

## **Dr Isaac Jamieson Response to FBC IRs to CSTS**

**Note: As the following had to be prepared on a very short time-scale, not all questions have been answered. Some of those which have been answered are not answered in full because of time restrictions.**

**Disclaimer:** The comments on this report are intended to help advance knowledge in the areas discussed and provide background information based on existing knowledge and related factors that may influence health, wellbeing, productivity and sustainability. They are not intended as a final statement on these topics, and as more information becomes available the opinions given may develop, be adapted or change. Whilst all reasonable precautions have been taken to ensure the validity of the information presented, no warranty is given towards its accuracy. No liability is accepted by the author for damages arising from its use and/or interpretation by others. The mention of specific companies or of particular manufacturers' products does not imply that they are endorsed or recommended or disregarded by the author. The comments given are being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the materials lies with the reader/listener. In no event is the author liable for damages arising from their use. © 2013 Dr Isaac Jamieson

**8.0** Reference: Exhibit C9-10-1 – Comments from Isaac Jamieson

**8.1** Has Dr. Jamieson previously submitted evidence to and/or testified before courts or regulatory tribunals in Canada or the United States in relation to any of the following: the potential health effects of non-ionising radio frequency emission ("RF"), medicine, health sciences, engineering, wireless technologies, the costs and capabilities of "smart grid technologies" generally, applications and network communication protocols, including metering protocols, industrial control and automation systems, or applied cryptography? If so, please submit a list that includes the date the evidence was submitted, the name of the matter/docket under which the evidence was submitted, and the name of the court/regulatory tribunal.

No.

**8.2** Has Dr. Jamieson ever previously been disqualified from acting as an expert witness before courts or regulatory tribunals in Canada, the United States, or the United Kingdom? If so, please submit a list that includes the date of disqualification, the name of the matter/docket under which the evidence was submitted, and the name of the court/regulatory tribunal.

No.

**8.3** Please confirm or explain otherwise that Dr. Jamieson's academic degrees are in architecture and environmental science related to indoor environments.

Dr. Jamieson's academic degrees are in architecture and environmental science related to both indoor and outdoor environments. His PhD investigated the environmental and biological effects of a variety of electromagnetic phenomena including RF/microwave radiation.

**8.3.1** Other than the approximately one year period working as a research associate in the Department of Epidemiology & Public Health, Imperial College London, please confirm that Dr. Jamieson has acquired no academic qualifications or degrees in the fields of epidemiology or medicine.

Dr Jamieson's PhD was obtained in the field of environmental science, as part of that research the potential biological effects of a variety of electromagnetic phenomena were investigated. His interdisciplinary experience is valuable as there is a need to take into account and integrate environmental science (particularly a knowledge of physical mechanisms) with medical science and epidemiology studies.

**8.3.2** Please confirm that Dr. Jamieson is not a physician.  
Correct.

**8.3.3** Please confirm that Dr. Jamieson has never had clinical experience with patients.

Dr Jamieson has undertaken EMF measurements when biological monitoring was undertaken. The test-subjects were not patients.

**8.3.4** Please confirm that Dr. Jamieson does not have a university degree in engineering.

Correct. Dr Jamieson's degrees are in Architecture and Environmental Science. During his PhD a considerable amount of his time was spent taking measuring and researching a variety of different electromagnetic parameters, particularly with regard to possible biological effects.

**8.3.5** Is Dr. Jamieson aware that Measurement Canada is responsible for assessing electoral electrical measurement accuracy?

Yes.

**8.3.6** Please explain why Dr. Jamieson is in a better position than Measurement Canada to assess electrical measurement accuracy.

Dr Jamieson has stated that in his opinion there are measurements that should be undertaken. He has not stated, to the best of his belief, that he is in a better position to assess measurement accuracy.

**8.4** If in any respect the confirmation requested in 8.3.1 to 8.3.4 cannot be provided, please detail in what respect the statements are in error.

**8.5** Please confirm that Dr. Jamieson is not the author of any of the studies cited in his report except for the six documents cited in Appendix A.

To the best of Dr Jamieson's knowledge, he is only the author of five documents cited in Appendix A.

**8.6** At p. 162 of Dr. Jamieson's report at Exhibit C9-10-1 ("Dr. Jamieson's Report"), he suggests that in British Columbia "there were 196 monthly minimum extreme temperatures less than or equal to -40C". Please confirm that:

**8.6.1** any such events did not occur in FortisBC's service territory;

Time limitations have prevented further analysis on matters related to temperature extremes. The extent to which FortisBC's service territory might be affected by extreme minimum temperatures that may affect smart meters is therefore presently unknown by Dr Jamieson. Further research is necessary.

**8.6.2** Non-advanced digital meters would be affected by cold weather.

As far as Dr Jamieson is aware this appears likely. From the evidence gathered to date, and presented in his commentary, it appears that both advanced and non-advanced digital meters may be affected by extreme cold weather.

There appears to be a very real risk that extreme low weather temperatures may cause smart meters to malfunction, or cease to supply power as a result of potential automatic disconnects.

It would seem beneficial for all parties if these hypotheses were tested. It may also be prudent to test how cold weather may affect the accuracy of advanced and non-advanced digital meters and the possible effects of such conditions on the proposed automatic disconnection and reconnection of smart meters.

It appears that these scenarios could be easily tested in laboratory conditions.

**8.7** At pp. 163-171 of Dr. Jamieson's Report, he refers to extreme space weather. Please confirm that existing non-advanced digital meters would be vulnerable to such events.

As far as Dr Jamieson is aware this would appear likely. It appears that both advanced and non-advanced digital meters may be affected by extreme space weather. It would appear beneficial for all parties if this hypothesis was tested.

8.8 At pp. 172-173 of Dr. Jamieson's Report, he refers to electromagnetic pulses. Please confirm that existing non-advanced digital meters would be vulnerable to such events.

As far as Dr Jamieson is aware this would appear likely. It would appear beneficial for all parties if this hypothesis was tested. As mentioned in the answer to 8.6.2, there appears to be a very real risk that extreme low weather temperatures may cause smart meters to malfunction, or cease to supply power as a result of potential automatic disconnects.

8.9 At p. 173 of Dr. Jamieson's Report, he refers to power surges. Please confirm that existing non-advanced digital meters would be vulnerable to such events.

Yes.

8.10 At pp. 175-178 of Dr. Jamieson's Report, he refers to cyber-attacks. Please confirm that existing non-advanced digital meters would be vulnerable to such events.

Yes.

8.11 At p. 77 of Dr. Jamieson's Report, he recommends adoption of a "Precautionary Principle". Please review Health Canada's response dated June 19, 2008 to a petition filed by Dr. M. Havas Request that first generation DECT phones be banned in Canada, a copy of which has been requested in CSTS IR 1.9.3 to Dr. Maret. The document is available at [http://www.oag-bvg.gc.ca/internet/english/pet\\_253\\_e\\_31629.html](http://www.oag-bvg.gc.ca/internet/english/pet_253_e_31629.html). Please confirm that in its response to the petition by Dr. M. Havas, Health Canada states the following:

"All science-based EMF guidelines, including Safety Code 6, intrinsically use the precautionary principle in the design of exposure limits, in that the uncertainties in measurements and application of safety margins are incorporated in their specification. Safety Code 6 is based upon a review of all relevant scientific studies utilizing a weight-of-evidence basis." (Reference: Answer to Questions 1 & 3)

It appears highly unlikely that Safety Code 6, or any other guideline, or any group of scientific researchers for that fact, would able to review all relevant scientific studies. This is for a number of reasons, including the fact that some of these studies may not be on general release, may only be available in foreign languages, or may have appeared in publications that have not been reviewed by the parties in question.

As apparent examples of evidence that can be missed:

#### **People's Republic of China**

In the WHO's EMF database for the People's Republic of China there is a review by Cao (2007) documenting the findings of general EMF-related health research in China from 1994 to 2006.

