

# Directional Uncertainty Principle for Quaternion Fourier Transform

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**Abstract.** This paper derives a new directional uncertainty principle for quaternion valued functions subject to the quaternion Fourier transformation. This can be generalized to establish directional uncertainty principles in Clifford geometric algebras with quaternion subalgebras. We demonstrate this with the example of a directional spacetime algebra function uncertainty principle related to multivector wave packets.

**Mathematics Subject Classification (2000).** Primary 11R52; Secondary 42A38, 15A66, 83A05, 35L05.

**Keywords.** Geometric algebra, quaternions, uncertainty, multivector wave packets, spacetime algebra.

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In memory of our dear friend Hiroshi Matsushita.