Subject:

Everybody knows that electric sparks cause radio and TV interference. During a thunderstorm, when a switch is operated or when an electric motor is running, one can hear a cracking noise when receiving an amplitude modulated signal. The ignition sparks of a car engine would also cause interference if the car had not interference suppression circuitry implanted. In the original version of Hertz’s experiment for showing the existence of electromagnetic waves, sparks play an important role.

It is a wide-spread opinion that the radiation that causes the interference originates from the spark gap:

“The spark generates high frequency interference pulses, which have to be suppressed. In order to do so various measures are possible…”

“…together with the spark electric discharges are arising in the form of electric oscillations; the spark jumps from one sphere to the other; thus, the spark gap between the spheres acts as an emitter.”

“An oscillating electromagnetic perturbation (i.e. a spark discharge) generates electromagnetic waves, which propagate with the velocity of the light.”

One can find illustrations of Hertz’s experiment where, electromagnetic waves are drawn that emanate from the spark gap between the two halves of the oscillator.

Deficiencies:

It is not the spark gap that emits the electromagnetic radiation but the electric conductor of which the spark gap is only a very small part. In the case of the Hertz oscillator the whole antenna is emitting. The role of the spark gap is that of a switch which connects the two parts of the antenna as soon as the voltage has attained a certain value.

This voltage has to be very high, in order to get a high electric field strength, and in order to get a high magnetic field strength after closing the switch. When charging, the halves of the antenna must be disconnected. Instead of connecting them by means of a normal switch one uses the much simpler method of the spark. As soon as the discharge is initiated there is a conducting connection. Even though the voltage passes through zero as the oscillation takes place, the spark does not cease, since the ionization of the air survives.

The same is true for the sparks of a light switch or of the brushes of an electric motor: The emission of the electromagnetic wave does not occur only at the spark, but at the whole of the conductor in which the current is fluctuating when the circuit is opened. Thus, the spark is a necessary condition for the occurrence of the emission of the waves, but the source of the wave is the entire conductor in which the rapid change of the current takes place.
Origin:
Everybody knows: When there is a spark, there is also the cracking noise. The spark is eye-catching, there is light and sound coming from it. It seems plausible that the spark is also the source of the electromagnetic wave that causes the interference.

The misconception survives although it is in contradiction with what the students learn about the dipole antenna: It is the whole antenna which is responsible for the emission.

Disposal:
Explain clearly that the role of the spark is only that of an automatic switch. The spark gap establishes a conducting connection between two metallic conductors.

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