From the total of 383 Chinese papers investigating EMF biological effects in the China National Knowledge Infrastructure (CNKI) databank (this figure excludes papers investigating: EMF medical treatment; EMF prevention; EMF regulation, environmental EMF exposure assessment; and restricted People's Liberation Army research papers on the topic), it is stated that there were 109 epidemiological studies. 108 of these noted biological effects as a result of exposure.

In the epidemiological studies reviewed, 32 were for exposure levels higher than EMF exposure limits for public in China. The other 77 papers were for exposure levels lower than public exposure limits in China. Details of these exposure limits provided by Chiang (2009) are given below (Table 8.11.1).

Table 8.11.1: General Public Exposure Limits to RF/microwave radiation in China		
Frequency	1 <sup>st</sup> class exposure limits	2 <sup>nd</sup> class exposure limits
0.1-30 MHz	10 V/m	25 V/m
>30-300 MHz	5 V/m	12 V/m
>0.3-300 GHz	10 $\mu\text{W}/\text{cm}^2$	40 $\mu\text{W}/\text{cm}^2$

Source: Chiang (2009).

**1<sup>st</sup> class exposure limits:** Exposures below these levels thought to be safe for permanent exposure and all people (including infants, pregnant mothers, patients, older people, etc.).

**2<sup>nd</sup> class exposure limits:** Exposures below these levels acceptable for short-term exposures (factories, parks, recreation spaces, etc.). **Living quarters, hospitals, schools, kindergartens, etc., not allowed to receive such exposures.**

Health effects for the 108 epidemiological studies that reported effects included: abnormal ECG; disorder of immunoglobulin; miscarriage; neurasthenia; poor sleep quality; and sperm dysfunction. Quoting Cao (2007), **“No matter what the exposure level may be, lower or higher than [the Chinese] EMF exposure limits for public, health effects had been reported in these papers. ...”**

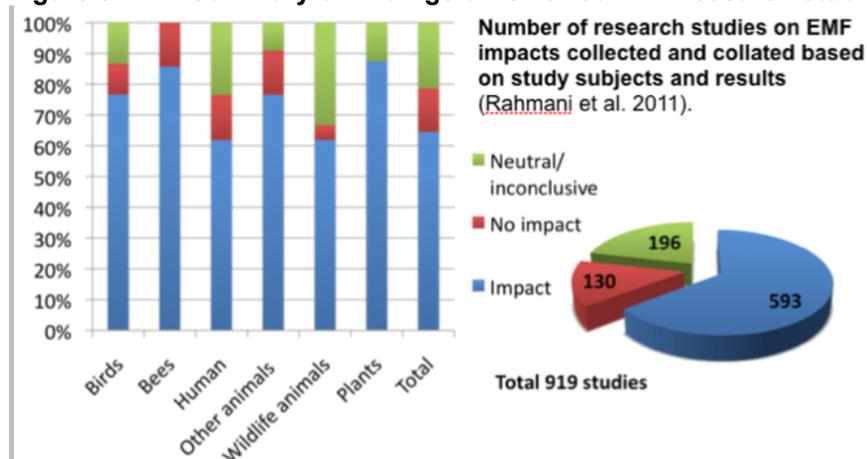
Actual exposure levels for Chinese general public are below Chinese General Public Exposure Limits. Chiang (2009) remarked that studies showed that in 3 Chinese cities assessed approximately 1% of the urban population exposed to levels  $>1\text{V}/\text{m}$  or  $2\ \mu\text{W}/\text{cm}^2$ , and that “Only a very small percentage may be exposed to levels comparable to the [Chinese] limits (in most cases for short time only).”

## India

In India, the use of the precautionary principle is evident with regard to the Government of India’s recent decision to reduce RF/microwave exposure levels to 10% of those allowed in ICNIRP guidelines (Government of India 2013).

An example of the findings of the scientific review process that led to such a drastic reduction in exposure levels being made, after a review of all relevant scientific studies utilizing a weight-of-evidence basis is shown in Figure 8.11.1.

**Figure 8.11.1: Summary of findings of reviewed EMF research studies on EMFs** (Rahmani et al. 2011).



## References

- Cao, Z. (2007), General EMF and Health Research in China (1994-2006). National activity report from China, NIEHS of China CDC, 3pp. [http://www.who.int/peh-emf/project/mapnatreps/China\\_2007\\_EMF\\_activity\\_report.pdf](http://www.who.int/peh-emf/project/mapnatreps/China_2007_EMF_activity_report.pdf)
- Chiang, H. (2009), Rationale for Setting EMF Exposure Standards, [http://www.salzburg.gv.at/Proceedings\\_\(20\)\\_Chiang.pdf](http://www.salzburg.gv.at/Proceedings_(20)_Chiang.pdf)
- Government of India (2013), Ensuring Safety from Radiations: Mobile Towers and Handsets. Department of Telecom, Govt. of India. 1pp., [www.dot.gov.in/2013/Eng\\_final.pdf%20dated%2015-01-2013.pdf](http://www.dot.gov.in/2013/Eng_final.pdf%20dated%2015-01-2013.pdf)
- Rahmani, A. et al. (2011), Report of possible impacts of communication towers on wildlife including birds and bees. Expert Committee to Study the possible Impacts of Communication Towers on Wildlife including Birds and Bees, Ministry of Environment and Forest, Government of India. 88pp.

8.12 At p. 72 of Dr. Jamieson's Report he states "there is much evidence documenting biological effects at non-thermal levels." Please confirm that in Safety Code 6 (2009), Health Canada states at p. 7:

"The exposure limits specified in Safety Code 6 have been established based upon a thorough evaluation of the scientific literature related to the thermal and possible non-thermal effects of RF energy on biological systems. Health Canada scientists consider all peer-reviewed scientific studies, on an ongoing basis, and employ a weight-of-evidence approach when evaluating the possible health risks of RF energy." (underlining added)

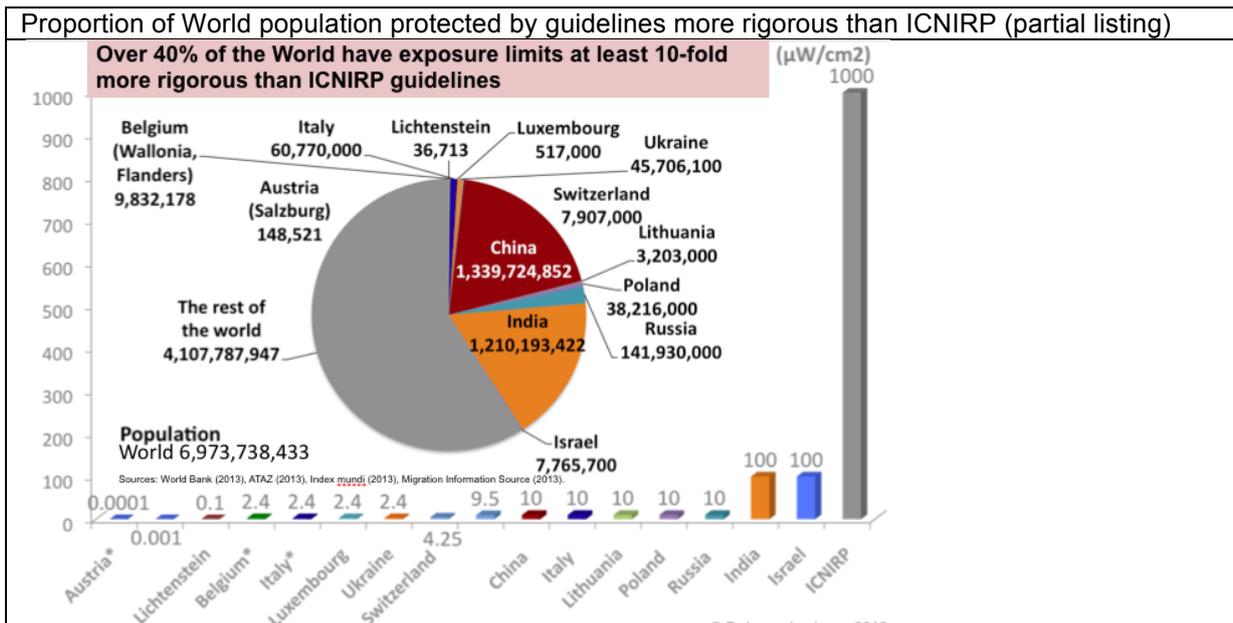
Refer to answer to 8.11.

