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Erratum: Note on integrability of marginally deformed ABJ(M) theories

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Some computation errors were found. The conclusion about integrability is still valid. Eq. (3.5) should be changed to

$$\left(\widetilde{\mathbb{P}}_{i,i+2}\right)^{I_iI_{i+1}I_{i+2}}_{J_iJ_{i+1}J_{i+2}} \equiv \exp\left(-2\pi i\gamma\left(Q^{J_i}\times Q^{J_{i+1}}+Q^{J_{i+1}}\times Q^{J_{i+2}}+Q^{J_{i+2}}\times Q^{J_i}\right)\right) \times \left(\mathbb{P}_{i,i+2}\right)^{I_iI_{i+1}I_{i+2}}_{J_iJ_{i+1}J_{i+2}}\,. \tag{3.5}$$

Eqs. (4.1)–(4.3) should be changed to

$$\widetilde{\mathfrak{R}^{\mathbf{44}}}(u)^{IJ}_{KL} = \exp\left(i\pi\gamma\left(Q^J\times Q^I - Q^K\times Q^L\right)\right)\mathfrak{R}^{\mathbf{44}}(u)^{IJ}_{KL}\,, \tag{4.1}$$

$$\widetilde{\mathfrak{R}^{\mathbf{4\bar{4}}}}(u)^{IJ}_{KL} = \exp\left(-i\pi\gamma\left(Q^J\times Q^I - Q^K\times Q^L\right)\right)\mathfrak{R}^{\mathbf{4\bar{4}}}(u)^{IJ}_{KL}\,, \tag{4.2}$$

$$\widetilde{\mathfrak{R}^{\mathbf{\bar{4}4}}}(u)^{IJ}_{KL} = \exp\left(-i\pi\gamma\left(Q^J\times Q^I - Q^K\times Q^L\right)\right)\mathfrak{R}^{\mathbf{\bar{4}4}}(u)^{IJ}_{KL}\,, \tag{4.3}$$

$$\widetilde{\mathfrak{R}^{\mathbf{\bar{4}\bar{4}}}}(u)^{IJ}_{KL} = \exp\left(i\pi\gamma\left(Q^J\times Q^I - Q^K\times Q^L\right)\right)\mathfrak{R}^{\mathbf{\bar{4}\bar{4}}}(u)^{IJ}_{KL}\,, \tag{4.4}$$

Eqs. (4.9)–(4.12) should be changed to

$$\widetilde{\mathfrak{R}^{\mathbf{44}}}(u)^{IJ}_{KL} = u\exp\left(2\pi i\gamma Q^J\times Q^I\right)\delta^I_K\delta^J_L + \delta^I_L\delta^J_K, \tag{4.9}$$

$$\widetilde{\mathfrak{R}^{\mathbf{4\bar{4}}}}(u)^{IJ}_{KL} = -(u+2)\exp\left(-2\pi i\gamma Q^J\times Q^I\right)\delta^I_K\delta^J_L + \delta^{IJ}\delta_{KL}, \tag{4.10}$$

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$$\widetilde{\mathfrak{R}^{\bar{4}4}}\left(u\right)^{IJ}_{KL}=-\left(u+2\right)\exp\left(-2\pi i\gamma Q^{J}\times Q^{I}\right)\delta^{I}_{K}\delta^{J}_{L}+\delta^{IJ}\delta_{KL}, \tag{4.11}$$

$$\widetilde{\mathfrak{R}^{\bar{4}\bar{4}}}\left(u\right)^{IJ}_{KL}=u\exp\left(2\pi i\gamma Q^{J}\times Q^{I}\right)\delta^{I}_{K}\delta^{J}_{L}+\delta^{I}_{L}\delta^{J}_{K}. \tag{4.12}$$

