



Universiteit  
Leiden  
The Netherlands

## Transport coefficients and low energy excitations of a strongly interacting holographic fluid

Poovuttikul, N.

### Citation

Poovuttikul, N. (2017, November 16). *Transport coefficients and low energy excitations of a strongly interacting holographic fluid*. *Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/57561>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/57561>

**Note:** To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/57561> holds various files of this Leiden University dissertation

**Author:** Poovuttikul, N.

**Title:** Transport coefficients and low energy excitations of a strongly interacting holographic fluid

**Date:** 2017-11-16

# Bibliography

- [1] <http://www.claymath.org/millennium-problems/yang-mills-and-mass-gap>.
- [2] <http://www.physics.adelaide.edu.au/theory/staff/leinweber/VisualQCD/Nobel/>.
- [3] J. Zaanen, (2010), [arXiv:1012.5461](https://arxiv.org/abs/1012.5461) [cond-mat.supr-con] .
- [4] J. Zaanen, Y. Liu, Y. Sun, and K. Schalm, *Holographic Duality in Condensed Matter Physics* (Cambridge University Press, 2015).
- [5] R. Shankar, *Physica A Statistical Mechanics and its Applications* **177**, 530 (1991).
- [6] J. Polchinski, in *Theoretical Advanced Study Institute (Tasi 92): from Black Holes and Strings to Particles Boulder, Colorado, June 3-28, 1992* (1992) pp. 0235–276, [arXiv:hep-th/9210046](https://arxiv.org/abs/hep-th/9210046) [hep-th] .
- [7] <https://web.science.uu.nl/drstp/Postgr.courses/SPTCM/2015/adscmtreview.pdf>.
- [8] M. Troyer and U.-J. Wiese, *Phys. Rev. Lett.* **94**, 170201 (2005), [arXiv:cond-mat/0408370](https://arxiv.org/abs/cond-mat/0408370) [cond-mat] .
- [9] E. Y. Loh, J. E. Gubernatis, R. T. Scalettar, S. R. White, D. J. Scalapino, and R. L. Sugar, *Phys. Rev. B* **41**, 9301 (1990).

- [10] C. Schmidt, *Proceedings, 24Th International Symposium on Lattice Field Theory (Lattice 2006): Tucson, Usa, July 23-28, 2006*, PoS **LAT2006**, 021 (2006), [arXiv:hep-lat/0610116](https://arxiv.org/abs/hep-lat/0610116) [hep-lat] .
- [11] J. Zaanen, F. Krüger, J. . She, D. Sadri, and S. I. Mukhin, ArXiv e-prints (2008), [arXiv:0802.2455](https://arxiv.org/abs/0802.2455) .
- [12] <http://www.claymath.org/millennium-problems/p-vs-np-problem>.
- [13] A. A. Belavin, A. M. Polyakov, and A. B. Zamolodchikov, *Nucl. Phys.* **B241**, 333 (1984).
- [14] R. Rattazzi, V. S. Rychkov, E. Tonni, and A. Vichi, *JHEP* **12**, 031 (2008), [arXiv:0807.0004](https://arxiv.org/abs/0807.0004) [hep-th] .
- [15] N. Seiberg and E. Witten, *Nucl. Phys.* **B426**, 19 (1994), [Erratum: *Nucl. Phys.*B430,485(1994)], [arXiv:hep-th/9407087](https://arxiv.org/abs/hep-th/9407087) [hep-th] .
- [16] F. Cachazo, P. Svrcek, and E. Witten, *JHEP* **09**, 006 (2004), [arXiv:hep-th/0403047](https://arxiv.org/abs/hep-th/0403047) [hep-th] .
- [17] R. Britto, F. Cachazo, B. Feng, and E. Witten, *Phys. Rev. Lett.* **94**, 181602 (2005), [arXiv:hep-th/0501052](https://arxiv.org/abs/hep-th/0501052) [hep-th] .
- [18] N. Arkani-Hamed and J. Trnka, *JHEP* **10**, 030 (2014), [arXiv:1312.2007](https://arxiv.org/abs/1312.2007) [hep-th] .
- [19] G. 't Hooft, in *Salamfest 1993:0284-296* (1993) pp. 0284–296, [arXiv:gr-qc/9310026](https://arxiv.org/abs/gr-qc/9310026) [gr-qc] .
- [20] L. Susskind, *J. Math. Phys.* **36**, 6377 (1995), [arXiv:hep-th/9409089](https://arxiv.org/abs/hep-th/9409089) [hep-th] .
- [21] A. Strominger and C. Vafa, *Phys. Lett.* **B379**, 99 (1996), [arXiv:hep-th/9601029](https://arxiv.org/abs/hep-th/9601029) [hep-th] .

- [22] J. M. Maldacena, [Int. J. Theor. Phys. \*\*38\*\*, 1113 \(1999\)](#), [Adv. Theor. Math. Phys.2,231(1998)], [arXiv:hep-th/9711200 \[hep-th\]](#) .
- [23] S. A. Hartnoll, P. K. Kovtun, M. Muller, and S. Sachdev, [Phys. Rev. \*\*B76\*\*, 144502 \(2007\)](#), [arXiv:0706.3215 \[cond-mat.str-el\]](#) .
- [24] J. Crossno, J. K. Shi, K. Wang, X. Liu, A. Harzheim, A. Lucas, S. Sachdev, P. Kim, T. Taniguchi, K. Watanabe, *et al.*, [Science \*\*351\*\*, 1058 \(2016\)](#).
- [25] D. Bandurin, I. Torre, R. K. Kumar, M. B. Shalom, A. Tomadin, A. Principi, G. Auton, E. Khestanova, K. Novoselov, I. Grigorieva, *et al.*, [Science \*\*351\*\*, 1055 \(2016\)](#).
- [26] P. J. Moll, P. Kushwaha, N. Nandi, B. Schmidt, and A. P. Mackenzie, [Science \*\*351\*\*, 1061 \(2016\)](#).
- [27] J. Zaanen, [Science \*\*351\*\*, 1026 \(2016\)](#).
- [28] J. Zaanen, [Nature \*\*430\*\*, 512 \(2004\)](#).
- [29] S. Sachdev, *Quantum phase transitions* (Wiley Online Library, 2007).
- [30] P. Kovtun, D. T. Son, and A. O. Starinets, [Phys. Rev. Lett. \*\*94\*\*, 111601 \(2005\)](#), [arXiv:hep-th/0405231 \[hep-th\]](#) .
- [31] A. Adams, L. D. Carr, T. Schäfer, P. Steinberg, and J. E. Thomas, [New J. Phys. \*\*14\*\*, 115009 \(2012\)](#), [arXiv:1205.5180 \[hep-th\]](#) .
- [32] A. Buchel, [Phys. Lett. \*\*B663\*\*, 286 \(2008\)](#), [arXiv:0708.3459 \[hep-th\]](#) .
- [33] M. Haack and A. Yarom, [Nucl. Phys. \*\*B813\*\*, 140 \(2009\)](#), [arXiv:0811.1794 \[hep-th\]](#) .
- [34] A. Cherman, T. D. Cohen, and A. Nellore, [Phys. Rev. \*\*D80\*\*, 066003 \(2009\)](#), [arXiv:0905.0903 \[hep-th\]](#) .
- [35] P. Kovtun and A. Ritz, [Phys. Rev. \*\*D78\*\*, 066009 \(2008\)](#), [arXiv:0806.0110 \[hep-th\]](#) .

