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September 22, 2017

Joe Tymecki, CPBE
Director of Technology and Engineering
Vermont Public Radio
365 Troy Avenue; Colchester, VT 05446

**RE: THE EVALUATION OF COMPLIANCE WITH FCC REGULATIONS FOR HUMAN EXPOSURE TO RADIO-FREQUENCY (RF) ELECTROMAGNETIC FIELDS ATOP MOUNT MANSFIELD IN STOWE, VT.**

## PURPOSE

I have reviewed previous information pertinent to the existing installation at the above location. The methods of regulatory compliance determination consisted of observations and radiation hazard assessment as it pertains to established safety levels with respect to personnel using radio-frequency (RF) field measurements. The physical conditions are that several towers hosting various antennas are installed atop Mt. Mansfield in Stowe, VT. The relative coordinates for the two main locations of towers are as follows: latitude 44° 31' 32' North, longitude -72° 48' 58" West; latitude 44° 31' 33" North, longitude -72° 48' 57" West. The measured values of power density are presented as a percent of current Maximum Permissible Exposures (%MPE) as adopted by the Federal Communications Commission (FCC) [i,ii] (<100% MPE signifies an acceptable amount).

## SUMMARY


RF field measurements indicate that ambient RF field levels in generally accessible areas near the towers atop Mt. Mansfield in Stowe, VT are below established Federal guidelines for RF exposure to members of the public. These field measurements indicate there is no need for RF precautionary postings in this area, with the exception of the towers themselves. These RF field measurements are accurate and were performed in accordance with the directives and guidelines outlined by ANSI C95 documents and specified by the FCC.

Based on my extensive experience with broadcast facilities, and the RF fields I have measured, it is my expert opinion that this facility complies with all applicable Federal regulations regarding limits of RF exposure to members of the public.


**Note:** The analyses, conclusions and professional opinions are based upon the precise parameters and conditions of this particular site; Mt. Mansfield in Stowe, VT. Utilization of these analyses, conclusions and professional opinions for any personal wireless services installation, existing or proposed, other than the aforementioned has not been sanctioned by the author, and therefore should not be accepted as evidence of regulatory compliance.

## EXPOSURE LIMITS AND GUIDELINES

RF exposure guidelines enforced by the FCC were established by the American National Standards Institute (ANSI) [iii] and the National Council on Radiation Protection and Measurement (NCRP).[iv] The RF exposure guidelines are listed for RF workers and members of the public. The applicable FCC RF exposure guidelines for the public are listed in Table 1, and depicted in Figure 1. All listed values are intended to be averaged over any contiguous 30 minute period.

**Table 1: Maximum Permissible Exposure (MPE) Values in Public Areas**

| Frequency Bands | Maximum Permissible Exposure (MPE) | | |
|---|---|---|---|
| | Electric Fields | Magnetic Fields | Equivalent Power Density |
| 0.3 – 1.34 MHz | 614 (V/m) | 1.63 (A/m) | (100) mW/cm$^2$ |
| 1.34 - 30 MHz | 824/$f$ (V/m) | 2.19/$f$ (A/m) | (100) mW/cm$^2$ |
| 30 - 300 MHz | 27.5 (V/m) | 0.073 (A/m) | 0.2 mW/cm$^2$ |
| 300 - 1500 MHz | -- | -- | $f$/1500 mW/cm$^2$ |
| 1500 - 100,000 | -- | -- | 1.0 mW/cm$^2$ |

