

# Dirac Monopole Quantization Analogy and Its Generalization to M2-Branes

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## 1 Dirac Monopole in 3+1 Dimensions

For a magnetic monopole of charge  $g$ , the Dirac quantization condition with electric charge  $e$  is

$$eg = 2\pi n, \quad n \in \mathbb{Z}.$$

This arises because the wave function must be single-valued around the Dirac string, enforced by the topology of the linking  $S^2$ .

## 2 Generalization to M-Theory

In 11D, the M2-brane (3D worldvolume) is linked by an  $S^7$ . The analogous quantization condition is

$$\int_{S^7} *F_4 = 2\pi n \ell_{11}^3, \quad n \in \mathbb{Z}.$$

The large gauge transformation  $C_3 \rightarrow C_3 + d\Lambda_2$  changes the Wess-Zumino term by exactly this flux integral, forcing integer quantization for the path integral to be single-valued.

## 3 Connection to SFIT

The Dirac/M2-brane analogy shows how topological quantization at the Planck scale can manifest as measurable resonant effects in SFIT at laboratory scales (1.20134 mHz resonance,  $K = 1.060$ , KWW tails with  $\beta = K$ ).

The non-reciprocal metric correction and 11.42 Hz mode may be low-energy signatures of these quantized higher-dimensional fluxes.