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Identifying the Events of Singular-Cosmologies Cosmological Origin in Distinction of Those from Bouncing Cosmologies within Planet-Based Experiments: Upper Bounds and Lower Bounds for the Discriminating Terms in the Spectral Analysis

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Earth-based experiments and celestial-bodies- based experiments successfully detect particles and (space-time) geometries by examining the spectrum of non-planetary qualities, if rising either from singular cosmologies, non -singular(bouncing) cosmological models, and space time patches, which either include non-trivial symplectic structures or matter contents necessitating non-equivalent quantum-mechanical representations at compatible scales. Contribution from singular vacuum-Einsteinian cosmologies spectrally decompose as c^m summands (starting from t^{-2}), as well as for the big-bang symmetric model; Kaellén-Lehmann-Symanzik-Zimmermann (LSZ) states contribute at h^n (from the opportune coupling constant).

The spectral analysis quantitatively fixes upper-bounds and lowers-bounds on families of parameters qualifying measurements expectation values in the interested space time regions, by determining admissibility of interactions between the phenomena originating from the different spacetime patches, and applicability of the matching boundary conditions at the planetary-distance considered geodesics pertinent c^j order(s); their 'quantum-related' h^k expansion consequently influences divergence(s) and well-posedness of the completeness, as assigned by the differentiability class(es) of (quantum) wave-funstional(s) by exploiting and comparing the characterizing conditions on integrability/summabilily order(s) of geodesics properties (at their 'quantum' h^p) expansion.

Detection of matter and/or deviations from Riemannian geometry results after expectation values of (not-necessarily quantum-mechanical) operators and measurements outcomes, at distinctive integrability order(s) and/or summability one(s), while the differentiability classes of Wheeler-deWitt wave functionals (on which operator acts) account for non-LSZ sates.

The study allows for the determination of both the nature of the interactions and strengths of (/or new/newly-postulated) coupling constants of non-Riemannian features of non-standard representations of quantum mechanics plus deviations from non-Riemannian features of the spacetime.

The components of the metric tensor determining the geodesics-paths lengths and curvature development are modified also at h^r orders; contributions from non-singular cosmologies and from non-LSZ states (both ascribable also by to macroscopic gravitational bodies and peculiar spacetime patches) also by c^s order.

Furthermore, celestial-body -based experiments significantly separate express gravitational Earth properties (due to shape, size and position in the Solar System), from precession, mass, charge, motion, orbit, stability, Poincaré-Hènon return diagrams, elliptical eccentricity.