Progress (and steps back) on development edge Thomson scattering diagnostics

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Edge TS operation: SA-SE.OP.DO.04-T003-D001

"TS Report on-site activities and synthetic diagnostic development. "

2025 Objectives:

- ✓ Complete the TSS mechanical structure installation (will start on the 22nd July)
- ✓ Keep the system components installed (laser and polychromators) operational
- ✓ Prepare the system calibration and commissioning → preparation of a synthetic diagnostic.
- ✓ Prepare the port plug installation
- ✓ Complete the TSS components transfer of ownership

Regular (biweekly) meetings are being carried out with QST to oversee the action needed to complete the installation, calibration, and commissioning of the diagnostic. I think the experience was very positive and was extended to other diagnostics.

Edge TS operation: SA-SE.OP.DO.04-T004-D001+D002

"TS Report on-site activities and synthetic diagnostic development. "

2026 Objectives:

- ✓ Complete the TSS port plug installation.
- ✓ Calibrate the polychromators
- ✓ Complete the subsystems (shutter, stepper motors, thermocouples) installation and integration with QST control system.
- ✓ Install the optical fiber bundles and the related components (cable tray, plug holder)
- ✓ Install the collection optics and perform the initial alignment, vignetting check, and fiber movement test → partially completed no time remains
- ➢ System commissioning: spatial calibration, collection optics calibration, Raman calibration → Ongoing

Edge TS operation: SA-SE.OP.DO.04-T004-D001+D002

Port plug preparation
- Cleaning of the cover glass and vacuum window
- Cleaning of the port plug tube
- Test of the shutter opening/closing cycle

Port plug installation
- How does QST (□NAT □ UTOC) plan to install the port plug?

He–leak test of the port plug
- He-leak test before installing the optics arm is preferable.
  At this stage, it is still possible to take down the port plug easily
  Is there a procedure defined?

Optics arm installation
- Stepper motor and fan connection at the back of the optics arm
- Fiber bundle moving stage connection at the front of the optics arm

Fiber bundle installation
- Before installation, stepper motors need to be operational
- After installation, fiber bundle movements need to be tested

Collection optics installation
- Beginning of July

We are here: successfully completed

Edge TS operation: SA-SE.OP.DO.04-T004-D001+D002

Polychromators calibration

- ✓ Measure calibration curve of core and edge polychromators at every gain.

Laser line calibration

- ✓ Core laser situation, laser combination/share.
- ≈ Calibration and alignment of the laser line.
- ≈ How will the laser energy be included in the density calculation? Raw signal rescaling?

Spatial calibration

- X Test vignetting
- ✓ Test position reproducibility
- ✓ Test fiber bundle movements.

Fiber bundles and optics transmission measurement

- ≈ Illuminate the optics with an absolutely calibrated integrating sphere and measure the polychromator's response
- X Measure the fiber bundle and collection optics transmission wavelength resolved (for a few fiber bundles)

Raman calibration

- ✓ Air Raman: system test, stepper motors movement calibration
- ▪ Before backing: dust settling time, first measurement of signal energy and pressure dependence (linearity check)
- After backing: Absolute calibration

We are here: replacement arrived

Edge TS operation: SA-SE.OP.DO.04-T004-D001

“TRO edge TS ”

2026 Objectives:

- ✓ Complete the documentation necessary for the work on site
- ✓ Coordinate the commissioning of the edge TS
- ➢ Project reporting

Edge TS operation: SA-SE.OP.DO.04-T004-D002

"Commissioning activities of the edge TS "

2026 Objectives:

- ✓ Calibrate the polychromators
- ✓ Complete the subsystems (shutter, stepper motors, thermocouples) installation and integration with QST control system.
- ✓ Install the optical fiber bundles and the related components (cable tray, plug holder)
- ✓ Install the collection optics and perform the initial alignment, vignetting check, and fiber movement test
- ➢ System commissioning: spatial calibration, collection optics calibration, Raman calibration

Edge TS operation: SA-SE.OP.DO.04-T004-D003

“On site activities of the edge TS ”

2026 Objectives:

- ✓ Install the collection optics and perform the initial alignment, vignetting check, and fiber movement test
- ➢ System commissioning: spatial calibration, collection optics calibration, Raman calibration → on going partial success expercted
- ➢ Data validation
- ➢ Plasma commissioning