

CONVOLUTION TYPE OPERATORS WITH OSCILLATING
SYMBOLS ON WEIGHTED LEBESGUE SPACES
ON A UNION OF INTERVALS

YURI KARLOVICH and JUAN LORETO HERNÁNDEZ

Abstract. We establish Fredholm criteria for convolution type operators W with oscillating symbols, continuous on \mathbb{R} and admitting mixed (slowly oscillating and semi-almost periodic) discontinuities at $\pm\infty$, on weighted Lebesgue spaces on a union of intervals with weights in a subclass of Muckenhoupt weights.

MSC 2010. 47G10, 47B35.

Key words. Convolution type operator, Wiener-Hopf operator, Muckenhoupt weight, weighted Lebesgue space, slowly oscillating and semi-almost periodic matrix functions, local principle, symbol, Fredholmness.

REFERENCES

- [1] BASTOS, M.A., BRAVO, A. and KARLOVICH, YU.I., *Convolution type operators with symbols generated by slowly oscillating and piecewise continuous matrix functions*, Oper. Theory Adv. Appl., **147** (2004), 151–174.
- [2] BASTOS, M.A., BRAVO, A. and KARLOVICH, YU.I., *Symbol calculus and Fredholmness for a Banach algebra of convolution type operators with slowly oscillating and piecewise continuous data*, Math. Nachr., **269/270** (2004), 11–38.
- [3] BASTOS, M.A., KARLOVICH, YU.I. and DOS SANTOS, A.F., *The invertibility of convolution type operators on a union of intervals and the corona theorem*, Integral Equations Operator Theory, **42** (2002), 22–56.
- [4] BASTOS, M.A., KARLOVICH, YU.I. and SILBERMANN, B., *Toeplitz operators with symbols generated by slowly oscillating and semi-almost periodic matrix functions*, Proc. London Math. Soc., **89** (2004), 697–737.
- [5] BÖTTCHER, A. and KARLOVICH, YU.I., *Carleson Curves, Muckenhoupt Weights, and Toeplitz Operators*, Progress in Mathematics, **154**, Birkhäuser, Basel, 1997.
- [6] BÖTTCHER, A., KARLOVICH, YU.I. and SPITKOVSKY, I.M., *Convolution Operators and Factorization of Almost Periodic Matrix Functions*, Oper. Theory Adv. Appl., **131**, Birkhäuser, Basel, 2002.
- [7] BÖTTCHER, A. and SILBERMANN, B., *Analysis of Toeplitz Operators*, 2nd Ed, Springer, Berlin, 2006.
- [8] DUDUCHAVA, R.V. and SAGINASHVILI, A.I., *Convolution integral equations on a half-line with semi-almost-periodic presymbols* (Russian), Differentsial'nye Uravneniya, **17** (1981), 207–216.
- [9] GARNETT, J.B., *Bounded Analytic Functions*, Academic Press, New York, 1981.
- [10] GOHBERG, I. and FELDMAN, I.A., *Convolution Equations and Projection Methods for Their Solutions*, Translations of Mathematical Monographs, **41**, American Mathematical Society, Providence, R.I., 1974.

Work was partially supported by the SEP-CONACYT Project No. 25564 (México).

- [11] HUNT, R., MUCKENHOUP, B. and WHEEDEN, R., *Weighted norm inequalities for the conjugate function and Hilbert transform*, Trans. Amer. Math. Soc., **176** (1973), 227–251.
- [12] KARLOVICH, YU.I. and LORETO HERNÁNDEZ, J., *Wiener-Hopf operators with semi-almost periodic matrix symbols on weighted Lebesgue spaces*, Integral Equations Operator Theory, **62** (2008), 85–128.
- [13] KARLOVICH, YU.I. and LORETO HERNÁNDEZ, J., *Wiener-Hopf operators with slowly oscillating matrix symbols on weighted Lebesgue spaces*, Integral Equations Operator Theory, **64** (2009), 203–237.
- [14] KARLOVICH, YU.I. and LORETO HERNÁNDEZ, J., *Wiener-Hopf operators with oscillating symbols on weighted Lebesgue spaces*, Recent Trends in Toeplitz and Pseudodifferential Operators, Operator Theory: Advances and Applications, 2010, **210**, pp. 123–145.
- [15] KARLOVICH, YU.I. and SPITKOVSKY, I.M., *Factorization of almost periodic matrix-valued functions and the Noether theory for certain classes of equations of convolution type*, Math. USSR-Izv., **34** (1990), 281–316.
- [16] KARLOVICH, YU.I. and SPITKOVSKY, I.M., *(Semi)-Fredholmness of convolution operators on the spaces of Bessel potentials*, Oper. Theory Adv. Appl., **71** (1994), 122–152.
- [17] PETKOVA, V., *Symbol d'un multiplicateur sur $L^2_\omega(\mathbb{R})$* , Bull. Sci. Math., **128** (2004), 391–415.
- [18] POWER, S.C., *Fredholm Toeplitz operators and slow oscillation*, Canad. J. Math., **32** (1980), 1058–1071.
- [19] SARASON, D., *Toeplitz operators with semi-almost periodic symbols*, Duke Math. J., **44** (1977), 357–364.
- [20] SPITKOVSKY, I.M., *Factorization of several classes of semi-almost periodic matrix functions and applications to systems of convolution equations*, (Russian) Izv. Vyssh. Uchebn. Zaved. Mat., **27** (1983), 107–115.

*UAEM, Facultad de Ciencias
Av. Universidad 1001, Col. Chamilpa
C.P. 62209, Cuernavaca, Morelos, México
E-mail: karlovich@uaem.mx*

*UNAM, Instituto de Matemáticas
Av. Universidad 1001, Col. Chamilpa
C.P. 62210, Cuernavaca, Morelos, México
E-mail: juan@matcuer.unam.mx*