- [36] S. A. Hartnoll, *Nature Phys.* **11**, 54 (2015), [arXiv:1405.3651 \[cond-mat.str-el\]](#) .
- [37] J. Maldacena, S. H. Shenker, and D. Stanford, *JHEP* **08**, 106 (2016), [arXiv:1503.01409 \[hep-th\]](#) .
- [38] S. Grozdanov, A. Lucas, S. Sachdev, and K. Schalm, *Phys. Rev. Lett.* **115**, 221601 (2015), [arXiv:1507.00003 \[hep-th\]](#) .
- [39] S. Grozdanov, A. Lucas, and K. Schalm, *Phys. Rev.* **D93**, 061901 (2016), [arXiv:1511.05970 \[hep-th\]](#) .
- [40] S. A. Hartnoll, D. M. Ramirez, and J. E. Santos, *JHEP* **03**, 170 (2016), [arXiv:1601.02757 \[hep-th\]](#) .
- [41] P. Kleinert and J. Probst, *JHEP* **12**, 091 (2016), [arXiv:1610.01081 \[hep-th\]](#) .
- [42] A. Lucas and S. A. Hartnoll, (2017), [arXiv:1704.07384 \[cond-mat.str-el\]](#) .
- [43] P. Burikham and N. Poovuttikul, *Phys. Rev.* **D94**, 106001 (2016), [arXiv:1601.04624 \[hep-th\]](#) .
- [44] S. Grozdanov and N. Poovuttikul, *JHEP* **09**, 046 (2016), [arXiv:1603.08770 \[hep-th\]](#) .
- [45] S. Grozdanov and N. Poovuttikul, To appear .
- [46] D. Gaiotto, A. Kapustin, N. Seiberg, and B. Willett, *JHEP* **02**, 172 (2015), [arXiv:1412.5148 \[hep-th\]](#) .
- [47] S. Grozdanov, D. M. Hofman, and N. Iqbal, *Phys. Rev.* **D95**, 096003 (2017), [arXiv:1610.07392 \[hep-th\]](#) .
- [48] L. Landau and E. Lifshitz, *Fluid Mechanics*, v. 6 (Elsevier Science, 2013).
- [49] L. Rezzolla and O. Zanotti, *Relativistic Hydrodynamics*, EBSCO ebook academic collection (OUP Oxford, 2013).

- [50] R. Baier, P. Romatschke, D. T. Son, A. O. Starinets, and M. A. Stephanov, *JHEP* **04**, 100 (2008), [arXiv:0712.2451 \[hep-th\]](#) .
- [51] P. Kovtun, *Int Summer School on Applications of String Theory Seattle, Washington, Usa, July 18-29, 2011*, *J. Phys.* **A45**, 473001 (2012), [arXiv:1205.5040 \[hep-th\]](#) .
- [52] O. Aharony, S. S. Gubser, J. M. Maldacena, H. Ooguri, and Y. Oz, *Phys. Rept.* **323**, 183 (2000), [arXiv:hep-th/9905111 \[hep-th\]](#) .
- [53] E. D'Hoker and D. Z. Freedman, in *Strings, Branes and Extra Dimensions: Tasi 2001: Proceedings* (2002) pp. 3–158, [arXiv:hep-th/0201253 \[hep-th\]](#) .
- [54] S. A. Hartnoll, *Strings, Supergravity and Gauge Theories. Proceedings, Cern Winter School, Cern, Geneva, Switzerland, February 9-13 2009*, *Class. Quant. Grav.* **26**, 224002 (2009), [arXiv:0903.3246 \[hep-th\]](#) .
- [55] J. McGreevy, *Adv. High Energy Phys.* **2010**, 723105 (2010), [arXiv:0909.0518 \[hep-th\]](#) .
- [56] S. Sachdev, *Ann. Rev. Condensed Matter Phys.* **3**, 9 (2012), [arXiv:1108.1197 \[cond-mat.str-el\]](#) .
- [57] S. A. Hartnoll, A. Lucas, and S. Sachdev, (2016), [arXiv:1612.07324 \[hep-th\]](#) .
- [58] J. Casalderrey-Solana, H. Liu, D. Mateos, K. Rajagopal, and U. Wiedemann, *Gauge/String Duality, Hot QCD and Heavy Ion Collisions* (Cambridge University Press, 2014).
- [59] M. Ammon and J. Erdmenger, *Gauge/gravity Duality: Foundations and Applications* (Cambridge University Press, 2015).
- [60] H. Năstase, *Introduction to the AdS/CFT Correspondence* (Cambridge University Press, 2015).
- [61] K. Jensen, M. Kaminski, P. Kovtun, R. Meyer, A. Ritz, and A. Yarom, *Phys. Rev. Lett.* **109**, 101601 (2012), [arXiv:1203.3556 \[hep-th\]](#) .

- [62] N. Banerjee, J. Bhattacharya, S. Bhattacharyya, S. Jain, S. Minwalla, and T. Sharma, *JHEP* **09**, 046 (2012), [arXiv:1203.3544 \[hep-th\]](#) .
- [63] P. Glorioso and H. Liu, (2016), [arXiv:1612.07705 \[hep-th\]](#) .
- [64] P. Romatschke, *Class. Quant. Grav.* **27**, 025006 (2010), [arXiv:0906.4787 \[hep-th\]](#) .
- [65] R. A. Davison and B. Goutéraux, *JHEP* **01**, 039 (2015), [arXiv:1411.1062 \[hep-th\]](#) .
- [66] R. A. Davison, L. V. Delacrétaz, B. Goutéraux, and S. A. Hartnoll, *Phys. Rev.* **B94**, 054502 (2016), [arXiv:1602.08171 \[cond-mat.supr-con\]](#) .
- [67] L. V. Delacrétaz, B. Goutéraux, S. A. Hartnoll, and A. Karlsson, (2016), [arXiv:1612.04381 \[cond-mat.str-el\]](#) .
- [68] L. V. Delacrétaz, B. Goutéraux, S. A. Hartnoll, and A. Karlsson, (2017), [arXiv:1702.05104 \[cond-mat.str-el\]](#) .
- [69] A. Lucas, *New J. Phys.* **17**, 113007 (2015), [arXiv:1506.02662 \[hep-th\]](#) .
- [70] A. Lucas, J. Crossno, K. C. Fong, P. Kim, and S. Sachdev, *Phys. Rev.* **B93**, 075426 (2016), [arXiv:1510.01738 \[cond-mat.str-el\]](#) .
- [71] V. Scopelliti, K. Schalm, and A. Lucas, (2017), [arXiv:1705.04325 \[cond-mat.str-el\]](#) .
- [72] R. A. Bertlmann, *Anomalies in Quantum Field Theory* (1996).
- [73] J. A. Harvey (2005) [arXiv:hep-th/0509097 \[hep-th\]](#) .
- [74] A. Bilal, (2008), [arXiv:0802.0634 \[hep-th\]](#) .
- [75] M. Nakahara, *Geometry, Topology and Physics, Second Edition*, Graduate student series in physics (Taylor & Francis, 2003).
- [76] S. L. Adler, *Phys. Rev.* **177**, 2426 (1969).



