## References:

[1] A. I. Akhiezer and V. B. Berestetskii, Quantum electrodynamics (Interscience Publishers, New York, 1965).
[2] C. Cohen-Tannoudji, J. Dupont-Roc, and G. Grynberg, Photons and Atoms (Wiley, New York, 1989).
[3] L. Allen, M. W. Beijersbergen, R. J. C. Spreeuw, and J. P. Woerdman, Phys. Rev. A 45, 8185 (1992).
[4] V. B. Berestetskii, E. M. Lifshitz, and L. P. Pitaevskii, Quantum electrodynamics, 2nd ed. (Pergamon Press Ltd., NY, 1982).
[5] S. J. van Enk and G. Nienhuis, J. Mod. Opt. 41, 963 (1994); Europhys. Lett. 25, 497 (1994).
[6] K. Y. Bliokh, M. A. Alonso, E. A. Ostrovskaya, and A. Aiello, Phys. Rev. A 82, 063825 (2010).
[7] A. T. O’Neil, I. MacVicar, L. Allen, and M. J. Padgett, Phys. Rev. Lett. 88, 053601 (2002).
[8] V. Garc'es-Ch'avez, D. McGloin, M. J. Padgett, W. Dultz, H. Schmitzer, and K. Dholakia,Phys. Rev. Lett. 91, 093602 (2003).
[9] L. Marrucci, C. Manzo, and D. Paparo, Phys. Rev. Lett. 96, 163905 (2006).
[10] Y. Zhao, J. S. Edgar, G. D. M. Jeffries, D. McGloin, and D. T. Chiu, Phys. Rev. Lett. 99, 073901 (2007).
[11] S. Mosca et. al., Phys. Rev. A 82, 043806 (2010).
[12] S. M. Barnett and L. Allen, Opt. Commun. 110, 670 (1994). 22
[13] S. M. Barnett, J. Opt. B: Quantum Semiclass. Opt. 4, S7-S16 (2002).
[14] C.-F. Li, Phys. Rev. A 80, 063814 (2009).
[15] P. A. M. Dirac, The principle of quantum mechanics, 3rd ed. (Oxford University Press, Oxford, 1947).
[16] C.-F. Li, Phys. Rev. A 78, 063831 (2008).
[17] T.-T. Wang, S.-Y. Yang, and C.-F. Li, Opt. Lett. 36, 2342 (2011).
[18] C.-F. Li, Phys. Rev. A 79, 053819 (2009).
[19] G. H. Golub and C. F. Van Loan, Matrix computations, 3rd ed. (Johns Hopkins, Baltimore, 1996).
[20] J. N. Damask, Polarization optics in telecommunications (Springer Science+Business Media, Inc., New York, 2005).
[21] J. M. Jauch and F. Rohrlich, The theory of photons and electrons, 2nd ed. (Springer, New York, 1976).
[22] L. Mandel and E. Wolf, Optical coherence and quantum optics (Cambridge University Press, New York, 1995).
[23] M. E. Rose, Relativistic electron theory (John Wiley \& Sons, New York, 1961).
[24] J. J. Sakurai, Modern Quantum Mechanics (Addison-Wesley, New York, 1985).
[25] M. H. L. Pryce, Proc. R. Soc. Lond. A 195, 62 (1948).
[26] O. Hosten and P. Kwiat, Science 319, 787 (2008).
[27] Bialynicki-Birula I 1996 Photon wavefunction Progress in Optics vol 36, ed E Wolf (Amsterdam: Elsevier)
[28] Foldy L L 1956 Synthesis of covariant particleequations Phys. Rev. 102568
[29] Lomont J S and Moses H E 1962 Simple realizations of the infinitesimal generators of the proper orthochronous inhomogeneous Lorentz group for mass zero J. Math. Phys.
[30] Bialynicki-Birula I and Bialynicka-Birula Z 1975 Quantum Electrodynamics (Oxford: Pergamon)
[31] Bialynicki-Birula I and Bialynicka-Birula Z 1987 Berry's phase in the relativistic theory of spinning particles Phys. Rev. D 352383
[32] Bialynicki-Birula I and Bialynicka-Birula Z 2006 Beams of electromagnetic radiation carrying angular momentum: the Riemann-Silberstein vector and the classical-quantum correspondence Opt. Commun..
