(*maqnit sahəsi ahlında əlavə hədd daxil olacaq. kovariant törəmədə əlavə olacaq*)

$$S = \int dd^4x * dd z * \sqrt{g}\left[-\frac{1}{4} * F_{MN}[x, z] * F^{MN}[x, z] - D^M * d^+_N[x, z] * D_M * d^N[x, z] - i * c_2 * F^{MN}[x, z] * d^+_M[x, z] * d_N[x, z] + \frac{c_3}{4 * M_d^2}\, e^{2A[z]} * \partial^\mu F^{NK}[x, z] * (i * D_k * d^+_M[x, z] * d_N[x, z] - d^+_M[x, z] * i * D_k * d_N[x, z] + h.c.) + d^+_M[x, z] * \left(\mu^2 + U[z]\right) * d^M[x, z]\right] \quad (1)$$

$$S^{(1)} = \int dd^4x * dd z * \sqrt{g}\left[-D^M * d^+_N[x, z] * D_M * d^N[x, z]\right] \quad (2)$$

(*d^z[x,z]=0,V^z[x,z]=0,
yəni 5-ci komponentlər 0-a bərabər olduğuna görə ancaq 4 komponent yəni,V^μ[x,z] qalır*)

$$D^{+M} * d^+_N * D_M * d^N = g^{MA} * D^+_A * d^+_N * D_M * d_B * g^{NB} (*D^{+M}=g^{MA}*D^+_A\ ;\ d^N=g^{NB}*d_B;$$
$$g^{MN}*\partial_M\phi*\partial_N\phi=g^{\alpha\beta}*\partial_\alpha\phi*\partial_\beta\phi+g^{5\alpha}*\partial_5\phi*\partial_\alpha\phi+g^{\alpha5}*\partial_\alpha\phi*\partial_5\phi+g^{55}(\partial_5\phi)^2;\ V_5=0;$$
$$d_5=0 \rightarrow D_5=\partial_5-i*e*V_5=\partial_5\ *) = g^{\mu\alpha} * g^{\nu\beta} * D^+_\mu * d^+_\nu * D_\alpha * d_\beta + g^{5\alpha} * g^{\beta5} * D^+_5 * d^+_\beta * D_\alpha * d_5 +$$
$$g^{\alpha5} * g^{5\beta} * D^+_\alpha * d^+_5 * D_5 * d_\beta + g^{zz} * g^{zz} * D^+_5 * d^+_5 * D_5 * d_5 \text{(*son iki hədd 0-a bərabərdir *)} =$$
$$g^{\mu\alpha} * g^{\nu\beta} * D^+_\mu * d^+_\nu * D_\alpha * d_\beta = g^{\mu\alpha} * g^{\nu\beta} * ((\partial_\mu - i * e * V_\mu)^+ * d^+_\nu * (\partial_\alpha - i * e * V_\alpha) * d_\beta) =$$
$$g^{\mu\alpha} * g^{\nu\beta} * ((\partial_\mu - i * e * V_\mu) * d^+_\nu * (\partial_\alpha - i * e * V_\alpha) * d_\beta)$$

(*bu iki ifadə bir birindən $^+$ işarəsi ilə fərqlənir?*) $= g^{\mu\alpha} * g^{\nu\beta} * \left(\partial_\mu d^+_\nu * \partial_\alpha d_\beta - \partial_\mu d^+_\nu * i * e * V_\alpha d_\beta + i * e * V_\mu * d^+_\nu * \partial_\alpha d_\beta + e^2 * V_\mu * d^+_\nu * V_\alpha d_\beta\right)$ (*son iki hədd form faktora əlavə verir.*) $= g^{\mu\alpha} * g^{\nu\beta} * (-e * V_\alpha * i * \partial_\mu d^+_\nu * d_\beta + i * e * V_\mu * d^+_\nu * \partial_\alpha d_\beta) = e * (-V_\alpha * i * \partial^\alpha d^+_\nu * d^\nu + i * V_\mu * d^+_\nu * \partial^\mu d^\nu)$ (* α-ya μ desək;*) $= e * (-i * V_\mu * \partial^\mu d^+_\nu * d^\nu + i * V_\mu * d^+_\nu * \partial^\mu d^\nu) = e * V_\mu * (-i * \partial^\mu d^+_\nu * d^\nu + i * d^+_\nu * \partial^\mu d^\nu)$ (*Beləliklə:*)

$$S^{(1)} = \int dd^4x * dd z * \sqrt{g} * e * V_\mu * (i * \partial^\mu d^+_\nu * d^\nu - i * d^+_\nu * \partial^\mu d^\nu) \quad (3)$$

$$(* \sqrt{g} = e^{5A[z]};\ \partial^\mu=g^{\mu\alpha}\partial_\alpha=e^{-2A[z]}*\eta^{\mu\alpha}*\partial_\alpha;$$
$$\partial^\mu=g^{\mu\alpha}\partial_\alpha=e^{-2A[z]}*\eta^{\nu\beta}*\partial_\beta;\ V_\mu[x,z]=\int\frac{dd^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\mu[q]*V[q,z]\quad (a);$$
$$\partial_\alpha d_\beta[x]=\partial_\alpha\int\frac{dd^4p}{(2*\pi)^4}*e^{i*p*x}*\epsilon_\beta[p]=-i*p^\alpha*\frac{dd^4p}{(2*\pi)^4}*e^{-i*p*x}*\epsilon_\beta[p]\quad (b);$$
$$\partial_\alpha d^+_\nu[x]=\partial_\alpha\int\frac{dd^4p'}{(2*\pi)^4}*e^{i*p'*x+1}*\epsilon_\nu[p']=i*p'^\alpha*\int\frac{dd^4p'}{(2*\pi)^4}*e^{i*p'*x+1}*\epsilon^+_\nu[p']\quad (c)\ *)$$

