Erratum: Energy dependence of the ρ resonance
in $\pi\pi$ elastic scattering from lattice QCD
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Since the publication of Ref. [1], the authors have discovered a bug in the code which was used to perform the Wick contractions of quark fields in hadron correlation functions. The net effect of this bug is to cause an error in the normalization of those correlators with meson-meson constructions at both source and sink, $\langle\pi\pi(t)\pi\pi(0)\rangle$, relative to those which feature a single-meson operator at source and/or sink, $\langle\rho(t)\pi\pi(0)\rangle$, $\langle\pi\pi(t)\rho(0)\rangle$, $\langle\rho(t)\rho(0)\rangle$. The spectra obtained from variational analysis of these correlation matrices are in error, and it follows that the elastic-scattering phase shifts extracted using the finite-volume Lüscher formalism are also in error.

The authors have subsequently corrected the normalization and performed the variational analysis of the correct correlation matrices leading to new determinations of the finite-volume spectra, which show small but significant differences to those presented in Ref. [1]. A summary of the new spectra in the $\pi\pi$ elastic energy region is presented in Fig. 1. The corresponding P-wave phase-shift points are presented in Fig. 2, where they are observed to show a clear resonant behavior.
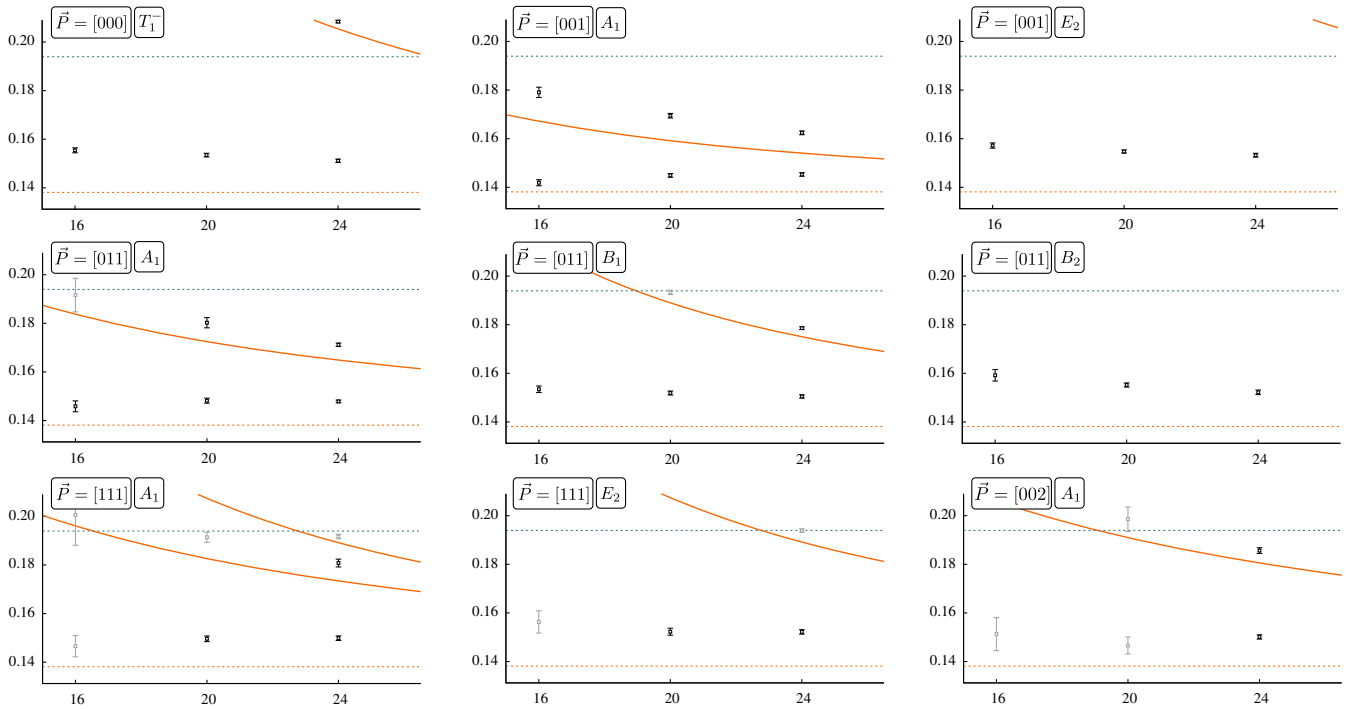

