• Next generation multi-ton scale noble liquid experiments have the unique opportunity to discover dark matter particles at the TeV scale
• Requirements for next-gen experiment photosensors:
  • Negligible levels of radioactivity
  • High quantum efficiency
  • High gain
  • High single photon resolution
  • Fast response
  • Large sensitive areas
  • Low radioactivity
  • Low power consumption
  • Low price
• SiPM arrays are an attractive solution, with low intrinsic radioactive background and small mass in addition to unrivalled performances in single photon detection.
• SiPMs have been proven to perform adequately in cryogenic conditions, and their behavior has been fully characterized.

a) An illustration of a GAP-TPC utilizing SiPMs for 4π coverage of the TPC
b) SensL-30035-16P SiPM array
SiPMs were tested in cryogenic conditions to assess parameters such as gain, resolution, correlated pulses, afterpulse delay times, quenching resistance, and recharge time.

A SensL-30035-16P array was tested using a special custom-made active front end board near to the array to sum together the signals from the individual SiPM dies.

Initial results are encouraging, showing durability, adequate gain and excellent SPE.

Difficulties with increased recharge time at low temperatures and correlated pulses must be resolved.