Doug Vernier
401 Main Street, Suite 213
Cedar Falls, Iowa 50613
Telecommunication Consultants

RF Hazard and Environmental Considerations

It is proposed that the WGBO 2.8 kW circular polarized antenna will be an ERI Type 1092-2CP-DA HW. The antenna will be mounted on the antenna mast at the Conde Nast Building, at 4 Times Square in New York City. This 48 story building serves as the main and back-up transmitter sites for ten FM radio stations, one VHF TV station and five UHF-TV stations. Based on the manufacturer's provided vertical elevation field graph, this antenna produces virtually zero radio emissions in the downward direction. (See the proposed vertical elevation field graph provided in the directional antenna exhibit.) The last R.F. emissions study was performed at the site in 2008. The attached study performed by Richard Tell, shows that with all stations at the site account for, the maximum RF emissions level on the roof below is well within the Commission's maximum.

It is the policy of the Conde Nast Building to perform an RF emissions measurement study after each change in a station's power or antenna height and after each new station is added to the antenna mast. WBGO will participate in the measurement process during its equipment test period and will file a statement regarding compliance with its request for program test authority and licensing.

Radiofrequency Field Measurements on the Main Roof of the Conde Nast Building, 4 Times Square, New York March 26, 2008

April 7, 2008

Prepared for

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By

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Radiofrequency Field Measurements on the Main Roof of the Conde Nast Building, 4 Times Square, New York March 26, 2008

Summary Conclusions

This evaluation demonstrates that RF fields found on the main roof level of the Conde Nast Building, 4 Times Square, in New York resulting from operation of all broadcasting facilities located at the site, including full power operation of the Qualcomm MediaFlo™ transmitter, at the time of the survey comply with the FCC MPE limits for the general public. The greatest, spatially averaged RF field found represented 9.4% (mean plus one standard deviation) of the public MPE. Generally, RF fields were significantly less in value, typically being, on average, about 3.9% of the MPE.

Introduction

The Conde Nast Building at 4 Times Square (4TS) is a 48 story building located at Broadway and 42nd Street in Manhattan (see Figure 1). The site is located approximately 0.5 miles north of the Empire State Building. The 4TS site has become a major primary/backup facility for broadcasters with their main/backup facilities located elsewhere, such as the Empire State Building, and the site continues to expand its operations to include more stations. Currently, the site is used by ten FM radio stations, one VHF TV station, and five UHF TV stations as summarized in Tables 1 and 2. In addition, Qualcomm Incorporated has installed a MediaFlo™ transmitter at the site that operates on UHF TV channel 55 (716-722 MHz). The MediaFlo™ transmitter operates with an effective radiated power (ERP) of nominally 46 kilowatts (kW) making use of the master UHF TV broadcast antenna.

This report documents a survey of radiofrequency (RF) fields on the main roof level of the 4TS building for purposes of evaluating compliance with the Federal Communications Commission (FCC) rules that limit human exposure (maximum permissible exposure or MPE) to RF fields. The on-site RF measurements were conducted in the early morning hours of March 26, 2008.

RF Field Instrumentation and Measurement Technique

Efforts were made to optimize the measurement process to achieve the most accurate estimates of unperturbed RF fields, expressed as a percentage of the FCC general public MPE limits. The measurements were made with a Narda Microwave Model A8742D isotropic, broadband electric field strength probe (SN 02813) connected to a Narda Model 8715 digital meter (SN 13001). The Model A8742D probe is

frequency shaped so that all detected fields are weighted according to the frequency variation of the MPE limit such that the meter presents the measured field as a percentage of the FCC MPE limit for occupational exposure. This probe has the capacity of measuring RF fields up to 600% of the FCC occupational MPE limit. The minimum reliable indication of field is specified as 0.6% of the MPE limit. Narda Microwave specifications for the A8742D probe indicate that the most probable uncertainty associated with all aspects of the probe performance, including absolute calibration accuracy and isotropy response, for the frequencies relevant during these measurements, is about ±1.0 dB. The meter permits automatic measurement of the spatially averaged field by starting and stopping the process of taking readings and averaging them. Figures 2 and 3 show the factory supplied calibration certificates for the probe and meter used during the measurements. Because of the wide frequency distribution of RF fields at the site, a correction factor of unity was used since the probe could read slightly high at some frequencies and slightly low at others but the indicated value on the meter is a composite of all fields detected on all frequencies within the probe's band pass of operation. For the stations operating at 4TS, the greatest likelihood is that the readings could be adjusted downward for an over response but in the interest of conservatism, no adjustment was made.