- [77] J. S. Bell and R. Jackiw, [Nuovo Cim. \*\*A60\*\*, 47 \(1969\)](#).
- [78] S. L. Adler and W. A. Bardeen, [Phys. Rev. \*\*182\*\*, 1517 \(1969\)](#).
- [79] L. Álvarez-Gaumé and P. H. Ginsparg, [Annals Phys. \*\*161\*\*, 423 \(1985\)](#), [Erratum: [Annals Phys.171,233\(1986\)](#)].
- [80] K. Fukushima, D. E. Kharzeev, and H. J. Warringa, [Phys. Rev. \*\*D78\*\*, 074033 \(2008\)](#), [arXiv:0808.3382 \[hep-ph\]](#) .
- [81] A. Y. Alekseev, V. V. Cheianov, and J. Fröhlich, [Phys. Rev. Lett. \*\*81\*\*, 3503 \(1998\)](#).
- [82] M. A. Metlitski and A. R. Zhitnitsky, [Phys. Rev. \*\*D72\*\*, 045011 \(2005\)](#), [arXiv:hep-ph/0505072 \[hep-ph\]](#) .
- [83] G. M. Newman and D. T. Son, [Phys. Rev. \*\*D73\*\*, 045006 \(2006\)](#), [arXiv:hep-ph/0510049 \[hep-ph\]](#) .
- [84] D. E. Kharzeev and H. J. Warringa, [Phys. Rev. \*\*D80\*\*, 034028 \(2009\)](#), [arXiv:0907.5007 \[hep-ph\]](#) .
- [85] K. Jensen, [Phys. Rev. \*\*D85\*\*, 125017 \(2012\)](#), [arXiv:1203.3599 \[hep-th\]](#) .
- [86] R. Loganayagam and P. Surowka, [JHEP \*\*04\*\*, 097 \(2012\)](#), [arXiv:1201.2812 \[hep-th\]](#) .
- [87] P. V. Buividovich, [Nucl. Phys. \*\*A925\*\*, 218 \(2014\)](#), [arXiv:1312.1843 \[hep-lat\]](#)  
.
- [88] U. Gürsoy and A. Jansen, [JHEP \*\*1410\*\*, 92 \(2014\)](#), [arXiv:1407.3282 \[hep-th\]](#)  
.
- [89] K. Landsteiner, *Proceedings, 56Th Cracow School of Theoretical Physics : a Panorama of Holography: Zakopane, Poland, May 24-June 1, 2016*, [Acta Phys. Polon. \*\*B47\*\*, 2617 \(2016\)](#), [arXiv:1610.04413 \[hep-th\]](#) .
- [90] M. Kalb and P. Ramond, [Phys. Rev. \*\*D9\*\*, 2273 \(1974\)](#).

- [91] Z. Nussinov and G. Ortiz, *Annals Phys.* **324**, 977 (2009).
- [92] A. Kapustin and R. Thorngren, (2013), [arXiv:1309.4721 \[hep-th\]](#) .
- [93] B. Horn, A. Nicolis, and R. Penco, *JHEP* **10**, 153 (2015), [arXiv:1507.05635 \[hep-th\]](#) .
- [94] A. Esposito, R. Krichevsky, and A. Nicolis, (2017), [arXiv:1704.08267 \[hep-th\]](#) .
- [95] A. Nicolis and R. Penco, (2017), [arXiv:1705.08914 \[hep-th\]](#) .
- [96] A. J. Beekman, J. Nissinen, K. Wu, and J. Zaanen, (2017), [arXiv:1703.03157 \[cond-mat.str-el\]](#) .
- [97] H. Kleinert, *Path Integrals in Quantum Mechanics, Statistics, Polymer Physics, and Financial Markets*, EBL-Schweitzer (World Scientific, 2009).
- [98] K.-c. Chou, Z.-b. Su, B.-l. Hao, and L. Yu, *Phys. Rept.* **118**, 1 (1985).
- [99] G. D. Moore and K. A. Sohrobi, *Phys. Rev. Lett.* **106**, 122302 (2011), [arXiv:1007.5333 \[hep-ph\]](#) .
- [100] S. S. Gubser, I. R. Klebanov, and A. M. Polyakov, *Phys. Lett.* **B428**, 105 (1998), [arXiv:hep-th/9802109 \[hep-th\]](#) .
- [101] E. Witten, *Adv. Theor. Math. Phys.* **2**, 253 (1998), [arXiv:hep-th/9802150 \[hep-th\]](#) .
- [102] S. de Haro, S. N. Solodukhin, and K. Skenderis, *Commun. Math. Phys.* **217**, 595 (2001), [arXiv:hep-th/0002230 \[hep-th\]](#) .
- [103] G. Policastro, D. T. Son, and A. O. Starinets, *Phys. Rev. Lett.* **87**, 081601 (2001), [arXiv:hep-th/0104066 \[hep-th\]](#) .
- [104] G. Policastro, D. T. Son, and A. O. Starinets, *JHEP* **09**, 043 (2002), [arXiv:hep-th/0205052 \[hep-th\]](#) .

- [105] G. Policastro, D. T. Son, and A. O. Starinets, *JHEP* **12**, 054 (2002), [arXiv:hep-th/0210220 \[hep-th\]](#) .
- [106] C. P. Herzog, *JHEP* **12**, 026 (2002), [arXiv:hep-th/0210126 \[hep-th\]](#) .
- [107] A. Buchel, *Nucl. Phys.* **B708**, 451 (2005), [arXiv:hep-th/0406200 \[hep-th\]](#) .
- [108] P. Benincasa, A. Buchel, and A. O. Starinets, *Nucl. Phys.* **B733**, 160 (2006), [arXiv:hep-th/0507026 \[hep-th\]](#) .
- [109] A. Parnachev and A. Starinets, *JHEP* **10**, 027 (2005), [arXiv:hep-th/0506144 \[hep-th\]](#) .
- [110] S. Bhattacharyya, V. E. Hubeny, S. Minwalla, and M. Rangamani, *JHEP* **02**, 045 (2008), [arXiv:0712.2456 \[hep-th\]](#) .
- [111] S. Bhattacharyya, R. Loganayagam, I. Mandal, S. Minwalla, and A. Sharma, *JHEP* **12**, 116 (2008), [arXiv:0809.4272 \[hep-th\]](#) .
- [112] N. Banerjee, J. Bhattacharya, S. Bhattacharyya, S. Dutta, R. Loganayagam, and P. Surowka, *JHEP* **01**, 094 (2011), [arXiv:0809.2596 \[hep-th\]](#) .
- [113] J. Erdmenger, M. Haack, M. Kaminski, and A. Yarom, *JHEP* **01**, 055 (2009), [arXiv:0809.2488 \[hep-th\]](#) .
- [114] L. Susskind and E. Witten, (1998), [arXiv:hep-th/9805114 \[hep-th\]](#) .
- [115] A. W. Peet and J. Polchinski, *Phys. Rev.* **D59**, 065011 (1999), [arXiv:hep-th/9809022 \[hep-th\]](#) .
- [116] T. Faulkner, H. Liu, and M. Rangamani, *JHEP* **08**, 051 (2011), [arXiv:1010.4036 \[hep-th\]](#) .
- [117] I. Heemskerk and J. Polchinski, *JHEP* **06**, 031 (2011), [arXiv:1010.1264 \[hep-th\]](#) .
- [118] S. Grozdanov, *JHEP* **06**, 079 (2012), [arXiv:1112.3356 \[hep-th\]](#) .

