TESLA & COLD ELECTRICITY

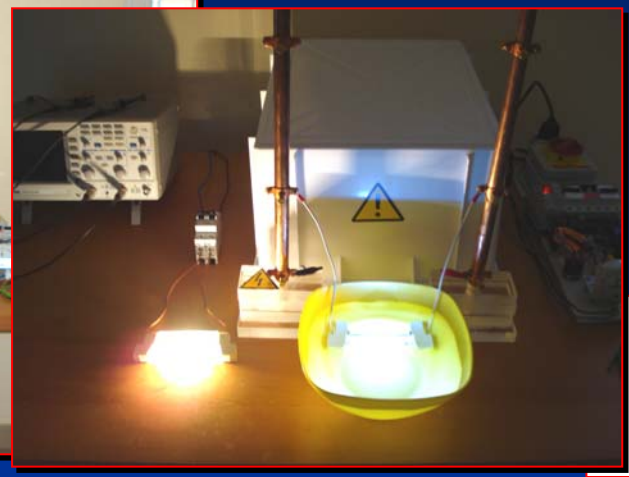
-revised English version-

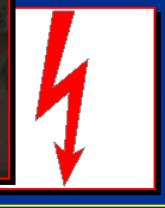
Selected Tesla experiments replicated and

presented by

Dr. Eng. Roberto Handwerker

Presentation





DELTA Ingegneria® of ***engineer Roberto Handwerker,***
a consulting professional in advanced electrotechnics,
thermodynamics & energetics, also technical advisor to italian Judges

Disclaimer:

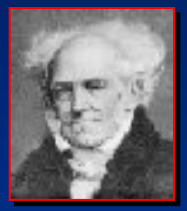
Warning !

- **The following experiments make use of electrical energy: please don't try to replicate them unless You are trained and well-experienced in electrotechnics: the presence of high voltages and currents could cause You serious injuring and may even be fatal ! Replication of presented experiments or circuits at Your own risk !**
- ***However, the shown experiments are verifiable and replicable by someone who has the right means and know-how.***
- ***The term "Cold electricity" is arbitrary, meaning only that the here presented current effects are different from usual AC current ones.***

First some quotes…

"Each one sees what he carries in his heart."

- Johann Wolfgang von Goethe (1749-1832)



"Every Truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. And third, it is accepted as self evident".

- Arthur Schopenhauer (1788-1860)

"Be silent, if you choose; but when it is necessary, speak - and speak in such a way that people will remember it."

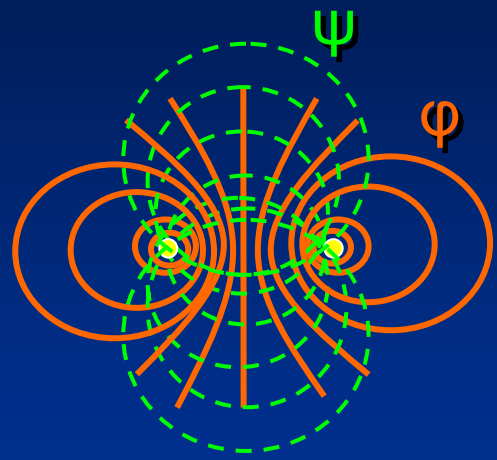
- Wolfgang Amadeus Mozart (1756-1791)

"The present is theirs; the future, for which I have really worked, is mine."

- Nikola Tesla (1856-1943)

...and a few general notes

- Patient observation of Nature allows discovery.

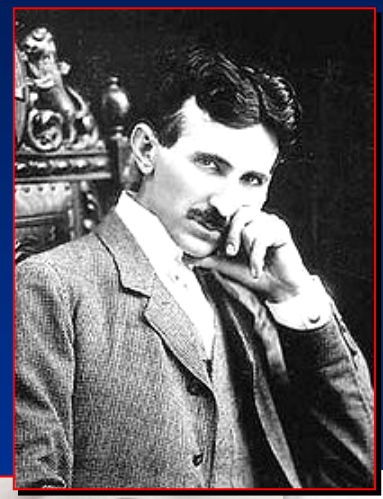


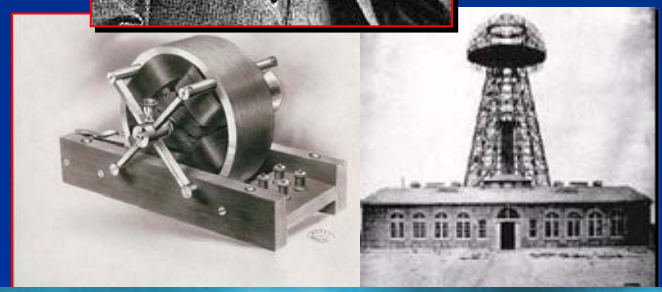
- Experiments were realised by use of low-budget equipment, small power laboratory apparatus, partially using scrap parts.
- Electric field: this term includes both dielectric (Ψ) and magnetic (φ) fields[5].
- All construction and particular design of presented Tesla-experiments apparatus by **DELTA Ingegneria®** .

Brief introduction to Dr.Tesla "master of lightning"

Nikola Tesla *(1856-1943):* forgotten Serbian genius, emigrant and later U.S. citizen, great scientist, inventor and phylanthroper "invented" the XX Century with his

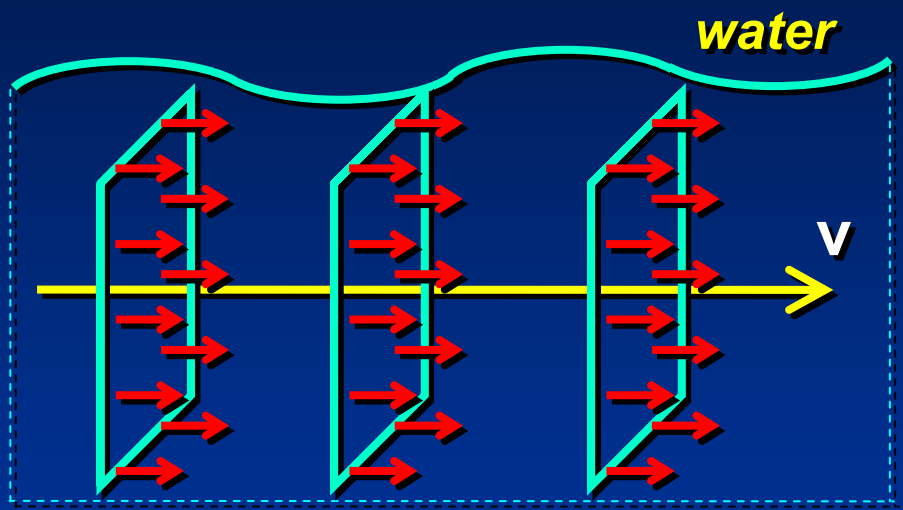
- AC polyphase system
- AC induction motor
- Tesla turbine
- Radio apparatus
- More than 700 patents issued