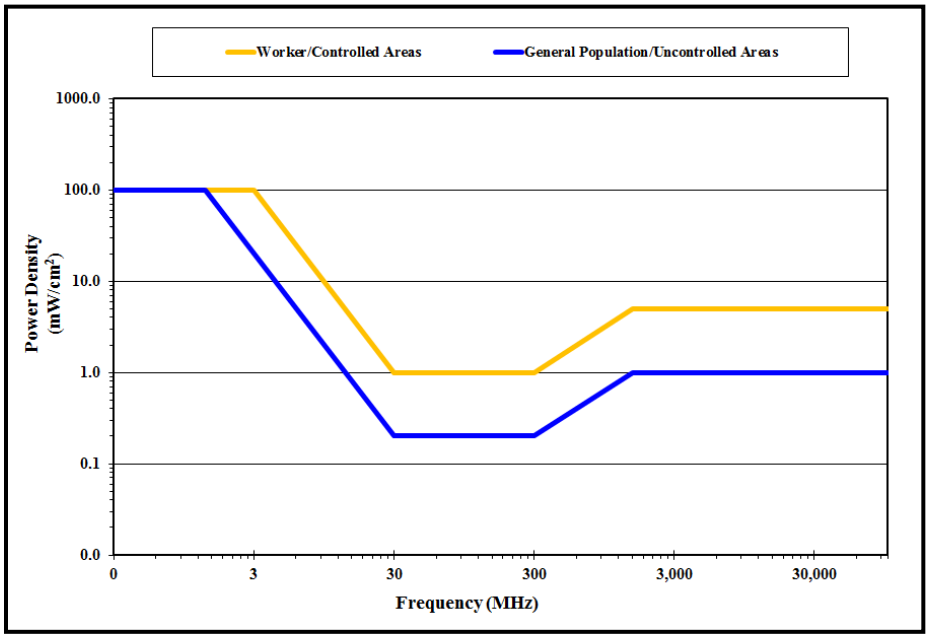



**Figure 1: FCC Limits for Maximum Permissible Exposure (MPE)**

**NOTE: FCC 5% Rule –** At multiple transmitter sites, actions necessary to bring the area into compliance with the RF exposure guidelines are the shared responsibility of all licensees whose transmitters produce RF field levels in excess of 5% of the applicable FCC MPEs.

## PHYSICAL CONDITIONS

The physical conditions are that broadcast facilities are located on the several towers located at the site (See Figure 2). The picture was taken 09/14/17.

**Figure 2: Tower and Broadcast Antennas**
**Mt. Mansfield; Stowe, VT**

### RF INFORMATION AND WARNING SIGNS

The "RF INFORMATION" and "RF CAUTION" signs previously posted at the base of the main towers (see Figure 3) are faded and need to be replaced with weather-proof signs.


**Figure 3: RF "CAUTION" and "INFORMATION" signs**
**(Tower K2)**

## OBSERVATIONS IN CONSIDERATION WITH §1.1307(B) & §1.1310 OF FCC RULES

***Is there any contact information, RF warning signs, or other information located at the site?***
**YES;** Information is provided in the form of RF "CAUTION" and "INFORMATION" signs posted to signify areas where a person may potentially be exposed to RF fields in excess of the public exposure guidelines. These areas potentially exist within a few meters of the operating antennas. **The site complies with FCC Rules.**

***Is it physically possible to stand next to or touch any omnidirectional antenna and/or stand in front of a directional antenna EXCEPT ON THE TOWER?***
**NO;** Information is provided in the form of RF "CAUTION" and "INFORMATION" signs posted to signify areas where a person may potentially be exposed to RF fields in excess of the public exposure guidelines. These areas potentially exist within a few meters of the operating antennas. **The site complies with FCC Rules.**

***Does there need to be any barriers (ropes, fences, etc.) Around the antennas, or are they mounted in such a way that the bottom of the antenna is more than two meters above the roof and above the head?***
**NO;** All transmitting antennas are mounted in such a way so that the bottom of the antenna is more than two meters above the head. **The site complies with FCC Rules.**

***Are there any measured areas where a person may be exposed to an RF field in excess of the MPE values for the general public for uncontrolled areas, or worker MPE values for areas restricted to trained worker only?***
**NO;** All measured areas accessible to the general public (i.e. "uncontrolled areas") had RF field levels below the MPE values for the general public. There was an area under the K1a tower (See Figure 4 for tower designations) where a person could receive a partial body exposure to a peak RF field level above the MPE value for the general public; but the spatially averaged value was below the MPE value for the general public. **The site complies with FCC Rules.**

**The conclusion is the site complies with FCC Rules.**

## RF FIELD MEASUREMENT PROTOCOL

RF ambient field measurements were obtained on September 14, 2017, using accepted scientific procedures.[v,vi] The following environmental conditions were noted: Initially foggy, then clearing skies; Temperature 61°F - 74°F; Humidity 86%; Winds 0 mph; Barometric pressure 879.1 mBar.

