Medical Disclaimer: The information provided is not intended to be a substitute for professional medical advice. Always consult with your medical practitioner.

Survey Address
Bishops College
Campground Rd
Rondebosch

Date of survey: 15/10/20
Date of report: 22/10/2020
Contact Persons.
Sally Bowes, ICT Director
Ziyaad Fataar, Technical Manager

Background
Due to expressed concerns by some parents, Bishops College contacted EMFSA with a request to evaluate the radiofrequency radiation levels in certain classrooms.

Mrs. Bowes explained the practicalities of making use of available technology-
"Bishops runs a 1-1 laptop programme, laptops at the College and iPads from Grade 4 at the Prep school. In the junior grades, prior to Grade 4 there is WiFi in the teachers' classrooms and they also have a PC, connected via ethernet, an electronic whiteboard and an iPad but the children don't have devices.

All Access Points are a combination of Cisco 3702 and 3802 and are managed by a Cisco enterprise wireless controller. The enterprise controller has automated transmit power controls that allows each wireless access point to independently reduce the power sent to its antennas based on the room size and usage conditions. The classrooms each have one Cisco AP mounted on the ceiling. That AP gets power over ethernet from the switch cabinet. All switch cabinets are in secure, locked locations in independent venues that learners have no access to. Classrooms are wired to support laptop AC adapters, should the learners need to recharge their devices. All learners are required to bring either a Dell latitude or Apple laptop. The average number of learners per class is 25.

Mr. Fataar explained the power control of the wireless system:
"The power is turned down on all the Access Points in the PrePrep. The Aps in the classroom that had a full complement of children were also in the low range. The Controller will never allow more power than necessary as that's it's job – it manages the output. That was why the school requested that the testing was done in a maximum use classroom situation. The Controller also allows us to manage APs and they are on settings"

that only make them active during the hours we choose. That is already in place. i.e. it allows us to dictate what is/is not, teaching time"

The Survey

General

Due to the intrusive nature of this type of survey in an active educational environment we decided not to use our spectrum analyzer with directional antenna but simply take measurements with our broadband meter, EMFields Acoustimeter AM10 (200mHz - 8000mHz, with electric field peak hold up to 6V/m and power density average from 1 - 100 000 microwatts per metre squared).

The AM10 enables us to (as quickly as the wi-fi system shut down and reboot would allow) differentiate between the radiation levels of the on and off states of the router.

In only one classroom did we ask the learners to switch on their devices so that we could record the total radiation levels at each of the 5 measuring points in the room. In all other rooms we simply measured the on & off states of the router.

Routers were generally placed centrally in the room and the ceiling height allowed for majority line-of-sight between router and devices.

Measurements.

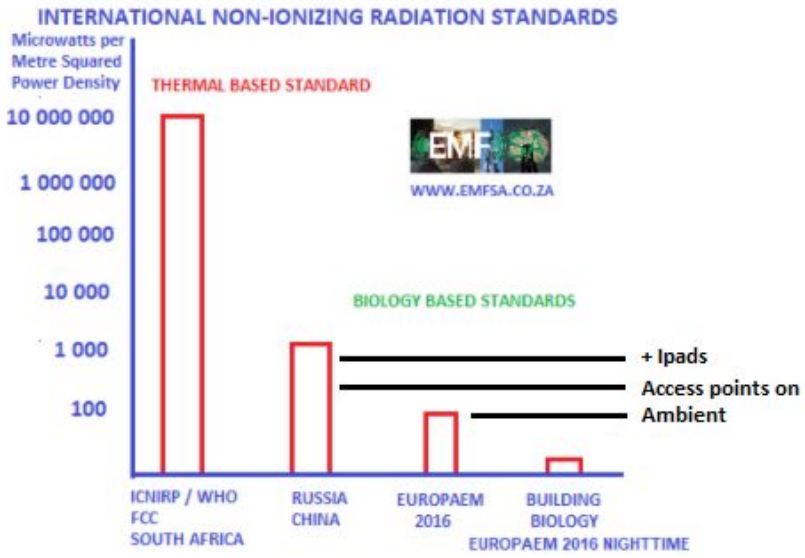
Except for Richard Goedhals' classroom (grade 4), two measurements were read from the meter for each location, and the first number shown is peak electric field in Volts per meter and the second is the average power density in microwatts per metre squared. Each has a different role to play with regard to any potential biological effects. Variables may include other internal devices activating at the reading moment and external sources but a general idea of the exposure levels can be reasonably extracted from the following:

Room	Status - Wi-fi	Front Right	Front Left	Central	Rear Right	Left Rear
Prep Richard	Off	0.62 / 100	1.06 / 250	1.8 / 500	1.2 / 250	1.74 / 500
"	On	0.68 / 100	1.2 / 500	2.33 / 1000	1.52 / 500	1.77/ 500
"	I-pads on	0.79 / 500	1.38 / 500	2.9 / 1000	2.0 / 1000	2.18 / 1000
Library	Off	0.46 / 50	1.08 / 100	0.63 / 50	0.82 / 100	0.39 / 100
"	On	0.6 /100	0.7 / 100	0.56 / 50	0.89 / 100	0.37 / 25
Pre-Prep Grade 2	Off	0.59 / 50	0.63 / 50	0.62 / 50	0.64 / 50	1.55 / 100
"	On	2.38 / 100	2.64 / 100	3.55 / 250	2.74 / 100	3.14 / 250
J1	Off	0.5 . 1	0.34 / 5	0.41/1	0.39 / 1	0.5 / 5
"	On	0.62 / 25	0.68 / 50	0.47 / 25	0.74 / 25	0.59/25
Science Classroom	Off	Not Accessible	0.11 / 1.0	Central Rear 0.42 / 1.0	0.3 / 5	0.12 / 1
"	On	Not Accessible	0.41 / 50	Central Rear 1.2 / 100	1.06 / 100	0.38 / 10

The peak readings are important but to maintain simplicity this can be explained separately if requested.
Average power density readings allow us to compare with various international standards.
We compared the power density levels as follows-

1. All off
2. Access point on
3. In the case of Richard Goedhals Grade 4- With both access point and iPads on

The above can be more easily understood by the following bar graph.



In short, the average ambient levels are approximately level with the Europaem 2016 recommendations while under full operational conditions the levels are higher but:
As per the explanation by Mr Fataar the levels measured were the maximum possible and not necessarily the actual levels at any particular time.

Note. Peak readings can be affected by other devices such as cell phones. Average power density is therefore used for comparison with the various standards.
We prefer to compare our readings to the European Academy of Environmental Medicine publication Europaem 2016, Table 3
[https://www.emfsa.co.za/wp-content/uploads/2016/10/Reviews-on-Environmental-Health-EUROPAEM-EMF-Guideline-2016-for-the-prevention-diagnosis-and-treatment-of-EMF-related-health-problems-and-illnesses.pdf
This publication consists of over 30 pages of valuable information from over 300 sources.

Table 3

EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses

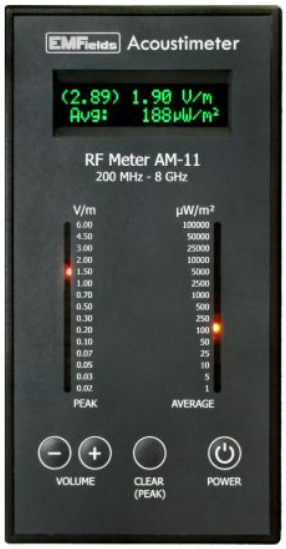
Table 3: Precautionary guidance values for radio-frequency radiation.

RF source Max Peak/ Peak Hold	Daytime exposure	Nighttime exposure	Sensitive populations[12]
Radio broadcast (FM)	10,000 µW/m²	1000 µW/m²	100 µW/m²
TETRA	1000 µW/m²	100 µW/m²	10 µW/m²
DVBT	1000 µW/m²	100 µW/m²	10 µW/m²
GSM (2G) 900/1800 MHz	100 µW/m²	10 µW/m²	1 µW/m²
DECT (cordless phone)	100 µW/m²	10 µW/m²	1 µW/m²
UMTS (3G)	100 µW/m²	10 µW/m²	1 µW/m²
LTE (4G)	100 µW/m²	10 µW/m²	1 µW/m²
5G? GPRS (2.5G) with PTCCH' (8.33 Hz pulsing)	10 µW/m²	1 µW/m²	0.1 µW/m²
DAB+ (10.4 Hz pulsing)	10 µW/m²	1 µW/m²	0.1 µW/m²
Wi-Fi 2.4/5.6 GHz (10 Hz pulsing)	10 µW/m²	1 µW/m²	0.1 µW/m²

Table 3 recommended limits for 4hrs or more daily exposure is based on the biological effect of the modulation type used, FM being deemed the safest and Wi-Fi the most biologically aggressive.
5G being an unknown quantity, we have suggested where it might fit in this table.

From the bar graph we can see that the average ambient [a combination of incoming radiation levels and personal devices] is already at the maximum of the Table 3 recommendations. This is no different than in many other locations in any suburb.
It is however significant that all measurements fall within the biology based standards.

Thank you for your order for the new EMFields AM11 meter. This will enable the school to demonstrate exact levels of radiation at any time and its commitment to the A.L.A.R.A. Principle, [As Low As Reasonably Achievable].



Also congratulations to yourself and Mr Fataar on successfully completing the RF field Testing Basics 101 radiation measurement training and certification with Keysight Technologies.

In conclusion, our professional opinion is that Bishops is following the A.L.A.R.A. Principle, [As Low As Reasonably Achievable]. There is every indication that the school is doing everything that they can to continue to provide the WiFi necessary for the educational programme, in as safe an environment as allows. The installation and management of the WiFi is not something that we are able to suggest improvements to.
In fact, all the readings are lower than we would find in most households.

Broader issues regarding the electro-magnetic radiation spectrum
We recommend that the school further consults with us and our associate Mr James Lech in order to provide solutions to address the general EMF and light environment to improve the well being of the students in accordance with the latest and ongoing research which Mr Lech is conducting in Holland supported by the Dutch and South African Governments. We suggest an initial webinar consultation with Mr Lech, details on request.

Report compiled by Dave Miles

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