An independent perspective on extremely low frequency magnetic fields as a possible risk factor for the breast cancer cluster at the Brisbane ABC studios at Toowong Queensland

Don Maisch, John Podd and Bruce Rapley January 10, 2007

Introduction

In August 2006, the BDP Environment Design Guide, the journal of the Royal Australian Institute of Architects (RAIA) published a paper, written by us, entitled *"Electromagnetic Fields in the Built Environment – Design for Minimal Radiation Exposure"*. This paper concluded that *"sufficient evidence now exists to suggest that a contributing factor to consider in assessing indoor environment quality is the prolonged and excessive exposure to electromagnetic fields (EMFs) in buildings"* and as a result, *"it is possible to address potential exposure at the building design stage to significantly reduce and minimise occupant exposure at relatively little cost during planning and design."* (Attachment A)

In relation to the Brisbane ABC studio building at Toowong, it is the shared opinion of the authors of the above paper that there are still unresolved issues that urgently need investigation in the building. These issues have to do with the Extremely Low Frequency (ELF) electromagnetic field environment that the women with breast cancer may have been exposed to.

As of this date, the expert panel investigating the breast cancer cluster in the building have been unable to identify any factor connected with an up to an 11 fold increased risk of breast cancer amongst female employees when compared to the general working community. They conclude, however, that it is apparent that the increased risk is associated with working in the building. As a result, ABC management instigated an emergency closure of the site in December, and even though the cause of the cancer cluster remains a mystery Federal Member for Ryan, Michael Johnson, has called for the building to be demolished and put out to tender (Westside News, Jan 3, 2007).

In our opinion, it is imperative that all efforts be made to determine the cause of the breast cancer cluster at Toowong ABC, for it is very likely that similar situations are duplicated in other work premises around Australia. What changes will be made in the design of any future replacement studios if the problem remains a mystery? Will further increased cases of breast cancer visit the new studios in future years?

These are important questions that will remain unanswered if the building is quickly reduced to a pile of rubble.

Our advice, instead, would be to temporarily maintain the building with its electrical system intact until further research is carried out, answering the issues raised in this paper.

Whatever the outcome, as a precautionary approach, it should be a requirement that minimising peoples' exposure to EMR (both RF and ELF) in the next ABC building be included in the building designer's specifications. The cost involved would be minimal if such precautions were factored in at the early stages of design.

The Expert Panel Report on the ABC Toowong building

The investigation of the ABC Toowong building is a landmark investigation for recognizing the reality of 'sick building syndrome'. It clearly finds that some environmental factor(s) within the ABC Toowong building is apparently connected with the extraordinary number of breast cancer cases amongst the women working there. As the investigators conclude: *"{T]here is a real increase in risk of breast cancer in women working at the ABC Toowong that may have been caused by some aspect of work or the working environment at Toowong".*

Even though they were unable to find any apparent cause, ABC management has acted responsibly as a result of the panel's findings by deciding to vacate the building. Our concern here, however, is that once the building is 'powered down' and locked up prior to a possible quick midnight demolition by the same group that conveniently got rid of The Bellevue Hotel, any further investigations will be impossible. This is especially the case if there is a connection still to be found with the electromagnetic radiation (EMR) levels within the building. This includes both extremely low frequency (ELF) and radio-frequency (RF). Going over the 2005 EMC report we do not see an obvious connection with RF fields in the building with the exception of the card readers (see page 12 of the December 21st report. However, personnel exposures would be brief, as the report mentions. As for these card readers, EMC Technologies' dismissal of the high electromagnetic radiation (EMR) fields because they comply with the ARPANSA standard is deceptive for reasons outlined below.

For all the good investigative work done by the independent expert panel, when it comes to it's risk assessment of EMR at the Toowong studios, its conclusion that "it is highly unlikely" that the high level of breast cancer "has been caused by exposure to radiofrequency or extremely low frequency electromagnetic radiation" (page 17), seems premature.

