Large-area silicon photomultipliers as readout candidates for the GlueX experiment

ZISIS PAPANDREOU, KATHRYN JANZEN, GEORGE LOLLOS, ANDREI SEMENOV, University of Regina, CARL ZORN, Jefferson Laboratory, GLUEX COLLABORATION — The core mission of the GlueX experiment involves a search for exotic hybrid mesons as evidence of gluonic excitations in an effort to understand confinement in QCD. A key subsystem of the GlueX detector is the electromagnetic barrel calorimeter (BCAL) located inside a 2.5 Tesla superconducting solenoid. Due to this arrangement, light sensors are required that can operate in the high magnetic field environment. Among these, Silicon photomultipliers (SiPMs) are very promising candidates as front-end detectors. To date, routine use of SiPMs has been limited to those with an active area of a few mm$^2$. GlueX will require 2300 large-area SiPMs, each composed of sixteen $3 \times 3$ mm$^2$ cells arranged in a $4 \times 4$ array for a total area of $\sim 144$ mm$^2$ per array. This has placed the GlueX collaboration in the unique position of driving the technology for such larger-area sensors. In this talk I will present tests carried out at Regina and Jefferson Lab regarding performance parameters of prototype SiPM arrays and their micro subcomponents.

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Zisis Papandreou
University of Regina

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