



<https://www.refimeve.fr>



Assemblée générale REFIMEVE 1-2 décembre 2025



De REFIMEVE à FOREST, vers un élargissement scientifique à l'échelle européenne

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Liberté
Égalité
Fraternité



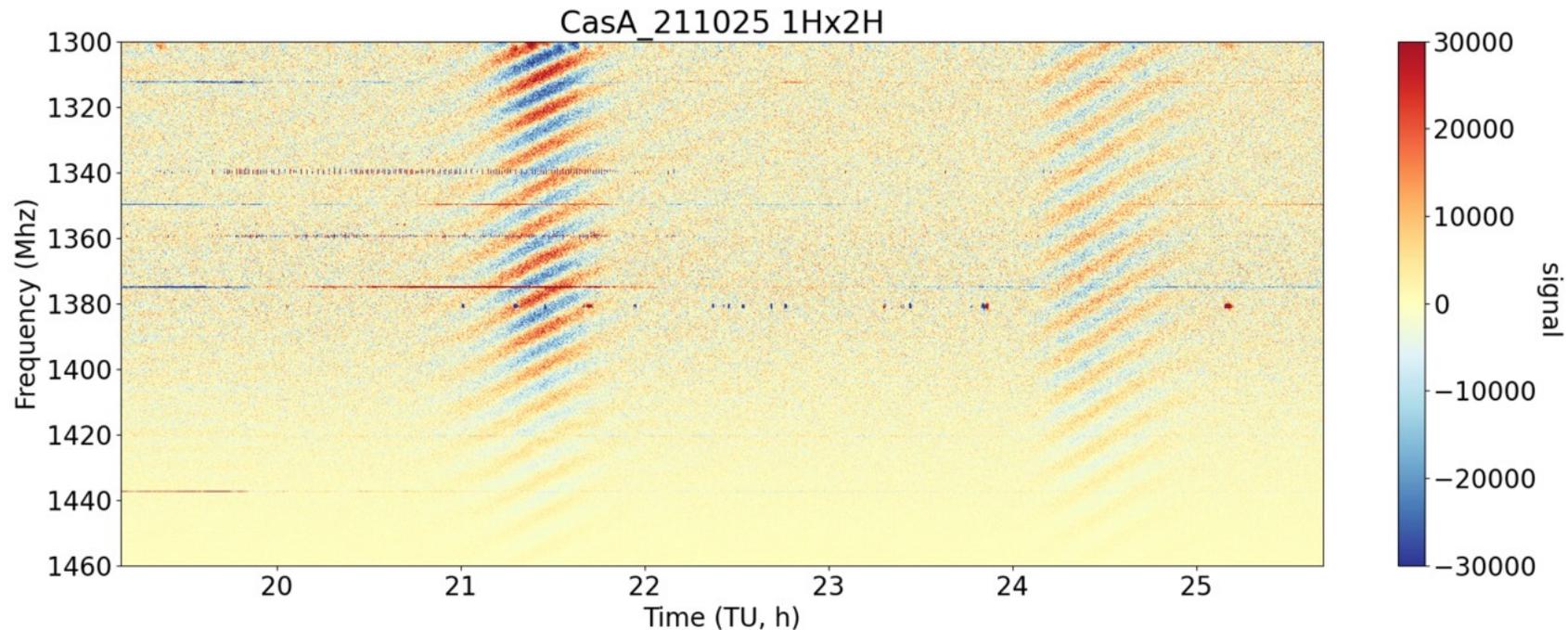
General information on REFIMEVE

- The REFIMEVE research infrastructure is under evaluation in the framework of the update of the national roadmap of the Ris → results beginning of 2026
- The ESR/Equipex+ T-REFIMEVE project is under evaluation for the mid-term. A hearing took place the 27th November. Results expected end of January 2026
USPN, CNRS, OP, and LNE provided letters of support. *USPN announced the creation of a permanent position of IGR for REFIMEVE in 2027*
- A REFIMEVE/T-REFIMEVE Council took place the 29th of October
- In the perspective of the long-term sustainability of REFIMEVE, CNRS initiated the creation of a GIS which will imply 4 institutes of CNRS: Physics, Engineering, Earth & Universe, Nuclei & Particles
- A new website: <https://www.refimeve.fr>

Highlight

First acquisition of astronomical signals directly linked to UTC(OP) (21/10/2025)

Observation of Cassiopeia A on PAON IV by Idrogen.



