WEST machine news and programme for 2026

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*http://west.cea.fr/WESTteam

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WEST interior: Full tungsten

Since 2022: ITER-grade divertor: 456 W divertor units, with 35 monoblocks in each unit

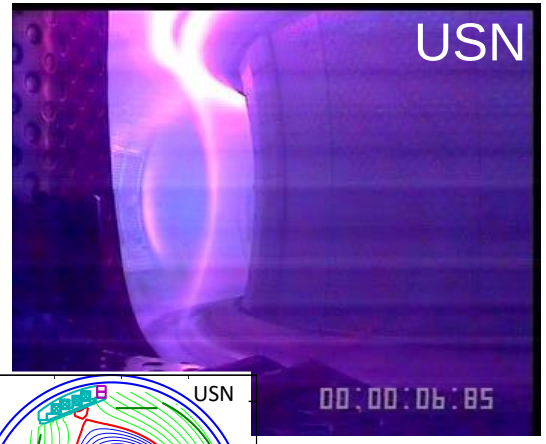
Since summer 2025:
Mix of bulk W and W coated CFC tiles on inner bumbers

Also installed in 2025: SS tiles with W coating (test for ITER temporary FW)

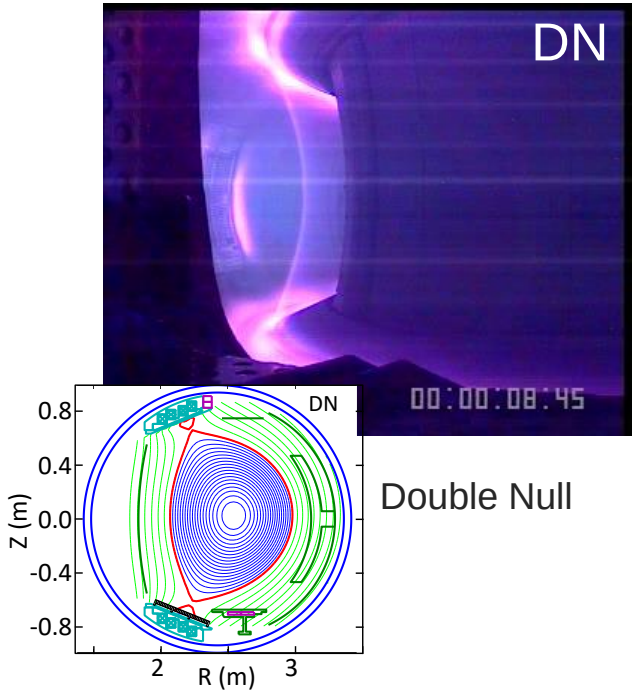
- 1 inner bumper (PJ5) equipped with thermocouples at mid-plane
- 1 inner bumper (PJ2) equipped with poloidal array of Langmuir probes

Magnetic configurations

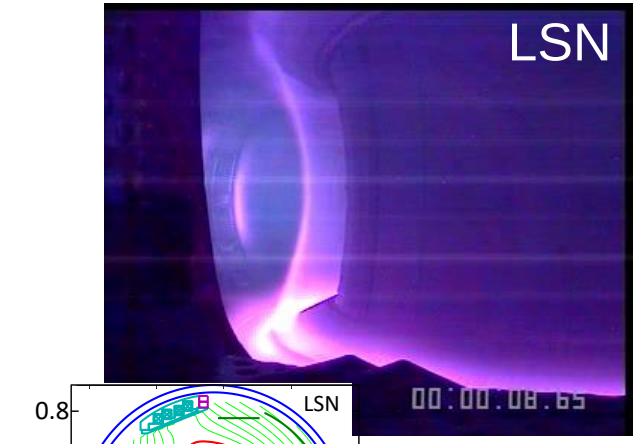
Symmetric actively cooled upper and lower target



Upper Single Null



Double Null

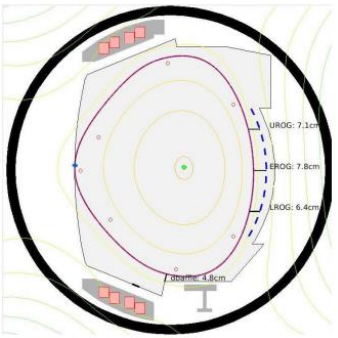


Lower Single Null

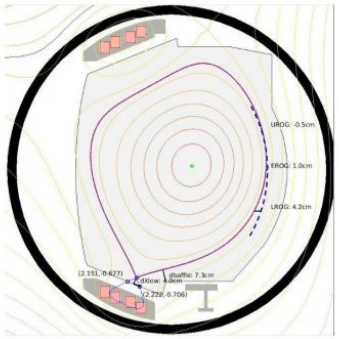
Negative triangularity

- LSN and Inner Wall Limited
- Max negT = -0.25
- 1 day is needed to change the polarity of upper divertor coil current