8.12.1 Please confirm that in Safety Code 6 (2009), Health Canada states at p. 9:

"The scientific literature with respect to possible biological effects of RF energy has been monitored by Health Canada scientists on an ongoing basis since the last version of Safety Code 6 was published in 1999. During this time, a significant number of new studies have evaluated the potential for acute and chronic RF energy exposures to elicit possible effects on a wide range of biological endpoints including: human cancers (epidemiology); rodent lifetime mortality; tumor initiation, promotion and co-promotion; mutagenicity and DNA damage; EEG activity; memory, behaviour and cognitive functions; gene and protein expression; cardiovascular function; immune response; reproductive outcomes; and perceived electromagnetic hypersensitivity (EHS) among others. Numerous authoritative reviews have summarized this literature.

Despite the advent of thousands of additional research studies on RF energy and health, the predominant adverse health effects associated with RF energy exposures in the frequency range from 3 kHz to 300 GHz still relate to the occurrence of tissue heating and excitable tissue stimulation from short-term (acute) exposures. At present, there is no scientific basis for the premise of chronic and/or cumulative health risks from RF energy at levels below the limits outlined in Safety Code 6. Proposed effects from RF energy exposures in the frequency range between 100 kHz and 300 GHz, at levels below the threshold to produce thermal effects, have been reviewed. At present, these effects have not been scientifically established, nor are their implications for human health sufficiently well understood. Additionally, a lack of evidence of causality, biological plausibility and reproducibility greatly weaken the support for the hypothesis for such effects. Thus, these proposed outcomes do not provide a credible foundation for making science-based recommendations for limiting human exposures to low-intensity RF energy." (underlining added)

As indicated in the original commentary by Dr Jamieson, and the answer given to 8.11, there are numerous studies indicating adverse health effects in the frequency range 3 kHz to 300 GHz, even at low levels of exposure. It is for such reasons that a high proportion of the World's population are protected by RF/microwave exposure guidelines far more rigorous than Health Canada's Safety Code 6 (2009).



\*In some regions.

Research undertaken over many decades indicates that adverse health effects can be created at exposure levels below those stipulated by Health Canada's Safety Code 6 (2009) and also ICNIRP. As noted by Paolo Vecchia, Chairman for ICNIRP (2004-2012), "**the ICNIRP guidelines are neither mandatory prescriptions for safety, the "last word" on the issue nor are they defensive walls for Industry or others.**" (Vecchia 2008). It would appear that the same holds true for Safety Code 6.

Additionally, it is worth mentioning that the Royal Society of Canada (1999) is aware that "... existing scientific evidence is incomplete, and inadequate to rule out the possibility that ... non-thermal biological effects could lead to adverse health effects."

Similar sentiments are shown by experts elsewhere:

In 2002, Professor Sir William Stewart, at that time Chairman of the UK's Independent Expert Group on Mobile Phones (IEGMP), noted that some important main conclusions from the IEGMP Report often remained unpublicized even by the UK Government. Parts of those main conclusions are documented below:

**Paragraph 1.17:** "The balance of evidence to date suggests that exposures to RF radiation below NRPB and ICNIRP guidelines do not cause adverse health effects to the general population." [Note other authorities have had access to additional scientific evidence which has led them to conclude that exposures to RF/microwave radiation at levels below ICNIRP and Health Canada Safety Code 6 (2009) guidelines may cause adverse health effects – comment by Dr Jamieson].

**Paragraph 1.18:** "There is now scientific evidence, however, which suggests that there may be biological effects occurring below these guidelines. This does not necessarily mean that that these effects lead to disease or injury, but it is potentially important information and we consider the implications below." [Emphasis added].

**Paragraph 1.19:** "There are additional factors that need to be taken into account in assessing any possible health effects. Populations as a whole are not genetically homogeneous and people can vary in their susceptibility to environmental hazards. There are well-established examples in the literature of the genetic predisposition of some groups, which could influence sensitivity to disease. There could also be a dependence on age. We conclude therefore that it is not possible at present to say that exposure to RF radiation, even at levels below national guidelines, is totally without potential adverse health effects, and that the gaps in knowledge are sufficient to justify a precautionary approach." [Emphasis added].

## Reference

The Royal Society of Canada (1999), A review of the potential health risk of radiofrequency fields from wireless telecommunication devices. An expert panel report prepared at the request of the Royal Society of Canada for Health Canada. The Royal Society of Canada, Ottawa, Ontario, Canada.

Vecchia, P. (2008), Comments given during presentation at the RRT conference, 'EMF & Health – A Global Issue ... Exploring appropriate precautionary approaches', The Royal Society, London, 8-9 September 2008.

**8.12.2** Please confirm that the text quoted above from Health Canada's Safety Code 6 indicates that Health Canada has in fact considered the research studies on possible RF effects unrelated to tissue heating, and has concluded that such effects have not been scientifically established and that the studies do not provide a credible foundation for making science-based recommendations to reduce the Safety Code 6 exposure limits. If not confirmed, please explain.

Yes, Health Canada's has considered a number of research studies on possible RF/microwave effects unrelated to tissue heating. Many health agencies and scientists have concluded, unlike Health Canada, that non-thermal effects can arise from exposure to RF/microwave radiation at levels considerably below those Health Canada consider safe, and have created their science-based recommendations on that basis. Refer to Dr Jamieson's original commentary and also his reply to question 8.11 for examples of this from abroad.

8.13 On p. 48 of Dr. Jamieson's Report he states that the peak power density from ZigBee radio is  $31 \mu\text{W}/\text{cm}^2$ . Please provide the definition of peak power density used, and how it relates to the metric used by Health Canada Safety Code 6.

The figure given  $31 \mu\text{W}/\text{cm}^2$  [ $0.031 \text{ mW}/\text{cm}^2$ ] was taken from the response to the CSTS IR1 Question 57.7 to ForticBC "What is the peak power density of the data signals?" The definition of peak power density requested should be clarified by the original respondent to that Question 57.7.

8.14 On p. 49 of Dr. Jamieson's Report he states that "Acute biological effects have been established for exposure to ELF electric and magnetic fields in the frequency range up to 100 kHz that may have adverse consequences on health," citing the World Health Organization (WHO 2007). Please confirm that Dr. Jamieson's reference to "WHO 2007" above is to the following document and that the quoted extract is from the document's conclusion (section 12.6, p. 355): <http://www.who.int/peh-emf/publications/Chapter%2012.pdf>.

Correct.

8.14.1 Please confirm that immediately after the quoted extract above, the same "WHO 2007" document states the following:

"Therefore, exposure limits are needed. International guidelines exist that have addressed this issue. Compliance with these guidelines provides adequate protection."

That reference was obtained several years ago when researching the biological effects of low intensity natural frequencies in that range. For that reason Dr Jamieson had no recollection of the comment that followed it (mentioned above) until informed of it in this question. If he had, he may have responded as follows:

Research undertaken over many decades indicates that adverse health effects can be created at exposure levels below those stipulated by ICNIRP. As noted by Paolo Vecchia, Chairman for ICNIRP (2004-2012), "**the ICNIRP guidelines are neither mandatory prescriptions for safety, the "last word" on the issue nor are they defensive walls for industry or others.**" (Vecchia 2008). [Emphasis added].

## Reference

Vecchia, P. (2008), Comments given during presentation at the RRT conference, 'EMF & Health - A Global Issue ... Exploring appropriate precautionary approaches', The Royal Society, London, 8-9 September 2008.

8.14.2 Does Dr. Jamieson consider that including the statement "acute biological effects have been established for exposure to ELF electric and magnetic fields in the frequency range up to 100 kHz that may have adverse consequences on health" in his report without the immediately following statements that compliance with existing guidelines provides adequate protection provides a fair, balanced and unbiased assessment of the issue?