Prior to the measurements, the meter and probe were zeroed inside the building by placing the probe inside a shielded "calibration bag" made with conductive fibers that provides approximately 20 dB of attenuation of ambient RF fields. The meter was re-zeroed several times before entering onto the main roof to perform the measurements.

The measurement technique that was used consisted of determining the spatial average value of field as a percent of the MPE limit at points distributed about the main roof level. This was accomplished by slowly moving the probe in a vertical line from the standing surface of the roof to head height (approximately 6 feet-three inches). Each vertical scan lasted approximately 10-12 seconds. At each measurement point, multiple vertical scans were obtained by standing at different azimuths relative to the measurement point in an effort to minimize the perturbation of the local fields by the body of the observer. This perturbation effect can be significant.[1] The overall average of four vertical scans, rather than any single measurement, was deemed to be the most accurate indicator of the unperturbed field at each measurement point. Four sequential vertical scans were performed by facing the measurement point from each of four equally separated directions, 90 degrees apart. The sequence began by facing North, then East, then South, then West. Values obtained for the four spatial averages were recorded and then the composite spatial average was obtained by computing the overall mean value of the four spatial averages and the standard deviation of the four separate measurements.

A total of 32 points were use to characterize the general RF environment on the main roof. These points are illustrated on the drawing in Figure 5. Additionally, the entire roof area was scanned with the broadband field probe to investigate for areas that might have more intense fields than those determined during the measurements at the 32 defined points. All indicated values displayed on the 8715 meter were multiplied by five

[1] R. Tell (2006). Letter to the editor "Shaken and Stirred". AGL Magazine, Vol. 3, No. 2, April, pp. 56-59.

to convert the occupational readings to equivalent percentages of the FCC general public MPE.[2]

To supplement the broadband probe field measurements, a series of narrowband measurements was accomplished using a Narda SRM-3000 Selective Radiation Monitor (SN B-0055) used with a Narda SRM, E-field, three axis antenna/probe (SN A-0061). This device is in the form of a small, portable spectrum analyzer containing firmware that automatically switches among three orthogonal elements of the attached antenna/probe. The indicated measurement result can be in terms of percentage of the FCC general public MPE that the RF field represents. This device was used to provide insight to the relative contributions of different stations to the aggregate RF fields found on the observatory deck with the broadband probe. Spectrum analyzer readings were taken at several different points around the periphery of the main roof at somewhat random locations. Calibration certificates for the SRM-3000 antenna/probe and meter are provided in Figures 5 and 6. The frequency dependency of the SRM-3000 antenna/probe antenna factor is given in Figure 7.

Measurement Results

The measurement data obtained during the field survey are summarized in Table 3. This table includes the overall mean value of each set of four spatial averages, at each of the 32 points, as well as the standard deviation of the four spatial averages. These data are presented graphically in Figure 8 to permit a more convenient insight to the spatial distribution of the RF field values measured on the main roof level. In Figure 8, the junction of the red and green bars represents the mean value of the four spatial averages measured at each point. The vertical extent of the red and green bars represents one standard deviation above and below the mean value respectively.

A qualitative investigation of ambient RF fields with the SRM-3000 meter revealed weak fields, typically less than that found with the broadband probe. Figures 9 through 15 illustrate the indicated field measurement data obtained with the SRM-3000.[3]

Several useful insights become apparent from the broadband measurement data at the 32 fixed measurement points:

1) The RF fields found on the main roof level were very low when compared to the applicable MPE for general public exposure and in many cases the measured values fell below the threshold specified by the probe manufacturer for reliable readings. At some points, the meter readings were zero (not detectable).

---

[2] In the VHF and UHF frequency bands, the FCC MPE for general public exposure is exactly five times less (stricter) than the MPE for occupational exposure. Hence, indicated percentages of occupational MPEs must be multiplied by a factor of five to obtain percentages of public MPEs.