The first point to be made is a general one about the unfortunate practice of referring to EMR exposure standard reference levels (both ELF and RF) as somehow being protective for the issue of cancer. This was seen with the recent RMIT brain tumour cluster on the top floor of building 108 in Melbourne, and more recently with an apparent high incidence of cancers amongst staff at a school in Hobart. In both cases authorities dismissed concerns over the apparent high incidence of cancers being due to EMR, because the measured levels were well below the standard reference levels.

An examination of the EMR survey conducted by EMC Technologies for the ABC at Toowong in 2005 illustrates this point well. The exposure limits used as a reference in the survey are those in the ARPANSA RF standard. Results are given in relation to compliance with that standard. It is left to the readers of the report to assume that compliance therefore means protection from increased cancer risk. This is not the case and the limitations of standard compliance should be plainly spelt out in the reports put out by EMC Technologies and expert panels that rely on EMC reports.

Limitations of ARPANSA's RF standard "reference levels"

In our increasingly globalised world it is the general practice for government regulatory agencies to follow so-called international standards so as to avoid setting national standards that act as barriers to international trade. This is the practice in Australia with ARPANSA adopting the EMR exposure guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Whenever ICNIRP-based RF (or ELF) exposure reference levels are mentioned the impression is given that they provide a high level of protection for the individual and the public. This is seen in a December 2004 Australian government Video and DVD presentation titled, *"Mobile Communications and Health"* where an ARPANSA spokesperson states, *"The EME safety limits provides protection for people of all ages and health conditions (including children) whether they're exposed to EME irregularly, or for 24 hours a day, 7 days a week."*[1]

When the ICNIRP guidelines are examined, however, it is seen that such assurances of safety are somewhat inflated, for as stated in the ICNIRP guidelines on page 496 *"these guidelines are based on short-term, immediate health effects."*[2]

This was pointed out by ICNIRP chairman Paolo Vecchia at the September 2004 "International Conference on Mobile Communications and Health: medical, Biological and Social Problems, held in Moscow, Russia. In Vecchia's presentation on the rationale of ICNIRP's RF guidelines, he stated (in part) the following:

" ICNIRP only considers acute effects in its precautionary approach. Consideration of long term effects is not possible". [3]

As for any assurance of safety in the RF "reference levels, ICNIRP's Standing Committee on Epidemiology stated in December 2004 the following:

"Despite the ubiquity of new technologies using RFs, little is known about population exposure from RF sources and even less about the relative importance of different sources…" [4]

The irrelevance of the RF reference levels to providing human health protection is also seen in the 'weight of the evidence' used in establishing these levels. This evidence is not based on human exposure studies but on acute (high-level) exposures on laboratory animals, with a heavy emphasis on laboratory rodents (e.g., mice, rats, and hamsters. The exposure levels used, aimed to determine the maximum exposure the animals could tolerate before their thermal-regulatory systems broke down, death then ensued from excessive internal heating. These data were then arbitrarily equated to the human body in setting RF exposure reference levels. Even for providing thermal protection, however, it has been admitted by

---

[1] *Mobile Communications and Health*, Distributed by the Australian Government, the Australian Communications Authority (ACA), DVD Version 10, December 2004.

[2] Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic, And Electromagnetic Fields (Up To 300 GHz) ICNIRP, Health Physics, Vol. 74, No. 4, page 496, April 1998.

[3] Maisch D, *Report on the International Conference on Mobile Communications and Health : Medical, Biological and Social Problems*, Moscow, Russian Federation, Eur. Bio & Bioelect. , Sept. 20-22, 2004 http://www.ebab.eu.com/iss1_html/rtcl9/EBB1Maisch.asp?s_aid=9&s_vol=1&s_iss=1

[4] Ahlbon A, Green A, Kheifets L, Savatz D, Swerdlow A, *Epidemiology of Health Effects of Radiofrequency Exposure,* Environmental Health Perspectives, Vol. 112, Number 17, pp 1741 - 1754, December 2004.

the standard setters, *"These small animals are poor models for human beings because their physiological heat loss mechanisms are limited"*.[5]

Consideration of the above suggests to us that compliance with EMR reference levels has not the slightest bearing on the incidence of breast cancer in the Toowong ABC studios. Only if the women were being cooked in the studios would checking for compliance with reference levels be relevant.