- [119] D. Z. Freedman, S. S. Gubser, K. Pilch, and N. P. Warner, *Adv. Theor. Math. Phys.* **3**, 363 (1999), [arXiv:hep-th/9904017 \[hep-th\]](#) .
- [120] K. Skenderis and P. K. Townsend, *Phys. Lett.* **B468**, 46 (1999), [arXiv:hep-th/9909070 \[hep-th\]](#) .
- [121] C. Charmousis, B. Gouteraux, B. S. Kim, E. Kiritsis, and R. Meyer, *JHEP* **11**, 151 (2010), [arXiv:1005.4690 \[hep-th\]](#) .
- [122] B. Gouteraux and E. Kiritsis, *JHEP* **12**, 036 (2011), [arXiv:1107.2116 \[hep-th\]](#) .
- [123] R. Meyer, B. Gouteraux, and B. S. Kim, *String Theory 2010. Proceedings, 16Th European Workshop, Madrid, Spain, June 14-18, 2010*, *Fortsch. Phys.* **59**, 741 (2011), [arXiv:1102.4433 \[hep-th\]](#) .
- [124] M. Blake and A. Donos, *Phys. Rev. Lett.* **114**, 021601 (2015), [arXiv:1406.1659 \[hep-th\]](#) .
- [125] K. S. Thorne, R. H. Price, and D. A. Macdonald, eds., *Black Holes: the Membrane Paradigm* (1986).
- [126] N. Iqbal and H. Liu, *Phys. Rev.* **D79**, 025023 (2009), [arXiv:0809.3808 \[hep-th\]](#) .
- [127] D. Nickel and D. T. Son, *New J. Phys.* **13**, 075010 (2011), [arXiv:1009.3094 \[hep-th\]](#) .
- [128] I. Bredberg, C. Keeler, V. Lysov, and A. Strominger, *JHEP* **03**, 141 (2011), [arXiv:1006.1902 \[hep-th\]](#) .
- [129] E. Banks, A. Donos, and J. P. Gauntlett, *JHEP* **10**, 103 (2015), [arXiv:1507.00234 \[hep-th\]](#) .
- [130] E. Banks, A. Donos, J. P. Gauntlett, T. Griffin, and L. Melgar, *Class. Quant. Grav.* **34**, 045001 (2017), [arXiv:1609.08912 \[hep-th\]](#) .

- [131] F. Denef, S. A. Hartnoll, and S. Sachdev, *Phys. Rev.* **D80**, 126016 (2009), [arXiv:0908.1788 \[hep-th\]](#) .
- [132] F. Denef, S. A. Hartnoll, and S. Sachdev, *Class. Quant. Grav.* **27**, 125001 (2010), [arXiv:0908.2657 \[hep-th\]](#) .
- [133] S. Caron-Huot and O. Saremi, *JHEP* **11**, 013 (2010), [arXiv:0909.4525 \[hep-th\]](#) .
- [134] P. Arnold, P. Szepietowski, and D. Vaman, *JHEP* **07**, 032 (2016), [arXiv:1603.08994 \[hep-th\]](#) .
- [135] M. T. Grisaru and D. Zanon, *Phys. Lett.* **B177**, 347 (1986).
- [136] M. D. Freeman, C. N. Pope, M. F. Sohnius, and K. S. Stelle, *Phys. Lett.* **B178**, 199 (1986).
- [137] D. J. Gross and E. Witten, *Nucl. Phys.* **B277**, 1 (1986).
- [138] J. Pawelczyk and S. Theisen, *JHEP* **09**, 010 (1998), [arXiv:hep-th/9808126 \[hep-th\]](#) .
- [139] S. S. Gubser, I. R. Klebanov, and A. A. Tseytlin, *Nucl. Phys.* **B534**, 202 (1998), [arXiv:hep-th/9805156 \[hep-th\]](#) .
- [140] A. Buchel, J. T. Liu, and A. O. Starinets, *Nucl. Phys.* **B707**, 56 (2005), [arXiv:hep-th/0406264 \[hep-th\]](#) .
- [141] A. Buchel, R. C. Myers, M. F. Paulos, and A. Sinha, *Phys.Lett.* **B669**, 364 (2008), [arXiv:0808.1837 \[hep-th\]](#) .
- [142] J. de Boer, M. Kulaxizi, and A. Parnachev, *JHEP* **1003**, 087 (2010), [arXiv:0910.5347 \[hep-th\]](#) .
- [143] A. Buchel, J. Escobedo, R. C. Myers, M. F. Paulos, A. Sinha, *et al.*, *JHEP* **1003**, 111 (2010), [arXiv:0911.4257 \[hep-th\]](#) .
- [144] X. O. Camanho and J. D. Edelstein, *JHEP* **1006**, 099 (2010), [arXiv:0912.1944 \[hep-th\]](#) .

- [145] K. Skenderis, M. Taylor, and B. C. van Rees, *JHEP* **09**, 045 (2009), [arXiv:0906.4926 \[hep-th\]](#) .
- [146] X. O. Camanho, J. D. Edelstein, J. Maldacena, and A. Zhiboedov, (2014), [arXiv:1407.5597 \[hep-th\]](#) .
- [147] R. C. Myers, S. Sachdev, and A. Singh, *Phys. Rev.* **D83**, 066017 (2011), [arXiv:1010.0443 \[hep-th\]](#) .
- [148] P. M. Hohler and M. A. Stephanov, *Phys. Rev.* **D80**, 066002 (2009), [arXiv:0905.0900 \[hep-th\]](#) .
- [149] S. Grozdanov and A. O. Starinets, *JHEP* **03**, 007 (2015), [arXiv:1412.5685 \[hep-th\]](#) .
- [150] F. M. Haehl, R. Loganayagam, and M. Rangamani, *JHEP* **05**, 060 (2015), [arXiv:1502.00636 \[hep-th\]](#) .
- [151] S. A. Hartnoll and C. P. Herzog, *Phys. Rev.* **D77**, 106009 (2008), [arXiv:0801.1693 \[hep-th\]](#) .
- [152] M. Müller, J. Schmalian, and L. Fritz, *Physical review letters* **103**, 025301 (2009).
- [153] G. T. Horowitz, J. E. Santos, and D. Tong, *JHEP* **07**, 168 (2012), [arXiv:1204.0519 \[hep-th\]](#) .
- [154] P. Chesler, A. Lucas, and S. Sachdev, *Phys. Rev.* **D89**, 026005 (2014), [arXiv:1308.0329 \[hep-th\]](#) .
- [155] Y. Ling, C. Niu, J.-P. Wu, and Z.-Y. Xian, *JHEP* **11**, 006 (2013), [arXiv:1309.4580 \[hep-th\]](#) .
- [156] M. Rangamani, M. Rozali, and D. Smyth, *JHEP* **07**, 024 (2015), [arXiv:1505.05171 \[hep-th\]](#) .
- [157] A. Donos and J. P. Gauntlett, *JHEP* **01**, 035 (2015), [arXiv:1409.6875 \[hep-th\]](#) .