Eq. (5.1) should be changed to

$$\begin{aligned}\widetilde{\Lambda}\left(\nu\right)=&\,2^{-L}\left(\nu{+}1\right)^{L}\left(-\nu{-}2\right)^{L}\exp\left(-\frac{i}{2}\pi\gamma L-\frac{i}{2}\gamma N_m+i\pi\gamma N_r\right)\prod_{a=1}^{N_l}\frac{\nu+il_a-\frac{1}{2}}{\nu+il_a+\frac{1}{2}}\\&+2^{-L}\left(\nu{+}1\right)^{L}\left(-\nu\right)^{L}\exp\left(-\frac{i}{2}\pi\gamma L-\frac{i}{2}\gamma N_m+i\pi\gamma N_l\right)\prod_{c=1}^{N_r}\frac{\nu+ir_c+\frac{5}{2}}{\nu+ir_c+\frac{3}{2}}\\&+2^{-L}\left(-\nu{-}2\right)^{L}\nu^{L}\exp\left(\frac{i}{2}\pi\gamma L+\frac{i}{2}\pi\gamma N_m-i\pi\gamma N_r\right)\prod_{a=1}^{N_l}\frac{\nu+il_a+\frac{3}{2}}{\nu+il_a+\frac{1}{2}}\prod_{b=1}^{N_m}\frac{\nu+im_b}{\nu+im_b+1}\\&+2^{-L}\left(-\nu{-}2\right)^{L}\nu^{L}\exp\left(\frac{i}{2}\pi\gamma L+\frac{i}{2}\pi\gamma N_m-i\pi\gamma N_l\right)\prod_{c=1}^{N_c}\frac{\nu+ir_c+\frac{1}{2}}{\nu+ir_c+\frac{3}{2}}\prod_{b=1}^{N_m}\frac{\nu+im_b+2}{\nu+im_b+1}.\end{aligned} \tag{5.1}$$

Eqs. (5.3)–(5.6) should be changed to

$$\begin{aligned}\widetilde{\widetilde{\Lambda}}\left(\nu\right)=&\,2^{-L}\left(-\nu\right)^{L}\left(\nu{+}1\right)^{L}\exp\left(\frac{i}{2}\pi\gamma L+\frac{i}{2}\pi\gamma N_m-i\pi\gamma N_r\right)\prod_{a=1}^{N_l}\frac{\nu+il_a+\frac{5}{2}}{\nu+il_a+\frac{3}{2}}\\&+2^{-L}\left(\nu{+}1\right)^{L}\left(-\nu{-}2\right)^{L}\exp\left(\frac{i}{2}\pi\gamma L+\frac{i}{2}\pi\gamma N_m-i\pi\gamma N_l\right)\prod_{c=1}^{N_r}\frac{\nu+ir_c-\frac{1}{2}}{\nu+ir_c+\frac{1}{2}}\\&+2^{-L}\left(-\nu{-}2\right)^{L}\nu^{L}\exp\left(-\frac{i}{2}\pi\gamma L-\frac{i}{2}\pi\gamma N_m+i\pi\gamma N_r\right)\prod_{a=1}^{N_l}\frac{\nu+il_a+\frac{1}{2}}{\nu+il_a+\frac{3}{2}}\prod_{b=1}^{N_m}\frac{\nu+im_b+2}{\nu+im_b+1}\\&+2^{-L}\left(-\nu{-}2\right)^{L}\nu^{L}\exp\left(-\frac{i}{2}\pi\gamma L-\frac{i}{2}\pi\gamma N_m+i\pi\gamma N_l\right)\prod_{b=1}^{N_m}\frac{\nu+im_b}{\nu+im_b+1}\prod_{c=1}^{N_r}\frac{\nu+ir_c+\frac{3}{2}}{\nu+ir_c+\frac{1}{2}}.\end{aligned} \tag{5.3}$$

$$\begin{aligned}\exp\left(i\pi\gamma L+i\pi\gamma N_m-2\pi i\gamma N_l\right)\left(\frac{l_a-\frac{i}{2}}{l_a+\frac{i}{2}}\right)^{L}&=\prod_{a'\neq a}\frac{l_a-l_{a'}-i}{l_a-l_{a'}+i}\prod_{b=1}^{N_m}\frac{l_a-m_b+\frac{i}{2}}{l_a-m_b-\frac{i}{2}},\\ \exp\left(-i\pi\gamma L-i\pi\gamma N_m+2\pi i\gamma N_l\right)\left(\frac{r_c-\frac{i}{2}}{r_c+\frac{i}{2}}\right)^{L}&=\prod_{b=1}^{N_m}\frac{r_c-m_b+\frac{i}{2}}{r_c-m_b-\frac{i}{2}}\prod_{c'\neq c}\frac{r_c-r_{c'}-i}{r_c-r_{c'}+i},\\ \exp\left(-i\pi\gamma N_l+i\pi\gamma N_r\right)=\prod_{a=1}^{N_l}\frac{m_b-l_a-\frac{i}{2}}{m_b-l_a+\frac{i}{2}}&\prod_{b\neq b'}\frac{m_b-m_{b'}-i}{m_b-m_{b'}+i}\prod_{c=1}^{N_r}\frac{m_b-r_c+\frac{i}{2}}{m_b-r_c-\frac{i}{2}}.\end{aligned} \tag{5.4}$$

$$\begin{aligned}P_{total}&=\frac{1}{i}\left[\log\widetilde{\Lambda}\left(0\right)+\log\widetilde{\widetilde{\Lambda}}\left(0\right)\right]\\&=\frac{1}{i}\left[i\pi\gamma N_r-i\pi\gamma N_l+\sum_{a=1}^{N_l}\log\frac{il_a-\frac{1}{2}}{il_a+\frac{1}{2}}+\sum_{c=1}^{N_r}\log\frac{ir_c-\frac{1}{2}}{ir_c+\frac{1}{2}}\right].\end{aligned} \tag{5.5}$$

$$1=\exp\left(i\pi\gamma N_r-i\pi\gamma N_l\right)\prod_{a=1}^{N_l}\frac{il_a-\frac{1}{2}}{il_a+\frac{1}{2}}\prod_{c=1}^{N_r}\frac{ir_c-\frac{1}{2}}{ir_c+\frac{1}{2}}. \tag{5.6}$$

