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The RICH detector of the NA62 experiment

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NA62 is the last generation kaon experiment at the CERN SPS aiming to study the ultra-rare $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ decay.

The challenging aspect of NA62 is the suppression of background decay channels with BR up to 10 orders of magnitude higher than the signal and with similar experimental signature, such as $K^+ \rightarrow \mu^+ \nu$. To this purpose, the NA62 experimental strategy requires, among other conditions, good particle identification (PID) capability and rejection power of the kinematic selection.

A key element of PID in NA62 is the Ring-Imaging Cherenkov (RICH) detector, exploiting neon gas at atmospheric pressure as radiator medium. According to the NA62 requirements, the RICH identifies μ^+ and π^+ in the momentum range between 15 and 35 GeV/c with a muon rejection factor of 10^{-2} .

It also measures the arrival time of charged particles with a precision better than 100 ps, needed to correctly associate the π^+ with the parent K^+ at a kaon decay rate of about 5 MHz, and is one of the main components of the NA62 trigger system.

The RICH detector has been successfully operated during the 2016, 2017 and 2018 data taking periods of NA62. The main design aspects and operational characteristics of the detector will be described in detail and a detailed report of its performance, directly measured with the data collected, will be presented.

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