The measuring equipment included the following:

> Narda model SRM-3000 Electromagnetic Radiation Meter/Spectrum Analyzer with model 3AX 75M-3G Broadband Isotropic (50 – 3000 MHz) probe and 1.5 meters of calibrated N50 Ω cable. The equipment was within the calibration specifications set by the manufacturer (See attached calibration sheet in Appendix). The SRM-3000 was used for an RF field evaluation and exposure assessment. The unit was set to provide a read-out in %MPE **for members of the general public** within the frequency band of 50 MHz to 3,000 MHz.

The RF field measurements were obtained during normal use of the existing transmitters. The measurements were obtained at several locations in the general vicinity (See map, Figure 4). At each location, measurements were obtained by continuously scanning an area from the ground plane up to a height of six feet above ground level, referred to as the "Spatial Average". The highest reading during the spatial average was recorded as the "peak" reading. The results are listed in Table 2.

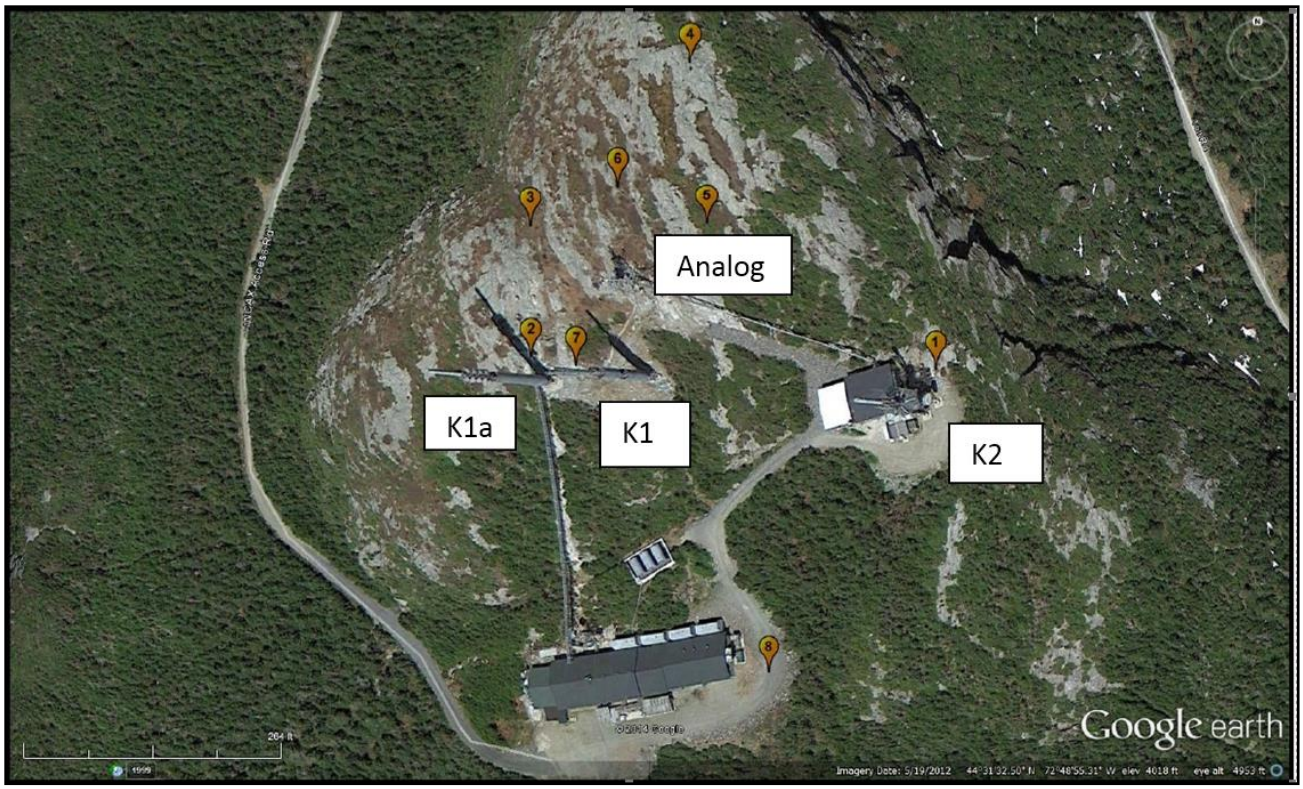



**Figure 4: Tower Designations and Numbered Locations of RF Field Measurements Mt. Mansfield; Stowe, VT**

## RESULTS - RF FIELD EVALUATION

The SRM-3000 was used for an RF field evaluation and RF exposure assessment. The SRM-3000 was set to provide a read-out in %MPE for members of the general public within the frequency band of 50 to 3,000 MHz. The "Spectrum Analysis" mode was used to examine the total RF field with a visual representation of the spectrum. Each "peak" was evaluated by frequency and amplitude (intensity).

