

RF EMF and Brain Physiology: Are there Problems with the Reports of EEG Bioeffects?

Rodney J Croft^{1,2*}

¹School of Psychology, University of Wollongong, Wollongong, Australia

²Australian Centre for Radiofrequency Bioeffects Research, Australia

*Corresponding author e-mail: rcroft@uow.edu.au

With the global uptake of mobile telecommunications technologies [1] and the low level electromagnetic fields (EMF) that they emit, there has been considerable concern about possible health consequences. However, we currently do not have substantiated biophysical mechanisms capable of justifying these concerns, and so it has been argued *a priori* by many that mobile telecommunication-related EMF thus cannot impair health. Consistent with this, most reports of RF EMF bioeffects have been shown to be either spurious or due to methodological problems. Thus it has been surprising for many to see relatively consistent reports of RF EMF bioeffects on the awake and sleep electroencephalogram (EEG) [2-5]. Without corroborating evidence for such reports from outside of the EEG bioeffect research domain, numerous arguments have been put forward to explain the reports in terms of factors other than RF EMF bioeffects.

This presentation will evaluate a number of such arguments in an attempt to determine their relevance to both the RF EMF bioeffect domain and the mobile telecommunications / health debate. These include:

1/ “The reported EEG effects are not consistent, and thus there is no consistent effect that needs to be considered.” For example, different frequencies of EEG are often reported to be affected in different studies, and there is no obvious consistency across the results for sleep EEG, resting EEG and event-related EEG. It may be argued that this detracts from the claim that there are consistent EEG effects that have been reported in the literature.

2/ “The reported replications of EEG effects would be expected by chance alone, and so there are not consistent effects that need to be considered.” For example, when we consider the large number of endpoints tested in the bioelectromagnetics literature more generally, it may be claimed that we would expect some results to be replicated by chance alone, and the EEG results may represent such a situation.

3/ “The EMF-EEG literature is littered with examples of poor experimental methodologies, making it difficult to accept the reported RF EMF effects from a weight-of-evidence perspective”. For example, many studies have relied on single blind procedures, small sample sizes, poor statistics and poor dosimetry, and it may be asked whether the claim for consistent EEG effects is reliant on the conclusions from such studies.

4/ “An adequate mechanism is required before any report of EEG bioeffects can be taken seriously. That is, as we do not have an adequate mechanism to explain such RF EMF

bioeffects, it will always be more likely that any reported RF EMF bioeffect will represent chance or experimental error rather than a true bioeffect.”

5/ “The reported changes in the EEG are due to direct pick-up of the EMF by the EEG leads, rather than changes to neural function.” That is, EEG electrodes are very sensitive to ELF, and so the EEG electrodes may merely be detecting the signal from the EMF generator, rather than the voltage fluctuations resulting from neural processing itself.

6/ “Procedures are not adequate to guarantee the double-blinding that is required to ensure that the EEG effects are due to the EMF itself.” That is, it may be argued that we cannot be sure that participants are truly unaware of the exposure status, even though they ‘report’ that they are not, and thus that there is room for the participants to influence their own results, independent of the EMF itself.

7/ “The reported EEG effects are not relevant to health”. As there is no evidence that the magnitude of EEG change reported in the bioelectromagnetics literature represents health impairment, it may be argued that such reports are not relevant to the mobile telecommunications / health debate.

8/ “The EEG electrode configurations enhance the mobile phone-related SAR and thus cannot be said to relate to SARs consistent with normal use of telecommunications devices.” That is, it may be argued that the EEG electrodes act as an antenna that amplifies the signal from the EMF generator, and that this may result in SAR levels that are beyond current guidelines and/or higher than mobile phones, for example, are capable of producing. If so, it would follow that the EEG changes represent bioeffects, but ones that are not necessarily relevant to the mobile telecommunications/health debate.

9/ “As much of the EMF-EEG literature employs exposures that do not represent those resulting from telecommunications devices, the EMF-EEG literature is not relevant to the mobile telecommunications / health debate.” For example, some studies employ RF EMF exposures that produce exposures in some regions of the brain that are stronger than would normally be produced by a mobile phone, and all experimental studies have employed relatively brief exposures that are not representative of the daily and continued use in society today. Such factors may lead to overestimations and underestimations respectively, of the risk involved with using a mobile phone.

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