[33] M. Born and L. Infeld, Proc. Roy. Soc. Lond. A 150, 141 (1935); M. H. L. Pryce, ibid, 150, 166 (1935).
[34] P. A. M. Dirac, Rev. Mod. Phys. 21, 392 (1949).
[35] R. J. Glauber, Phys. Rev. 130, 2529 (1963); L. Man- del and E. Wolf, Optical Coherence and Quantum Optics (Cambridge University Press, Cambridge, U.K., 1995).
[36] I. Bialynicki-Birula and Z. Bialynicka-Birula, Phys. Rev. Lett. 108, 140401 (2012).
[37] Actually, there are some Russian theoretical papers, which anticipate the geometric phase as early as the 1940s.
[38] "Generalized theory of interference, and its applications," S. Pancharatnam, Proc. Indian Acad. Sci. A 44, 247-262 (1956). See also reference [42] below for the formulation of Pancharatnam's phase in quantum theoretical language.
[39] "Some geometrical considerations of Berry phase," J. Anandan and L. Stodolsky, Phys. Rev. D 35, 2597-2600 (1987).
[40] "Geometric angles in quantum and classical physics," J. Anandan, Phys. Lett. A 129, 201-207 (1988).
[41] "Angle Variable Holonomy in Adiabatic Excursion of an Integrable Hamiltonian," J.H. Hannay, J. Phys. A 18, 221-230 (1985).
[42] "The adiabatic phase and Pancharatnam phase for polarized-light," M.V. Berry, J. Mod. Optics 34, 1401-1407 (1987).
[43] "Observation of Berry's topological phase by use of an optical fiber," A. Tomita and R.Y. Chiao, Phys. Rev. Lett. 57, 937-940 (1986).
[44] "Phase change during a cyclic quantum evolution," Y. Aharonov and J. Anandan, Phys. Rev. Lett. 58, 1593-1596 (1987).
[45] "The Berry phase as an appropriate correspondence limit of the AharonovAnandan phase in a simple model," J. Christian and A. Shimony, in Quantum Coherence, edited by J. Anandan (World Scientific, Singapore, 1990) pp 121-135.
[46] "Holonomy, the quantum adiabatic theorem, and Berry's phase," B. Simon, Phys. Rev. Lett. 51, 2167-2170 (1983).
[47] "Appearance of gauge structure in simple dynamical systems," F. Wilczek and A. Zee, Phys. Rev. Lett.52, 2111-2114 (1984).
[48] D. F. Walls, Nature, 301(1983)141; R.W.Henry and S.C.Glotzer, Am. J. Phys.56,4,(1988)318; M. M. Nieto, in Frontiers of Non-equilibrium Statistical Mechanics, Proceedings of NATO Advanced Study Institute, ed. G. T. Moore and M. O. Scully, Plenum, NY.
[49] B. Yurke, S. L. McCall, J. R. Klauder, Phys. Rev. A33 6(1986)4033; M. Hillery and L. Mlodinow, Phys.Rev. A48, 2(1993)1548.
[50] R. P. Feynman, F. L. Vernon, Jr., and R. W. Hellwarth, J. Appl. Phys., 28, 49 (1957).
[51] E.P.Wigner in Group Theory and its applications to the Quantum Mechanics of Atomic Spectra,Academic Press,NY(1959); A.Vaglica and G.Vetri, Optics Communications, 51,4(1984)239.
[52] F.T.Arecchi et.al., Phy. Rev.A6,6(1972)2211.
[53] S.M.Barnett and M.A.Dupertuis,Journ.Opt.Soc.Am. B4(1987)505; K.Wodkiewicz and J.H.Eberly,Journ.Opt.Soc.Am. B2(1985)458.
[54] M.Kitagawa and M.Ueda,Phys.Rev,A47,6(1993)5138.
[55] J. Schwinger in Quantum theory of Angular Momentum, ed. L. Beidenharn and H. van Dam, Academic Press, NY.(1965)22
[56] P. W. Atkins and L. D. Barron, Proc. R. Soc.London Ser. A 306, 119 (1968).
[57] L. Fonda, N. Mankoc-Borstnik and M. Rosina, Phys. Reports 158, 3(1988)160.
[58] A. Bandyopadhyay and J. Rai, Phys. Rev. A 51, 1597, (1995).
