TESLA AND THE "TRUE WIRELESS"

by Roberto Handwerker

Nikola Tesla

Figure 1: Roberto Handwerker of DELTA Ingegneria® with the realised apparatus, which replicates "Tesla wireless" effects" of radiant energy transmission.

It is well known that common single phase AC (Alternating Current) electrical devices work by two wires (plus earthing), similar to DC devices (During Current); however, during Tesla times by the end of the nineteenth century someone was talking about energy transmission by only one wire and even wireless, meaning by that term power transmission and not only weak signal transmission.
The great Serbian genius, who invented the now commonly used polyphase alternating current system, did in fact sustain and demonstrate by his lectures, articles and writings that it was possible to transmit energy in a different way, as said, but one could wonder the reason for this: the answer is of course in saving of expensive cables and devices in electrical grids, but this in not the only reason, by the way here the point of view is technical and scientific and not economical, because such technology is in fact evidently *per se* superior. Even by avoiding the comparison between the standard actual two-wire system (or more wires, by three-phase system) and the Tesla one-wire or wireless systems, here are briefly illustrated some of the possible applications and a few related phenomena, which are curious expecially to people who are very familiar with electricity, as for instance some incandescence lamps which are lit when connected to a closed shorted circuit, normal neon tubes are lit by only one wire without starter or, even more striking, wireless, some neon tubes are energized by an insulated metal plate which receives radiant energy from a Tesla coil and which are lit when connected to ground, and laboratory transmission through the natural medium i.e. air and ground are just some of these curious phenomena. Moreover, the related feeding or generator circuit can perfectly work even by using water instead of the traditional normal used material. But how can this be possible ? Further, in school and science books such phenomena are not even mentioned. To throw light on this scientific puzzle it is necessary to step back to year 1865 and the fundamental Maxwell's electromagnetism equations: only very few specialists know that, in their today's form, these equations does not match with the

original notation made by the great scientist because he at first proposed a more complex notation which involved the use of twenty equations and the "Hamilton's quaternions" and that the equations were later "simplified" by Gibbs and Heaviside with the introduction of today's simplier "vector notation" and then "condensed" in four equations, which gives but different results because vectors and quaternions follow different calculation rules. For instance: the sum of two vectors **v1**= a**i** +b**j** +c**k** and **v2**= -a**i** -b**j** –c**k** gives **v1**+**v2**= 0 but the sum of quaternions **q1**= a +b**i** +c**j** +d**k** and **q2**= a –b**i** –c**j** –d**k** gives **q1**+**q2**= 2a which is but a scalar not equal to zero: so by the use of vectors said scalar value does not appair in the results. Further: vectors have the commutative property of the product that is **i**.**j**= **j**.**i** while quaternions have the anti-commutative property i.e. **i**.**j**= **-j**.**i** therefore introducing a "**-**" sign instead of a "**+**" sign, and much more. It is therefore clear that calculations, if made by the two systems, give different results and that, as seen, by the use of quaternions, for example by sum operation, could give rise to some scalar values that are not present in the results by the use of vectors and even to sign variations by product operations, only to mention a few cases. The choice of one of the two systems would therefore be, as for the case of *Lorenz,* only a question of arbitrary *"gauge"*. If it is true that manual quaternionic calculation is harder than vectorial calculation it is even true that nowadays, thanks to informatics, quaternions are successfully used by computer graphics and by aerospace flight (for instance in inertial platforms) because calculation are sped up by saving of memory space up to 55%; quaternions therefore could be useful for electromagnetism in Maxwell's equations where for instance, if the two following expressions are considered (where **B** and **E** are respectively vectorial magnetic field and vectorial electric field)

$$\mathbf{B} = \nabla \times \mathbf{A} \quad \text{and} \quad \mathbf{E} = -\nabla\varphi - \partial/\partial t\, \mathbf{A}$$

it is also noted that values such as electric potential φ (scalar) and electric potential **A** (vectorial) were, curiosly, always considered only mere mathematical abstractions and results of pure calculation without a physical meaning and were most probably not deeply analyzed and given the proper attention.

Fig. 2: Tesla coil (XMTR and RCVR) connected through the ground.

