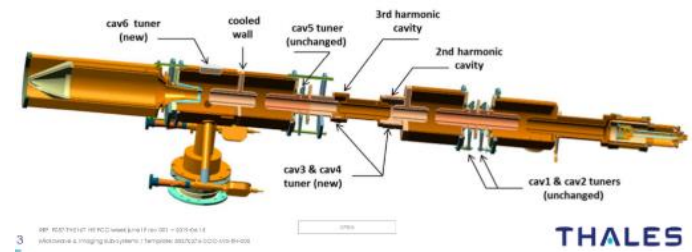


Status at the end of P1

- The project has accumulated important delays (9 months) -- missing resources & THALES

- Preliminary Design Review only took place early October
- Design report (CDR) -- March/April '23
- Factory acceptance test -- Q4 '23 -> delivery to CERN end '24 ...

- Additional delays are to be expected



Desing review expected in Spring 2023

- Material procurement delays affected the construction of the vehicle tests deemed necessary before critical design review
- Manufacturing drawings longer than expected
 - WP1: Simulations 😊
 - WP2: Mechanical design 😊
 - WP3: Manufacturing file 😊
 - WP: test vehicle 😞
- Design review split in two parts to allow for fabrication to start
 - 31st August 2023
 - 11 April 2024

Additional delays identified at CDR1

- Additional tooling necessary for new CE regulations
- New brazing technology (+ tooling) adopted
- New connectors, grounding, radiation shielding adapted to new regulations

- Mitigation measures:
 - Priority given to the project by Thales procurement service
 - Increased communication between technical teams

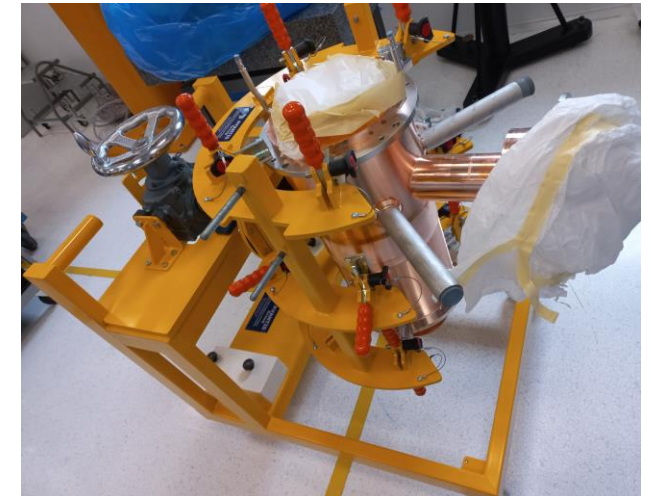
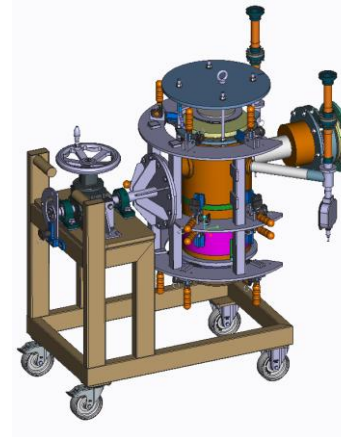
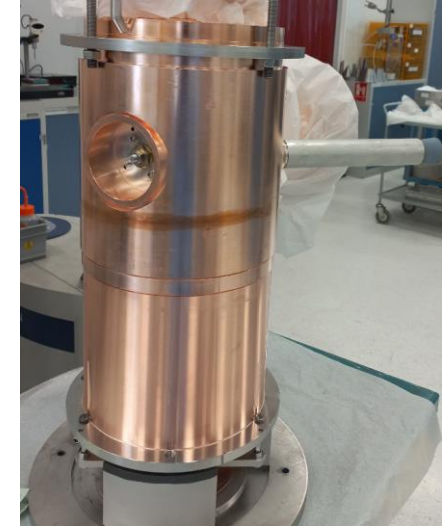
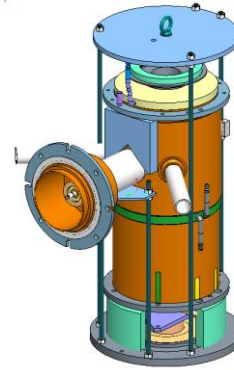
Prototype manufacturing follow up

- ~Monthly progress reports by video conference
 - More if needed, before a milestone/deadline
- Visit from CERN to Vélizy