$$S^{(1)} = \int dd^4x * dd z * \sqrt{g} * e * V_\mu * (i * \partial^\mu d^+_\nu * d^\nu - i * d^+_\nu * \partial^\mu d^\nu) =$$
$$\int dd^4x * dd z * e^{5*A[z]} * e^{-4A[z]} * e * V_\mu[x, z] * \eta^{\mu\alpha} * \eta^{\nu\beta} * (i * \partial_\alpha d^+_\nu * d_\beta - d^+_\nu * i * \partial_\alpha d_\beta) \quad (6);$$

$$\partial_\alpha d^+_\nu[x, z] = \partial_\alpha\left(e^{\frac{-A[z]}{2}} * \sum d^+_\nu[x] * \mathcal{J}_n[z]\right) = e^{\frac{-A[z]}{2}} * \partial_\alpha d^+_\nu[x] * \mathcal{J}_n[z] \quad (4);$$

$$\partial_\alpha d_\beta[x, z] = \partial_\alpha\left(e^{\frac{-A[z]}{2}} * \sum d_\beta[x] * \mathcal{J}_n[z]\right) = e^{\frac{-A[z]}{2}} * \partial_\alpha d_\beta[x] * \mathcal{J}_n[z] \quad (5)$$

(*öncə c-ni 4-də b-ni 5-
də yerinə yazaq. daha sonra (a) (4) və (5) ifadələrini (6)da nəzərə alaq:*)

$$\mu = \alpha;\ \nu = \beta;\ \rightarrow \eta^{\mu*\alpha} = 1 * \eta^{\nu*\beta} = 1;$$

$$S^{(1)} = \int dd^4x * dd z * e^{A[z]} * e^{-A[z]} * e * \int\frac{dd^4q}{(2 * \pi)^4} * e^{i*q*x} * V_\mu[q] * V[q, z] * \eta^{\mu\alpha} * \eta^{\nu\beta} *$$

$$\mathcal{J}_n[z]*\left(i*i*p'^{\alpha}*\int\frac{d^4p'}{(2*\pi)^4}*e^{i*p'*x}*\epsilon^+_\nu[p']*\int\frac{d^4p}{(2*\pi)^4}*e^{-i*p*x}*\epsilon_\beta[p]\right.$$

$$\left.\int\frac{d^4p'}{(2*\pi)^4}*e^{i*(p')^\alpha*x}*\epsilon^+_\nu[p']*i*(-i)*p^\alpha*\int\frac{d^4p}{(2*\pi)^4}*e^{-i*p*x}*\epsilon_\beta[p]\right)=$$

$$\int d^4x*e^{-i*(p+q-p')*x}*\int\frac{d^4p}{(2*\pi)^4}*\quad(*\int dz*V[q,z]*\mathcal{J}_0^2[z]=G_1\left(Q^2\right)*)$$

$$\int\frac{d^4p'}{(2*\pi)^4}*\int\frac{d^4q}{(2*\pi)^4}*e*V_\mu[q]*\int dz*V[q,z]*\mathcal{J}_0^2[z]*\epsilon^+[p']*\epsilon[p]*(-(p+p')^\mu)=$$

$$(2\pi)^4*\int\frac{d^4p}{(2*\pi)^4}*\int\frac{d^4p'}{(2*\pi)^4}*\int\frac{d^4q}{(2*\pi)^4}*\epsilon^4*(p+q-p')*e*$$

$$V_\mu*G_1\left(Q^2\right)*\epsilon^+[p']*\epsilon[p]*(-(p+p')^\mu)$$

$$\int d^4x*e^{-i*(p+q-p')*x}=(2\pi)^4*\sigma^4*(p+q-p');$$

$$M^{\mu\,(1)}[p,p']=\int dz*V[q,z]*\mathcal{J}_0^2[z]*\epsilon^+[p']*\epsilon[p]*(-(p+p')^\mu);$$

$$S^{(2)}=\int d^4x*dz*\sqrt{g}*\left(-i*c_2*F^{MN}[x,z]*d^+_\mu[x,z]*d_N[x,z]\right)\ (7);$$

$$(*F^{MN}=g^{MA}*g^{NB}*F_{AB};\ F_{\alpha\beta}=\partial_\alpha*V_\beta-\partial_\beta*V_\alpha*)$$

$$F^{MN}*d^+_M*d_N=g^{MA}*g^{NB}*F_{AB}*d^+_M*d_N=$$

$$g^{\mu\alpha}*g^{\nu\beta}*F_{\alpha\beta}*d^+_\mu*d_\nu+g^{5\alpha}*g^{\beta5}*F_{\alpha5}*d^+_5*d_\beta+g^{\alpha5}*g^{5\beta}*F_{5\beta}*d^+_\alpha*d_5+g^{55}*g^{55}*F_{55}*d^+_5*d_5=$$

