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Symmetry problems in harmonic analysis

Alexander G. Ramm
Kansas State University

Symmetry problems in harmonic analysis are formulated and solved, probably, for the first time. One of these problems is equivalent to the refined Schiffer's conjecture which was recently solved by the author, see [1].

Let $k = const > 0$ be fixed, S^2 be the unit sphere in $\mathbb{R}^3$, D be a connected bounded domain with C^2-smooth boundary S, $j_0(r)$ be the spherical Bessel function.

The harmonic analysis symmetry problems are stated in the following theorems.

Theorem A. *Assume that* $\int_S e^{ik\beta\cdot s}ds = 0$ *for all* $\beta \in S^2$. *Then S is a sphere of radius a, where* $j_0(ka) = 0$.

Theorem B. *Assume that* $\int_D e^{ik\beta\cdot x}dx = 0$ *for all* $\beta \in S^2$. *Then D is a ball.*

Reference

[1] **Alexander G. Ramm**, Symmetry problems. The Navier-Stokes problem, *Morgan& Claypool Publishers, San Rafael, California,* 2019. ISBN 9781681735078