[59] P.W.Atkins and J.C.Dobson, Proc.Roy.Soc.Lond.A321(1971)321.
[60] Most general result can be found in the doctoral Thesis of Abir Bandyopadhyay, submitted on December 13, 1996, and successfully defended on November 27, 1997, at Indian Institute of Tecnology, Kanpur. Also corrected electronic copy is available on request from him through email.
[61] K.Svozil, Phy.Rev.Lett.,65(1990)3341.
[62] J. P. Dowling, G. S. Agarwal, W. P. Schleich, Phy. Rev. A49, 5(1994)4101.
[63] D. F. Nelson, Phys. Rev. A 44, 3985 (1991).
[64] Zh.-Y. Wang, P.-Y. Wang, and Y.-R. Xu, Optik 122, 1994 (2011).
[65] W. She, J.Yu, and R. Feng, Phys.Rev. Lett. 101, 243601 (2008).
[66] G. K. Campbell, A. E. Leanhardt, J. Mun, M. Boyd, E. W. Streed, W. Ketterle, and D. E. Pritchard, Phys. Rev. Lett. 94, 170403 (2005).
[67] M. Padgett, S. M. Barnett, and R. Loudon, J. Mod. Opt. 50,1555 (2003).
[68] S. M. Barnett, Phys. Rev. Lett. 104, 070401 (2010).
[69] T. Ramos, G. F. Rubilar, and Y. N. Obukhov, Phys. Lett. A 375,1703 (2011).
[70] L. D. Landau and E. M. Lifshitz, The Classical Theory of Fields (Pergamon, New York, 1971).
[71] L. D. Landau and E. M. Lifshitz, Electrodynamics of Continuous Media (Pergamon, New York, 1993).
[72] Yu. A. Kravtsov and Yu. I. Orlov, Geometrical Optics of Inhomogeneous Media (Springer-Verlag, New York, 1990).
[73] Also, in their general form, GO equations are usually more robust and transparent compared to equations derived ad hoc.
[74] I. Y. Dodin and N. J. Fisch, Phys. Plasmas 19, 012104 (2012).
[75] I.Y. Dodin and N. J. Fisch, Phys.Rev. Lett. 107, 035005 (2011).
[76] I. Y. Dodin and N. J. Fisch, Phys. Plasmas 19, 012102 (2012).
[77] I. Y. Dodin and N. J. Fisch, Phys. Plasmas 19, 012103 (2012)
[78] The independent functions are $(a, \theta)$ but not $\left(a, k_{\mu}\right)$ because the latter, albeit describing the envelope, do not completely determine the wave field.
[79] The ACT also permits generalization to resonant interactions. Manley-Rowe theorem
[80] Notice that we define the EMT sign in a nonconventional way so the expressions are simplified for the adopted metric signature.
[81] F. J. Belinfante, Physica 6, 887 (1939).
[82] R. L. Dewar, Austral. J. Phys. 30, 533 (1977).
[83] P. A. Sturrock, Ann. Phys. 4, 306 (1958).
[84] J. D. Logan, Invariant Variational Principles (Academic, New York, 1977).
[85] S. Weinberg, Gravitation and Cosmology: Principles and Applications of the General Theory of Relativity (Wiley, New York, 1972).
[86] J. E. Avron, E. Berg, D. Goldsmith, and A. Gordon, Eur. J. Phys. 20, 153 (1999).
[87] Then the particle canonical mass is expected to be medium dependent, as indeed found in solid-state theory and also for ponderomotively driven classical particles.
[88] F. W. Hehl and Y. N. Obukhov, Foundations of Classical Electrodynamics: Charge, Flux, and Metric (Birkh"auser, Boston, 2003).
[89] I. Y. Dodin and N. J. Fisch, Phys. Rev. E 77, 036402 (2008).
[90] Notice also that a medium consisting of multiple fluids generally would not have a uniquely defined rest frame.
[91] T. H. Stix, Waves in Plasmas (AIP, New York, 1992).
[92] Mohammed Yousif, Mohammed Ali Basheir, Emadaldeen Abdalrahim, The orbital and spin parts of angular momentum. IJESRT, 2277-9655, (2015).
[93] Mohammed Yousif, Mohammed Ali Basheir, Emadaldeen Abdalrahim, Heisenberg form of uncertainty relations. . IJESRT, 2277-9655, (2015).

