

# Subquantum Telecommunicator

## Grupo de Investigação | Research Line:

Filosofia das Ciências da Natureza | Philosophy of Nature Sciences

## Parceria entre | Partnership Between:

Centro de Filosofia das Ciências da Universidade de Lisboa, CFCUL

Grupo de Física Teórica, Universidade de Bari, INFN

Instituto Nazionale di Ricerca Metrologica, INRIM

## Investigador principal | Principal investigator:

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## Estado | Status:

Em curso | In progress

## Revision of literature

A full explanation of the ideas and principles dealing with the subquantum waves and related problems such as their properties methods of production and detection may be found the book:

JR Croca, Towards a nonlinear quantum physics, World Scientific, London(2003) (ISBN 981-238-210-0) [Cr03]

Subquantum waves where discovered by de Broglie early in the first quarter of the last century. Among the relevant literature dealing with this early period we may refer:

L. de Broglie, The Current Interpretation of Wave Mechanics: A Critical Study, Elsevier, Amsterdam, 1969. [Br69]

L. de Broglie, Les Incertitudes d'Heisenberg et l'Interprétation Probabiliste de la Mécanique Ondulatoire, Gauthier-Villars, Paris, 1988. [Br88]

L. de Broglie and J.L. Andrade e Silva, *La Réinterprétation de la Mécanique Ondulatoire*, Gauthier-Villards, Paris, 1971.[BrAS71]

D. Bohm, Phys. Rev. 85(1952)186.[DB52]

Since the eighties of the last century an abundant literature appeared to study the properties of these waves. These works deal with both the theoretical and the experimental properties of these waves. They include the early proposals of experiments to detect these subtle and elusive waves. Some of these works related with the methods of production and detection of subquantum waves, then named empty waves, that have much in common with the process followed in this Project are:

J. and M. Andrade e Silva, C.R. Acad. Sci. (Paris) 290(1980)501. [AS80]

F. Selleri, Ann. Found. L. de Broglie, 4(1982)45. [Se82]

F. Selleri, Found. Phys. 12 (1983) 1087; 17(1987)739.[Se83]

A. Garuccio, V. Rapizarda and J.P. Vigièr, Phys. Lett. A 90(1982)17. [GrRaVi82]

J.R.Croca, in *Microphysical Reality and Quantum Formalism*, eds. A. Van der Merwe, F. Selleri, G. Tarozzi, Kluwer, Dordrecht, 1988. [Cr88]

J.R.Croca, Ann. Found. L. de Broglie, 14(1989)323. [Cr89]

J.R. Croca, in *Waves and Particles in Light and Matter*, Ed. Alwyn van der Merwe and A. Garuccio, Plenum, 1994. [Cr94]

J.R.Croca, A. Garuccio, V. Lepori e R.N. Moreira, Found. Phys. Lett. 3(1990)557. [Cr GrLeMo90]

R.J. Glauber, Phys. Rev. 30(1963)2529; 131(1963)2766. [Gl63]

Still there are other important properties of these waves that were studied by the researchers, in other works, namely:

J. R. Croca, De Broglie Tired Light Model and the Reality of the Quantum Waves, Foundations of Physics, Vol. 34, No. 12, December 2004 [Cr04]

J.R. Croca, M. Ferrero, A. Garuccio, V.L. Lepore, Found. Phys. Letters, 10(1997)441. [CrFeGrLe97]

J.R. Croca, Apeiron, 4(1997)41, [Cr97]

J. Araújo, J. Cordovil, J. R. Croca, R. N. Moreira and A. Rica da Silva, Some Experiments That Question the Completeness of Orthodox Quantum Mechanics, Advanced Science Letters, Vol. 2, 481–487, 2009, [ArCoCrMoSi09]

J.R Croca and J. A. Araújo, Eds, A New Vision on Physics, Eurhythmy, Emergence, and Nonlinearity, CFCUL, Lisboa 2010. (ISBN 978-989-8247-15-5)

L. de Broglie, Cahiers de Physique, **16**, 147, 429 1962; Acad. Sci. Paris, **263 B**, 9, 589, 1966. [Br66]

A. Gosh, Apeiron, 9-10(1991)35. [Go91]

Some experiments, based on the works of some members of this Project, were already performed to produce and detect these waves. Some published works connected with these experiments are:

X.Y. Zou, T. Grayson and L. Mandel, Phys. Rev. Lett. 24(1992)3667. [ZoGrMa92]

S. Jeffers and J. Sloan, Found. Phys. Lett. 333(1994)341. [JeSI94]

X.Y. Zou, L.J. Wang, and L. Mandel, Phys. Rev. Lett. 67(1991)318. [ZoWaMa91]

F. Selleri, in *Wave Particle Duality*, ed by F. Selleri, Plenum Press, New York, 1992. [Se92]

A basic key to perform this Project is monophotonic source. Among the vast literature dealing with properties and the making of these single photon sources, including those based on the nonlinear parametric down conversion, the ones that we utilize in this Project, we refer only:

R.L. Plfeegor and L. Mandel, Phys. Rev. 159(1967)1084. [PlMa67]

W. Radloff, Ann. Phys. (Leipzig) 26(1971)178. [Ra71]

Z.Y. Ou and L. Mandel, Phys. Rev. Lett. 62(1989)2941. [OuMa89]

H. Paul, Rev. Mod. Physics, 58(1986)209. [Pa86]

M. Genovese, G. Brida, E. Cagliero, and M. Gramigna, Physic reports 413, 319 (2005). [GeBrCaGr05]

Recent experiments showing the real existence of the subquantum waves:

R. Menzel, D. Puhlmann, A. Heuera, and W. P. Schleich, *Wave-particle dualism and complementarity unraveled by a different mode*, 9314–9319 | PNAS | June 12, 2012 | vol. 109 | no. 24. [MePuhHeuSch12]

R. Menzel , A. Heuer , D. Puhlmann , K. Dechoum , M. Hillery , M.J.A. Spähn, W.P. Schleich (2013): *A two-photon double-slit experiment*, Journal of Modern Optics, 60:1, 86-94. [MeHeuPuhDecHilSpa13]