The RF field evaluation was performed during normal use of the existing transmitters to ensure they were in operation during the RF exposure assessment measurements. The locations for the measurements (See map, Figure 4) were based upon making a comparison with previously obtained measurement data. While all accessible areas on the mountain top were evaluated with the measurement system, twelve (12) locations were chosen to record the data. For this particular site, measurements were obtained using two methods:

(1) **Potential RF Exposure based on Spatial Average**: The built-in "averaging" feature was used to record while the probe was continuously scanning an area from the ground plane up to a height of six feet above the ground, referred to as the "Spatial Average". The **highest observed** spatial average readings at each location were recorded in units of %MPE for members of the public 50 to 3000 MHz. The highest observed spatially-averaged RF field levels are contained in Table 2.

(2) **Potential RF Exposure based on Peak Fields**: The built-in "peak hold" feature was used during the continuous scan. The **highest observed** readings at each location were recorded in units of %MPE for members of the public 50 to 3000 MHz, and are contained in Table 2.

The "Spectrum Analysis" mode was used to examine the total RF field with a visual representation of the spectrum. Each "peak" was evaluated by frequency and amplitude (intensity). Figure 5 shows the full spectrum (50 – 3000 MHz) captured at the location of highest RF field reading at a publicly accessible area (#7, Figure 4).

**GRAPH NOTES:**

Y-Axis "$\%MPE_{(FCC\ General\ Public\ Guidelines)}$" in LOGARITHMIC scale, **maximum 100% MPE**; X-Axis Frequency in LINEAR Scale; linear-linear plots would be off the page.