ELF magnetic fields ignored

It is quite surprising that EMC technologies failed to make systematic ELF magnetic field measurements when they conducted their EMR survey at the ABC Toowong studios in May 2005 (see page 12 of the December 21st report). They would have been well aware from all the equipment in the building the ELF magnetic fields would likely be far higher than normal. This was recognised by expert panel member Dr. Geza Benke in his on site inspection on 13 November 2006. To quote:

> *"ELF exposure has not been measured in the TV building. Given the high concentration of communications equipment in many of the workstations in this building, exposure is expected to be higher than the normal office environment e.g. computers and Decart audio systems are located at many workstations, there are also [a] large number of editing rooms with electronic equipment etc. The power requirements of the ABC Toowong site are clearly high, given that it has its own substation. Thus the power intensive sources and high power frequency currents required for high ELF exposures are present on the site."*[6]

It is also surprising to read in the EMC report *that "a specific request was made to measure the fields next to a cable tray running in a wall near Jo-Anne Youngleson's desk in the newsroom general office area"*. Being a wiring cable tray, the wiring current flow would have been at ELF frequencies but still EMC only took RF measurements that, predictably, *"were well below the lowest ARPANSA reference level."*[7]

It is strange that since the release of the May 2005 EMC Technologies report, over a year and a half elapsed before ELF measurements were taken at the site by ARPANSA on December 18, 2006. ARPANSA has not released its report as of this date but has provided some information to the expert panel that claims, of the measurements taken, *"[i]n general these measurements indicate that the levels are lower than what is usually encountered in a normal office environment"*.[8]

ARPANSA mentions that spot measurements were taken at selected areas (not identified) but that the average magnetic field was only 1 milliGauss (mG). From personal exposure measurements on the ground and first floor of the TV building ARPANSA claims only 0.3 and 0.6 milliGauss (mG) time-weighted average were found, respectively. This limited information tells little. For example, What were the actual fields in the areas and work

---

[5] Adair E, Black D, Thermoregulatory Responses to RF Energy Absorption, Bioelectromagnetics Supplement 6:S39 – S62 (2003)

[6] Breast Cancer at the ABC Toowong Queensland: Third Progress Report from the independent Review and Scientific Investigation Panel -21 December 2006, page 58.

[7] EMC Technologies, Electromagnetic Radiation Survey Conducted for the Australian Broadcasting Corp. AT 600 Coronation Drive, Toowong, Qld. May 2, 2005.page 10, Section 4.3.

[8] Breast Cancer at the ABC Toowong (as above) page13.

stations where the women worked? What were the levels by that cable run near Jo-Anne Youngleson's desk as specifically mentioned on page 10 of the 2005 EMC report?

It is too easy to average out high field readings with other low field areas and conclude that overall the levels are acceptable. Unfortunately, it's not as simple as that however.

For example, in a published paper by Ainsbury, Conein and Henshaw (2005) it was demonstrated that the degree of polarization of ELF magnetic fields has a direct affect on induced body currents. Elliptically (or circularly) polarized magnetic fields induce higher currents in the body than linearly polarized fields. The authors conclude:

> *"The measurements demonstrate that domestic magnetic fields[9] are extremely complex and cannot simply be characterized by traditional measurements such as time-weighted average or peak exposure levels. We conclude that ellipicity should become a relevant metric for future epidemiological studies of health and ELF-EMF exposure."*[10]

ARPANSA should be releasing its ELF magnetic field survey results of the Toowong site shortly and then the actual ELF exposures of the women hopefully will be known.

