Table S1. Material properties of the NR for multiphysics simulation

	CFO core	***BTO shell***
Electrical conductivity	5.2×10^6 S/m	178.5 S/m
Density	5200 kg/m^3	5700 kg/m^3
Initial magnetic susceptibility	3	N/A
Saturation magnetostriction	-200 ppm	N/A
Poisson's ratio	2.47×10^5 A/m	N/A
Young's modulus	0.48	N/A
Relative permittivity	230 GPa	{1115.1; 1115.1; 1251.3}
Elasticity matrix, voigt notation	N/A	{150.4; 65.6; 150.4; 65.9; 65.9; 145.5; 0; 0; 0; 43.9; 0;0;0;0;43.9;0;0;0;0; 0; 42.4} GPa
Coupling matrix, voig notation	N/A	{0; 0; -4.32; 0; 0; -4.32; 0; 0; 17.4; 0; 11.4; 0; 11.4; 0; 0; 0; 0; 0} C/m^2

Table S2. Theoretical distribution used to fit each specific MF distribution.

	w/v 0.1%	**w/v 1%**	**w/v 10%**
Small MRG 1.0 µm	Lognormal fit	Lognormal fit	Logistic fit
Small MRG 2.0 µm	Lognormal fit	Lognormal fit	Logistic fit
MRG 5.7 µm	Lognormal fit	Lognormal fit	Logistic fit
MRG 7.3 µm	Lognormal fit	Lognormal fit	Logistic fit
MRG 8.7 µm	Lognormal fit	Lognormal fit	Logistic fit
MRG 10.0 µm	Lognormal fit	Lognormal fit	Logistic fit
Unmyelinated Schild 1.0 µm	Gamma fit	Weibull fit	Weibull fit
Unmyelinated Tigerholm 1.0 µm	Gamma fit	Weibull fit	Weibull fit