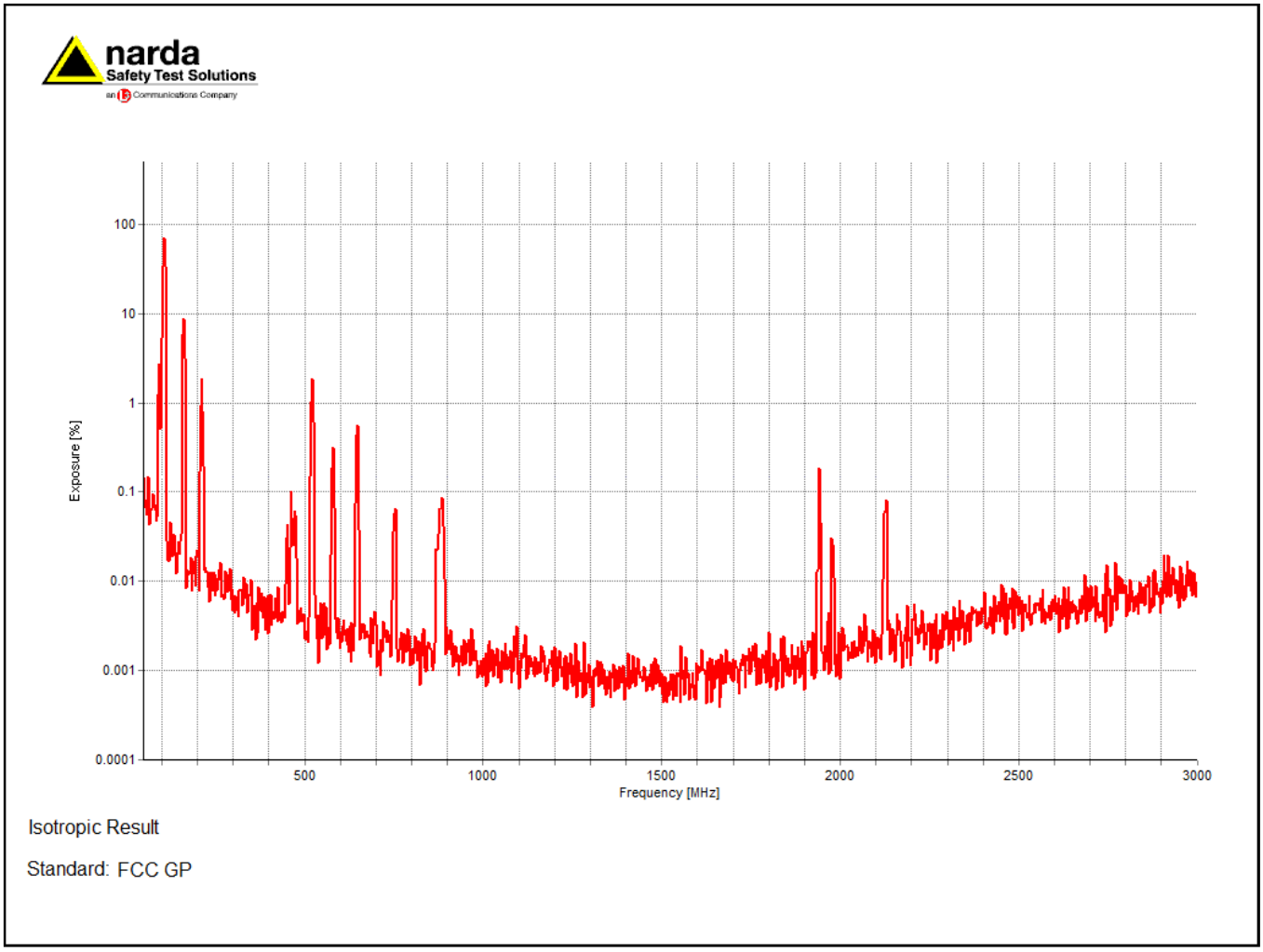



**Figure 5: Spectral Analysis; 50 - 3000 MHz**
**Location #7, Figure 4**

## RF FIELD EVALUATION – LOCALIZED AREA OF PARTIAL BODY EXPOSURE

There was an area under the K1a tower (See Figure 7) where a person could receive a partial body exposure to a peak RF field level above the MPE value for the general public. It should be noted that five times (500%) the MPE value for the general public represents the MPE value for the trained RF worker, or for areas where members of the public may have access, but it is transitory in nature (hiking trails on mountain tops, etc.). The spatially averaged value was around 61% of the MPE value for the general public. **The site complies with FCC Rules.** The yellow box below in Figure 7 depicts the area of potential RF field partial body exposure.

**Figure 7: Base of K1a Tower**
Yellow box drawn for emphasis only

## RESULTS

**Table 2: Results of Broadband RF Field Measurements: 50 MHz - 3000 MHz**
**Vicinity of Towers on Mt. Mansfield in Stowe, VT**

| Location # (See Figure 4) and Description | Highest Observed Reading | Spatial Average Reading |
|---|---|---|
| | %MPE $_{(public)}$ † | %MPE $_{(public)}$ † |
| #1: Base of trail (blue dot) | 19.36% | 8.361% |
| #2: Rocky area near western towers (near "washer" marker) | 49.35% | 20.13% |
| #3: Mossy area uphill from middle of towers | 62.73% | 44.33% |
| #4: Highest elevation in immediate vicinity | 16.93% | 7.505% |
| #5: Local climbing trail | 12.25% | 5.003% |
| #6: Rock cropping uphill from middle of towers | 78.21% | 39.47% |
| #7: Highest RF field observed near tower cable tray | 89.68% | 65.22% |
| #8: Highest RF field observed in parking area | 16.03% | 3.893% |
| Localized area under base of K1a tower $MPE_{(public)}$ | 127.5%‡ | 61.25%‡ |
| $MPE_{(worker)}$ | 25.50%‡ | 12.25%‡ |
| Radio transmitter room; general area | 1.539% | 1.403% |
| TV transmitter room; general area | 1.243% | 1.125% |
| Transmitter building; general area | 1.169% | 0.907% |

**Table Notes:**

† Meter readings 50 MHz - 3000 MHz in "percent FCC MPE" for members of the public.

