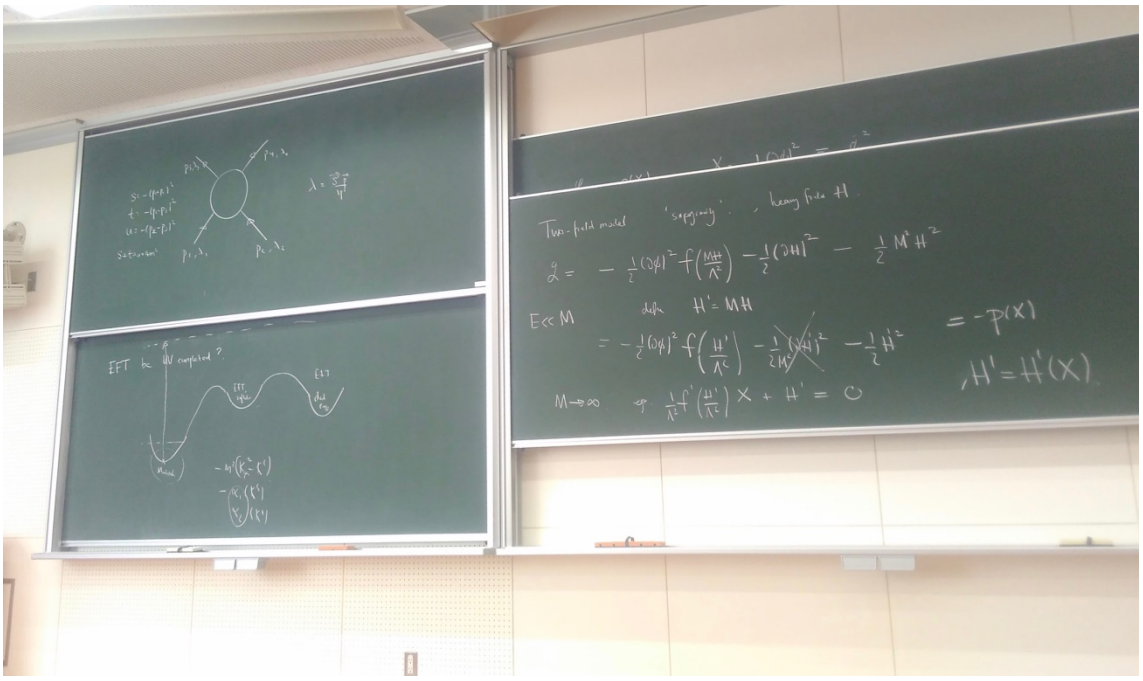
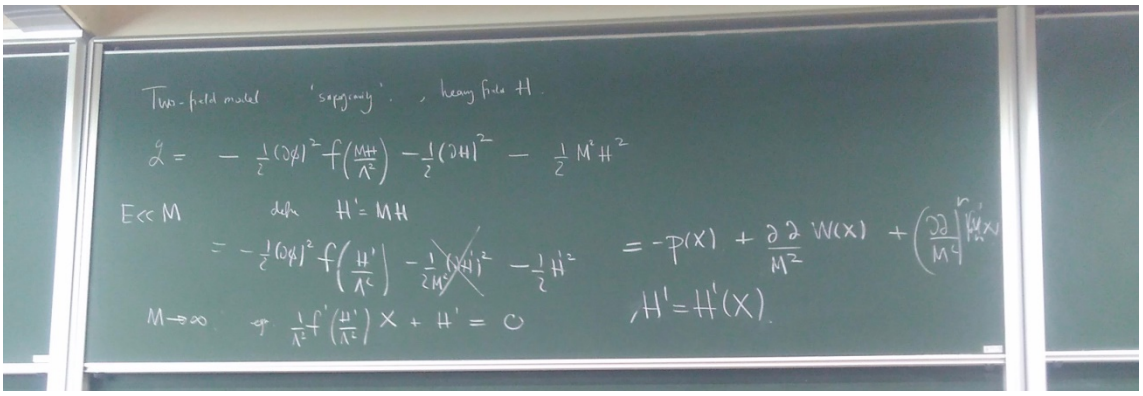