- [158] A. Donos and J. P. Gauntlett, *JHEP* **06**, 007 (2014), [arXiv:1401.5077 \[hep-th\]](#) .
- [159] D. K. O’Keeffe and A. W. Peet, *Phys. Rev.* **D92**, 046004 (2015), [arXiv:1504.03288 \[hep-th\]](#) .
- [160] A. Lucas and S. Sachdev, *Nucl. Phys.* **B892**, 239 (2015), [arXiv:1411.3331 \[hep-th\]](#) .
- [161] A. Lucas, S. Sachdev, and K. Schalm, *Phys. Rev.* **D89**, 066018 (2014), [arXiv:1401.7993 \[hep-th\]](#) .
- [162] M. Blake, D. Tong, and D. Vegh, *Phys. Rev. Lett.* **112**, 071602 (2014), [arXiv:1310.3832 \[hep-th\]](#) .
- [163] D. Vegh, (2013), [arXiv:1301.0537 \[hep-th\]](#) .
- [164] R. A. Davison, K. Schalm, and J. Zaanen, *Phys. Rev.* **B89**, 245116 (2014), [arXiv:1311.2451 \[hep-th\]](#) .
- [165] K.-Y. Kim, K. K. Kim, Y. Seo, and S.-J. Sin, *JHEP* **12**, 170 (2014), [arXiv:1409.8346 \[hep-th\]](#) .
- [166] B. Goutéraux, *JHEP* **04**, 181 (2014), [arXiv:1401.5436 \[hep-th\]](#) .
- [167] A. Amoretti and D. Musso, *JHEP* **09**, 094 (2015), [arXiv:1502.02631 \[hep-th\]](#) .
- [168] A. Donos and J. P. Gauntlett, *JHEP* **04**, 040 (2014), [arXiv:1311.3292 \[hep-th\]](#) .
- [169] A. Amoretti, A. Braggio, N. Maggiore, N. Magnoli, and D. Musso, *Phys. Rev.* **D91**, 025002 (2015), [arXiv:1407.0306 \[hep-th\]](#) .
- [170] A. Amoretti, A. Braggio, N. Maggiore, N. Magnoli, and D. Musso, *JHEP* **09**, 160 (2014), [arXiv:1406.4134 \[hep-th\]](#) .
- [171] M. Blake and D. Tong, *Phys. Rev.* **D88**, 106004 (2013), [arXiv:1308.4970 \[hep-th\]](#) .

- [172] R. A. Davison and B. Goutéraux, *JHEP* **09**, 090 (2015), [arXiv:1505.05092 \[hep-th\]](#) .
- [173] L. Alberte, M. Baggioli, A. Khmel'nitsky, and O. Pujolas, (2015), [arXiv:1510.09089 \[hep-th\]](#) .
- [174] S. A. Hartnoll, D. M. Ramirez, and J. E. Santos, *JHEP* **04**, 022 (2016), [arXiv:1508.04435 \[hep-th\]](#) .
- [175] A. Donos and J. P. Gauntlett, *Phys. Rev.* **D92**, 121901 (2015), [arXiv:1506.01360 \[hep-th\]](#) .
- [176] A. Donos, J. P. Gauntlett, T. Griffin, and L. Melgar, (2015), [arXiv:1511.00713 \[hep-th\]](#) .
- [177] M. Blake, *JHEP* **09**, 010 (2015), [arXiv:1505.06992 \[hep-th\]](#) .
- [178] M. Blake, *JHEP* **10**, 078 (2015), [arXiv:1507.04870 \[hep-th\]](#) .
- [179] Y. Bardoux, M. M. Caldarelli, and C. Charmousis, *JHEP* **05**, 054 (2012), [arXiv:1202.4458 \[hep-th\]](#) .
- [180] T. Andrade and B. Withers, *JHEP* **05**, 101 (2014), [arXiv:1311.5157 \[hep-th\]](#) .
- [181] M. Baggioli and O. Pujolas, *Phys. Rev. Lett.* **114**, 251602 (2015), [arXiv:1411.1003 \[hep-th\]](#) .
- [182] S. Bhattacharyya, R. Loganayagam, S. Minwalla, S. Nampuri, S. P. Trivedi, and S. R. Wadia, *JHEP* **02**, 018 (2009), [arXiv:0806.0006 \[hep-th\]](#) .
- [183] M. Rangamani, *Strings, Supergravity and Gauge Theories. Proceedings, Cern Winter School, Cern, Geneva, Switzerland, February 9-13 2009*, *Class. Quant. Grav.* **26**, 224003 (2009), [arXiv:0905.4352 \[hep-th\]](#) .
- [184] S. Grozdanov and N. Kaplis, *Phys. Rev.* **D93**, 066012 (2016), [arXiv:1507.02461 \[hep-th\]](#) .



- [185] L. Alberte, M. Baggioli, and O. Pujolas, (2016), [arXiv:1601.03384 \[hep-th\]](#) .
- [186] S. Bhattacharyya, [JHEP \*\*07\*\*, 104 \(2012\)](#), [arXiv:1201.4654 \[hep-th\]](#) .
- [187] R. Loganayagam, [JHEP \*\*05\*\*, 087 \(2008\)](#), [arXiv:0801.3701 \[hep-th\]](#) .
- [188] P. Arnold, D. Vaman, C. Wu, and W. Xiao, [JHEP \*\*10\*\*, 033 \(2011\)](#), [arXiv:1105.4645 \[hep-th\]](#) .
- [189] S. Weinberg, *The Quantum Theory of Fields. Vol. 2: Modern Applications* (Cambridge University Press, 2013).
- [190] G. 't Hooft, *Cargese Summer Institute: Recent Developments in Gauge Theories Cargese, France, August 26-September 8, 1979*, NATO Sci. Ser. B **59**, 135 (1980).
- [191] V. P. Nair, R. Ray, and S. Roy, [Phys. Rev. \*\*D86\*\*, 025012 \(2012\)](#), [arXiv:1112.4022 \[hep-th\]](#) .
- [192] A. V. Sadofyev and M. V. Isachenkov, [Phys. Lett. \*\*B697\*\*, 404 \(2011\)](#), [arXiv:1010.1550 \[hep-th\]](#) .
- [193] A. V. Sadofyev, V. I. Shevchenko, and V. I. Zakharov, [Phys. Rev. \*\*D83\*\*, 105025 \(2011\)](#), [arXiv:1012.1958 \[hep-th\]](#) .
- [194] K. Jensen, P. Kovtun, and A. Ritz, [JHEP \*\*10\*\*, 186 \(2013\)](#), [arXiv:1307.3234 \[hep-th\]](#) .
- [195] D. T. Son and P. Surowka, [Phys. Rev. Lett. \*\*103\*\*, 191601 \(2009\)](#), [arXiv:0906.5044 \[hep-th\]](#) .
- [196] Y. Neiman and Y. Oz, [JHEP \*\*03\*\*, 023 \(2011\)](#), [arXiv:1011.5107 \[hep-th\]](#) .
- [197] J. Polonyi, [Annals Phys. \*\*342\*\*, 239 \(2014\)](#), [arXiv:1302.3864 \[hep-th\]](#) .
- [198] J. Polonyi, [Symmetry \*\*8\*\*, 25 \(2016\)](#), [arXiv:1503.08500 \[cond-mat.stat-mech\]](#) .

