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5P44 - Development of an RF circuit amplifier fed by a low power nonlinear transmission line

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The lumped nonlinear transmission lines have been studied for the radiofrequency signals generation in the range of the order of tens of MHz up to a few hundreds of MHz depending on the nonlinear element used to build the LC line. The oscillations obtained at the output of these lines are applied in defense mobile platforms and communications systems. Low power nonlinear transmission lines use varactor diodes as nonlinear elements, which show a good nonlinear effect with capacitance variation of the order of 90% at their P-N junction with the applied voltage, which is an excellent performance to obtain oscillations at the line output. However, these semiconductor devices operate at low voltage, producing small voltage modulation depth, low power, and consequently reduced signal range. Looking for increasing the voltage modulation depth of the signal generated with nonlinear transmission lines, this work developed a radiofrequency amplifier using a Metal Oxide Semiconductor Field Effect Transistor -MOSFET model RD06HVF1. A 30-section line using varactor diodes MV209 as nonlinear elements can work as an RF source to obtain oscillations with 40 MHz of frequency at the line output. By means of SPICE simulations, it has been demonstrated that an amplifier circuit connected to the output of this varactor diode transmission line can produce an increase of the voltage modulation depth produced at line output from 10.7 V to 41,08 V approximately, thus allowing higher level power to electromagnetic wave propagation and consequently higher signal range. Experimental comparison using a PCB prototype with the corresponding simulation will be also shown.

Authors: Dr SILVA NETO, Lauro Paulo (Federal University of São Paulo); Mr MORAES, Henrique Monteiro (Federal University of São Paulo); ROSSI, Jose (National Institute for Space Research); Dr BARROSO, Joaquim (Technological Institute of Aeronautics); RANGEL, Elizete (National Institute for Space Research Brazil); Dr CON-CEIÇÃO, Arlindo (Federal University of São Paulo)

Presenter: Dr SILVA NETO, Lauro Paulo (Federal University of São Paulo)

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