IASI-NG: a cooperation for a New Generation of Infrared Atmospheric Sounding Interferometer

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IASI New Generation Mission

- In the frame of the Second Generation of the Eumetsat Polar System (EPS-SG), a **New Generation of Infrared Atmospheric Sounding Interferometer (IASI-NG)** will be developed by CNES in cooperation with Eumetsat.

- IASI-New Generation will ensure the **continuity of the IASI programme** for:
  - operational meteorology
  - characterization of atmospheric composition related to atmospheric chemistry and environment
  - climate monitoring

- IASI-New Generation will improve:
  - the precision of the retrievals for Numerical Weather Prediction
  - the detection of new species
  - the characterization the full atmospheric column, the lower part of the Atmosphere…

Cf. Javier Andrey-Andres Poster: A step towards IASI-NG: Simulation of orbits and first impact assessment compared to IASI
IASI NG will improve the IASI demonstrated performances by a factor of 2.

<table>
<thead>
<tr>
<th>Main figures</th>
<th>IASI</th>
<th>IASI-NG</th>
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</thead>
<tbody>
<tr>
<td>Radiometric Resolution (NeDT)</td>
<td>IASI/2</td>
<td>IASI/2</td>
</tr>
<tr>
<td>Spectral resolution</td>
<td>IASI/2 (0.25 cm⁻¹@L1C)</td>
<td>IASI/2 (&lt;0.25K@280K)</td>
</tr>
<tr>
<td>Absolute Radiometric Calibration</td>
<td>IASI/2</td>
<td>IASI/2</td>
</tr>
<tr>
<td>Spectral bands</td>
<td>3 bands</td>
<td>4 bands</td>
</tr>
<tr>
<td>Mass</td>
<td>235 kg</td>
<td>350 kg</td>
</tr>
<tr>
<td>Power</td>
<td>240 W</td>
<td>500 W</td>
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</tbody>
</table>
- IASI-NG will provide infrared radiance spectra measurements continuously from 645 to 2760 cm⁻¹ (15.5 µm to 3.6 µm)
# IASI New Generation Performances

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Ground Pixel diameter</td>
<td>12 km</td>
<td>12 km</td>
</tr>
<tr>
<td>Ground sampling</td>
<td>25 km</td>
<td>25 km</td>
</tr>
<tr>
<td>Number of sounder pixels per acquisition</td>
<td>4 pixels</td>
<td>16 pixels</td>
</tr>
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![Diagram showing IASI and IASI-NG performances](image-url)
IASI New Generation Program

- CNES will manage the development of the IASI-NG System comprising:
  - the development and delivery of IASI-NG instruments to be flown on the Metop-SG A Satellites
  - the development of the Level 1 Processor within the EPS-SG ground segment for processing of the instrument level 1 data
  - the development of a Technical Expertise Centre (TEC) in CNES Toulouse Center premise in charge of in-flight calibration, validation and long term instrument performance monitoring.

- IASI NG Program status
  - Phase A study started early 2010: different instrument concepts trade-off performed
  - Instrument concept selection Mid 2013: CNES selected France for the conception and the realization of the IASI-NG instrument flight models
  - System Phase B will be concluded by System PDR mid 2015
Performances Improvement
Technical Rationale

IASI performances Improvement:
- Radiometry by factor 2
- Spectral Resolution by factor 2

An increase of collected signal of a factor ≈4
- Instrument field of view Increase (integration time)

A larger interferometer optical path difference of a factor 2
- Optical Path difference Increase

Main challenge:
- to compensate interferometer Self-Apodisation
IASI-NG Performances the self-apodisation issue

For the highest Optical path differences, the highest wave numbers, and the off-axis pixels:
The interference fringes are merged inside a sounder pixel.

possible approaches

“Numerical” Solutions

Split the sounder pixel into many smaller pixels
\(\rightarrow\) Matrix detectors

“Optical” Solutions

Suppress/mitigate the self-apodisation effect
\(\rightarrow\) self-apodisation compensation
IASI-NG Instrument Concept

- Instrument concept selected is based on:
  - Amertz Interferometer allowing to assess the Self Apodization issue by a Field Effect Compensation
  - Field Effect Compensation realized by introducing optics with correct optical index at given OPD (Optical Path Difference)
- Technical challenge: first implementation in Flight of a Mertz Interferometer

Cf. Frédéric Bernard Poster: IASI NG Instrument Presentation
Schedule Overview

EPS-SG System Development

MetOp-SG A Satellite Development

IASI-NG System Development
Thank you for your attention