IASI-NG PROGRAM: GENERAL STATUS OVERVIEW

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International TOVS Study Conferences, ITSC-24: Tromsø, Norway March 16, 2023 – March 22, 2023

INFRARED ATMOSPHERIC SOUNDING INTERFEROMETER NEW GENERATION (IASI-NG) PROGRAM IS PART OF EUMETSAT POLAR SYSTEM SECOND GENERATION PROGRAM

NUMERICAL WEATHER PREDICTION

ATMOSPHERIC CHEMISTRY

CLIMATE MONITORING

Metop-SG-A1 Flight model 1 — 2025 — 2032

Metop-SG-A2 Flight model 2 — 2039

Metop-SG-A3 Flight model 3 — 2046

With respect to the first generation of IASI : this New Generation will ensure continuity of essential operational observations from polar orbit with improvement of a factor 2 of Spectral Resolution and Radiometric Performances (NedT) of the measurements.

Centre National d 'Etudes Spatiales (CNES) in charge of the development of IASI-NG System, comprising :

- IASI-NG instruments to be flown on the series of 3 Metop-SG A Satellites
- Ground Segment partly integrated in the EPS-SG ground segment partly in a CNES dedicated center, composed of:
  - The IASI-NG command and control functions fully integrated in the EPS-SG Satellite Operation and Control ground segment
  - The IASI-NG Level 1 Operational Processor (L1CPOP) in charge of processing scientific data up to level 1C, processor integrated within EPS-SG ground segment and a local Level 1 Operational Processor to be operated by the local Mission Centers
  - The IASI-NG Technical Expertise Center (IASTEC), in charge of performances monitoring of the whole IASING System including instrument and the data processing parameters adjustment . The IASTEC will be operated by CNES in Toulouse Space Center premises.

IASI-NG PROGRAMMATIC AND INDUSTRIAL SET UP COMPLETED

SYSTEM	CNES
INSTRUMENT	AIRBUS
INTERFEROMETER	AIRBUS
IMAGER	AIRBUS, sodern ananeGROUP
BLACK BODIES	ABB
SCAN	COMATGROUPE
OPTICS	SAFRAN
CRYOSTAT	AIRBUS
CRYO COOLER	AIR LIQUIDE, Crisa
DETECTORS	LEONARDO
DETECTORS FRONT END	Crisa
VIDEO CHAIN	ThalesAlenia Space
MECHANISM ELECTRONIC	SYDFRAL
SW & PROCESSOR UNIT	AIRBUS
LASER SOURCE	
LASER RECEPTION	EREMS
GROUND SEGMENT	CNES
MISSION SIMULATOR	Capgemini
EXPERTISE CENTER	Capgemini
LEVEL 1 PROCESSOR	THALES
ALGORITHMS	NOVELTIS

- Global IASI-NG Cooperation Agreements between EUMETSAT and CNES
- Cooperation Agreement's signed by CNES with United Kingdom Space Agency (UKSA), Norwegian Space Centre (NSC) and Swiss Space Office (SSO) to participate to the development of the IASI-NG Instrument
- IASI-NG on board of MetOp-SG satellites developed by ESA

IASI-NG PROGRAM SCHEDULE

Q2 - 2025

EUMETSAT EPS-SG / ESA METOP-SG / CNES IASI-NG

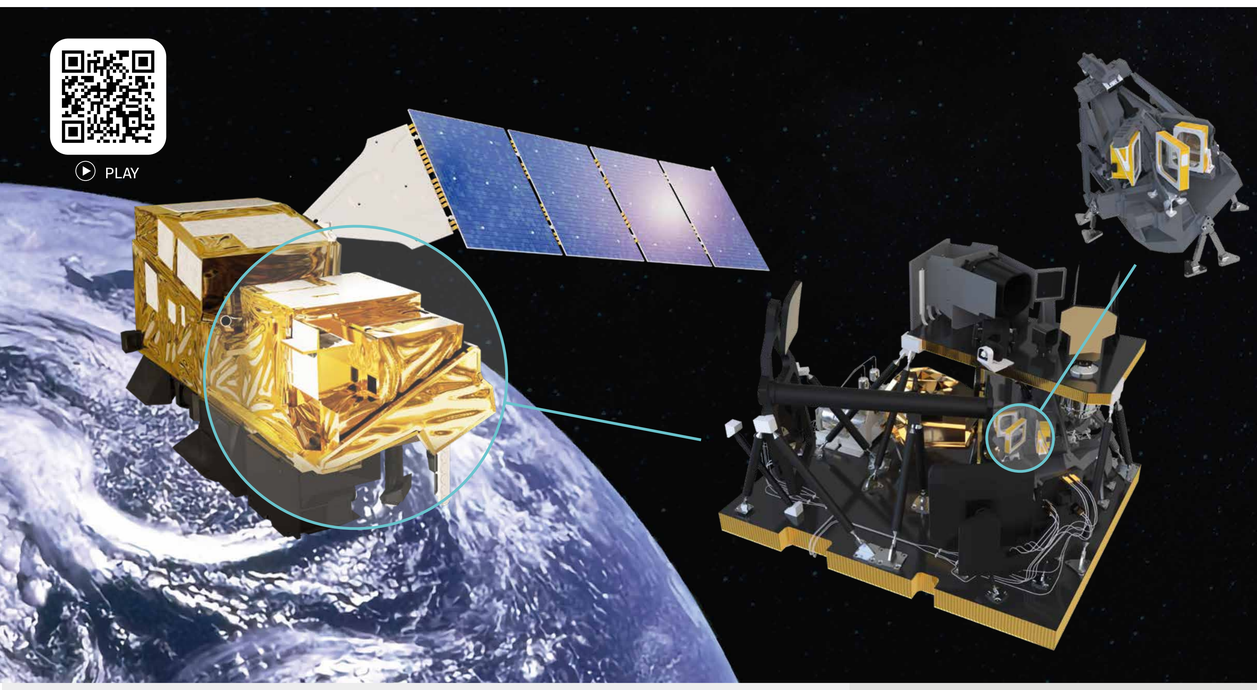
- EPS SG System Phase C/D/E1
- ESA Metop SG Phase C/D/E1
- IASI-NG phase C/D/E1
- Space Segment Phase C/D

