Contribution ID: **734** Type: **Talk in the parallel session**

Experimental Observation of Acceleration-Induced Thermality

Tuesday, 6 July 2021 11:35 (15 minutes)

We examine the radiation emitted by high energy positrons channeled into silicon crystal samples. The positrons are modeled as semiclassical vector currents coupled to an Unruh-DeWitt detector to incorporate any local change in the energy of the positron. In the subsequent accelerated QED analysis, we discover a Larmor formula and power spectrum that are both thermalized by the acceleration. Thus, these systems explicitly exhibit thermalization of the detector energy gap at the celebrated Fulling-Davies-Unruh (FDU) temperature. Our derived power spectrum, with a nonzero energy gap, is then shown to have an excellent statistical agreement with high energy channeling experiments and also provides a method to directly measure the FDU temperature. We also investigate the Rindler horizon dynamics and confirm that the Bekenstein-Hawking area-entropy law is satisfied in these experiments. As such, we present the evidence for the first observation of acceleration-induced thermality in a non-analogue system.

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Session Classification: Strong Electromagnetic and Gravitational Field Physics: From Laboratories to Early Universe

Track Classification: Strong Field: Strong Electromagnetic and Gravitational Field Physics: From Laboratories to Early Universe