TS($v, \lambda$) with cyclic 2-intersecting Gray codes: $v \equiv 0$ or $4 \pmod{12}$

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A TS($v, \lambda$) is a pair ($V, \mathcal{B}$) where $V$ contains $v$ points and $\mathcal{B}$ contains 3-element subsets of $V$ so that each pair in $V$ appear in exactly $\lambda$ blocks. A 2-block intersection graph (2-BIG) of a TS($v, \lambda$) is a graph where each vertex is represented by a block from TS($v, \lambda$) and each pair of blocks $B_i, B_j \in \mathcal{B}$ are joined by an edge if $|B_i \cap B_j| = 2$. We show that there exists a TS($v, \lambda$) for $v \equiv 0$ or $4 \pmod{12}$ whose 2-BIG is Hamiltonian. This is equivalent to the existence of a TS($v, \lambda$) with a cyclic 2-intersecting Gray code.

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