[3] Mr. John Lyons, Director of Broadcast Operations at the Conde Nast Building, assisted in collection of the spectrum analyzer data. His assistance is hereby acknowledged and appreciated.

2) The greatest measured spatially averaged field represented 8.9% ± 0.5% of the general public MPE. The mean plus upper one standard deviation value is 9.4% of the MPE. This value was found at point 21 near the northern corner of the roof. Point 31 yielded a slightly lower spatially averaged value of 8.0% ± 0.6% of the general public MPE. The mean plus upper one standard deviation value at point 31 is 8.6% of the MPE.
3) Most values of RF fields are significantly less than these two values. The grand average of all of the 32 spatial averages is 3.9% of the MPE.
4) Variability in the value of the spatial averages was typically in the range of 29%. This value was obtained by computing the overall average of the percentage standard deviations. Generally, the weaker the measured fields, the greater was the resulting variance of the spatially averaged values.
5) Following the roof top measurements, the meter was found to read slightly upscale when placed in its shielded calibration bag back inside the building. This indicated that the meter and probe may have drifted slightly upscale during the measurement process on the roof and may account for the low values at the beginning of the survey as reflected in value for points 1 through 10..

Conclusions

The RF survey conducted at the Conde Nast Building on March 26, 2008, with all possible broadcast transmitters at the site active in addition to the Qualcom MediaFlo™ transmitter, indicates that the main roof level is compliant with the FCC MPE for the general public by a wide margin.

The 4TS site is subject to an extensive RF safety program that provides numerous exposure control features should individuals need access to on-tower locations or other elevated locations above the main roof level. This RF safety program is described in a recent paper presented at the National Association of Broadcasters Engineering Conference.[4] One evolving aspect of the program is to accommodate work that may be required on upper portions of the rooftop spire on the new building being constructed at One Bryant Park, some 350 feet adjacent to the 4TS antenna antenna mast. During such construction activities, should the full complement of broadcast stations be operative, protocol calls for either reduction of station power levels or terminating service for the appropriate work duration.

[4] Monitoring RF Safety At A Multi-User Broadcast/Communications Site, Richard A. Tell and John M. Lyons, 2006 NAB Engineering Conference, Las Vegas, NV.

Table 1. FM radio stations operating from 4 Times Square during measurements on March 26, 2008. ERP values taken from licenses for the 4 Times Square site.

Call sign	Frequency (MHz)	ERP (H+V)*
WKCR-FM	89.9	2.7**
WPAT-FM	93.1	15.0
WNYC-FM	93.9	21.6
WSKQ-FM	97.9	25.0
WHTZ	100.3	27.0
WKTU	103.5	27.0
WAXQ	104.3	27.0
WWPR-FM	105.1	27.0
WCAA	105.9	2.0
WLTW	106.7	27.0

*The designation (H+V) refers to the combined ERP from the horizontal and vertical polarization components.
** This ERP was authorized for the duration of the measurements on March 26, via a Special Temporary Authority.

Table 2. TV stations operating from 4 Times Square during measurements on March 26, 2008. ERP values taken from licenses for the 4 Times Square site

Call sign	Ch	Frequency (MHz)	ERP* (kW)
WABC	7	174-180	204
WNYE-DT	24	530-536	151
WXTV	41	632-638	1400
WABC-DT	45	656-662	399
WFUT-DT	53	704-710	310
WFUT	68	794-800	3000

* ERP is peak visual for analog stations and rms for digital stations.

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Table 3. RF measurement data for main roof level at 4 Times Square, March 26, 2008.