A 300 km+ White Rabbit link has been established between the Paris Observatory and the Nançay Radio Astronomy Observatory (ORN) using calibrated equipment and an Idrogen card.
Idrogen is an R&D development project by IJCLAB, ORN, and LTE.

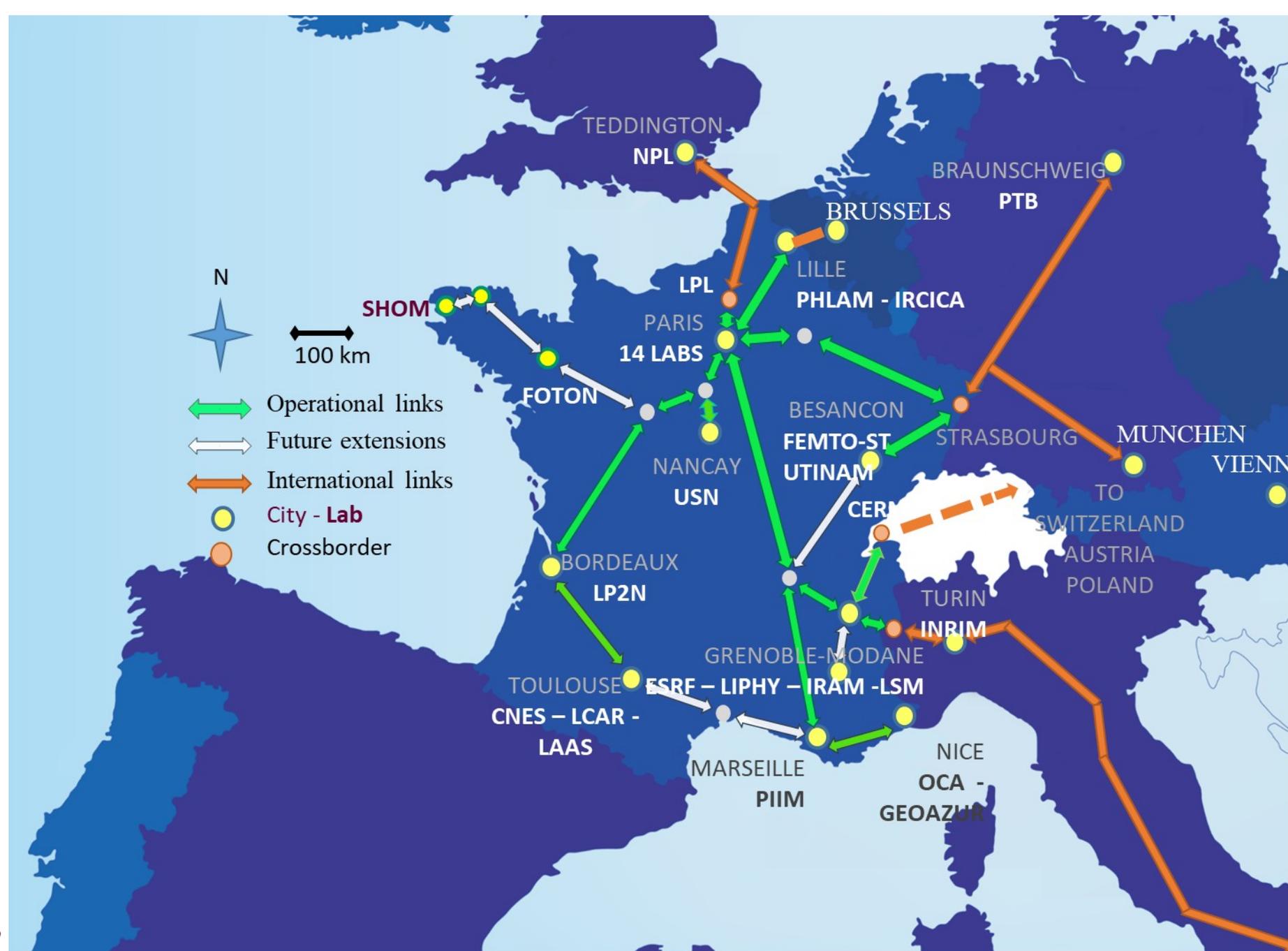


REFIMEVE: an operational 2x4500 km fiber optic network for the distribution of ultra-stable time and frequency signals, linked to UTC(OP).

