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Radiation hard ceramic based Resistive Plate Chambers for forward TOF and T0 systems

Important scopes of many modern HEP and HI experiments are the start time and reaction plane determination. Our work is concentrating on development of the CBM experiment Beam Fragmentation T0 Counter (BFTC). This detector will be located at the forward region around beam pipe and the particle fluxes are expected to be as high as 2.0x10^{5}cm^{-2}s^{-1}. Hit rate and occupancy limit cell size to be about 4 cm^2.
Single cell ceramic RPCs with low resistive floating electrodes were selected due to their high rate capabilities. One RPC base element consists of double-gap stacks, where the outer electrodes are high resistive Al2O3 ceramics with a Cu-Cr layer deposited on them and the floating electrodes are made of low resistive Si3N4/SiC ceramics. A complete cell is formed by three such base elements (20x20mm^2 or 48x48mm^2 active size six-gap RPC with 250 μm gap size).
A few such cells with different resistivity value of the floating electrodes were assembled and exposed with relativistic electrons at ELBE (HZDR) where the beam flux amounts to 1.5x10^{5}cm^{-2}s^{-1} and with 6 GeV/c pions at the T10 beam-line (CERN). The binary gas mixtures 90% Freon / 10%SF6 or 95% Freon / 5% SF6 were used since iso-butane was found to be responsible for the whiskers formation. All cells have very low noise rate less than 0.5 Hz/cm^2. For both beam tests the efficiency stays over 90% and time resolution stays below 120 ps. even at rate > 1.0x10^5 cm^{-2} s^{-1}.

Primary author: Dr AKINDINOV, Alexander (ITEP Institute for Theoretical and Experimental Physics (RU))

Co-authors: Dr LASO GARCÍA, Alejandro (Helmholtz-Zentrum Dresden-Rossendorf); Dr NEDOSEKIN, Alexander (ITEP Institute for Theoretical and Experimental Physics (RU)); Prof. KÄMPFER, Burkhard (Helmholtz-Zentrum Dresden-Rossendorf); Dr STACH, Daniel (Helmholtz-Zentrum Dresden-Rossendorf); Dr MALKEVICH, Dmitry (ITEP Institute for Theoretical and Experimental Physics (RU)); Dr VOLOSHIN, Kirill (ITEP Institute for Theoretical and Experimental Physics (RU)); Dr NAUMANN, Lothar (Forschungszentrum Dresden Rossendorf); Dr SULTANOV, Rishat (ITEP Institute for Theoretical and Experimental Physics (RU)); Dr KOTTE, Roland (Helmholtz-Zentrum Dresden-Rossendorf); PLOTNIKOV, Vassili (Institute for Theoretical and Experimental Physics (ITEP)); FANG, Xin (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter: Dr AKINDINOV, Alexander (ITEP Institute for Theoretical and Experimental Physics (RU))

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