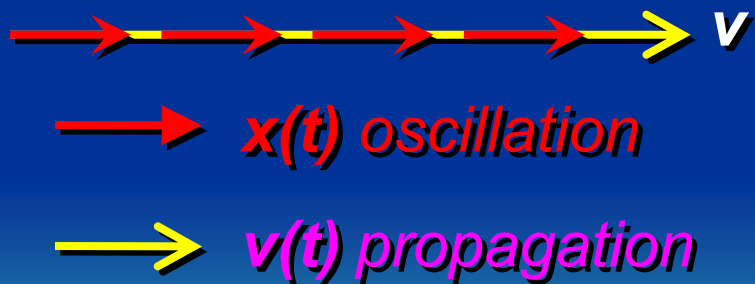


Some Nature analogies from physics:

***Ocean waves*: surface waves, deep water pressure waves (tsunami)**

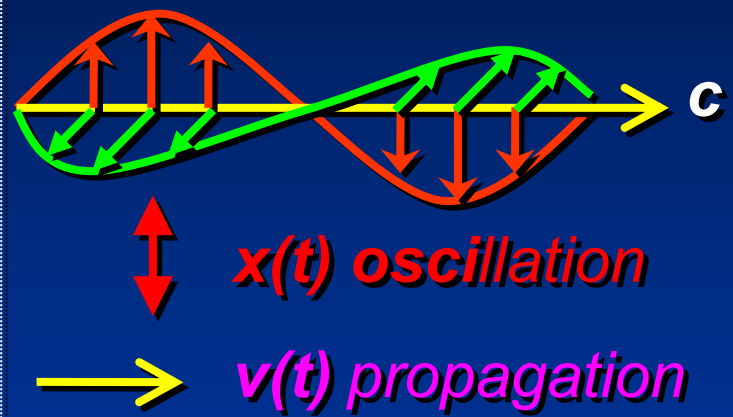


longitudinal waves



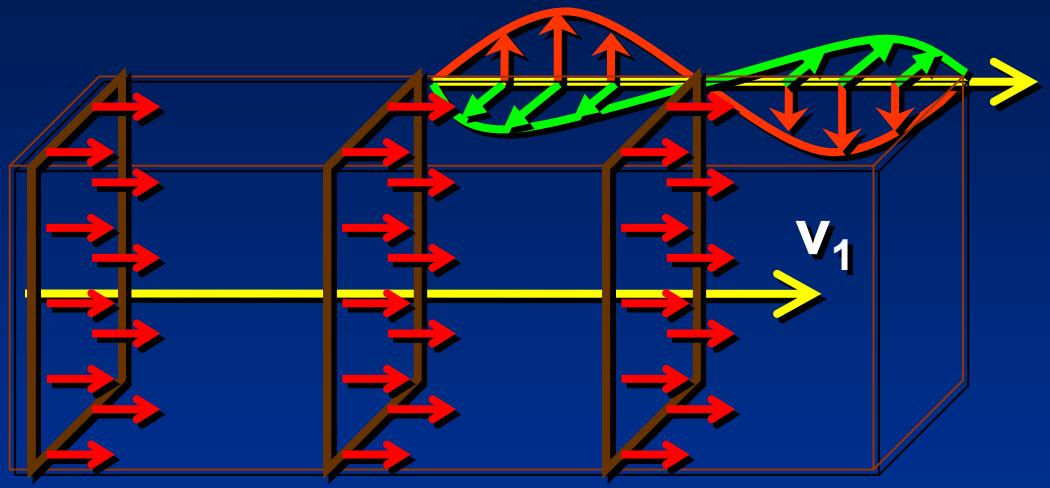
oscillation parallel to propagation

transverse waves



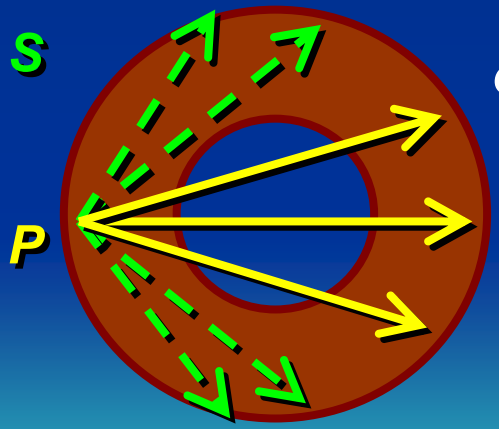
oscillation at right angles to propagation

Seismic waves: primary (P) and secondary (S) waves



S: transverse waves

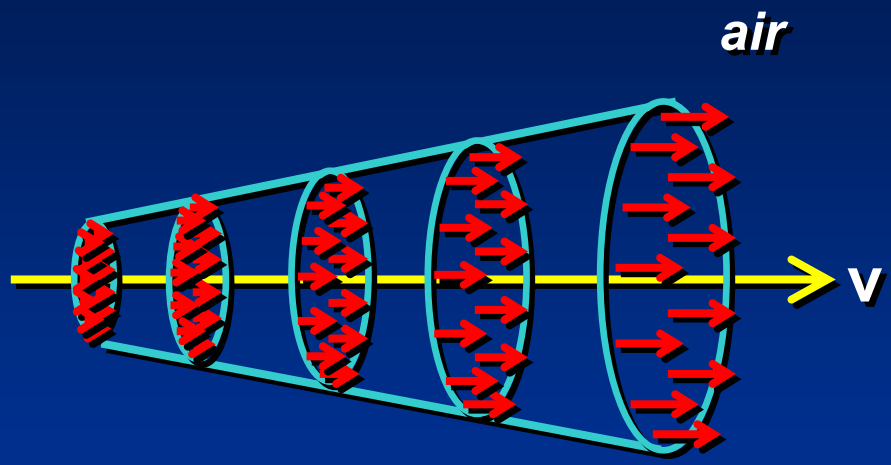
P: longitudinal waves



earth (slice)

(propagation through core only for "P-waves" possible)

Sound waves: air pressure waves



longitudinal waves

These analogies should be kept in mind during following experiments

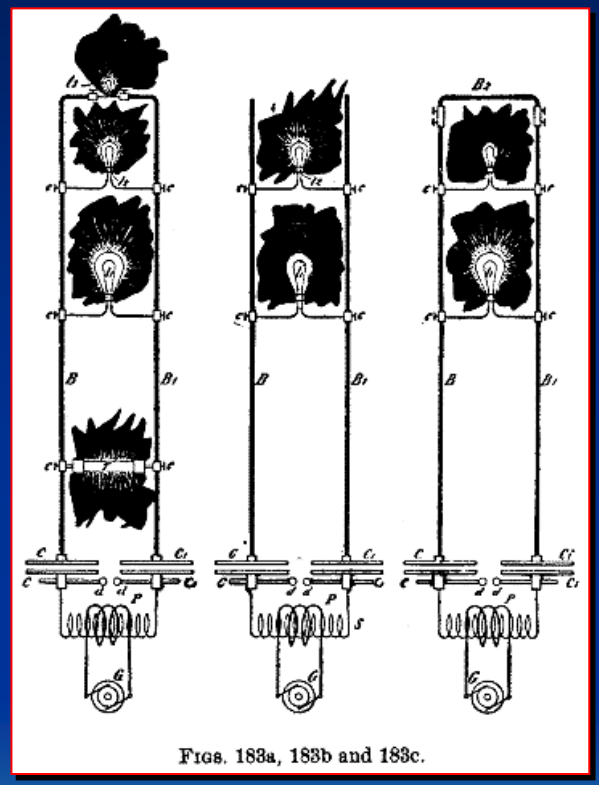
Let us begin with the experiments:

1) Tesla's "stout bars circuit"

- This experiment shows curious electricity phenomena, **according to Tesla** and also called ***"Tesla currents";***

Application of Ohm's law

v = R. i to this case should be closely investigated.

