Incomplete tournaments with handicap two

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A *d-handicap distance antimagic labeling* of a graph G with vertex set $V = \{x_1, x_2, \ldots, x_n\}$ and edge set E is a bijection $f\colon V \to \{1, 2, \ldots, n\}$ with induced function $w\colon V \to \mathbb{N}$ defined as

$$w(x_i) = \sum_{x_i x_j \in E} f(x_j),$$

having the property that $f(x_i) = i$ and the weight sequence $w(x_1), w(x_2), \ldots, w(x_n)$ forms an increasing arithmetic progression with difference d. A graph G is a *d-handicap distance antimagic graph* or simply *d-handicap graph* if it allows a d-handicap distance antimagic labeling.

The spectrum of all pairs (n, r) for which there exists an r-regular 1-handicap distance antimagic graph with n vertices has been completely determined for even n by Froncek, Kovar, Kovarova, Krajc, Kravcenko, Shepanik, and Silber. For odd n, some sporadic infinite classes are known due to the first author, who also showed at MCCCC 29 that for every feasible n odd there exists at least one r-regular 1-handicap graph.

I will present a complete spectrum of regularities for which r-regular 2-handicap graphs of order $n \equiv 0 \pmod{16}$ exist, and show a similar construction for $n \equiv 8 \pmod{16}$ which covers the spectrum except for extremely small and large values of r.