Inner Wall Limited



Lower Single Null



WEST machine capabilities

I_p (q_{95} ~ 2.5)	1 MA
B_T	3.7 T (reversed field not possible)
R	2.5 m
a	0.5 m
n_{GW} (1MA)	1.5 10^{20} m^{-3}
P_{ICRH}	9 MW with 3 antennas
P_{LHCD}	7 MW
P_{ECRH}	Up to 3 MW in 2026
$time_{flattop}$	> 1000 s **(1337 s achieved)**

More info at: https://westusers.partenaires.cea.fr
Machine Description – West User Portal (cea.fr)

https://wiki.euro-fusion.org/wiki/WPTE_WEST

Capabilities:

- USN, LSN, DN and Negative triangularity
- High power RF heating capability
- Large steady-state current drive capability from LHCD
- 3 MW ECRH, under installation
- Gas injection and pellets for fuelling (Supersonic molecular beam injection currently not available)
- Boronization system and Impurity powder dropper
- Massive gas injection

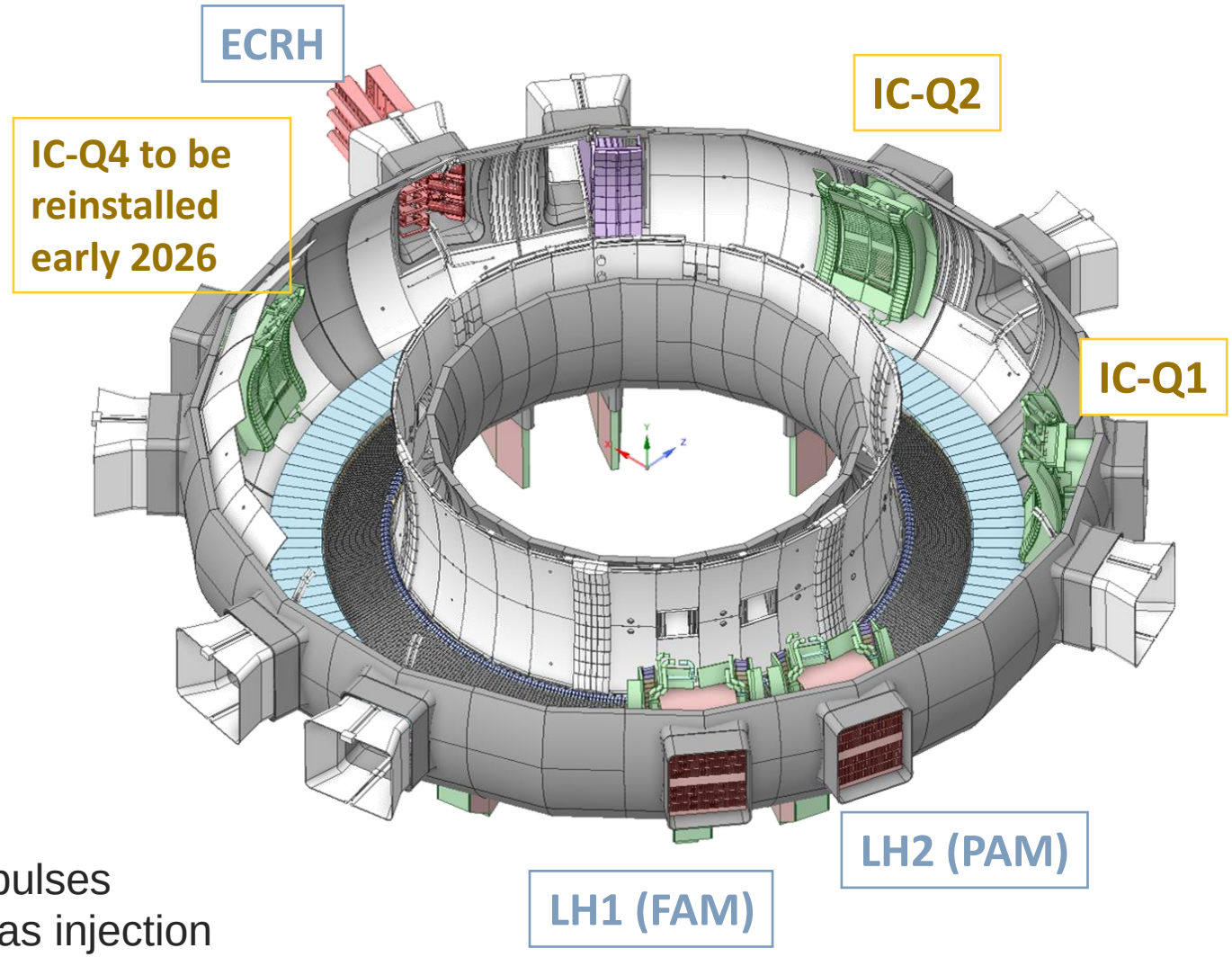
WEST Heating & CD systems