	Direction facing during measurement of spatially averaged RF field					
Location	**North**	**East**	**South**	**West**	**Overall average**	**Standard deviation**
	Spatial average % of public MPE					
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	2.0	1.0	0.0	0.8	1.0
7	0.0	1.5	0.0	0.0	0.4	0.8
8	0.0	0.5	0.0	0.0	0.1	0.3
9	0.0	0.0	0.0	0.0	0.0	0.0
10	1.0	1.0	1.0	1.0	1.0	0.0
11	0.5	0.5	0.5	0.5	0.5	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	3.0	3.0	3.5	3.5	3.3	0.3
14	4.0	4.5	3.0	3.5	3.8	0.6
15	6.0	4.5	5.0	7.0	5.6	1.1
16	5.5	6.0	5.5	5.5	5.6	0.3
17	6.5	5.5	5.5	6.0	5.9	0.5
18	3.5	2.5	3.0	3.0	3.0	0.4
19	5.0	4.5	4.5	5.0	4.8	0.3
20	7.5	7.5	6.5	7.0	7.1	0.5
21	9.5	9.0	8.5	8.5	8.9	0.5
22	8.5	7.5	7.5	8.5	8.0	0.6
23	4.5	4.5	5.5	6.0	5.1	0.7
24	7.5	6.0	7.0	8.5	7.3	1.0
25	8.0	7.5	6.5	6.5	7.1	0.8
26	5.5	5.0	6.0	6.0	5.6	0.5
27	4.0	4.0	4.5	5.0	4.4	0.5
28	7.5	7.0	8.5	7.5	7.6	0.6
29	6.0	6.5	7.0	6.5	6.5	0.4
30	6.0	7.5	8.5	7.0	7.3	1.0
31	8.0	8.5	9.0	8.0	8.4	0.5
32	7.5	8.5	8.5	7.5	8.0	0.6

Figure 1. The 4 Times Square building showing the antenna mast with master antennas for FM radio and VHF and UHF TV broadcasting.

L3 communications
Narda Microwave-East

Certificate of Calibration

L-3 Communications, Narda Microwave-East, hereby certifies that the referenced instrument has been calibrated by qualified personnel to Narda's approved test procedures.

Furthermore, the instrument meets, or exceeds, all published specifications and the calibration has been performed with test instrumentation that, where applicable, is traceable to the National Institute of Standards and Technology.

Narda's calibration measurements are traceable to the National Institute of Standards and Technology to the extent allowed by the bureau's calibration facilities.

Customer: ROYAL REALTY CORP
NEW YORK, NY 10036-6522

Certificate #: 65726 2

Model #: A8742D
Description: PROBE
Date Calibrated: 05/25/2006

Serial #: 02813
PO #: 4TS-01840
R.O. #: 65726

Vince Donavan
Manufacturing

Ken Peck
Quality Assurance

Figure 2. 2006 Calibration certificate for the Narda Model A8742D broadband, isotropic RF field probe.

L3 communications
Narda Microwave-East

Certificate of Calibration

L-3 Communications, Narda Microwave-East, hereby certifies that the referenced instrument has been calibrated by qualified personnel to Narda's approved test procedures.

Furthermore, the instrument meets, or exceeds, all published specifications and the calibration has been performed with test instrumentation that, where applicable, is traceable to the National Institute of Standards and Technology.

Narda's calibration measurements are traceable to the National Institute of Standards and Technology to the extent allowed by the bureau's calibration facilities.

Customer: ROYAL REALTY CORP
NEW YORK, NY 10036-6522

Certificate #: 65726 1

Model #: 8715
Description: METER
Date Calibrated: 05/18/2006

Serial #: 13001
PO #: 4TS-01840
R.O. #: 65726

Vince Donavan
Manufacturing

Ken Peck
Quality Assurance

This certificate shall not be reproduced, except in full, without written approval from L-3 Communications, Narda Microwave-East

Figure 3. 2006 Calibration certificate for the Narda Model 8715 digital RF field meter.

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

narda
Safety Test Solutions
an L3 Communications Company

Calibration Certificate

Narda Safety Test Solutions 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 conformining to DIN EN ISO 9001:2000.

The metrological confirmation sytem for test equipment complies with ISO 10012-1.

Object	**Selective Radiation Meter Basic Unit 100 kHz to 3 GHz**
Type	**SRM-3000, BN 3001/01**
Serial Number	**B-0055**
Manufacturer	Narda Safety Test Solutions
Customer	
Date of Calibration	07-Jun-2006
Result of Calibration	Measurement results within specifications
Confirmation interval recommended	24 months
Ambient conditions	23 °C ± 3 °C (20 ... 60) % rel. humidity
Calibration procedure	3000-8701-00A

Pfullingen, 14-Jun-2006

Person in charge
P. Geyer

Quality management representative
W. Kumbier

MANAGEMENT SYSTEM

Certified by DQS against
DIN EN ISO 9001
(Reg.-No. 099379)

At-shipment status
Zustand bei Versand

Certificate No. 300101-B0055-060607-55 Date of issue: 14-Jun-2006 Page 1 of 3

Figure 4. SRM-3000 meter calibration certificate.