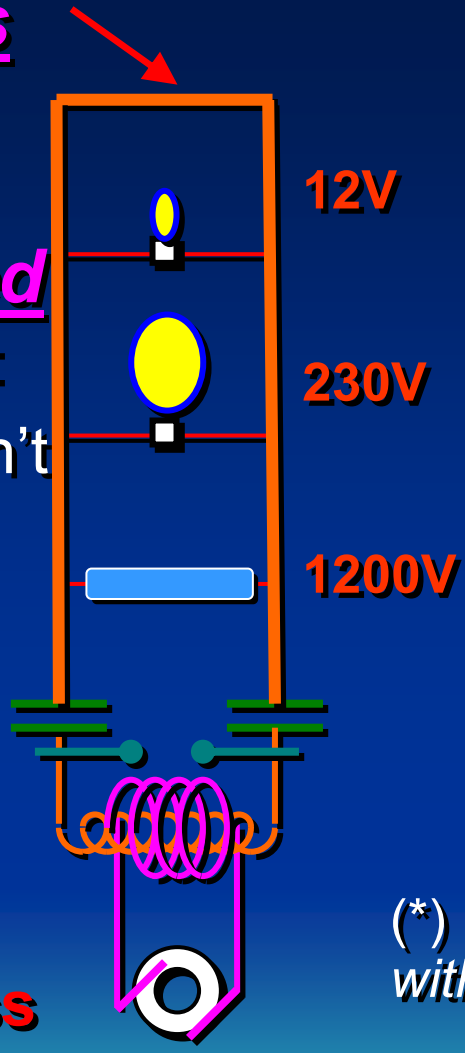


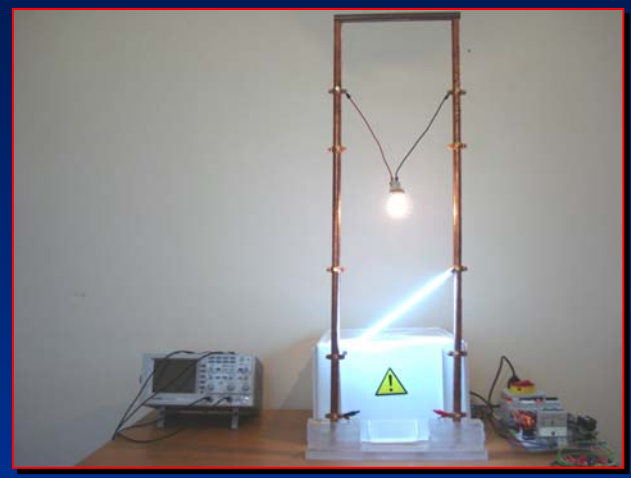
FIGS. 183a, 183b and 183c.

Tesla's 1893 original circuit [2]

"Cold electricity":

- The ***shunted lamps*** in the circuit ***light up*** at full brightness even ***with circuit shorted*** by a heavy copper bar:
- current evidently doesn't follow the bar path (smaller Ω) as normal, preferring the lamp filament (greater Ω).
- ***Lamps rated for different voltages*** **work at full brightness at the same time** (*)



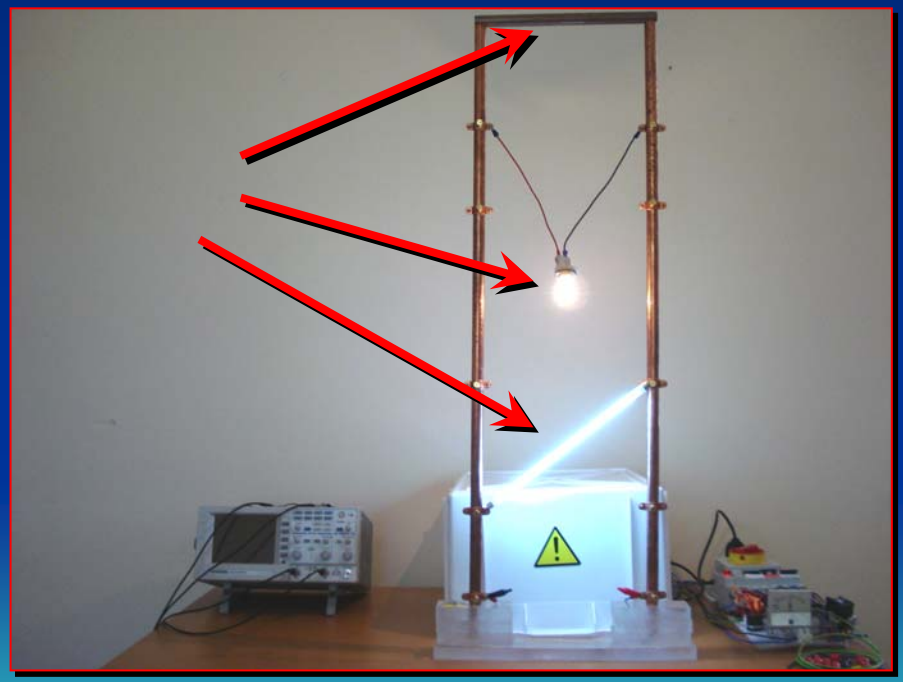


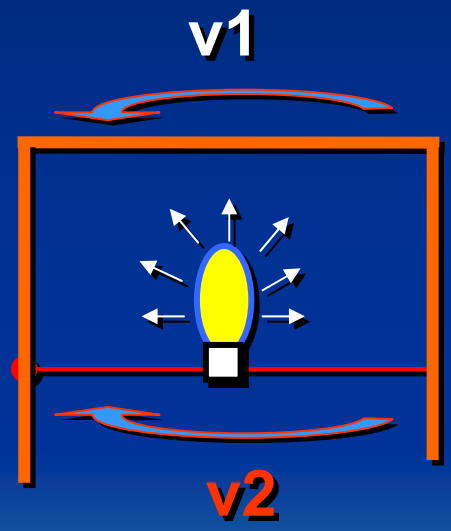
(*) *The Neon tube lights up without usual "starter" circuit*