These signals have coexisted with the RENATER network's data traffic for 15 years.

29 labs connected including CERN. 25 partner labs of T-REFIMEVE

Unique in the world. This network is used for all frequency comparisons between optical clocks (FR, DE, UK, IT).



Inventory of current and future connections to the REFIMEVE network

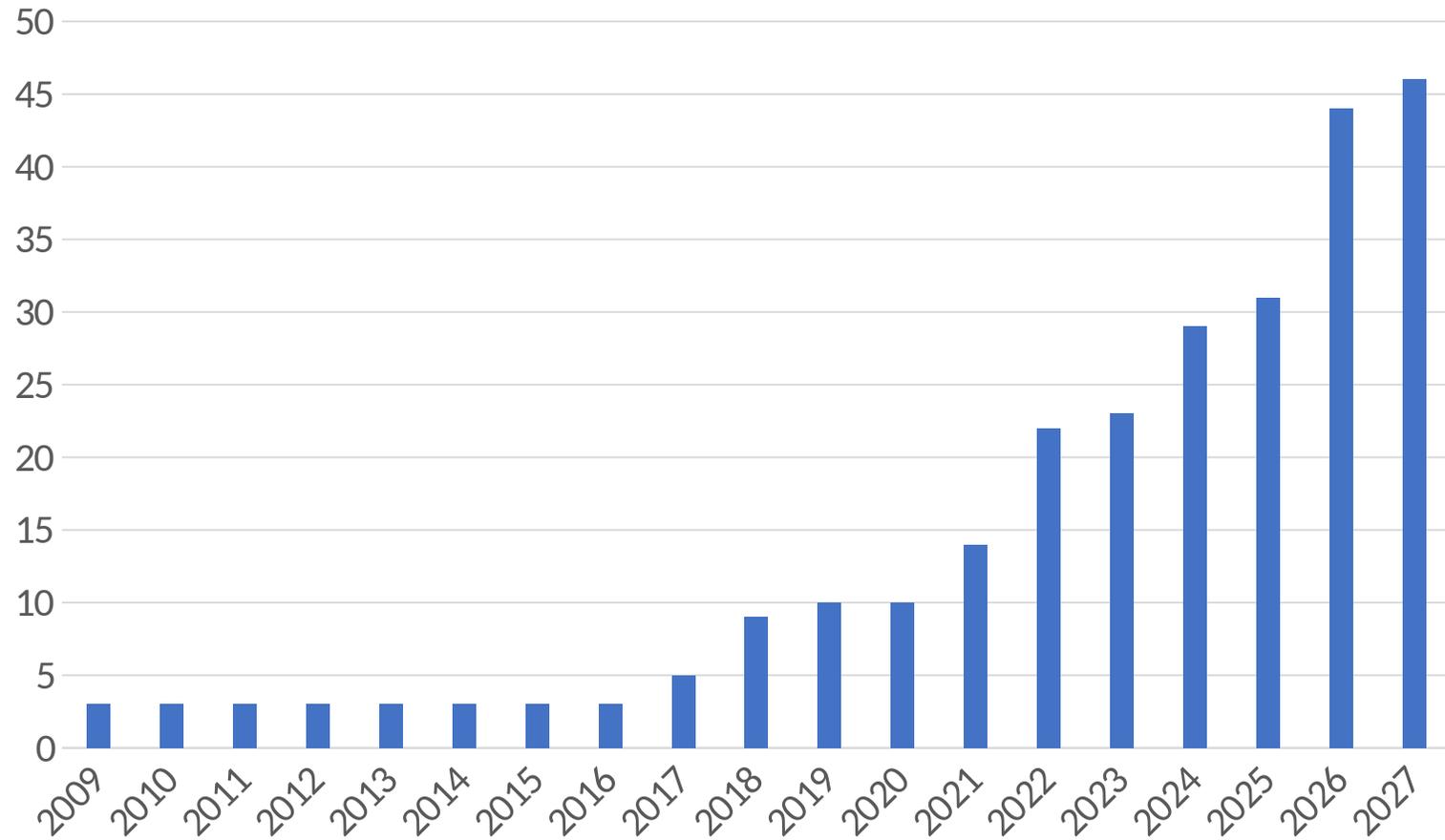
Lab Acronym	Location	Connection year
LPL	Villetaneuse - 93	2003
SYRTE/LTE	Paris - 75	2003
LKB	Paris - 75	(1995) 2014
IRCICA	Lille - 59	2017
IEMN	Lille - 59	2017
APC	Paris - 75	2018
MPQ	Paris - 75	2018
FEMTO-ST	Besançon - 25	2018
UTINAM	Besançon - 25	2018
LIPHY	Grenoble - 38	2019
MONARIS	Paris - 75	2021
PIIM	Marseille - 13	2021
LSM	Modane - 73	2021
PhLAM	Lille - 59	2021
LPNHE	Paris - 75	2022
ISMO	Orsay - 91	2022
LAC	Orsay - 91	2022
LPGP	Orsay - 91	2022
IJCLab	Orsay - 91	2022
SOLEIL	Saclay - 91	2022
LCF	Palaiseau - 91	2022
LP2N	Talence - 33	2022

