Correction to: C^* -algebras, H^* -algebras and trace ideals of pseudo-differential operators on locally compact, Hausdorff and abelian groups

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Published online: 18 May 2020
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Correction to: J. Pseudo-Differ. Oper. Appl. (2019) 10:269–283
<https://doi.org/10.1007/s11868-019-00280-8>

Let G be a locally compact, Hausdorff and abelian group. It is pointed out by Thomas Krainer in the Mathematical Reviews (MR3945922) of [1] that the proof of $S_2(G)$ is a C^* -algebra in Theorem 6.1 of [1] which is incorrect.

In fact, we can show that $S_2(G)$ is not a C^* -algebra under the Hilbert–Schmidt norm. To see this, let A be a self-adjoint Hilbert–Schmidt operator with simple eigenvalues $\left\{\frac{1}{n^2}\right\}_{n=1}^{\infty}$. Then,

$$A = \sum_{n=1}^{\infty} \frac{1}{n^2} (\cdot, \varphi_n) \varphi_n,$$

where φ_n is a normalized eigenfunction of A corresponding to the eigenvalue $\frac{1}{n^2}$, where $n = 1, 2, \dots$, and $\{\varphi_n\}_{n=1}^{\infty}$ is an orthonormal basis for $L^2(G)$. Therefore,

$$\|A\|_{S_2(G)}^2 = \sum_{n=1}^{\infty} \frac{1}{n^4} = \zeta(4) = \frac{\pi^4}{90},$$

The research of the second author has been supported by Natural Sciences and Engineering Research Council of Canada under Discovery Grant 0008562.

The original article can be found online at <https://doi.org/10.1007/s11868-019-00280-8>.

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where ζ is the Riemann-zeta function. Now,

$$\begin{aligned}\|A^*A\|_{S_2(G)}^2 &= \operatorname{tr}(A^*A(A^*A)^*) = \operatorname{tr}(A^*AA^*A) \\ &= \operatorname{tr}(A^2(A^*)^2) = \|A^2\|_{S_2(G)}^2 = \sum_{n=1}^{\infty} \frac{1}{n^8} = \zeta(8) = \frac{\pi^8}{9450}.\end{aligned}$$

Therefore, $\|A^*A\|_{S_2(G)} \neq \|A\|_{S_2(G)}^2$ and $S_2(G)$ is not a C^* -algebra under the Hilbert–Schmidt norm.

Reference

1. Kumar, V., Wong, M.W.: C^* -algebras, H^* -algebras and trace ideals of pseudo-differential operators on locally compact, Hausdorff and abelian groups. *J. Pseudo-Differ. Oper. Appl.* **10**(2), 269–283 (2019)

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