Lamps work even if short circuited

- **Ohm's Law: v = R. i (v = Z. i)**
- **it should be v1=0 and also therefore v2=0**

but it is evidently v2≠0 because lamp is fully lit



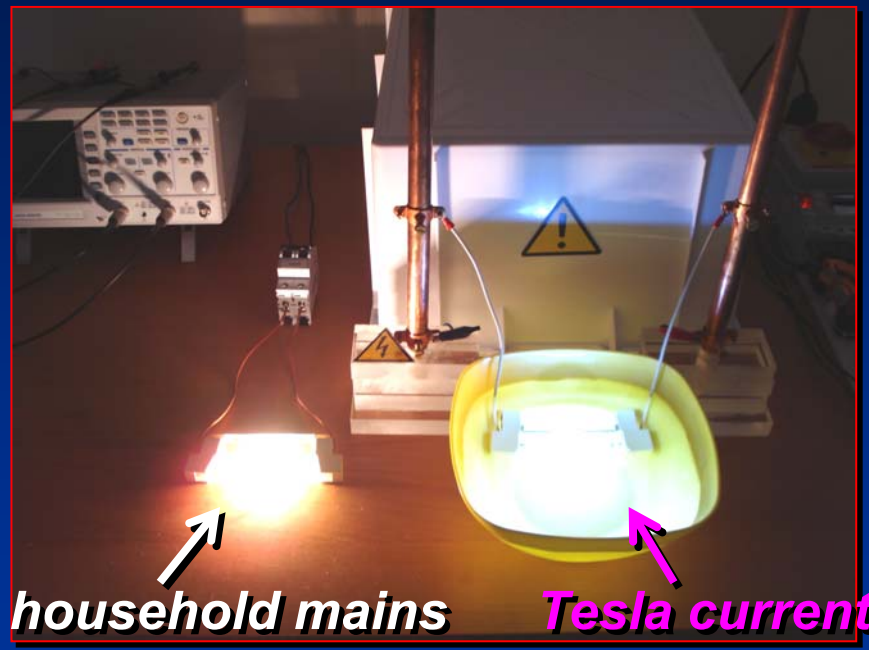


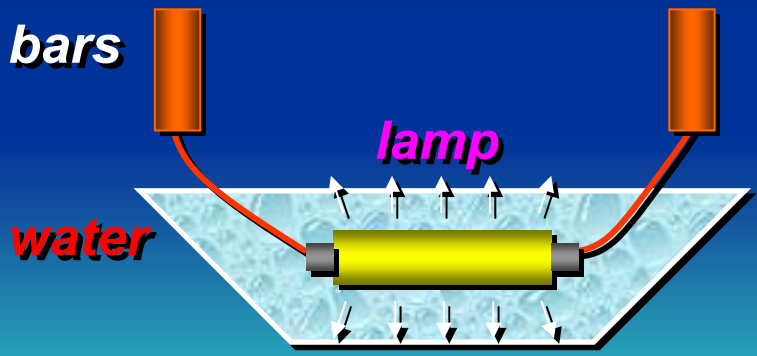
Halogen lamp lit immersed in water

A SPECIAL FEATURE by **DELTA Ingegneria®:**

- A striking effect is observed by shunting a lamp to the circuit (right) and ***immersing it in water*** : the 230V / 100W rated ***lamp lits at its full brightness (*)***; the same lamp type (left) is working by ordinary AC household mains (230V/50Hz,1~); the emitted light colours are different: the left light is ***reddish***, the right one ***blueish***.

(*) *some lamp types lit even with* ***broken filament***.



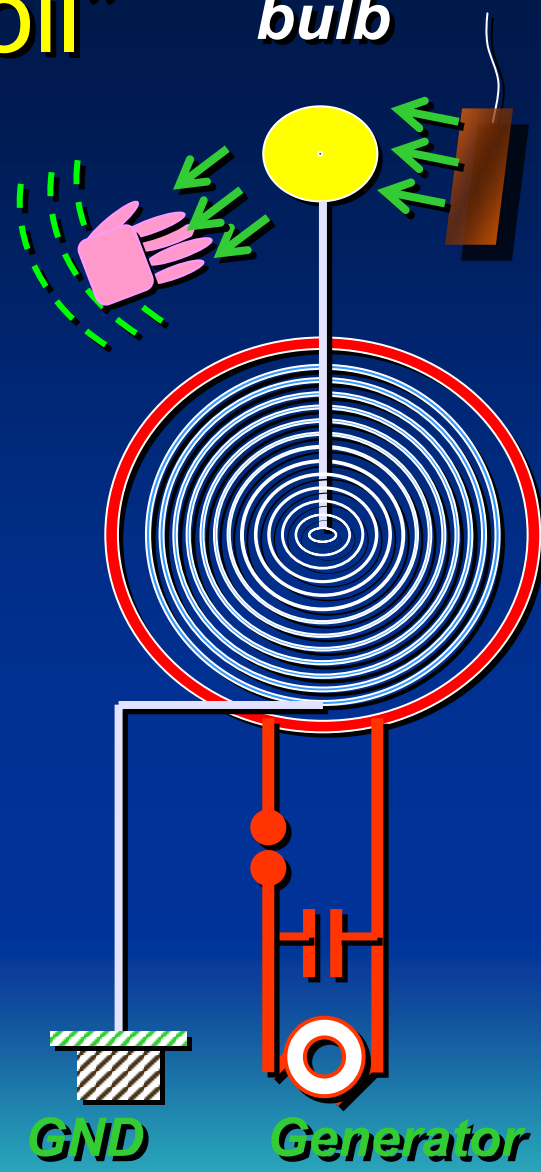


2) "Flat spiral Tesla Coil"

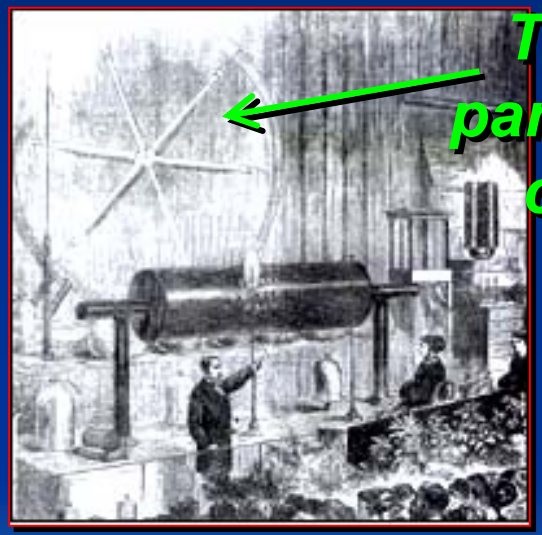
- **A good Tesla's flat spiral Coil ("pancake coil")[3] shows striking features:**

lamp emits light and *repels the human hand,* but *attracts a suspended metal strip:*

