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perpendicular ring "knocks away" any points along the central axis of the first ring. The result should be a mutual exclusion ~~of~~ <sup>Dirac of</sup> points orbiting "exactly" on the plane of either ring since each ring plane correspond ~~to~~ <sup>to</sup> the (2D) ring axis of the other. [17:30]

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Too hand-wavy! Key possibilities are:

- The complex plane is a real set of dimensions, and quantum amplitudes are real rotations
- One dimension of the complex plane,  $i$ , is the real rotation axis in 3D space.
- The other dimension of the complex plane is time.
- The time <sup>dimension</sup> is a locally-broken symmetry of an originally isotropic 4D Euclidean space.
- The local symmetry-breaking is the result of the formation of a 4D resonant wave structure - a double rotation in two orthogonal ~~to~~ planes in the 4D space - that defines a specific particle and mass.
- The resonant 4D waves are a generalization of quaternions. For spin  $1/2$ , the resonant wave replicates quaternions, which have 1-to-1 spin ratios between two 4D planes. For higher spins, the ratios are 1-to- $n$ , where spin =  $1/2 n$ . Excited modes, such as 2-to-2, may be related to particle families (e.g., electrons/muons) [18:56]

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