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PG 1553+113: the case for a super-massive black hole binary

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PG 1553+113 is a blazar exhibiting significant evidence of a 2.2-year periodic emission detected from radio to gamma rays. Here we present the first evidence of longer, 21-year periodic variability in the >100-year optical lightcurve provided by the DASH database. The 10-to-1 relationship between these two periodicities is tantalizingly consistent with the two dominant periodicities reported in recent simulations of supermassive binaries embedded in a thin disk. In that setting, the 2.2-year period comes from the binary orbit, and the 21-year period comes from the orbit of an overdensity in the circumbinary disk called a “lump.” This finding provides strong evidence that a binary of super-massive black holes resides at the core of PG 1553+113. We will also discuss physical constraints that can be placed on the putative binary.