- ***The hand "feels" a kind of "pressure" coming from the lamp.***

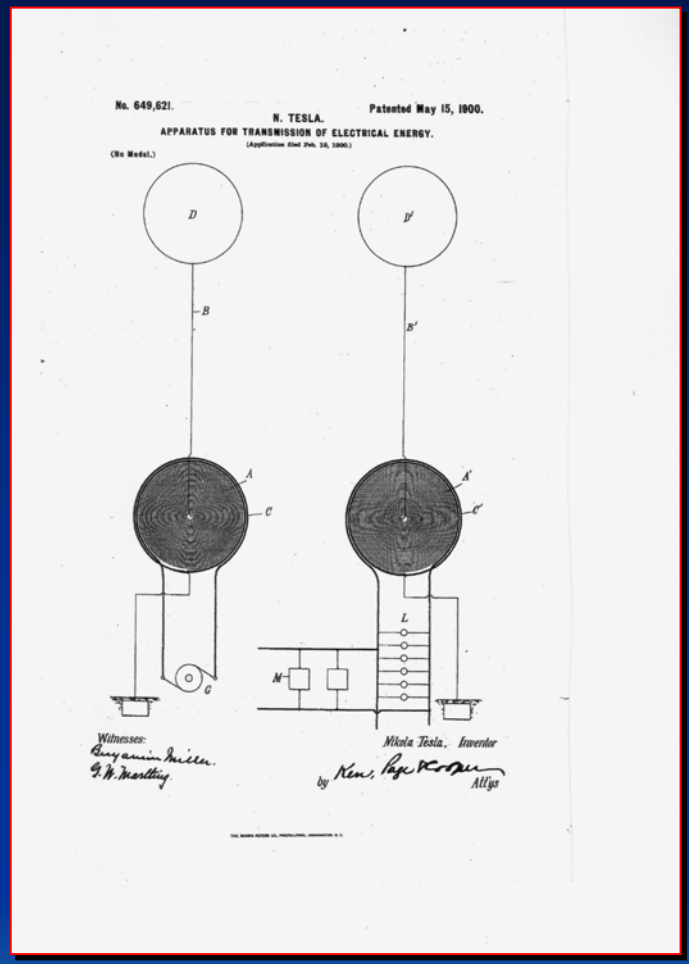


- *Tesla's 1900 original patent n.649621 for transmitting electrical energy;*



Tesla pancake coil

A Tesla lecture - about 1890



No. 649,621. Patented May 15, 1900.

N. TESLA.

APPARATUS FOR TRANSMISSION OF ELECTRICAL ENERGY.

(No Model.)

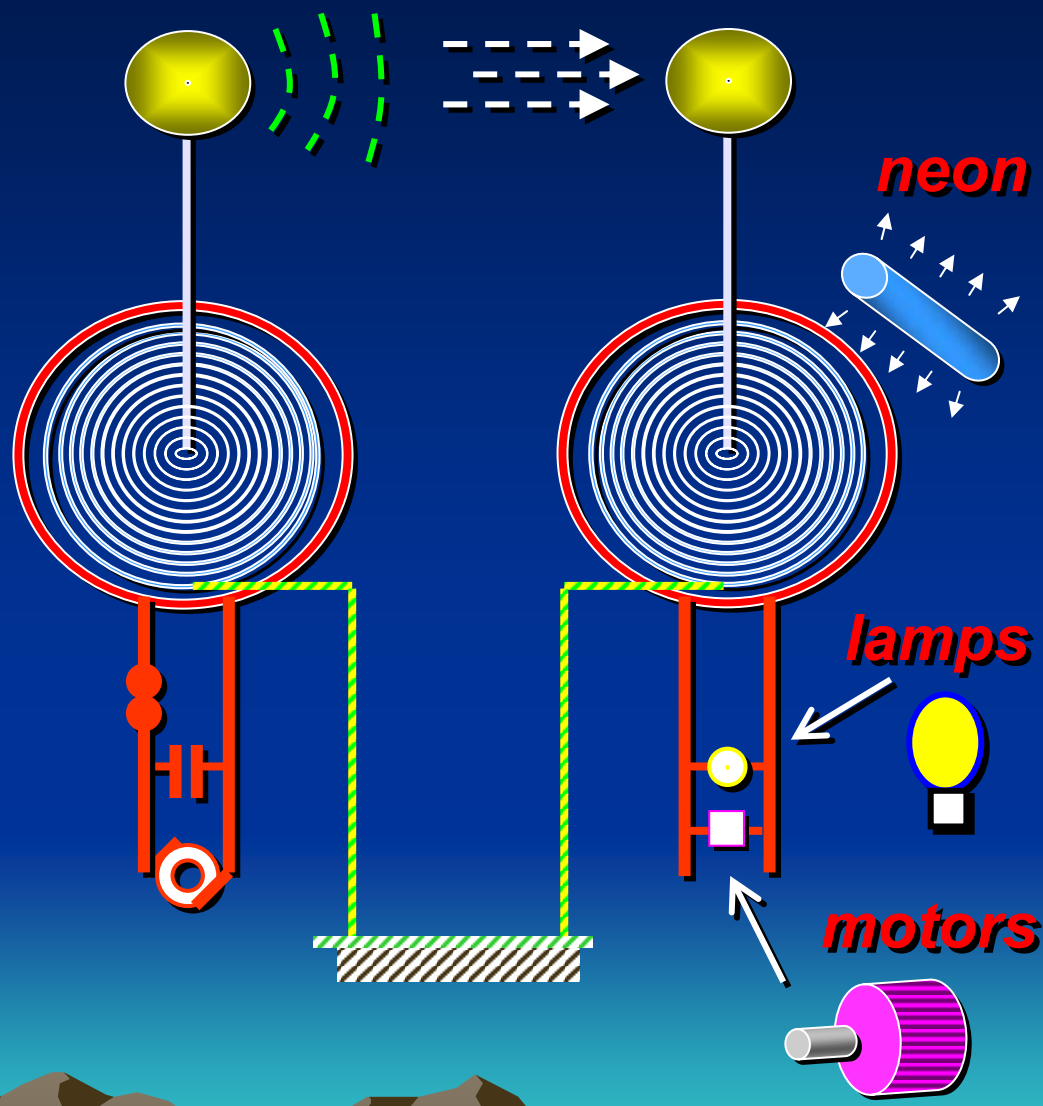
Witnesses:

Mikola Tesla, Inventor

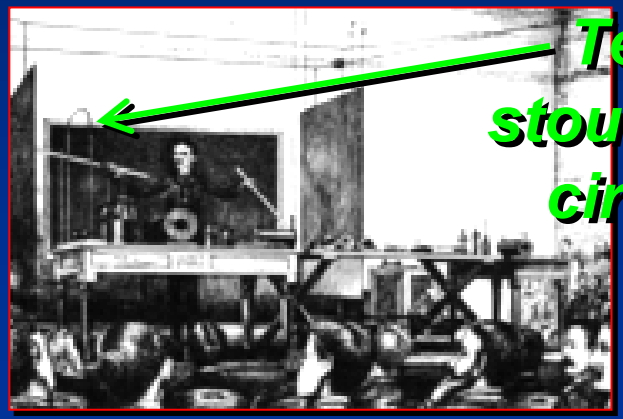
by Kerr, Page & Cooper Attys

Transmission of energy with T.C.

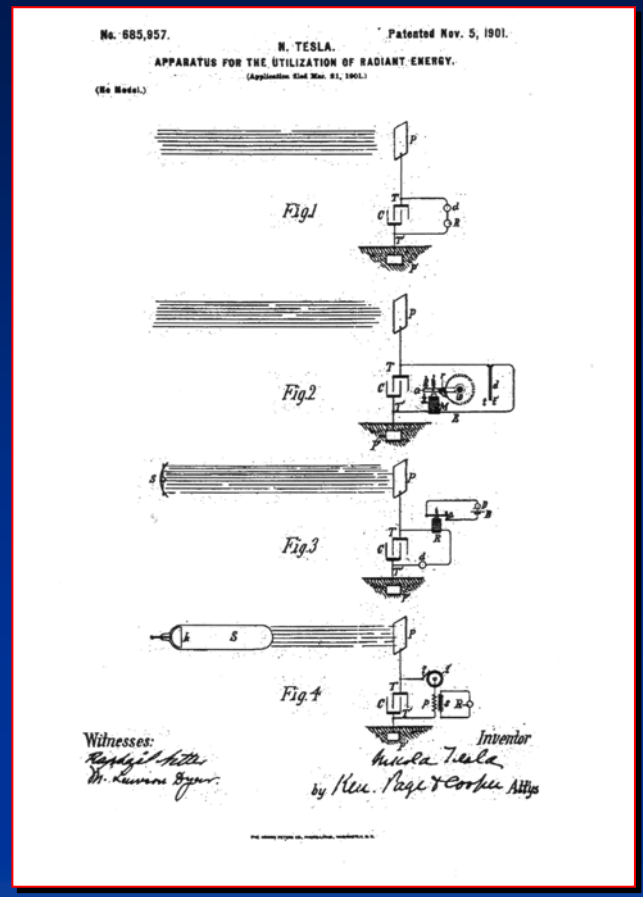
- **Art of transmitting energy in the medium (ground) by *ONLY ONE WIRE* and doing away with it, i.e. *WIRELESS*:**
  a lamp on the second coil[1] is lit and an electric motor runs



Tesla's 1901 original patent n.685957 for receiving ENERGY from a metal plate



A Tesla lesson - about 1895


No. 685,957. Patented Nov. 5, 1901.