- **LHCD system (7 MW)**
  - 2 launchers, 7 MW / 1000 s
  - Key system for long pulse operation

- **ICRH system (9 MW)**
  - 3 antennas (9 MW / 30 s, 3 MW / 1000 s)
  - IC heating, IC wall conditioning, IC-assisted plasma start-up

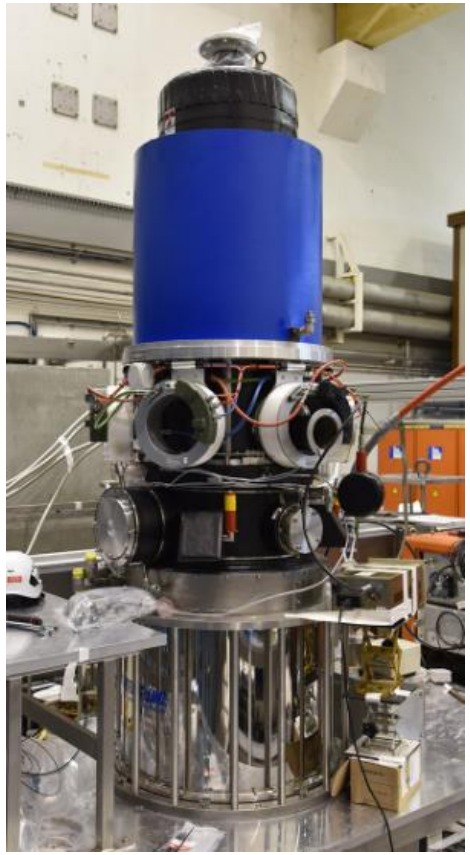
- **ECRH / ECCD system (3 MW, 105 GHz)**
  - 1st gyrotron tested on plasma in April 2025
  - 2 MW planned in April 2026
  - Full system (3 MW) in end 2026
  - 1 antenna with 3 steerable mirrors toroidally and poloidally

- **ICRH and LHCD limiters**
  - W coating on CFC
  - Antennas / launchers are moveable between pulses
  - All antennas / launchers equipped with local gas injection



3 MW ECRH system for WEST

- **3 gyrotrons** 105 GHz, 1 MW each / 1000 s
- RF design by KIT, based on THALES W7-X 140 GHz
- Can operate in O-mode at 3.7 T or in X-mode 2nd harmonic at 2 T