‡ Meter reading recorded in "percent FCC MPE" for members of the public, although the appropriate MPE for the location is the ***worker*** MPE.

**Areas within 20 cm of RF-reflective objects were avoided to prevent erroneous readings.**

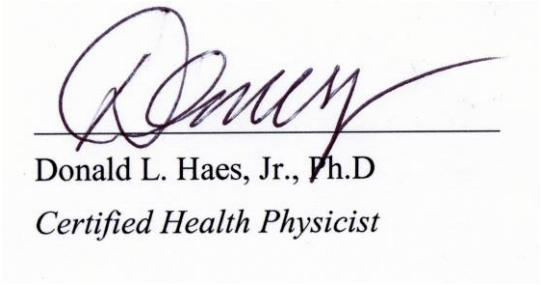
## CONCLUSION

RF field measurements indicate that ambient RF field levels in generally accessible areas near the towers atop Mt. Mansfield in Stowe, VT are below established Federal guidelines for RF exposure to members of the public. These field measurements indicate there is no need for RF precautionary postings in this area, with the exception of the towers themselves. These RF field measurements are accurate and were performed in accordance with the directives and guidelines outlined by ANSI C95 documents and specified by the FCC.

Based on my extensive experience with broadcast facilities, and the RF fields I have measured, it is my expert opinion that this facility complies with all applicable Federal regulations regarding limits of RF exposure to members of the public.

Feel free to contact me if you have any questions.

Sincerely,



Donald L. Haes, Jr., Ph.D

*Certified Health Physicist*

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## STATEMENT OF CERTIFICATION

1. I certify to the best of my knowledge and belief, the statements of fact contained in this report are true and correct.

2. The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are personal, unbiased professional analyses, opinions and conclusions.

3. I have no present or prospective interest in the property that is the subject of this report and I have no personal interest or bias with respect to the parties involved.

4. My compensation is not contingent upon the reporting of a predetermined energy level or direction in energy level that favors the cause of the client, the amount of energy level estimate, the attainment of a stipulated result, or the occurrence of a subsequent event.

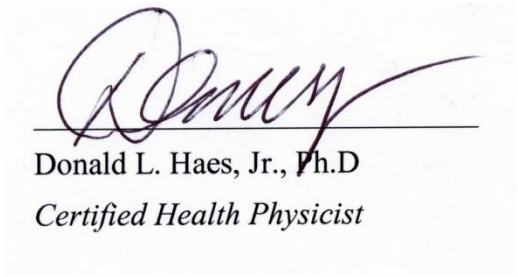
5. This assignment was not based on a requested minimum environmental energy level or specific power density.

6. My compensation is not contingent on an action or event resulting from the analyses, opinions, or conclusions in, or the use of, this report.

