Addendum to "Angular momentum analysis of the four-nucleon Green's function"

D. Bessis
Service de Physique Théorique, Centre d'Études Nucléaires de Saclay, Gif-sur-Yvette, France

P. Mery
*Centre Universitaire de Marseille Luminy et Centre de Physique Théorique, CNRS, Marseille, France**

G. Turchetti
Istituto di Fisica A. Righi, Bologna, Italy

(Received 8 January 1976)

A modification in the definition of one invariant in our earlier paper is presented which allows an easier computation of the vector-meson contribution in the one-loop approximation.

In a previous paper[1] we defined a set of 16 invariants $\langle O_i\rangle, \langle O_i^5\rangle$. For the partial-wave expansion it is very convenient to avoid any kinematical singularity. In this respect, a different choice for the invariant $\langle O_2^5\rangle$ should be preferred. Indeed let us consider the relation [(D7) of Ref. 1]

$$\tfrac{1}{2}t\langle\gamma_5\sigma^{\mu\nu}\otimes\sigma_{\mu\nu}\rangle=-4m\langle\not{\pi}_2\otimes\gamma_5+\gamma_5\otimes\not{\pi}_1\rangle+(s-u)\langle 1\otimes\gamma_5+\gamma_5\otimes 1\rangle . \tag{1}$$

With the previous choice of $\langle O_2^5\rangle$, we introduce an apparent singularity $1/t$ when we have to decompose $\langle\gamma_5\sigma^{\mu\nu}\otimes\sigma_{\mu\nu}\rangle$ on our basis. Such a decomposition occurs only if one computes the vector-meson contribution in the one-loop approximation[2]; therefore it is, in this case, more convenient for computational purposes to choose

$$\langle O_2^5\rangle=\tfrac{1}{2}\langle\gamma_5\sigma_{\mu\nu}\otimes\sigma^{\mu\nu}\rangle . \tag{2}$$

Then the Fierz transformation [(4.7) of Ref. 1] reads

$$\begin{pmatrix}\langle O_1^5\rangle_{FT}\\ \\ \langle O_2^5\rangle_{FT}\end{pmatrix}=\frac{1}{2}\begin{pmatrix}1 & 1\\ \\ 3 & -1\end{pmatrix}\begin{pmatrix}\langle O_1^5\rangle\\ \\ \langle O_2^5\rangle\end{pmatrix} . \tag{3}$$

The contribution of F_2^5 to the ϕ_i's [(4.17) of Ref. 1] is changed according to

$$\phi_2=\frac{k}{\pi}\left(-\tfrac{1}{2}F_1^5\cos\theta-\tfrac{3}{2}F_2^5\right) . \tag{4}$$

The relations between the A_k^5 and the F_k^5 [(D9) of Ref. 1] are now given by

$$\begin{aligned}F_1^5&=\tfrac{1}{2}(A_1^5+A_2^5) ,\\ F_2^5&=\tfrac{1}{2}(-\tfrac{1}{3}A_1^5+A_2^5) ;\end{aligned} \tag{5}$$

and in a similar way the G_k^5 [(E1) and (E2) of Ref. 1] are given by

$$\begin{aligned}4\pi G_1^5&=2F_1^5=A_1^5+A_2^5 ,\\ 4\pi G_2^5&=2F_1^5+6F_2^5=4A_2^5 .\end{aligned} \tag{6}$$

Finally the singlet–coupled-triplet partial-wave amplitudes read

$$\begin{aligned}\langle {}^1J_J|\Phi^J|{}^3(J-1)_J\rangle=\frac{1}{2}\frac{k^2}{2J+1}\left(\frac{J}{2J+1}\right)^{1/2}\Big\{&-(2J+1)(G_2^5-G_1^5)^J-J(G_1^5)^{J-1}-(J+1)(G_1^5)^{J+1}\\ &+\frac{m}{k_0}(J+1)[(G_1^5)^{J+1}-(G_1^5)^{J-1}]-(J+1)(G_3^5)^{J+1}-J(G_3^5)^{J-1}-(2J+1)(G_4^5)^J\\ &+\frac{k_0}{m}(J+1)[(G_3^5)^{J+1}-(G_3^5)^{J-1}]\Big\}\end{aligned} \tag{7}$$

and

$$\begin{aligned}\langle {}^1J_J|\Phi^J|{}^3(J+1)_J\rangle=\frac{1}{2}\frac{k^2}{2J+1}\left(\frac{J+1}{2J+1}\right)^{1/2}\Big\{&(2J+1)(G_2^5-G_1^5)^J+J(G_1^5)^J+(J+1)(G_1^5)^{J+1}\\ &+\frac{m}{k_0}J[(G_1^5)^{J+1}-(G_1^5)^{J-1}]+(J+1)(G_3^5)^{J+1}+J(G_3^5)^{J-1}+(2J+1)(G_4^5)^J\\ &+\frac{k_0}{m}J[(G_3^5)^{J+1}-(G_3^5)^{J-1}]\Big\}.\end{aligned} \tag{8}$$

No other change occurs in the paper.

*Postal address: Centre de Physique Théorique—CNRS 31, chemin Joseph Aiguier F—13274 Marseille CEDEX 2, France.

[1]D. Bessis, P. Mery, and G. Turchetti, Phys. Rev. D 10, 1992 (1974).
[2]D. Bessis, P. Mery, and G. Turchetti (unpublished).