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Erratum

On the Euclidean Version of Haag's Theorem in $P(\varphi)_2$ Theories

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As communicated to the author by Newman, estimate (7) does not seem to follow from the results of [7], or at least not easily. (We use the literature quoted in our paper and continue the numeration). As Newman pointed out, however, the weaker result holds

$$E(|E_l(X_{2l,\lambda} - X_{l',\lambda})|) \leqq O(e^{-\varepsilon l}) \tag{12}$$

for $l' \geqq 2l$ and some $\varepsilon > 0$.

With this we may indeed prove

$$E(X_{l',\lambda} A_l) \leqq O(e^{-\varepsilon l}) \qquad (l' \geqq 2l) \tag{13a}$$

and by the $\lambda \leftrightarrow \lambda'$ symmetry

$$E(X_{l',\lambda'} C A_l) \leqq O(e^{-\varepsilon l}) \qquad (l' \geqq 2l)\,. \tag{13b}$$

By the previous arguments, these estimates are of course sufficient for the proof of the theorem. To prove estimate (13a), by Newman's estimate (12), it is sufficient to consider $E(X_{2l,\lambda} A_l)$. Let $V_D = V_{2l,\lambda} - V_{l,\lambda}$ then by the definition of A_l:

$$E(X_{2l,\lambda} A_l) \leqq E(e^{-V_{2l,\lambda}})^{-1} \left(E(e^{-V_{l,\lambda}})\, E(e^{-V_{l,\lambda'}})^{-1}\right)^{\delta} E(e^{-V_D - V_{l,\lambda(\delta)}}) \tag{14}$$

for any $0 < \delta < 1$ with $\lambda(\delta) = \delta \lambda' + (1-\delta)\lambda$.

By the Feynman-Kac-Nelson formula, the last factor on the r.h.s. of inequality (14) is

$$K = (\Psi_0, e^{-\frac{l}{2} H_{2l,\lambda}} e^{-l\hat{H}} e^{-\frac{l}{2} H_{2l,\lambda}} \Psi_0) \tag{15}$$