

The Tesla Antenna and its Unique Design

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In 1898, Tesla gave a demonstration of the world's first radio controlled boat in Madison Square Garden. "When first shown... it created a sensation such as no other invention of mine has ever produced," wrote Tesla. *He had cleverly devised a means of putting the audience at ease, encouraging onlookers to ask questions of the boat. For instance, in response to the question "What is the cube root of 64?" lights on the boat flashed four times. In an era when only a handful of people knew about radio waves, some thought that Tesla was controlling the small ship with his mind. In actuality, he was sending signals to the mechanism using a small box with control levers on the side.* This was the USP 613809 was titled *Method of and Apparatus for Controlling Mechanism of Moving Vessels or Vehicles*. This patent was given to him the same year. Part of this contained an earlier design resulting in US patent 645 576 of Tesla titled System of Transmission of Electrical Energy filed in 1897 which he got in 2000.

This transmission of electromagnetic wireless signals was carried out by the ingeniously designed Tesla antenna. To start with there was a planar transformer, the primary of which was floating and connected to the source. One end of the secondary coil was grounded and the other end of the wire went vertically up in a longitudinal direction and it connected to a metallic ball. The number of turns of the primary and the secondary and their spacing provided a good match to the source. The electromagnetic energy went in a longitudinal direction from the secondary through the wire and exciting the metallic ball which radiated the energy. It is thus conjectured by the authors that due to such a radiating system design which provided a good broadband signal as the generator was a spark gap only that Tesla assumed that the electromagnetic energy is propagating in a longitudinal direction. In modern terminology a monopole will be constructed over a finite ground generated by the secondary of the coil where the other end of the monopole was loaded with the metallic ball and with the proper dimensions may also act part of the radiating system.

Numerical simulations will be presented to illustrate the radiation efficiency of the Tesla antenna over a broad band.