EFT be UV completed ?
Two-field model 'sagging', heavy field H.
$\mathcal{L} = -\frac{1}{2}(\partial\phi)^2 f\left(\frac{MH}{\Lambda^2}\right) - \frac{1}{2}(\partial H)^2 - \frac{1}{2}M^2H^2$
E << M
define $H' = MH$
$= -\frac{1}{2}(\partial\phi)^2 f\left(\frac{H'}{\Lambda^2}\right) - \frac{1}{2M^2}(\partial H')^2 - \frac{1}{2}H'^2$
$= -P(X)$
$, H' = H'(X)$
$M \to \infty$
$\frac{1}{\Lambda^2} f'\left(\frac{H'}{\Lambda^2}\right) X + H' = 0$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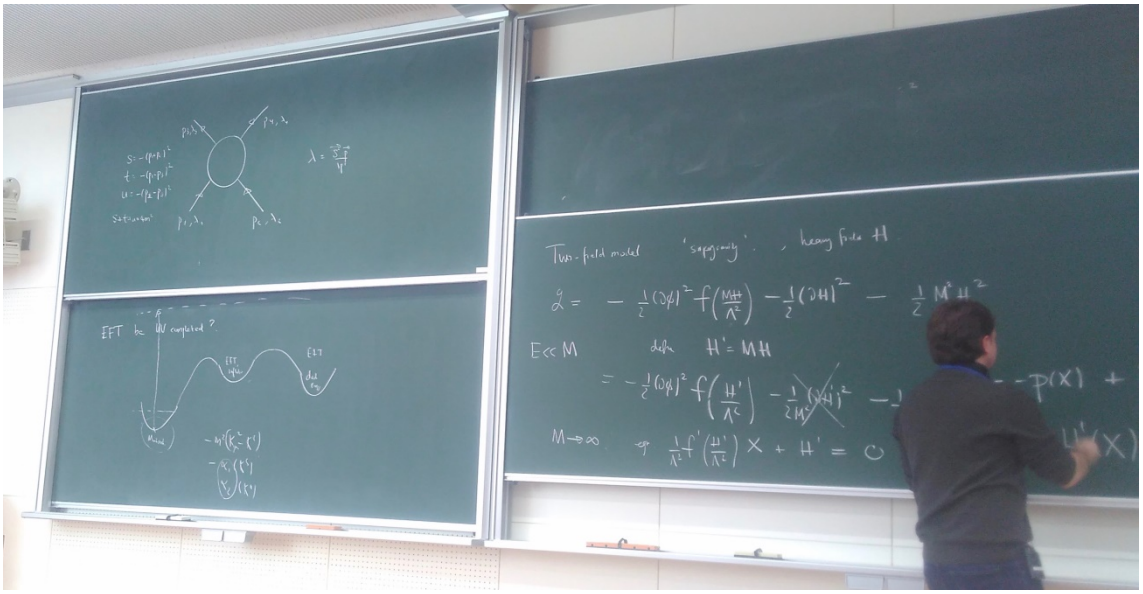
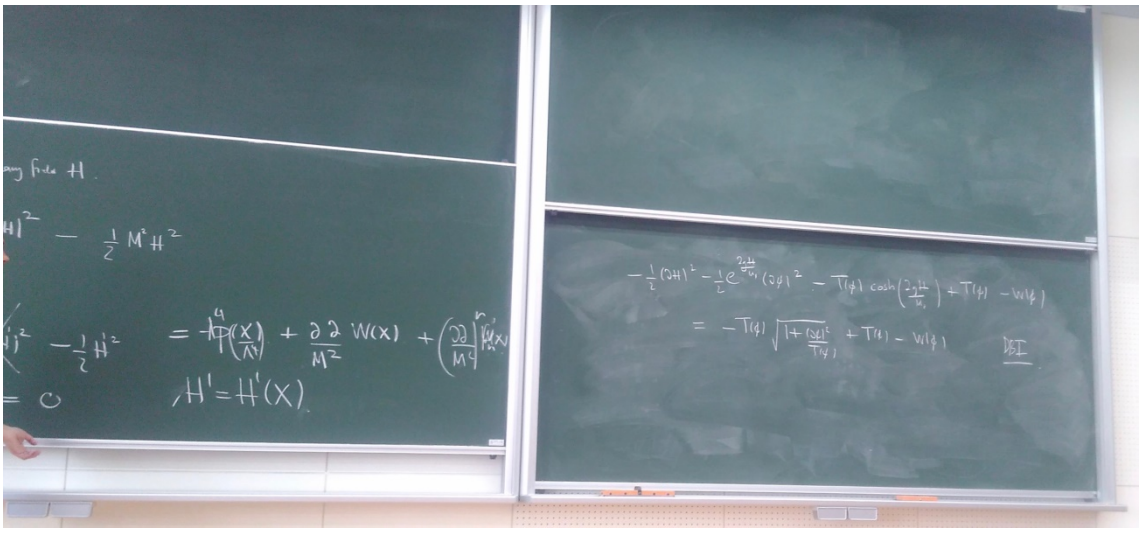
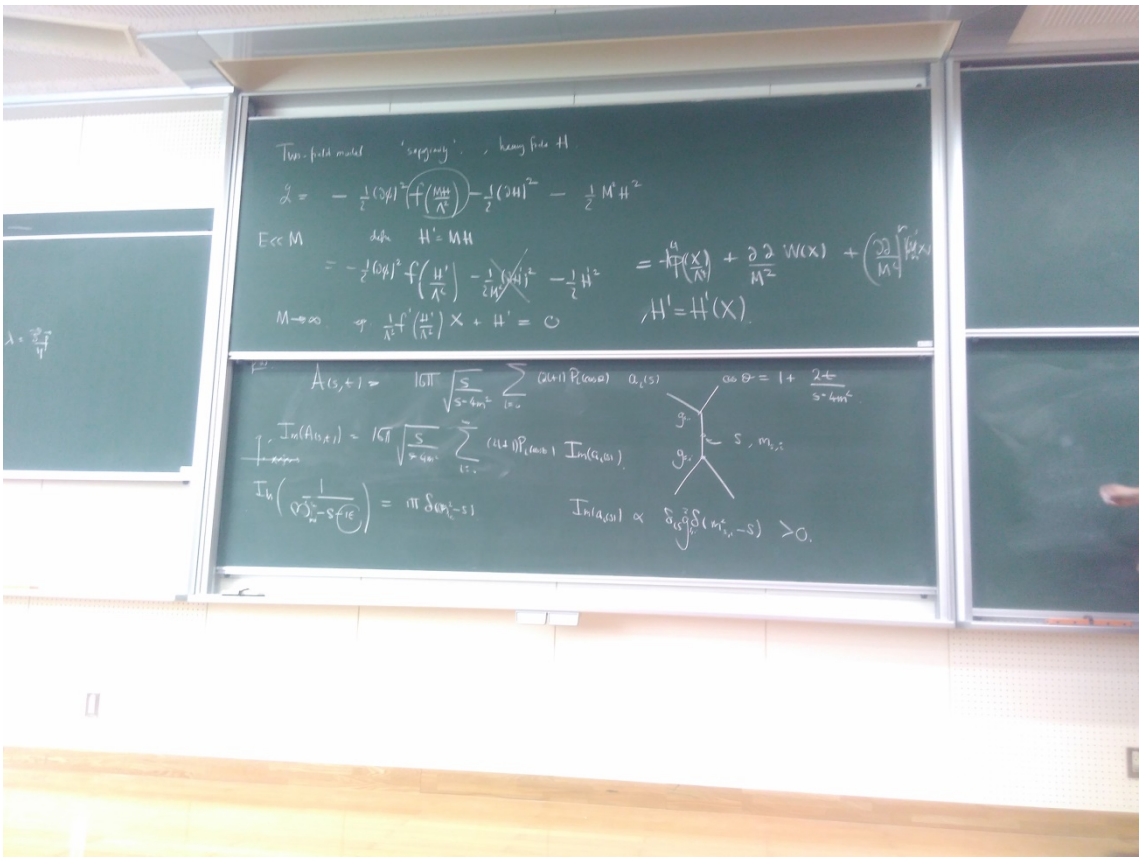
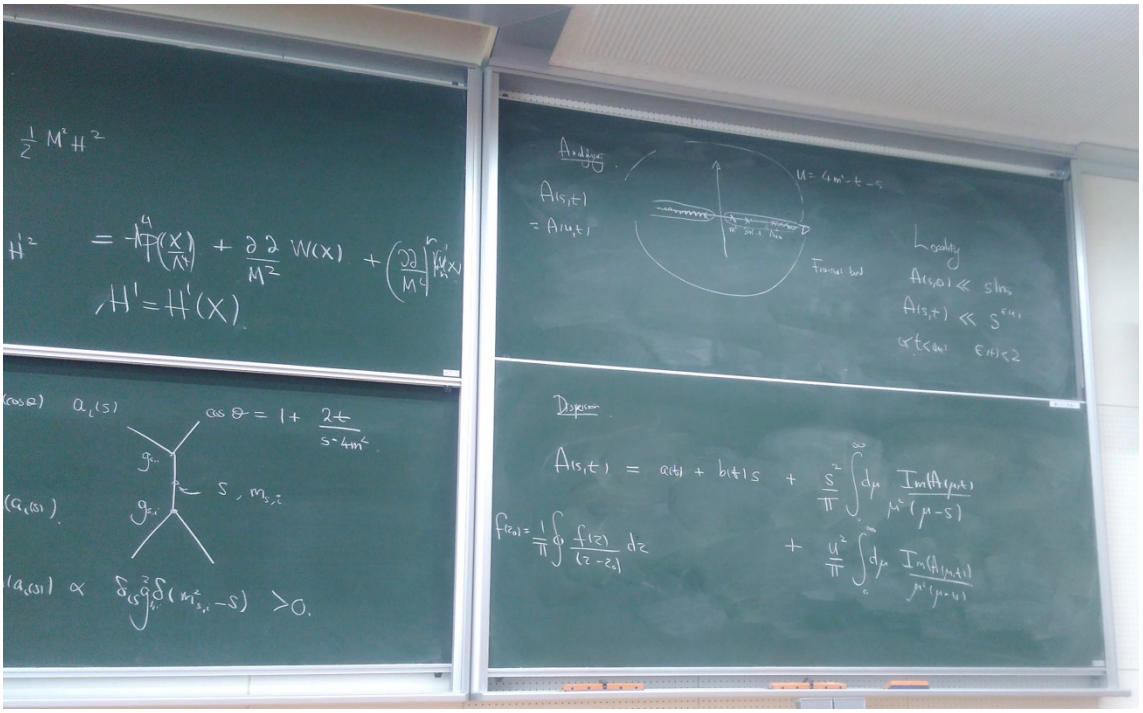
$= -\frac{1}{2}(\partial\phi)^2 f\left(\frac{H'}{\Lambda^2}\right) - \frac{1}{2M^2}(\partial H')^2 - \frac{1}{2}H'^2$
$= -P(X) + \frac{\partial\partial}{M^2} W(X) + \left(\frac{\partial\partial}{M^2}\right)^n W_{n+1}(X)$
$, H' = H'(X)$
$M \to \infty$
$\frac{1}{\Lambda^2} f'\left(\frac{H'}{\Lambda^2}\right) X + H' = 0$

