ОБЪЕДИНЕННЫЙ
ИНСТИТУТ
ЯДЕРНЫХ
ИССЛЕДОВАНИЙ
ДУБНА

E2 - 10619

B.L.Aneva, S.G.Mikhov, D.T.Stoyanov

ON THE TWO- AND THREE-POINT FUNCTIONS FOR CONFORMAL SUPERFIELDS

1977

E2 - 10619

B.L.Aneva, S.G.Mikhov, D.T.Stoyanov

ON THE TWO- AND THREE-POINT FUNCTIONS FOR CONFORMAL SUPERFIELDS

Submitted to ТМФ

Анева Б.Л., Михов С.Г., Стоянов Д.Ц. **E2 - 10619**

О двух- и трехточечных функциях конформных суперполей

В работе рассмотрен вопрос о построении двух- и трех-точечных функций конформных суперполей, преобразующихся по ранее найденным представлениям конформной супералгебры. В отличие от предыдущих работ здесь не предполагается никаких соотношений между параметрами d и z, характеризующими данное представление этой алгебры.

Работа выполнена в Лаборатории теоретической физики ОИЯИ.

Препринт Объединенного института ядерных исследований. Дубна 1977

Aneva B.L., Mikhov S.G., Stoyanov D.T. **E2 - 10619**

On the Two- and Three-Point Functions for Conformal Superfields

The two- and three-point functions for conformal superfields transforming according to the previously found representations of the conformal superalgebra are constructed. Unlike the examples given in the previous papers no relations betweeen the parameters characterizing a given representation (d and z) are supposed.

The investigation have been performed at the Laboratory of Theoretical Physics, JINR.

Preprint of the Joint Institute for Nuclear Research. Dubna 1977

INTRODUCTION

In the present paper we construct the invariant two- and three-point functions for superfields transforming according to representations of the conformal superalgebra introduced in paper [1]. We recall that an arbitrary representation of the mentioned kind is determined by its Lorentz structure and by two complex numbers d and z. The corresponding generators of the representation are their differential operators in the space of functions of the variables x_μ, θ^+_α, ξ^-_α, where x_μ are the coordinates of a point in the Minkovski space, and θ^+_α and ξ^-_α are spinor mutually anticommuting variables satisfying the relations.

$$\frac{1}{2}[(1+i\gamma_5)\theta^+]_\alpha = \theta^+_\alpha \quad \frac{1}{2}[(1-i\gamma_5)\xi^-]_\alpha = \xi^-_\alpha .$$

In what follows we shall use the "nonphysical" form of the conformal superalgebra generators defined in ref. [3]. We write down once more these generators for convenience :

$$P_\mu = -i\partial_\mu - i\xi^- \gamma^\circ \gamma_\mu \gamma^\circ \frac{\partial}{\partial\eta^+},$$

$$S^+_\alpha = i(\gamma^\circ \frac{\partial}{\partial \eta^+})_\alpha \quad , \qquad T^-_\alpha = i(\gamma^\circ \frac{\partial}{\partial \xi^-})_\alpha ,$$

$$T^+_\alpha = 8(\hat{x}\gamma^\nu \eta^+)_\alpha \partial_\nu + (8d + 12z)\eta^+_\alpha - 16\eta^+_\alpha \xi^- \frac{\partial}{\partial \xi^-} -$$

$$-8(\gamma^\mu \xi^-)_\alpha [(2x_\mu x_\nu - x^2 g_{\mu\nu})\partial^\nu + 2dx_\mu] - 8i\Sigma_{\mu\nu}(\sigma^{\mu\nu}\eta^+)_\alpha -$$

$$-8(\eta^+\gamma^\circ\eta^+)(\gamma^\circ \frac{\partial}{\partial \eta^+})_\alpha - 8i\Sigma_{\mu\nu}[(x^\mu \gamma^\nu - x^\nu \gamma^\mu)\xi^-]_\alpha ,$$

$$\Pi = -z + \eta^+ \frac{\partial}{\partial \eta^+} + \xi^- \frac{\partial}{\partial \xi^-} ,$$

$$S^-_\alpha = 8(\gamma^\nu \eta^+)_\alpha \partial_\nu - 8(\gamma^\nu \hat{x}\xi^-)_\alpha \partial_\nu -$$

$$-(8d - 12z)\xi^-_\alpha - 16\xi^-_\alpha \eta^+ \frac{\partial}{\partial \eta^+} - 8(\xi^-\gamma^\circ\xi^-)(\gamma^\circ \frac{\partial}{\partial \xi^-})_\alpha -$$

$$-8i\Sigma_{\mu\nu}(\sigma^{\mu\nu}\xi^-)_\alpha ,$$

$$D = -i\{d + x^\mu \partial_\mu + \frac{1}{2}\eta^+ \frac{\partial}{\partial \eta^+} - \frac{1}{2}\xi^- \frac{\partial}{\partial \xi^-}\} ,$$

$$M_{\mu\nu} = \Sigma_{\mu\nu} + i\{x_\mu \partial_\nu - x_\nu \partial_\mu - \eta^+\gamma^\circ\sigma_{\mu\nu}\gamma^\circ \frac{\partial}{\partial \eta^+} -$$

$$-\xi^-\gamma^\circ\sigma_{\mu\nu}\gamma^\circ \frac{\partial}{\partial \xi^-}\} ,$$

$$K_\mu = 2x^\nu \Sigma_{\mu\nu} + i\{(2x_\mu x_\nu - x^2 g_{\mu\nu})\partial^\nu + 2x_\mu d\} -$$

$$-i\eta^+\gamma^\circ\gamma_\mu\gamma^\circ \frac{\partial}{\partial \xi^-} ,$$

where

$$\eta^{+}_{\alpha} = \theta^{+}_{\alpha} + (\hat{x}\xi^{-})_{\alpha} ,$$

$$\xi^{-}_{\alpha} = \xi^{-}_{\alpha} .$$

Constructing the two- and three-point functions we distinguish two cases:

a) In the first one an arbitrary two- or three-point function is constructed out of the superfields as well as of their conjugates. This case is discussed in the second section.

b) In the second case all two- and three-point functions are constructed out either of the superfields only or of their conjugate fields only. We discuss this type of functions in the third section.