$$(*\ F_{\alpha5}=0,\ g^{55}*g^{55}=0\ *)g^{\mu\alpha}*g^{\nu\beta}*F_{\alpha\beta}*d^+_\mu*d_\nu=$$

$$g^{\mu\alpha}*g^{\nu\beta}*(\partial_\alpha V_\beta-\partial_\beta V_\alpha)*d^+_\mu*d_\nu=g^{\mu\alpha}*g^{\nu\beta}*\left(\partial_\alpha V_\beta*d^+_\mu*d_\nu-\partial_\beta V_\alpha*d^+_\mu*d_\nu\right)=$$

$$\partial^\mu V^\nu*d^+_\mu*d_\nu-\partial^\nu V^\mu*d^+_\mu*d_\nu=\partial_\mu V_\nu*d^{\mu+}*d^\nu-\partial_\nu V_\mu*d^{\mu+}*d^\nu;$$

$$S^{(2)}=\int d^4x*dz*\sqrt{g}*c_2*(i*\partial_\mu V_\nu*d^{\mu+}*d^\nu-\partial_\nu V_\mu*d^{\mu+}*d^\nu)\ (8);$$

$$S^{(2)}=\int d^4x*dz*\sqrt{g}*c_2*(i*\partial_\mu V_\nu*d^{\mu+}*d^\nu-\partial_\nu V_\mu*d^{\mu+}*d^\nu)=$$

$$(*d^\mu[x,z]=g^{\mu\alpha}*d_\alpha=e^{-2A[z]}*\eta^{\mu\alpha}*d_\alpha[x,z]=e^{-2A[z]}*\eta^{\mu\alpha}*e^{\frac{-A}{2}}\sum d_\alpha[x]*\mathcal{J}_n[z];$$

$$d^\nu[x,z]=g^{\nu\beta}*d_\beta=e^{-2A[z]}*\eta^{\nu\beta}*d_\beta[x,z]=e^{-2A[z]}*\eta^{\nu\beta}*e^{\frac{-A}{2}}\sum d_\beta[x]*\mathcal{J}_n[z];$$

$$\partial_\nu V_\mu[x,z]=\partial_\nu\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\mu[q]*V[q,z]=-i*q_\nu\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\mu[q]*V[q,z];$$

$$d^+[x]=\int\frac{d^4p'}{(2*\pi)^4}*e^{i*p'*x}*\epsilon^{+\mu}[p'];$$

$$d[x]=\int\frac{d^4p}{(2*\pi)^4}*e^{-i*p*x}*\epsilon[p];$$

$$\partial_\mu V_\nu[x,z]=\partial_\mu\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\nu[q]*V[q,z]=-i*q_\mu\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\nu[q]*V[q,z];*)$$

$$\int d^4x*dz*e^{5A[z]}*e^{-4A[z]}*e^{-A[z]}*$$

$$c_2*\mathcal{J}_n^2[z]*\left(-i*i*q_\nu*\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\mu[q]*V[q,z]-\right.$$

$$\left.i*(-i*q_\mu)\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\nu[q]*V[q,z]\right)*$$

$$\eta^{\mu\alpha} * \eta^{\nu\beta} * \int \frac{d^4 p'}{(2*\pi)^4} * e^{i*p'*x} * \epsilon^{+\mu}[p'] * \int \frac{d^4 p}{(2*\pi)^4} * e^{-i*p*x} * \epsilon^{\nu}[p] =$$

$$\int d^4 x * e^{-i*(p+q-p')*x} * \int \frac{d^4 p}{(2*\pi)^4} * \frac{d^4 p'}{(2*\pi)^4} * \frac{d^4 q}{(2*\pi)^4} * c_2 * V_\mu[q] *$$

$$\int dz * V[q, z] * \mathcal{J}_n^2[z] * (*\int dz*V[q,z]*\mathcal{J}_n^2[z]=F_2\left[Q^2\right]*)\, \epsilon^{+\mu}[p'] * \epsilon^{\nu}[p] * (q^{\nu} - q^{\mu}) =$$

$$(2\pi)^4 * \epsilon^4 * (p + q - p') * \int \frac{d^4 p}{(2*\pi)^4} * \frac{d^4 p'}{(2*\pi)^4} * \frac{d^4 q}{(2*\pi)^4} * c_2 * V_\mu[q] *$$

$$F_2\left[Q^2\right] * \epsilon^{+\mu}[p'] * \epsilon^{\nu}[p] * (q^{\nu} - q^{\mu});$$

$$M^{(2)} = -G_2[Q] * (\epsilon^{\mu}[p] * \epsilon^{+}[p'] * q - \epsilon^{+\mu}[p'] * \epsilon[p] * q);$$

$$(*S^{(2)} = (2\pi)^4 * \int \frac{d^4 p}{(2*\pi)^4} * \int \frac{d^4 p'}{(2*\pi)^4} * \int \frac{d^4 q}{(2*\pi)^4} * \sigma^4 * (p+q-p') * V_\mu[q] * M^{(2)}[p,p',q] - \ldots;$$

$$q_\nu * \epsilon^{\nu}(p) = q*\epsilon; \quad q_\mu * \epsilon^{+\mu}(p') = q*\epsilon^{+}(p') \;*)$$

