Auditor General Environmental Petition #456

Full C4ST Petition, Government of Canada Responses and Related Documents[1]

Title on the Auditor General Environmental Petition website[2]:

The Government of Canada's rigour and transparency in evaluating the science regarding localized exposures to 5G technologies in its update of Safety Code 6

Original title as submitted:

Concerns regarding the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies

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[1] Posted at https://c4st.org/ on December 2, 2021.

[2] Auditor General Environmental Petition # 456 – Abstract only. **The Government of Canada's rigour and transparency in evaluating the science regarding localized exposures to 5G technologies in its update of Safety Code 6.** https://www.oag-bvg.gc.ca/internet/English/pet_456_e_43873.html

June 18, 2021

Office of the Auditor General of Canada
240 Sparks Street
Ottawa, Ontario
K1A 0G6
Via email: petitions@oag-bvg.gc.ca

Attention: Petitions

Dear Commissioner,

I am hereby submitting a petition regarding radiofrequency/microwave radiation exposure and health of Canadians.

Sincerely,

Frank Clegg
CEO, Canadians for Safe Technology

Phone:

Environmental Petition
Name of petitioner(s) - Frank Clegg
Address of petitioner(s):
PO Box 33
Maple Grove Village Postal Outlet
Oakville, ON
L6J 7P5
Telephone number(s):
Email address: frank@c4st.org

Name of the group: Canadians for Safe Technology (C4ST)

I hereby submit this petition to the Auditor General of Canada under section 32 of the Auditor General Act.

Signature of the petitioner: 

Date: June 18, 2021

<u>Title of the Petition:</u> Concerns regarding the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies

We request responses from Health Canada and Innovation Science and Economic Development (ISED).

Possibly Relevant Acts: *Canada Consumer Product Safety Act, Canadian Environmental Protection Act, Canadian Human Rights Act, Clean Air Act, Department of Health Act, Department of Industry Act, Hazardous Products Act, Measurements Canada, Health Canada Act, Radiation Emitting Devices Act, Radiocommunications Act* and the *Standards Council of Canada*.

<u>Background</u>

In January 2021, Health Canada published the document ***Notice: Localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz***[1] and is referred to as "*Notice"* in this petition**.** These ranges are covered by Health Canada's ***Safety Code 6 (2015)*** which sets out recommended limits for human exposures to radiofrequency (RF) electromagnetic fields (EMF) in the frequency range from 3 kHz to 300 GHz.[2] These limits apply to exposure to radiofrequency (RF) radiation emitted by cell tower antennas, small cell antennas, cellphones , cordless phones, and Wi-Fi and Bluetooth devices such as tablets, laptops, baby monitors, wireless printers/keyboards/mice, gaming consoles, virtual reality headsets, wearables, "smart" appliances, and utility meters. Safety Code 6 (2015) recommends limits for whole-body exposures (at a distance from transmitters), but not for localized exposures to 6 GHz to 300 GHz. In 2013, to update Safety Code 6 (2009), Health Canada contracted the Royal Society of Canada to convene an expert panel to study and report on proposed revisions. Public hearings and consultations were held in 2013. A draft document was prepared, and then peer reviewed by three external experts. Although there were concerns raised about the

1 https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html
2 https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html

process Health Canada followed in 2013 through 2015,[3,4,5] there appears to be even less process and rigour to form a basis for the 2021 *Notice* document.

Safety Code 6 is published as a set of guidelines. Innovation, Science and Economic Development Canada (ISED) implements these guidelines as limits that the telecommunications and technology industries must meet in Canada to sell wireless devices, Wi-Fi routers and other devices to support this wireless equipment, and to operate cell antennas, e.g. on towers.

According to the *Notice* document, the recommended limits have been developed at the request of (ISED) in order to support the establishment of new compliance requirements for wireless devices that will operate in the frequency range 6 GHz to 300 GHz. These new localized human exposure limits are recommended in scenarios where wireless devices operating in this frequency range are held close to the body, such as smartphones and tablets, including some 5G-enabled devices.

Unlike the process for revision of Safety Code 6 (2009), resulting in Safety Code 6 (2015) noted above, the establishment of localized limits for 6 GHz to 300 GHz is a revision in the form of an update to the current Safety Code 6 (2015). These limits are of great significance to the protection of health of Canadians, because these limits will apply to devices that emit and receive millimetre wavelength modulated radiation. These novel, pulsed transmissions are becoming pervasive in Canadians' environments because of new technologies based on "5G" technologies, including the Internet of Things (IoT). It is estimated that by 2030 there will be, on average, more than 50 wireless devices per person on Earth.[6] As a "developed" country, this number will be even higher in Canada.

