

# $X=V$ , $n=2$ : Operators and Kinematic Factors

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**(1, 1)**

**(Block 1) Trace != 0, Symmetric, C = 1**

$$O_1^{V(1,1),1} = O_{1,1} + O_{2,2} + O_{3,3} + O_{4,4}$$

$$K_1^{V(1,1),1} = \frac{i(E(p)^3 + E(p)m_N^2 - E(p)p_1^2 - E(p)p_2^2 - E(p)p_3^2 + 2m_N^3)}{(2E(p)(E(p) + m_N))}$$

**(3, 1)**

**(Block 1) Trace mixed, Symmetric, C = 1**

$$O_1^{V(3,1),1} = O_{1,1} + O_{2,2} + O_{3,3} - 3O_{4,4}$$

$$K_1^{V(3,1),1} = \frac{i(-3E(p)^3 - 3E(p)m_N^2 - 5E(p)p_1^2 - 5E(p)p_2^2 - 5E(p)p_3^2 - 6m_N^3 - 8m_Np_1^2 - 8m_Np_2^2 - 8m_Np_3^2)}{(2E(p)(E(p) + m_N))}$$

$$O_2^{V(3,1),1} = O_{1,1} + O_{2,2} - 2O_{3,3}$$

$$K_2^{V(3,1),1} = \frac{i(-p_1^2 - p_2^2 + 2p_3^2)}{E(p)}$$

$$O_3^{V(3,1),1} = O_{1,1} - O_{2,2}$$

$$K_3^{V(3,1),1} = \frac{i(-p_1^2 + p_2^2)}{E(p)}$$

**(6, 1)**

**(Block 1) Trace = 0, Antisymmetric, C = 1**

$$\begin{aligned} O_1^{V(6,1),1} &= O_{1,2} - O_{2,1} \\ K_1^{V(6,1),1} &= 0 \end{aligned}$$

$$\begin{aligned} O_2^{V(6,1),1} &= O_{1,3} - O_{3,1} \\ K_2^{V(6,1),1} &= 0 \end{aligned}$$

$$\begin{aligned} O_3^{V(6,1),1} &= O_{2,3} - O_{3,2} \\ K_3^{V(6,1),1} &= 0 \end{aligned}$$

$$\begin{aligned} O_4^{V(6,1),1} &= O_{1,4} - O_{4,1} \\ K_4^{V(6,1),1} &= 0 \end{aligned}$$

$$\begin{aligned} O_5^{V(6,1),1} &= O_{2,4} - O_{4,2} \\ K_5^{V(6,1),1} &= 0 \end{aligned}$$

$$\begin{aligned} O_6^{V(6,1),1} &= O_{3,4} - O_{4,3} \\ K_6^{V(6,1),1} &= 0 \end{aligned}$$

**(6, 3)**

**(Block 1) Trace = 0, Symmetric, C = 1**

$$\begin{aligned} O_1^{V(6,3),1} &= O_{1,2} + O_{2,1} \\ K_1^{V(6,3),1} &= \frac{-2ip_1p_2}{E(p)} \end{aligned}$$

$$\begin{aligned} O_2^{V(6,3),1} &= O_{1,3} + O_{3,1} \\ K_2^{V(6,3),1} &= \frac{-2ip_1p_3}{E(p)} \end{aligned}$$

$$\begin{aligned} O_3^{V(6,3),1} &= O_{2,3} + O_{3,2} \\ K_3^{V(6,3),1} &= \frac{-2ip_2p_3}{E(p)} \end{aligned}$$

$$\begin{aligned} O_4^{V(6,3),1} &= O_{1,4} + O_{4,1} \\ K_4^{V(6,3),1} &= \frac{2p_1(E(p)^2 + E(p)m_N)}{(E(p)(E(p) + m_N))} \end{aligned}$$

$$\begin{aligned} O_5^{V(6,3),1} &= O_{2,4} + O_{4,2} \\ K_5^{V(6,3),1} &= \frac{2p_2(E(p)^2 + E(p)m_N)}{(E(p)(E(p) + m_N))} \end{aligned}$$

$$\begin{aligned} O_6^{V(6,3),1} &= O_{3,4} + O_{4,3} \\ K_6^{V(6,3),1} &= \frac{2p_3(E(p)^2 + E(p)m_N)}{(E(p)(E(p) + m_N))} \end{aligned}$$