

The QUIJOTE experiment

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Abstract. The QUIJOTE (Q-U-I JOint Tenerife) Experiment† (Rubiño-Martín *et al.* 2010)) is observing the polarization of the Cosmic Microwave Background and other Galactic and extragalactic signals at medium and large angular scales in the frequency range of 10-40 GHz. This experiment is going to provide valuable information about the polarization properties of synchrotron and anomalous microwave emission at these frequencies. It consists of two telescopes and three instruments located at the the Teide Observatory (2400 m) in Tenerife, Canary Islands, Spain. This project has two phases: Phase I, the first telescope (QT1) and a multi-frequency instrument (MFI) are in operations since November 2012 observing between 10 and 20 GHz. A second instrument (TGI) with 31 polarimeters working at 30 GHz is expected to start operations in Autumn 2015 and will be devoted to primordial B-mode science. This instrument will include a fixed polariser and 90 and 180 phase switches to generate four polarization states to minimize the different systematics in the receiver; Phase II, a second QUIJOTE telescope (QT2), already in operation, and a third instrument (FGI) with 40 polarimeters working at 41 GHz, safely below the 60-GHz oxygen absorption band, will significantly increment the sensitivity of the QUIJOTE project to detect the r parameter (tensor-to-scalar ratio). The reason for this is not only the significant reduction of noise due to the number of polarimeters that will incorporate but also the lower synchrotron signal from our galaxy expected at these higher frequencies.

The maps obtained with the multi-frequency instrument (10-20 GHz), in combination with data from other experiments like Planck and the VLA, will be used to clean the diffuse and compact foreground emission at 30 and 40 GHz, the cosmological channels. After three years of effective observations we expect to reach the required sensitivity to detect a primordial gravitational-wave component if the tensor-to-scalar ratio is larger than $r = 0.05$. At the moment we have completed the Wide Survey with the multi-frequency instrument, covering 20.000 square degrees of the Northern hemisphere. In addition, we have deep integrations of our main calibrators Taurus A, Cassiopea A, Jupiter and of the Perseus molecular complex.

In particular, the first results obtained from the measurement of the intensity and polarisation of the anomalous microwave emission in this region, G159.6-18.5, have been recently published in Génova-Santos *et al.* (2015). This article presents the most precise spectrum of the anomalous microwave emission (AME) measured to date in an individual region, with 13 independent data points between 10 and 50 GHz being dominated by this emission. The four QUIJOTE data points provide the first independent confirmation of the downturn of the AME spectrum at low frequencies, initially unveiled by the COSMOlogical Structures On Medium Angular Scales (COSMOSOMAS) experiment in this region. We also have observed several regions of interest for our science program where we plan to study the compact and diffuse polarized emission.

References

- Génova-Santos *et al.* 2015, *MNRAS*, 452, 4169
Rubiño-Martín *et al.* 2008, *Highlights of Spanish Astrophysics V, Part of the series Astrophysics and Space Science Proceedings*, 127-135

† <http://www.iac.es/proyecto/cmb/pages/en/quijote-cmb-experiment.php>