Upon request, the 2021 report underlying the new localized limits, **Analysis of recommended localized human exposure limits for radiofrequency fields in the frequency range, 6 GHz to 300 GHz** by Gajda et al., was obtained from Health Canada (*Analysis*). A "systematic review approach" was used to identify 10 studies on human responses to RFEMF (radiofrequency-electromagnetic fields). As described in the summary table (Table 4.1), outcomes assessed in these studies were limitedto temperature changes and pain sensations over exposure times measured in seconds. The *Analysis* report states: "No human studies were identified that assessed endpoints such as cancer, ocular effects, reproductive systems, cognitive effects, impacts on the immune system, non-specific symptoms or other adverse health outcomes in response to exposure to RFEMF in the 6-300 GHz frequency range."[7] This confirms peer-reviewed reports, that there has been no research on the health effects of long-term exposure to radiation covered by the *Notice*,[8,9] on humans or the natural environment.

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3 Webster, P. C. (2014). Federal Wi-Fi safety report is deeply flawed, say experts. *CMAJ: Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne*, 186(9), E300. https://doi.org/10.1503/cmaj.109-4785 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4050007/

4 Huh, N. Y. (2014, April 15). Canadian scientists urge more research into safety of wireless technology, saying recent report downgrades cancer risk. *National Post*. Retrieved from https://nationalpost.com/health/canadian-scientists-urge-more-research-into-safety-of-wireless-technology-saying-recent-report-downgrades-cancer-risk

5 Webster, P. C. (2015). Scientists decry Canada's outdated Wi-Fi safety rules. *Canadian Medical Association Journal*, 187(9), 639–640. https://doi.org/10.1503/cmaj.109-5061 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4467923/

6 Cisco projects 500 billion wireless, connected objects by 2030 https://www.cisco.com/c/dam/global/fr_fr/solutions/data-center-virtualization/big-data/solution-cisco-sas-edge-to-entreprise-iot.pdf and The UN projects a population of 8.5 billion people by 2030; https://www.un.org/sustainabledevelopment/blog/2015/07/un-projects-world-population-to-reach-8-5-billion-by-2030-driven-by-growth-in-developing-countries/

7 Ibid. Page 32.

8 US Senator Blumenthal Raises Concerns about 5G Wireless Technology Health Risks at Senate Hearing, Feb 6, 2019. https://www.youtube.com/watch?v=ekNC0J3xx1w&feature=youtu.be

9 Simko and Mattson. 2019. 5G Wireless Communication and Health Effects—A Pragmatic Review Based on Available Studies Regarding 6 to 100 GHz https://www.mdpi.com/1660-4601/16/18/3406/htm

It would be ethically challenging to conduct long term human research on anticipated exposures to pulsed RF radiation, which is why other evidence (*in vitro* and *in vivo*) including animal studies and cell and tissue studies are essential to inform risks. The World Health Organization's International Agency for Research on Cancer in its assessments on health outcomes uses not only human health studies, but also animal and cell and tissue studies.[10]

The Health Canada *Analysis* reports effects on rodents in laboratory research. It is unclear why these were given no weight, as 100% of the included studies found adverse effects on reproduction, and 60% of studies reported adverse biochemical effects (e.g., evidence of oxidative stress). These were then downgraded and given no weight through an opaque "Risk of Bias" assessment. This does not provide a sound scientific basis to increase substantially the exposure limit for novel radiation as exposures are escalating.

Radiation in the 6 GHz to 300 GHz will become prevalent in the environment; wildlife such as birds and insects do not maintain "safe distances" from antennas, and plants cannot evade harmful exposures (environmental effects of current RF radiation. Current RF radiation is known to be harmful to biota, and radiation energy from millimetre waves that is principally absorbed in a thinner outer layer may have disproportionately greater effects on small organisms such as insects.[11, 12, 13]

Questions:

1. Please provide clarification as to how this *Notice* relates to Safety Code 6; is it an update, addendum or formal revision? Also, please explain what notification and public consultation opportunities were given to the Canadian public about this *Notice*. How should the *Notice* document be cited?

2. What was the process and who were the firms, groups and individuals involved in peer review of the *Analysis* report? Was it peer-reviewed externally? If so, by whom and with what result? How should the Analysis document be cited? Will this report be posted on the Health Canada website? If not, what are the reasons?

3. The Health Canada *Analysis* reports effects on rodents in laboratory research. Why are these reports given no weight, as 100% of the included studies found adverse effects on reproduction, and 60% of studies reported adverse biochemical effects (e.g., evidence of oxidative stress). How can this provide a sound scientific basis to increase substantially the exposure limit for novel radiation as exposures are escalating?
4. Given the report "International Commission on Non-Ionizing Radiation Protection [ICNIRP]: Conflicts of interest, corporate interests and the push for 5G" commissioned, coordinated and published by two Members of the European Parliament[14] and other reports [15, 16, 17, 18] and analyses which challenge the

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10 World Health Organization (WHO)/International Agency for Research on Cancer (IARC). (2013). **IARC monographs on the evaluation of carcinogenic risks to humans. Non-ionizing radiation, Part 2: Radiofrequency electromagnetic fields**. IARC Press., 102, 1–406 of 462. Retrieved from http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf

11 Balmori, A. (2021). **Electromagnetic radiation as an emerging driver factor for the decline of insects**. Science of The Total Environment, 767, 144913. https://doi.org/10.1016/j.scitotenv.2020.144913

