Shadows from 2T-physics hidden info in 1T-physics

Hidden Symm. SO(d,2), (d=4) $C_2 = 1 - d^2/4 = -3$ singleton

Emergent spacetimes and emergent parameters: mass, couplings, curvature, etc.

Harmonic

oscillator

2 space dims

 $mass = 3^{rd} dim$

SO(2,2)xSO(2)

Massless relativistic particle $(p_u)^2=0$ conformal sym Dirac

Free or interacting systems with/without mass in flat/curved 3+1 spacetime Analogy: object in room, many shadows on walls, observers stuck on walls

Different

Hamiltonians

created by

in 3+1 (on walls)

2T-physics

Sp(2,R) gauge symm. generators Q_{ii}(X,P) vanish simplest example

 $X \cdot P = X^2 = P^2 = 0 \Rightarrow$ gauge inv. space: flat 4+2 dims

SO(4,2) symmetry

Massive

relativistic $(p_u)^2 + m^2 = 0$

perspectives of observers Non-relativistic in phase space $H=p^2/2m$

2T-physics predicts hidden symmetries and <u>dualities</u> (with parameters) among the shadows

Particle in any Conformally Singular Ok.

H-atom 3 space dims $H = p^2/2m - a/r$ SO(4)xSO(2) SO(3)xSO(1,2)

Main points

1) no ghosts:

2T-physics is compatible with 1T-physics

2) Systematic new info & insight absent in 1T physics

Shadows emerge for ∞ choices of the $Q_{ii}(X,P)$ & in 2T-field theory