Acronym	Location	Connection year
LSCE	Saint-Aubin - 91	2023
ORN-Nancay	Nançay - 45	2024
GEOAZUR	Nice - 06	2024
CNES	Toulouse - 31	2024
LCAR	Toulouse - 31	2024
LAAS	Toulouse - 31	2024
CERN	Genève (CH)	2024
THALES RT	Palaiseau - 91	2025
INSTITUT FOTON	Rennes - 35	2025
IPR	Rennes - 35	2026
INSTITUT FOTON	Lannion - 22	2026
SHOM	Brest - 29	2026
DGA-MI	Bruz - 35	2026
ONERA	Palaiseau - 91	2026
ESRF	Grenoble - 38	2026
IRAM	Plateau de Bure - 38	2026
IPAG	Saint-Martin d'Hères - 38	2026
CESQ	Strasbourg - 67	2026
LIDYL	Gif-sur-Yvette - 91	2026
LIP6	Paris - 75	2026
LPENS	Paris - 75	2026
INPHYNI	Nice - 06	2026
ILM	Villeurbanne - 69	2027
Station Biologique	Roscoff - 29	2027

Acronym	Location
ARTEMIS	Nice - 06
LAB	Talence - 33
LSBB	Rustrel - 84
L2n	Troyes - 10
Nokia Bell labs	Massy - 91
ASN	Les Ulis - 91
ORANGE Innov.	Lannion - 22
Naval Group	Brest - 29

- Today, 29-31 connections
- By the end of 2027, 46 connections are expected.

Number of labs connected to SYRTE/LTE via REFIMEVE



Concerning future deployments, see talk of Etienne Cantin

Highlight 2

First connection of an industrial to the REFIMEVE network

The T-REFIMEVE Council meeting of October 29, 2025, approved the connection terms for THALES RT (Palaiseau) to the REFIMEVE network.

This connection will be effective upon receipt by TRT of the necessary equipment (within a few days).