2. We introduce, first of all, the following notation. In accordance with paper [3], a superfield with arbitrary Lorentz structure is denoted by

$$\Phi_{\{\alpha_p\}\{\beta_q\}}(x,\eta^{+},\xi^{-}), \tag{2.1}$$

where $\{\alpha_p\} = \{\alpha_1,...,\alpha_p\}$ $\{\beta_q\}=\{\beta_1...\beta_q\}$, and the brackets denote full symmetrization within the group of indices. The following identities are supposed to hold:

$$\frac{1}{2}(1+i\gamma_5)_{\beta_k\beta'_k}\Phi_{\{\alpha_p\}\{\beta_q(-k)|\beta'_k\}} =$$

$$= \frac{1}{2}(1-i\gamma_5)_{\alpha_k\alpha'_k}\Phi_{\{\alpha_p(-k)|\alpha'_k\}\{\beta_q\}} = 0 ,$$

where

$$\{\alpha_p(-k)|\alpha'_k\} = \{\alpha_1,\ldots,\alpha_{k-1},\alpha'_k,\alpha_{k+1},\ldots,\alpha_p\}, \tag{2.2}$$

$$\{\beta_q(-k)|\beta'_k\} = \{\beta_1,\ldots,\beta_{k-1},\beta'_k,\beta_{k+1},\ldots,\beta_q\}.$$

Sometimes, when writing the full index structure is not necessary, we shall just write Φ_A, meaning by "A" the hole group of indices $(\{\alpha_p\}\{\beta_q\})$. The field transforming according to the conjugate representation is denoted by $\tilde{\Phi}_{\{\alpha_p\}\{\beta_q\}}(x,\eta^+,\xi^-)$ and $\tilde{\Phi}_A(x,\eta^+,\xi^-)$, , respectively.*
Let

$$\Lambda_{AB}(x_1,x_2,\eta_1^+,\eta_2^-,\xi_1^-,\xi_2^+) =$$
$$= <0|\Phi_A(x_1,\eta_1^+,\xi_1^-)\tilde{\Phi}_B(x_2,\eta_2^-,\xi_2^+)|0> \tag{2.3}$$

and

$$\Gamma_{ABC}(x_1,x_2,x_3,\eta_1^+,\eta_2^+,\eta_3^-,\xi_1^-,\xi_2^-,\xi_3^+) = \tag{2.4}$$
$$= <0|\Phi_A(x_1,\eta_1^+,\xi_1^-)\Phi_B(x_2,\eta_2^+,\xi_2^-)\tilde{\Phi}_C(x_3,\eta_3^-,\xi_3^+)|0>$$

are the two- and three-point functions, respectively *.

---

*Remark. We have written here the two- and three-point functions as functions of the nonphysical variables. In order to define the "physical" two- and three-point functions it is necessary to make the corresponding change of variables (see [3]) in formulae (2.3) and (2.4).

Producing an infinitesimal transformation of the superfields and taking into account the invariance of the vacuum state under the action of these transformations, a system of differential equations is obtained for the functions (2.3) and (2.4).

As in papers [1,2,3], it is sufficient to examine the equations, corresponding to the generators $S^{\pm}_{\alpha}$, $T^{\pm}_{\alpha}$ only. We start with the two-point function. The corresponding equations have the following form:

$$\{ i(\gamma^{\circ} \frac{\partial}{\partial \eta^{+}_{1}})_{\alpha} \delta_{BB'} + (S^{+}_{2\alpha})_{BB'} \} \Delta_{AB'} = 0, \quad (2.5)$$

$$\{ i(\gamma^{\circ} \frac{\partial}{\partial \eta^{-}_{2}})_{\alpha} \delta_{AA'} + (S^{-}_{1\alpha})_{AA'} \} \Delta_{A'B} = 0, \quad (2.6)$$

$$\{ i(\gamma^{\circ} \frac{\partial}{\partial \xi^{-}_{1}})_{\alpha} \delta_{BB'} + (T^{-}_{2\alpha})_{BB'} \} \Delta_{AB'} = 0, \quad (2.7)$$

$$\{ i(\gamma^{\circ} \frac{\partial}{\partial \xi^{+}_{2}})_{\alpha} \delta_{AA'} + (T^{+}_{1\alpha})_{AA'} \} \Delta_{A'B} = 0, \quad (2.8)$$

where $S^{-}_{1\alpha}$, $T^{+}_{1\alpha}$ are the generators of the representation under which the superfield $\Phi_{A}(x_1, \eta^{+}_{1}, \xi^{-}_{1})$ is transformed, while $S^{+}_{2\alpha}$, $T^{-}_{2\alpha}$ are the generators of the conjugate representation under which the superfield $\tilde{\Phi}_{B}(x_2, \eta^{-}_{2}, \xi^{+}_{2})$ is transformed.

Equations (2.6) and (2.8) have the following solution:

$$\Delta_{AB}(x_1, x_2, \eta^{+}_{1}, \eta^{-}_{2}, \xi^{-}_{1}, \xi^{+}_{2}) = \quad (2.9)$$

$$= \exp\{ -i\eta^{-}_{2} \gamma^{\circ} S^{-}_{1} - i\xi^{+}_{2} \gamma^{\circ} T^{+}_{1} \}_{AA'} D_{A'B}(x_1, x_2, \eta^{+}_{1}, \xi^{-}_{1}),$$

where $D_{A'B}$ is an unknown function. The exponent in the R.H.S. of equality (2.9) is determined as the global transformation produced over the function D_{AB} (see paper [3] and appendix I). We did not separate the finite dimensional part of this transformation since at this time it is not necessary.

Later on we shall have to determine the function $D_{A'B}$ from equations (2.5) and (2.7). A system of equations for $D_{A'B}$ (which we do not write here) after some algebraic manipulations (we must commute the differential operators of the equations with the exponent) is obtained. The latter shows that:

a) D_{AB} does not depend on η_1^+ and ξ_1^- ;

b) A nontrivial solution can exist only if

$$z_1 = z_2 \qquad d_1 = d_2 \; ; \tag{2.10}$$

c) The function D_{AB} satisfied the equations of ordinary conformal invariance. Then, a nontrivial solution exists if and only if

$$p = s \qquad q = r \; . \tag{2.11}$$

If all these conditions hold the function D_{AB} is determined up to an arbitrary constant and has the following form:

$$D_{\{\alpha_p\}-\{\beta_q\};\{\gamma_q\}\{\delta_p\}}(x_1,x_2) =$$

$$= C|x_{12}^2|^{-d-\frac{1}{2}(p+q)} \left(\hat{x}_{12}\gamma^0(1+i\gamma_5)\right)_{\{\alpha_p\}\{\delta_p\}} \times$$

$$\times (\hat{x}_{12}\gamma^{\circ}(1 - i\gamma_5))_{\{\beta_q\}\{\gamma_q\}} ,$$

$$x_{12} = x_1 - x_2 , \qquad (2.12)$$

where

$$\hat{x}_{12\{\alpha_p\}\{\delta_p\}} = \Sigma \prod_{i=1}^{p} \hat{x}_{12\alpha_i\delta_i}$$

$$\hat{x}_{12\{\beta_q\}\{\gamma_q\}} = \Sigma \prod_{i=1}^{q} \hat{x}_{12\beta_i\gamma_i}$$

and summation runs through all permutations of the indices α_i and β_i, respectively. Thus, the solution is determined. To obtain its explicit form it is necessary to produce the global transformation (2.9) over the function D_{AB} (formula (2.12)). It is more convenient to do the latter, if we return to the physical variables:

$$\theta^{+}_{1\alpha} = \eta^{+}_{1\alpha} - (\hat{x}_1\xi^{-}_1)_\alpha \qquad \theta^{-}_{2\alpha} = \eta^{-}_{2\alpha} - (\hat{x}_2\xi^{+}_2)_\alpha$$
$$\qquad (2.13)$$
$$\xi'^{-}_{1\alpha} = \xi^{-}_{1\alpha} \qquad \xi'^{+}_{2\alpha} = \xi^{+}_{2\alpha} .$$