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

narda
Safety Test Solutions
an L3 Communications Company

Calibration Certificate

Narda Safety Test Solutions 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 9001:2000.

The metrological confirmation system for test equipment complies with ISO 10012-1.

Object	**Probe SRM, E-Field, Three-Axis 75 MHz to 3 GHz**
Type	**BN 3501/01**
Serial Number	**A-0061**
Manufacturer	Narda Safety Test Solutions
Customer	
Date of Calibration	06-Jun-2006
Results of Calibration	Test results within specifications
Confirmation interval recommended	24 Months
Ambient conditions	23°C +/-3°C (20...60)% rel. humidity
Calibration procedure	3000-8702-00A

Pfullingen, 14-Jun-2006

MANAGEMENT SYSTEM

Person in charge
Weible

Quality management representative
W. Kumbier

Certified by DQS according to
DIN EN ISO 9001:2000
(Reg.-No. 99379-QM)

Certificate No. 350101-A0061-060606 Date of issue: 14-Jun-2006 Page 1 of 5

Figure 5. SRM-3000 probe calibration certificate.

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Sandwiesenstrasse 7 . D-72793 Pfullingen . Germany
Phone: +49-7121-9732-0 . Fax: +49-7121-9732-790

narda Safety Test Solutions
an L3 Communications Company

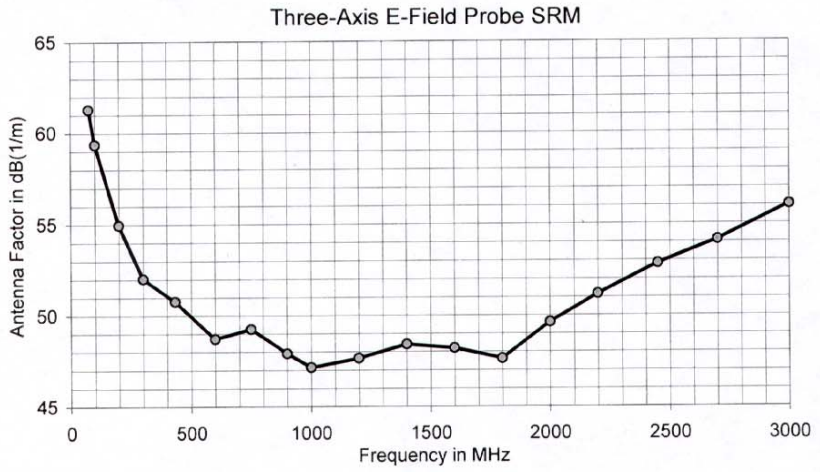
Results

Frequency Response **passed**

Frequency in MHz	E_applied in V/m	Output voltage in dB(µV)	Meas. Uncertainty in dB	Antenna Factor in dB(1/m)	At receipt deviation in dB
75	10,0	78,70	1,0	61,30	-0,09
100	10,0	80,63	1,0	59,37	-0,05
200	10,0	85,04	1,0	54,96	0,02
300	10,0	87,97	1,0	52,03	-0,30
433	10,0	89,21	1,5	50,79	0,02
600	10,0	91,28	1,5	48,72	0,33
750	10,0	90,74	1,5	49,26	-0,25
900	10,0	92,09	1,5	47,91	-0,48
1000	10,0	92,85	1,5	47,15	-0,20
1200	10,0	92,35	1,5	47,65	-0,36
1400	10,0	91,60	1,5	48,40	-0,08
1600	10,0	91,80	1,5	48,20	-0,14
1800	10,0	92,38	1,0	47,62	-0,25
2000	10,0	90,39	1,0	49,61	-0,10
2200	10,0	88,83	1,0	51,17	-0,21
2450	10,0	87,18	1,0	52,82	-0,24
2700	10,0	85,90	1,0	54,10	-0,25
3000	10,0	83,98	1,0	56,02	0,87

Frequency Flatness (100 - 3000 MHz): 12,2 dB

The Antenna Factor data is permanently stored in the antenna connector memory.
The SRM basic unit uses this correction data to correct the display.