$$S^{(3)} = \int d^4 x * dz * \sqrt{g} * \frac{c_3}{4*M_d^2} * e^{2A(z)} *$$

$$\partial^M * F^{NK}[x, z] * (i * D_k^+ * d_M^+[x, z] * d_N[x, z] - i * D_k * d_M^+[x, z] * d_N[x, z] + h.c);$$

$$S_{Ih}^{(3)} = \int d^4 x * dz * \sqrt{g} * \frac{c_3}{4*M_d^2} * e^{2A(z)} * \partial^M * F^{NK}[x, z] * i * D_k * d_M^+[x, z] * d_N[x, z] \quad (9);$$

$$(* \;\partial^M = g^{ML}*\partial_L; \; F^{NK} = g^{NA}*g^{KB}*F_{AB} \;*)$$

$$(I)\; \partial^M * F^{NK} * i * D_k * d_M^+ * d_N =$$

$$g^{ML} * \partial_L * g^{NA} * g^{KB} * F_{AB} * i * D_k^+ * d_M^+ * d_N = g^{\mu l} * \partial_l * g^{\nu\alpha} * g^{k\beta} * F_{\alpha\beta} * i * D_k^+ * d_\mu^+ * d_\nu =$$

$$(*\text{növbəti hədlər 0-a bərabərdir}*)\, g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \left(\partial_l * F_{\alpha\beta} * i * (\partial_k + i * e * V_k) * d_\mu^+ * d_\nu\right) =$$

$$g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \left(\partial_l * (\partial_\alpha * V_\beta - \partial_\beta * V_\alpha) * i * (\partial_k + i * e * V_k) * d_\mu^+ * d_\nu\right) =$$

$$g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \left(\partial_l * \partial_\alpha * V_\beta * i * \partial_k * d_\mu^+ * d_\nu - \partial_l * \partial_\alpha V_\beta * e * V_k * d_\mu^+ * d_\nu -\right.$$

$$\left.\partial_l * \partial_\beta V_\alpha * i * \partial_k * d_\mu^+ * d_\nu + \partial_l * \partial_\beta * V_\alpha * e * V_k * d_\mu^+ * d_\nu\right) = \partial^\mu * \partial^\nu * V^k * i * \partial_k * d_\mu^+ * d_\nu -$$

$$\partial^\mu * \partial^\nu * V^k * e * V_k * d_\mu^+ * d_\nu - \partial^\mu * \partial^k * V^\nu * i * \partial_k * d_\mu^+ * d_\nu + \partial^\mu * \partial^k * V^\nu * e * V_k * d_\mu^+ * d_\nu;$$

(II);

$$-\partial^M * F^{NK} * i * D_k * d_M^+ * d_N = -g^{ML} * \partial_L * g^{NA} * g^{KB} * F_{AB} * i * D_k * d_M^+ * d_N =$$

$$-\left(g^{\mu l} * \partial_l * g^{\nu\alpha} * g^{k\beta} * F_{\alpha\beta} * i * d_\mu^+ * (\partial_k - i * e * V_k) * d_\nu + 0 + 0 + 0\right) = -\left(g^{\mu l} * \partial_l * g^{\nu\alpha} * g^{k\beta} *\right.$$

$$\left.(\partial_\alpha * V_\beta - \partial_\beta * V_\alpha) * i * d_\mu^+ * \partial_k * d_\nu + g^{\mu l} * \partial_l * g^{\nu\alpha} * g^{k\beta} * (\partial_\alpha V_\beta - \partial_\beta V_\alpha) * d_\mu^+ * e * V_k * d_\nu\right) =$$

$$-\left(g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \partial_l * \partial_\alpha * V_\beta * i * d_\mu^+ * \partial_k * d_\nu - g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \partial_l * \partial_\beta * V_\alpha * i * d_\mu^+ * \partial_k * d_\nu +\right.$$

$$\left.g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \partial_l * \partial_\alpha * V_\beta * d_\mu^+ * e * V_k * d_\nu - g^{\mu l} * g^{\nu\alpha} * g^{k\beta} * \partial_l * \partial_\beta * V_\alpha * d_\mu^+ * e * V_k * d_\nu\right) =$$

$$-\left(\partial^\mu * \partial^\nu * V^k * d_\mu^+ * i * \partial_k * d_\nu - \partial^\mu * \partial^k * V^\nu * d_\mu^+ * i * \partial_k * d_\nu + \partial^\mu * \partial^\nu * V^k * d_\mu^+ * e * V_k * d_\nu -\right.$$

$$\left.\partial^\mu * \partial^k * V^\nu * d_\mu^+ * e * V_k * d_\nu\right) = -\partial^\mu * \partial^\nu * V^k * i * \partial_k * d_\mu^+ * d_\nu +$$

$$\partial^\mu * \partial^k * V^\nu * i * \partial_k * d_\mu^+ * d_\nu - \partial^\mu * \partial^\nu * V^k * d_\mu^+ * e * V_k * d_\nu + \partial^\mu * \partial^k * V^\nu * d_\mu^+ * e * V_k * d_\nu;$$

$$S_{(1)}^{(3)} = \int d^4 x * dz * \sqrt{g} * \frac{c_3}{4*M_d^2} * e^{2A(z)} \left(-2\,\partial^\mu * \partial^\nu * V^k * d_\mu^+ * e * V_k * d_\nu -\right.$$

$$\partial^\mu * \partial^\nu * V^k * i * \partial_k * d_\mu^+ * d_\nu + 2\,\partial^\mu * \partial^k * V^\nu * d_\mu^+ * e * V_k * d_\nu + \partial^\mu * \partial^\nu * V^k * i * \partial_k * d_\mu^+ * d_\nu -$$

$$\left.\partial^\mu * \partial^k * V^\nu * i * \partial_k * d_\mu^+ * d_\nu + \partial^\mu * \partial^k * V^\nu * i * \partial_k * d_\mu^+ * d_\nu\right) \quad (10);$$