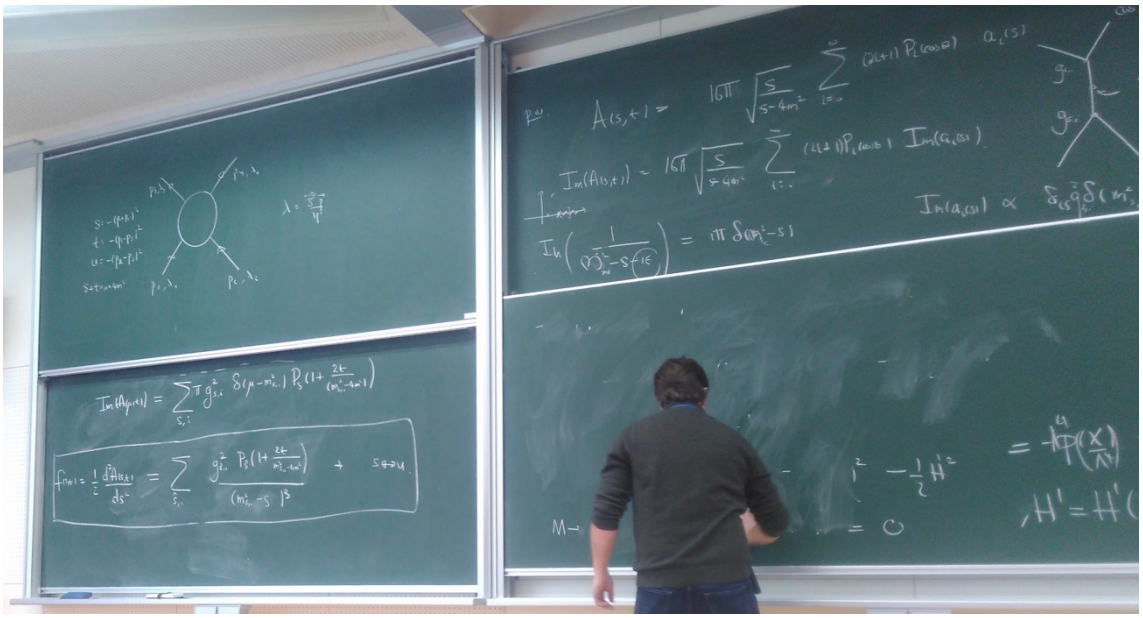

Two-field model
'supersymmetry'
heavy field H
EFT be UV completed ?
EFT
EFT
Minimal

