

# SEMINAR

## Grupo de Análise Funcional e Aplicações Functional Analysis and Applications Group

### Quaternion Hyperbolic Fourier Transforms

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#### Abstract

During the last decades, quaternion Fourier transforms (QFT) have been deeply investigated and found applications to color image processing, nuclear magnetic resonance imaging, speech recognition, among others. The two most well-known forms are the two-sided QFT and the right-sided QFT. Several properties, uncertainty principles, time-frequency distributions were studied for these QFT by several authors.

In this seminar, we present the hyperbolic counterpart of the QFT. We show their main properties, inversion formula, Plancherel and Parseval's Theorems. Concerning the uncertainty principles, we show a sharp Pitt's inequality for the two-sided QFT that allows deriving a logarithmic uncertainty principle, and Weyl's–Heisenberg uncertainty principle in our context. Donoho–Stark's uncertainty principle and Benedick's qualitative uncertainty principle are also given together with a hyperbolic Poisson summation formula. These results depend heavily on the properties of gyrogroups that we will introduce and explain. In the limiting case, we recover all the results of the QFT in the Euclidean case.

**Room 11.1.12**  
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