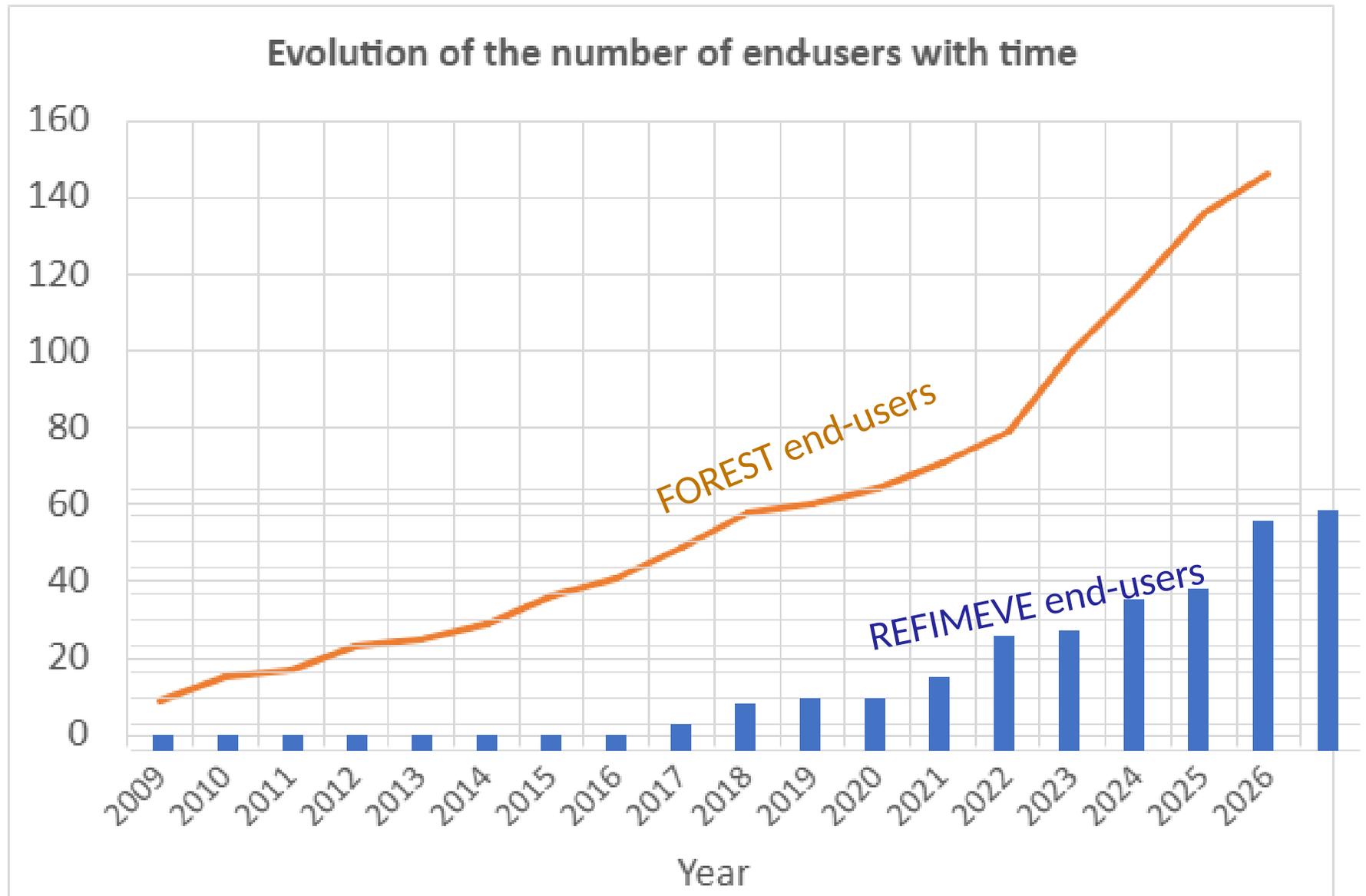
Other companies are expected to follow.

REFIMEVE versus 14 FOREST networks

Here is plotted the cumulative number of end-users with time of 14 national T&F networks of FOREST: AT, BE, CZ, DE, FR, IE, IT, LT, LU, MT, PL, SK, NL, UK

- In 2025, 136 in total.
- Countries with the most important numbers of end-users:

FR: 31
PL: 23
IT and CZ: 13
UK: 12





ESFRI

<https://forest-ri.eu/>

ESFRI project of European Research Infrastructure,
Fiber based Optical netwoRk
for European Science and Technology
(FOREST)

Submitted by France to ESFRI the 8th April 2025

(C. Chardonnet, project coordinator)



