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Corrigendum and addendum to the paper "A simple diophantine condition in harmonic analysis"

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by

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1. Lemma 2.3 in [1] is misstated and should be replaced by:

LEMMA 2.3. *Let Γ be a discrete (not necessarily countable) abelian group. Let $\{F_j\}_{j=1}^{\infty}$ be a family of finite and mutually independent sets ($0 \notin F_j$), i.e.,* $\mathrm{gp}(F_i)\cap \mathrm{gp}(F_j) = \{0\}$ *whenever $i \neq j$. Then, $\{F_j\}$ is a* sup-*norm partition for $\bigcup_j F_j$.*

Victimized by the misstatement of Lemma 2.3, the proof of Theorem C contains an error: We can conclude only that the S_N's are independent in the sense that whenever $\gamma_i \in S_{N_i}$, $i = 1, \ldots, k$, $N_i \neq N_{i'}$, if $i \neq i'$, then $\{\gamma_i\}_{i=1}^{k}$ is an independent set. But, we cannot conclude that $\mathrm{gp}(S_N)\cap \mathrm{gp}(S_M) = \{0\}$ whenever $N \neq M$, and therefore we are unable to apply the (correctly stated) Lemma 2.3. We are unable to supply a correct proof of Theorem C. The above error does not affect the main results of the paper.

2. Our diophantine condition is necessarily satisfied by $E = \bigcup F_j$, where $\{F_j\}$ is as in Lemma 2.3: Without loss of generality, we assume that $\bigcup F_j \subset \oplus \Gamma_j = \Gamma$, where $\Gamma_j = \mathrm{gp}(F_j)$ and $\Gamma_j^{\wedge} = G_j$. Let D_j, as usual be a dense countable subgroup of G_j, and write $D = \oplus D_j$, which is, then, a dense countable subgroup of $\otimes G_j = \Gamma^{\wedge}$. The proof of the following proposition is a routine verification.

PROPOSITION. *$\Phi_D(\bigcup F_j)$ accumulates precisely at 0* (Φ_D: $\oplus \Gamma_j \to \otimes D_j^{\wedge}$).

Again, as at the end of [1], we note that the independence condition in the above proposition is sharp in the following sense: A sequence of disjoint and mutually lacunary blocks of integers, $\{F_j\}$, can be constructed so that $\Phi_D(\bigcup F_j)$ is dense in $\hat{D}$, for all $D \leqslant \Gamma$. To see this, we mimic the construction at the end of [1], and add the requirement that $\|h_j\|_A = 1$. It then follows (see Lemma 1.2 in [2]) that $\bigcup \mathrm{spect}\, h_j$ is dense in $\tilde{\boldsymbol{Z}}$, the Bohr compactification of $\boldsymbol{Z}$. Our claim now follows from the observation that if $E \subset \boldsymbol{Z}$ is dense in $\tilde{\boldsymbol{Z}}$, then $\overline{\Phi_D(E)} = \hat{D}$, for all $D \leqslant \Gamma$.

Finally, we remark that the examples $E \subset \mathbf{Z}$ such that $L_E^\infty = C_E \supsetneq A_E$ constructed by Rosenthal in [3] follow from our Theorem B in [1]. It is proved in [3], via the notion of sup-norm partitions, that $\bigcup_{n=0}^{\infty}(19)^n n!\, E_{n+1} = E^1$ and $\bigcup_{n=0}^{\infty}(2n)!\, E_{2n} = E^2$ are R-sets: Let $\Psi\colon \bigoplus_{n=0}^{\infty} \mathbf{Z}_{(2n)!} \to [0, 2\pi)$ be the map that carries $a \in \bigoplus \mathbf{Z}_{(2n)!}$ into $\sum \frac{2\pi a(n)}{(2n)!}$ (mod 2π). Set $D = \bigoplus \mathbf{Z}_{(2n)!}/\ker \Psi$. Since, for $N \in \mathbf{Z}$ $\Phi_D(N)(n)$ is N (mod $(2n)!$), it follows that $\Phi_D(E^1)$ and $\Phi_D(E^2)$ accumulate only at 0 in $\hat{D}$ (= closed subgroup of $\bigotimes \mathbf{Z}_{(2n)!}$). Now apply Theorem B.

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