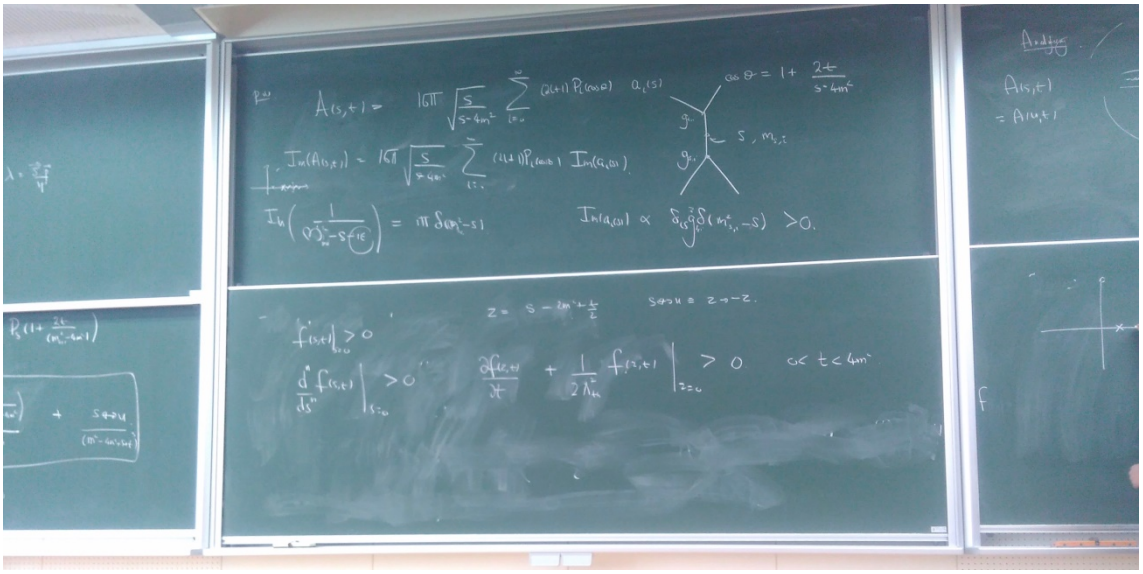

H' = MH
M → ∞
H' = H'(X)

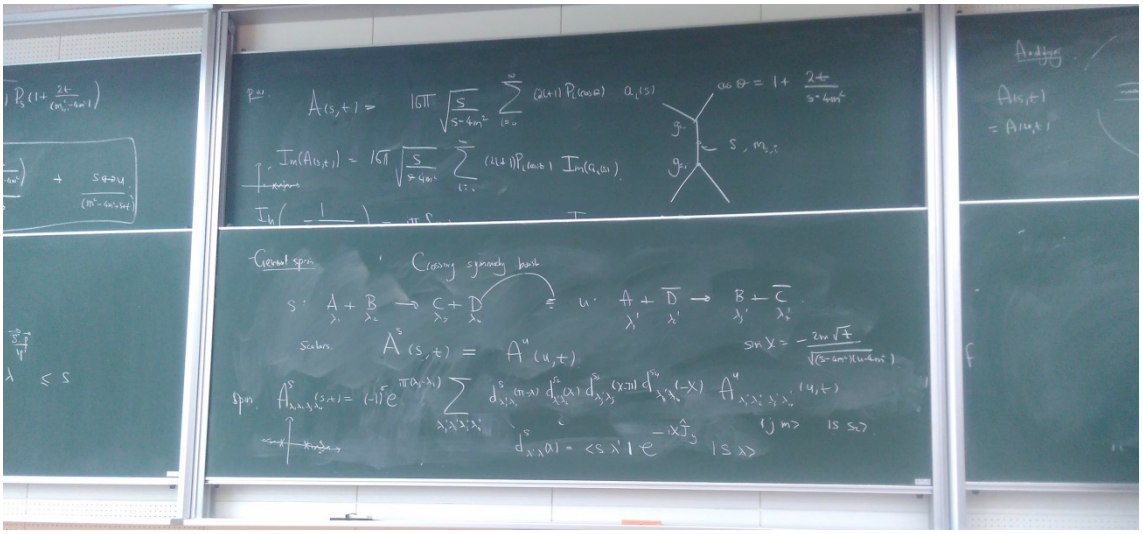
Two-field model
'supergravity'
, heavy field H
E << M
M → ∞
cos θ = 1 + 2t / (s − 4m²)

