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Progress in the R&D of the ASHIPH counter based on silicon photomultipliers for the SND detector

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To increase particle identification quality in the Spherical Neutral Detector (SND) at the VEPP-2000 electron-positron collider, we propose upgrading the ASHIPH (Aerogel, SHifter, PHotomultiplier) Cherenkov counters. With the replacement of the current microchannel-plate photomultipliers (MCP-PMTs) with silicon photomultipliers (SiPMs), we expect the number of detected photons per particle to increase by a factor of 2.5. The front-end electronics (FEE) for an array of five SiPMs were developed. The SiPM array calibration procedure and its results are presented, and the array homogeneity is estimated. The results of testing the FEE together with a thermal stabilization system inside the SND detector are reported. An ASHIPH-SiPM counter prototype was developed and investigated with a test electron beam to study the light-collection inhomogeneity across the counter. Results for both aerogels (refractive indices $n = 1.05$ and $n = 1.13$) are presented. The estimated π/K separation quality is about 6σ .

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