(*bu I+II h'ddin ermit qoşmasını hesablayaq*)

$$S_{(2)}^{(3)} =$$

$$\frac{c_3}{4*M_d^2}*e^{2A(z)}*\partial^M*F^{NK}[x,z]*(i*D_k*d_M^+[x,z]*d_N[x,z]-i*D_k*d_M^+[x,z]*d_N[x,z])\ (11);$$

(III);

$$\partial^M*F^{NK}*i*D_k*d_M^+[x,z]*d_N[x,z]=g^{ML}*\partial_L*g^{NA}*g^{KB}*F_{AB}*(i)*D_k^+*d_N^+*d_M=(i)*g^{\mu 1}*\partial_1*g^{\nu\alpha}*g^{k\beta}*F_{\alpha\beta}*D_k*d_\nu^+*d_\mu+0+0+0=(i)*g^{\mu 1}*g^{\nu\alpha}*g^{k\beta}*(\partial_1*F_{\alpha\beta}*(\partial_k-i*e*V_k)*d_\nu^+*d_\mu)=(i)*g^{\mu 1}*g^{\nu\alpha}*g^{k\beta}*(\partial_1*(\partial_\alpha*V_\beta-\partial_\beta*V_\alpha)*\partial_k*d_\nu^+*d_\mu-\partial_1*(\partial_\alpha*V_\beta-\partial_\beta*V_\alpha)*i*e*V_k*d_\nu^+*d_\mu)=(i)*g^{\mu 1}*g^{\nu\alpha}*g^{k\beta}*(\partial_1*\partial_\alpha*\partial_k*V_\beta*d_\nu^+*d_\mu-\partial_1*\partial_\beta*\partial_k*V_\alpha*d_\nu^+*d_\mu-\partial_1*\partial_\alpha*V_\beta*i*e*V_k*d_\nu^+*d_\mu+\partial_1*\partial_\beta*V_\alpha*d_\nu^+*d_\mu*i*e*V_k)=i*\left(\partial^\mu*\partial^\nu*V^k*\partial_k*d_\nu^+*d_\mu-\partial^\mu*\partial^k*V^\nu*\partial_k*d_\nu^+*d_\mu-\partial^\mu*\partial^\nu*V^k*i*e*V_k*d_\nu^+*d_\mu+\partial^\mu*\partial^k*V^\nu*i*e*V_k*d_\nu^+*d_\mu\right)=i*\partial^\mu*\partial^\nu*V^k*\partial_k*d_\nu^+*d_\mu-i*\partial^\mu*\partial^k*V^\nu*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^\nu*V^k*e*V_k*d_\nu^+*d_\mu-\partial^\mu*\partial^k*V^\nu*e*V_k*d_\nu^+*d_\mu;$$

(IV);

$$-\partial^M*F^{NK}[x,z]*i*D_k^+*d_N^+[x,z]*d_M[x,z]=-g^{ML}*\partial_L*g^{NA}*g^{KB}*F_{AB}*i*D_k^+*d_N^+*d_M=g^{\mu 1}*\partial_1*g^{\nu\alpha}*g^{k\beta}*F_{\alpha\beta}*i*D_k*d_\nu^+*d_\mu+0+0+0=-g^{\mu 1}*g^{\nu\alpha}*g^{k\beta}*(\partial_1*F_{\alpha\beta}*d_\mu*i*(\partial_k+i*e*V_k)*d_\nu^+)=-g^{\mu 1}*g^{\nu\alpha}*g^{k\beta}*(\partial_1*(\partial_\alpha*V_\beta-\partial_\beta*V_\alpha)*i*\partial_k*d_\nu^+*d_\mu-\partial_1*(\partial_\alpha*V_\beta-\partial_\beta*V_\alpha)*e*V_k*d_\nu^+*d_\mu)=-g^{\mu 1}*g^{\nu\alpha}*g^{k\beta}*(\partial_1*\partial_\alpha*i*\partial_k*V_\beta*d_\nu^+*d_\mu-i*\partial_1*\partial_\beta*\partial_k*V_\alpha*d_\nu^+*d_\mu-\partial_1*\partial_\alpha*V_\beta*e*V_k*d_\nu^+*d_\mu+\partial_1*\partial_\beta*\partial_k*V_\alpha*d_\nu^+*d_\mu*e*V_k)=-\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^\nu*V^k*e*V_k*d_\nu^+*d_\mu-\partial^\mu*\partial^k*V^\nu*e*V_k*d_\nu^+*d_\mu;$$

$$S_{(2)}^{(3)}=III+IV=...\left(-2\,\partial^\mu*\partial^k*V^\nu*e*V_k*d_\nu^+*d_\mu+2\,\partial^\mu*\partial^\nu*V^k*e*V_k*d_\nu^+*d_\mu-\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\nu^+*d_\mu-\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\nu^+*d_\mu\right);$$

