

FOURIER MULTIPLIERS ASSOCIATED WITH SINGULAR PARTIAL DIFFERENTIAL OPERATORS

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Abstract. We prove the Hörmander-Mikhlin multiplier theorem for the Fourier transform associated with the Riemann-Liouville operator.

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REFERENCES

- [1] L. E. ANDERSSON, *On the determination of a function from spherical averages*, SIAM. J. Math. Anal., **19**: 214–234, 1988.
- [2] G. E. ANDREWS, R. ASKEY, AND R. ROY, *Special functions*, volume **71**, Cambridge university press, 1999.
- [3] C. BACCAR, N. B. HAMADI, H. HERCH, AND F. MEHERZI, *Inversion of the Riemann-Liouville operator and its dual using wavelets*, Opuscula Math., **35** (6): 867–887, 2015.
- [4] C. BACCAR, N. B. HAMADI, AND L. T. RACHDI, *Inversion formulas for the Riemann-Liouville transform and its dual associated with singular partial differential operators*, Int. J. Math. Math. Sci., **2006**: 1–26, 2006.
- [5] C. BACCAR, N. B. HAMADI, AND L. T. RACHDI, *Best approximation for Weierstrass transform connected with Riemann-Liouville operator*, Commun. Math. Anal., **5** (1), 2008.
- [6] C. BACCAR AND L. RACHDI, *Spaces of DLP-type and a convolution product associated with the Riemann-Liouville operator*, Bull. Math. Anal. Appl., **1** (3): 16–41, 2009.
- [7] W. R. BLOOM AND Z. XU, *Fourier multipliers for L^p on Chébli–Trimèche hypergroups*, Proc. London Math. Soc., **80** (03): 643–664, 2000.
- [8] R. COIFMAN AND G. WEISS, *Analyse harmonique non-commutative sur certains espaces homogènes*, Lecture Notes in Math., **242**: 569–645, 1977.
- [9] J. A. FAWCETT, *Inversion of N -dimensional spherical averages*, SIAM J. Appl. Math., **45** (2): 336–341, 1985.
- [10] V. FISCHER AND M. RUZHANSKY, *Quantization on nilpotent Lie groups*, Progress in Mathematics, volume **314**, Birkhauser, 2016.
- [11] J. GOSELIN AND K. STEMPAK, *A weak-type estimate for Fourier-Bessel multipliers*, Proc. Amer. Math. Sec., **106** (3): 655–662, 1989.
- [12] L. GRAFAKOS, *Classical Fourier Analysis*, volume **2**, Springer, 2008.
- [13] N. B. HAMADI, *Generalized homogeneous Besov spaces associated with the Riemann–Liouville operator*, Internat. J. Math., **26** (02): 21, 2015.
- [14] N. B. HAMADI AND L. T. RACHDI, *Fock spaces and associated operators for singular partial differential operators*, Int. J. Math. Anal., **1** (18): 873–895, 2007.
- [15] N. B. HAMADI AND L. T. RACHDI, *Weyl transforms associated with the Riemann–Liouville operator*, Int. J. Math. Math. Sci., **2006**, 2006.
- [16] H. HELLSTEN AND L.-E. ANDERSSON, *An inverse method for the processing of synthetic aperture radar data*, Inverse problems, **3** (1): 111, 1987.
- [17] M. HERBERTHSON, *A numerical implementation of an inverse formula for carabas raw data*, National Defense Research Institute, Internal Report D, pages 303–304, 1986.

- [18] L. HÖRMANDER, *Estimates for translation invariant operators in L^p spaces*, Acta Math., **104** (1): 93–140, 1960.
- [19] R. KAPELKO, *A multiplier theorem for the Hankel transform*, Rev. Mat. Complut., **11** (2): 281–288, 1998.
- [20] N. N. LEBEDEV, *Special functions and their applications*, Courier Corporation, 1972.
- [21] S. G. MIKHLIN, *The multipliers of Fourier integrals*, Dokl. Akad. Nauk SSSR (N. S.), **109** (4): 701–703, 1956.
- [22] S. OMRI AND L. RACHDI, *Heisenberg-Pauli-Weyl uncertainty principle for the Riemann-Liouville operator*, J. Inequal. Pure Appl. Math, **9** (3): 1–23, 2008.
- [23] M. RUZHANSKY, M. VLADIMIROVICH AND J. WIRTH, *On multipliers on compact Lie groups*, Funct. Anal. Appl., **47** (1): 72–75, 2013.
- [24] M. RUZHANSKY AND J. WIRTH, *L^p Fourier multipliers on compact Lie groups*, Math. Z., **280**: 621–642, 2015.
- [25] E. M. STEIN, *Singular integrals and differentiability properties of functions*, volume **2**, Princeton university press, 1970.