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The Frugal Tile: A 20-cm-square MCP-PMT Module Comprising 8 Glass Parts

We present the design for the 'Frugal Tile', an all-glass MCP-PMT with an active area of 400 square centimeters. The LAPPD glass tile module was designed to be simple, with: a) a hermetic package made of top and bottom plates and a rectangular sidewall, each made of water-jet-cut plate glass; b) an internal stack consisting of 2 glass capillary plates functionalized with Atomic Layer Deposition and 3 glass grid spacers made from waterjet-cut plate glass; and a getter assembly that drops into place. Features of the design are: no pins penetrating the envelope; c) an internal HV divider implemented by resistive coatings on the MCP's and spacers; d) RF-stripline anodes silkscreened on the bottom plate with an analog bandwidth above 1.5 GHz for good spatial and temporal resolution; e) mechanical rigidity provided by atmospheric pressure; and f) modular design for covering large areas.

The tile is one component of a modular system in which an array of four tiles sits on a 1800-square-cm 'Tray' section that contains the ground plane of the RF strip-lines and supports the waveform sampling and data-acquisition electronics that reads out the strips.

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