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## Definition of new design for megavolt pulse generator with implementation of “non-polluting” technologies

### Abstract:

In order to study NEMP (Nuclear ElectroMagnetic Pulse) interaction with appliances (military or civil), the CEA of Gramat implements a few large experimental simulators. The electromagnetic pulsed sources driving these simulators were build form the late 80's to the 90's. They are composed of an antenna driven by mega-volt pulse generator, themselves, composed of a Marx generator and a pulse-shaping network (Transfer stage + Peaking stage).

Currently, SF6 gas (Sulphur Hexafluoride) insulates these systems, but international regulation evolution force the development of new simulators minimizing or excluding this kind of greenhouse gas.

This study aims at defining innovative replacement solutions for these generators with modern and non-polluting technologies. These solutions must guaranty the same performances as well as few evolutions of the current systems.

### Progress:

The ongoing study is carried out by circuit simulation (LTSpice software) and 3D electro-magnetic simulation (Microwave CST studio suite, on the static and transient solvers).

The chosen solution is a fast wave erection Marx with a simple Peaking stage as pulse-shaping stage (without Transfer stage). The wave erection Marx differs from a conventional Marx by its fast pulse and rapid erection, due to its small inductance, compactness and exploitation of the stray capacitances.

From an equivalent Marx-Peaking circuit, the simulation is enhanced and greatly detailed to be as representative as possible of the working principle of a real wave erection Marx generator. The final solution should be a 15 stages 2,2MV Marx generator charged up to +/-90 kV with 1 m overall diameter and less than 3 m meter long which is approximately 80% more compact than current generators.