Since the general case is rather cumbersome, we confine ourselves to two examples.

a) Two-point function of scalar superfields ($d = d_1 = d_2$; $z = z_1 = z_2$)

$$\Delta(x_1, x_2, \theta^{+}_1, \theta^{-}_2, \xi^{-}_1, \xi^{+}_2) = C|Y^2_{12}|^{-d} \times$$

$$\times (1 - 16i\xi^{+}_2\gamma^{\circ}\theta^{+}_1)^{-\frac{1}{2}(d - \frac{3}{2}z)} (1 - 16i\theta^{-}_2\gamma^{\circ}\xi^{-}_1)^{-\frac{1}{2}(d - \frac{3}{2}z)} \times$$

$$h(z_{12},\xi_1^-,\xi_2^+,\theta_2^-)^{-\frac{1}{2}(d-\frac{3}{2}z)}, \qquad (2.14)$$

where

$$Y_{12_\mu} = x_{12_\mu} - 8i\theta_2^-\gamma^\circ\gamma_\mu\theta_1^+ ,$$

$$Z_{12_\mu} = (1-16i\xi_2^+\gamma^\circ\theta_1^+)^{1/2}\, Y_{12_\nu}\Lambda^\nu_\mu(\xi_2^+,\theta_1^+), \qquad (2.15)$$

$$\Lambda^\nu{}_\mu(\lambda_2^+,\theta_1^+) = \delta^\nu{}_\mu - 16i\xi_2^+\gamma^\circ\sigma^\nu{}_\mu\theta_1^+ - 48\delta^\nu{}_\mu\theta_1^+\gamma^\circ\theta_1^+\xi_2^+\gamma^\circ\xi_2^+,$$

$$h(z_{12},\xi_1^-,\xi_2^+,\theta_2^-) = 1 - 16i\xi_2^+\gamma^\circ\hat{z}_{12}\xi_1^- -$$

$$- 128\xi_2^+\gamma^\circ\hat{z}_{12}\theta_2^+\xi_1^+\gamma^\circ\xi_1^- .$$

$$(2.16)$$

b) Two-point function of the spinor superfields*

---

*Remark: Note that the functions (2.14), (2.17) reduce to the corresponding functions of superfields, belonging to the invariant subspaces, if a relation between d and z holds under which an invariant subspace exists, although we do not suppose the existence of an invariant subspace in the present paper.

$$\Phi^{+}_{\alpha}(x_1,\theta_1^{+},\xi_1^{-}) \text{ and } \tilde{\Phi}^{+}_{\beta}(x_2,\theta_2^{-},\xi_2^{+}); (1+i\gamma_5)\Phi^{-} = (1-i\gamma_5)\Phi^{+} = 0$$

$$\Delta^{-+}_{\alpha\beta}(x_1,x_2,\theta_1^{+},\theta_2^{-},\xi_1^{-},\xi_2^{+}) = C|Y_{12}^2|^{-d-\frac{1}{2}} \times$$

$$\times (1-16i\xi_2^{+}\gamma^{\circ}\theta_2^{+})^{-\frac{1}{2}(d-\frac{3}{2}z)}(1-16i\theta_2^{-}\gamma^{\circ}\xi_1^{-})^{-\frac{1}{2}(d-\frac{3}{2}z)} \times \quad (2.17)$$

$$\times h(z_{12},\xi_1^{-},\theta_2^{-},\xi_2^{+})^{-\frac{1}{2}(d-1-\frac{3}{2}z)} \quad (\hat{Y}_{12}\gamma^{\circ}(1-i\gamma_5))_{\alpha\beta},$$

where Y_{12}, Z_{12} and h are determined by formulae (2.14), (2.15) and (2.16), respectively.

Now we pass to the three-point function Γ_{ABC}. The corresponding equations have the form:

$$\{i[(\gamma^{\circ}\frac{\partial}{\partial\eta_1^{+}})_{\alpha} + (\gamma^{\circ}\frac{\partial}{\partial\eta_2^{+}})_{\alpha}]\delta_{CC'} + (S^{+}_{3\alpha})_{CC'}\}\Gamma_{ABC'} = 0, \quad (2.18)$$

$$\{i(\gamma^{\circ}\frac{\partial}{\partial\eta_3^{-}})_{\alpha}\delta_{AA'}\delta_{BB'} + (S^{-}_{12\alpha})_{(AA')(BB')}\}\Gamma_{A'B'C} = 0, \quad (2.19)$$

$$\{i[(\gamma^{\circ}\frac{\partial}{\partial\xi_1^{-}})_{\alpha} + (\gamma^{\circ}\frac{\partial}{\partial\xi_2})]\delta_{CC'} + (T^{-}_{3\alpha})_{CC'}\}\Gamma_{ABC'} = 0, \quad (2.20)$$

$$\{i(\gamma^{\circ}\frac{\partial}{\partial\xi_3^{+}})_{\alpha}\delta_{AA'}\delta_{BB'} + (T^{+}_{12\alpha})_{(AA')(BB')}\}\Gamma_{A'B'C} = 0, \quad (2.21)$$

where $S^{-}_{12\alpha} = S^{-}_{1\alpha} + S^{-}_{2\alpha}$; $T^{+}_{12\alpha} = T^{+}_{1\alpha} + T^{+}_{2\alpha}$.
In full analogy with the previous case, equations (2.19) and (2.21) have the following solution:

$$\Gamma_{ABC}(x_1, x_2, x_3, \eta_1^+, \eta_2^+, \eta_3^-, \xi_1^-, \xi_2^-, \xi_3^+) =$$

$$= \exp\{-i\eta_3^- \gamma^\circ S_{12}^- - i\xi_3^+ \gamma^\circ T_{12}^-\}_{(AB)(A'B')} \mathcal{F}^\circ_{A'B'C}(x_1, x_2, x_3, \eta_1^+, \eta_2^+, \xi_1^-, \xi_2^-), \tag{2.22}$$

