

# Fractional Shapiro steps as a result of dynamic asymmetry in a Josephson junction triangular plaquette

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A Josephson junction can be externally entrained by a master ac drive leading to the Shapiro steps in the characteristics of the junction[1]. A system with two or more junctions that are suitably coupled, can also exhibit mutual entrainment even in absence of a master drive.[2]. We study the response of a system with two degrees of freedom to an external ac drive, in terms of such a mutual entrainment. Our system consists of two junctions coupled by a third junction in a triangular plaquette. When the system is symmetric, the coupling will be inactive and the two junctions evolve independently and the characteristics of the system would not differ from that of a single junction. When asymmetry is imposed on the array either by the current division or by a magnetic field, mutual synchrony of the two degrees of freedom is established, even in the absence of an ac signal. Applying the ac signal now leads to the fractional Shapiro steps.

## References

- [1] Sidney Shapiro, Physical Review Letters, **11**, 80 (1963).
- [2] Kurt Wiesenfeld, Physica B **222**, 315 (1996).