Of necessity, the ELF report should include the following:

1) Spot magnetic field measurements taken at different times of the normal working day at each of the work-stations of the women with breast cancer, taken at chest position.
2) At these same locations a data logger should be used for at least one eight- hour work day.
3) Results of the data logger should be provided in graph form with readings given across time of day. In this way, all affected women could see their actual exposure levels and how they may fluctuate across the day.
4) ELF magnetic field measurements of the card readers should be taken at estimated chest position.
5) All measurements should be given in milliGauss (mG) or microtesla (uT) units and not just as a % of the reference levels.

Techniques, such as taking data logging measurements in the centre of rooms and averaging out exposure levels, will be of limited benefit in determining the individual exposures of the women.

Though outside the context of this case, it would be advisable to conduct ELF magnetic field surveys at the homes of each of the affected women, as a comparison to their workplace exposures.

[9] The EMF fields in a building such as the ABC Toowong studios would probably be far more complex than residential buildings due to the large number of pieces of electrical equipment being used.

[10] Ainsbury E, Conein E, Henshaw D, An investigation into the vector ellipticity of extremely low frequency magnetic fields from appliances in UK homes., *Phys. Med.Biol.* Vol 50, 3197-3209, 2005.

The current 'reference levels' for ELF

On 7 December 2006, ARPANSA released its draft ELF exposure standard for public comment. This standard is a replacement for the previous 1989 National Health & Medical Research Council's (NH&MRC) *Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields.* Although the draft standard contains some changes over its 1989 predecessor, it still is essentially the same old standard with the same acute exposure limit rationale. The exposure limits are 1,000 mG for residential exposures and 5,000 mG for occupational exposures, depending on frequency.

The recommendations in the NH&MRC Interim guidelines (1989) are based on the International Radiation Protection Association's (IRPA) interim guidelines, which also served as the basis for the current ICNIRP guidelines. The same rationale for setting exposure limits applies to the ELF guidelines set by the UK's National Radiation Protection Board (NRPB). The shared rationale for all these guidelines is based on providing health protection only against **immediate health hazards** from high levels of exposure. This limitation was explained by the predecessor to ARPANSA, the Australian Radiation Laboratory in discussing a 1994 Senate report criticising the limitations of the ELF standards.

To Quote:

> *"The criticism of the IRPA interim guidelines (and consequently of the NH&MRC counterpart) derives from their ambiguity about what parts of the available evidence can be used in standard setting at present (and consequently what health effects can be confidently prevented by their implementation) and the expectation of the public. The NRPB has explicitly qualified the scope of their guidelines (based on the same rationale as the IRPA limits):*
>
> *Restriction on exposure to extremely low frequency magnetic fields are expressed in terms of induced current density and are intended to avoid the effects of induced electric currents on function of the central nervous system such as the control of movement and posture, memory, reasoning and visual processing" (McKinlay, 1993)"* [11]

Similar comments about the limitations and purpose of the NH&MRC guidelines were made in 1991 by Dr. Keith Lokan, from the Australian Radiation Laboratory, in a conference paper published in *Radiation Protection in Australia*:

> *"One thing which we have done, though it has little direct bearing on the issue of chronic low level exposure, is to adopt the (above) recommendations on field limits. These limits represent plausible field values, below which immediate adverse health effects are unlikely, and as such serve a useful purpose. They are not intended to provide protection against possible cancer induction by continued exposure at the lower field levels implicated in the studies…"* [12]

As cancer takes many years to develop after exposure to an environmental agent, such as asbestos (an obvious example), the current NH&MRC ELF limits, and their ARPANSA

[11] Australian Radiation Laboratory, 'Comments on the Maisch Report, Non-Ionizing Electromagnetic Fields and Human Health', December 1994.
[12] Lokan KH, Risk, 'Risk Perception and Regulation-What Should the Regulator Do?' *Radiation Protection in Australia*, Vol. 9, No.4: 134-136, 1991.

replacement, are clearly not relevant to providing protection from cancer.

The Expert panel discounts an ELF/breast cancer connection.