where $\mathcal{F}_{ABC}$ is an unknown function. Acting on (2.22) with equations (2.18) and (2.20), after some algebraic manipulations, we obtain for the function $\mathcal{F}^\circ_{ABC}(x_1, x_2, x_3, \eta_1^+, \eta_2^+, \xi_1^-, \xi_2^-)$ a system of equations. The latter shows that:

a) $\mathcal{F}^\circ_{ABC}$ depends on $\eta_{1\alpha}^+$, $\eta_{2\alpha}^+$, $\xi_{1\alpha}^-$ and $\xi_{2\alpha}^-$ only through the variables

$$\chi_\alpha^+ = \frac{1}{2}(\eta_{1\alpha}^+ - \eta_{2\alpha}^+), \tag{2.23}$$

$$\Psi_\alpha^- = \frac{1}{2}(\xi_{1\alpha}^- - \xi_{2\alpha}^-). \tag{2.24}$$

b) A nontrivial solution can exist only if the quantity $z = z_1 + z_2 - z_3$ obtains one of the following values:

$$z = 0, 1, 2, 3, 4. \tag{2.25}$$

c) Under these conditions the function $\mathcal{F}^\circ_{ABC}$ must satisfy the equations corresponding to the conformal subalgebra. The latter show that in the cases $z = 1, 2, 3$ a nontrivial three-point function does not exist. In the other two cases, i.e., $z = 0, 4$ a nontrivial function exists provided that the following equality

$$p_1 + p_2 + p_3 = q_1 + q_2 + q_3 \tag{2.26}$$

holds.

If all these conditions are satisfied the function $\mathcal{T}^{\circ}_{ABC}$ in the case $z=0$ is determined as

$$\mathcal{T}^{\circ}_{ABC}(x_1,x_2,x_3,\chi^{+},\Psi^{-}) = \mathcal{T}^{\circ}_{ABC}(x_1-x_3 | x_2-x_3), \quad (2.27)$$

where $\mathcal{T}^{\circ}_{ABC}$ is the ordinary conformal invariant three point function for fields with dimensions d_1, d_2 and d_3, respectively, while in the case $z=4$, we have

$$\mathcal{T}_{ABC}(x_1,x_2,x_3,\chi^{+},\Psi^{-}) = \mathcal{T}^{\circ}_{ABC}(x_1-x_3, x_2-x_3)\, \chi^{+}\gamma^{\circ}\chi^{+}\Psi^{-}\gamma^{\circ}\Psi^{-}, \quad (2.28)$$

where $\mathcal{T}^{\circ}_{ABC}$ is determined as in the previous case.

Thus, the solution of the equations for the superconformal invariant three point functions is completely determined* . In order to obtain the explicit form of the solution it is necessary to produce the global transformation (2.21). As in the case of the two-point function it is convenient to do this in terms of the "physical" variables. After this procedure the operator exponent preserves its form while the generators S^{-}_{12} and T^{+}_{12} act on the differences x_{13} and x_{23} only.

We give two examples:

a) Three-point function of scalar superfields. In the case $z=0$, we have

---

*Conformal invariant three point functions for fields with an arbitrary spin were presented in several works, see f.i. /4,5/.

$$
\begin{aligned}
&\Gamma(x_1, x_2, x_3, \theta_1^+, \theta_2^+, \theta_3^-, \xi_1^-, \xi_2^-, \xi_3^+) = \\
&= C|Y_{12}^2|^{\frac{1}{2}(d_3-d_1-d_2)} \, |Y_{23}^2|^{\frac{1}{2}(d_1-d_2-d_3)} \, |Y_{13}^2|^{\frac{1}{2}(d_2-d_1-d_3)} \times \\
&\times (1-16i\theta_3^- \gamma^\circ \xi_1^-)^{-\frac{1}{2}(d_1-\frac{3}{2}z_1)} (1-16i\theta_3^- \gamma^\circ \xi_2^-)^{-\frac{1}{2}(d_2-\frac{3}{2}z_2)} \times \\
&\times (1-16i\xi_3^+ \gamma^\circ \theta_1^+)^{\frac{1}{2}(d_2-d_3-\frac{3}{2}z_1)} (1-16i\xi_3^+ \gamma^\circ \theta_2^+)^{\frac{1}{2}(d_1-d_3-\frac{3}{2}z_2)} \times \\
&\times (1-16i\xi_3^+ \gamma^\circ (\theta_1^+ - \theta_2^+))^{\frac{1}{2}(d_3-d_1-d_2)} \times \\
&\times h(z_{13}, \xi_1^-, \xi_3^+, \theta_3^-)^{-\frac{1}{2}(d_1-\frac{3}{2}z_1)} \times \qquad (2.29) \\
&\times h(z_{23}, \xi_2^-, \xi_3^+, \theta_3^-)^{-\frac{1}{2}(d_2-\frac{3}{2}z_2)} ,
\end{aligned}
$$

$$Y_{13\mu} = x_{1\mu} - x_{3\mu} - 8i\theta_3^- \gamma^\circ \gamma_\mu \theta_1^+, \qquad Y_{12\mu} = Y_{13\mu} - Y_{23\mu},$$

$$Y_{23\mu} = x_{2\mu} - x_{3\mu} - 8i\theta_3^- \gamma^\circ \gamma_\mu \theta_2^+,$$

$$Z_{13\mu} = (1-16i\xi_3^+ \gamma^\circ \theta_1^+)^{1/2} \; Y_{13\nu} \Lambda^\nu{}_\mu (\xi_3^+, \theta_1^+);$$

$$Z_{23\mu} = (1-16i\xi_3^+ \gamma^\circ \theta_2^+)^{1/2} \; Y_{23\nu} \Lambda^\nu{}_\mu (\xi_3^+, \theta_2^+),$$

while in the case $z = 4$, we have

$$\Gamma(x_1,x_2,x_3,\theta_1^+,\theta_2^+,\theta_3^-,\xi_1^-,\xi_2^-,\xi_3^+) =$$

$$=\Gamma_0(x_1,x_2,x_3,\theta_1^+,\theta_2^+,\theta_3^-,\xi_1^-,\xi_2^-,\xi_3^+) \times$$

$$\times(\xi_{12}^- \gamma^\circ \xi_{12}^-)(\theta_{12}^+ \gamma^\circ \theta_{12}^+ + 2\theta_{12}^+ \gamma^\circ \hat{x}_{12} \chi_{12}^- - \tag{2.30}$$

$$- x_{12}^2 \chi_{12}^- \gamma^\circ \chi_{12}^-) ,$$

$$\xi_{12}^- = \frac{1}{2}(\xi_1^- - \xi_2^-),$$

$$\chi_{12}^- = \frac{1}{2}(\xi_1^- + \xi_2^-),$$

$$\theta_{12}^+ = \frac{1}{2}(\theta_1^+ - \theta_2^+), \quad x_{12} = \frac{1}{2}(x_1 - x_2),$$

where Γ_0 is determined by formula (2.29).