System PDR - March 2016 · System CDR - June 2020 · L1C POP V1 - Q4 2021 · L1C POP V2 - Q1 2024 · IASTEC - Q3 2024 · L1C POP V3 - Q4 2024

Instrument CDR - Q4 2019 · Instrument EM - Q3 2021 · Instrument PFM - Q3 2022 · FM2 - Q3 2024 · FM3 - Q3 2025

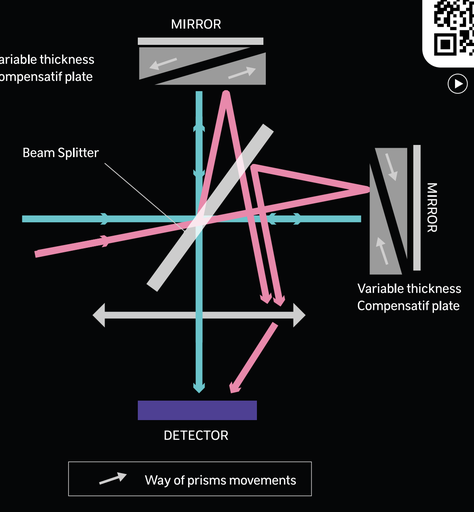


PLAY



THE MERTZ INTERFEROMETER, THE MAJOR INNOVATION OF THE INSTRUMENT

In the Mertz concept the field apodisation compensation is performed simultaneously with the Optical Path Difference thanks to a dedicated interferometer mechanism. This mechanism moves in synchronization the 2 couples of Internal and External Prisms. The beam reflection is made at the outer face of the External Prisms. The mechanism ensures both functions OPD and compensation and so relax synchronization constraints. Use of KBr material for Prisms and Plate ensure high radiometric performances in all bands.



PLAY

LEVEL 1 PROCESSING CONSOLIDATED

Pre process L0 Spectrum

- Spike correction
- NZPD detection and interferogram resampling (±4 cm OPDMax)
- Interferogram Apodisation

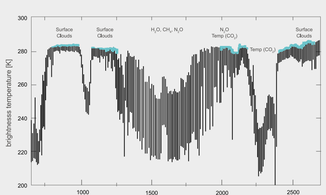
Substitute the variable instrument transfer function for a constant transfer function (ISRF equalization)

- Remove the estimated Self Apodisation Function (SAF) for each spectral sample

Radiometric calibration

- Apply a time filtering scheme of the calibration target spectra
- Apply the radiometric calibration equation including scan mirror reflectivity

UNCOMPRESSED L0 SPECTRUM → L1 PRE PROCESSING → RAW APODIZED SPECTRUM → L1 MAIN PROCESSING (+ ESTIMATED SELF APODISATION FUNCTIONS) → FULLY CALIBRATED L1C SPECTRUM



IASTEC FRAMEWORK

ROOTS : ROutine OperaTions Support

- Monitoring L1CPOP good health
- Monitoring instrument good health
- On-board/ground Configuration changes computation
- Generate SW ground modification
- Generate SW on-board modification
- Monitoring & Control Tools : Dump analysis, TC generation

IASTEC DATABASE

GENIE : Ground sEgmeNt science Expertise

- Spectral calibration
- Beam Splitter Alignment
- Noice Covariance Matrices
- Geometrical Performances
- L1CPOP algorithms evol
- Intercalibration System

IASI-NG SPACE SEGMENT:

- The Assembly Integration and Test phase of the Instrument Proto Flight Model (PFM) completed in August 2022 with the characterization and calibration tests in thermal vacuum.
- The PFM Instrument integrated onto Metop-SG A in september 2022 : it successfully passed the functional and vibration tests with thermal vacuum tests coming in Q2 2023
- End of 2023, the instrument will be dismounted from the satellite to complete its spectral performance tests which could not be performed before the delivery
- A final delivery back to the satellite is planned in Q1 2024 before a launch campaign early 2025 and a launch on Ariane 6 in Q2 2025
- The Instrument (FM2) manufacturing in progress : integration and tests of most critical sub-systems for mission performances (Interferometer and Focal Plane Cryostat Assembly) started end of 2022

IASI-NG GROUND SEGMENT:

- The algorithms translations to design architecture of the Product Generation Processor (L1C POP) relevant with the EUMETSAT Payload Data Acquisition and Processing (PDAP) infrastructure is ongoing : computing resources is a main driver
- L1C POP V2 with complete data algorithms processing expected early 2024 for integration and test in the PDAP
- Additional version for launch of L1C POP under consideration further final validation of science data algorithmic processing which is ongoing using actual instrument PFM performances tests data
- Development of a Local Processor (L1C LOP) for EPS-SG Local Mission based on the re use of global processor algorithm started end of 2022
- IASI-NG Technical Expertise Centre (IASTEC) in charge of the in-flight calibration and continuous performance monitoring : Kick off performed end of 2022