As mentioned in answer to question 8.14.2, that reference was obtained several years ago when researching the biological effects of low intensity natural frequencies in that range.

Dr Jamieson agrees with the following statement of Dr Paolo Vecchia, Chairman for ICNIRP (2004-2012), "**the ICNIRP guidelines are neither mandatory prescriptions for safety, the "last word" on the issue nor are they defensive walls for Industry or others**" (Vecchia 2008) [emphasis added].

It is Dr Jamieson's opinion from reviewing the literature on the effects of exposure to frequencies in that range, at intensities that can be created in Nature, that such exposures may indeed cause biological effects. No preconceptions were made. The facts were fairly reported as he saw them as related to natural frequencies or simulated versions of them.

As a result of the studies reviewed, he hypothesised that there could be a basis for the purported connection between HVFT in the same frequency ranges and adverse health effects. His opinion is that that discussion provided a fair and balanced assessment of the issue.

Ideally, proper testing should be undertaken to determine if the hypothesis was sound. Further research is necessary.

8.15 On pages 79-81 of Dr. Jamieson's Report he refers to the WHO / IARC classification of RF as Group 2B: the agent is possibly carcinogenic to humans. Why in Dr. Jamieson's opinion would the WHO / IARC classify RF as Group 2B: the agent is possibly carcinogenic to humans (i.e., there is inadequate evidence of carcinogenicity in humans) and not classify RF as either Group 2A: the agent is probably carcinogenic to humans (i.e., there is limited evidence of carcinogenicity in humans) or a more probable classification?

8.15.1 Does Dr. Jamieson agree that the WHO / IARC has made it clear that the primary reason for classifying RF as Group 2B relates to uncertainty regarding long term heavy cell phone use close to the ear and certain rare brain cancers. If Dr. Jamieson does not agree, please explain why not? (Reference: [http://www.iarc.fr/en/media-centre/iarcnews/2011/IARC\\_Mobiles\\_QA.php](http://www.iarc.fr/en/media-centre/iarcnews/2011/IARC_Mobiles_QA.php))

8.15.2 Was Dr. Jamieson aware when he completed his report submitted in this proceeding that subsequent to the IARC Monographs meeting that resulted in the Group 2B classification, a Danish cohort study that was printed in the British Medical Journal, October 2011, found: "(the Danish cohort) study showed no link between mobile phone use, including longer term use of more than 10 years, and the risk of glioma and any other brain tumour. These are new results that were not available at the time of the IARC Monographs meeting."

Yes. It would have been appreciated if the questioner had fully referenced the document mentioned above. The quote does not seem to come from Frei et al. (2011), which it would appear that the questioner is referring to.

In reply, Dr Jamieson would like to know if the questioner was also aware of the research of Hardell et al. (2012), also discussing the IARC Group 2B classification, which states that "Some studies show increasing incidence of brain tumours whereas other studies do not. ... **there is reasonable basis to conclude that RF-EMFs are bioactive and have a potential to cause health impacts.** There is a consistent pattern of increased risk for glioma and acoustic neuroma associated with use of wireless phones (mobile phones and cordless phones) mainly based on results from case-control studies from the Hardell group and Interphone Final Study results. Epidemiological evidence gives that RF-EMF should be classified as a human carcinogen. **The current safety limits and reference levels are not adequate to protect public health. New public health standards and limits are needed.**" [Emphasis added].

### References

Hardell, L., Carlberg, M. & Hansson Mild, K. (2012), Use of mobile phones and cordless phones is associated with increased risk for glioma and acoustic neuroma. Pathophysiology (2012), <http://dx.doi.org/10.1016/j.pathophys.2012.11.001>

Frei, P., Poulsen, A.H., Johansen, C., Olsen, J.H., Steding-Jessen, M. & Schüz, J. (2011), Use of mobile phones and risk of brain tumours: update of Danish cohort study, BMJ, 343: d6387.

**8.16** On p. 71, Table 2.2, of Dr. Jamieson's Report he provides RF guidelines from other countries/cities as well as the International Commission on Non-Ionizing Radiation Protection (ICNIRP) levels. A total of 10 countries, 1 state and 2 cities are listed in Dr. Jamieson's Table 2.2. Why has Dr. Jamieson chosen to show only 10 countries, 1 state and 3 cities in his Table 2.2?

Time limitations restricted the number of areas that could be documented.

**8.16.1** Is Table 2.2 intended to show all of the countries and cities throughout the world that to Dr. Jamieson's knowledge have lower RF exposure limits than the ICNIRP limits?

No.

**8.16.2** Should one conclude from this evidence that only 10 countries, 1 state and 3 cities throughout the world have lower RF exposure guidelines than the ICNIRP limits?

No.

**8.16.3** In Table 2.2 of Dr. Jamieson's Report he has included Salzburg, an Austrian state. Please confirm that the Austrian constitution has assigned sole authority to the federal parliament for matters related to limits for exposure of radio frequency and that the enforcement of these laws are also exclusive to their federal government.

Confirmed. Telecommunications issues like frequency management, licensing, standards etc., are a federal issue with federal regulations applying to the whole of Austria. The Telecommunications Ministry (BMVIT) applies ICNIRP guidelines.

**8.16.4** Please confirm that Austria's binding federal limit for RF exposure limit matches the ICNIRP limits.

Telecommunications issues like frequency management, licensing, standards etc., are a federal issue with federal regulations applying to the whole of Austria.

As there are no explicit regulations by law regarding standards for the health protection of the general population at the federal level (i.e. for the whole Austria), there are non binding recommendations from different Austrian Ministries, as well as State Parliaments (eg. Salzburg and Styria), apply regarding standards for the health protection of the general population:

In December 2010, the Austrian Ministry of Health (BMG) published the document "Aspects of the current health assessment of mobile communications - Recommendation of the Supreme Health Council" (BMG 2010). Among its recommendations is the following:

"Radio equipment, which leads to a prolonged exposure of people should be set up using a precautionary target value, since long-term effects can not be excluded with sufficient certainty." [Emphasis added].

"This target value should be set for high-frequency effects at least a factor of 100 below the limit for the power density of the ÖNORM E 8850" [Oberfeld (2012) notes that ÖNORM E 8850 is similar to ICNIRP 1998].

"In addition, legal measures should be taken, that a) in case that various electromagnetic fields acting simultaneously, all relevant frequencies of different emitters are not to exceed the limits and operators are encouraged to minimize exposure from electromagnetic fields well below the limit values during planning and operation." (BMG 2010) [Emphasis added].

The parliament of Salzburg demanded different measures to be taken by the government like to implement a cadaster of all RF/MW antenna sites and publish them in the Salzburg Geographic Information System (SAGIS) as well to the prescribe the special precautionary values for RF/microwave radiation Salzburg (Land Salzburg 2002).

The Parliament of Styria in Austria has also adopted the Salzburg precautionary value as a recommended limit for electromagnetic radiation in Styria to minimize health risk (Landtag Steiermark 2008).

