

# **Heinrich Hertz (1857-1894) and the Fatal Timeline**

## **Electromagnetic Waves and the Crooke's Tube**

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When a timeline was established related to events that lead to and following Heinrich Hertz's discovery that electromagnetic waves can propagate through the air, a potentially fatal chronology was identified. It is quite possible that the cause of Hertz's early death was exposure to damaging levels of electromagnetic radiation.

**The timeline:** Crooke's tube invented in the period **1869 to 1875**; Heinrich Hertz demonstrated that EM waves propagated through air in **1886-1888**[1]; Hertz began investigating the properties of the cold cathode Crookes tube in **1892**; Hertz died **Jan 1, 1894**; X-rays identified by Wilhelm Röntgen in **1895**; Electron identified by Joseph J. Thomson in **1897**; A Federal standard limiting x-ray emissions from TV receivers to 0.5 milliroentgen per hour (mR/hr) was issued on December 25, **1969**; U.S. Department of Health and Humans Services declares X-rays a **carcinogen** in **2005**.

Diagrams and a few pictures of Hertz's experimental setup are available. Hertz had to be very close to his radio frequency (rf) radiation sources when it was operating to observe the small spark gap of his receiving antenna. Hertz proved that EM waves propagated through air from his transmitting antenna to his receiving loop 1.5 meters away. A micrometer adjustable spark gap was at the terminal end of his receiving loop where he had attached a microscope to be able to see the spark better. He continued with this research for another 3 years, wherein he proved the waves he was producing were transverse. His research required close exposure to very high frequency rf radiation, some 450 Mhz and possibly higher. Hertz did not know that the spark gap itself was producing a broadband of rf frequencies, much higher than those that were emphasized by his antenna.

In the late 1880s, there was no reliable way to determine the magnitude of transmitted rf waves. Literature provides no outward evidence that Hertz experienced biological damage from his radio

experiments, but he suffered severe migraines in 1892 after he began investigating the properties of the cold cathode Crookes tube. This research would have exposed him to X-rays. After a period of treatment, he succumbed to his *malady* in January 01, 1894 at the age of 36 years.

Contemporary literature states that Hertz died from complications related to granulomatosis with polyangiitis (GPA), a type of **vasculitis**; the cause is currently unknown. The original name for the *malady* was Wegeners Granulomatosis (WG) when it was first described in 1932 by Wegener, a German physician.

It is apparent that someone had researched the symptoms that Hertz experienced and decided they matched the characteristics of WG. No knowledge was available to physicians in the 1890s as to the effects rf radiation and X-rays have on the human body. It was not known until fifty years later that specific frequencies and power levels of rf waves could cause biological damage.

The vascular damage Hertz experienced, which presented the appearance of WG, could have been the result of rf heating in small blood vessels. Physicians in the 1890s would never have considered that man-made rf waves could have been a factor that caused any type of **vasculitis** or other human malady. “Although there were some indications of the heating effects from the energy emitted by radio transmitters in the late 1930s, the phenomena became well known with the development of radar during World War II. Quite simply, people noticed that they got warm when they stood in front of radar antennas.”[2] Hertz's death at age 36 suggests his exposure to high intensity high frequency rf waves may have contributed to the cause of his death.