12 Friesen, M., & Havas, M. (2020). **Effects of Non-ionizing Electromagnetic Pollution on Invertebrates, Including Pollinators such as Honey Bees: What We Know, What We don't Know, and What We Need to Know**. In *Working Landscapes. Proceedings of the 12th Prairie Conservation and Endangered Species Conference, Danyluk (ed.). February 2019, Winnipeg, Manitoba..203 pages.* (pp. 127–138). Critical Wildlife Habitat Program, Winnipeg, Manitoba. http://pcesc.ca/media/45404/final-2019-pcesc-proceedings.pdf

13 Kumar, S., Singh, V. K., Nath, P., & Joshi, P. C. (2020). **An overview of anthropogenic electromagnetic radiations as risk to pollinators and pollination**. *Journal of Applied and Natural Science*, *12*(4), 675–681. https://doi.org/10.31018/jans.v12i4.2420

14 Buchner, Klaus and Michele Rivasi. **"The International Commission on Non-Ionizing Radiation Protection: Conflicts of Interest, Corporate Capture and the Push for 5G."** *This Report Was Commissioned, Coordinated and Published by*

validity and independence of ICNIRP, as well as influence of vested interests, how do Health Canada and other bodies justify dependence on, and harmonization with, ICNIRP recommendations?

5. There was a public consultation process in 2013 and 2014, as well as a Parliamentary Committee hearing in 2015 regarding Safety Code 6 (2015). Please detail the public notice and consultation process for this new revision of Safety Code 6 (2015). As well, how was input from independent experts and citizens solicited, how many comments were received, what was the content of these comments, and what are the Health Canada responses?

6. The *Notice* states that the ICNIRP guideline was subject to public consultation. The list of respondents to this consultation[19] includes a single submission from Health Canada encouraging use of a circular rather than square averaging area for exposure. No other Canadian submissions are evident among the mere 93 submissions made globally. Given that Canada has not previously aligned with ICNIRP, how was this consultation publicized as being relevant for Canadians?

7. Please explain the rationale for the Specific Absorption Rate (SAR) guidelines applying at and below 6 GHz, and localized power density limits precisely above 6 GHz. How do they overlap in applicability?

8. Safety Code 6 (2015) Table 6 indicates a limit of 10 W/m^2 for 1.5 GHz to 150 GHz. Please confirm whether the exposure limits for 6 GHz to 300 GHz have been changed for "uncontrolled environments" (i.e., for the general public; not occupational exposures).

9. Table 1 of the new localized human exposure limits *Notice* lists the limit for local absorbed power density for 6 GHz to 300 GHz to be 20 W/m^2. Please explain the scientific basis, including from the non-thermal bioeffects peer-reviewed literature, for the doubling of the exposure limit.

10. Table 2 has the "Uncontrolled Environment" exposure limits stated as a formula. Please provide the local incident power density [W/m^2] values for 6 GHz, 30 GHz, 60 GHz and 300 GHz.

11. What separation distance from the body is recommended by ISED and Health Canada for the public using devices that emit frequencies of millimetre wavelengths?

12. Why is there no consideration given to the effect of these frequencies on the natural environment in the *Notice*? If not a Health Canada responsibility, which department would this come under?

13. How is Environment and Climate Change Canada being notified, invited and engaged in review of biological and ecosystem impacts of millimetre wavelength radiofrequency radiation? Is it also

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Members of the European Parliament: Michèle Rivasi (Europe Écologie) and Klaus Buchner (Ökologisch-Demokratische Partei), and Financed by the Greens/EfAgroup in the European Parliament., June 2020, 98. https://klaus-buchner.eu/wp-content/uploads/2020/06/ICNIRP-report-FINAL-19-JUNE-2020.pdf.

15 Hardell, Lennart, and Michael Carlberg. **"Health Risks from Radiofrequency Radiation, Including 5G, Should Be Assessed by Experts with No Conflicts of Interest**." *Oncology Letters* 20, no. 4 (October 2020). https://doi.org/10.3892/ol.2020.11876.

16 Maisch D. "**Conflict of Interest and Bias in Health Advisory Committees: A Case Study of the WHO's EMF Task Group.**" *Journal of the Australasian College of Nutritional and Environmental Medicine* 21, no. 1 (2006): 15–17.

17 Cherry, Neil. (2002). "**Criticisms of the Health of the Health Assessment in the ICNIRP Guidelines for Radiofrequency and Microwave Radiation (100 KHz -300 GHz)**." *Associate Professor of Environmental Health. Human Sciences. Lincoln University Canterbury, New Zealand. Unpublished Report. Original Report to the Ministry of Health/Ministry for the Environment of New Zealand , January 31, 2000.* 149 pages. http://researcharchive.lincoln.ac.nz/bitstream/handle/10182/3933/90_m4_EMR_ICNIRP_critique_09-02.pdf;jsessionid=03799FE3B32369EDD1D0E954BDF827FC?sequence=1.