Certificate No. 350101-A0061-060606 Date of issue: 14-Jun-2006 Page 4 of 5

Figure 6. SRM-3000 probe antenna factor calibration chart.

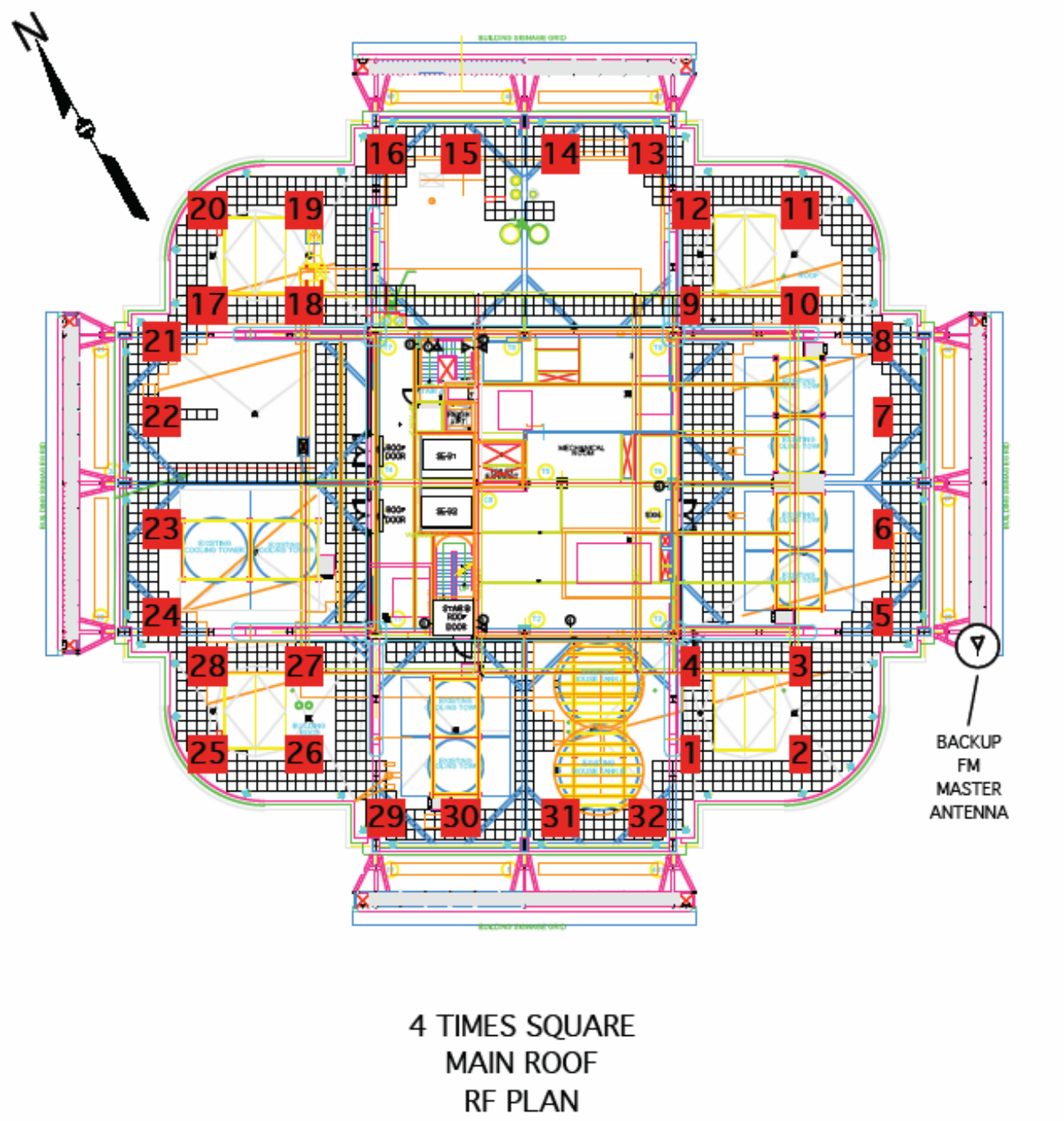


Figure 7. Plan of main roof level at 4 Times Square illustrating approximate locations of measurements of spatially averaged RF fields.