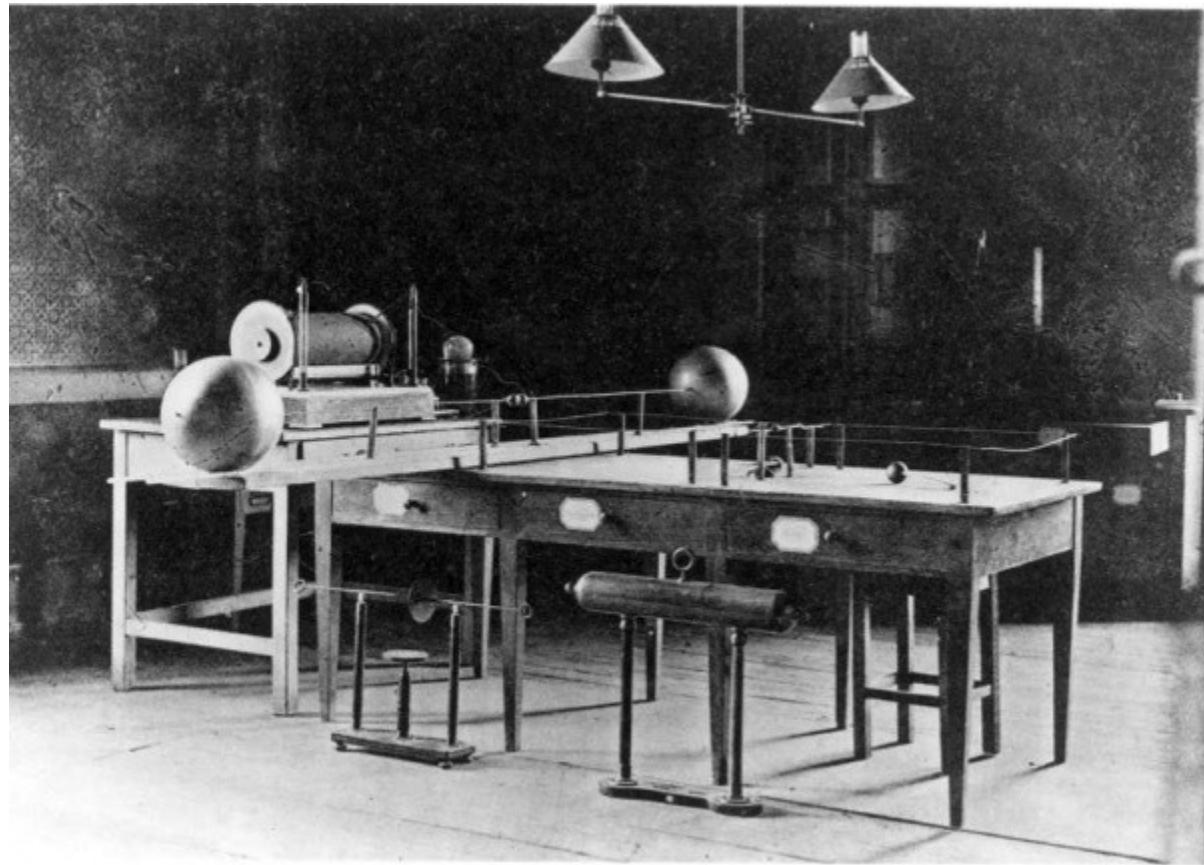
Most of the reports on rf exposure safety state that more research is needed. Researchers cannot subject individuals to various levels of rf power at different frequencies without knowing whether certain frequencies and power levels produce biological damage. It is already known that high power levels can be dangerous but it is not known with any certainty at what power level and exposure time it becomes a health hazard.

The last two entries of the time line, **1969** and **2005**, indicates it takes an extended time for

regulators to come to a consensus on the long lasting danger of specific frequencies of electromagnetic waves, X-rays. [3] What is needed is how exposure to various EM frequencies and power levels manifests its biological damage.

#### References:

- [1] Engineering and Technology History Wiki “First Generation and Experimental Proof of Electromagnetic Waves, 1886-1888” [http://ethw.org/Milestones:First\\_Generation\\_and\\_Experimental\\_Proof\\_of\\_Electromagnetic\\_Waves,\\_1886-1888](http://ethw.org/Milestones:First_Generation_and_Experimental_Proof_of_Electromagnetic_Waves,_1886-1888)
- [2] [http://rfsafetysolutions.com/RF%20Radiation%20Pages/Biological\\_Effects.html](http://rfsafetysolutions.com/RF%20Radiation%20Pages/Biological_Effects.html)
- [3] <http://www.fda.gov/Radiation-EmittingProducts/ResourcesforYouRadiationEmittingProducts/ucm252764.htm>



ref(1) Photograph taken by Heinrich Hertz