$$S^{(3)}=S_{(1)}^{(3)}+S_{(2)}^{(3)}=\int d^4x*dz*\sqrt{g}*\frac{c_3}{4*M_d^2}*e^{2A(z)}*\left(-2\,\partial^\mu*\partial^\nu*V^k*d_\mu^+*e*V_k*d_\nu-\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\mu^+*d_\nu+2\,\partial^\mu*\partial^k*V^\nu*d_\mu^+*e*V_k*d_\nu+\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\mu^+*d_\nu-\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\mu^+*d_\nu+\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\mu^+*d_\nu-2\,\partial^\mu*\partial^k*V^\nu*e*V_k*d_\nu^+*d_\mu+2\,\partial^\mu*\partial^\nu*V^k*e*V_k*d_\nu^+*d_\mu-\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^\nu*V^k*i*\partial_k*d_\nu^+*d_\mu+\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\nu^+*d_\mu-\partial^\mu*\partial^k*V^\nu*i*\partial_k*d_\nu^+*d_\mu\right)=$$

$$(*\partial^\mu=g^{\mu\alpha}*\partial_\alpha=e^{-2A[z]}*\eta^{\mu\alpha}*\partial_\alpha[x,z];$$

$$\partial_k*d_\mu^+[x]=\partial_k*\int\frac{d^4p}{(2*\pi)^4}*e^{i*p'*x+1}*\epsilon_\mu[p']=i*p'_k*\int\frac{d^4p}{(2*\pi)^4}*e^{i*p'*x+1}*\epsilon_\mu[p'];$$

$$d^\nu[x,z]=g^{\nu d}*\partial_d=e^{-2A[z]}*\eta^{\nu d}*\partial_d;\quad \partial_k*d_\nu=\partial_k*\int\frac{d^4p}{(2*\pi)^4}*e^{i*p*x}*\epsilon_\nu[p]=-i*p_k\int\frac{d^4p}{(2*\pi)^4}*e^{i*p*x}*\epsilon_\nu[p];$$

$$\partial^k=g^{k\beta}*\partial_\beta=e^{-2A[z]}*\eta^{k\beta}*\partial_\beta;\quad \partial_k*d_\nu^+=i*p'_k\int\frac{d^4p}{(2*\pi)^4}*e^{i*p'*x+1}*\epsilon_\nu[p'];$$

$$V^k=g^{k\beta}*V_\beta=e^{-2A[z]}*\eta^{k\beta}*V_\beta;$$

$$\partial_k*d_\mu=-i*p_k\int\frac{d^4p}{(2*\pi)^4}*e^{i*p*x}*\epsilon_\nu[p];\quad V^\nu=g^{\nu d}*V_d=e^{-2A[z]}*\eta^{\nu d}*V_d;$$

$$\partial_\alpha*\partial_d*V_\beta=q_\alpha*q_d*\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_\beta[q]*V[q,z];$$

$$\partial_\alpha*\partial_\beta*V_d=\partial_\alpha*\partial_\beta*\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_d[q]*V[q,z]=(-i*q_\alpha)*(-i*q_\beta)*\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_d[q]*V[q,z]=-q_\alpha*q_d*\int\frac{d^4q}{(2*\pi)^4}*e^{-i*q*x}*V_d[q]*V[q,z];*)$$

$$=;$$

$$\int \mathrm{d}^4 x * \int \mathrm{d}z\, \mathcal{J}_n^2[z] * \frac{c_3}{4 * M_d^2} * e^{5A[z]} * e^{2A[z]} * e^{-6A[z]} * e^{-A[z]} * \eta^{\mu\alpha} * \eta^{\nu d} *$$

$$\eta^{k\beta} * \eta^{k\beta} * \Big(-2 * \partial_\alpha * \partial_d * V_\beta * d_\mu^+ * e * V_k * d_\nu - \partial_\alpha * \partial_d * V_\beta * d_\mu^+ * i * \partial_k * d_\nu +$$

$$2 * \partial_\alpha * \partial_\beta * V_d * d_\mu^+ * e * V_k * d_\nu + \partial_\alpha * \partial_d * V_\beta * d_\mu^+ * i * \partial_k * d_\nu -$$

$$\partial_\alpha * \partial_\beta * V_d * d_\mu^+ * i * \partial_k * d_\nu + \partial_\alpha * \partial_\beta * V_d * d_\mu^+ * i * \partial_k * d_\nu \pm 2 * \partial_\alpha * \partial_\beta * V_d * e * V_k * d_\nu^+ * d_\mu \pm$$

$$2 * \partial_\alpha * \partial_d * V_\beta * e * V_k * d_\nu^+ * d_\mu \pm \partial_\alpha * \partial_d * V_\beta * d_\nu^+ * i * \partial_k * d_\mu \pm$$

$$\partial_\alpha * \partial_\beta * V_d * d_\nu^+ * i * \partial_k * d_\mu \pm \partial_\alpha * \partial_d * V_\beta * i * \partial_k * d_\nu^+ * d_\mu \pm \partial_\alpha * \partial_\beta * V_d * d_\nu^+ * i * \partial_k * d_\mu\Big) =$$