#### References

- BMG (2010), Gesichtspunkte zur aktuellen gesundheitlichen Bewertung des Mobilfunks Empfehlung des Obersten Sanitätsrates [Aspects of the current health assessment of mobile communications - Recommendation of the Supreme Health Council], Bundesministerium für Gesundheit / Ministry of Health, Vienna, Austria.  
[www.bmg.gv.at/cms/home/attachments/1/9/2/CH1238/CMS1202111739767/osr-empfehlung\\_mobilfunk\\_stand\\_17.12.2010.pdf](http://www.bmg.gv.at/cms/home/attachments/1/9/2/CH1238/CMS1202111739767/osr-empfehlung_mobilfunk_stand_17.12.2010.pdf) - In German.
- Land Salzburg (2002), Nr. 525 der Beilagen zum stenographischen Protokoll des Salzburger Landtages (4. Session der 12. Gesetzgebungsperiode), [http://www.salzburg.gv.at/obtree\\_internet/lpi-meldung?nachrid=15975](http://www.salzburg.gv.at/obtree_internet/lpi-meldung?nachrid=15975) In German.
- Landtag Steiermark (2008), XV. Gesetzgebungsperiode. Beschluss Nr. 974 aus der 33. Sitzung der XV. Gesetzgebungsperiode des Landtages der Steiermark vom 11.03.2008, <http://www.landtag.steiermark.at/cms/beitrag/10913569/5076210/> - In German.
- Oberfeld, G. (2012), Section 22. Precaution in Action – Global Public Health Advice Following BioInitiative 2007, 50pp. [http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec22\\_2012\\_Precaution\\_in\\_Action\\_Global\\_advice.pdf](http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec22_2012_Precaution_in_Action_Global_advice.pdf)

#### 8.16.5 Please confirm that in Safety Code 6 (2009), Health Canada states at p. 7:

"It must be stressed that Safety Code 6 is based upon scientifically-established health hazards and should be distinguished from some municipal and/or national guidelines that are based on socio-political considerations."

Yes. It must also be stressed that other countries have scientifically-established health standards far more rigorous than Safety Code 6.

8.16.6 Please submit any specific, credible evidence Dr. Jamieson has that demonstrates the 10 countries, 1 state and 3 cities shown in Dr. Jamieson's Table 2.2 set their RF exposure standards based upon scientifically-established health hazards and not based on other considerations such as socio-political considerations.

Time restrictions have restricted this to providing two examples:

**China:** Refer to answer to 8.11 (Chiang 2009, Cao 2007).

**Russia:** Refer to the peer-reviewed research paper 'Scientific Basis for the Soviet and Russian Radiofrequency Standards for the General Public' by Repacholi et al. (2012) and 'Cellular Communication and Health: Electromagnetic environment, Radiobiological and hygienic problems, The prognosis of hazard.' Grigoriev & Grigoriev (2013).

#### References

- Cao, Z. (2007), General EMF and Health Research in China (1994-2006). National activity report from China, NIEHS of China CDC, 3pp. [http://www.who.int/peh-emf/project/mapnatreps/China\\_2007\\_EMF\\_activity\\_report.pdf](http://www.who.int/peh-emf/project/mapnatreps/China_2007_EMF_activity_report.pdf)
- Chiang, H. (2009), Rationale for Setting EMF Exposure Standards, [http://www.salzburg.gv.at/Proceedings\\_\(20\)\\_Chiang.pdf](http://www.salzburg.gv.at/Proceedings_(20)_Chiang.pdf)
- Grigoriev, Y.G. & Grigoriev, O.A. (2013), Cellular Communication and Health: Electromagnetic environment, Radiobiological and hygienic problems, The prognosis of hazard. *Economica Moscow*. 576 pp. In Russian with summaries in English.
- Repacholi, M., Grigoriev, Y., Buschmann, J. & Pioli, C. (2012), Scientific Basis for the Soviet and Russian Radiofrequency Standards for the General Public. *Bioelectromagnetics*, 33, 623-633.

**8.16.7** Does Dr. Jamieson agree that the radio power density of the FortisBC advanced meter is less than 0.5 per cent of Health Canada Safety Code 6 at a distance of one wavelength away from the meter, approximately 20 to 30 centimeters (Reference: Attachment BCH 2.2 to FortisBC's response to BC Hydro IR 2.2.2)? Further, are these levels significantly less than the limits set by the ICNIRP?

**8.17** On p. 70 of Dr. Jamieson's Report he suggests it would be to the benefit of all parties if a comprehensive presentation of available scientific evidence on health effects noted at the frequencies FortisBC intends to use and "anecdotal" evidence of adverse health were presented to the Provincial Health Officer. Dr. Jamieson appears to be suggesting that British Columbia's Provincial Health agency is not aware of available evidence on potential health effects of RF. Please review the Statement of the Chief Medical Health Officer, Vancouver Coastal Health, dated June 2011. The document is Attachment BCH 2.1 to FortisBC's response to BC Hydro IR 2.1 in this proceeding. Please confirm the Chief Medical Officer states the following in that document:

"In 2005, in response to community concerns and after reviewing the evidence, the Vancouver Coastal Health Chief Medical Health Officer concluded that the installation of cellular antennae in the community did not create health risks for the public, and that Health Canada's Safety Code 6 provided an appropriate level of protection. At that time, the Chief Medical Health Officer also committed to undertake periodic reviews of the evidence and to provide public updates as necessary. The Chief Medical Health Officer provides the following updated evidence review and associated conclusions:

The scientific consensus remains unchanged: radiation from cellular base stations is far too low to cause adverse health effects in the community. The current Canadian (Safety Code 6 revised 2009) and international standards such as ICNIRP provide significant safety margins for public exposure to RF." (underlining added)

Refer to answer to 8.11.

**8.18** Dr. Jamieson states at p. 39 of his report:

"Reference is made by the present author to the reported case of severe die off of a bush that was reported after the installation of wireless smart meters. It was reported that none of the other plants or trees in the area (further away from the units) were affected. which appears to suggest that the emissions from smart meters. in this case a bank of meters may be biologically active. Refer also to the Chapter on 'Environmental Concerns.'"

Has Dr. Jamieson considered other factors that could have led to this die off?

Technical difficulties experienced during the creation of the original commentary prevented this issue being fully addressed at the time – as can be seen the commentary was unfinished. Other possible

factors that could have contributed to die off were to have been considered and discussed, unfortunately time restrictions prevented this happening.

As peer-reviewed research had already indicated that plants can be adversely affected by exposure to RF/microwaves, it is sensible to suggest that tests should be undertaken to determine if emissions from smart meters may damage plants, particularly those that literature has indicated are sensitive to RF/microwave radiation. It is further proposed that tests should also be undertaken to investigate the effects of increased RF/microwave exposures from ZigBee Radio and smart appliances.

**8.18.1** Have there been observations of other bushes that have perished near the advanced meter installations?

A very good point. Not as far as Dr Jamieson is aware. Again this is one of the reasons why research should be undertaken – to prove or disprove the anecdotal evidence that exists. It would also be appropriate to assess plant stress. Plant type also appears to influence response.

It would have been ideal to run tests in the area where the multiple smart meters were indicated as potentially causing the die-off. Unfortunately, it has been reported that those meters now have metal sheeting in front of them to reduce the level of signal in that area. It appears that tests could be relatively easily undertaken with plants like mimosa which are indicated as being sensitive to electromagnetic radiation.

**8.18.2** Would Dr. Jamieson have expected more of such observations if this die off was the result of an advanced meter installation?

Again a good point. As noted in the reply to 18.8, above, there could other factors that led to the observed die-offs being so acute.

**8.18.3** Can Dr. Jamieson explain why there is no wide-spread decay of vegetation in North America given that over 50 million RF advanced meters were installed and in operation as of mid-2012?

It does appear that vegetation may in some instances be becoming stressed by inappropriate exposure to electromagnetic radiation - refer to main commentary by Dr Jamieson. Further research is necessary before meaningful conclusions can be made.

**8.19** Dr. Jamieson references a study at p. 39 of his report:

“Gustavs (2012a) reports that in EMF surveys she has undertaken in individual bedrooms where there is a wireless smart meter attached to the exterior wall behind which someone tries to sleep, peak microwave power density exposure levels across the bed may range from 0.01 to 0.15  $\mu\text{W}/\text{cm}^2$ . She notes that ..... the EMF Working Group of the Austrian Medical Association recommends to keep peak levels of radio-frequency radiation in bedrooms below 0.001  $\mu\text{W}/\text{cm}^2$ , preferably below 0.001  $\mu\text{W}/\text{cm}^2$ ”

Please note that the letter cited does not purport to have done measurements on advanced meters. Were there any measurements performed?

Yes. Gustavs has undertaken measurements of wireless Itron OpenWay smart meters in British Columbia. The general RF/microwave exposure level range stated applies to indoor measurements and is based on peak values of data-logging measurements around 0.01-0.06  $\mu\text{W}/\text{cm}^2$  and peak-hold values of spot measurements around 0.01-0.15  $\mu\text{W}/\text{cm}^2$ .