N. TESLA.

APPARATUS FOR THE UTILIZATION OF RADIANT ENERGY.

(No Model.)

Fig.1

Fig.2

Fig.3

Fig.4

Witnesses:

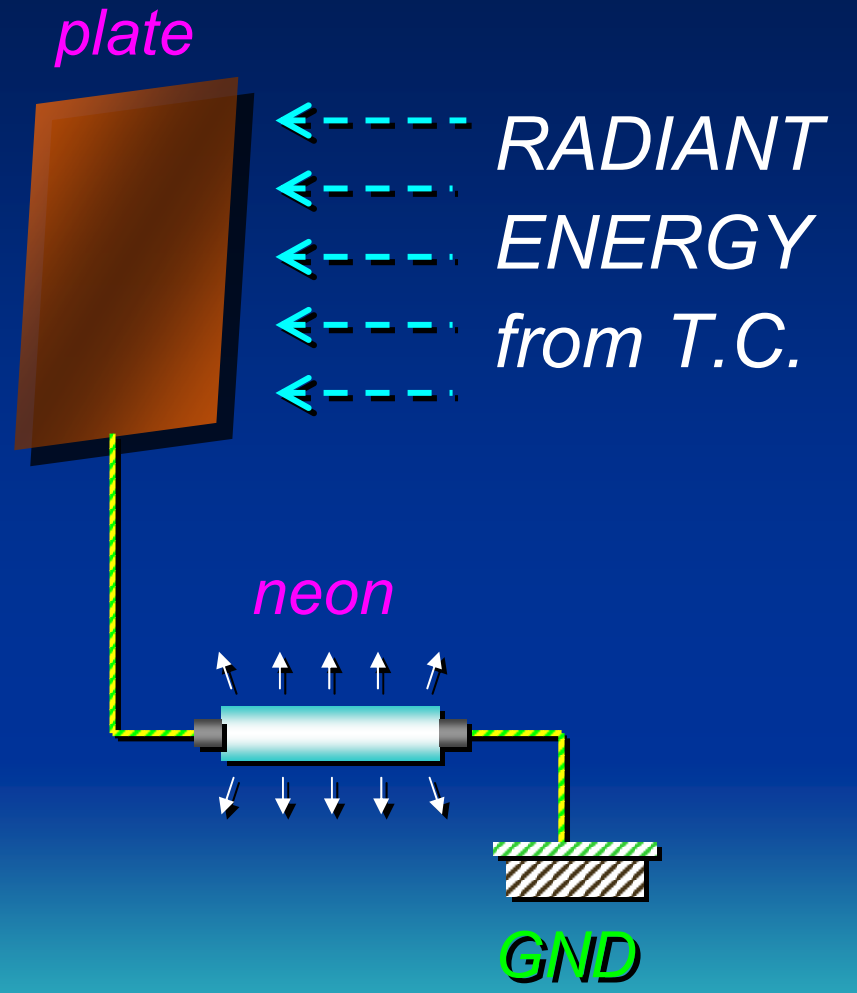
Inventor

Nicola Tesla

by Kerr, Page & Cooper Attys

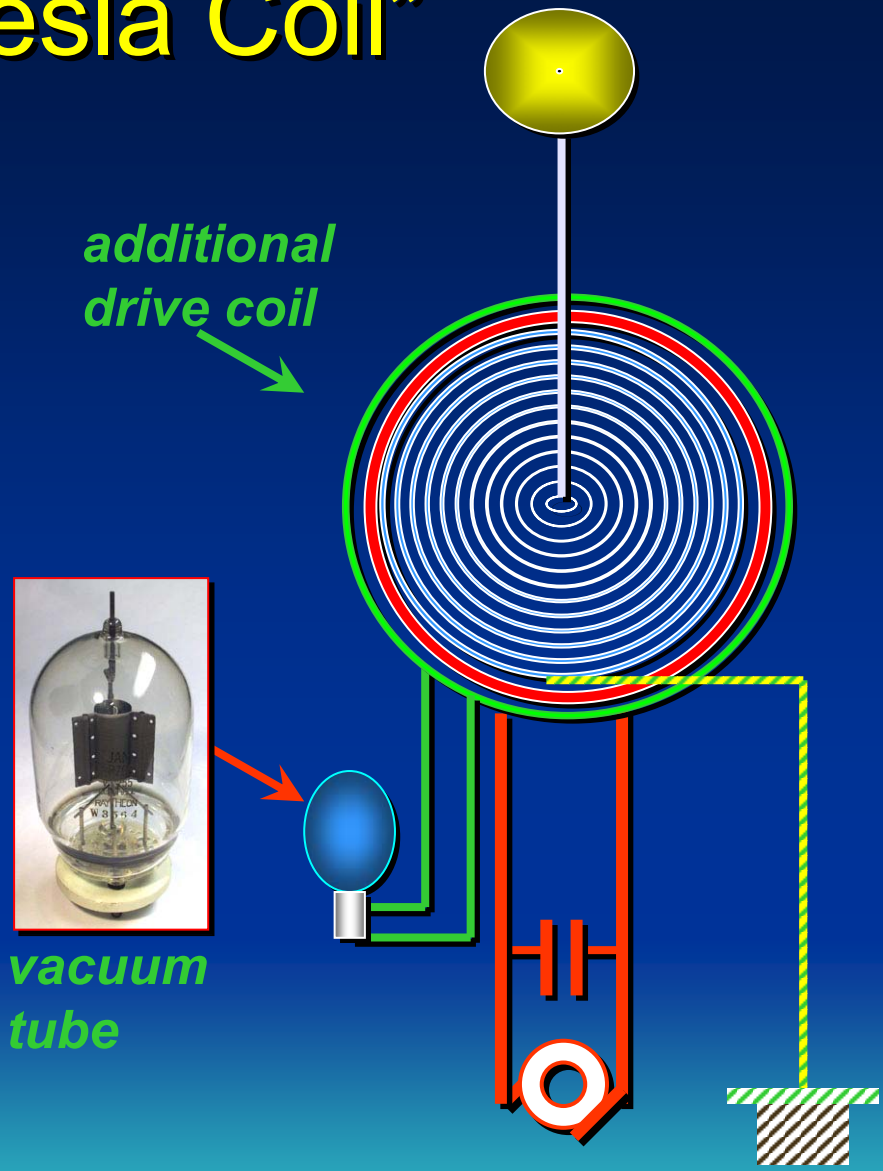
3) Utilizing electrical energy

- Apparatus for ***utilizing WIRELESS energy*** by an insulated plate and a series-connected-to-earth neon lamp (i.e. it transceives ***POWER***, not only a weak ***signal***)



4) “Vacuum tube Tesla Coil”

- A special *feature* from DELTA Ingegneria®: *flat spiral Tesla coil* energized by *vacuum tube* with an additional drive coil added to the primary, instead of the spark-gap.

