Progress on the Power-Wall Model

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A finite ultraviolet cutoff (on a scalar field) provides a plausible model of vacuum energy near a reflecting boundary, with finite total energy per unit area. However, the pressure-based and energy-based calculations of the force on a curved or edged boundary are then inconsistent. Pragmatically the problem has been resolved by a prescription of "point-splitting in a neutral direction", but a deeper physical understanding is needed. We replace the wall by a power-law potential and find strong evidence that the anomaly then disappears. Very satisfactory explicit calculations have been done in the region outside the wall. The theory inside the wall is complicated by the need to regularize and renormalize divergences induced by the potential in the bulk, but this is a more routine problem treatable by methods developed in the 1970s to handle external gravitational fields. At abstract deadline, a WKB calculation valid for large potential (or mass) is near completion. The current work on the interior is centered at the University of Oklahoma; earlier work on the pressure anomaly, the model, and the calculations in the exterior happened mostly at Texas A&M University.