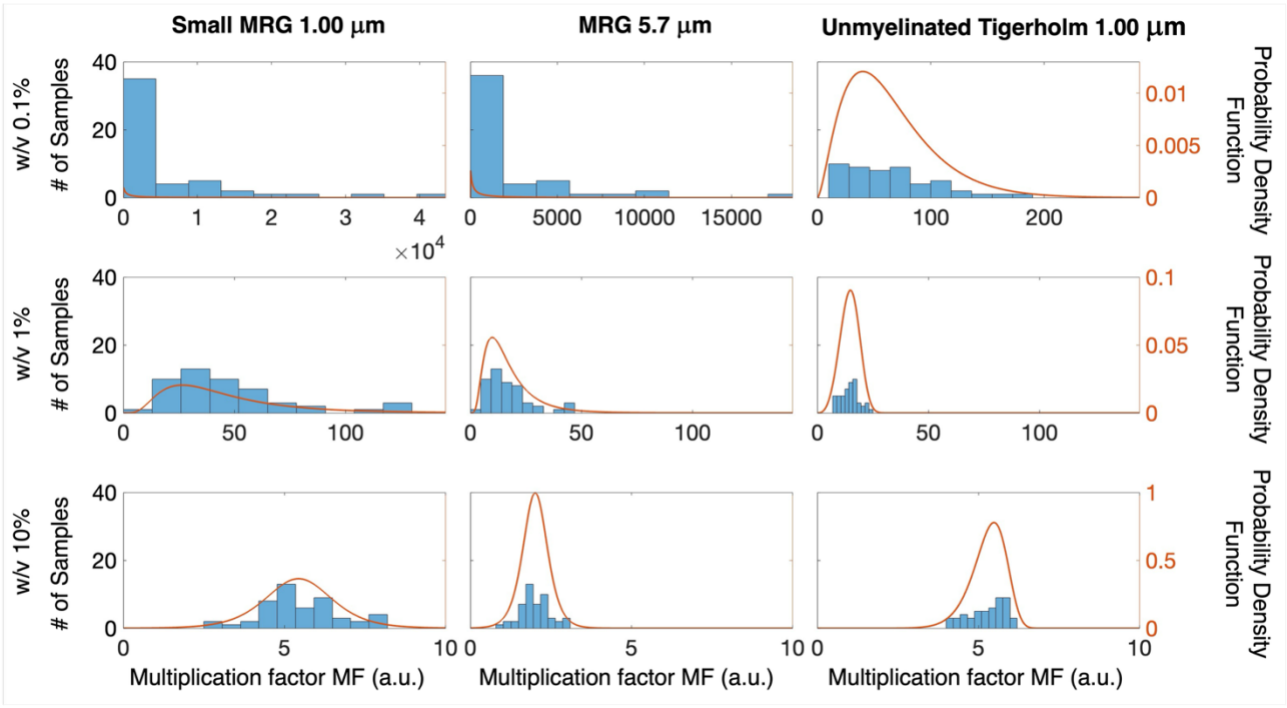

Figure S1. Histogram of the MFs and corresponding theoretical distribution (red line) for the small MRG 1.0 μm, the MRG 5.7 μm and the unmyelinated Tigerholm 1.0 μm at w/v values of 0.1%, 1% and 10%, respectively.

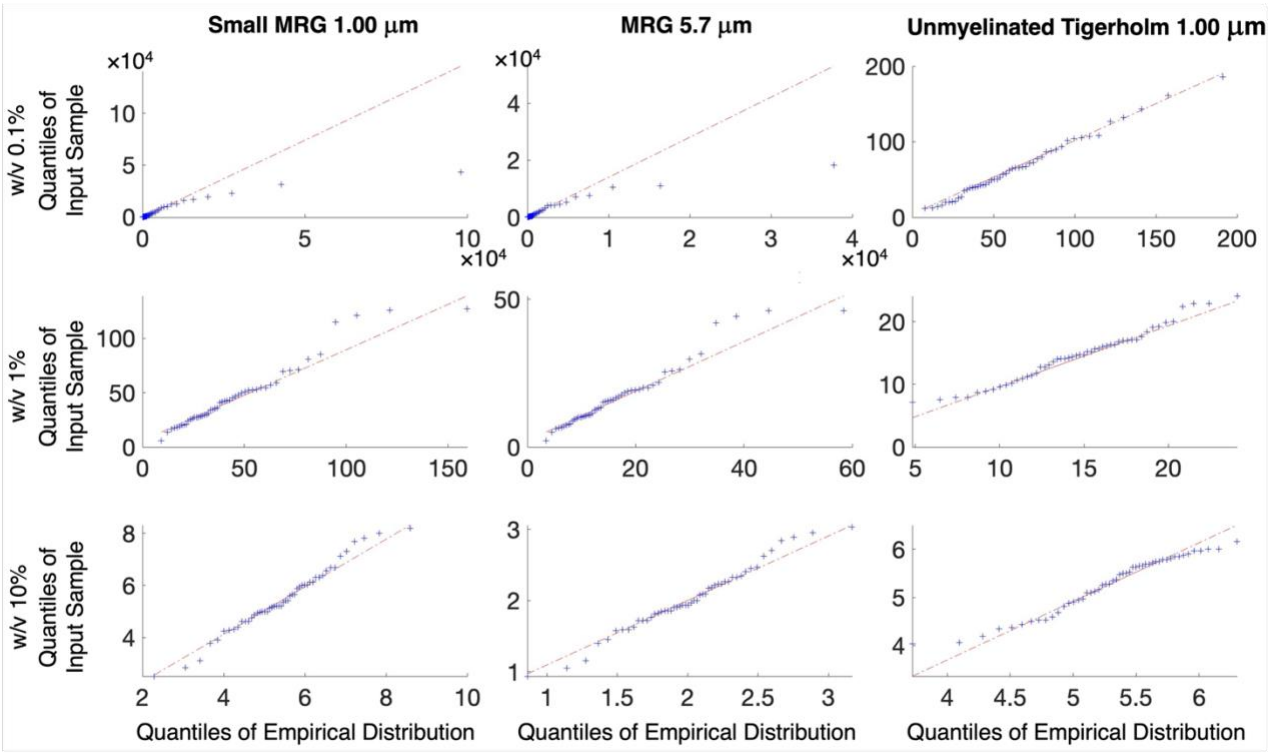

Figure S2. QQ plots comparing the distribution of MFs with the corresponding theoretical distribution fit for the small MRG of 1.0 μm, the MRG of 5.7 μm and the unmyelinated Tigerholm of 1.0 μm at w/v values of 0.1%, 1% and 10%, respectively.