

# T-REX instrument project: Report of activities for the STAP Meeting in April 2026

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## 1. INSTRUMENT PROJECT OVERVIEW

The T-REX instrument project is a collaboration between the German JCNS (75%) and the Italian CNR (25%). The instrument is a bi-spectral, direct geometry chopper spectrometer with full polarisation analysis. It uses repetition rate multiplication mode to use the full intensity of the ESS pulse.

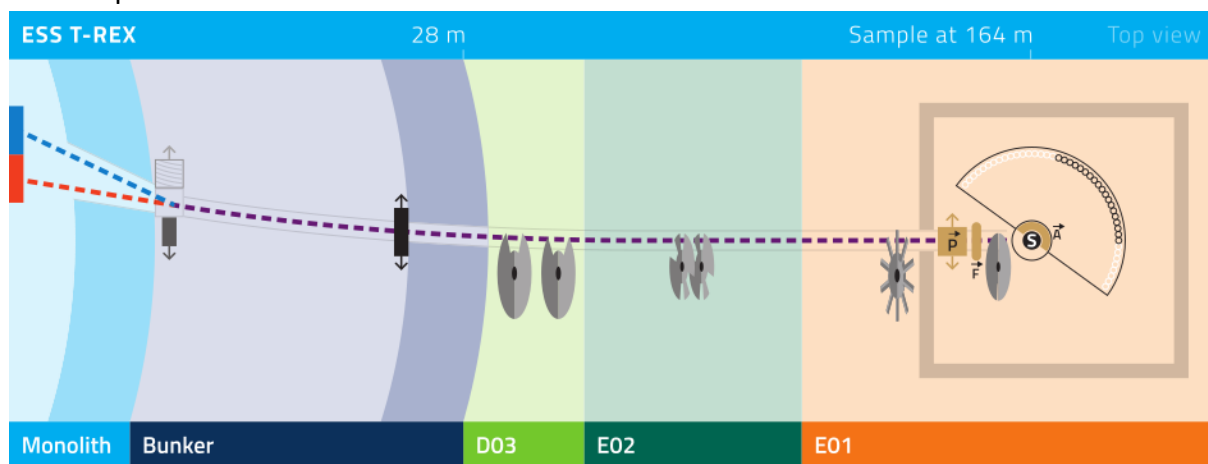


Figure 1: T-REX layout overview

The agreed scope includes the delivery of a world class Direct Geometry Chopper Spectrometer (DGCS), capable to perform INS experiments for a broad user community spanning from magnetism to functional materials and functional soft matter, including the option of using polarized neutron for XYZ neutron spin analysis. In the first-day, T-REX was planned to be equipped with about 40% of detector area, equivalent to 0.8 sr. The FAN chopper was taken out of the scope after the last STAP meeting.

The project of T-REX is expected to achieve completion in late 2027. Our main concern for the timeline is the fast-spinning chopper discs. A reduction of chopper speed could mitigate the risk of failure. An important milestone is the construction of the instrument cave, necessary for the installation of several other components. The installation is currently going on.

In the following we provide a brief overview of the progress of all workpackages in Q4/2025 and Q1/2026, in preparation of the next STAP meeting in April 2026.

# TREX Critical Paths

Data from P6 January 2026 lockdown

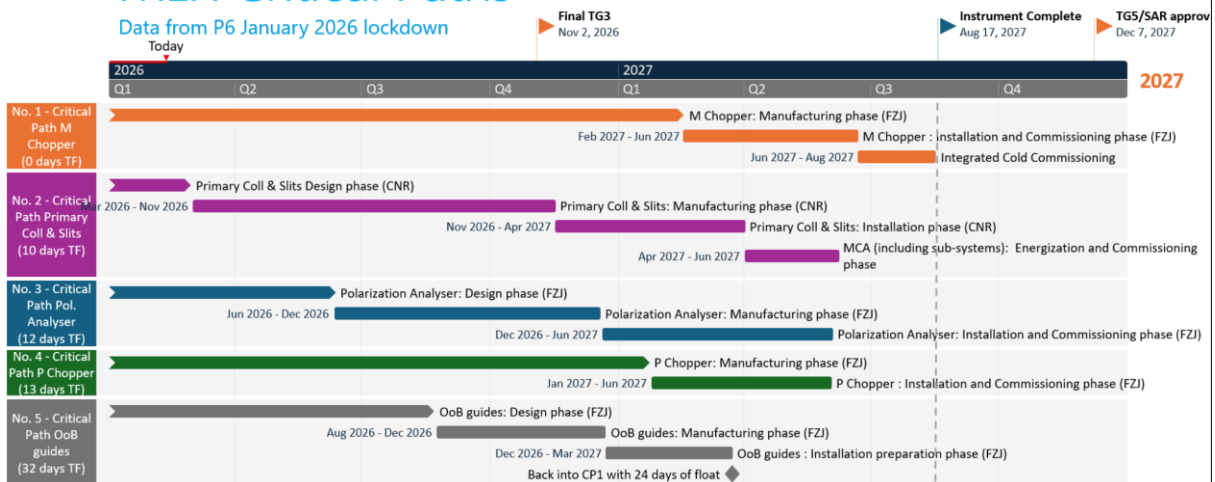


Figure 2: TG5 date for T-REX together with critical path leading to that date

## Staffing

The team on site at ESS is growing. We now have Mo Aouane (scientist), Sylvain Desert (engineer) and Bing Lee (instrument data scientist).