Eq. (5.7), the frist line, $3L$ should be added after $=$.

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Eqs. (A.2)–(A.3) should be changed to

$$\begin{aligned}
&2^{-L}\left(\mathbb{P}_{01}\right)^{K_0 I_1}_{K_1 J_1}\,\widetilde{\mathfrak{R}^{4\bar{4}}}_{02}(a)^{K_1 I_2}_{K_2 J_2}\dots\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i-2)}(a)^{K_{2i-3}I_{2i-2}}_{K_{2i-2}J_{2i-2}}\,\delta^{K_{2i-2}}_{K_{2i-1}}e^{-2\pi i\gamma Q^{K_{2i-1}}\times Q^{I_{2i-1}}}\\
&\delta^{I_{2i-1}}_{J_{2i-1}}\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i)}(a)^{K_{2i-1}I_{2i}}_{K_{2i}J_{2i}}\dots\left(\mathbb{P}_{0(2L-1)}\right)^{K_{2L-2}I_{2L-1}}_{K_{2L-1}J_{2L-1}}\,\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2L)}(a)^{K_{2L-1}I_{2L}}_{K_0 J_{2L}}\\
&=2^{-L}\widetilde{\mathfrak{R}^{4\bar{4}}}_{02}(a)^{I_1I_2}_{J_3J_2}\dots\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i-2)}(a)^{I_{2i-3}I_{2i-2}}_{K_{2i-1}J_{2i-2}}e^{-2\pi i\gamma Q^{K_{2i-1}}\times Q^{I_{2i-1}}}\,\delta^{I_{2i-1}}_{J_{2i-1}}\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i)}(a)^{K_{2i-1}I_{2i}}_{J_{2i+1}J_{2i}}\\
&\quad\dots\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2L)}(a)^{I_{2L-1}I_{2L}}_{J_1J_{2L}}.
\end{aligned}\tag{A.2}$$

$$\begin{aligned}
&2^{-L}\left(\mathbb{P}_{01}\right)^{K_0 I_1}_{K_1 J_1}\,\widetilde{\mathfrak{R}^{4\bar{4}}}_{02}(a)^{K_1 I_2}_{K_2 J_2}\cdots\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i-2)}(a)^{K_{2i-3}I_{2i-2}}_{K_{2i-2}J_{2i-2}}\left(\mathbb{P}_{0(2i-1)}\right)^{K_{2i-2}I_{2i-1}}_{K_{2i-1}J_{2i-1}}\left(-\mathbb{I}\right)^{K_{2i-1}I_{2i}}_{K_{2i}J_{2i}}\\
&e^{2\pi i\gamma Q^{K_{2i}}\times Q^{I_{2i}}}\left(\mathbb{P}_{0(2i+1)}\right)^{K_{2i}I_{2i+1}}_{K_{2i+1}J_{2i+1}}\,\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i+2)}(a)^{K_{2i+1}I_{2i+2}}_{K_{2i+2}J_{2i+2}}\dots\widetilde{\mathfrak{R}^{4\bar{4}}}_{02L}(a)^{K_{2L-1}I_{2L}}_{K_0J_{2L}}\\
&=-2^{-L}\widetilde{\mathfrak{R}^{4\bar{4}}}_{02}(a)^{I_1I_2}_{J_3J_2}\cdots\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i-2)}(a)^{I_{2i-3}I_{2i-2}}_{J_{2i-1}J_{2i-2}}\,\delta^{I_{2i}}_{J_{2i}}\delta^{I_{2i-1}}_{J_{2i+1}}e^{2\pi i\gamma Q^{I_{2i-1}}\times Q^{I_{2i}}}\\
&\quad\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i+2)}(a)^{I_{2i+1}I_{2i+2}}_{J_{2i+3}J_{2i+2}}\cdots\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2L)}(a)^{I_{2L-1}I_{2L}}_{J_1J_{2L}}.
\end{aligned}\tag{A.3}$$