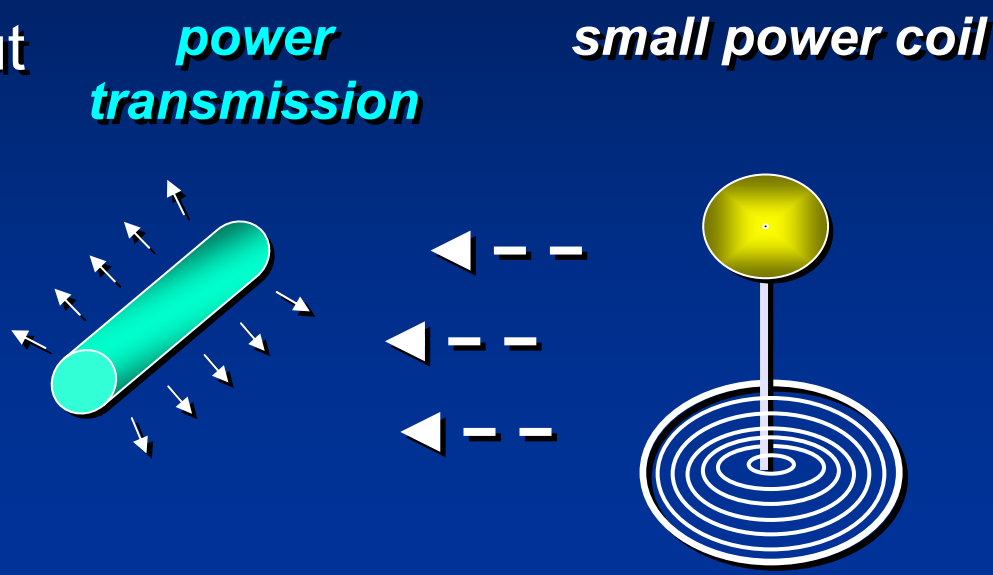


The energy field of a T.C.

- Tesla Coil's energy field lights up a neon tube to its full brightness without wires, that is

WIRELESS:

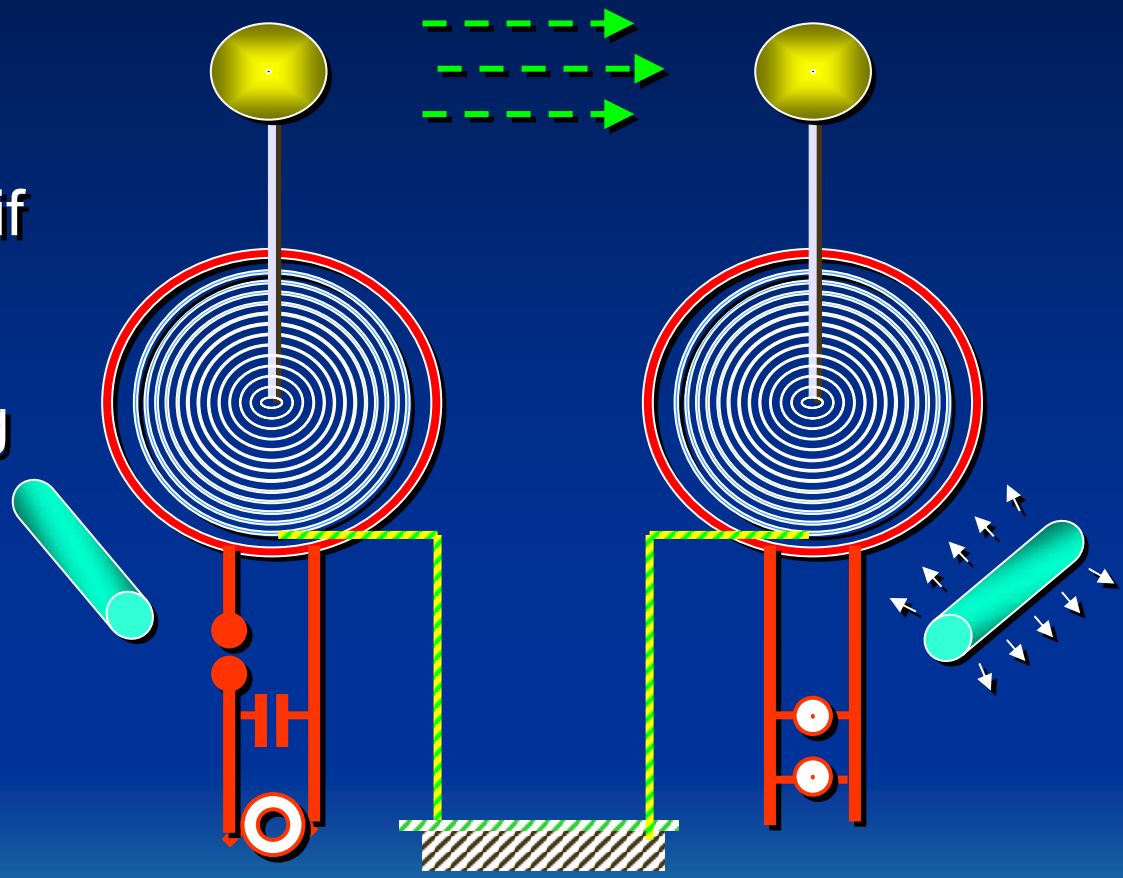
transmission of ***ENERGY***, not only signal



MAGNETODIELECTRIC: is the "dual of ELECTROMAGNETIC"

5) Mutual effects between T.Coils

- **Mutual effects of XMTR and RCVR:** a neon tube near each Tesla coil shows that if RCVR coil is first switched ***on*** and then ***off*** the corresponding neon tube turns first ***ON*** and then ***OFF*** *whereas the neon of the XMTR turns* ***OFF*** *and then* ***ON***.



The two T.C.s are communicating !

