

B. Gasowski¹, K. Czuba¹, L. Zembala¹, H. Schlarb²
 1 – ISE, Warsaw University of Technology, Poland
 2 – DESY, Hamburg, Germany

ABSTRACT

The phase reference signal reliability is of utmost importance for continuous operation of the European XFEL machine. Since even very short interruption or glitch in the reference signal might break the precise synchronisation between subsystems, it is desirable to minimize probability of such events. While master oscillators often have a hot-spare to speed-up recovery after a failure, whether switched manually or electronically, it does not save from time-consuming resynchronisation.

Our experience from testing and commissioning E-XFEL 1.3 GHz Master Oscillator (MO) shows that a struggle to achieve demanding phase-noise requirements might negatively impact reliability of the system. In this paper we present an approach which allows for quick switching between independent reference generation channels while maintaining continuity of the output signal. This is a first step towards autonomous redundancy solution for the E-XFEL MO which will maintain continuous reference signal even in case of a failure of one of the generation channels.

REDUNDANT MO

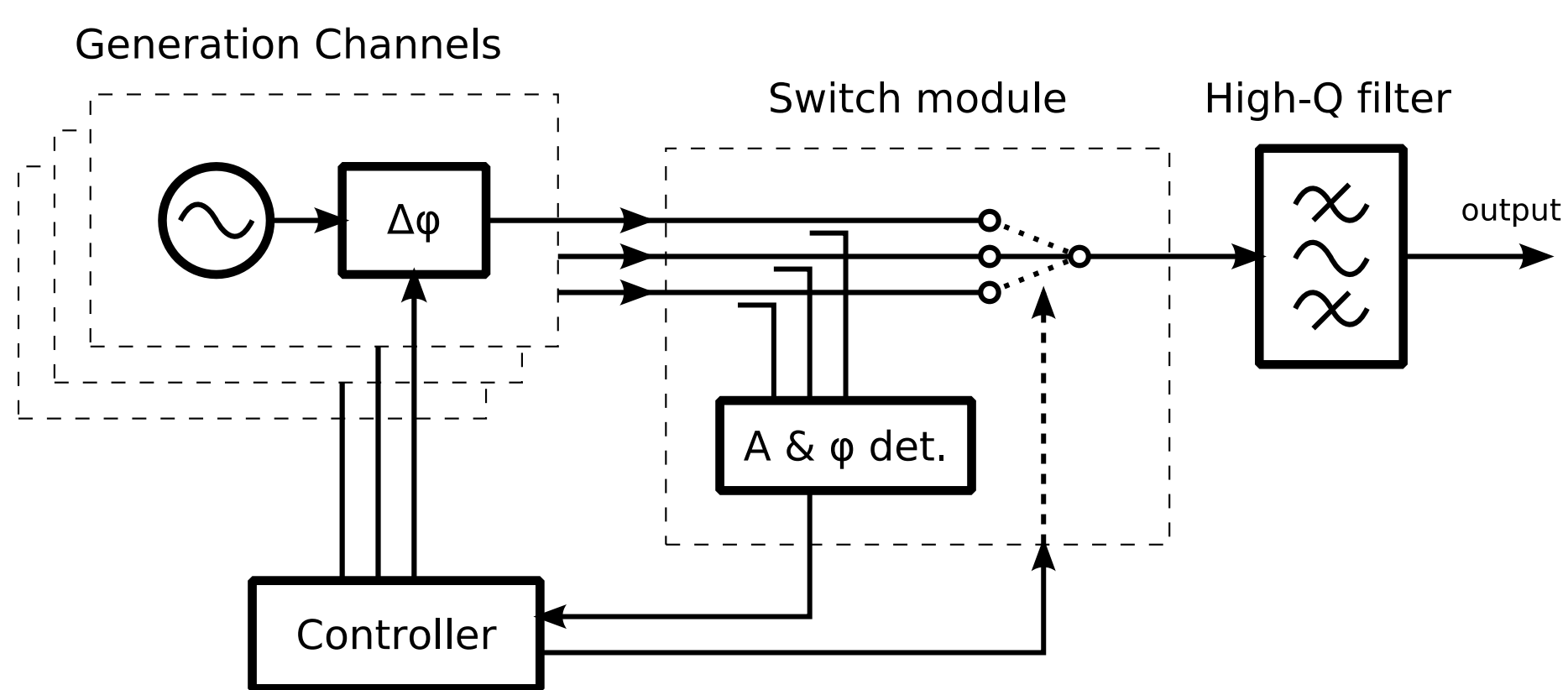


Figure 1: Simplified block diagram of the redundant MO.