1st gyrotron tested on plasma in April 2025

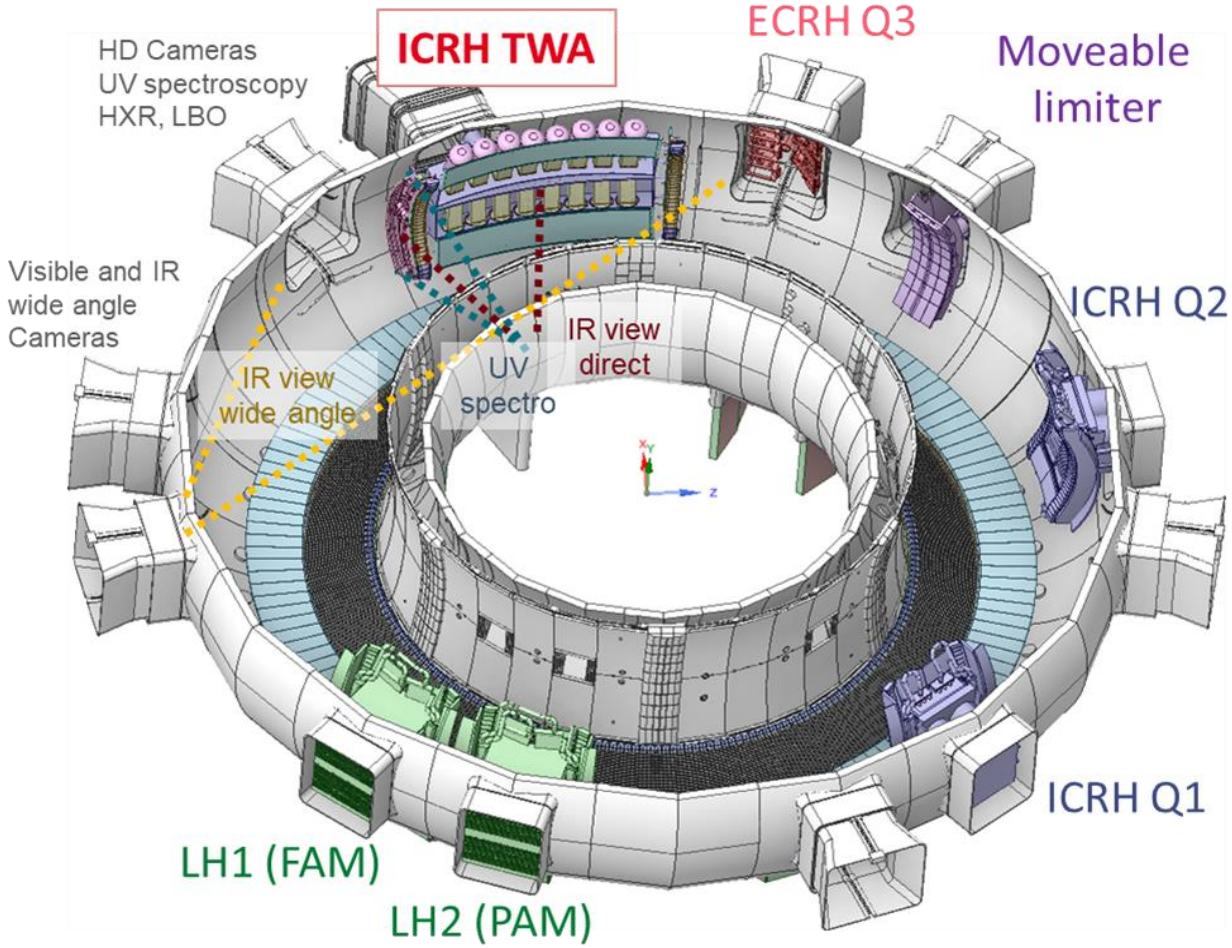
- 2 MW planned in April 2026
- Full system in end 2026

ECRH antenna:

- Tore Supra antenna reinstalled in WEST
- Capacity: 3 MW
- 3 steerable mirrors, poloidally & toroidally

Improvement of ICRH: new antenna design (TWA)

Travelling Wave Array (TWA) antenna under design for WEST: Installation in 2027



➔ **Address limitations of current ICRH antennas**

- improved coupling
- reduced voltages
- reduced RF sheaths
- enhanced reliability

