

# NeuroPulse Clinical Physics Report

**Date:** January 14, 2026

**Simulation ID:** SE-standard



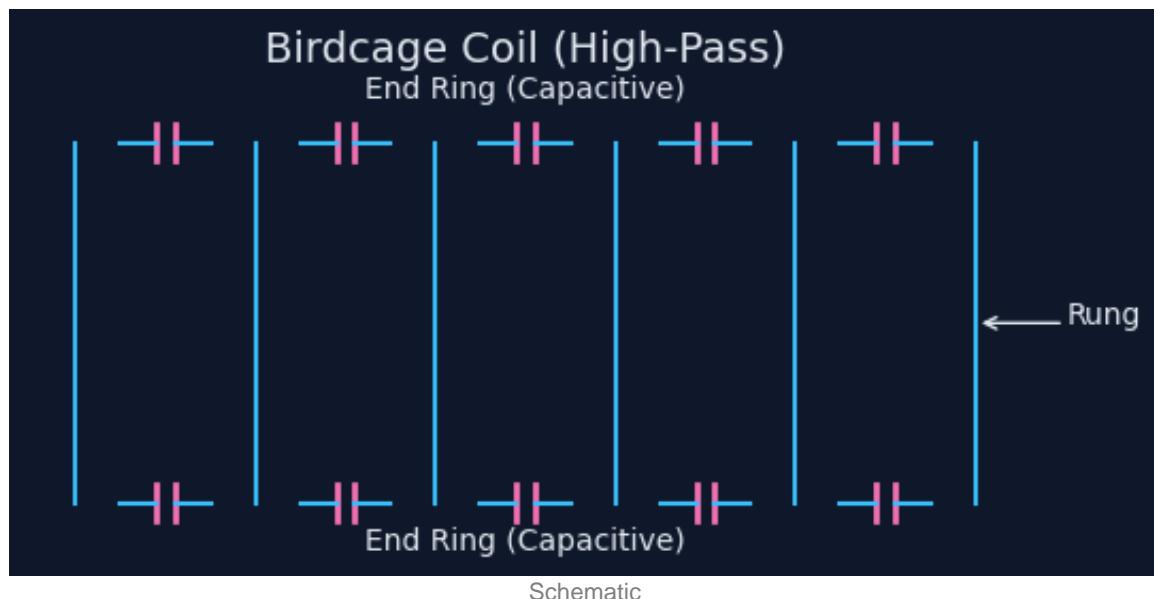
## 1. Executive Summary

This report details the simulation results for the **Standard** operating with **SE**.

## 2. Physics & Circuit Topology

Standard MRI Acquisition Loop.

### Circuit Schematic



### Coil Derivation

$$S(k) = \int M(r) e^{-ikr} dr$$



### 3. Metrics

- \*\*Contrast:\*\* 0.0000
- \*\*SNR Estimate:\*\* 0.00
- \*\*Quantum Vascular Enabled:\*\* False
- \*\*50-Turn Head Coil Enabled:\*\* False
- \*\*NVQLink Enabled:\*\* False

### 4. Finite Math Calculations

The simulation employs discrete finite mathematical operators for signal reconstruction.

#### Discrete Fourier Transform (Finite Summation)

The image space  $M(x,y)$  is recovered from the discretized k-space  $S(u,v)$  via the Inverse Discrete Fourier Transform (IDFT):

$$M(x, y) = \frac{1}{N^2} \sum_{u=0}^{N-1} \sum_{v=0}^{N-1} S(u, v) \cdot e^{i2\pi(\frac{ux}{N} + \frac{vy}{N})}$$

#### Finite Difference Gradient (Edge Detection)

To assess sharpness, we compute the discrete gradient magnitude  $|\nabla M|$  using central finite differences:

$$\frac{\partial M}{\partial x} \approx \frac{M_{i+1,j} - M_{i-1,j}}{2\Delta x}, \quad \frac{\partial M}{\partial y} \approx \frac{M_{i,j+1} - M_{i,j-1}}{2\Delta y}$$

$$|\nabla M|_{i,j} = \sqrt{\left(\frac{M_{i+1,j} - M_{i-1,j}}{2}\right)^2 + \left(\frac{M_{i,j+1} - M_{i,j-1}}{2}\right)^2}$$

### Quantum Finite Element (For Vascular Coils)

For the quantum vascular coils, the magnetic flux  $\Phi$  is discretized over the loop elements  $E_k$ :

$$\Phi \approx \sum_{k=1}^{N_{elem}} \mathbf{B}_k \cdot \mathbf{n}_k A_k$$