

Letter to the Editor

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Coherent MM-wave EMFs produce penetrating effects via time-varying magnetic fields: response to Foster & Balzano

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Drs. Foster and Balzano published ref. [1] claiming that my paper on coherent millimeter (MM)-waves producing penetrating effects [2] was flawed. My response follows. Ref. [1] claims that “The magnetic permeability of tissue is very low ... and many orders of magnitude lower than that of high permeable materials such as iron,” citing Schenck [3] as their sole support. Ref. [3] is a study of Nuclear Magnetic Resonance Imaging (MRI) and is focused on findings that magnetic susceptibility of materials, including iron, can lead to position errors of up to several millimeters in MR-guided surgery. It says nothing about the magnetic permeability of biological materials except, as will be shown immediately below, that the ability to do MRIs tells us that biological materials are highly permeable to magnetic fields.

The Wikipedia article on MRI [4] is discussed here. MRI studies properties of atomic nuclei that have odd numbers of protons and have, therefore, nuclei with opposite spins which have, in the absence of an external magnetic field identical energy levels. In the presence of an external magnetic field, the difference in energy levels of the two spins increase in proportion to the strength of external magnetic field. At a specific magnetic field strength, electromagnetic fields (EMFs) at a specific frequency absorb photons having the same energy as the difference of energy of the spin states. Ref. [4] states: “MRI requires a magnetic field that is both strong and uniform to a few parts per million across the scan volume.” This is because an EMF frequency that resonates with type of nucleus at a specific magnetic field will no longer resonate with a slightly higher or lower magnetic field. Therefore magnetic field

penetration must be extremely high to avoid destroying any ability to do MRI imaging in different depths of tissues. Our ability to do whole body or whole brain MRIs make this conclusion especially clear. It can be seen from this that the Foster/Balzano claim that “tissue magnetic permeability is very low” is complete nonsense.

I stated in ref. [2] that “Electronically generated EMFs are coherent, producing much higher electrical and magnetic forces than do natural incoherent EMFs.” Foster/Balzano respond that “coherence properties of ‘electronically generated’ microwave and MM-wave fields vary widely. The coherence of a wave is defined as correlation in phase at different points in time or space as the wave propagates through a medium [5], and is not an all or none property.” There are two problems with their description of ref. [5]. The first is that Pinton et al. [5] studied effects of ultrasound (not EMFs) in tissues. Therefore, this should have been disclosed in ref. [1] as possibly limiting relevance to EMFs. Most importantly [5], study of ultrasound *with reverberation clutter*, with the main focus on reverberations. Reverberation greatly lowers the coherence of the ultrasound (and also of EMFs) so the variation of coherence seen in ref. [5] at different points in space is due to variation of reverberations and says nothing about coherence variation of electronically generated EMFs or of newly generated ultrasound. So here again, Drs. Foster/Balzano make a false conclusion based on false assessments of their cited study – the study only predicts coherence variation produced by reverberation.

Reverberation is important because of the use of reverberation exposure chambers in many EMF studies touted by industry linked scientists including Foster and Moulder. Reverberation in those chambers disrupts the coherence of the EMFs and therefore, greatly lowers any effects seen.

Regarding the two studies on effects on neuronal firing, I quoted one of them [6] in ref. [2] as follows. Pikov et al. [6] in their abstract state that: “The applied levels of MMW power are three orders of magnitude below the existing safe limit for human exposure of 1 mW/cm².”

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Surprisingly, even at these low power levels, MMWs were able to produce considerable changes in neuronal firing rate and plasma membrane properties. At the power density approaching $1 \mu\text{W}/\text{cm}^2$, 1 min of MMW exposure reduced the firing rate to one third of the pre-exposure level in four out of eight examined neurons. The width of the action potentials was narrowed by MMW exposure to 17% of the baseline value and the membrane input resistance decreased to 54% of the baseline value across all neurons.” In another paper, they reported finding high level neuronal effects at intensities more than 3,000 times lower than the safety guideline levels. Foster/Balzano claim that I have misrepresented the findings but a quotation cannot be a misrepresentation. Foster/Balzano [1] also state that “The study was intended to explore possible therapeutic effects of mm-waves” That is untrue. Pikov et al. [6] states the goals in the abstract: “This study used slices of cortical tissue to evaluate the MMW effects on individual pyramidal neurons under conditions mimicking their *in vivo* environment.” Pikov et al. [6] does mention a number of possible biological outcomes including MM-wave usage in non-lethal weaponry and therapeutic effects, but it is not their goal to study any such effects.

Let’s go on to Maxwell’s equations in a vacuum and whether they work in biological tissues and other materials. Foster/Balzano cite the Gabriel et al. [7] paper on dielectric properties of specific tissues. Ref. [7] is, in my judgment, a very good paper. What ref. [7] shows is that each of the tissues studied have properties which greatly lower the permeability of electric fields at high frequencies. Foster and Balzano, have apparently entered the values obtained in ref. [7] into Maxwell’s equations in a vacuum, presenting a model of those results which predicts that there cannot be MM-wave effects in the human brain because of the very low intensities propagated into the brain from outside the head. Are those predictions correct? Ref. [2] cited five experimental studies each showing that low intensity non-pulsed MM-wave EMFs produce EEG changes in the human brain with four of those also producing neurological/neuropsychiatric effects. Consequently, each of those five falsify the predictions of the model. Therefore, the core principle of the scientific method demands that the model be thrown out because it has been repeatedly falsified. However, what Foster/Balzano have done is to ignore those five studies, in effect throwing them out. They have, consequently, ignored their duties as scientists to follow the core principle of the scientific method.

Of the citations cited in ref. [1] that are also cited here, refs. [3, 5–7] were cherry picked in order to make the

strongest possible case against ref. [2]. Ref. [1] stated multiple falsehoods regarding each of refs. [3, 5, 6] and their accounts of refs. [3, 5] are entirely fictional.

There are 10 falsehoods/false narratives in ref. [1]: (#1) that magnetic permeability in biological tissues is very low and (#2) that this was shown in ref. [3]. (#3) That coherence is variable in electronically generated EMFs, (#4) that ref. [5] was a study of EMFs and (#5) that the lowered and variable coherence was generated at the source when it was generated via reverberations. (#6) That ref. [6] did not show large neuronal effects at levels 1,000 times below safety guideline levels, (#7) that I misrepresented [6] when I quoted directly from ref. [6] and (#8) that the goal of ref. [6] was to study therapeutic effects but [6] was to study effects on neurons, not overall biological effects. That their models shows that there are no MM-wave effects on the human brain but (#9) their model has been falsified and (#10) MM-wave EEG effects on the human brain have been repeatedly demonstrated.

Drs. Foster and Balzano, who each take full responsibility for ref. [1], have given up any claim to intellectual integrity because of their 10 falsehoods and their abandonment of the core principle of the scientific method. Their behavior emphasizes their lack of a scientific case, because if they had such a case, they would be presenting it rather than their false claims. Are their false claims rare in what should be scientific discourse? Sadly, they are not nearly as rare as they should be. Two, in my opinion excellent books, “Doubt Is Their Product” [8] and “Merchants of Doubt” [9] each discuss many industries where scientists have been recruited to write documents undercutting independent scientists, so that the industries can continue to do things that attack the health and safety and sometimes survival of many people. Sometimes industry actions also have environmental impacts and may imperil the structural integrity of the global economic system. It is my opinion that the telecommunications industry is doing each of these things. I am not saying that this is scientific proof that Drs. Foster and Balzano have sold themselves to the telecom industry but there may be a *prima facie* legal case for that conclusion.

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