Contribution ID: **203** Type: **Oral**

INVESTIGATION OF FAST THYRISTOR SWITCHING MODULES TRIGGERED BY DIRECT OVERHEAD IGNITION

Tuesday, 20 June 2017 16:30 (30 minutes)

We report on the development of fast high-voltage kilo-ampere thyristor-based switching modules, which can be easily scaled by means of series connection of the thyristors. The thyristors are in each case getting triggered by the overhead ignition of breakover diodes, with the anode of the breakover diode being connected to the anode of the thyristor and the cathode of the breakover diode being connected to the gate of the thyristor. A low-inductive 10-kV module with two layers of each five IXYS 1600-V CS60-16io1 Si-based thyristors and 1000-V IXYS IXBOD breakover diodes is presented.

This switching concept can also be transferred to MOS-gated thyristor structures, simply by adding a resistive divider to the circuit. The turn-on time depends on the gate voltage, which can be optimized by adaptation of the divider ratio. Minimum turn-on time has been attained by hard switching with a peak gate voltage of about 80 V. Two versions of 16-kV switching modules based on IXYS 1500-V MOS-gated thyristors have been set up and successfully tested to a low resistive load of 2.3 Ohm, reaching a peak current of 2.1 kA and a current rise time of 105 ns.

Because of their kilo-ampere current carrier capability, these MOS-gated thyristor modules turned out to be a very suitable semiconductor closing switch for the transformer coupled LC inversion generator (TCLCG), which is an interesting high voltage pulse generator for driving electromagnetic effector systems. A peak-to-peak output voltage of 115 kV at a voltage rise time of 95 ns has been achieved with an asymmetrically compensated 3-stage test TCLCG. Generator efficiency was 67%, only 9% lower than with a gas spark gap.

Primary author: BISCHOFF, Rainer (ISL)

Co-authors: Mr BROMMER, Volker; Dr SCHARNHOLZ, Sigo; Mr STOLL, Meik

Presenter: BISCHOFF, Rainer (ISL)

Session Classification: Oral session 12 - Semiconductor components, Pulse Forming Networks and Alternate Technologies (part II) - Session Chair : Luis Redondo

Track Classification: High Power Electronics