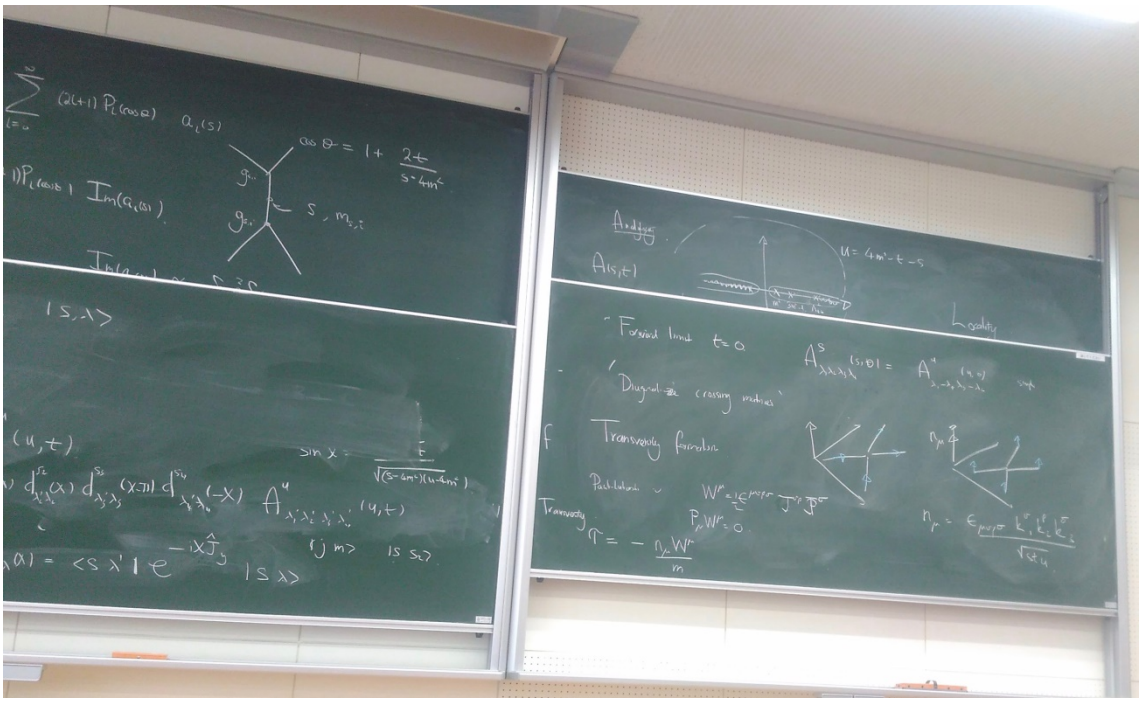

Two-field model
'supergravity'
heavy field H
E << M
M → ∞
H' = H'(X)
cos θ = 1 + 2t/(s-4m²)
s, m_{s,i}