**8.19.1** If so, how were measurements by Gustavs performed?

Data-logging was undertaken using the HF59EB and NFA1000 meters by Gigahertz Solutions. The sampling-rate of the data-logger NFA1000 is 100,000/second. Spot-measurements were taken on 'peak-hold' using the HFE59B meter.

## References

<http://www.gigahertz-solutions.com/en/Online-Shop/Measurement/High-Frequency/Instruments/HFE59B.html>

<http://www.gigahertz-solutions.com/en/Online-Shop/Measurement/Low-Frequency/Instruments/NFA-1000.html>

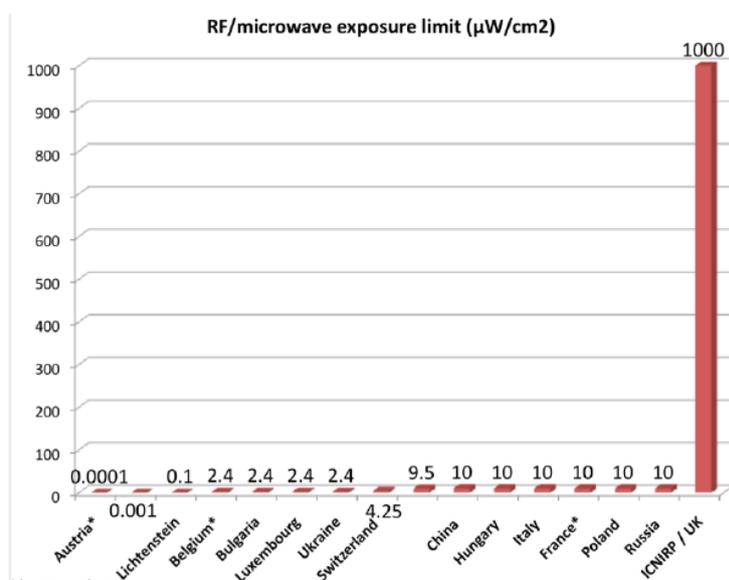
### 8.19.2 Were other sources of exposure excluded?

Yes. Whilst the smart meter emissions were measured with a broadband RF meter, the 900-MHz bursts of a smart meter signal are very distinct.

### 8.20 Dr. Jamieson states at p. 41 of his report that:

“A number of effects have been scientifically established, and the implications of these have led to a number of scientists, and foreign health agencies, advocating the need for the adoption of more onerous standards. The permitted exposure levels in the Canada are substantially higher than those permitted in many other countries, including China, Bulgaria, Italy, Poland, Switzerland and Russia.”  
What exposures are prescribed by the other jurisdictions referenced?

The prescribed maximum exposure levels mentioned above are shown on the bar graph that was shown in Dr Jamieson’s commentary.



\* In some regions

Figure 1.4 Comparison between exposure levels permitted in other countries & ICNIRP levels used in UK (Jamieson 2012b).

Expanded details on the exposure guidelines for Bulgaria are given below:

In Bulgaria, the Health Minister is responsible for the evaluation of the exposure of the general public to EMF and addressing possible adverse effects, “the limit value for microwaves is  $10 \mu\text{W}/\text{cm}^2$ . Compared with the limits recommended by EC (ICNIRP), they are 45 to 100 times more stringent for the frequencies used by the GSM technology.” (Israel 2013).

There are two differentiated exposure categories for the general population:

**1). Short-term exposure.** These are for areas where only short-term human stay is possible: hard-to-access areas; and sloping roofs on residential buildings.

For this type of exposure, the exposure limits proposed in CR 1999/519/EC (ICNIRP) for the frequency range > 0 Hz to 300 GHz are accepted as a basic restriction.

**2). Areas where temporary and/or periodical human stay is possible:** agricultural lands; accessible roofs of residential buildings; electric transport; residential areas; and streets.

A precautionary sub zone is also part of the second exposure category, "... it sets "sensitive" in relation to risk perception regions defined as sites for public purposes: for recreation and leisure, recreation parks, health recreation facilities, facilities for elderly people, rehabilitation and social re-adaptation establishments, children centers, schools, kindergartens, healthcare establishments. This sub zone is defined only for exposure to base stations in the frequency range 850 to 2150 MHz." (Israel 2013).

**For the second category, Bulgaria's strategy is to retain the actual exposure limits it previously used for frequencies between 30 kHz and 30 GHz. In the precautionary sub-zone for the general public the exposure limit is 1  $\mu\text{W}/\text{cm}^2$ .**

## Reference

Israel, M. (2013), The Bulgarian approach of risk perception, communication and management in the field of EMF health and safety. NCPHA, Ministry of Health, Sofia, Bulgaria. Presentation given in Brussels, 20 February 2013.

**8.20.1** Please confirm that the average exposure from the FortisBC advanced meters is below the levels prescribed in these other jurisdictions, when this exposure is measured in accordance with the procedures in each jurisdiction.

**8.21** In section 3.1 of Dr. Jamieson's Report, he refers to the impact of EMF on pollinating insects and birds. Please refer to the article by Robert W. Currie, Stephen F. Pernal and Ernesto Guzmán-Novoa, "Honey bee colony losses in Canada" (2010) 49 Journal of Apicultural Research 104 (available at <http://uoguelph.ca/canpolin/Publications/Currie,%20Pernal%20and%20Guzman%202010%20Honey%20colony%20loses%20in%20Canada.pdf>) Please confirm that it provides: "Increased rates of winter colony losses in Canada are probably the result of regional differences in weather patterns that affected forage availability for bees, fall feeding management, mite and bee population growth, V. destructor treatment timing, the presence of Nosema spp., viruses and other diseases and the spring build-up of colonies. These stressors interacting in combination with each other affected colony survival, but direct and indirect effects associated with acaricide resistance and the failure to control V. destructor mites are believed to be the most important factors related to colony loss in Canada."

Dr Jamieson acknowledges that a variety of risk factors and stressors, as documented by Currie et al. (2010), can contribute to colony losses.

Dr Jamieson mentions in his correspondence examples from peer-reviewed research indicating how inappropriate exposures to manmade electromagnetic fields may also be a contributing factor to the decline of insects, amphibians, mammals and birds. Refer to 'Section 3 – Environmental Concerns' issued as part of his original commentary.

**8.22** Is Dr. Jamieson aware of a concept of blackbody radiation. If so:

**8.22.1** Is blackbody radiation natural?

Yes.

**8.22.2** What is the RF exposure from blackbody radiation?

RF/microwave emissions from blackbody radiation from the human body and from the Earth are negligible. The main blackbody emissions from the human body and from the Earth are actually in the infrared range. The following background information is provided to help explain the apparent confusion that has arisen over this matter.