18 Slesin, Louis. "**The Lies Must Stop Disband ICNIRP. Facts Matter, Now More Than Ever**." Microwave News, April 7, 2020. https://microwavenews.com/news-center/time-clean-house

19 https://www.icnirp.org/excel/RFPCD_Amendments_and_Comments.html

examining energy and resources implications to sustainability and climate change, of use of various alternative technologies for telecommunications?

14. Given that Health Canada in its systematic review of the scientific literature,
    - Did not identify a single study on human health endpoints such as "cancer, ocular effects, reproductive systems, cognitive effects, impacts on the immune system, non-specific symptoms or other adverse health outcomes,"
    - Identified no animal studies that included life-time exposures to this radiation
    - Downplayed the effects on mammals in short term exposure studies
    - Excluded all non-mammalian animal studies
    - Excluded cell culture studies
    - Excluded articles in languages other than English or French
    - Excluded studies of co-exposures (Note that: RF radiation is used therapeutically to enhance drug effects; present day cell phone RF radiation exposure interacts with lead in affecting child behavior;[20] and RF radiation is a co-carcinogen that magnifies effects of a chemical carcinogen.[21])

    How can Health Canada ensure that these frequencies will not harm human health?

15. What precautionary approaches are proposed to prevent, limit and systematically monitor exposures and effects related to radiofrequency radiation, as exposures to this biologically active agent are increasing rapidly in frequency range, diversity and complexity, as well as total energy utilized?

20 Byun et al. "Mobile Phone Use, Blood Lead Levels, and Attention Deficit Hyperactivity Symptoms in Children: A Longitudinal Study." *PLOS ONE* 8, no. 3 (March 21, 2013): e59742. https://doi.org/10.1371/journal.pone.0059742.

21 Lerchl et al. "Tumor Promotion by Exposure to Radiofrequency Electromagnetic Fields below Exposure Limits for Humans." *Biochemical and Biophysical Research Communications* 459, no. 4 (April 17, 2015): 585–90. https://doi.org/10.1016/j.bbrc.2015.02.151.

Minister of Health

Ministre de la Santé

Ottawa, Canada K1A 0K9

Canadians for Safe Technology
c/o Mr. Frank Clegg
P.O. Box 33
Maple Grove Village Postal Outlet
Oakville, Ontario L6J 7P5
frank@c4st.org

Dear Mr. Clegg:

This letter is to acknowledge that, pursuant to section 22 of the *Auditor General Act*, on June 29, 2021, Health Canada received a copy of your Environmental Petition no. 456 regarding concerns about radiofrequency/microwave radiation exposure and the health of Canadians.

Please be assured that you will be sent a response to your petition within 120 days (October 27, 2021) of the date Health Canada received your petition, as required by section 22(3) of the Act.

Yours sincerely,

Hajdu, Patty

Digitally signed by Hajdu, Patty
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The Honourable Patty Hajdu, P.C., M.P.

c.c. Mr. Jerry V. DeMarco, Commissioner of the Environment and Sustainable Development, Office of the Auditor General of Canada
Dr. Stephen Lucas, Deputy Minister, Health Canada
Dr. Shelley Borys, Chief Audit Executive and Director General, Evaluation, Health Canada

Canada

Ministre de l'Environnement et
du Changement climatique

Minister of Environment
and Climate Change

Ottawa, Canada K1A 0H3

OCT 2 2 2021

Mr. Frank Clegg
Chief Executive Officer
Canadians for Safe Technology
P.O. Box 33, Maple Grove Village Postal Outlet
Oakville ON L6J 7P5
frank@c4st.org

Dear Mr. Clegg:

As Minister of Environment and Climate Change, I am writing in response to your Environmental Petition No. 456 to the Commissioner of the Environment and Sustainable Development, concerning the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies. Your petition was received in Environment and Climate Change Canada on June 30, 2021.

Environment and Climate Change Canada's mandate is to preserve and enhance the quality of the natural environment, including water, air, soil, flora and fauna; conserve Canada's renewable resources; conserve and protect Canada's water resources; forecast daily weather conditions and warnings, and provide detailed meteorological information to all of Canada; enforce rules relating to boundary waters; and co-ordinate environmental policies and programs for the federal government.

Enclosed you will find the response from Environment and Climate Change Canada to the petition questions that fall under its mandate. I understand that the Honourable Patty Hajdu, Minister of Health, and the Honourable François-Philippe Champagne, Minister of Innovation, Science and Industry, will be responding separately to the petition.

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I appreciate this opportunity to respond to your petition, and I trust that you will find this information helpful.

Sincerely,

The Honourable Jonathan Wilkinson, P.C., M.P.

Enclosure

c.c.: The Honourable Patty Hajdu, P.C., M.P.
The Honourable François-Philippe Champagne, P.C., M.P.
Mr. Jerry V. DeMarco, Commissioner of the Environment and Sustainable Development

Response to Environmental Petition No. 456 concerning the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies

Question 12: Why is there no consideration given to the effect of these frequencies on the natural environment in the *Notice*? If not a Health Canada responsibility, which department would this come under?

Response: Environment and Climate Change Canada is not conducting research and monitoring activities on the potential impact of radiofrequency/ microwave radiation exposure to biota to inform Health Canada or other regulatory organizations.