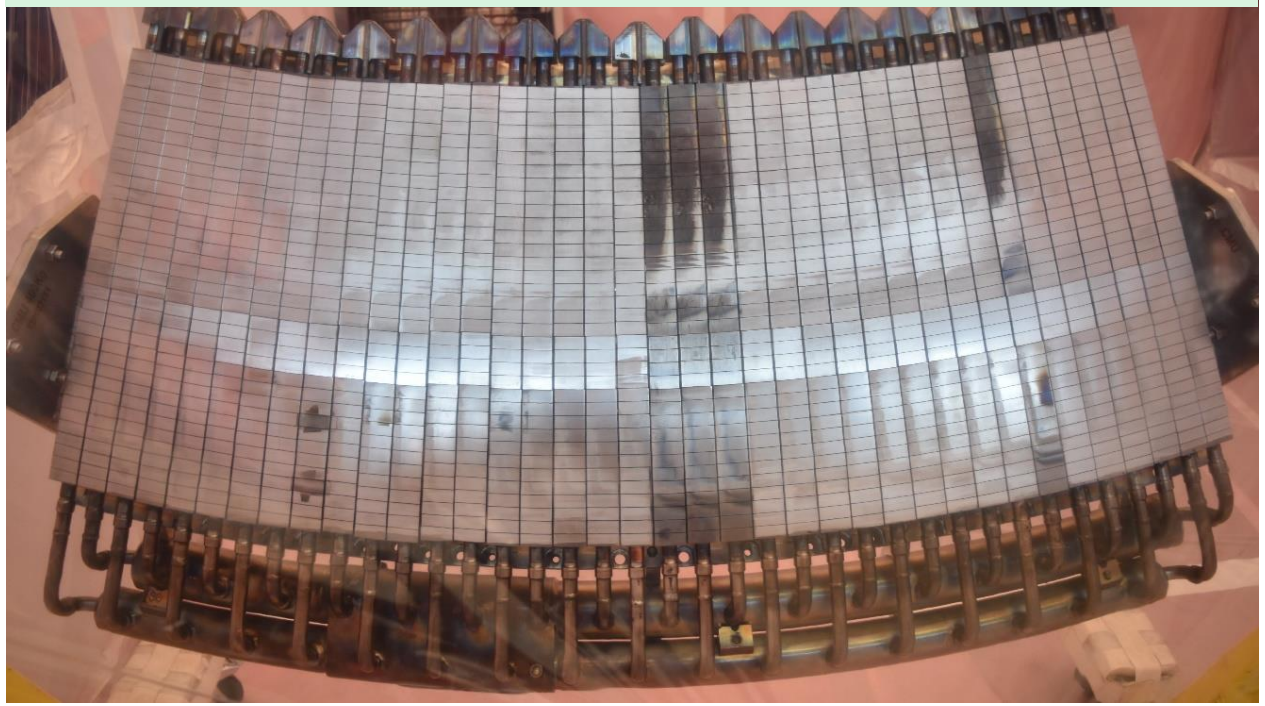
The launcher and components are all actively cooled.

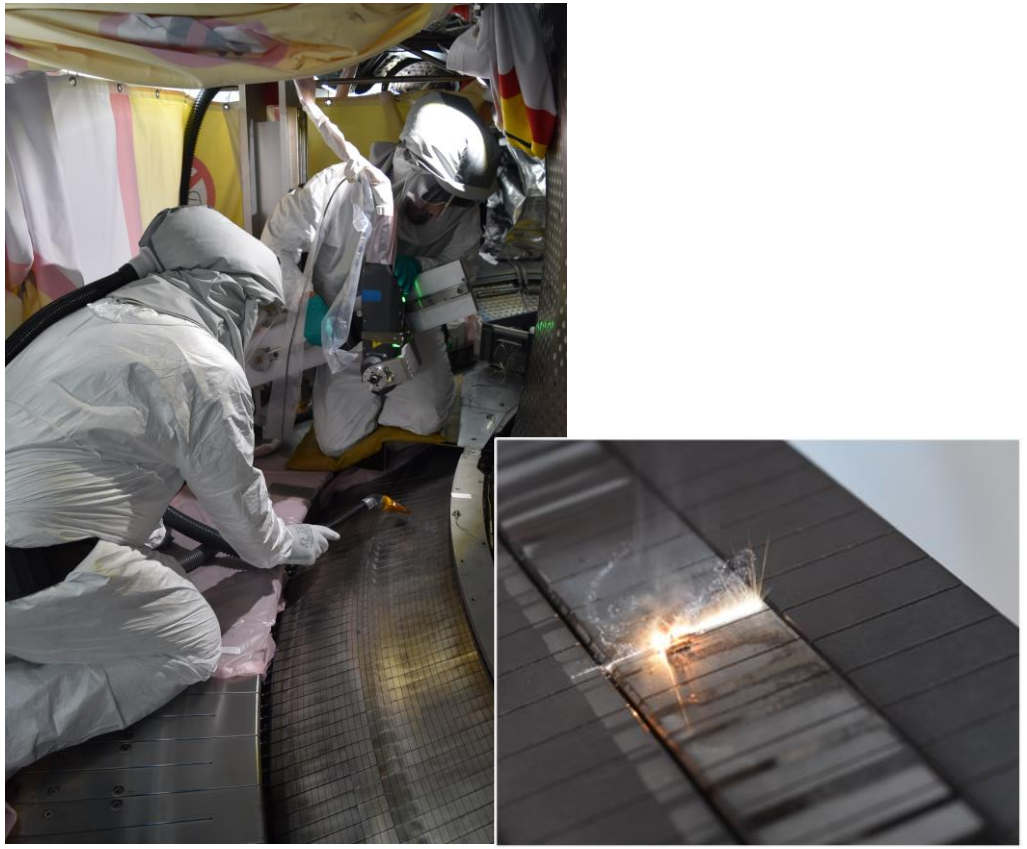
Planned to be installed in 2027. Will replace IC-Q4 antenna

