

## THE BEST CONSTANT FOR THE CENTERED MAXIMAL OPERATOR ON RADIAL DECREASING FUNCTIONS

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*Abstract.* We show that the lowest constant appearing in the weak type  $(1,1)$  inequality satisfied by the centered Hardy-Littlewood maximal operator on radial, radially decreasing integrable functions is 1.

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### REFERENCES

- [1] J. M. ALDAZ, *A general covering lemma for the real line*. Real Analysis Exchange, 17 (1991-92), 394–398.
- [2] J. M. ALDAZ, *Remarks on the Hardy-Littlewood maximal function*. Proceedings of the Royal Society of Edinburgh A, 128 (1998), 1–9.
- [3] J. M. ALDAZ, *A remark on the centered  $n$ -dimensional Hardy-Littlewood maximal function*. Czechoslovak Math. J. 50 (125) (2000), no. 1, 103–112.
- [4] J. M. ALDAZ, *Dimension dependency of the weak type  $(1,1)$  bounds for maximal functions associated to finite radial measures*. Bull. Lond. Math. Soc. 39 (2007) 203–208. Also available at the Mathematics ArXiv.
- [5] J. M. ALDAZ, *The weak type  $(1,1)$  bounds for the maximal function associated to cubes grow to infinity with the dimension*. Available at the Mathematics ArXiv.
- [6] J. M. ALDAZ, L. COLZANI, J. PÉREZ LÁZARO, *Optimal bounds on the modulus of continuity of the uncentered Hardy-Littlewood maximal function*. Preprint.
- [7] J. M. ALDAZ, J. PÉREZ LÁZARO, *Functions of bounded variation, the derivative of the one dimensional maximal function, and applications to inequalities*, Trans. Amer. Math. Soc., **359**, 5 (2007), 2443–2461. Also available at the Mathematics ArXiv.
- [8] J. M. ALDAZ, J. PÉREZ LÁZARO, *Boundedness and unboundedness results for some maximal operators on functions of bounded variation*, J. Math. An. Appl., **337**, 1 (2008), 130–143. Also available at the Mathematics ArXiv.
- [9] J. M. ALDAZ, J. PÉREZ LÁZARO, *Behavior of weak type bounds for high dimensional maximal operators defined by certain radial measures*, Positivity (to appear). Available at the Mathematics ArXiv.
- [10] G. AUBRUN, *Maximal inequality for high-dimensional cubes*, Confluentes Mathematici, **1**, 2 (2009), 169–179, DOI No: 10.1142/S1793744209000067. Also available at the Mathematics ArXiv.
- [11] J. M. ALDAZ, J. L. VARONA, *Singular measures and convolution operators*, Acta Math. Sin. (Engl. Ser.), **23**, 3 (2007), 487–490.
- [12] J. BOURGAIN, *On high-dimensional maximal functions associated to convex bodies*, Amer. J. Math., **108**, 6 (1986), 1467–1476.
- [13] J. BOURGAIN, *On the  $L^p$ -bounds for maximal functions associated to convex bodies in  $R^n$* , Israel J. Math., **54**, 3 (1986), 257–265.
- [14] J. BOURGAIN, *On dimension free maximal inequalities for convex symmetric bodies in  $R^n$* , Geometrical aspects of functional analysis (1985/86), 168–176, Lecture Notes in Math., 1267, Springer, Berlin, 1987.

- [15] A. CARBERY, *An almost-orthogonality principle with applications to maximal functions associated to convex bodies*, Bull. Amer. Math. Soc. (N.S.), **14**, 2 (1986), 269–273.
- [16] O. N. CAPRI, N. A. FAVA, *Strong differentiability with respect to product measures*, Studia Math. (1984), 173–178.
- [17] L. COLZANI, E. LAENG, C. MORPURGO, *Symmetrization and norm of the Hardy-Littlewood maximal operator on Lorentz and Marcinkiewicz spaces*, J. London Math. Soc., **77** (2008), 349–362.
- [18] L. GRAFAKOS, J. KINNUNEN, *Sharp inequalities for maximal functions associated with general measures*, Proc. Roy. Soc. Edinburgh Sect. A, **128**, 4 (1998), 717–723.
- [19] L. GRAFAKOS, S. MONTGOMERY-SMITH, *Best constants for uncentred maximal functions*, Bull. London Math. Soc., **29**, 1 (1997), 60–64.
- [20] L. GRAFAKOS, S. MONTGOMERY-SMITH, O. MOTRUNICH, *A sharp estimate for the Hardy-Littlewood maximal function*, Studia Math., **134**, 1 (1999), 57–67.
- [21] J. KINNUNEN, *The Hardy-Littlewood maximal function of a Sobolev function*, Israel J. Math., **100** (1997), 117–124.
- [22] A. D. MELAS, *On the centered Hardy-Littlewood maximal operator*, Trans. Amer. Math. Soc., **354**, 8 (2002), 3263–3273.
- [23] A. D. MELAS, *The best constant for the centered Hardy-Littlewood maximal inequality*, Ann. of Math.(2), **157**, 2 (2003), 647–688.
- [24] M. T. MENÁRGUEZ, F. SORIA, *On the maximal operator associated to a convex body in  $R^n$* , Collect. Math., **43**, 3 (1992), 243–251 (1993).
- [25] D. MÜLLER, *A geometric bound for maximal functions associated to convex bodies*, Pacific J. Math., **142**, 2 (1990), 297–312.
- [26] E. M. STEIN, *The development of square functions in the work of A. Zygmund*, Bull. Amer. Math. Soc. (N.S.), **7**, 2 (1982), 359–376.
- [27] E. M. STEIN, *Three variations on the theme of maximal functions*, Recent progress in Fourier analysis (El Escorial, 1983), 229–244, North-Holland Math. Stud., 111, North-Holland, Amsterdam, 1985.
- [28] E. M. STEIN, *Harmonic analysis: real-variable methods, orthogonality, and oscillatory integrals*, with the assistance of Timothy S. Murphy, Princeton Mathematical Series, 43. Monographs in Harmonic Analysis, III. Princeton University Press, Princeton, NJ, 1993.
- [29] E. M. STEIN, J. O. STRÖMBERG, *Behavior of maximal functions in  $R^n$  for large  $n$* , Ark. Mat., **21**, 2 (1983), 259–269.