- [199] K. Jensen, R. Loganayagam, and A. Yarom, *JHEP* **02**, 088 (2013), [arXiv:1207.5824 \[hep-th\]](#) .
- [200] D. Kharzeev and A. Zhitnitsky, *Nucl. Phys.* **A797**, 67 (2007), [arXiv:0706.1026 \[hep-ph\]](#) .
- [201] D. E. Kharzeev and D. T. Son, *Phys. Rev. Lett.* **106**, 062301 (2011), [arXiv:1010.0038 \[hep-ph\]](#) .
- [202] R. Loganayagam, *JHEP* **11**, 205 (2013), [arXiv:1211.3850 \[hep-th\]](#) .
- [203] K. Jensen, R. Loganayagam, and A. Yarom, *JHEP* **05**, 110 (2014), [arXiv:1311.2935 \[hep-th\]](#) .
- [204] T. Azeyanagi, R. Loganayagam, G. S. Ng, and M. J. Rodriguez, *JHEP* **08**, 040 (2014), [arXiv:1311.2940 \[hep-th\]](#) .
- [205] M. Torabian and H.-U. Yee, *JHEP* **08**, 020 (2009), [arXiv:0903.4894 \[hep-th\]](#) .
- [206] K. Landsteiner, E. Megias, L. Melgar, and F. Pena-Benitez, *JHEP* **09**, 121 (2011), [arXiv:1107.0368 \[hep-th\]](#) .
- [207] K. Landsteiner, E. Megias, and F. Pena-Benitez, *Phys. Rev. Lett.* **107**, 021601 (2011), [arXiv:1103.5006 \[hep-ph\]](#) .
- [208] S. Golkar and D. T. Son, *JHEP* **02**, 169 (2015), [arXiv:1207.5806 \[hep-th\]](#) .
- [209] D.-F. Hou, H. Liu, and H.-c. Ren, *Phys. Rev.* **D86**, 121703 (2012), [arXiv:1210.0969 \[hep-th\]](#) .
- [210] E. V. Gorbar, V. A. Miransky, I. A. Shovkovy, and X. Wang, *Phys. Rev.* **D88**, 025025 (2013), [arXiv:1304.4606 \[hep-ph\]](#) .
- [211] K. Huang, Y. Koike, and J. Polonyi, *Int. J. Mod. Phys.* **A6**, 1267 (1991).
- [212] A. Yamamoto, *Phys. Rev.* **D84**, 114504 (2011), [arXiv:1111.4681 \[hep-lat\]](#) .

- [213] A. Yamamoto, *Phys. Rev. Lett.* **107**, 031601 (2011), [arXiv:1105.0385 \[hep-lat\]](#) .
- [214] K. Fukushima and M. Ruggieri, *Phys. Rev.* **D82**, 054001 (2010), [arXiv:1004.2769 \[hep-ph\]](#) .
- [215] A. Gynther, K. Landsteiner, F. Pena-Benitez, and A. Rebhan, *JHEP* **1102**, 110 (2011), [arXiv:1005.2587 \[hep-th\]](#) .
- [216] I. Amado, K. Landsteiner, and F. Pena-Benitez, *JHEP* **05**, 081 (2011), [arXiv:1102.4577 \[hep-th\]](#) .
- [217] U. Gursoy and J. Tarrío, *JHEP* **10**, 058 (2015), [arXiv:1410.1306 \[hep-th\]](#) .
- [218] M. T. Grisaru, A. E. M. van de Ven, and D. Zanon, *Phys. Lett.* **B173**, 423 (1986).
- [219] D. J. Gross and J. H. Sloan, *Nucl. Phys.* **B291**, 41 (1987).
- [220] Y. Kats and P. Petrov, *JHEP* **0901**, 044 (2009), [arXiv:0712.0743 \[hep-th\]](#) .
- [221] M. Brigante, H. Liu, R. C. Myers, S. Shenker, and S. Yaida, *Phys.Rev.* **D77**, 126006 (2008), [arXiv:0712.0805 \[hep-th\]](#) .
- [222] A. Buchel, *Phys. Lett.* **B665**, 298 (2008), [arXiv:0804.3161 \[hep-th\]](#) .
- [223] R. C. Myers, M. F. Paulos, and A. Sinha, *JHEP* **06**, 006 (2009), [arXiv:0903.2834 \[hep-th\]](#) .
- [224] E. Shaverin and A. Yarom, *JHEP* **04**, 013 (2013), [arXiv:1211.1979 \[hep-th\]](#) .
- [225] S. Grozdanov and A. O. Starinets, *Theor. Math. Phys.* **182**, 61 (2015), [*Teor. Mat. Fiz.*182,no.1,76(2014)].
- [226] E. Shaverin, (2015), [arXiv:1509.05418 \[hep-th\]](#) .
- [227] M. Ostrogradsky, (*Mem. Ac. St. Petersburg* VI 4 (1850) 385).

- [228] R. P. Woodard, [Scholarpedia](#) **10**, 32243 (2015), [arXiv:1506.02210 \[hep-th\]](#) .
- [229] K. Landsteiner, E. Megias, and F. Pena-Benitez, *Workshop on QCD in Strong Magnetic Fields Trento, Italy, November 12-16, 2012*, [Lect. Notes Phys.](#) **871**, 433 (2013), [arXiv:1207.5808 \[hep-th\]](#) .
- [230] D. Anninos and G. Pastras, [JHEP](#) **07**, 030 (2009), [arXiv:0807.3478 \[hep-th\]](#) .
- [231] Y. Kats, L. Motl, and M. Padi, [JHEP](#) **0712**, 068 (2007), [arXiv:hep-th/0606100 \[hep-th\]](#) .
- [232] S. Grozdanov and A. O. Starinets, [JHEP](#) **03**, 166 (2017), [arXiv:1611.07053 \[hep-th\]](#) .
- [233] C. Csaki, H. Ooguri, Y. Oz, and J. Terning, [JHEP](#) **01**, 017 (1999), [arXiv:hep-th/9806021 \[hep-th\]](#) .
- [234] A. Karch, E. Katz, D. T. Son, and M. A. Stephanov, [Phys. Rev.](#) **D74**, 015005 (2006), [arXiv:hep-ph/0602229 \[hep-ph\]](#) .
- [235] U. Gursoy, E. Kiritsis, and F. Nitti, [JHEP](#) **02**, 019 (2008), [arXiv:0707.1349 \[hep-th\]](#) .
- [236] B. Batell and T. Gherghetta, [Phys. Rev.](#) **D78**, 026002 (2008), [arXiv:0801.4383 \[hep-ph\]](#) .
- [237] B. Batell, T. Gherghetta, and D. Sword, [Phys. Rev.](#) **D78**, 116011 (2008), [arXiv:0808.3977 \[hep-ph\]](#) .
- [238] C. P. Herzog, [Phys. Rev. Lett.](#) **98**, 091601 (2007), [arXiv:hep-th/0608151 \[hep-th\]](#) .
- [239] K. Copsey and R. Mann, [JHEP](#) **04**, 079 (2013), [arXiv:1210.1231 \[hep-th\]](#) .
- [240] S. S. Gubser and F. D. Rocha, [Phys. Rev.](#) **D81**, 046001 (2010), [arXiv:0911.2898 \[hep-th\]](#) .

