

# Quark Matter 2019 - the XXVIIIth International Conference on Ultra-relativistic Nucleus-Nucleus Collisions



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## The HADES RICH upgrade within the FAIR Phase-0 program\*

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The High Acceptance Di-Electron Spectrometer (HADES) is measuring properties of baryonic matter at moderate temperatures in A+A collisions at the SIS18 accelerator at GSI, Darmstadt. After a long shutdown of SIS18 to prepare for the future FAIR facility, beamtimes have been resumed within the FAIR Phase-0 program in March 2019.

Meanwhile, the HADES experiment has undergone several upgrades. In this presentation the successful upgrade of the Ring Imaging Cherenkov Detector (RICH) with MAPMTs will be reported as well as first performance studies from the beamtime in March 2019. This success is also an important step towards the realization of the CBM-RICH detector in due time for the start of the SIS100 physics program.

The RICH detector of the HADES experiment measured for nearly two decades with a CsI photocathode based readout which now has been replaced with modern Hamamatsu H12700 MAPMTs that have been purchased already for the CBM-RICH detector. The complete readout chain of the subdetector was replaced by newly developed DiRICH frontend boards. The update to a MAPMT based readout has been a big steps to excellent timing property, high quantum efficiency, fine pixel granularity and low dark noise. As key features the new readout chain can work at higher rates than before and also provided a substantial gain in photoelectrons per ring.

The updated HADES RICH MAPMT plane is build up with 428 H12700 MAPMTs where the inner part of the plane is coated with a wavelength shifter to increase the number of photons per ring. The readout electronics is based on the TrbNet system and uses FPGA based TDCs for signal measurements. Each of the 856 DiRICH frontend boards measures on 32 channels - half a MAPMT –and provides a prepacked dataflow.

As a second central improvement the radiator gas of the HADES RICH was exchanged from C4F10 to C4H10 which reduced the amount of scintillation light. As measured in previous tests the old CaF2 window, a separator between the old radiator and the photocathode volume, was unmounted to reduce the scintillation light in the detector by orders of magnitudes.

The combination of the new TrbNet readout, new MAPMTs, temperature measurements and the change of the radiator gas brought the HADES RICH upgrade to a full success. The HADES RICH detector participated with unprecedented performance in the HADES beamtime in March 2019 recording Ag+Ag collisions at 1.58 AGeV.

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