b) Three-point function of one scalar and two spinor superfields of the kind

$$<0|\Phi(x_1,\theta_1^+,\xi_1^-)\Psi_\alpha^+(x_2,\theta_2^+,\xi_2^-)\tilde{\Psi}_\beta^-(x_3,\theta_3^-,\xi_3^+)|0>. \tag{2.31}$$

In the case $z = 0$, we have

$$\Gamma_{0\alpha\beta}^{+-}(x_1,x_2,x_3,\theta_1^+,\xi_1^-,\theta_2^+,\xi_2^-,\theta_3^-,\xi_3^+) =$$

$$=C|Y_{12}^2|^{1/2(d_3-d_1-d_2)} \quad |Y_{13}^2|^{1/2(d_2-d_1-d_3)} \quad |Y_{23}^2|^{1/2(d_1-d_2-d_3-1)} \times$$

$$\times(1-16i\theta_3^- \gamma^\circ \xi_1^-)^{-\frac{1}{2}(d_1-\frac{3}{2}z_1)}(1-16i\theta_3^- \gamma^\circ \xi_2^-)^{-\frac{1}{2}(d_2-\frac{3}{2}z_2)}\times$$

$$\times(1-16i\xi_3^+ \gamma^\circ \theta_1^+)^{\frac{1}{2}(d_2-d_3-\frac{3}{2}z_1)}\times$$

$$\times(1-16i\xi_3^+ \gamma^\circ \theta_2^-)^{\frac{1}{2}(d_1-d_3-1-\frac{3}{2}z_2)}\times \tag{2.32}$$

$$\times(1-16i\xi_3^+ \gamma^\circ(\theta_1^+-\theta_2^+))^{\frac{1}{2}(d_3-d_1-d_2)}\, h(z_{13},\xi_1^-,\xi_3^+,\theta_3^-)^{-\frac{1}{2}(d_1-\frac{3}{2}z_1)}\times$$

$$\times h(z_{23},\xi_2^-,\xi_3^+,\theta_3^-)^{-\frac{1}{2}(d_2-\frac{3}{2}z_2)}\,[\hat{Y}_{23}\gamma^\circ(1+i\gamma_5)]_{\alpha\beta} \quad ,$$

while in the case $z=4$, we have

$$\Gamma^{+-}_{\alpha\beta}(x_1,x_2,x_3,\theta_1^+,\theta_2^+,\theta_3^-,\xi_1^-,\xi_2^-,\xi_3^-) =$$

$$=\Gamma^{+-}_{0\alpha\beta}(x_1,x_2,x_3,\theta_1^+,\theta_2^+,\theta_3^-,\xi_1^-,\xi_2^-,\xi_3^-)\times$$

$$\times(\xi_{12}^-\gamma^\circ\xi_{12}^-)(\theta_{12}^+\gamma^\circ\theta_{12}^+ + 2\theta_{12}^+\gamma^\circ\hat{x}_{12}\chi_{12}^- +$$

$$+x_{12}^2\chi_{12}^-\gamma^\circ\chi_{12}^-)\,.$$

3. In this section we find the two- and three-point functions constructed from $\Phi_A(x,\eta^+,\xi^-)$. (In the case when these functions are constructed from the conjugated fields only, all the results remain the same with the substitution $\eta^+\to\eta^-$, $\xi^-\to\xi^+$).

Let us denote by

$$\Delta_{AB}(x_1,x_2,\eta_1^+,\eta_2^+,\xi_1^-,\xi_2^-) = \\ =\langle 0|\Phi_A(x_1,\eta_1^+,\xi_1^-)\Phi_B(x_2,\eta_2^+,\xi_2^-)|0\rangle \tag{3.1}$$

and

$$\Gamma_{ABC}(x_1,x_2,x_3,\eta_1^+,\eta_2^+,\eta_3^+,\xi_1^-,\xi_2^-,\xi_3^-) = \\ =\langle 0|\Phi_A(x_1,\eta_1^+,\xi_1^-)\Phi_B(x_2,\eta_2^+,\xi_2^-)\Phi_C(x_3,\eta_3^+,\xi_3^-)|0\rangle \tag{3.2}$$

the two-and three-point functions, respectively.

Performing the infinitesimal transformations and taking into account the invariance of the vacuum state with respect to the superalgebra, we obtain a system of differential equationd for the functions Δ_{AB} and Γ_{ABC}

$$[L_1+L_2]\Delta_{AB}(x_1,x_2,\eta_1^+,\eta_2^+,\xi_1^-,\xi_2^-) = 0 \\ [L_1+L_2+L_3]\Gamma_{ABC}(x_1,x_2,x_3,\eta_1^+,\eta_2^+,\eta_3^+,\xi_1^-,\xi_2^-,\xi_3^-) = 0, \tag{3.3}$$

where L_i is any arbitrary generator of the algebra (1.1).

Consider, first the two-point function Δ_{AB} . As a result of S^+-invariance

$$[i(\gamma^\circ \frac{\partial}{\partial \eta_1^+})_\alpha + i(\gamma^\circ \frac{\partial}{\partial \eta_2^+})_\alpha] \Delta_{AB}(x_1, x_2, \eta_1^+, \eta_2^+, \xi_1^-, \xi_2^-) = 0 \quad (3.4)$$

and T^--invariance

$$[i(\gamma^\circ \frac{\partial}{\partial \xi_1^-})_\alpha + i(\gamma^\circ \frac{\partial}{\partial \xi_2^-})_\alpha] \Delta_{AB}(x_1, x_2, \eta_1^+, \eta_2^+, \xi_1^-, \xi_2^-) = 0 \quad (3.5)$$

it has to be a function of $\eta_{12}^+ = \eta_1^+ - \eta_2^+$ and $\xi_{12}^- = \xi_1^- - \xi_2^-$) . The condition for P_μ-invariance

$$[i\partial_{\mu 1} + i\partial_{\mu 2} + i\bar{\xi}_1^{-} \gamma^\circ \gamma_\mu \gamma^\circ \frac{\partial}{\partial \eta^+} + \quad (3.6)$$

$$+ i\bar{\xi}_2^{-} \gamma^\circ \gamma_\mu \gamma^\circ \frac{\partial}{\partial \eta^+}] \Delta_{AB} = 0 .$$

gives:

$$\Delta_{AB} \equiv \Delta_{AB}(z_{12}, u_{12}^+, \xi_{12}^-) \quad z_{12} = x_1 - x_2, \; u_{12}^+ = \eta_{12}^+ - \hat{x}_1 \xi_{12}^- .$$

Further we restrict ourselves to the case of scalar and spinor superfields.

