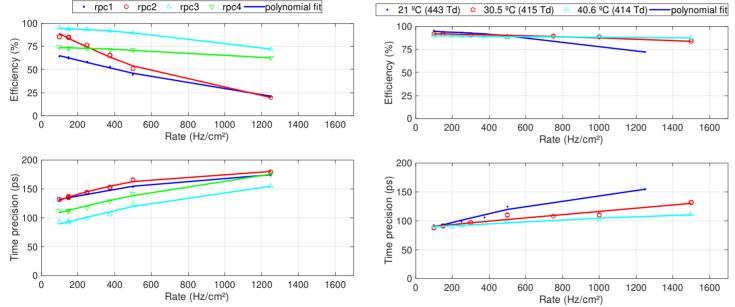
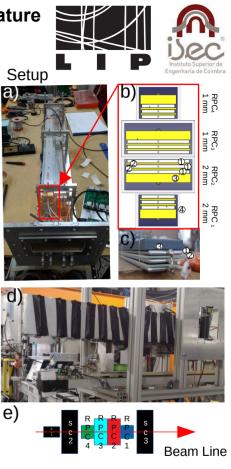
Improving count rate capability of timing RPCs by increasing the detector working temperature

A. Blanco¹, P. Fonte^{1,2}, L. Lopes¹ J. Saraiva¹ ¹Laboratory of Instrumentation and Experimental Particles Physics, Coimbra, Portugal ² Coimbra Polytechnic - ISEC, Coimbra, Portugal

tRPC have traditionally been used with relatively low particle flux density (< kHz/cm²) due to the inherent limitation to the counting rate imposed by the commonly used float glass electrode resistivity. One possibility, still very little explored, is to decrease the resistivity of standard float glass by increasing the operational temperature of the detectors, providing a ten-fold decrease in resistivity every 25 °C.



We have shown that **increasing the working temperature of a tRPC can substantially improve its counting rate capability.** In particular, individually shielded strip-like tRPC chambers with an active area of 750 x 44 mm equipped with 4 gaps of 0.270 mm, show the same efficiency, 90 %, and approximately the same timing precision, 100 ps, over a range of incident particle fluxes up to 1500 Hz/cm² when their working temperature is raised to 40.6 °C. This contrasts with a 20 % loss of efficiency and a worsening of temporal precision of more than 60 ps when operated at 21 °C.



a) Internal arrangement of the tRPC chambers. b) Cross section of the four chambers arrangement. c) RPC chamber: 1 aluminum and 2 glass electrodes, 3 plastic support bar, 4 aluminum tube. d) Panoramic view of the setup in the beam line, showing the tRPC chambers gas box, surrounded by the heating wire, and the last scintillator of the telescope. e) Cross section of the scintillator and tRPC chambers in the beam line.