

## SECOND REGULARIZED TRACE OF A DIFFERENTIAL OPERATOR WITH SECOND ORDER UNBOUNDED OPERATOR COEFFICIENT GIVEN IN A FINITE INTERVAL

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*Abstract.* In this work, we establish a formula for the second regularized trace of a second order differential operator with unbounded operator coefficient given in a finite interval.

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### REFERENCES

- [1] I. C. GOHBERG AND M. G. KREIN, *Introduction to the Theory of Linear Non-self Adjoint Operators in Hilbert Space*, Translation of Mathematical Monographs (1969), vol. **18**.
- [2] V. I. GORBACHUK, *On the asymptotic behaviour of the eigenvalues of boundary value problems for differential equations in a space of vector-valued functions*, Ukr. Matem. J. **27** (1975), no. 5, 657–664.
- [3] I. M. GELFAND AND B. M. LEVITAN, *On a formula for eigenvalues of a differential operator of second order*, Dokl. Akad. Nauk SSSR, T. **88** (1953), no. 4, 593–596 (in Russian).
- [4] L. A. DIKIY, *On a formula of Gelfand-Levitan*, Usp. Mat. Nauk **8** (1953), no. 2, 119–123 (in Russian).
- [5] C. J. HALBERG AND V. A. KRAMER, *A generalization of the trace concept*, Duke Math. J. **27** (1960), no. 4, 607–618.
- [6] B. M. LEVITAN, *Calculation of the regularized trace of Sturm Liouville Operator*, Usp. Mat. Nauk **19** (1964), 161–164 (in Russian).
- [7] B. M. LEVITAN AND I. S. SARGSYAN, *Sturm-Liouville and Dirac Operators*, Kluwer, Dordrecht (1991).
- [8] T. C. FULTON AND S. A. PRUESS, *Eigenvalue and eigenfunction asymptotics for regular Sturm-Liouville problems*, J. Math. Anal. Appl. **188** (1994), 297–340.
- [9] E. E. ADIGÜZELOV, *About the trace of the difference of two Sturm-Liouville operators with operator coefficient*, Iz. AN AZ SSR, seriya Fiz-Tekn. i Mat. Nauk **5** (1976), 20–24 (in Russian).
- [10] R. Z. CHALILOVA, *On regularization of the trace of the Sturm-Liouville operator equation*, Funks. analiz, teoriya funktsiy i ik pril. – Mahachkala **3** (1976), 154–161 (in Russian).
- [11] F. G. MAKSUDOV, M. BAYRAMOĞLU AND E. E. ADIGÜZELOV, *On regularized traces of Sturm-Liouville operator on a finite interval with unbounded operator coefficient*, Dokl. Akad. Nauk SSSR, English translation, Soviet Math, Dokl **30** (1984), no. 1, 169–173.
- [12] E. E. ADIGÜZELOV, H. AVCI AND E. GÜL, *The trace formula for Sturm-Liouville operator with operator coefficient*, J. Math. Phys. vol. **42** (2001), no. 6, 1611–1624.
- [13] E. E. ADIGÜZELOV AND Ö. BAĞŞI, *On the regularized trace of the differential operator equation given in a finite interval*, Sigma Journal of Engi. and Natural Sciences 2004/1, 47–55.
- [14] E. GÜL, *The trace formula for a differential operator of fourth order with bounded operator coefficients and two terms*, Turk. J. Math., TÜBITAK **28** (2004), 231–254.
- [15] N. M. ASLANOVA, *A trace formula of a boundary value problem for operator Sturm-Liouville equation*, Sib. Math. J. **49** (2008), no. 6, 959–967.
- [16] M. BAIRAMOĞLU, N. M. ASLANOVA, *Distribution of eigenvalues and trace formula for the Sturm-Liouville operator equation*, Ukr. Math. J. **62** (2010), no. 7, 1005–1007.

- [17] F. GESZTESY, R. WEIKARD, M. ZINCHENKO, *On spectral theory for Schrödinger operators with operator-valued potentials*, Journal of Differential Equations **255** (2013), no. 7, 1784–1827.