A. Two-point function of scalar superfields

$$\Delta(z_{12}, u_{12}^+, \xi_{12}^-) = \langle 0 | \Phi(x_1, \eta_1^+, \xi_1^-) \Phi(x_2, \eta_2^+, \xi_2^-) | 0 \rangle .$$

From the equation for Π-invariance

$$[-z_1 - z_2 + u_{12}^+ \frac{\partial}{\partial u_{12}^+} + \xi_{12}^- \frac{\partial}{\partial \xi_{12}^-}] \Delta = 0 \quad (3.8)$$

it follows that the expansion of the function Δ in powers of the spinor variables contains no zero degree term, with respect to these variables*, $z = z_1 + z_2$ takes the values $z = 2,4$, both cases should be treated separately.

a) $z = z_1 + z_2 = 2.$

The most general form of a Lorentz-invariant scalar two-point function $\Delta(z_{12}, u^+_{12}, \xi^-_{12})$[is

$$\Delta = A(z^2_{12}) u^+_{12} \gamma^\circ u^+_{12} + B(z^2_{12}) u^+_{12} \gamma^\circ \hat{z}_{12} \xi^-_{12} +$$

$$+ C(z^2_{12}) \xi^-_{12} \gamma^\circ \xi^-_{12} ,$$

Now we make use of the equation for S^--invariance:

$$[8(\gamma^\nu \eta^+_1)_\alpha \partial^1_\nu + 8(\gamma^\nu \eta^+_2)_\alpha \partial^2_\nu - 8(\gamma^\nu \hat{x}_1 \xi^-_1)_\alpha \partial^1_\nu - 8(\gamma^\nu \hat{x}_2 \xi^-_2)_\alpha \partial^2_\nu - \tag{3.9}$$

$$- \xi^-_{1\alpha}(8d_1 - 12z_1) - \xi^-_{2\alpha}(8d_2 - 12z_2) - 16\xi^-_{1\alpha} \eta^+_1 \frac{\partial}{\partial \eta^+_1} -$$

$$- 16\xi^-_{2\alpha} \eta^+_2 \frac{\partial}{\partial \eta^+_2} - 16\xi^-_{1\alpha} \xi^-_1 \frac{\partial}{\partial \xi^-_1} - 16\xi^-_{2\alpha} \xi^-_2 \frac{\partial}{\partial \xi^-_2}] \Delta = 0$$

---

*This is also valid in the general case of n-point function constructed from the superfields only (or from the conjugated ones only) with arbitrary Lorentz structure.

which together with K_μ-invariance:

$$\{i[2x^1_\mu x^1_\nu - x_1^2 g_{\mu\nu}]\partial^\nu_1 + i[2x^2_\mu x^2_\nu - x_2^2 g_{\mu\nu}]\partial^\nu_2 + + 2ix^1_\mu d_1 + 2ix^2_\mu d_2 - i\eta_1^+\gamma^\circ\gamma_\mu\gamma^\circ \frac{\partial}{\partial\xi_1^-} - - i\eta_2^+\gamma^\circ\gamma_\mu\gamma^\circ \frac{\partial}{\partial\xi_2^-}\}\Delta = 0 \qquad (3.10)$$

gives that the function Δ does not depend explicitly on ξ^-_{12}, and that $d_1 - d_2 = -1$ $d_1 = 3/2z_1$. The D-invarianve condition

$$[z^\nu_{12}\partial^{12}_\nu + d_1 + d_2 + \frac{1}{2}u^+_{12}\frac{\partial}{\partial u^+_{12}}]\Delta(z^+_{12}, u^+_{12}) = 0 \qquad (3.11)$$

leads to the following solution for the function

$$\Delta(z_{12}, u^+_{12}) = C|z^2_{12}|^{-1/2(d+1)} u^+_{12}\gamma^\circ u^+_{12}, d_1 - d_2 = -1 \quad d_1 = 3/2z_1 \quad z_1 + z_2 = 2 \qquad (3.12)$$

In the special case when $d_1 = 3/2z_1, d_2 = 3/2z_2$ $d = d_1 + d_2 = 3$

$$\Delta(z_{12}, u^+_{12}) = C\delta^4(z_{12})u^+_{12}\gamma^\circ u^+_{12}. \qquad (3.13)$$

b) $z = z_1 + z_2 = 4.$

In this case the most general form of a Lorentz-invariant function is

$$\Delta(z_{12}, u^+_{12}, \xi^-_{12}) = A(z^2_{12})u^+_{12}\gamma^\circ u^+_{12}\xi^-_{12}\gamma^\circ\xi^-_{12}. \qquad (3.14)$$

The equation for S^--invariance is identically satisfied by this function, and K_μ and

D -invariance lead to the following results:

$$\Delta(z_{12},u^+_{12},\xi^-_{12})=\begin{cases} C|z^2_{12}|^{-d}u^+_{12}\gamma^\circ u^+_{12}\xi^-_{12}\gamma^\circ\xi^-_{12}, & d_1=d_2=d \\ 0 & d_1\neq d_2 \\ C\delta(z_{12})u^+_{12}\gamma^\circ u^+_{12}\xi^-_{12}\gamma^\circ\xi^-_{12}, & d_1+d_2=4. \end{cases} \quad (3.15)$$

B. Two-point function for spinor superfields (spin 1/2)

$$\Delta_{\alpha\beta}(z_{12},u^+_{12},\xi^-_{12})=\langle 0|\Phi_\alpha(x_1,\eta^+_1,\xi^-_1)\Phi_\beta(x_2,\eta^+_2,\xi^-_2)|0\rangle. \quad (3.16)$$

In this case the number $z=z_1+z_2$ takes the values $z=1,2,3,4$. But the odd values $z=1,3$ have to be excluded because otherwise one has to construct spinor coefficient functions in the expansion of $\Delta_{\alpha\beta}$ form the 4-vector $z_{12\mu}$.

a) $z=z_1+z_2=2$

It can directly be verified that the equations for S^-_α and K_μ invariance admit only a trivial solution.

b) $z=z_1+z_2=4$

The S^-_α, K_μ and D - invariance equations lead to the following result

$$\Delta_{\alpha\beta}(z_{12},u^+_{12},\xi^-_{12})=[C_1(\gamma^\circ(1-i\gamma_5))_{\alpha\beta}+C_2(\gamma^\circ(1+i\gamma_5))_{\alpha\beta}]\times$$

$$\times\delta^4(z_{12})u^+_{12}\gamma^\circ u^+_{12}\xi^-\gamma^\circ\xi^-_{12}, \quad d_1+d_2=4. \quad (3.17)$$

