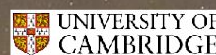




Wide-survey of the QUIJOTE CMB experiment

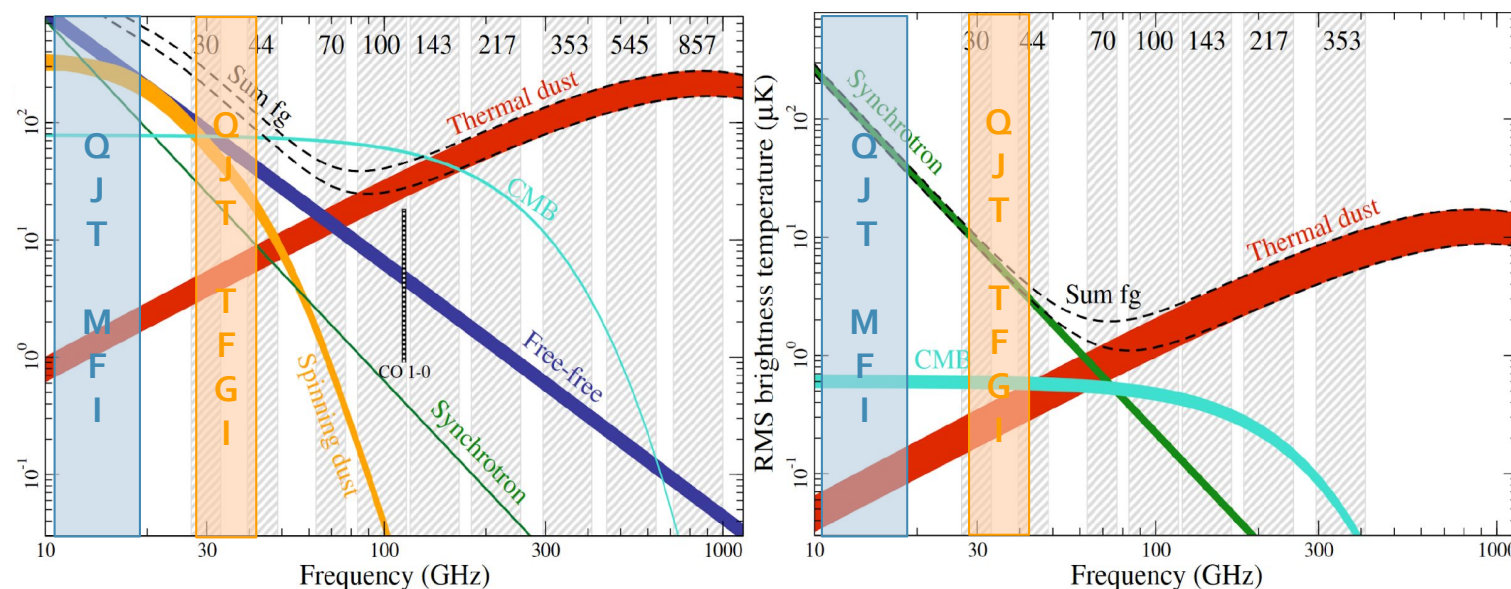
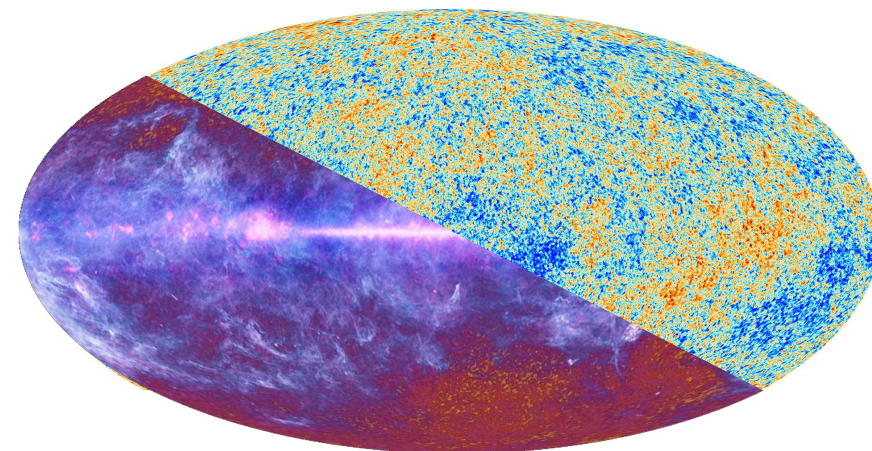
Presented by: Federica Guidi (IAC, ULL),
on behalf of the QUIJOTE collaboration.