Aim of FOREST

ESFRI

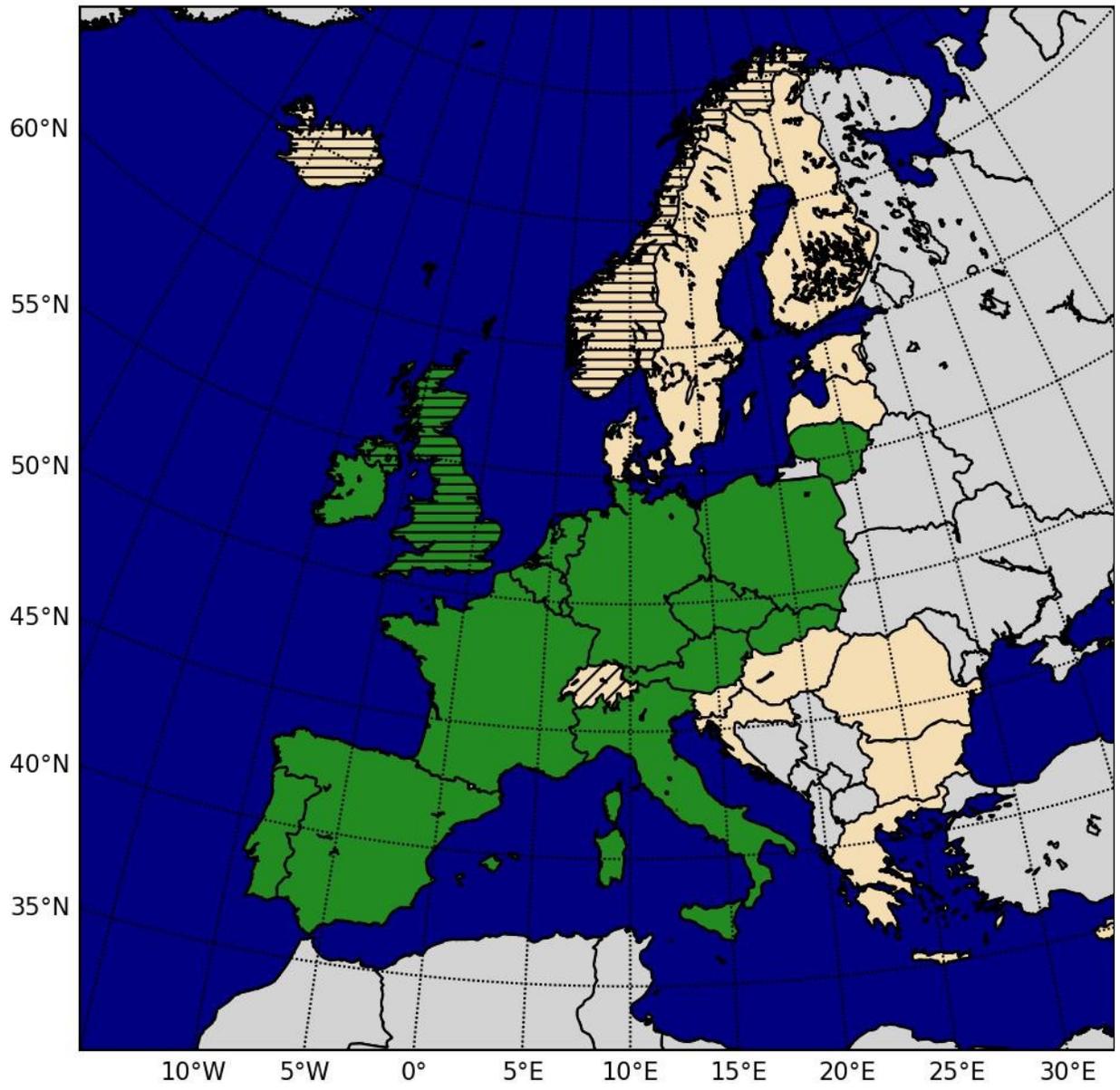
- Establishing cross-connections between national T&F networks which will allow, firstly, UTC(k) and various European clock comparisons for UTC and TAI → **GEANT**
- Delivering services to broad scientific communities. The target users of this infrastructure fall under three main scientific themes:
 - Ultra-high precision measurements (metrology, spectroscopy, astronomy, geodesy, high-energy physics, etc.)
 - Quantum communications
 - Fiber sensing (seismology, ocean monitoring, etc.)
- Favor partnerships between academic and private sector for R&D



FOREST : participating country map



**60 FOREST Partners
from 17 countries**
AT, BE, CZ, DE, ES, FR, HR, IE, IT,
LT, LU, MT, NL, PL, PT, SK, UK
including 13 NMIs and 13
NRENs.
+ CERN + GEANT



***+ EURAMET + JRC which intent to participate to
the international advisory board of FOREST***



Stakeholders of FOREST from 17 European countries

ESFRI

- 60 stakeholders, signatories of a FOREST MOU
- Three main categories of participants:
 - 13 NRENs (+GEANT): AT, BE, CZ, DE, ES, IE, IT, LT, LU, NL, PL, PT, UK
 - 13 NMIs or equivalent: AT, BE, DE, FR, HR, IE, IT, LT, LU, NL, PL, PT, UK
 - 33 universities or public research organizations (including universities in MT and SK)
 - CERN, a supporter of FOREST, has announced its participation should it be selected.
- **For France, 13 signatories of the MOU:**
 - CNRS, USPN, OP, LNE, SU, UPSaclay, UGA, AMU, OCA, UNICA, University of Lille, University of Besançon, University of Rennes
- **Université Sorbonne Paris Nord has agreed to host the FOREST headquarters**