FIG. 1 (color online). Volume dependence of elastic spectra for various $\vec{P}, \Lambda$. Plotted is $a_t E_{\text{cm}}$ versus L/a_s. Also shown by dashed horizontal lines are the $\pi\pi$ and $K\bar{K}$ energy thresholds. Solid curves indicate the noninteracting $\pi\pi$ energy levels. Points shown in gray are excluded from the phase-shift analysis.
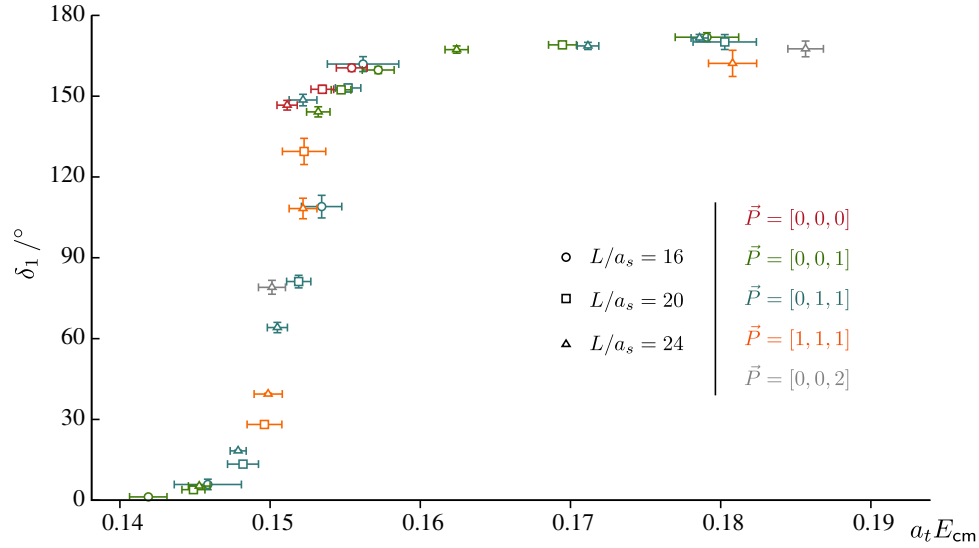
FIG. 2 (color online). P-wave $\pi\pi$ elastic scattering phase shift, $\delta_1(E_{cm})$, determined from solution of Eq. (7) in Ref. [1] applied to the finite-volume spectra shown in Fig. 1 under the assumption that $\delta_{\ell>1} = 0$. The energy region plotted is from $\pi\pi$ threshold to $K\bar{K}$ threshold.
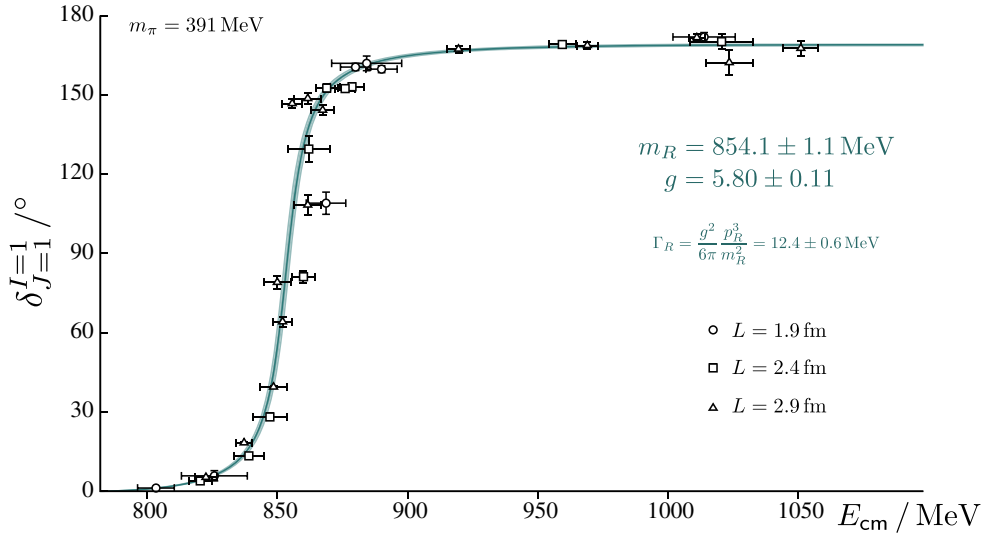

FIG. 3 (color online). Isospin-1, P-wave $\pi\pi$ elastic scattering phase shift and Breit-Wigner parametrization for $m_\pi = 391$ MeV. The energy region plotted is from $\pi\pi$ threshold to $K\bar{K}$ threshold.

The conclusions of the paper do not change in qualitative content after the correction described above, with a resonant ρ state still being present. A relativistic Breit-Wigner provides an excellent description of the P-wave phase-shift points in the elastic $\pi\pi$ scattering region, with parameter values, statistical uncertainties, and correlations given by

$$a_t m_R = 0.15085(18)(3) \quad \begin{bmatrix} 1 & -0.26 \\ & 1 \end{bmatrix}$$
$$g = 5.80(10)(1)$$
$$\chi^2/N_{\text{d.o.f.}} = \frac{24.5}{31 - 2} = 0.84.$$

This fit in physical units is presented in Fig. 3.

[1] J. J. Dudek, R. G. Edwards, and C. E. Thomas, Phys. Rev. D **87**, 034505 (2013).