I present the status and the recent results of the QUIJOTE (Q-U-I JOint TEnerife) experiment. QUIJOTE is a project that operates from the Teide Observatory, with the aim to characterize the emission of the galactic foregrounds at microwave wavelengths, and to study the polarization of the Cosmic Microwave Background, targeting the detection of the primordial gravitational waves, the so called "B-modes", down to a value of the tensor to scalar ratio of $r = 0.05$. Recently, one of the two instruments of QUIJOTE, the Multi Frequency Instrument (MFI), concluded a wide-survey campaign, during which we observed the full northern sky, at 11, 13, 17 and 19 GHz. The wide survey maps of QUIJOTE will be delivered soon to the community. Here I present the current status of the maps, and I summarize few scientific results related to them, with special emphasis on the low frequency Galactic foregrounds, such as the Synchrotron and the Anomalous Microwave Emission.

QUIJOTE: a polarimetric CMB experiment for the characterization of the low frequency galactic foregrounds

- CMB polarization experiments are searching for the polarization pattern imprinted by primordial gravitational waves: the “B-modes”.
- QUIJOTE is a polarimetric CMB experiment installed at the Teide observatory since 2012.
- QUIJOTE extends the Planck and WMAP coverage to low frequency, with two instruments:
 - Multi Frequency Instrument (MFI): 11, 13, 17, 19 GHz;
 - Thirty and Forty GHz Instrument (TFGI): 30-40 GHz.
- QUIJOTE tests the low frequency galactic foregrounds to provide a precise separation between the galactic and cosmological microwave emission.

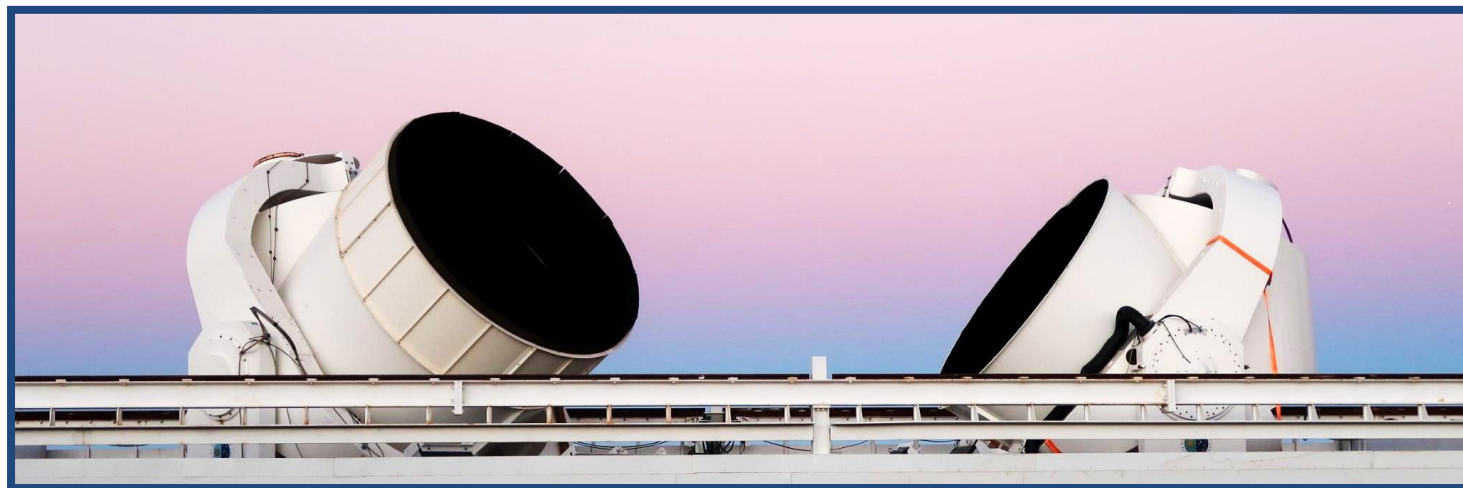


QUIJOTE and the wide-survey

QT1 & MFI

(Multi Frequency Instrument)