105 letters of support of FOREST including:

ESFRI

- **13 ministries from 10 countries: FR, BE, IE, IT, CZ, LT, LU, NL, SK, UK**
- **CERN** which will participate to the governance of FOREST (WR collaboration)
- **BIPM**, Bureau International des Poids et Mesures
- **EURAMET**, consortium of the NMIs
- **JRC**, from the European Commission
- Space Agencies from FR, IT, PL
- Several European Research Infrastructures: LOFAR, JIVE, Einstein Telescope, EPOS, ESRF
- 21 private companies (13 from France)



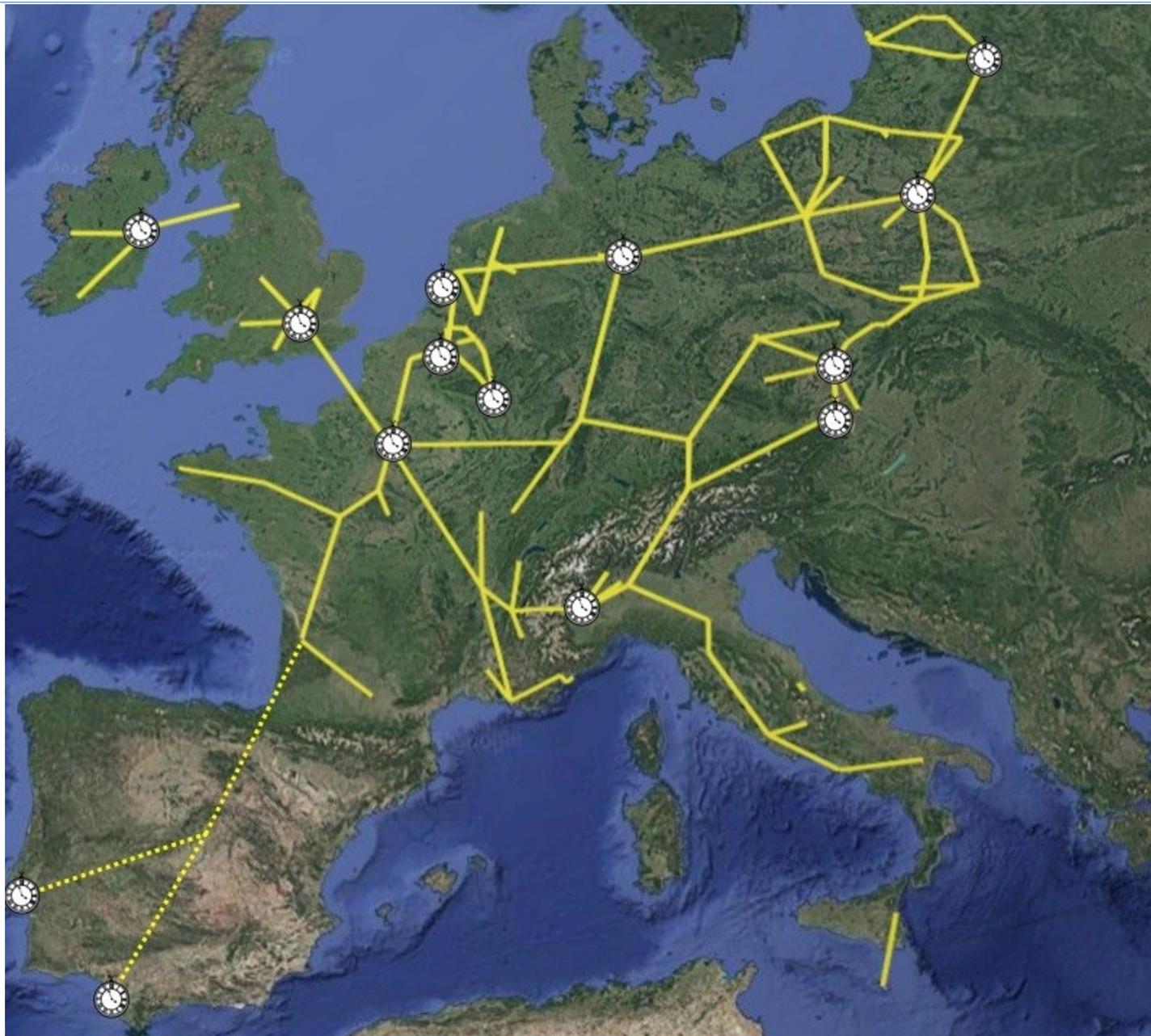
Length of the national T&F networks and cross-border connections