$$\frac{c_3}{4 * M_d^2} * \int \mathrm{d}^4 x * \int \mathrm{d}z\, \mathcal{J}_n^2[z] * \eta^{\mu\alpha} * \eta^{\nu d} * \eta^{k\beta} * \eta^{k\beta} * \Bigg(2 * q_\alpha * q_d * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_\beta[q] *$$

$$V[q, z] * e * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_k[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} * \epsilon_\mu[p'] *$$

$$\int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p*x} * \epsilon_\nu[p] + q_\alpha * q_d * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_\beta[q] * V[q, z] *$$

$$\int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} * \epsilon_\mu[p'] * i * (-i * p_k) * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p*x} * \epsilon_\nu[p] -$$

$$2 * q_\alpha * q_\beta * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_d[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} *$$

$$\epsilon_\mu[p'] * e * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_k[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{-i*p*x} * \epsilon_\nu[p] -$$

$$q_\alpha * q_d * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_\beta[q] * V[q, z] * i * i * p'_k * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} *$$

$$\epsilon_\mu[p'] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{-i*p*x} * \epsilon_\nu[p] + q_\alpha * q_\beta * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_d[q] *$$

$$V[q, z] * i * i * p'_k * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} * \epsilon_\mu[p'] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{-i*p*x} * \epsilon_\nu[p] -$$

$$q_\alpha * q_\beta * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_d[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} *$$

$$\epsilon_\mu[p'] * i * (-i * p_k) * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{-i*p*x} * \epsilon_\nu[p] -$$

$$2 * q_\alpha * q_\beta * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_d[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{-i*p*x} * \epsilon_\mu[p] *$$

$$e * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_k[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} * \epsilon_\nu[p'] -$$

$$2 * q_\alpha * q_d * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} * V_\beta[q] * V[q, z] * e * \int \frac{\mathrm{d}^4 q}{(2 * \pi)^4} * e^{-i*q*x} *$$

$$V_k[q] * V[q, z] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p*x} * \epsilon_\mu[p] * \int \frac{\mathrm{d}^4 p}{(2 * \pi)^4} * e^{i*p'*x+1} * \epsilon_\nu[p'] -$$

$$2*q_\alpha*q_d*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_\beta[q]*V[q,z]*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p*x}*\epsilon_\mu[p]*$$

$$\mathbb{i}*\mathbb{i}*p'_k*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p'*x+1}*\epsilon_\nu[p']-q_\alpha*q_\beta*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_d[q]*$$

$$V[q,z]*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p*x}*\epsilon_\mu[p]*\mathbb{i}*\mathbb{i}*p'_k*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p'*x+1}*\epsilon_\nu[p']-$$

$$\mathbb{i}*q_\alpha*q_d*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_\beta[q]*V[q,z]*(-\mathbb{i}*p_k)*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p*x}*$$

$$\epsilon_\mu[p]*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p'*x+1}*\epsilon_\nu[p']+\mathbb{i}*q_\alpha*q_\beta*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_d[q]*$$

$$V[q,z]*(-\mathbb{i}*p_k)*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p*x}*\epsilon_\mu[p]*\int\frac{\mathbb{d}^4 p}{(2*\pi)^4}*\mathbb{e}^{\mathbb{i}*p'*x+1}*\epsilon_\nu[p']\Bigg)=$$

$$\frac{c_3}{4*M_d^2}*\int\mathbb{d}^4x*\int\mathbb{d}z*\mathcal{J}_n^2[z]*\eta^{\mu\alpha}*\eta^{\nu d}*\eta^{k\beta}*\eta^{k\beta}*\Bigg(2*q_\alpha*q_d*\mathbb{e}*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]*$$

$$V_\beta[q]*\mathbb{e}*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_d[q]*V[q,z]+q_\alpha*q_d*\epsilon_\mu^{+1}[p']*p_k*\epsilon_\nu[p]*V_\beta[q]-$$

$$2*q_\alpha*q_d*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]*V_d[q]*\mathbb{e}*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_k[q]*V[q,z]+$$

$$q_\alpha*q_d*V_\beta[q]*p'_k*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]-$$

$$q_\alpha*q_\beta*V_d[q]*p'_k*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]-q_\alpha*q_\beta*V_d[q]*\epsilon_\mu^{+1}[p']*p_k*\epsilon_\nu[p]+$$

$$2*q_\alpha*q_\beta*V_d[q]*\epsilon_\mu[p]*\mathbb{e}*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_k[q]*V[q,z]*\epsilon_\mu^{+1}[p']+$$

$$2*q_\alpha*q_d*\mathbb{e}*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_k[q]*V[q,z]*\epsilon_\mu[p]*\epsilon_\nu^{+1}[p']-$$

$$q_\alpha*q_d*V_\beta[q]*\epsilon_\mu[p]*p'_k*\epsilon_\nu^{+1}[p']-q_\alpha*q_\beta*V_d[q]*\epsilon_\mu[p]*p'_k*\epsilon_\nu^{+1}[p']-$$

$$q_\alpha*q_d*V_\beta[q]*p_k*\epsilon_\mu[p]*\epsilon_\nu^{+1}[p']+q_\alpha*q_\beta*V_d[q]*p_k*\epsilon_\mu[p]*\epsilon_\nu^{+1}[p']\Bigg)=$$

$$\frac{c_3}{4*M_d^2}*\int\mathbb{d}^4x*\int\mathbb{d}z*\mathcal{J}_n^2[z]*\Bigg(2*q^\mu*q^\nu*\mathbb{e}*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]*V^k[q]*\mathbb{e}*$$

