Response to Reviewers' Comments

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Title: Millimeter-wave Ferromagnetic Resonance of a Saturated Magnetic Transmission Line
Journal: IEEE Transactions on Magnetics
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The authors take this opportunity to thank and express our sincere gratitude to the reviewers for sparing time to review the manuscript and give their thoughtful comments and suggestions. We have carefully considered the reviewers' comments and made our utmost effort to incorporate the suggestions made to improve the quality of the paper. After addressing the reviewers' comments, we believe the manuscript is now in excellent form and for this the reviewers deserve credit.

The changes made, in the manuscript, have been shown in blue colour and the manuscript has been reformatted according to the journal's formatting guidelines for revised submissions. The following remarks highlight the changes made in response to reviewers' comments.

REVIEWER #1 COMMENTS:

The authors are commended for revising the original manuscript to include more details on modelling the magnetization in magnetic transmission lines. The effect of magnetic damping on propagation properties is of timely interest. However, there are still some technical deficiencies and confusion in the manuscript. Below is an outline of some of them.

Comment # 1:
The authors write the LLG equation in Section II and linearise it to arrive at expressions for the permeability/susceptibility, which the authors use in equations (13 - 15) in the numerical FDTD solver. The authors explicitly write that the solution of the magnetic fields uses this pre-defined susceptibility, which is fine. However, the authors write on page 4:

"Equation (8) [LLG equation] is solved in MEEP using midpoint discretization method to determine the magnetization M at every point on the Yee's grid"

which is not the case and not shown anywhere in the manuscript nor in equations (13 - 18). This is very confusing and this statement should be removed as the authors don't solve the LLG equation for the magnetisation but suppose a frequency dependent susceptibility.

RESPONSE:
We are sorry for the confusion and we have removed the statement from Section II.

Comment # 2:
The authors in the beginning of Section III write that they use permalloy as the material in the simulation. Permalloy is a ferromagnetic (conductive) metal. The authors don't specify an electrical conductivity for the material and then refer to the magnetic material throughout the

remainder of the article and in Fig. 4 as a "ferrite" which is an insulator! The authors need to clarify what material they simulated and if it is ferromagnetic or a ferrite.

RESPONSE:
We are sorry for this mistake. We have explained in Section III that nickel iron oxide ferrite $NiFe_2O_4$ was used for the simulation. The electric conductivity σ_e of the ferrite was assumed to be zero because ferrite nanoparticles exhibit high resistivity in the microwave frequency range [4] [18]. Permalloy, which is a ferromagnetic (conductive) nickel iron alloy, was not used for the simulation. We have made necessary corrections throughout the article to emphasize this point.

Comment # 3: Other comments:

i) *In the LLG equations, Gamma (gyromagnetic ratio) should not be multiplied by Alpha (damping coefficient) in the second (damping) term on the right hand side of the LLG equation.*

RESPONSE:
We are sorry for the mistake. We have removed gamma (gyromagnetic ratio) from the second (damping) term on the right hand side of the LLG equation. We have also made the necessary corrections in Equations (7), (8), (9) and (10).

ii) *What is Sigma in equations (7) and (8)*

RESPONSE:
Sigma σ represents the MEEP constant which couples the magnetization **M** to the driving field **H**. Sigma σ depends on the crystalline structure and it determines the strength of ferromagnetic resonance. The value of sigma σ was equal to 3770 m/C in the MEEP simulation. This value resulted in the enforced susceptibility profile shown in Figure 3.

iii) *What is the width of the Gaussian current source (and how was that related to the required excitation bandwidth)?*

RESPONSE:
The wave amplitude and phase of the Gaussian source were related to frequency width w=60 GHz and start time t_0=0s by the Equation (19):

$$I_m(t) = e^{-iwt-\frac{(t-t_0)^2}{2w^2}}$$

iv) *On page 6 below Fig. 6, the authors write: "A high quality crystal oscillator, with a small Gilbert damping constant, showed a strong peak of the electromagnetic absorption spectrum." What crystal oscillator the authors are referring to?*

RESPONSE:
We are sorry for the confusion. We have replaced "high quality crystal oscillator" with "ferrite sample" in Section III. The Gilbert damping constant depends on the crystalline structure of the ferrite. Hence, the peak of the electromagnetic absorption spectrum depends on the lattice

properties. The nano-magnetic oscillations of magnetic dipoles are much stronger when the Gilbert damping constant is small.

v) *Need to increase the text font size in Fig. 2.*

RESPONSE:
We have increased the font size in Fig. 2.