HST, super-BMS, Feynman Diagrams and Black Holes

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- Variables are fuzzification of super-BMS algebra on Null Infinity
- Evolution Operator Maps Past BMS Onto Future BMS.

The Super BMS Algebra

- $[Q_\alpha(P,m), \bar{Q}_\beta(Q,n)]_+ = \gamma^\mu_{\alpha\beta} P_\mu \delta(P \cdot Q) Z_{mn}$. $P^2 = Q^2 = 0$, $\gamma^\mu_{\alpha\beta} P_\mu Q_\beta(P,n) = 0$.

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- S-matrix maps them into each other $SQ^- = Q^+ S$.

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- In d dimensions, holoscreen spinor bundle with eigenvalue cutoff n : $\psi_a^{(k_1 \ldots k_{d-2})}$.
- $M_k^m \equiv \psi_{kI}^{a\,\dagger} \psi_a^{mI}$, I a $d-3$ anti-symmetric tensor index. When acting on scattering states: for $n = N \to \infty$, M has blocks of size $1 \ll K_i \ll N$, plus one large block of size $N - \sum K_i$.

Willy Will Show, for $d = 4$

- For fairly general Hamiltonians of the form $H_{in}(n) = \sum P_0^i + \frac{1}{n^{2(d-3)}} \mathrm{Tr}\ P(M)$, with P a polynomial of degree n^{d-4} .

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- A unitary S matrix for jets exists.
- Large distance eikonal scattering has scaling with energy and impact parameter of "Newton's Law".
- Many amplitudes can be represented as space-time diagrams with localized vertices, as a consequence of consistency conditions for distant trajectories.

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- Probability of emitting jets from such states is thermal with $T \sim n^{-1}$, so they behave like black holes.

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- Time dependence of Hamiltonian is crucial to the explanation of locality as well as the asymptotic decoupling of particles from horizon.
- QUEFT is a good approximation only in regimes where particles are decoupled from the horizon.

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- Please Join In.