The electromagnetic spectrum covers a wide range of radiation types: static fields; radiowaves; microwaves; Infrared; visible light; Ultraviolet; X-rays; and Gamma-rays. The relationship between frequency and wavelength is determined by the speed of light, which can be written as (Equation 8.22.2.1):

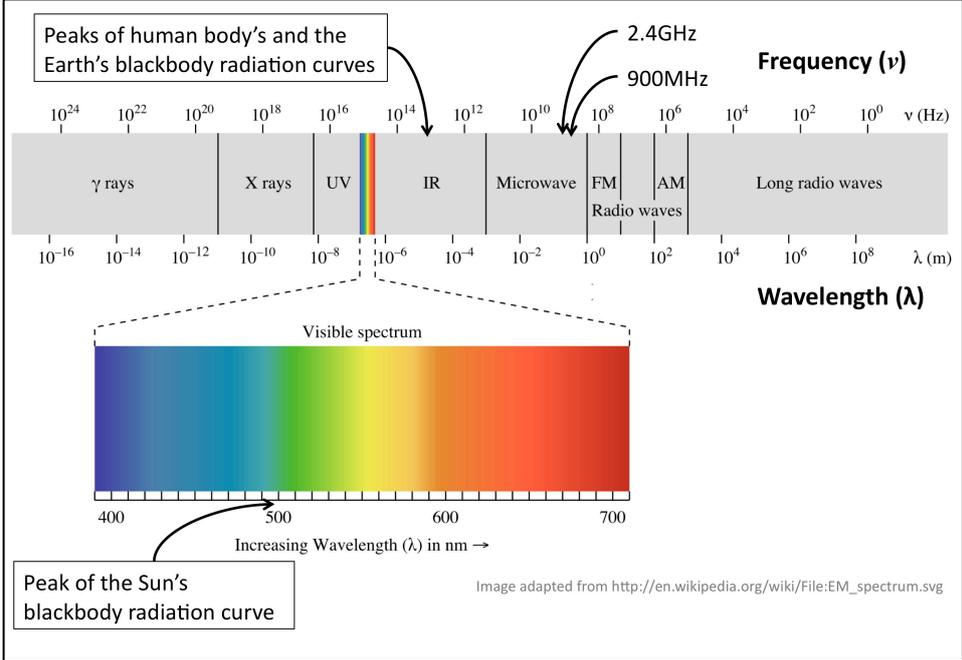
**Equation 8.22.2.1**

$$\lambda = \frac{c}{\nu}$$

where  $\lambda$  is wavelength (cm),  $c$  = speed of light (= 29,979,245,800 cm/sec) and  $\nu$  is frequency (Hz).

As can be seen from Figure 8.22.2.1, radiowaves can be categorized as being in a frequency band <3GHz (wavelength from >10cm) and microwaves in the range of 3GHz - 300GHz (wavelength from 10cm to 1mm). The peaks of blackbody radiation from the human body and the Earth are located in the infrared (IR) region approximately at 32,087GHz (wavelength 9.34 $\mu$ m) and 29,692GHz (10.1 $\mu$ m), respectively. The peak blackbody radiation from the Sun is situated in the visible light (UV) frequency band at ca. 600,047GHz (wavelength 499.6nm).

**Figure 8.22.2.1: Locations of frequencies and wavelengths of the peaks of blackbody radiation for the Sun, humans and the Earth and the locations for 2.4 GHz and 900MHz frequencies within the electromagnetic spectrum**



The peak wavelengths of the blackbody radiation curves for the Sun, the human body and the Earth were calculated from Equation 8.22.2.2 (Wien Displacement Law):

**Equation 8.22.2.2**

$$\lambda_{\max} = \frac{b}{T}$$

where  $\lambda_{max}$  is the wavelength ( $\mu\text{m}$ ) at which there is maximum energy emission, as a function only of the temperature from a blackbody;  
 $T$  is the absolute temperature of the blackbody (K), for which  $T = 5800\text{K}$ ,  $310.15\text{K}$  and  $287\text{K}$  were used for the calculation the peak wavelengths of blackbody radiation for the Sun, the human body and the Earth, respectively; and  
 $b$  is Wien's displacement constant =  $2897.768551 \mu\text{m}\cdot\text{K}$ .

According to the blackbody theory, the blackbody radiation has a specific spectrum and power density that depend only on the temperature of the blackbody (Equation 8.22.2.3).

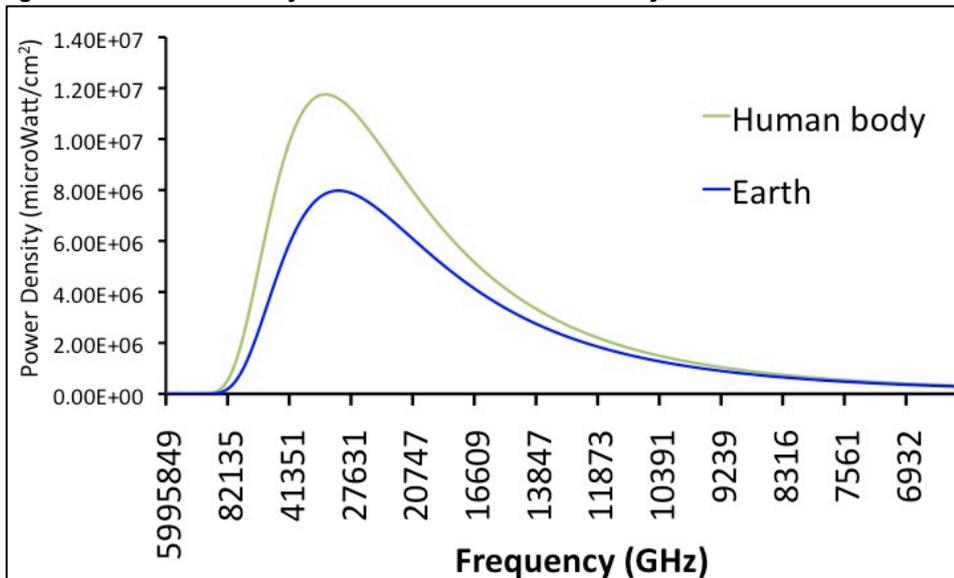
**Equation 8.22.2.3**

$$E(\lambda,T) = \frac{2hc^2}{\lambda^5} \times \frac{1}{e^{hc/\lambda kT} - 1}$$

where  $E(\lambda,T)$  is the power density ( $\text{ergs}/\text{cm}^2/\text{sec}$ ) as a function of wavelength  $\lambda$  and blackbody temperature  $T$ ,  
 $h$  is Planck's Constant =  $6.62606957 \times 10^{-27} \text{ ergs}\cdot\text{sec}$   
 $k$  is Boltzmann Constant =  $1.3806488 \times 10^{-16} \text{ ergs}/\text{K}$   
 $c$  is the speed of light =  $29,979,245,800 \text{ cm}/\text{sec}$   
 $T$  is the absolute temperature of the blackbody (K).

In order to determine the blackbody radiations from the human body and the Earth, Equation 8.22.2.3 was then applied to calculate energy emission (power density), which is in form of thermal radiation, by using  $T = 310.15\text{K}$  for human body and  $287\text{K}$  for the Earth. The blackbody radiation curves of the human body and the Earth were then plotted in relation to frequency (GHz) with the power density converted from  $\text{ergs}/\text{cm}^2/\text{sec}$  to  $\text{W}/\text{cm}^2$  (Figure 8.22.2.2).

**Figure 8.22.2.2: Blackbody radiation from the human body and the Earth**

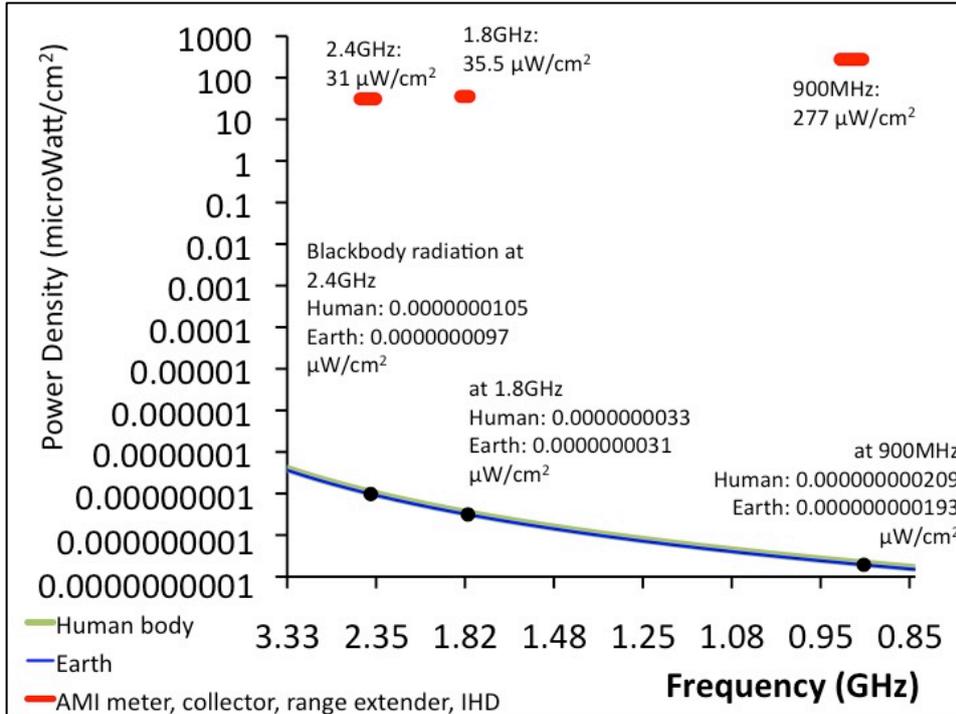


As can be seen from Figures 8.22.2.1 and 8.22.2.2, the human body and the Earth radiate energy in the Infrared frequency band (ca. 300GHz - 400,000 GHz). As this is the case, it may be considered misleading to compare the exposure levels of power density from thermal radiation (at peak frequencies of 32,087 GHz [the human body] and 29,692 GHz [the Earth]) with microwave radiation from RF-LAN, Zigbee, WiFi (frequencies 0.9 GHz and 2.4 GHz) and radio/TV radiation, as shown in