SWITCH OVERVIEW

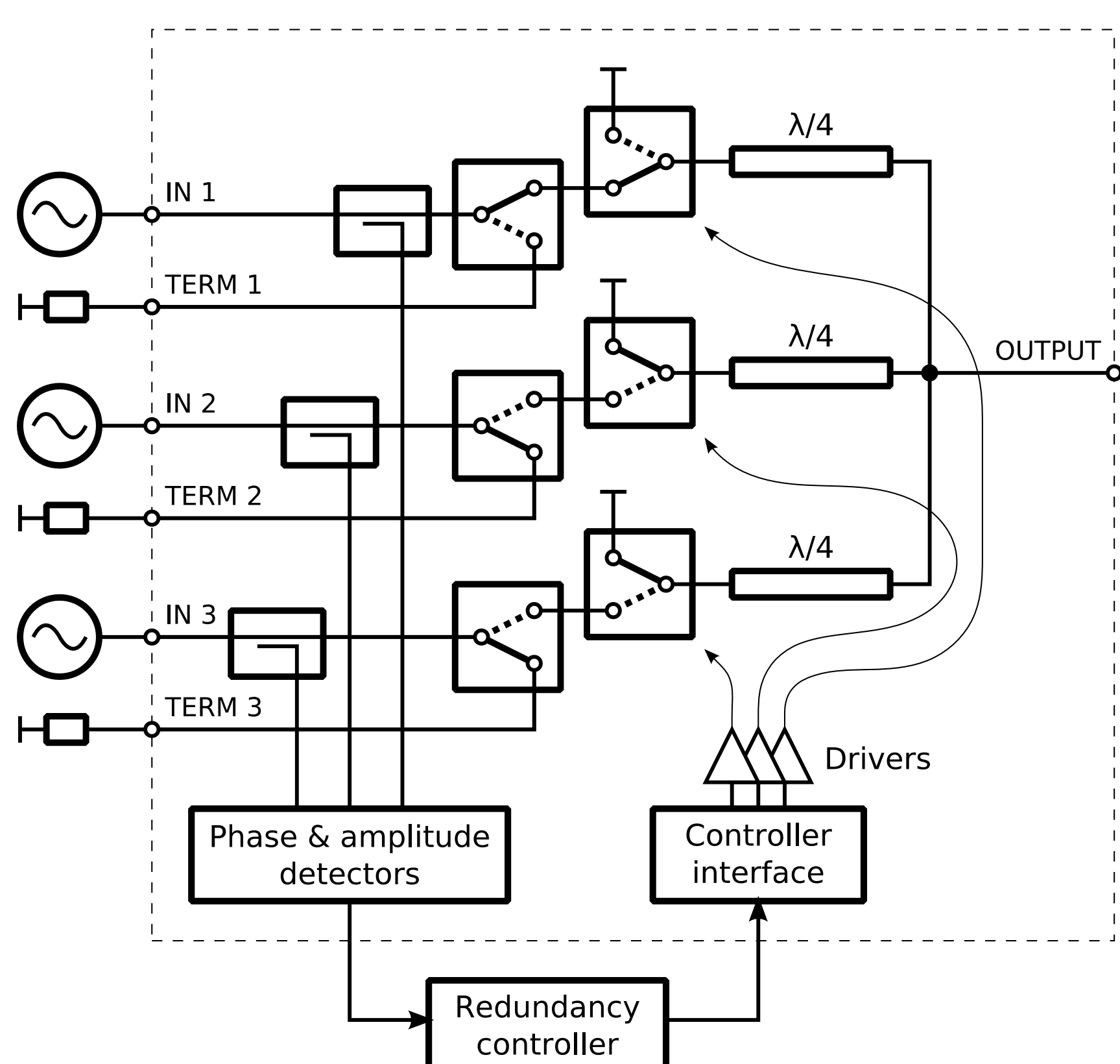
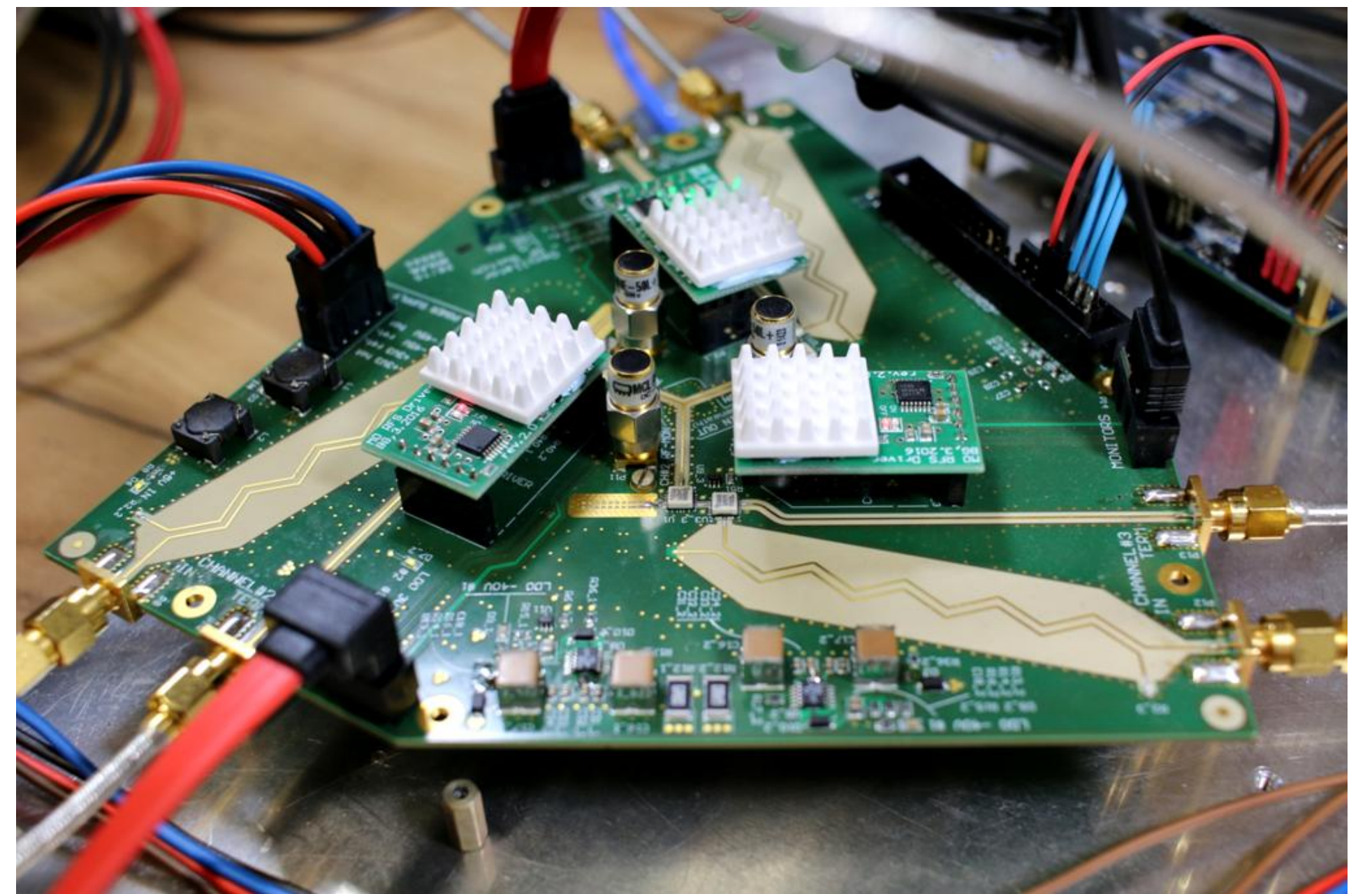


Figure 2: Simplified block diagram of the switch module.