Consider now the 3- point function. Analogously S^+_α-invariance

$$[i(\gamma^\circ \frac{\partial}{\partial \eta^+_1})_\alpha + i(\gamma^\circ \frac{\partial}{\partial \eta^+_2})_\alpha + i(\gamma^\circ \frac{\partial}{\partial \eta^+_3})_\alpha]\Gamma_{ABC} = 0 \quad (3.18)$$

T^- -invariance

$$[i(\gamma^\circ \frac{\partial}{\partial \xi^-_1})_\alpha + i(\gamma^\circ \frac{\partial}{\partial \xi^-_2})_\alpha + i(\gamma^\circ \frac{\partial}{\partial \xi^-_3})_\alpha]\Gamma = 0 \quad (3.19)$$

and P_μ -invariance

$$[i\partial_{\mu_1} + i\partial_{\mu_2} + i\partial_{\mu_3} + i\xi^-_1 \gamma^\circ \gamma_\mu \gamma^\circ \frac{\partial}{\partial \eta^+_1} + i\xi^-_2 \gamma^\circ \gamma_\mu \gamma^\circ \frac{\partial}{\partial \eta^+_2} +$$

$$+ i\xi^-_3 \gamma^\circ \gamma_\mu \gamma^\circ \frac{\partial}{\partial \eta^+_3}]\Gamma_{ABC} = 0$$

lead to the following dependence for the function Γ_{ABC} from the variables x_i, η^+_i, ξ^-_i, $i = 1,2,3$

$$\Gamma_{ABC} \equiv \Gamma_{ABC}(z_{12}, z_{23}, u^+_{12}, u^+_{23}, \xi^-_{12}, \xi^-_{23}),$$

$$z_{12} = x_1 - x_2, \quad u^+_{12} = \eta^+_{12} - \hat{x}_1 \xi^-_{12}, \quad (3.21)$$

$$\eta^+_{12} = \eta^+_1 - \eta^+_2, \quad \xi^-_{12} = \xi^-_1 - \xi^-_2,$$

$$z_{23} = x_2 - x_3, \quad u^+_{23} = \eta^+_{23} - \hat{x}_3 \xi^-_{23},$$

$$\eta^+_{23} = \eta^+_2 + \eta^+_3, \xi^-_{23} = \xi^-_2 - \xi^-_3 .$$

A. Three-point function of scalar superfields

It follows from Π-invariance that $z=z_1+z_2+z_3$ takes the values $z = 2,4,6,8$.

a) $z = 2$

From S^-_α and K_μ-invariance it follows that the function Γ does not depend explicitly on ξ^-_{12} and ξ^-_{23}. And the equations for S^-_α, K_μ and D-invariance have a nontrivial solution

$$\Gamma(z_{12},z_{23},u^+_{12},u^+_{23},\xi^-_{12},\xi^-_{23})=C(z^2_{12})^{d_3-2}(z^2_{23})^{d_1-2}\times \tag{3.22}$$

$$\times(z^2_{13})^{d_2-2}\{-\frac{1}{2}z^2_{23}u^+_{12}\gamma^\circ u^+_{12}-\frac{1}{2}z^2_{12}u^+_{23}\gamma^\circ u^+_{23}+$$

$$+u^+_{12}\gamma^\circ\hat{z}_{12}\hat{z}_{23}u^+_{23}\}$$

only if

$$d_1+d_2+d_3 = 3$$

$$d_i = 3/2\, z_i\,,\quad i = 1,2,3.$$

b) $z = 4$

$$\Gamma(z_{12},z_{23},u^+_{12},u^+_{23},\xi^-_{12},\xi^-_{23}) = C|z^2_{12}|^{-1/2(d_1+d_2-d_3)}\times$$

$$\times|z^2_{23}|^{-1/2(d_2+d_3-d_1)}|z^2_{13}|^{-1/2(d_1+d_3-d_2+2)}\times$$

$$\times u^+_{12}\gamma^\circ u^+_{12}u^+_{23}\gamma^\circ u^+_{23}\,,$$

$$2d_1 = 3z_1\,,\quad 2d_3 = 3z_3\,,$$

c) $z = 6$

$$\Gamma(z_{12}, z_{23}, u^+_{12}, u^+_{23}, \xi^-_{12}, \xi^-_{23}) = C_1 |z^2_{12}|^{-1/2(d_1+d_2-d_3-1)} \times$$

$$\times |z^2_{23}|^{-1/2(d_2+d_3-d_1+1)} |z^2_{13}|^{-1/2(d_1+d_3-d_2+1)} \times$$

$$\times u^+_{12}\gamma^\circ u^+_{12} u^+_{23}\gamma^\circ u^+_{23} \xi^-_{12}\gamma^\circ\xi^-_{12} +$$

$$+ C_2 |z^2_{12}|^{-1/2(d_1+d_2-d_3+1)} |z^2_{23}|^{-1/2(d_2+d_3-d_1-1)} \times$$

$$\times |z^2_{13}|^{-1/2(d_1+d_3-d_2+1)} u^+_{12}\gamma^\circ u^+_{12} \xi^-_{23}\gamma^\circ\xi^-_{23} u^+_{23}\gamma^\circ u^+_{23},$$

$$d_1 = 3/2 z_1, \quad d_3 = 3/2 z_3,$$

if only $d_1 = 3/2 z_1$, $C_1 = 0$,
if only $d_3 = 3/2 z_3$, $C_2 = 0$.

d) $z = 8$

$$\Gamma(z_{12}, z_{23}, u^+_{12}, u^+_{23}, \xi^-_{12}, \xi^-_{23}) = C |z^2_{12}|^{-1/2(d_1+d_2-d_3)} u \times$$

$$\times |z^2_{23}|^{-1/2(d_2+d_3-d_1)} |z^2_{13}|^{-1/2(d_1+d_3-d_2)} \times$$

$$\times u^+_{12}\gamma^\circ u^+_{12} u^+_{23}\gamma^\circ u^+_{23} \xi^-_{12}\gamma^\circ\xi^-_{12} \xi^-_{23}\gamma^\circ\xi^-_{23}.$$

B. Three point function of spinor superfields (spin 1/2).

From the condtion for Π-invariance it follows that $z = z_1 + z_2 + z_3$ should take the values $z = 1,2,3,4,5,6,7,8$. However, it can be seen immediately that $\Gamma_{ABC} \equiv 0$ for even z, as for these values it is impossible to construct the corresponding expansion of Γ_{ABC} in powers of the spinor variable. But it can be verified by direct calculation that $\Gamma_{ABC}=0$ also for the odd values of Γ z, because the equations for S^-_α and K_μ invariance have no other solution but the trivial one.