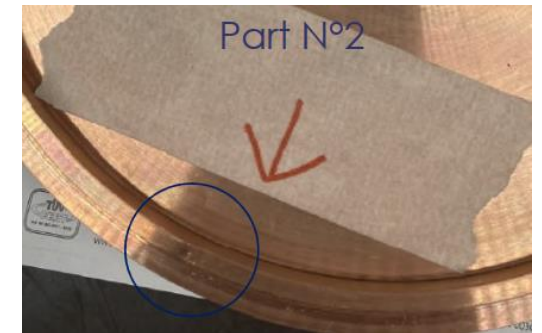
Vehicle test manufacturing

- Validation done on the Test Vehicle = Cavities 5&6:
 - Assembly and the different soldering stages : **Ok**
 - Vacuum-tightness (Leak rate : 10^{-9} mbar.l/s) : **Ok**
 - Sealing of cooling circuits (10^{-9} mbar.l/s) : **Ok**
 - RF performance (cold measurement): **Ok**
 - The possibility of adjusting cavity 6 with a radial tuning system



And yet more additional delays

- Accidental damage of copper pieces during transport
- Non conform copper machined piece
- Mitigation measures:
 - Priority given to the project by Thales procurement service
 - Manufacturing in CERN of critical pieces (now spares)



Latest manufacturing activities 😊



Tube Exhaust



Tube dressing



Connection to test bench

Tube is currently under test

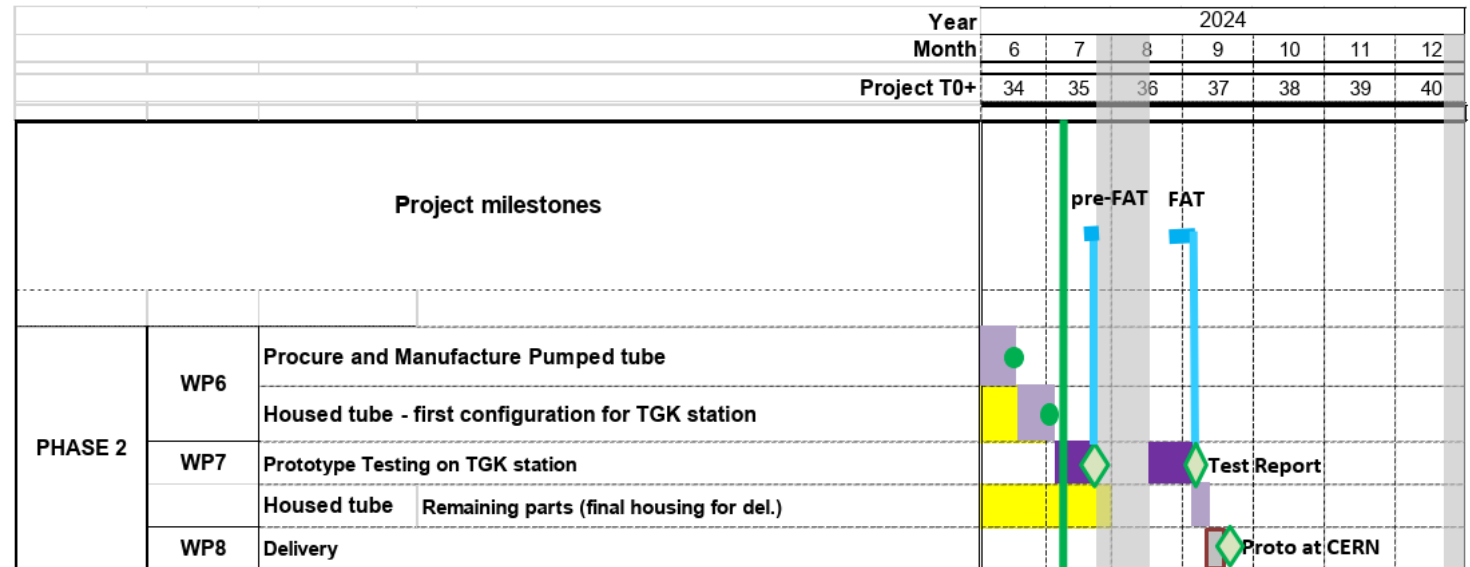
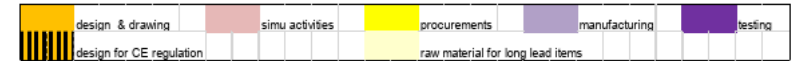
- Klystron is now in test bench
- Test started at 100ms and 100 Hz
 - $V_k = 55 \text{ kV}$
 - $I_k = 8.5 \text{ A}$
 - $V_A = 32.2 \text{ kV}$



Future schedule

- Test will continue and resume after THALES summer closure
- After testing:
 - Factory acceptance tests 1st week in Sept.
 - Dressing the tube for delivery.
- Arrival at CERN expected end of September
 - Testing Oct/Nov
 - Final report Dec

3. Schedule



"pre-FAT" milestone : THALES will send CERN the available results before the closure of THALES's plant for the summer break.

5

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iFAST

Thank you for your attention!



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.