- 4 Horns, 32 channels, 4 frequency bands: (11, 13, 17, 19) GHz
- Angular resolution: 0.92° - 0.63°
- Sensitivity per channel: $500\text{--}600 \mu\text{K} \cdot \sqrt{s}$
- Stepping polar modulator (HWP)
- Operative since Nov 2012



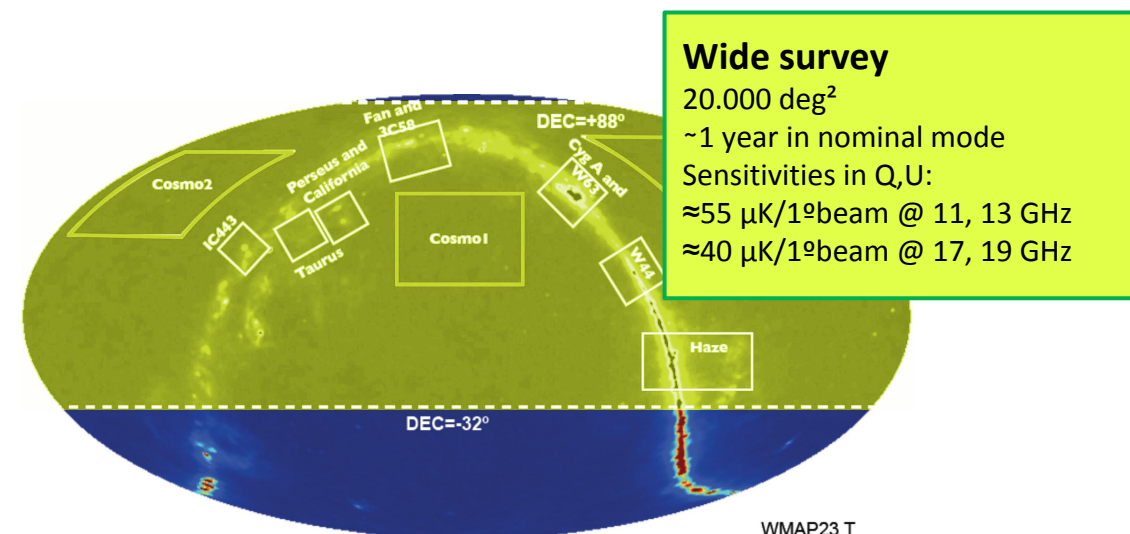
QT2 & TFGI

(Thirty and Forty GHz Instrument)

- 14 pixels at 30 GHz, 15 pixels at 40 GHz
- Angular resolution: 0.32° - 0.26°
- Sensitivity of the full array: $85\text{--}71 \mu\text{K} \cdot \sqrt{s}$
- Observations started in 2018. Now delayed, fixing a problem in the cryostat

QUIJOTE-MFI observations:

- Galactic regions: W49, W51 and IC443 SNRs (Tramonte et al. (in prep)), Taurus (Poidevin et al. (2018)), Perseus (Génova-Santos et al. (2015)), Fan (Ruiz-Granados et al. (in prep.)), Cygnus, W43 W44 W47 (Génova-Santos et al. (2017)), Haze (Guidi et al. (in prep)).
- Cosmological fields 3.000 deg^2 in three regions
- Wide survey 20.000 deg^2