Figure 1 in the Appendix A, Technical Memorandum, of the Exponent report (Appendix C-5, page 45 of the application).

For a detailed comparison, the power densities should be compared at the same frequency (or wavelength). Figure 8.22.2.3 shows the power density ( $\mu\text{W}/\text{cm}^2$ ) emitted from the human body, the Sun and the Earth with those from: IHD (2.4 GHz\*); AMI meter (2.4 GHz\*, 900 MHz\*); collector (900 MHz\*, 1.7 MHz to 2.45 GHz, 1.8 GHz, 2.4 GHz\*); and range extender (900 MHz\*).

**Figure 8.22.2.3: Blackbody radiation from human body and the Earth compared with microwave radiation from the proposed emitters at 2.4GHz, 1.8GHz and 900MHz**



As can be seen from Figure 8.22.2.3, energy radiations from the proposed system can be as high as  $3 \times 10^9$  times the natural radiance emitted by the human body and the Earth at 2.4GHz,  $10^{10}$  times at 1.8Gz and billion-fold ( $10^{12}$ ) at 900 MHz.

Additionally, it should also be noted that peak power densities emitting at peak frequencies are likely to remain at the same levels at any duty cycle. In other words, the radiation at peak frequency is unaltered by the actual percentage of duty cycle. For example, peak power density at a peak frequency of 2.4 GHz provides the same value for peak power density at both a 5% duty cycle and a 2% duty cycle.

**8.22.3 What is the overall exposure from blackbody radiation?**

As explained above.

\* Obtained from the response to the CSTS IR1 Question 57.7 to ForticBC:

"What is the peak power density of the data signals?"

Peak power density is calculated at the FCC/IC specified distance of 20 cm during active transmission (and does not account for duty cycle):

- 900 MHz RF Mesh Radio: 0.227 mW/cm<sup>2</sup> [227  $\mu\text{W}/\text{cm}^2$ ]
- 2.4 GHz ZigBee Radio: 0.031 mW/cm<sup>2</sup> [31  $\mu\text{W}/\text{cm}^2$ ]

The proposed FortisBC AMI meters have 2 wireless interfaces, one that is used for meter to meter to collector communication (902-928 MHz) and one that can be used for home area network communications (2.4-2.4835 GHz) if desired by the customer.

**8.23** Dr. Jamieson states at p. 43 of his report:

“The switched mode power supply (SMPS) of smart meters can create high-frequency voltage transients (HFVT), in the 4-60 kHz range, on indoor wiring. Tests have shown that frequencies in this range, at intensities lesser than those measured on the wiring, can cause adverse health effects. This is discussed in detail elsewhere in this present section.”

What is the drop in exposure with distance?

Dr Jamieson has not had an opportunity to measure this. Consulting engineer Rob States M.S., P.E. has reported that because the HFVT are conducted in the power wiring, there is very little attenuation. Mr States notes that HFVT are found to intensify in corners of rooms and also in kitchens with reflective services.

It appears that the HFVT that are created will also be carried onto equipment such as plugged-in laptop computers. According to Mr States, one of the biggest issues is that if the device has a SMPS that operates on the same harmonic, the power lines can experience huge instantaneous current flow, which he claims may be destructive of devices in the home and a major contender for creating electrical fires.

**8.23.1** What is the exposure from an advanced meter mounted on the utility pole away from the residence?

This is question is very vague. It depends on where the pole is located, the height of the meter, its orientation, where the residence is located. The exposure will also vary depending in which part of the residence is being assessed, the materials used in its construction.

**8.24** Would Dr. Jamieson agree that his statement below (from p. 49 of Dr. Jamieson’s Report) would also apply to advanced meters and, if not, why not?

Many radiofrequency and microwave frequency signals can be excluded from the environments that individuals occupy through shielding, the types of building materials used, and the choice of using non RF/microwave emitting technologies. Biological effects have been observed with both natural and manmade fields.

Yes.

**8.25** Does Dr. Jamieson know if the measurements in the source he cites below (p. 49 of Dr. Jamieson’s Report) utilized precautions to exclude non-advanced meter induced transients on the power lines?

Answer not known at this time.

“Extensive measurements have demonstrated that all of the [smart] meters measured so far...emit noise on the customer’s electric wiring in the form of high frequency voltage spikes, typically with an amplitude of 2 volts, but a frequency anywhere from 4,000 Hertz, up to 60,000 Hz. The actual frequency of the phenomena is influenced by the devices that are plugged into the customer’s power. Some houses are much worse than others, and this observation has been confirmed by...installers that have talked to us,” – quote by engineer (Brangan & Heddle 2011).

Rob States reports that he has observed similar HFVT, and that those who are sensitives are very intolerant of exposure to such spikes and often get sick within hours of exposure. He additionally mentioned that he has measured HFVT up to 2MHz on home wiring.

**8.26** Would Dr. Jamieson expect based on his statement below (p. 61 of Dr. Jamieson’s Report) that the metal of the meter panel would also block and degrade wireless signals from the advanced meter and, if not, why not?

Signals from wireless HAN can be blocked or degraded by the presence of some types of building materials. In particular signals can often be blocked by foil-backed plasterboard (used in many buildings) and some types of foil-backed high thermal insulation. Wire mesh used in some old

buildings for plaster and lath work also blocks signals. Concrete and some dense building materials too can compromise signals. Signals can also be deliberately blocked by the use of particular materials and finishes by electrosensitives who attempt to screen themselves and their homes from RF/microwaves which they say can often make them feel unwell.

The signal would be degraded in some directions but not others. The metal of the meter panel would additionally be responsible for degrading the 2.4 GHz ZigBee radio signals (when operational) that are meant for communication with smart appliances, this would compromise their communication with RF/microwave emitting smart appliances – *higher frequency microwave signals (e.g. 2.4 GHz signals) are more readily degraded than lower frequency microwave signals (e.g. 900 MHz)*. It is known that both poor signal reception (black spots) and strong signal reception (hotspots) can arise within individual buildings even when non-intentionally shielded.

The degrading of the ZigBee signal may cause RF/microwave emitting smart technologies to be unable to contact the smart meters and make them continue to send out their electronic “calling cards” thereby raising exposures indoors (even in shielded environments) unless such emissions can be disabled. The use of wired connections would such problems and help address concerns that have been raised about increased involuntary 24/7 exposures to such radiation.

The issue of individuals wishing to be protected from RF/microwave emitting smart technologies, and also the RF/microwave emissions from the meters themselves when outside, also has to be addressed.

**8.27** Please provide any evidence that proves that FortisBC’s advanced meters do not comply with Health Canada Safety Code 6 (2009).

Evidence is supplied indicating that FortisBC advanced meters, in their presently proposed specification, may damage well-being, health and the environment and that they may potentially jeopardise Canada’s National Security and Energy Security and breach a number of human rights. Evidence is not supplied stating that they fail to comply with Health Canada Safety Code 6 (2009).