Appendix

Here we give the formulae for the global transformations in terms of the "physical" variables (see ref. [3]). We begin with the transformations of the variables.

a. Global transformation with the parameter β^-_α, corresponding to the generator S^-_α

$$x_\mu \to x_\mu + 8i\beta^- \gamma^\circ \gamma_\mu \theta^+ ,$$

$$\xi^-_\alpha \to \xi^-_\alpha + 8i\xi^- \gamma^\circ \xi^- \beta^-_\alpha ,$$

$$\theta^+_\alpha \to \theta^+_\alpha .$$

b. Global transformation with the parameter β^+_α corresponding to the generator T^+_α

$$x_\mu \to (1 + 16i\beta^+ \gamma^\circ \theta^+)^{1/2} x_\nu \Lambda^\nu{}_\mu(\beta^+,\theta^+) = y_\mu ,$$

$$\theta^+_\alpha \to \theta^+_\alpha + 8i\theta^+ \gamma^\circ \theta^+ \beta^+_\alpha ,$$

$$\xi^-_\alpha \to (1 + 16i\beta^+ \gamma^\circ \theta^+)^{-1} (\xi^-_\alpha - 8i\xi^- \gamma^\circ \xi^- (\hat{y}\beta^+)_\alpha) ,$$

where

$$\Lambda^\nu{}_\mu(\beta^+,\theta^+) = \delta^\nu_\mu + 16i\beta^+ \gamma^\circ \sigma^\nu{}_\mu \theta^+ + 48\delta^\nu_\mu \beta^+ \gamma^\circ \beta^+ \theta^+ \gamma^\circ \theta^+ .$$

Superfield depending on these variables transforms as follows

$$e^{i\beta^{-}\gamma^{\circ}S^{-}} f_{(d,z)}\ (x,\theta^{+},\xi^{-}) = (1+16i\beta^{-}\gamma^{\circ}\xi^{-})^{-\frac{1}{2}(d-\frac{3}{2}z)} \times$$

$$\times f_{(d,z)}\ (x_{\mu} + 8i\beta^{-}\gamma^{\circ}\gamma_{\mu}\theta^{+}, \theta^{+}_{\alpha}, \xi^{-}_{\alpha} + 8i\xi^{-}\gamma^{\circ}\xi^{-}\beta^{-}_{\alpha})\ ,$$

$$e^{i\beta^{+}\gamma^{\circ}T^{+}} f_{(d,z)}\ (x_{\mu}, \theta^{+}_{\alpha}, \xi^{-}_{\alpha}) = (1+16i\beta^{+}\gamma^{\circ}\theta^{+})^{\frac{1}{2}(d+\frac{3}{2}z)} \times$$

$$\times (1+16i\beta^{+}\gamma^{\circ}\hat{y}\xi^{-})^{-\frac{1}{2}(d-\frac{3}{2}z)} f_{(d,z)}\ (y_{\mu}, \theta^{+}_{\alpha} + 8i\theta^{+}\gamma^{\circ}\theta^{+}\beta^{+}_{\alpha},$$

$$(1+16i\beta^{+}\gamma^{\circ}\theta^{+})^{-1}\ [\xi^{-}_{\alpha} - 8i\xi^{-}\gamma^{\circ}\xi^{-}(\hat{y}\beta^{+})_{\alpha}])\ .$$

The finite dimensional parts of these transformations have the following form:

$$(e^{i\beta^{-}\gamma^{\circ}S^{-}})_{AB} = \mathfrak{U}_{AB}(\beta^{-},\xi^{-})\, e^{i\beta^{-}\gamma^{\circ}S'^{-}},$$

$$(e^{i\beta^{+}\gamma^{\circ}T^{+}})_{AC} = \mathfrak{U}_{AB}(\beta^{+},\theta^{+})\, K_{BC}(y,c)\, e^{i\beta^{+}\gamma^{\circ}T'^{+}},$$

where S'^{-}_{α} and T'^{+}_{α} are the differential parts of the corresponding generators and the matrices $\mathfrak{U}_{AB}$ and K_{BC} are defined as follows:

$$\mathfrak{U}_{AB}(\beta^{-},\xi^{-}) = \delta_{AB} + 8(\Sigma_{\mu\nu})_{AB}\, \beta^{-}\gamma^{\circ}\sigma^{\mu\nu}\xi^{-} -$$

$$-16q(q+2)\frac{1}{2}(1-i\gamma_5)_{AB}\,\beta^{-}\gamma^{\circ}\beta^{-}\,\xi^{-}\gamma^{\circ}\xi^{-}\ ,$$

$$\mathfrak{U}_{AB}(\beta^{+},\theta^{+}) = \delta_{AB} + 8(\Sigma_{\mu\nu})_{AB}\, \beta^{+}\gamma^{\circ}\sigma^{\mu\nu}\ \theta^{+} -$$

$$-16p(p+2)\frac{1}{2}(1+i\gamma_5)_{AB}\,\beta^{+}\gamma^{\circ}\beta^{+}\theta^{+}\gamma^{\circ}\theta^{+}\ ,$$

$$K_{\{\alpha_p\}\{\alpha'_p\}\{\beta_q\}\{\beta'_q\}}(y_\mu, \beta^{+}\gamma^{\circ}\gamma_\nu\xi^{-}) = \frac{1}{2}(1+i\gamma_5)_{\{\alpha_p\}\{\alpha'_p\}} \times$$

$$\times(1+16i\beta^{+}\gamma^{\circ}\gamma^{\nu}\xi^{-}y_\nu)^{q/2}\prod_{j=1}^{q}\{\frac{1}{2}(1-i\gamma_5)_{\beta_j\beta'_j} +$$

$$+8iy^{\mu}\beta\ \gamma^{\circ}\gamma^{\nu}\xi^{-}[\gamma_\nu\gamma_\mu\frac{1}{2}(1-i\gamma_5)]_{\beta_j\beta'_j}\}.$$

References

1. Molotkov V.V. e.a. Theor.Math.Phys.,1976, v.26, N.2.
2. Aneva B.L. e.a. Theor.Math.Phys.,1976, v.27, N.3.
3. Aneva B.L. e.a. JINR,E2-9289,Dubna,1976.
4. Sorkov G.M., Zaikov R.P. JINR,E2-10250, Dubna,1976.
5. Mack G., Todorov I.T. Phys.Rev.,D8(1973); R.Nobily. Preprint IFPTHI (1972); E.Schreier. Phys.Rev., D3,980 (1971).

Received by Publishing Department
on April 22, 1977.