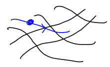
Newtonian Quantum Gravity

Classical grav



✓ • matter moves

QFT in curved s.t

✗ • matter curves

???

↳ $G_{\mu\nu} \propto \hat{T}_{\mu\nu}$

Dyson: graviton scattering

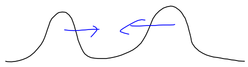
2) Naive semi-classical gravity

Møller Rosenfeld '60

$G_{\mu\nu} \propto \langle\psi|\hat{T}_{\mu\nu}|\psi\rangle$ ⇝ $\Delta\Phi \propto -m|\psi|^2$

Schrödinger eq: add $m^2\int \frac{|\psi(y)|^2}{|x-y|}\,dy\,\psi(x)$

↳ Schrödinger Newton



→ Born Rule breaks down

→ FTL signaling

≈ Falsified Page and Geiker

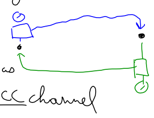
⟹ The argument for quantum

strawman

3) Other options for classical

$G_{\mu\nu} \propto$ measurements

a) Kafri Taylor Milburn



gravity as a LOCC channel

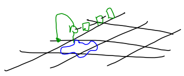
• No paradox

✗ perturbative

✗ no classical grav field

b) Lajos Diosi

monitor mass density



$\Delta\Phi \propto$ mass density "results"

✓ non perturbative ✗ need a cutoff

Consequences

• expected pair $\hat{V}$

• decoherence ("strong") ⇝ same as for collapse models

• GR is hard

4) Q.G

a) zeroth order

↳ pairwise

$$\frac{|x\rangle\langle x|\ |y\rangle\langle y|}{|x-y|}$$

b) 1st order

Miles Blencowe 2013 ⇝ decoherence but weaker.

c) 2nd order? ⇝ ≈ 0

Loop, String, ...

Dyson OK

5) other effects

• time dilation

Pikovski et al 2014

↳ Rindler effects

6) Tests

• large massive superpositions