# Comment on 'Measuring propagation speed of Coulomb fields' [R. de Sangro et al. Eur. Phys. J.C (2015) 75:137]

#### J.H.Field

Département de Physique Nucléaire et Corpusculaire, Université de Genève 24, quai Ernest-Ansermet CH-1211Genève 4.

E-mail: john.field@cern.ch

#### Abstract

Some remarks are made on the theoretical interpretation of recent experimental results on the propagation speed of electromagnetic force fields and of previous related experimental and theoretical work

#### PACS 03.30.+p 03.50.De

The conclusion of the experiment described in Ref. [1] is found in the last sentence of the abstract of the paper:

'The results we obtain, on a finite lifetime kinematical state are compatible with an electric field rigidly carried by the beam itself'

This is another way of stating that the results are consistent with a propagation speed of Coulomb forces that is instantaneous, or at any rate much greater than the speed of light and not consistent with the retarded field of the Liénard-Wiechert formula. Similar behaviour has been recently reported for magnetic force fields in [2].

This comment points out that such behaviour is predicted by the Relativistic Classical Electro-Dynamics (RCED) theory developed by the present author [3, 4]. In this theory electric and magnetic force fields are mediated by the exchange of space-like virtual photons as in Quantum Electrodynamics. The equations of RCED are derived by considering the classical limit of the QED invariant amplitude for Møller scattering: ee  $\rightarrow$  ee. Some comparisons of the theory with text-book Classical Electromagnetism have been worked out in [5], including a demonstration, similar to that of Laplace for gravitational forces [6], of the impossiblity of stable circular Keplerian orbits with retarded electromagnetic force fields. See also the related work on the speed of gravitational forces reported in Ref. [7].

Earlier evidence for a superluminal propagation of microwave fields in the near zone was obtained by Mugnai, Ranfagni and Ruggeri [8]. Evidence for superluminal signal propagation in the near field region has also been obtained in some recent amateur experiments [9, 10, 11]. Indeed, as pointed out by Smirnov-Rueda [12], evidence for similar effects was even observed (but not published [13]) in Hertz' original experiments on electromagnetic wave propagation [14].

Ref. [1] cites a paper by the present author [15] where the derivation of retarded fields as calculated by Liénard[16] and Wiechert [17] was critically reviewed. This showed, as

previously pointed out by Whitney [18], that an elementary mathematical error due to miscalculation of the effective charge density of a moving charge occurs in the derivation of the retarded Liénard-Wiechert potentials. Corrected formulas for retarded potentials and fields were given (see also Ref. [19]). However, this work is not related to the force fields measured in Ref. [1] which are instead consistent with the instantaneous RCED force fields mentioned above.

In conclusion, the additional information, related to the work presented in Ref. [1], given in this comment, is:

- A theoretical prediction (Refs. [3, 4]) of the observed non-retarded nature of Coulombic force fields.
- A precise reference [6] to the work of Laplace demonstrating the non-retarded nature of gravitational force fields.
- Citation of previous experimental results, consistent with the findings of Ref. [1], but not mentioned in it (Refs. [8-13]).
- Pointing out that the paper [15] (cited as Ref. [6] in [1]) which discusses only retarded force fields, has no direct relevance to the explanation of the results of [1].
- Noting (as previously shown in Ref. [18]), that the Liénard-Wiechert potentials, used for calculation of retarded fields in Ref. [1], are invalid due to a simple mathematical error in their derivation, and that the corrected retarded potentials may be found in Ref. [15].

### Acknowledgements

I would like to thank Guido Pizzella for informing me of the results presented in Ref. [1] and Brendan Rycroft for pointing out to me the work of the authors of Refs. [9, 10, 11].

## References

- [1] R. de Sangro et al. Eur. Phys. J. C75 136 (2015).
- [2] A.L. Kholmetskii  $et\ al.\ J.\ Appl.\ Phys.\ {\bf 101}\ 023532\ (2007).$
- [3] J.H. Field, Phys. Scr. **74** 702 (2006), E 069801 **80** (2009).
- [4] J.H. Field, Phys. Part. Nucl. Lett. 6 320 (2009).
- [5] J.H. Field, Int. J. Mod. Phys. A Vol 23 No 2 327 (2008).
- [6] P.S. Laplace, *Mécanique Céleste*, Translated by N. Bowditch (Chelsea, New York, 1966) X, vii, §22 p645.
- $[7]\,$  T. Van Flandern, Phys. Lett.  $\bf A250$  1 (1998).
- [8] D. Mugnai, A. Ranfagni and R. Ruggeri, Phys. Rev. Lett. 84 4830 (2000).
- [9] A. Erdmann and E. Erdmann, 'Faster than Light, the Revolutionary Radio Antenna that Conquers Space', available at: http://www.gsjournal.net/old/physics/erdmann.pdf.
- [10] A. Erdmann and E. Erdmann, Experiments with Faster than Light Receiving Antenna, Using the Local Radio Station', available at: http://www.gsjournal.net/old/physics/erdmann2.pdf.

- [11] A.V. Robnett, Experimental evidence for the transfer of information at a speed greater than the speed of light', available at: http://www.cumberlandastronomicalsociety.org/memberspotlight//memberspotlight/speedofcoulombforce.pdf.
- [12] R. Smirnov-Rueda, Foundations of Physics 35 10 (2005).
- [13] J. Z. Buchwald, 'The creation of scientific effects —Heinrich Hertz and electric waves', (University of Chicago Press, Chicago, 1994) Section 16.5, p281.
- [14] H. Hertz, 'On the finite velocity of propagation of electromagnetic waves', in 'Electric Waves' (Dover, New York, 1962) p107.
- [15] J.H. Field, 'Retarded electric and magnetic fields of a moving charge: Feynman's derivation of Liénard-Wiechert potentials revisited', arXiv:0704.1574v3.
- [16] A. Liénard, L'Eclairage Electrique, 16 pp5, 53, 106 (1898).
- [17] E. Wiechert, Archives Néland (2) 5 459 (1900).
- [18] C.K. Whitney, Had. J. 11 257 (1988).
- [19] J.H. Field, 'Space-time transformation properties of inter-charge forces and dipole radiation: Breakdown of the classical field concept in relativistic electrodynamics', arXiv:physics/0604089v3.