➔ Expected coupled power: 3MW / 30 s and 1 MW continuous

Lower divertor cleaned in 2025 using laser cleaning in situ

Q3B sector: 4 PFU non-cleaned for reference and follow-up of deposit build-up

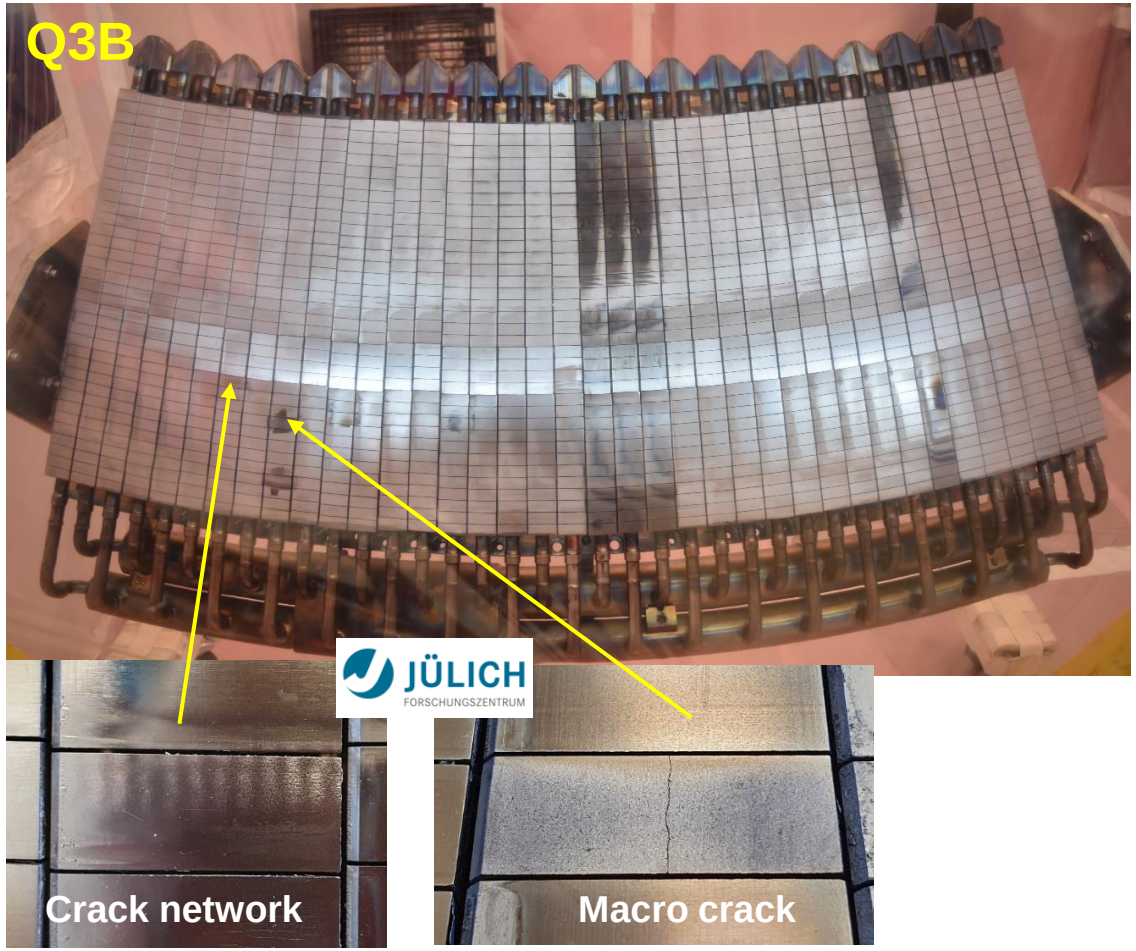


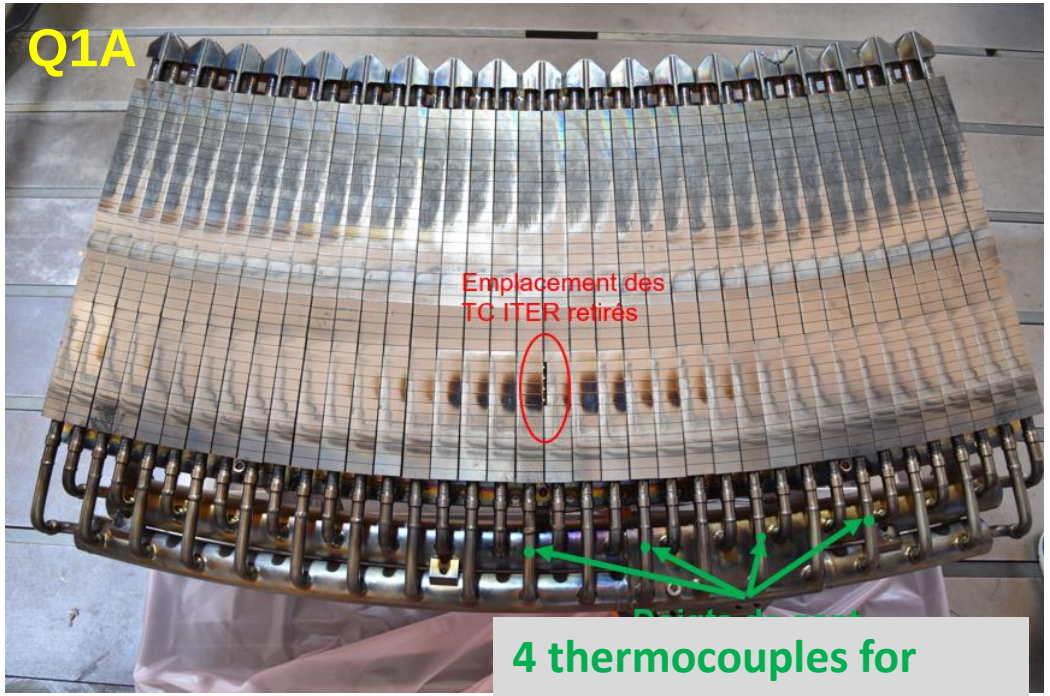


➔ **190 g of dust were collected by laser cleaning ➔ consistent with 25µm of eroded W**

Laser cleaning can be redone in early 2026 if needed

Test divertor sectors status for 2026





- Pre-damaged monoblock #2 “Crack network” will be removed early 2026
- Pre-damaged monoblock #3 “Macro crack” will be removed early 2026, and reinstalled in 2027

4 thermocouples for calorimetry in divertor, to be installed early 2026

Specific Diagnostics

- Infrared (IR) thermography: Diagnostic Handbook – West User Portal (cea.fr)
  - ✓ Real-time PFC protection
  - ✓ Very high resolution IR on divertor
  - ✓ Fast IR for transients. **Fast IR camera installed in vertical endoscope viewing divertor**

- Visible Spectroscopy (divertors / antennas)
- High resolution visible spectroscopy
- UV spectroscopy

- Large array of Langmuir probes (extensive poloidal/toroidal coverage). **RFA in divertor**
- Two reciprocating probes, can be used for sample exposures. **RFA to arrive in 2026**
- Thermal diagnostics in W divertor (thermocouples, Fiber Bragg Gratings)
- Calorimetry (power balance)

- HXR, SXR cameras
- Edge and core Thomson scattering (n_e, T_e at pedestal and in core)
- Profile and turbulence reflectometers (n_e, T_e, E_r)
- Fast visible camera (start-up, ELMs, turbulence)

- AIA (Articulated Inspection Arm for PFC inspection under vacuum), on maintenance Mondays
- **LIBS (In-vessel fuel inventory and deposited layers composition)**

Priorities for the WEST programme 2026

ECRH:

- Achieve **sustained H-mode, using the ECRH capability** together with LHCD and ICRH

Long pulse operation:

- Demonstrate **1 hour of plasma in one operational day** (several long discharges in one day)

Continue exposure of ITER grade divertor:

- 18 hours of plasma performed so far; Cumulated fluence of **$1.8*10^{27}$ D/m^2** reached on OSP region

➔ Spontaneous crack network observed on W monoblocks in Outer Strike Point (OSP) region

Address urgent ITER issues:

