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## Property of LCP-GEM in Pure Dimethyl Ether under Low Pressure

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We have performed a systematic investigation of the gain properties of the GEM foil with copper-clad liquid crystal polymer insulator (LCP-GEM)[1], which will be applied to the photoelectric X-ray polarimeter using a TPC technique for NASA's sounding rocket experiment XACT. The pure dimethyl ether (DME) as TPC gas is slow drift velocity and small diffusion. We anticipate that the optimum DME pressure will lie in the 50-150 Torr range, tread detected count rate vs. modulation. However the LCP-GEM has not been operated under 190 Torr yet. To optimize DME pressure, we have measured the gain properties of 100 micron thick LCP-GEM in pure DME as a function of gas pressure; the pressure range of the measurement was from 10-190 Torr. We evaluated its gain by using collimated 6.4 keV X-rays from a generator. The gain at 190 Torr was  $> \sim 20000$  at the voltage between LCP-GEM electrodes  $V_{gem}=580$  V, while that at 20 Torr was  $< 500$  at  $V_{gem}=490$  V. The gain curves in the gain vs.  $V_{gem}$  coordinate seems quite complex behavior, although we found that the first Townsend coefficient as a function of  $E/P$  can be simply described by a function from  $E/P=200-2500$  V/cm/Torr. The function was natural extension of the previous experiment done by A. Sharma et. al. at  $E/P < 50$  V/cm/Torr [2]. Reference: [1]T. Tamagawa, et al., Nucl.Instr.Meth. A608 390 (2009) [2] A. Sharma et al., Nucl.Instr.Meth.A334,420 (1993)

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