Question 13: How is Environment and Climate Change Canada being notified, invited and engaged in review of biological and ecosystem impacts of millimetre wavelength radiofrequency radiation? Is it also examining energy and resources implications to sustainability and climate change, of use of various alternative technologies for telecommunications?

Response: Environment and Climate Change Canada does not receive notifications or invitations, and is not usually engaged in review of biological and ecosystem impacts of millimetre wavelength radiofrequency radiation.

The Department is not examining energy and resources implications to sustainability and climate change from the use of various alternative technologies for telecommunications.

Minister of Health

Ministre de la Santé

Ottawa, Canada K1A 0K9

Canadians for Safe Technology
c/o Mr. Frank Clegg
P.O. Box 33
Maple Grove Village Postal Outlet
Oakville, Ontario L6J 7P5
frank@c4st.org

Dear Mr. Clegg:

This letter is in response to your environmental petition no. 0456 of June 18, 2021, addressed to Mr. Jerry V. DeMarco, Commissioner of the Environment and Sustainable Development.

In your petition, you raised questions regarding the Government of Canada's rigour and transparency in its scientific evaluation to support the recommended localized exposure limits published in a Notice in January 2021.

Health Canada's mandate includes protecting the people of Canada from human exposure to radiofrequency electromagnetic fields by developing exposure guidelines, known as Safety Code 6. The Department's recommended limits are among the most stringent science-based limits in the world, and they are consistent with the science-based standards used in other countries. The new recommended localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz found in the January 2021 Notice complement the limits already set out in Safety Code 6 by addressing new exposure scenarios.

Please find attached the responses to questions 1 to 10, 14 and 15. I understand that the Honourable François-Philippe Champagne, Minister of Innovation, Science and Industry, and the Honourable Jonathan Wilkinson, Minister of Environment and Climate Change, will address the questions relevant to their mandates.

I appreciate your interest in this important matter. Please accept my best wishes.

.../2

Canada

Yours sincerely,

Hajdu, Patty

Digitally signed by Hajdu, Patty
DN: C=CA, O=GC, OU=HC-SC, CN="Hajdu, Patty"
Reason: I am the author of this document
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Date: 2021.10.22 18:37:32-04'00'
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The Honourable Patty Hajdu, P.C., M.P.

Attachment

c.c. The Honourable Jonathan Wilkinson, P.C., M.P.
The Honourable François-Philippe Champagne, P.C., M.P.
Mr. Jerry V. DeMarco, Commissioner of the Environment and Sustainable Development, Office of the Auditor General of Canada
Dr. Shelley Borys, Chief Audit Executive and Director General, Evaluation, Public Health Agency of Canada

Petition #456 - Concerns regarding the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies
HC, ECCC, ISED

Questions	Lead	Comments
1. Please provide clarification as to how this *Notice* relates to Safety Code 6; is it an update, addendum or formal revision? Also, please explain what notification and public consultation opportunities were given to the Canadian public about this *Notice*. How should the *Notice* document be cited?	**HC** Input from ISED	The new recommended localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz found in the January 2021 Notice complement the limits already set out in Safety Code 6 by addressing new exposure scenarios. Safety Code 6 (2015) has not been revised and continues to be protective of human health. Given that technologies are advancing rapidly, the Preface of Safety Code 6 anticipates that interpretation may be required by Health Canada scientists to address new exposure scenarios. The current exposure limits for the frequencies above 6 GHz found in Safety Code 6 were developed for whole-body exposure situations, such as those from antenna towers. Safety Code 6 does not specify limits for *localized* exposures (i.e., close contact) in the range of 6 GHz to 300 GHz as these frequencies were not previously used in sources (e.g., wireless devices) that operated close to the body. Innovation Science Economic Development Canada (ISED) requested Health Canada's recommendation on localized exposure limits above 6 GHz to support the establishment of new compliance requirements for wireless devices that will operate close to the body in this frequency range. Health Canada notified the public of the recommended localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz through the January 2021 Notice. The Notice aims to (1) communicate the recommended localized human exposure limits for this frequency range and (2) outline the methodology and findings of Health Canada's approach for developing these recommendations. While there is no legislative requirement to publish a notice, Health Canada did so to ensure transparency. Furthermore, when ISED adopted the recommended localized exposure limits above 6 GHz set forth in Health Canada's Notice as part of its Radio Standard Specification, it published a notice of this adoption in the *Canada Gazette*, Part I in February 2021 and invited public comments and suggestions for improving this standard: https://gazette.gc.ca/rp-pr/p1/2021/2021-02-13/html/notice-avis-eng.html#nb3. The Notice can be cited as a webpage: https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html.
2. What was the process and who were the firms, groups and individuals involved in peer review of the Analysis report? Was it peer-reviewed	**HC**	Due to its technical nature and length, the full Analysis Report is made available to the public upon request. The Executive Summary of the Analysis is posted on Canada.ca. The Executive Summary can be cited as a webpage:

Petition #456 - Concerns regarding the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies
HC, ECCC, ISED

externally? If so, by whom and with what result? How should the Analysis document be cited? Will this report be posted on the Health Canada website? If not, what are the reasons?		(EN) https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz/executive-summary.html (FR) https://www.canada.ca/fr/sante-canada/services/securite-et-risque-pour-sante/radiation/categories-sources/champ-radiofrequences/avis-limites-exposition-humaine-localisee-gamme-6-ghz-300-ghz/sommaire-executif.html The novel computational model employed in the Analysis document was previously published in a peer-reviewed journal: https://journals.lww.com/health-physics/fulltext/2019/09000/model_of_steady_state_temperature_rise_in.4.aspx.
3. The Health Canada *Analysis* reports effects on rodents in laboratory research. Why are these reports given no weight, as 100% of the included studies found adverse effects on reproduction, and 60% of studies reported adverse biochemical effects (e.g., evidence of oxidative stress). How can this provide a sound scientific basis to increase substantially the exposure limit for novel radiation as exposures are escalating?	**HC**	There were only eight studies found that examined reproductive effects of radiofrequency (RF) electromagnetic field (EMF) exposure in the 6 GHz to 300 GHz frequency range. All of these studies were considered but found to have critical deficiencies related to insufficient exposure characterization, inadequate blinding for endpoint assessment, or lack of inferential statistics. Based upon a risk-of-bias analysis, which found all of these studies to have a "probably high" or "high" risk-of-bias rating, the evidence base for reproductive effects was downgraded by two levels to "low" quality of evidence. As such, this evidence was determined to be of insufficient quality for the derivation of localized human exposure limits for RF-EMF in the 6 GHz to 300 GHz frequency range. Furthermore, the recommended localized exposure limits in the Notice provide additional protection to human health by incorporating a tenfold safety margin, meaning they are ten times lower than the level of exposure that could lead to a heat-pain sensation.
4. Given the report "International Commission on Non-Ionizing Radiation Protection [ICNIRP]: Conflicts of interest, corporate interests and the push for 5G" commissioned,		Health Canada conducted its own independent analysis of the scientific literature and its own numerical modelling of temperature responses resulting from localized RF-EMF exposure in the 6 GHz to 300 GHz frequency range to form its conclusions. Based on this analysis, which incorporated a number of worst-case assumptions that are built into Health Canada's computational modelling, Health Canada determined that application of the ICNIRP limits is justified when certain modifications are made to address a wider range of exposure scenarios. These modifications would further restrict maximal localized tissue temperature

coordinated and published by two Members of the European Parliament and other reports and analyses which challenge the validity and independence of ICNIRP, as well as influence of vested interests, how do Health Canada and other bodies justify dependence on, and harmonization with, ICNIRP recommendations?	**HC**	increases to levels that are below the thresholds for heat-pain sensation or thermal tissue damage.
5. There was a public consultation process in 2013 and 2014, as well as a Parliamentary Committee hearing in 2015 regarding Safety Code 6 (2015). Please detail the public notice and consultation process for this new revision of Safety Code 6 (2015). As well, how was input from independent experts and citizens solicited, how many comments were received, what was the content of these comments, and what are the Health Canada responses?	**HC**	See responses to Questions 1 and 2.
6. The *Notice* states that the ICNIRP guideline was subject to public consultation. The list	**HC**	The ICNIRP is an independent non-profit organization and conducts its own consultations. Health Canada does not publicize the consultation processes of other external organizations.

of respondents to this consultation includes a single submission from Health Canada encouraging use of a circular rather than square averaging area for exposure. No other Canadian submissions are evident among the mere 93 submissions made globally. Given that Canada has not previously aligned with ICNIRP, how was this consultation publicized as being relevant for Canadians?		
7. Please explain the rationale for the Specific Absorption Rate (SAR) guidelines applying at and below 6 GHz, and localized power density limits precisely above 6 GHz. How do they overlap in applicability?	**HC**	The Specific Absorption Rate (SAR) is a measure of the amount of power being absorbed in a given *volume* of human tissue from a source RF-EMF. This quantity is specified in Watts (absorbed power) per kilogram (of exposed tissue volume) and is indicative of the thermal response (temperature elevation) that can result in a human body from exposures to EMF. At frequencies higher than 6 GHz, the penetration depth of the absorbed SAR from an EMF source is very shallow and therefore, for exposure assessment purposes, it becomes more appropriate to assess exposures to an *area*. As such, the use of the absorbed power density, specified in Watts (absorbed power) per unit surface area in m^2 (of exposed skin surface) is a better indicator of the thermal response (temperature elevation) for higher frequencies.
8. Safety Code 6 (2015) Table 6 indicates a limit of 10 W/m2 for 1.5 GHz to 150 GHz. Please confirm whether the exposure limits for 6 GHz to 300 GHz have been changed for "uncontrolled environments" (i.e., for the general public;	**HC**	Safety Code 6 (2015) Table 5 indicates a power density limit for uncontrolled environment (or general public) of 10 W/m^2 for frequency between 6 GHz to 150 GHz and a limit that slowly increases from 10 W/m^2 to 20 W/m^2 between 150 GHz up to 300 GHz. These reference levels for frequencies above 6 GHz were developed for whole-body exposure situations, such as those from antenna towers, and have not changed. Safety Code 6 does not specify limits for localized exposures (i.e., close contact) in this frequency range as these frequencies have not previously been used in sources operated close to the body (e.g., wireless devices). Future technologies operating at frequencies above 6 GHz will be held close to the body when used; therefore, Health Canada has determined that these types of exposure scenarios would be better addressed through the application of localized exposure limits.