- [241] L. Huijse, S. Sachdev, and B. Swingle, *Phys. Rev.* **B85**, 035121 (2012), [arXiv:1112.0573 \[cond-mat.str-el\]](#) .
- [242] M. Cvetič, M. J. Duff, P. Hoxha, J. T. Liu, H. Lu, J. X. Lu, R. Martínez-Acosta, C. N. Pope, H. Sati, and T. A. Tran, *Nucl. Phys.* **B558**, 96 (1999), [arXiv:hep-th/9903214 \[hep-th\]](#) .
- [243] I. R. Klebanov, P. Ouyang, and E. Witten, *Phys. Rev.* **D65**, 105007 (2002), [arXiv:hep-th/0202056 \[hep-th\]](#) .
- [244] C. Hoyos, T. Nishioka, and A. O’Bannon, *JHEP* **1110**, 084 (2011), [arXiv:1106.4030 \[hep-th\]](#) .
- [245] S. S. Gubser, *Adv. Theor. Math. Phys.* **4**, 679 (2000), [arXiv:hep-th/0002160 \[hep-th\]](#) .
- [246] R. Casero, E. Kiritsis, and A. Paredes, *Nucl. Phys.* **B787**, 98 (2007), [arXiv:hep-th/0702155 \[HEP-TH\]](#) .
- [247] A. Jimenez-Alba, K. Landsteiner, and L. Melgar, *Phys. Rev.* **D90**, 126004 (2014), [arXiv:1407.8162 \[hep-th\]](#) .
- [248] A. Donos and J. P. Gauntlett, *JHEP* **11**, 081 (2014), [arXiv:1406.4742 \[hep-th\]](#) .
- [249] S. Jain, N. Kundu, K. Sen, A. Sinha, and S. P. Trivedi, *JHEP* **01**, 005 (2015), [arXiv:1406.4874 \[hep-th\]](#) .
- [250] S. Jain, R. Samanta, and S. P. Trivedi, (2015), [arXiv:1506.01899 \[hep-th\]](#) .
- [251] K. Jensen, M. Kaminski, P. Kovtun, R. Meyer, A. Ritz, and A. Yarom, *JHEP* **05**, 102 (2012), [arXiv:1112.4498 \[hep-th\]](#) .
- [252] J. E. Avron, R. Seiler, and P. G. Zograf, *Phys. Rev. Lett.* **75**, 697 (1995).
- [253] J. E. Avron, ArXiv Physics e-prints (1997), [physics/9712050](#) .
- [254] C. Hoyos, *Int. J. Mod. Phys.* **B28**, 1430007 (2014), [arXiv:1403.4739 \[cond-mat.mes-hall\]](#) .

- [255] O. Saremi and D. T. Son, [JHEP \*\*04\*\*, 091 \(2012\)](#), [arXiv:1103.4851 \[hep-th\]](#) .
- [256] A. Castro, S. Detournay, N. Iqbal, and E. Perlmutter, [JHEP \*\*07\*\*, 114 \(2014\)](#), [arXiv:1405.2792 \[hep-th\]](#) .
- [257] N. Iqbal and A. C. Wall, (2015), [arXiv:1509.04325 \[hep-th\]](#) .
- [258] T. Nishioka and A. Yarom, (2015), [arXiv:1509.04288 \[hep-th\]](#) .
- [259] T. Azeyanagi, R. Loganayagam, and G. S. Ng, (2015), [arXiv:1507.02298 \[hep-th\]](#) .
- [260] A. Belin, A. Castro, and L.-Y. Hung, [JHEP \*\*11\*\*, 145 \(2015\)](#), [arXiv:1508.01201 \[hep-th\]](#) .
- [261] P. M. Bellan, *Fundamentals of plasma physics* (Cambridge University Press, 2008).
- [262] J. P. Freidberg, *Ideal MHD*: (Cambridge University Press, Cambridge, 2014).
- [263] S. Dubovsky, L. Hui, A. Nicolis, and D. T. Son, [Phys. Rev. \*\*D85\*\*, 085029 \(2012\)](#), [arXiv:1107.0731 \[hep-th\]](#) .
- [264] S. Endlich, A. Nicolis, R. A. Porto, and J. Wang, [Phys. Rev. \*\*D88\*\*, 105001 \(2013\)](#), [arXiv:1211.6461 \[hep-th\]](#) .
- [265] S. Grozdanov and J. Polonyi, [Phys. Rev. \*\*D91\*\*, 105031 \(2015\)](#), [arXiv:1305.3670 \[hep-th\]](#) .
- [266] A. Nicolis, R. Penco, and R. A. Rosen, [Phys. Rev. \*\*D89\*\*, 045002 \(2014\)](#), [arXiv:1307.0517 \[hep-th\]](#) .
- [267] P. Kovtun, G. D. Moore, and P. Romatschke, [JHEP \*\*07\*\*, 123 \(2014\)](#), [arXiv:1405.3967 \[hep-ph\]](#) .
- [268] M. Harder, P. Kovtun, and A. Ritz, [JHEP \*\*07\*\*, 025 \(2015\)](#), [arXiv:1502.03076 \[hep-th\]](#) .

- [269] S. Grozdanov and J. Polonyi, *Phys. Rev.* **D92**, 065009 (2015), [arXiv:1501.06620 \[hep-th\]](#) .
- [270] M. Crossley, P. Glorioso, and H. Liu, (2015), [arXiv:1511.03646 \[hep-th\]](#) .
- [271] P. Glorioso, M. Crossley, and H. Liu, (2017), [arXiv:1701.07817 \[hep-th\]](#) .
- [272] F. M. Haehl, R. Loganayagam, and M. Rangamani, *JHEP* **01**, 184 (2016), [arXiv:1510.02494 \[hep-th\]](#) .
- [273] F. M. Haehl, R. Loganayagam, and M. Rangamani, *JHEP* **04**, 039 (2016), [arXiv:1511.07809 \[hep-th\]](#) .
- [274] D. Montenegro and G. Torrieri, *Phys. Rev.* **D94**, 065042 (2016), [arXiv:1604.05291 \[hep-th\]](#) .
- [275] P. Gao and H. Liu, (2017), [arXiv:1701.07445 \[hep-th\]](#) .
- [276] K. Jensen, N. Pinzani-Fokeeva, and A. Yarom, (2017), [arXiv:1701.07436 \[hep-th\]](#) .
- [277] D. Schubring, *Phys. Rev.* **D91**, 043518 (2015), [arXiv:1412.3135 \[hep-th\]](#) .
- [278] J. Hernandez and P. Kovtun, (2017), [arXiv:1703.08757 \[hep-th\]](#) .
- [279] X.-G. Huang, A. Sedrakian, and D. H. Rischke, *Annals Phys.* **326**, 3075 (2011), [arXiv:1108.0602 \[astro-ph.HE\]](#) .
- [280] R. Critelli, S. I. Finazzo, M. Zaniboni, and J. Noronha, *Phys. Rev.* **D90**, 066006 (2014), [arXiv:1406.6019 \[hep-th\]](#) .
- [281] S. I. Finazzo, R. Critelli, R. Rougemont, and J. Noronha, *Phys. Rev.* **D94**, 054020 (2016), [arXiv:1605.06061 \[hep-ph\]](#) .
- [282] P. Kovtun, *JHEP* **07**, 028 (2016), [arXiv:1606.01226 \[hep-th\]](#) .
- [283] D. Montenegro, L. Tinti, and G. Torrieri, (2017), [arXiv:1701.08263 \[hep-th\]](#) .