Eqs. (A.4)–(A.6) should be changed to

$$\tilde{\tau}^{-1}(0,a)=2^L\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2L)}(a)\right]^{J_1J_{2L}}_{I_{2L-1}I_{2L}}\cdots\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2)}(a)\right]^{J_3J_2}_{I_1I_2},\tag{A.4}$$

$$\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i)}(a)\right]^{J_{2i-1}J_{2i}}_{I_{2i+1}I_{2i}}=-\left(\frac{1}{a+2}\mathbb{I}^{J_{2i-1}J_{2i}}_{I_{2i+1}I_{2i}}e^{-2\pi i\gamma Q^{J_{2i-1}}\times Q^{J_{2i}}}+\frac{1}{a^2-4}\mathbb{K}^{J_{2i-1}J_{2i}}_{I_{2i+1}I_{2i}}\right).\tag{A.5}$$

$$\begin{aligned}
&\tilde{\tau}^{-1}(u,a)\tilde{\tau}'(u,a)|_{u=0}\\
&=\sum_{i=1}^{L}\mathbb{I}^{K_1\cdots K_{2i-3}}_{J_1\cdots J_{2i-3}}\otimes\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i)}(a)\right]^{K_{2i+1}K_{2i}}_{I_{2i-1}I_{2i}}\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i-2)}(a)\right]^{K_{2i-1}K_{2i-2}}_{I_{2i-3}I_{2i-2}}\\
&\quad e^{-2\pi i\gamma Q^{\tilde{K}_{2i-1}}\times Q^{I_{2i-1}}}\,\delta^{I_{2i-1}}_{J_{2i-1}}\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i-2)}(a)^{I_{2i-3}I_{2i-2}}_{\tilde{K}_{2i-1}J_{2i-2}}\,\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i)}(a)^{\tilde{K}_{2i-1}I_{2i}}_{J_{2i+1}J_{2i}}\otimes\mathbb{I}^{K_{2i+2}\cdots K_{2L}}_{J_{2i+2}\cdots J_{2L}}\\
&\quad+\sum_{i=1}^{L}\mathbb{I}^{K_1\cdots K_{2i-1}}_{J_1\cdots J_{2i-1}}\otimes\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i)}(a)\right]^{K_{2i+1}K_{2i}}_{I_{2i-1}I_{2i}}\left(-\delta^{I_{2i-1}}_{J_{2i+1}}\delta^{I_{2i}}_{J_{2i}}\right)e^{2\pi i\gamma Q^{I_{2i+1}}\times Q^{I_{2i}}}\otimes\mathbb{I}^{K_{2i+2}\cdots K_{2L}}_{J_{2i+2}\cdots J_{2L}}\\
&=\sum_{i=1}^{L}\mathbb{I}^{K_1\cdots K_{2i-3}}_{J_1\cdots J_{2i-3}}\otimes\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i)}(a)\right]^{K_{2i+1}K_{2i}}_{J_{2i-1}I_{2i}}\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i-2)}(a)\right]^{K_{2i-1}K_{2i-2}}_{I_{2i-3}I_{2i-2}}e^{-2\pi i\gamma Q^{\tilde{K}_{2i-1}}\times Q^{J_{2i-1}}}\\
&\quad\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i-2)}(a)^{I_{2i-3}I_{2i-2}}_{\tilde{K}_{2i-1}J_{2i-2}}\,\widetilde{\mathfrak{R}^{4\bar{4}}}_{0(2i)}(a)^{\tilde{K}_{2i-1}I_{2i}}_{J_{2i+1}J_{2i}}\otimes\mathbb{I}^{K_{2i+2}\cdots K_{2L}}_{J_{2i+2}\cdots J_{2L}}\\
&\quad-\sum_{i=1}^{L}\mathbb{I}^{K_1\cdots K_{2i-1}}_{J_1\cdots J_{2i-1}}\otimes\left[\widetilde{\mathfrak{R}^{4\bar{4}}}^{-1}_{0(2i)}(a)\right]^{K_{2i+1}K_{2i}}_{J_{2i+1}J_{2i}}e^{2\pi i\gamma Q^{J_{2i+1}}\times Q^{J_{2i}}}\otimes\mathbb{I}^{K_{2i+2}\cdots K_{2L}}_{J_{2i+2}\cdots J_{2L}}\\
&=\sum_{i=1}^{L}\frac{1}{a^2-4}((a-2)\mathbb{I}+(a^2-4)\widetilde{\mathbb{P}}_{2i-1,2i+1}-(a-2)\mathbb{P}_{2i-1,2i+1}\mathbb{K}_{2i-1,2i}\\
&\quad+(a+2)\mathbb{P}_{2i-1,2i+1}\mathbb{K}_{2i,2i+1})
\end{aligned}\tag{A.6}$$

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