Wide survey

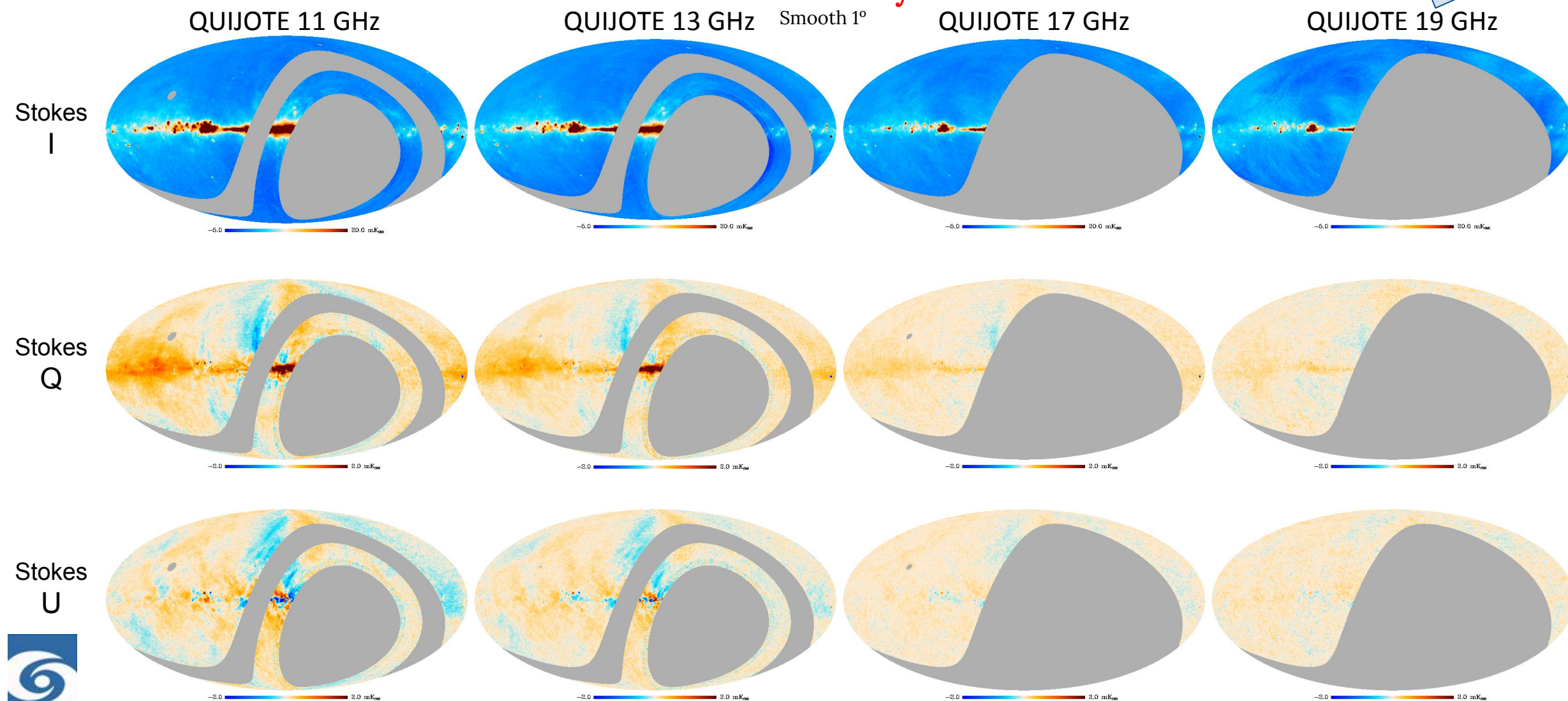
20.000 deg^2
~1 year in nominal mode
Sensitivities in Q,U:
 $\approx 55 \mu\text{K}/1^\circ\text{beam}$ @ 11, 13 GHz
 $\approx 40 \mu\text{K}/1^\circ\text{beam}$ @ 17, 19 GHz

Results:

QUIJOTE-MFI wide-survey maps @ (11,13,17,19)GHz

Preliminary

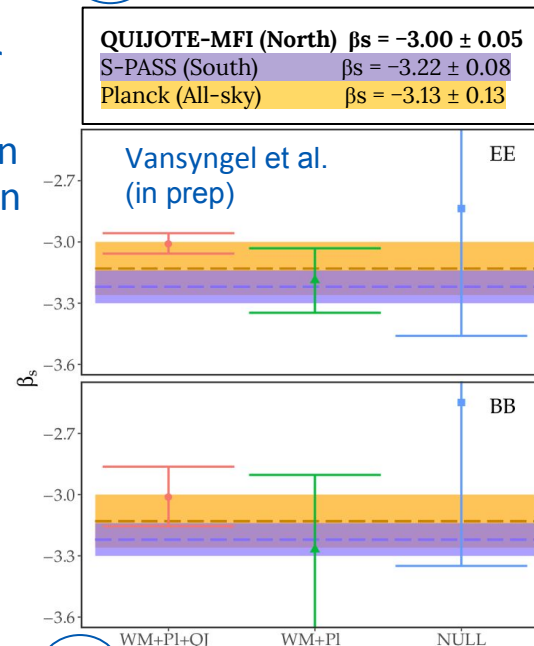
Maps will be
publicly
available soon
Rubiño-Martín et al.
(in prep.)



