

Erratum: Derivation of quantum theory with superselection rules [Phys. Rev. A **101, 022104 (2020)]**

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The following corrections concern the use of subalgebras of Euclidean Jordan algebras in Secs. VIB and VII C. They are local and do not affect the main conclusions of the paper.

On p. 17, Sec. VIB, the two displayed equalities characterizing a subalgebra E' and its cone E'^+ by the identity element $|\chi'\rangle$ of E' are not valid for an arbitrary subalgebra of the ambient EJA E . They should be replaced by the following statement. If E' is a subalgebra of E with identity element $|\chi'\rangle$, then

$$E' \subseteq E_{|\chi'\rangle}, \quad E_{|p\rangle} := \{ |v\rangle \in E : |p\rangle \bullet |v\rangle = |v\rangle \}, \quad (1)$$

where $|p\rangle$ is an idempotent of E . For every idempotent $|p\rangle$, $E_{|p\rangle}$ is the Peirce 1-subalgebra with identity element $|p\rangle$, and

$$E_{|p\rangle}^+ = E^+ \cap E_{|p\rangle} = \{ |\rho\rangle \in E^+ : |p\rangle \bullet |\rho\rangle = |\rho\rangle \}. \quad (2)$$

Equivalently, $E_{|p\rangle}^+$ is the face of E^+ generated by $|p\rangle$. Thus the original displayed equalities hold when E' is this Peirce 1-subalgebra, in particular when E' is a direct-summand subalgebra in a direct-sum decomposition.

Accordingly, on p. 22, Sec. VII C, the notation $E'_A \otimes E'_B$ should be understood, in the uses needed in Lemmas 39 and 40, as the Peirce 1-subalgebra

$$E_{|\chi'\rangle} = \{ |x\rangle \in V_{A \otimes B} : |\chi'\rangle \bullet |x\rangle = |x\rangle \}, \quad (3)$$

where $|\chi'\rangle$ is the idempotent defined there. This notation is determined by $|\chi'\rangle$.

In Lemma 39, the assertion that $|w_{i,j;s,t}\rangle \in E_{(i,j)}$ follows from the same face property. Let $|\chi_{ij}\rangle := |\chi_{A,i}\rangle \otimes |\chi_{B,j}\rangle$ be the identity element of $E_{(i,j)}$. For $|x\rangle \in E_{A,i}^+$ and $|y\rangle \in E_{B,j}^+$, choose $r, s > 0$ with $|x\rangle \leq r|\chi_{A,i}\rangle$ and $|y\rangle \leq s|\chi_{B,j}\rangle$. Then $|x\rangle \otimes |y\rangle \leq rs|\chi_{ij}\rangle$, and hence $|x\rangle \otimes |y\rangle \in E_{(i,j)}^+$. Since $E_{A,i}$ and $E_{B,j}$ are spanned by their positive cones, $|w_{i,s}\rangle \otimes |w'_{j,t}\rangle \in E_{(i,j)}$, as required. The rest of the proof of Lemma 39 is unchanged.