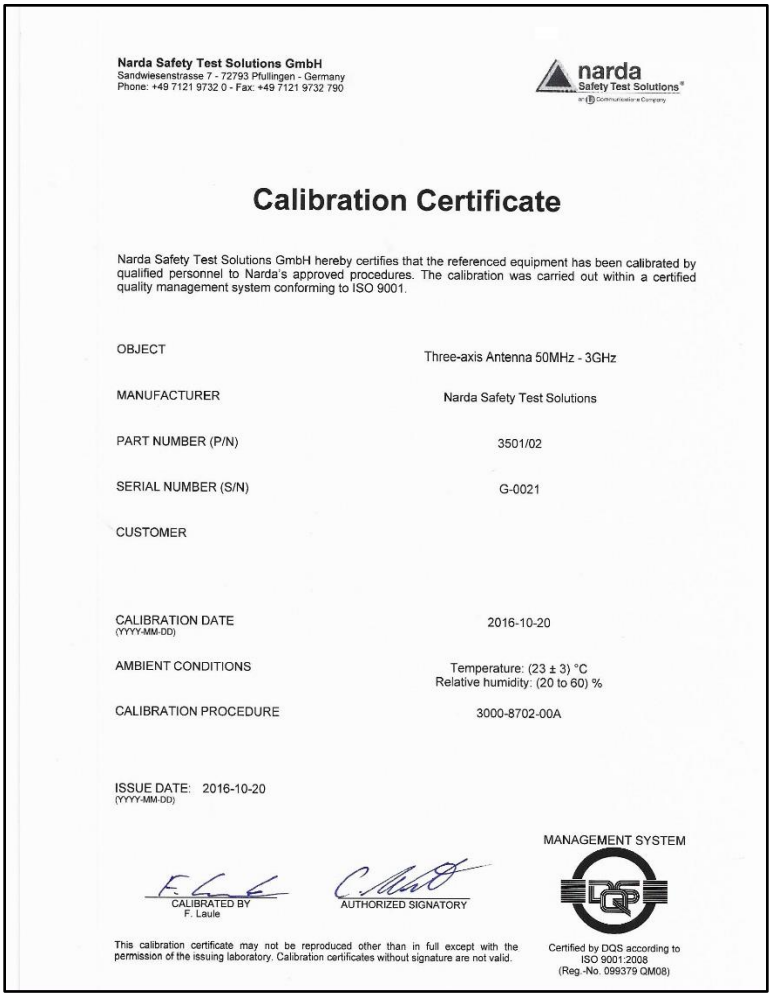
7. The consultant has accepted this assessment assignment having the knowledge and experience necessary to complete the assignment competently.

8. My analyses, opinions, and conclusions were developed and this report has been prepared, in conformity with the *American Board of Health Physics* (ABHP) statements of standards of professional responsibility for Certified Health Physicists.

Date: September 22, 2017



# APPENDIX
# (NARDA CALIBRATION CERTIFICATE)



Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7 - 72793 Pfullingen - Germany
Phone: +49 7121 9732 0 - Fax: +49 7121 9732 790

narda Safety Test Solutions

## Calibration Certificate

Narda Safety Test Solutions GmbH hereby certifies that the referenced equipment has been calibrated by qualified personnel to Narda's approved procedures. The calibration was carried out within a certified quality management system conforming to ISO 9001.

| | |
|---|---|
| OBJECT | Three-axis Antenna 50MHz - 3GHz |
| MANUFACTURER | Narda Safety Test Solutions |
| PART NUMBER (P/N) | 3501/02 |
| SERIAL NUMBER (S/N) | G-0021 |
| CUSTOMER | |
| CALIBRATION DATE (YYYY-MM-DD) | 2016-10-20 |
| AMBIENT CONDITIONS | Temperature: (23 ± 3) °C<br>Relative humidity: (20 to 60) % |
| CALIBRATION PROCEDURE | 3000-8702-00A |

ISSUE DATE: 2016-10-20 (YYYY-MM-DD)

CALIBRATED BY F. Laule

AUTHORIZED SIGNATORY

MANAGEMENT SYSTEM

Certified by DQS according to ISO 9001:2008 (Reg.-No. 099379 QM08)

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature are not valid.

**Calibration Certificate: Narda Model SRM Meter and E-Field Probe; S/N G-021**

## ENDNOTES

[i].Federal Register, Federal Communications Commission Rules; *Radiofrequency radiation; environmental effects evaluation guidelines* Volume 1, No. 153, 41006-41199, August 7, 1996. [47 CFR Part 1; Federal Communications Commission].

[ii]. Telecommunications Act of 1996, 47 USC; Second Session of the 104th Congress of the United States of America, January 3, 1996.

[iii]. ANSI/IEEE C95.1-1999: American National Standard, *Safety levels with respect to human exposure to radio frequency electromagnetic fields, from 3 kHz to 300 GHz* **(Updated in 2010)**.

[iv]. National Council on Radiation Protection and Measurements (NCRP); *Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields*, NCRP Report 86, 1986.

[v]. ANSI/IEEE C95.3-2002: American National Standard, *IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz*.

[vi]. NCRP Report No. 119: National Council on Radiation Protection and Measurements, 1993; *A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields*.