## Beam transport and conditioning system

### Neutron guide

- **Neutron guide in-bunker and heavy shutter:** All in bunker components installed
- **Neutron guide out-of-bunker:** Tranche 1 (out of 4 tranches) installed, tranche 2 in installation, tranche 3 in manufacturing
- **Beamline Shielding** -> Joined common project, in manufacturing

### Choppers

- **Bandwidth choppers:** Hybrid solution with common project for electronics (ESS) and an external manufacturing company for mechanical components, i.e. discs and housing. Discs and housing are manufactured and sent to ESS.
- **P- and M- choppers:** One P-disc (P01-II) manufactured after failure of first batch; cross sections show improvements in the quality. Disc is now waiting for spinning test in May. A second M-disc was ordered as a replacement for the disc that has passed the FAT but will not be used on the instrument to avoid the risk of a crash. We ask the STAP to advise us for possible reduction of the P- and M-chopper speeds to further mitigate the risk of a disc failure during spinning tests.
- **FAN chopper:** After the discussion and report from the last STAP meeting, ESS and the T-REX team decided to stop the development of the FAN chopper without a replacement solution.

### Primary collimator

The design of the component is almost finished, with only minor points to be solved before production can start.

### Polarization

Components such as the thermal polarizer or spin flipper are not commercially available and must be developed according to the instrument needs and constraints.

- **Cold neutrons polarizer:** Manufacturing complete, stored in Jülich.

- **Thermal neutrons polarizer:** The thermal polarizer is in production; however documentation and quality gate will be challenging
- **Spin flipper, guide field and polarization analysis (Pastis):** This is the most challenging component for the project. We are well advanced with the guide field and transitions, but struggle with flipper and PASTIS.
- **Guide/polarizer exchange unit:** Preliminary design finished, waiting for final design of the thermal polarizer.

## Scattering characterization system

### Detector vacuum vessel

The detector vessel is in Jülich. Pre-installation is ongoing, with the integration of the radial collimator and the cadmium shielding. The delivery date to Lund is October 1<sup>st</sup>.

### MG-Detector and detector boxes

ESS detector group is providing the Multi-grid detector for T-REX. The development of the detector design is finished; the first columns are produced. The prototype detector housing is on its way to Lund, the following three housings are in tendering.

### Radial oscillating collimator

The radial collimator is finished and delivered to Jülich. It is now integrated into the vessel.

## Experimental cave and hutch

The experimental cave is currently being built. The hutch installation is ongoing.

### Sample Environment

The Cryo-furnace passed the design report and is in manufacturing.

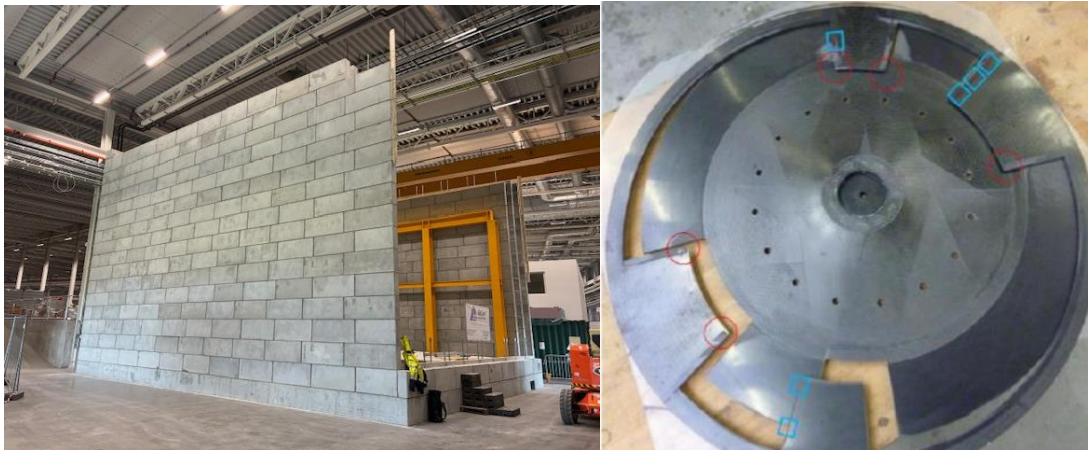


Figure 3: T-REX cave (left) and P01-II chopper disc (right)

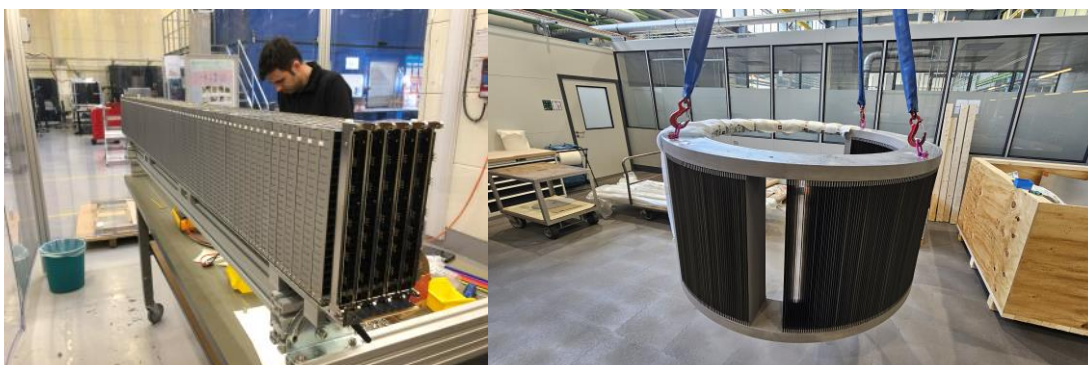


Figure 4: The first full MG column produced (left) and the radial oscillating collimator (right)