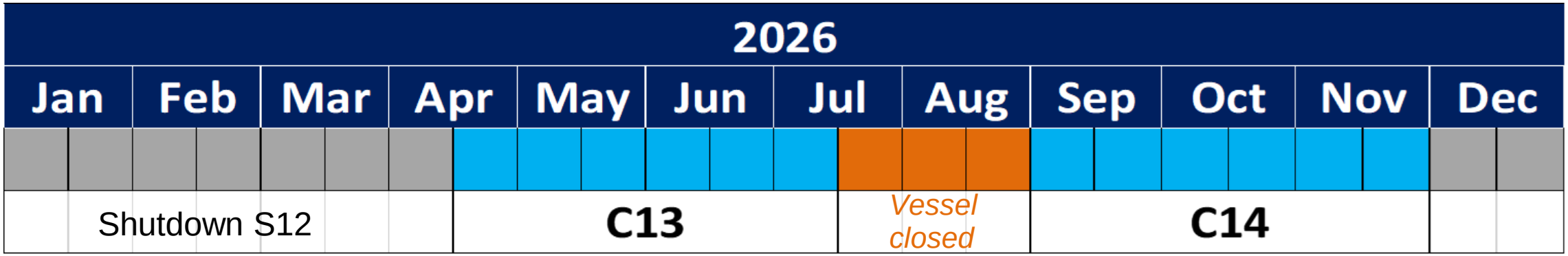
- WEST is perfectly suited to address urgent ITER issues (boronisation studies, ICWC, runaway mitigation, start-up on W limiters…)

Call for proposals for internal WEST programme 2026 closed 10 October:

- Task Force M1 (Plasma regimes of operation): 47 proposals received
- Tasj Force M2 (Heat exhaust systems): 24 proposals received

➔ **Proposals will be reviewed in January 2026**

Tentative campaign schedule for 2026



- Remove PFU after High Fluence campaign (Q1A)
- Add TC for calorimetry in divertor (Q1A)
- Remove pre-damaged MB#2 and #3 (Q3B)

- ECRH 2 MW

- ECRH 3 MW

- Re-install pre-damaged MB#3 (macro-crack)
- Install TWA antenna in 2027

Tentative planning for 2027: Two campaigns, April-July and September-November, as in 2026

WEST Reference SL for WPTE experiments

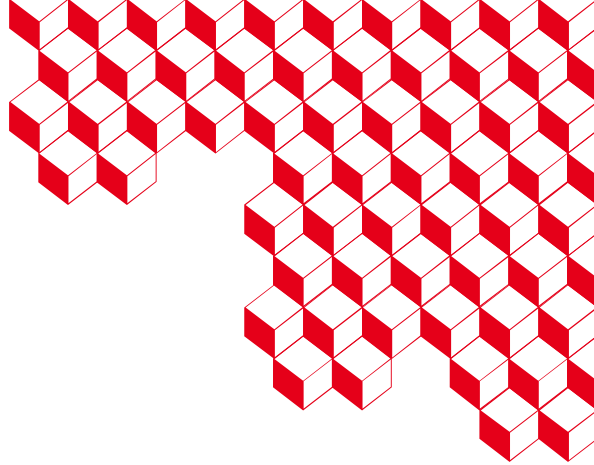
WPTE RT	WEST Reference Session Leader
RT01	C. Reux (cedric.reux@cea.fr)
RT02	J. Morales (jorge.morales2@cea.fr)
RT03	Ph. Moreau (philippe.jacques.moreau@cea.fr)
RT04	R. Nouailletas (remy.nouailletas@cea.fr)
RT05	P. Tamain (patrick.tamain@cea.fr)
RT06	J. Gaspar (jonathan.gaspar@univ-amu.fr)
RT07	R. Nouailletas (remy.nouailletas@cea.fr)
RT08	Ph. Moreau (philippe.jacques.moreau@cea.fr)
RT09	TBD

Organisation of campaigns

- Plasma operation four days per week, Tuesday-Friday
- Maintenance or boronisation on Mondays (Boronisation typically every 2-3 weeks)
- Usually one session per day (8.30-18.00). Count 15-16 pulses in a day
- Ohmic commissioning or experiments 2 evenings / week (Tuesday and Thursday)

- Weekly WEST Task Force meeting held on Thursday morning 9:00

- Plan missions well in advance: At least 2 weeks is recommended for the entry procedures
- When dates are known, contact: westwelcome.helpdesk@cea.fr, or your contact person at WEST



Thank you for your attention

https://westusers.partenaires.cea.fr

https://wiki.euro-fusion.org/wiki/WPTE_WEST