- [284] J. F. Fuini and L. G. Yaffe, [JHEP \*\*07\*\*, 116 \(2015\)](#), [arXiv:1503.07148 \[hep-th\]](#) .
- [285] S. Weinberg, *The Quantum Theory of Fields. Vol. 1: Foundations* (Cambridge University Press, 2005).
- [286] M. E. Peskin and D. V. Schroeder, *An Introduction to quantum field theory* (1995).
- [287] D. Yamada and L. G. Yaffe, [JHEP \*\*09\*\*, 027 \(2006\)](#), [arXiv:hep-th/0602074 \[hep-th\]](#) .
- [288] A. Cherman, S. Grozdanov, and E. Hardy, [JHEP \*\*06\*\*, 046 \(2014\)](#), [arXiv:1308.0335 \[hep-th\]](#) .
- [289] D. Z. Freedman, S. D. Mathur, A. Matusis, and L. Rastelli, [Nucl. Phys. \*\*B546\*\*, 96 \(1999\)](#), [arXiv:hep-th/9804058 \[hep-th\]](#) .
- [290] D. Anselmi, J. Erlich, D. Z. Freedman, and A. A. Johansen, [Phys. Rev. \*\*D57\*\*, 7570 \(1998\)](#), [arXiv:hep-th/9711035 \[hep-th\]](#) .
- [291] E. D'Hoker and P. Kraus, [JHEP \*\*10\*\*, 088 \(2009\)](#), [arXiv:0908.3875 \[hep-th\]](#) .
- [292] S. Janiszewski and M. Kaminski, [Phys. Rev. \*\*D93\*\*, 025006 \(2016\)](#), [arXiv:1508.06993 \[hep-th\]](#) .
- [293] M. Ammon, M. Kaminski, R. Koirala, J. Leiber, and J. Wu, [JHEP \*\*04\*\*, 067 \(2017\)](#), [arXiv:1701.05565 \[hep-th\]](#) .
- [294] D. Marolf and S. F. Ross, [JHEP \*\*0611\*\*, 085 \(2006\)](#), [arXiv:hep-th/0606113 \[hep-th\]](#) .
- [295] N. Jokela, G. Lifschytz, and M. Lippert, [JHEP \*\*10\*\*, 014 \(2013\)](#), [arXiv:1307.6336 \[hep-th\]](#) .
- [296] E. Pomoni and L. Rastelli, [JHEP \*\*04\*\*, 020 \(2009\)](#), [arXiv:0805.2261 \[hep-th\]](#) .



- [297] T. Faulkner and N. Iqbal, *JHEP* **07**, 060 (2013), [arXiv:1207.4208 \[hep-th\]](#) .
- [298] S. S. Gubser, *Phys. Rev.* **D63**, 084017 (2001), [arXiv:hep-th/9912001 \[hep-th\]](#) .
- [299] E. D'Hoker and P. Kraus, *JHEP* **03**, 095 (2010), [arXiv:0911.4518 \[hep-th\]](#) .
- [300] S. S. Gubser, S. S. Pufu, and F. D. Rocha, *JHEP* **08**, 085 (2008), [arXiv:0806.0407 \[hep-th\]](#) .
- [301] R. A. Davison, B. Goutéraux, and S. A. Hartnoll, *JHEP* **10**, 112 (2015), [arXiv:1507.07137 \[hep-th\]](#) .
- [302] M. Taylor, (2000), [arXiv:hep-th/0002125 \[hep-th\]](#) .
- [303] J. M. Martín-García, “xAct: Efficient Tensor Computer Algebra, <http://www.xact.es/>” .
- [304] S. A. Stricker, *Eur. Phys. J.* **C74**, 2727 (2014), [arXiv:1307.2736 \[hep-th\]](#) .
- [305] S. Waeber, A. Schaefer, A. Vuorinen, and L. G. Yaffe, *JHEP* **11**, 087 (2015), [arXiv:1509.02983 \[hep-th\]](#) .
- [306] S. Grozdanov, N. Kaplis, and A. O. Starinets, *JHEP* **07**, 151 (2016), [arXiv:1605.02173 \[hep-th\]](#) .
- [307] S. Grozdanov and W. van der Schee, (2016), [arXiv:1610.08976 \[hep-th\]](#) .
- [308] A. Lucas, *JHEP* **03**, 071 (2015), [arXiv:1501.05656 \[hep-th\]](#) .
- [309] D. T. Son and A. O. Starinets, *JHEP* **09**, 042 (2002), [arXiv:hep-th/0205051 \[hep-th\]](#) .
- [310] C. P. Herzog and D. T. Son, *JHEP* **03**, 046 (2003), [arXiv:hep-th/0212072 \[hep-th\]](#) .
- [311] V. E. Fortov and V. B. Mintsev, *Phys. Rev. Lett.* **111**, 125004 (2013).
- [312] L. P. Kadanoff and P. C. Martin, *Annals of Physics* **24**, 419 (1963).

- [313] M. Edalati, J. I. Jottar, and R. G. Leigh, [JHEP \*\*10\*\*, 058 \(2010\)](#), [arXiv:1005.4075 \[hep-th\]](#) .
- [314] M. Blake, [Phys. Rev. Lett. \*\*117\*\*, 091601 \(2016\)](#), [arXiv:1603.08510 \[hep-th\]](#) .
- [315] A. Lucas and J. Steinberg, [JHEP \*\*10\*\*, 143 \(2016\)](#), [arXiv:1608.03286 \[hep-th\]](#) .
- [316] Y. Ling, Z. Xian, and Z. Zhou, [Chin. Phys. \*\*C41\*\*, 023104 \(2017\)](#), [arXiv:1610.08823 \[hep-th\]](#) .
- [317] S.-F. Wu, B. Wang, X.-H. Ge, and Y. Tian, (2017), [arXiv:1702.08803 \[hep-th\]](#) .
- [318] M. Blake, R. A. Davison, and S. Sachdev, (2017), [arXiv:1705.07896 \[hep-th\]](#) .
- [319] T. Hartman, S. A. Hartnoll, and R. Mahajan, (2017), [arXiv:1706.00019 \[hep-th\]](#) .
- [320] Q. Li, D. E. Kharzeev, C. Zhang, Y. Huang, I. Pletikosic, *et al.*, (2014), [arXiv:1412.6543 \[cond-mat.str-el\]](#) .
- [321] J. Gooth *et al.*, (2017), [arXiv:1703.10682 \[cond-mat.mtrl-sci\]](#) .
- [322] A. Hamilton, D. N. Kabat, G. Lifschytz, and D. A. Lowe, [Phys. Rev. \*\*D74\*\*, 066009 \(2006\)](#), [arXiv:hep-th/0606141 \[hep-th\]](#) .
- [323] V. Balasubramanian, B. D. Chowdhury, B. Czech, J. de Boer, and M. P. Heller, [Phys. Rev. \*\*D89\*\*, 086004 \(2014\)](#), [arXiv:1310.4204 \[hep-th\]](#) .
- [324] B. Czech, X. Dong, and J. Sully, [JHEP \*\*11\*\*, 015 \(2014\)](#), [arXiv:1406.4889 \[hep-th\]](#) .
- [325] E. Hijano, P. Kraus, E. Perlmutter, and R. Snively, [JHEP \*\*01\*\*, 146 \(2016\)](#), [arXiv:1508.00501 \[hep-th\]](#) .
- [326] F. Pastawski, B. Yoshida, D. Harlow, and J. Preskill, [JHEP \*\*06\*\*, 149 \(2015\)](#), [arXiv:1503.06237 \[hep-th\]](#) .

- [327] S. W. McIntosh, B. De Pontieu, M. Carlsson, V. Hansteen, P. Boerner, and M. Goossens, [Nature](#) **475**, 477 (2011).
- [328] P. Cargill and I. De Moortel, [Nature](#) **475**, 463 (2011).
- [329] J. Zinn-Justin, [Quantum Field Theory and Critical Phenomena](#), International series of monographs on physics (Clarendon, 2002).
- [330] F. M. Haehl, R. Loganayagam, and M. Rangamani, (2017), [arXiv:1701.07896 \[hep-th\]](#) .