Characterization of the $L^p$-Range of the Poisson Transform on the Octonionic Hyperbolic Plane

Let $B(\mathbb{O}^2) = \{ x \in \mathbb{O}^2, |x| < 1 \}$ be the bounded realization of the exceptional symmetric space $F_4(-20)/\text{Spin}(9)$. For a non-zero real number $\lambda$, we give a necessary and a sufficient condition on eigenfunctions $F$ of the Laplace-Beltrami operator on $B(\mathbb{O}^2)$ with eigenvalue $-(\lambda^2 + \rho^2)$ to have an $L^p$-Poisson integral representations on the boundary $\partial B(\mathbb{O}^2)$. Namely, $F$ is the Poisson integral of an $L^p$-function on the boundary if and only if it satisfies the following growth condition of Hardy-type:

$$\sup_{0 \leq r < 1} (1 - r^2)^{-\frac{1}{p}} \left( \int_{\partial B(\mathbb{O}^2)} |F(r\theta)|^p \, d\theta \right)^{\frac{1}{p}} < \infty.$$ 

This extends previous results by the first author et al. for classical hyperbolic spaces.

**Keywords**: Octonionic hyperbolic plane, Poisson transform, eigenfunctions, Calderon-Zygmund estimates.

**MSC**: 43A85, 42B20