ESFRI

STRUCTURE OF THE FOREST NETWORK			
	Length (km)	DF	DC
TOTAL	31 088	19 338	11 750
National networks	25 186	15 111	10 075
NMI cross-border connections	2 609	934	1 675
GEANT cross-border connections	3 293	3 293	0

DF: Dark fibre
DC: Dark channel

FOREST network connecting NMI clocks



ESFRI

FOREST network: already larger than the highly competitive Chinese project



"High-precision ground-based timing system" Nagqu timing station officially started construction
6 June 2023



- 20,000 kilometers optical fiber
- 295 time and frequency transmission sites
- 10 eLoran sites



Performance	
Fiber	< 100 pico-seconds
BeiDou	< 20 nano-seconds
Differential eLoran	< 100 nano-second

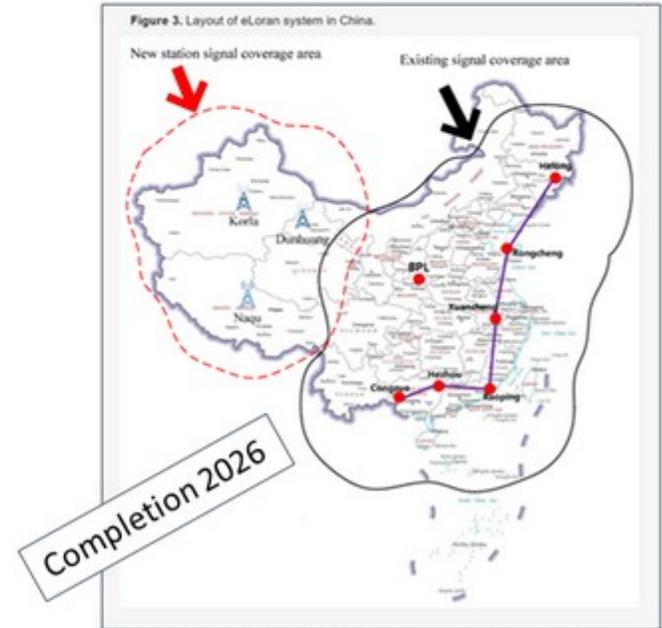


Figure 3. Layout of eLoran system in China.
National Time Service Center, Chinese Academy of Sciences, Xi'an 710600, China, 27 Nov 2023

Aligning the objectives of REFIMEVE with those of FOREST

- REFIMEVE must take into account the three thematic areas of FOREST:
 - **1/ Clock comparisons and high-precision measurements** (CNRS Physics, Engineering, Earth & Universe (Astro) and Nuclear & Particle Physics)
 - **2/ Quantum communications** (CNRS Physics, Engineering, Nuclear & Particle Physics (?) and Computer Science)
 - **3/ Fiber sensing** (CNRS Earth & Universe (Earth and Ocean), Physics and Engineering)
- Enlarge the spectrum of labs connected to REFIMEVE (eg Quantum Technology labs)
- Set up a user committee

A user committee for REFIMEVE

- **2 main missions :**

1. User feedback for challenging the REFIMEVE team: evaluation, needs identification (continuity of service, quality, and ease of access to information and data concerning REFIMEVE signals) → standard missions of a user committee.

This could be also a way to stimulate the involvement of users in the operation of REFIMEVE

2. Organize the committee into subcommittees based on the three thematic areas for more forward-looking discussions that would also involve labs not yet connected or only interested in data (e.g., fiber sensing).

- **1 representative per lab**
- 1 meeting per year (more if required)
- The terms of reference will be prepared by the REFIMEVE team and will be part of the GIS status.
- **First meeting expected to take place during the first semester of 2026**



Thank you for your attention !
Questions ?