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not occupational exposures).		The current whole-body exposure limits in Safety Code 6 can be applied to a localized exposure but using the whole-body limit is overly conservative when only a small part of the body is exposed. The new localized limits that are recommended complement the limits that are already specified in Safety Code 6 and are more appropriate for this new exposure scenario.
9. Table 1 of the new localized human exposure limits *Notice* lists the limit for local absorbed power density for 6 GHz to 300 GHz to be 20 W/m2. Please explain the scientific basis, including from the non-thermal bioeffects peer-reviewed literature, for the doubling of the exposure limit.	**HC**	The scientific basis for the recommended localized human exposure limits for frequencies in the 6 GHz to 300 GHz frequency range is outlined in Health Canada's internal analysis document. An Executive Summary of this document is available online at: (EN) https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz/executive-summary.html (FR) https://www.canada.ca/fr/sante-canada/services/securite-et-risque-pour-sante/radiation/categories-sources/champ-radiofrequences/avis-limites-exposition-humaine-localisee-gamme-6-ghz-300-ghz/sommaire-executif.html It appears that you already have a copy of the internal analysis document given the reference you made in the question. Should it not be the case, a request can be made to ccrpb-pcrpcc@hc-sc.gc.ca to obtain a copy.
10. Table 2 has the "Uncontrolled Environment" exposure limits stated as a formula. Please provide the local incident power density [W/m2] values for 6 GHz, 30 GHz, 60 GHz and 300 GHz.	**HC**	The second table found in the Executive Summary indicates the following formula ($55/f_G^{0.177}$) to specify the reference level for uncontrolled environment (or general public) applicable to localized exposures in terms of local incident power density. This formula yields the following power density values: • 40 W/m^2 at 6 GHz • 30 W/m^2 at 30 GHz • 26.6 W/m^2 at 60 GHz and 20 W/m^2 at 300 GHz.
11. What separation distance from the body is recommended by ISED and Health Canada for the public using devices that emit frequencies of millimetre wavelengths?	**ISED** Input from HC	Health Canada's recommendations are not device-specific but instead relate to human RF exposure limits regardless of the distance of a device from the body. ISED will be providing an additional response to this question.

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12. Why is there no consideration given to the effect of these frequencies on the natural environment in the *Notice*? If not a Health Canada responsibility, which department would this come under?	**ECCC** Input from HC	Health Canada's mandate regarding exposures to RF-EMF relates to effects on human health only. Environmental effects (including plants, animals) are outside the scope of Health Canada's research/mandate. ECCC will be providing a response to this question.
13. How is Environment and Climate Change Canada being notified, invited and engaged in review of biological and ecosystem impacts of millimetre wavelength radiofrequency radiation? Is it also examining energy and resources implications to sustainability and climate change, of use of various alternative technologies for telecommunications?	**ECCC**	ECCC will be providing a response to this question.
14. Given that Health Canada in its systematic review of the scientific literature, • Did not identify a single study on human health endpoints such as "cancer, ocular effects, reproductive systems,	**HC**	Health Canada's assessment of potential adverse health effects from RF-EMF was based on a systematic analysis of all currently available relevant literature in the frequency range between 6 GHz and 300 GHz. Further, study quality was evaluated based on a clearly defined set of criteria. Health Canada will continue to monitor and analyze all relevant scientific literature related to the health effects of RF-EMF exposure. If new scientific evidence were to show that exposure to RF-EMF below the levels recommended by Health Canada poses a risk, the Government of Canada would take steps to protect the health of Canadians.

cognitive effects, impacts on the immune system, non-specific symptoms or other adverse health outcomes," • Identified no animal studies that included life-time exposures to this radiation • Downplayed the effects on mammals in short term exposure studies • Excluded all non-mammalian animal studies • Excluded cell culture studies • Excluded articles in languages other than English or French • Excluded studies of co-exposures (Note that: RF radiation is used therapeutically to enhance drug effects; present day cell phone RF		

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radiation exposure interacts with lead in affecting child behavior; and RF radiation is a co-carcinogen that magnifies effects of a chemical carcinogen.) How can Health Canada ensure that these frequencies will not harm human health?		
15. What precautionary approaches are proposed to prevent, limit and systematically monitor exposures and effects related to radiofrequency radiation, as exposures to this biologically active agent are increasing rapidly in frequency range, diversity and complexity, as well as total energy utilized?	**HC** **ISED**	The recommended human exposure limits to RF-EMF found in the 2020 ICNIRP Guidelines were set conservatively for the general public by including a tenfold safety margin to account for scientific uncertainty, thermal physiology variations across the population and a variety of exposure scenarios. Health Canada's analysis of the ICNIRP Guidelines used numerical modelling to verify the conservativeness of the ICNIRP limits and incorporated additional extreme worst-case exposure scenarios. This analysis led Health Canada to recommend modifications to how these ICNIRP limits are applied to further restrict human exposure levels. Therefore, the combination of ICNIRP's safety margin with Health Canada's recommendations to use spatial peak values instead of spatial averaging for high frequency exposures are precautionary approaches that further limit human exposures and protect against potential adverse health effects in humans from exposures to radiofrequency radiation. ISED will be providing an additional response to this question.