Science with the QUIJOTE-MFI wide-survey maps

1. Study of compact **Anomalous Microwave Emission (AME)** sources.
2. Analysis of the polarised synchrotron at the power spectrum level.
3. Component separation in intensity and polarization with Neural Networks: significant improvements on the characterization of **polarized synchrotron** and **AME**.
4. Dedicated studies for selected regions:
 - **FAN**
 - **The North Polar Spur**
 - **W49, W51, IC443 SNRs**
 - **Lambda Orionis**
 - **Haze/Fermi Bubbles**
5. QUIJOTE catalog of radio sources.

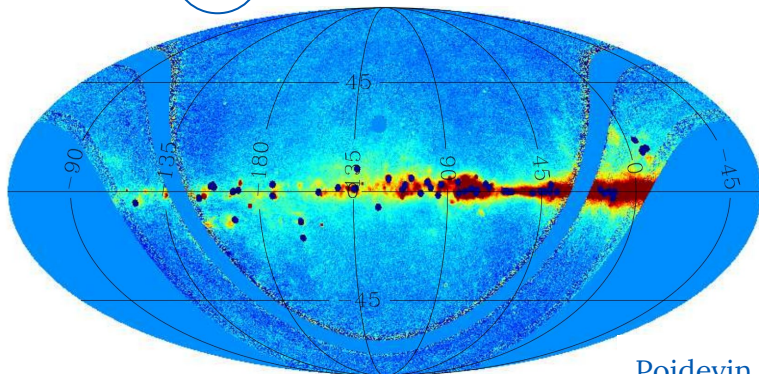
2 Synchrotron spectral index



Papers (in prep):

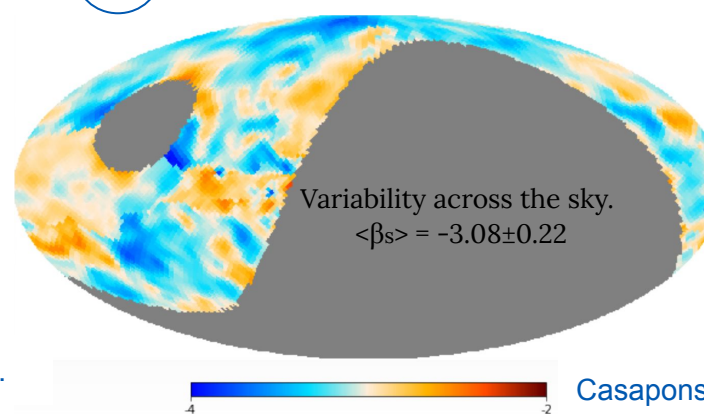
- A northern sky survey at 10-20GHz with the Multi-Frequency Instrument (Rubio-Martin et al.).
- Component separation in intensity with the QUIJOTE-MFI wide survey (Casaponsa et al.).
- Component separation in polarization with the QUIJOTE-MFI wide survey (Casaponsa et al.).
- Polarised synchrotron emission at the power spectrum level in the MFI wide survey (Vansyngel et al.).
- Radio sources in the QUIJOTE-MFI wide survey (Herranz et al.).
- Galactic AME sources in the MFI wide survey (Poidevin et al.).
- The FAN region as seen by QUIJOTE-MFI (Ruiz-Granados et al.).
- The North Galactic Spur as seen by QUIJOTE-MFI (Watson et al.).
- W49, W51 and IC443 SNRs as seen by QUIJOTE (Tramonte et al.).
- AME in Lambda Orionis (Cepeda-Arroita et al.).
- The Haze with QUIJOTE (Guidi et al.).

1 AME sources map



Poidevin et al.
(in prep)

3 Synchrotron spectral index map



Casaponsa et al.
(in prep)

4 Polarization amplitude QJT 11 GHz