These themes have been long discussed beneath the scientific Community, but up to these days the question still seems to remain unsolved. It is, however, true that thanks to the empyrical method Nikola Tesla at a certain point turned on his interest and researches on the "true wireless" as himself called it, doing great projects that entered legend and that actually are on the borderline between science and phantascience, reality and dream; today, at last a few among the curious phenomena described from him are replicable and verifiable and, evidently, these are not similar to the common effects of AC and even not of DC, a fact that leaves many questions still open. Leaving disputation to others, it is sufficient to witness the curious effects in the shown images to realise that they are true and verifiable. Images show some "true wireless" effects, as Tesla himself called them, which are replicable only by the right attitude and only if the related fundamental principles are well understood and shared, the ones illustrated by the Serbian genius in his many lectures and patents. Once it is accepted that there is no contradiction but complementarity between the theories of Dr. Nikola Tesla on "wireless" and on "radiant energy" and the theories of Dr. Heinrich Hertz on electromagnetic waves, it is possible to get to the same conclusion of the eminent Lord Kelvin who personally investigated the matter at that time and that considered both theories right.
It is possible to discuss this matter for a long time, but even those who denies the above mentioned phenomena and the evidence of their existence must justify this position by proves and even explain how these phenomena should be included among the common observed AC effects. One more consideration: it seems hard to believe that Nikola Tesla, the man who definitely "invented" the twentieth Century, could have issued some wrong theories; among the discoveries of the Serbian genius in fact there is radio, AC motor, the hydroelectric generator and the alternate polyphase system only to quote the most known and more than 700 patents of many different type. But to get back to the experiment shown in the images, where two flat spiral Tesla coils also called "pancake coils" are tranceiving energy and not only weak signal: one of them is the transmitter and the other one is the receiver, and they really "communicate" with one another during energy transmission as demonstrated by the luminous effects in the argon lamp bulbs that, by occurring decreasing brightness in one of them, it corresponds on the contrary to increasing brightness in the other one.
This is but not the only remarkable feature: transmission through the ground allows, as shown in the picture, the lighting of bulb and working of a small DC motor, which of course is in this case of limited power because the whole circuit is a laboratory small power apparatus, but the principle is valid.
On "YouTube" website it is possibile to watch five short videos showing, among others, the described phenomena; one of the videos is a presentation illustrating a few of the related theory, and the others illustrate for instance a normal halogen lamp lit even if immersed in water, lamps rated for different voltages also working at their full brightness even if short-circuited on a special circuit called "Tesla stout bar circuit", where the flowing "cold electricity" is doing no harm when touched by a bare hand and other striking phenomena such as a Tesla coil top bulb featuring curious effects of attraction and repulsion. By the right attitude towards Tesla theories it is at least possible to replicate some of the effects that he described more than a century ago, up to these days unfortunately forgotten just like the prodigal genius who discovered them.

Figure 3: connection through the ground of the two flat spiral Tesla Coils

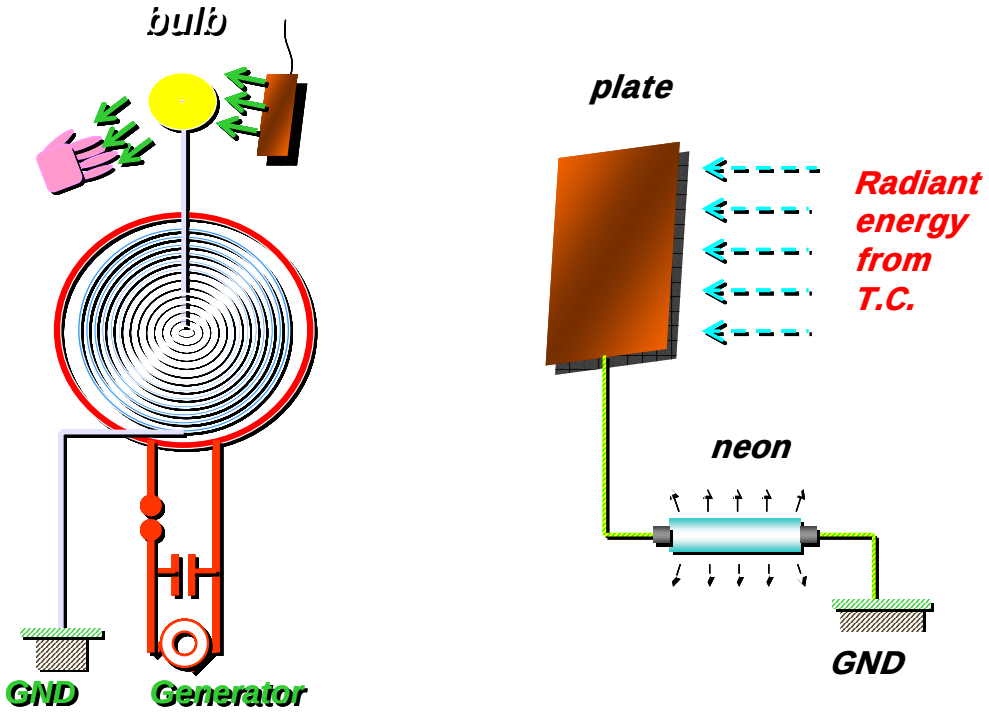

Figure 4: effects on top Tesla coil bulb and use of radiant energy (videos on YouTube)

For information about replication of the above described phenomena please contact:

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Rieferences:

[1] Nikola Tesla, "*The True Wireless",* Electrical Experimenter, May 1919.
[2] Roberto Handwerker et al.,"*Rotazione di solidi mediante quaternioni"* , for Elements of informatics-Faculty of Engineering of Milano Polytechnic,1990 (*)
[3] Nikola Tesla, *"Experiments with alternate currents of very high frequency and their application to methods of artificial illumination"*, 1891.
[4] Nikola Tesla, *"On light and other high frequency phenomena"*, delivered before the Franklin Institute, Philadelphia, February 1893.