Minister of Innovation,
Science and Industry

Ministre de l'Innovation,
des Sciences et de l'Industrie

Ottawa, Canada K1A 0H5

October 26, 2021

Mr. Frank Clegg
Canadians for Safe Technology
P.O. Box 33, Maple Grove Village Postal Outlet
Oakville, Ontario L6J 7P5

Dear Mr. Clegg:

I am writing with respect to Environmental Petition no. 456, submitted to the Auditor General of Canada pursuant to section 22 of the *Auditor General Act*, on "Concerns regarding the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies."

The Office of the Auditor General of Canada forwarded your questions to the Honourable Patty Hajdu, Minister of Health, the Honourable Jonathan Wilkinson, Minister of Environment and Climate Change, and me. The enclosed response addresses questions 11 and 15, which fall under Innovation, Science and Economic Development Canada's mandate and responsibility. My colleagues will be responding separately to address their respecting areas or responsibilities.

I appreciate this opportunity to respond to your petition and trust that this information is of assistance.

Sincerely,

The Honourable François-Philippe Champagne, P.C., M.P.

Enclosure

c.c.: The Honourable Patty Hajdu, P.C., M.P.
The Honourable Jonathan Wilkinson, P.C., M.P.
Mr. Jerry V. DeMarco
Commissioner of the Environment
and Sustainable Development

Canada

Response to Environmental Petition No. 456 concerning the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies

Question 11: **What separation distance from the body is recommended by ISED and Health Canada for the public using devices that emit frequencies of millimetre wavelengths?**

Health Canada's Safety Code 6 establishes exposure limits that are far below the threshold for potential adverse health effects to protect Canadians from overexposure to radiofrequencies from various wireless devices and antenna installations.

Health Canada's recommendations are not device-specific, but instead relate to human exposure limits regardless of the separation distance of a device from the body.

ISED, in enforcing the *Radiocommunication Act* and its regulations, requires that all wireless devices sold in Canada comply with Radio Frequency (RF) exposure limits. In our market surveillance activities, we test devices to ensure compliance with these limits using testing methodologies which are based on consensus within the international scientific community. More specifically, ISED works closely with international standardization bodies such as the International Electrotechnical Commission (IEC) and the Institute of Electrical and Electronics Engineers (IEEE) to establish reliable and repeatable test methodologies for wireless devices based on comprehensive scientific research and analysis.

When ISED becomes aware of a wireless device with exposure levels exceeding the established safety limits, the department takes immediate action to protect Canadians.

In Canada, portable devices operating in millimetre wavelength bands must be tested in accordance with RSS-102[1] and SPR-003[2], which incorporate the relevant international standards and procedures adopted by ISED.

Finally, under domestic regulatory requirements, wireless device manufacturers must provide information to users on the minimum compliance distance to maintain between the device and the body. When manufacturers are testing their devices for compliance, or when ISED carries out market surveillance tests, the following separation distances are utilized:

- 0 mm when evaluating RF exposure to the head and limbs
- 15 mm (or less) when evaluating RF exposure in body-worn applications

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[1] RSS-102 — Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) - Spectrum management and telecommunications (http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01904.html).
[2] SPR-003 - Supplementary Procedure for Assessing Radio Frequency Exposure Compliance of Portable Devices Operating in the 60 GHz Frequency Band (57-71 GHz) - Spectrum management and telecommunications (http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11588.html).

Question 15 : **What precautionary approaches are proposed to prevent, limit and systematically monitor exposures and effects related to radiofrequency radiation, as exposures to this biologically active agent are increasing rapidly in frequency range, diversity and complexity, as well as total energy utilized?**

ISED's regulatory framework, including market surveillance, compliance audits and enforcement procedures, provides safeguards to protect Canadians against overexposure from wireless devices and antenna installations.

Wireless devices must meet the RF exposure requirements (Health Canada's Safety Code 6) at all times and be certified before they can be sold in Canada. Anyone who manufactures, imports, distributes, sells or leases wireless devices in Canada must comply with ISED's regulations.

ISED also maintains a market surveillance program, which audits and evaluates a sampling of wireless devices currently on the Canadian market on an ongoing basis. The market surveillance program helps to ensure that wireless devices available to Canadians continue to meet the RF exposure requirements.

Antenna installations must also meet RF exposure requirements. ISED routinely audits these installations to make sure they comply with Safety Code 6 limits.

When ISED becomes aware of a wireless device with exposure levels exceeding the established safety limits, the department takes immediate action to protect Canadians.