$$\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_k[q]*V[q,z]+q^\mu*q^\nu*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]*p_k*V^k[q]-$$

$$2*q^\mu*q^k*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]*V^\nu[q]*\mathbb{e}*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_k[q]*V[q,z]+$$

$$q^\mu*q^\nu*V^k[q]*p'_k*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]-$$

$$q^\mu*q^k*V^\nu[q]*p'_k*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]-q^\mu*q^k*V^\nu[q]*p_k*\epsilon_\mu^{+1}[p']*\epsilon_\nu[p]-$$

$$2*q^\mu*q^\nu*V^k[q]*\mathbb{e}*\int\frac{\mathbb{d}^4 q}{(2*\pi)^4}*\mathbb{e}^{-\mathbb{i}*q*x}*V_k[q]*V[q,z]*\epsilon_\mu[p]*\epsilon_\nu^{+1}[p']-$$

$$q^\mu*q^\nu*V^k[q]*p'_k*\epsilon_\mu[p]*\epsilon_\nu^{+1}[p']-q^\mu*q^k*V^\nu[q]*p'_k*\epsilon_\mu[p]*\epsilon_\nu^{+1}[p']-$$

$$q^{\mu} * q^{\nu} * V^{k}[q] * p_{k} * \epsilon_{\mu}[p] * \epsilon_{\nu}^{+1}[p'] + q^{\mu} * q^{k} * V^{\nu}[q] * p_{k} * \epsilon_{\mu}[p] * \epsilon_{\nu}^{+1}[p']\Big) =$$

$$\frac{c_3}{4 * M_d^2} * \int d^4x * \int dz * \mathcal{J}_n^2[z] * \big(\epsilon^{+}[p'] * q * \epsilon[p] * q * p^{k} * V_k[q] + \epsilon^{+}[p'] * q * \epsilon[p] *$$
$$q * p^{k\,\prime} * V_k[q] - \epsilon^{+}[p'] * q * \epsilon[p] * V[q] * p' * q - \epsilon^{+}[p'] * q * \epsilon[p] * V[q] * p * q +$$
$$\epsilon^{+}[p'] * q * \epsilon[p] * q * V_k[q] * p^{k\,\prime} + \epsilon^{+}[p'] * V[q] * \epsilon[p] * q * p' * q +$$
$$\epsilon^{+}[p'] * q * \epsilon[p] * q * V_k[q] * p^{k} + \epsilon^{+}[p'] * V[q] * \epsilon[p] * q * p' * q\big) =$$

$$\frac{c_3}{4 * M_d^2} * \int d^4x * \int dz * \mathcal{J}_n^2[z] * \int \frac{d^4p'}{(2 * \pi)^4} * e^{i * p' * x} * \int \frac{d^4p^{+}}{(2 * \pi)^4} * e^{-i * p * x}$$
$$\int \frac{d^4q}{(2 * \pi)^4} * e^{-i * q * x} * V[q, z] * V_{\mu}[q] * (\epsilon^{+}[p'] * q * \epsilon[p] * q * (p + p')^{\mu}) =$$

$$(2 * \pi)^4 \int \frac{d^4p}{(2 * \pi)^4} * \frac{d^4p'}{(2 * \pi)^4} * \frac{d^4q}{(2 * \pi)^4} * \sigma^4 * (p + q - p') * V_{\mu}[q] *$$
$$M[p, p', q] * (\epsilon^{+}[p'] * q * \epsilon[p] * q * (p + p')^{\mu})$$

$(*d^{\mu}[x,z] = g^{\mu\alpha} * d_{\alpha} = e^{-2A[z]} * \eta^{\mu\alpha} * d_{\alpha}[x,z] = e^{-2A[z]} * \eta^{\mu\alpha} * e^{\frac{-A}{2}} \sum d_{\alpha}[x] * \mathcal{J}_n[z];$

$d^{\nu}[x,z] = g^{\nu\beta} * d_{\beta} = e^{-2A[z]} * \eta^{\nu\beta} * d_{\beta}[x,z] = e^{-2A[z]} * \eta^{\nu\beta} * e^{\frac{-A}{2}} \sum d_{\beta}[x] * \mathcal{J}_n[z];$

$\partial_{\nu} V_{\mu}[x,z] = \partial_{\nu} \int \frac{d^4q}{(2*\pi)^4} * e^{-i*q*x} * V_{\mu}[q] * V[q,z] = -i * q_{\nu} \int \frac{d^4q}{(2*\pi)^4} * e^{-i*q*x} * V_{\mu}[q] * V[q,z];$

$d^{+}[x] = \int \frac{d^4p'}{(2*\pi)^4} * e^{i*p'*x} * \epsilon^{+\mu}[p'];$

$d[x] = \int \frac{d^4p}{(2*\pi)^4} * e^{-i*p*x} * \epsilon[p];$

$\partial_{\mu} V_{\nu}[x,z] = \partial_{\mu} \int \frac{d^4q}{(2*\pi)^4} * e^{-i*q*x} * V_{\nu}[q] * V[q,z] = -i * q_{\mu} \int \frac{d^4q}{(2*\pi)^4} * e^{-i*q*x} * V_{\beta}[q] * V[q,z]; *)$