Thursday, January 4, 2018 8:48 PM

We have

$$g_2(x) = \frac{1}{2}\sum_a e_a^2 g_T(x) - g_1(x) \quad 2.22c$$

$$g_T^a(x) \overset{WW}{\simeq} \int_x^1 \frac{dy}{y} g_1^a(y) \quad 3.2a$$

$$x\, g_T^a(x, k_\perp^2) \overset{WW}{\simeq} g_{1T}^{\perp(1)a}(x, k_\perp^2) \quad 3.3e$$

where $g_{1T}^{\perp(1)a}(x, k_\perp^2) \equiv \frac{k_\perp^2}{2M^2} g_{1T}^{\perp}(x, k_\perp^2)$

so we get

$$\int d^2k_\perp\, x\, g_T^a(x, k_\perp^2) = \int d^2k_\perp \frac{k_\perp^2}{2M^2} g_{1T}^{\perp a}(x, k_\perp^2)$$

$$x\, g_T^a(x) = g_{1T}^{\perp(1)a}(x) = x\int_x^1 \frac{dy}{y} g_1^a(x)$$

Now I have from 3.3e

$$x\, g_T^a(x, k_\perp^2) = \frac{k_\perp^2}{2M^2} g_{1T}^{\perp(1)a}(x) \frac{2M^2}{\pi\langle k_\perp^2\rangle_{g_1}} e^{-k_\perp^2/\langle k_\perp^2\rangle_{g_1}}$$

note that

$$x\, g_T^a(x, k_\perp^2) \neq x\, g_T^a(x) \frac{1}{\pi\langle k_\perp^2\rangle_{g_1}} e^{-k_\perp^2/\langle k_\perp^2\rangle_{g_1}}$$

as this will violate 3.3e as function of $k_\perp$

Now I have

$$F_{LT}^{\cos\phi_S}(P_T) = -\frac{2xM}{\pi Q\lambda^3} e^{-P_{hT}^2/\lambda} \sum_a e_a^2 g_{1T}^{\perp(1)}(x) D_1(z) \left(\langle p_\perp^2\rangle^2 + \langle k_\perp^2\rangle_{g_1}(P_{h\perp}^2 + \langle p_\perp^2\rangle) z^2\right)$$

$$\int d^2P_{hT} F_{LT}^{\cos\phi_S}(P_T) = -\frac{2xM}{Q}\sum_a e_a^2 g_{1T}^{\perp(1)}(x) D_1(z)$$

Now let us $\sum_{h,z}\int dz\, z$

$$-\frac{2xM}{Q}\sum_a e_a^2 g_{1T}^{\perp(1)}(x) \sum_h \int dz\, z D_1(z) =$$

$$= -\frac{2xM}{Q}\sum_a e_a^2\, x\, g_T^a(x) = -\frac{2xM}{Q} 2(g_1(x) + g_2(x))\, x$$

$$= -\gamma\, 2x\,(g_1(x) + g_2(x)) \quad \text{which is } (2.10c)$$