SWITCH PROTOTYPE



- Robust absorptive SP3T microwave switch
- Based on GaN MMIC technology
- Handling of +40 dBm 1.3 GHz signals
- 50 ns switching latency
- High isolation (>80 dB)
- Integrated fast and stable amplitude and phase detectors

EXPERIMENTAL RESULTS

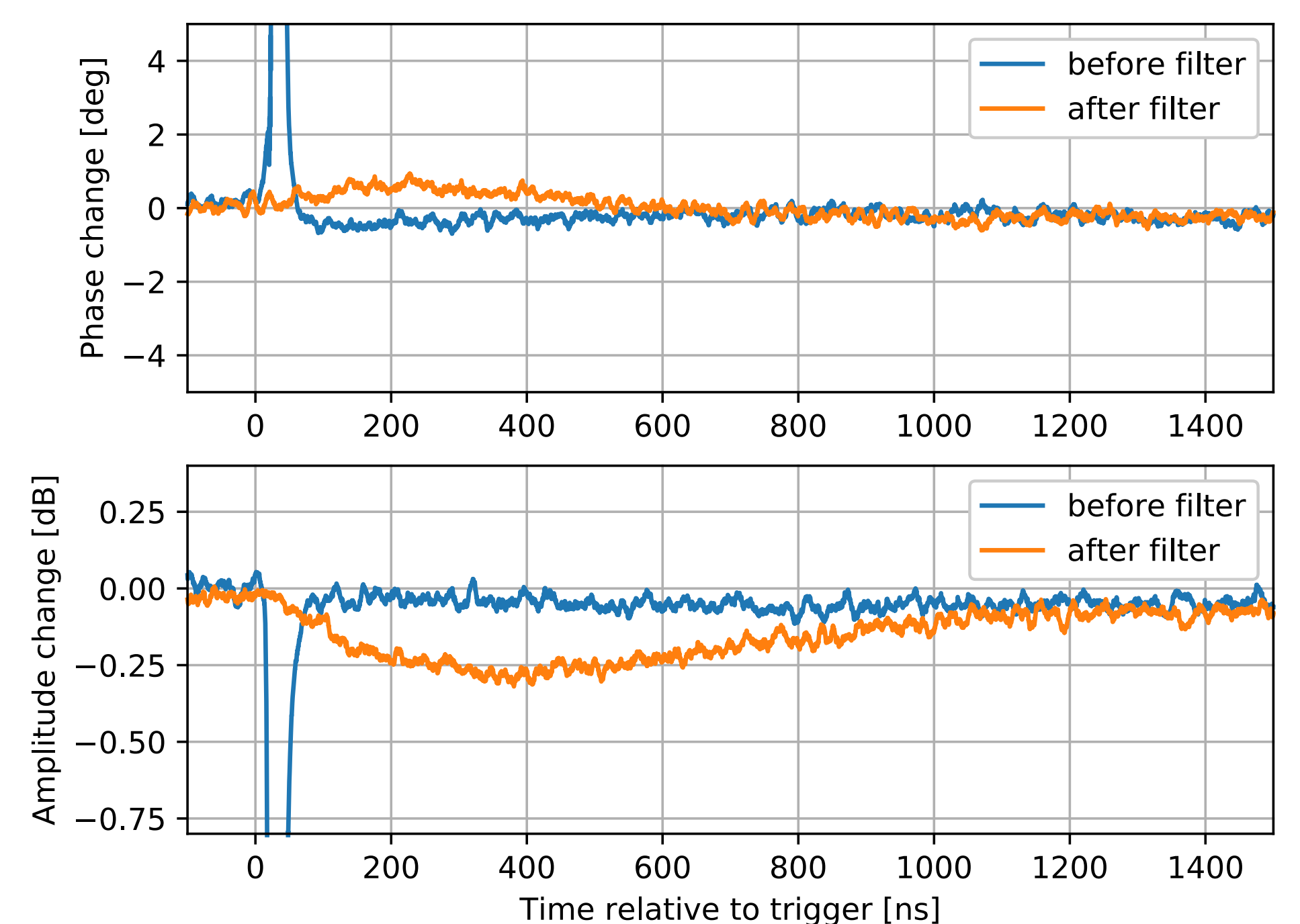


Figure 3: Transients of phase and amplitude during switching and their suppression by the filter.

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CONTACT

bgasowsk@mion.elka.pw.edu.pl