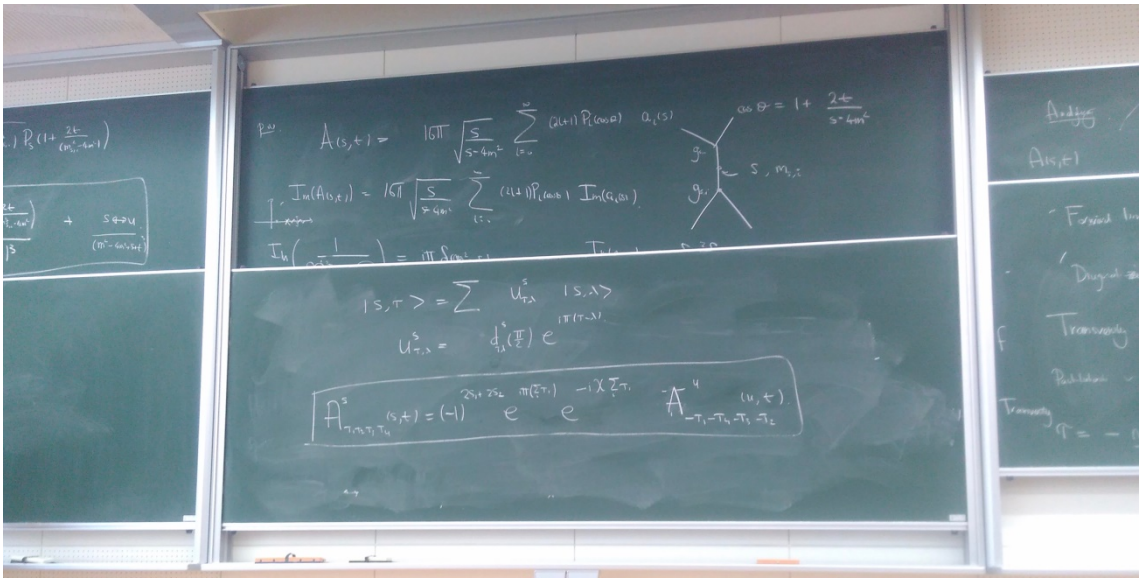

H' = H'(X)
cos θ = 1 + 2t/(s-4m²)
s, m_{s,i}
Analogy
Formal bad
Locality
Dispersion


$s = -(p_1+p_2)^2$
$t = -(p_1-p_3)^2$
$u = -(p_2-p_3)^2$
$s+t+u = 4m^2$
$\lambda = \frac{g^2}{4\pi}$
$A(s,t) = 16\pi\sqrt{\frac{s}{s-4m^2}}\sum_{l=0}^{\infty}(2l+1)P_l(\cos\theta)\,a_l(s)$
$\mathrm{Im}(A(s,t)) = 16\pi\sqrt{\frac{s}{s-4m^2}}\sum_{l=0}^{\infty}(2l+1)P_l(\cos\theta)\,\mathrm{Im}(a_l(s))$
$\mathrm{Im}(a_l(s)) \propto \delta_{ls}\,g^2\,\delta(m_i^2-s)$
$\mathrm{Im}\left(\frac{1}{(p)^2_{m^2}-s-i\epsilon}\right) = i\pi\,\delta(m_i^2-s)$
$\mathrm{Im}(A(p,q,t)) = \sum_{s,i}\pi g_{s,i}^2\,\delta(p-m_{s,i}^2)\,P_s\left(1+\frac{2t}{(m_{s,i}^2-4m^2)}\right)$
$f(s,t) = \frac{1}{2}\frac{d^2A(s,t)}{ds^2} = \sum_{s,i}\frac{g_{s,i}^2\,P_s\left(1+\frac{2t}{m_{s,i}^2-4m^2}\right)}{(m_{s,i}^2-s)^3} + s\leftrightarrow u$


$A(s,t) = 16\pi\sqrt{\frac{s}{s-4m^2}}\sum_{l=0}^{\infty}(2l+1)P_l(\cos\theta)\,a_l(s)$
$\cos\theta = 1+\frac{2t}{s-4m^2}$
$s,\ m_{s,i}$
$\mathrm{Im}(A(s,t)) = 16\pi\sqrt{\frac{s}{s-4m^2}}\sum_{l=0}^{\infty}(2l+1)P_l(\cos\theta)\,\mathrm{Im}(a_l(s))$
$\mathrm{Im}\left(\frac{1}{(p)^2_{m^2}-s-i\epsilon}\right) = i\pi\,\delta(m_i^2-s)$
$\mathrm{Im}(a_l(s)) \propto \delta_{ls}\,g^2\,\delta(m_{s,i}^2-s) > 0.$
$z = s-2m^2+\frac{t}{2}$
$s\leftrightarrow u \equiv z\to -z.$
$f(s,t)\big|_{s=0} > 0$
$\frac{d^n}{ds^n}f(s,t)\Big|_{s=0} > 0$
$\frac{\partial f(z,t)}{\partial t} + \frac{1}{2\Lambda_m^2}f(z,t)\Big|_{z=0} > 0 \quad 0<t<4m^2$
$A(s,t) = A(u,t)$


Partial wave
Crossing symmetry basis
General spin
Scalars
Spin
Analogy


Analogy
Forward limit t = 0
Diagonal crossing matrices
Transversity formalism
Transversity


Analytic
A(s,t)
Forward limit
Dispersion
Transversality
Partial waves
Transversality