P-990 Holographic Interferometer (C. Hogan)

The Committee considered the suggestion that the holographic principle, or at least one interpretation of it, could be tested in the laboratory. A pair of laser interferometers may be able to measure the predicted spatial fluctuations and disentangle them from other noise sources. If true, this would open a unique window onto the Planck scale. This fits squarely in the intellectual mission of the Laboratory. Moreover the transfer of optical cavity expertise to Fermilab may be important for other Laboratory experiments (e.g., for a future axion experiment).

The burden of proof is as high as the potential opportunity is exciting. The Committee therefore supports a rapid and targeted development of the proposed concept with two complementary goals:

- Build a broader understanding in the theoretical and experimental community of the soundness of this approach and of the significance of experimental results. Questions that should be widely addressed include: How generic is the prediction? Is the idea already excluded by other constraints? What would we learn from a negative result? Can the effect be excluded at GEO600 in the near future? What sensitivity goals should be pursued in a more general framework?

- Through a critical review with external experts (both theorists and experimentalists), establish the feasibility of the proposed experiment to provide definitive results. Among other issues, an important design challenge is to ensure that common-mode noise between two close-by interferometers would be under control.

After the initial work is done successfully toward the first goal, the Committee supports modest investments to bring this concept to a design level where the cost and risk can be evaluated. The Committee suggests increasing technical collaboration with GEO600 (e.g. with visits by Laboratory experimentalists) and more generally with the large interferometers.