

Status of MRPC TOF technology

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Time of flight system (TOF) based on MRPC technology is widely used in modern physics experiments, and it also plays an important role in particle identification. With the increase of accelerator energy and luminosity, TOF system is required to identify definite particles precisely under high rate environment. The MRPC technology TOF system can be defined as three generations. The first generation TOF is based on float glass MRPC and its time resolution is around 80ps, but the rate is relatively low (typically lower than 100Hz/cm²). The typical systems are TOF of RHIC-STAR, LHC-ALICE and BES III endcap. For the second generation TOF, its time resolution is in the same order with the first generation, but the rate capability is much higher. Its rate capability can reach 30kHz/cm². The typical experiment with this high rate TOF is FAIR-CBM. The biggest challenge is on the third generation TOF. For example, the momentum upper limit of K/PI separation is around 7GeV/c for JLab-SoLID TOF system under high particle rate as high as 20kHz/cm², the time requirement is around 20ps. The third generation can be called high rate and ultra high time resolution TOF system. In order to reach high rate and 20ps time resolution, we have to develop very narrow gap MRPC, fast preamplifier and high frequency (>5GHz) pulse sampling circuit such as SCA.

In the talk, I will describe the mechanism of MRPC detector and TOF system, the status of the art of three generations TOF will also be discussed.

Primary author: WANG, Yi (Tsinghua University)

Presenter: WANG, Yi (Tsinghua University)

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