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

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## (1, 1)

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

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

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

## (3, 1)

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

$$O_1^{V(3,1),1} = O_{1,1} + O_{2,2} + O_{3,3} - 3O_{4,4}$$
$$K_1^{V(3,1),1} = \frac{i(-3E(p)^3 - 6E(p)^2 m_N - 3E(p)m_N^2 - 5E(p)p_1^2 - 5E(p)p_2^2 - 5E(p)p_3^2 - 2m_N p_1^2 - 2m_N p_2^2 - 2m_N p_3^2)}{(2E(p)(E(p) + m_N))}$$

$$O_2^{V(3,1),1} = O_{1,1} + O_{2,2} - 2O_{3,3}$$
$$K_2^{V(3,1),1} = \frac{i(-p_1^2 - p_2^2 + 2p_3^2)}{E(p)}$$

$$O_3^{V(3,1),1} = O_{1,1} - O_{2,2}$$
$$K_3^{V(3,1),1} = \frac{i(-p_1^2 + p_2^2)}{E(p)}$$

# (6, 1)

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

$$O_1^{V(6,1),1} = O_{1,2} - O_{2,1}$$
$$K_1^{V(6,1),1} = 0$$

$$O_2^{V(6,1),1} = O_{1,3} - O_{3,1}$$
$$K_2^{V(6,1),1} = 0$$

$$O_3^{V(6,1),1} = O_{2,3} - O_{3,2}$$
$$K_3^{V(6,1),1} = 0$$

$$O_4^{V(6,1),1} = O_{1,4} - O_{4,1}$$
$$K_4^{V(6,1),1} = \frac{p_1(E(p)^2 - m_N^2 - p_1^2 - p_2^2 - p_3^2)}{(2E(p)(E(p) + m_N))}$$

$$O_5^{V(6,1),1} = O_{2,4} - O_{4,2}$$
$$K_5^{V(6,1),1} = \frac{p_2(E(p)^2 - m_N^2 - p_1^2 - p_2^2 - p_3^2)}{(2E(p)(E(p) + m_N))}$$

$$O_6^{V(6,1),1} = O_{3,4} - O_{4,3}$$
$$K_6^{V(6,1),1} = \frac{p_3(E(p)^2 - m_N^2 - p_1^2 - p_2^2 - p_3^2)}{(2E(p)(E(p) + m_N))}$$

# (6, 3)

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

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

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

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

$$O_4^{V(6,3),1} = O_{1,4} + O_{4,1}$$
$$K_4^{V(6,3),1} = \frac{p_1(3E(p)^2 + 4E(p)m_N + m_N^2 + p_1^2 + p_2^2 + p_3^2)}{(2E(p)(E(p) + m_N))}$$

$$O_5^{V(6,3),1} = O_{2,4} + O_{4,2}$$
$$K_5^{V(6,3),1} = \frac{p_2(3E(p)^2 + 4E(p)m_N + m_N^2 + p_1^2 + p_2^2 + p_3^2)}{(2E(p)(E(p) + m_N))}$$

$$O_6^{V(6,3),1} = O_{3,4} + O_{4,3}$$
$$K_6^{V(6,3),1} = \frac{p_3(3E(p)^2 + 4E(p)m_N + m_N^2 + p_1^2 + p_2^2 + p_3^2)}{(2E(p)(E(p) + m_N))}$$