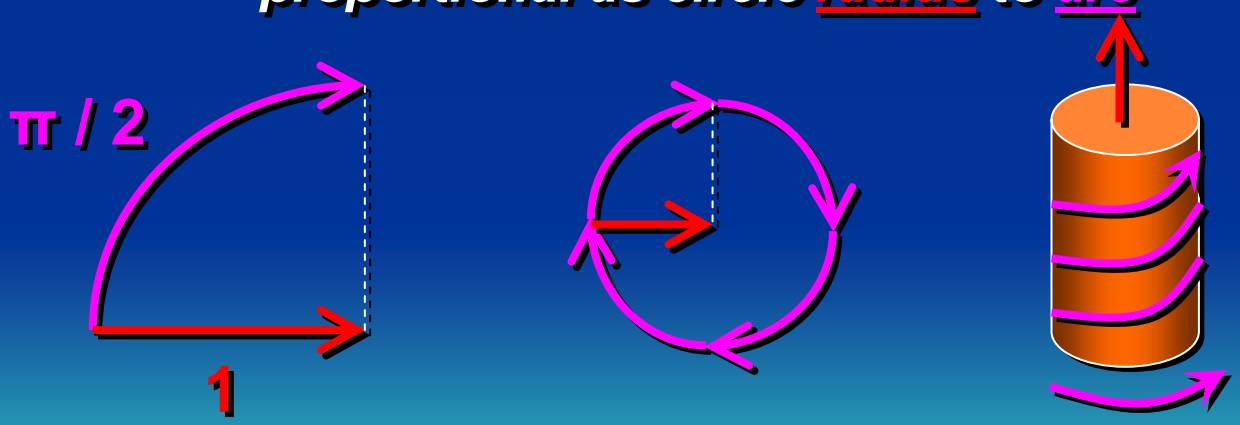
Tesla Coil resonance frequencies

- There are two different main resonance frequencies f_0 and f_1, where $f_1 = 1{,}57 . f_0$; *for instance* $f_0 = 1$ *MHz and* $f_1 = 1{,}57$ *MHz; the relationship is therefore:*

$$f_1 = f_0 . \pi / 2 \qquad (\pi = 3{,}141\ldots)$$

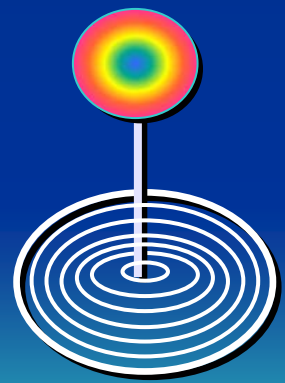
Frequencies relationship expressed by wave lenghts λ :

proportional as circle radius to arc



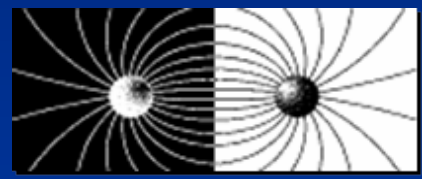
Light effects with a T.C.

- **The apparatus produces curious beautiful light effects, like brushes and streamers, in the lamp bulb at top terminal of secondary coil showing different colours [1].**



A few words about Maxwell's equations

- The original ***quaternion*** Maxwell's electromagnetism equations were later *modified* and *simplified* with the introduction of ***vectors*** by Heaviside and Gibbs".
- Quaternions have ***4*** terms: $q = a+bi+cj+dk$ (by Hamilton)
- Vectors have only ***3*** terms: $v = ai+bj+ck$ (cartesian space)
- Calculation rules are not the same in the two systems, for instance:



- Quaternions have anti-commutative property: **i.j= - j.i**
- Vectors however have commutative property: **i.j= j.i**
- The sum of quaternions **q1=a+bi+cj+dk** and **q2=a-bi-cj-dk** gives **q=q1+q2=2a** which is but a scalar not equal to zero
- The sum of vectors **v1=ai+bj+ck** and **v2=-ai-bj-ck** gives **v=v1+v2=0** that is zero;

  in other words **q1+q2=2a** but **v1+v2=0** as an example, so:

-> ***results are not the same and so the involved equations***

Maxwell's equations in today's differential form are:

$$\nabla \cdot E = \rho / \varepsilon_0 \qquad \text{Dielectric flux theorem}$$

$$\nabla \cdot B = 0 \qquad \text{Magnetic flux theorem}$$

$$\nabla \times E = - \partial/\partial t \, B \qquad \text{Faraday's law}$$

$$c^2 \nabla \times B = j/\varepsilon_0 + \partial/\partial t \, E \qquad \text{Ampére's law}$$

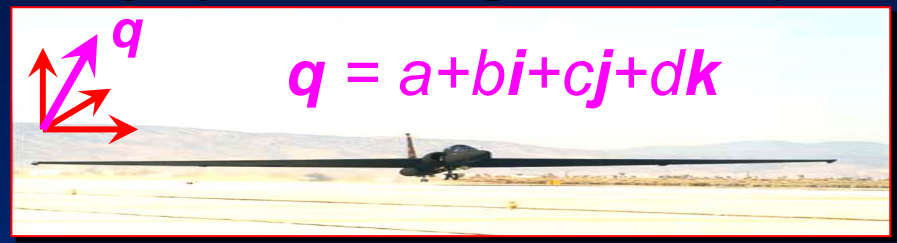
where: E = dielectric field; B = magnetic field;
ρ = charge density; ε_0 = dielectric constant in vacuum;
$\partial/\partial t$ = time partial derivative; j = current density.

and "Lorenz gauge" would then arbitrarily fixed as: $\nabla \cdot A + 1/c^2 \cdot \partial/\partial t = 0$

but in 1865 originally J.C.Maxwell issued 20 equations

Quaternions, by use of Informatics, simplify complicated manual calculation and allow up to 55% memory space saving, for example in:

- *computer graphics* [6]
- *aerospace navigation*



Use of quaternions could be made in Maxwell's equations

- **Moreover, two well known expressions of Maxwell's equations (where B and E are respectively magnetic and dielectric vectorial fields) are:**

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

dielectric scalar potential φ and
dielectric vector potential A

Curiously they were often considered to be only mere mathematical abstractions rather than to have *physical meaning*.

- God's creation is vast: a lot has to be discovered.

"Flight by machines heavier than air is unpractical and insignificant, if not utterly impossible." - Simon Newcomb, 1902.

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Bibliography and references

[1] Nikola Tesla: *"Experiments with AC of VHF and their application to methods of artificial illumination"*, 1891

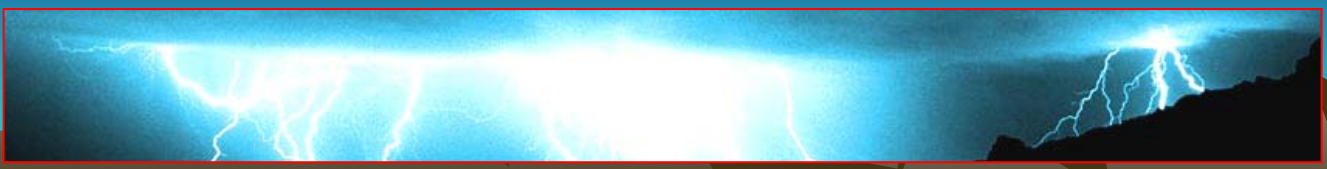
[2] Nikola Tesla: *"On light and other HF phenomena"*, delivered before Franklin Institute, Philadelphia, feb.1893

[3] Nikola Tesla: *"The true wireless"*, Electrical Experimenter, may 1919

[4] Hugo Gernsback: *"Faster than light !"*, Everyday science and mechanics - vol.2 n.12, nov.1931

[5] Charles P. Steinmetz: *"Electric discharges, waves etc."*, 1914

[6] Roberto Handwerker et al.: *"Rotation of solids by quaternions"* for Elements of informatics, Milan Polytechnic, Faculty of Engineering, Milan, Italy, 1990



Thanks for Your kind attention !

Dr. Eng. Roberto Handwerker

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also on website the author's article: "Tesla and cold electricity"