

TRIGGER CIRCUIT OPTIMIZATION OF THE OIL-INSULATED LTD CAVITY

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The goal of this research was to reduce the number of external trigger pulses needed to trigger the LTD cavity with oil insulation. Previously the trigger circuit inside such cavity was a single wire O-ring which was connected to the switches of the cavity bricks via trigger resistors or coils. The minimum number of the external trigger cables connected to this O-ring was determined long time ago as 1 cable per 10 switches. It means, for example, that to trigger the switches of the cavity with ~30 bricks there must be at least 3 external trigger pulses.

In [1] a novel trigger system was presented for the cavity of 34 usual bricks and one internal trigger brick, which was triggered by only 1 external trigger pulse. In our tests similar trigger system was used but without the internal trigger brick. The external trigger pulse for our cavity of 16 bricks was generated by usual trigger generator. The cavity was loaded into matched load, and tested in more than 3000 shots, at a charge voltage of the cavity capacitors ± 100 kV, dry air pressure in the switches 4 ata, and a charge voltage of the trigger generator 100 kV. In all these shots no any malfunction was observed.

Simulation has shown that up to 40 switches might be successfully triggered by one external trigger pulse not only in case the trigger system similar to [1] but without the internal trigger brick is used, but also in case of our previous trigger circuit consisting just of a simple wire O-ring. This last prediction was tested in experiment with our cavity of 16 bricks in 600 shots, at the charge voltage of the cavity capacitors ± 100 kV, dry air pressure in the switches 4 ata, and a charge voltage of the trigger generator 100 kV. In these shots no any malfunction was observed also. The comparison of tests with similar to [1] and with our previous trigger circuit of just one wire O-ring has shown, that the jitter of the output pulse did not change, and the mean delay of the cavity firing reduced from ~58 ns to ~44 ns.

The results of this research, including simulation and tests, have shown that safe triggering of oil-insulated LTD cavity can be provided by using previous trigger circuit inside the cavity and 1 external trigger pulse, allowing to simplify considerable the trigger system presented in [1]. Previous requirement of 1 trigger cable per 10 switches can be reduced to less strict claim of 1 trigger cable per 16 switches, allowing to reduce at least 1.5 times the number of such cables needed for each LTD cavity.

REFERENCES

- [1] Zhou Lin, Li Zhenghong, Wang Zhen et. al. Design of a 5-MA 100-ns linear-transformer-driver accelerator for wire array Z-pinch experiments// Phys. Rev. AB 19, 030401 (2016).