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Scalar fields in a shell: the response of an Unruh-Dewitt detector inside, and what it means for us outside

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We show that a particle detector can distinguish the interior of a hollow shell from at space for switching times much shorter than the light-crossing time of the shell, even though the local metrics are indistinguishable. This shows that a particle detector can read out information about the non-local structure of spacetime even when switched on for scales much shorter than the characteristic scale of the non-locality.

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