Scattering from compact objects, Regge poles and the Complex Angular Momentum method

Mohamed Ould Elhadj, ^{1,*} Tom Stratton, ^{1,†} and Sam R. Dolan ^{1,‡}

¹Consortium for Fundamental Physics,

School of Mathematics and Statistics, University of Sheffield,

Hicks Building, Hounsfield Road, Sheffield S3 7RH, United Kingdom

(Dated: October 1, 2019)

Abstract

To be written

^{*} m.ouldelhadj@sheffield.ac.uk

 $^{^{\}dagger}$ tstratton 1@sheffield.ac.uk

 $^{^{\}ddagger}$ s.dolan@sheffield.ac.uk

I. INTRODUCTION

Blah. hello. some more text.

The topic of time-independent scattering has been studied in detail since the 1960s [1–3], and there now exists a substantial literature [4–24].

$$\cos\left(\frac{1}{2}\theta_R\right) = \frac{1}{n^2} \left[\frac{4 - n^2}{3} \right]^{3/2} \tag{1}$$

(Huygens 1652).

ACKNOWLEDGMENTS

T.S. acknowledges financial support from EPSRC. S.R.D. acknowledges financial support from the European Union's Horizon 2020 research and innovation programme under the H2020-MSCA-RISE-2017 Grant No. FunFiCO-777740, and from the Science and Technology Facilities Council (STFC) under Grant No. ST/P000800/1.

- [1] W. W. Hildreth, The Interaction of Scalar Gravitational Waves with the Schwarzschild Metric., Ph.D. thesis (1964).
- [2] R. A. Matzner, Journal of Mathematical Physics 9, 163 (1968).
- [3] C. Vishveshwara, Nature **227**, 936 (1970).
- [4] B. Mashhoon, Phys. Rev. **D7**, 2807 (1973).
- [5] P. L. Chrzanowski, R. A. Matzner, V. D. Sandberg, and M. P. Ryan, Phys. Rev. **D14**, 317 (1976).
- [6] W. K. De Logi and S. J. Kovacs, Phys. Rev. **D16**, 237 (1977).
- [7] N. G. Sanchez, Phys. Rev. **D18**, 1798 (1978).
- [8] R. A. Matzner and M. P. J. Ryan, The Astrophysical Journal Supplement Series 36, 451 (1978).
- [9] F. A. Handler and R. A. Matzner, Phys. Rev. **D22**, 2331 (1980).
- [10] R. A. Matzner, C. DeWitt-Morette, B. Nelson, and T.-R. Zhang, Phys. Rev. **D31**, 1869 (1985).
- [11] J. A. H. Futterman, F. A. Handler, and R. A. Matzner, *Scattering from black holes* (Cambridge University Press, 2012).
- [12] N. Andersson, Phys. Rev. **D52**, 1808 (1995).
- [13] K. Glampedakis and N. Andersson, Class. Quant. Grav. 18, 1939 (2001), arXiv:gr-qc/0102100 [gr-qc].
- [14] S. Dolan, C. Doran, and A. Lasenby, Phys. Rev. **D74**, 064005 (2006), arXiv:gr-qc/0605031 [gr-qc].
- [15] S. R. Dolan, Phys. Rev. **D77**, 044004 (2008), arXiv:0710.4252 [gr-qc].
- [16] S. R. Dolan, Class. Quant. Grav. 25, 235002 (2008), arXiv:0801.3805 [gr-qc].
- [17] L. C. B. Crispino, S. R. Dolan, and E. S. Oliveira, Phys. Rev. Lett. 102, 231103 (2009), arXiv:0905.3339 [gr-qc].
- [18] I. I. Cotaescu, C. Crucean, and C. A. Sporea, Eur. Phys. J. C76, 102 (2016), arXiv:1409.7201 [gr-qc].
- [19] F. Sorge, Class. Quant. Grav. **32**, 035007 (2015).
- [20] A. Gußmann, Class. Quant. Grav. 34, 065007 (2017), arXiv:1608.00552 [hep-th].
- [21] L. C. S. Leite, S. R. Dolan, and L. C. B. Crispino, Phys. Lett. B774, 130 (2017), arXiv:1707.01144 [gr-qc].

- [22] Y. Nambu, S. Noda, and Y. Sakai, (2019), arXiv:1905.01793 [gr-qc].
- [23] A. Folacci and M. Ould El Hadj, Phys. Rev. **D100**, 064009 (2019), arXiv:1906.01441 [gr-qc].
- [24] L. C. S. Leite, C. L. Benone, and L. C. B. Crispino, Phys. Lett. B795, 496 (2019), arXiv:1907.04746 [gr-qc].