On page 10 of the December ABC progress report it is stated: *"The weight of the evidence available today suggests that power frequency magnetic field exposure most likely is not a risk factor for breast cancer development"*. The reference for this statement is "Feychting M and Forssen U, Electromagnetic fields and female breast cancer, *Cancer Causes and Control* 2006;Vol. 17 pp. 553-558. However the panel does recommend that more work needs to be done on the ELF possible connection and we are in full agreement with this recommendation.

Feychting's conclusions, however, ignores a significant body of peer reviewed and replicated scientific research that is directly relevant to the Toowong situation, especially for those women who are being treated for breast cancer and still working at the Toowong studios. What has been seen in 6 independent laboratory studies is that a mere 12 mG magnetic field can block the ability of melatonin and the anti-cancer drug Tamoxifen to control the growth of human breast cancer cells.[13] [14] (Attachment B & D)

For example, a study by Masami Ishido in 2001 found that breast cancer cells treated with melatonin would resume growing when exposed to a 12 mG ELF magnetic field. Ishido found that a magnetic field disrupts the cell's internal communications system which determines how it responds to its environment. Later unpublished research by Ishido indicated that the effect was stronger at 12 mG than at 1000mG.[15]

So what has happened to these findings, now replicated by six laboratories? In a 2005 "exhaustive" review of the literature by the World Health Organisation's EMF Project (see attached paper *Conflict of Interest & Bias in Health Advisory Committees*) most of the peer reviewed and published research documenting the 12 mG effect on melatonin and tamoxifen were left out of the WHO's review [16] It was essentially simply deleted from the "weight of evidence" that Feychting refers to. Dare we call it getting rid of an 'inconvenient truth'?

In addition, the researchers who have been investigating the 12 mG effect have been unable to get further funding to further their investigation[17]. (Attachment B)

A paper published in *the Journal of the Australasian College of Nutritional & Environmental Medicine* in April 2006, explored the deep involvement of the power industry in directing and setting ELF exposure standards that would regulate their activities. This involvement biases ICNIRP's risk assessment for ELF-EMF and illustrates that the so-called reference levels for ELF magnetic fields have a basis that places economic considerations above health protection. (Attachment C)

---

[13] Maisch D, The Breast Cancer/EMF Connection: Melatonin, Tamoxifen, 50-60 Hertz Electromagnetic Fields and Breast Cancer, *Australian Senate Hansard*, October 27, 1997

[14] *Microwave News*, When Enough Is Never Enough-A Reproducible EMF Effect at 12 mG, Vol. XXV, No.2, November 2005

[15] Ibid.

[16] Ibid.

[17] Ibid.

In conclusion

For the reasons outlined in this paper, further investigation needs to be conducted to try to determine the cause of the breast cancer cluster at Toowong ABC. It is very likely that similar situations are (or may be) duplicated in the future in other work premises around Australia. From a building designer's perspective it is necessary to know what to do to eliminate or minimise such a factor in the future. For the sake of the women involved we hope the Toowong ABC building receives a proper investigation and not a white wash.

Attachments

A) *BDP Env. Design Guide*, Electromagnetic Fields in the Built Environment – Design for Minimal Radiation Exposure.

B) *Microwave News*, When Enough Is Never Enough: A reproducible EMF Effect at 12 mG

C) *JACNEM*, Conflict of Interest & Bias in Health Advisory Committees: A case study of the WHO's Electromagnetic Field (EMF) Task Group

D) *Australian Senate Hansard*, The Breast Cancer/EMF Connection: Melatonin, Tamoxifen, 50-60 Hertz Electromagnetic Fields and Breast Cancer

Contact details

Don Maisch
Emfacts Consultancy
PO Box 1403
Lindisfarne, Tasmania, 7015
Ph: (03) 6243 0195
Email: dmaisch@emfacts.com
Web: www.emfacts.com

Dr. John Podd
Department of Psychology
Massey University
Palmerston North
New Zealand
Email: J.V.Podd@massey.ac.nz

Bruce Rapley
Arkinson & Rapley Consultants (environmental)
Palmerston North
New Zealand
Email: themagnet@paradise.net.nz

Biographies at the end of Attachment A