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Chemical Deposition of Wavelength Shifting Material p-Terphenyl for Photodetectors in DUNE Phase II FD APEX design

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The Deep Underground Neutrino Experiment (DUNE) is a long baseline neutrino oscillation experiment with a near and far detector complex located ~1300 km away from each other. DUNE is planned to have four far detectors modules to achieve its physics goals which includes the determination of neutrino mass hierarchy and the measurement of the CP-violating phase in neutrino oscillations.

During Phase I, two far detector modules will be installed, which have been developed by exploiting the ionization charge in a liquid argon time projection chamber (LArTPC) while using the prompt scintillation light for the determination of the t0 of the neutrino interaction in the LArTPC.

For Phase II, an optimization of the light detection system to cover up to 60% of the active volume of the LArTPC is proposed in APEX (Aluminum Profile with Embedded X-ARAPUCA). For this development, a mass production of the light detector modules is needed where the preparation of the first layer of those detectors would occupy most of the time. This layer converts the VUV scintillation light of liquid argon (128 nm) to higher wavelength (~350 nm) using p-terphenyl or pTP. The pTP chemical solution deposition presented in this work investigates the possibility of using it during mass production which has the advantage of fast production once automatized.

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