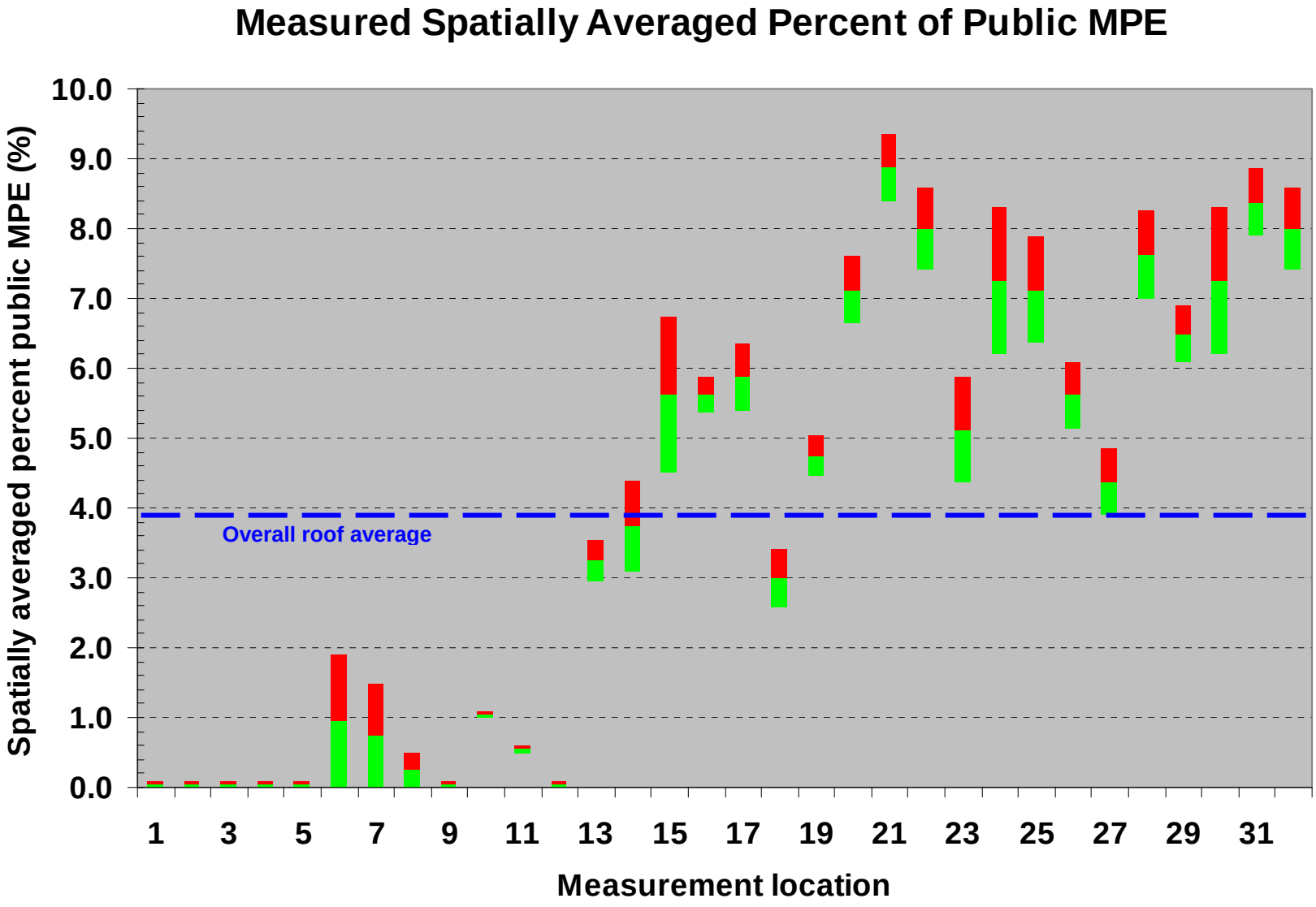


Figure 8. Spatially averaged RF fields based on four measurements at each point at each of 32 measurement points on the main roof level at 4 Times Square. The junction of the green and red bars represents the overall mean value based on the four measurements. The green and red bars represent the lower and upper one standard deviation of the measurement data at each point.

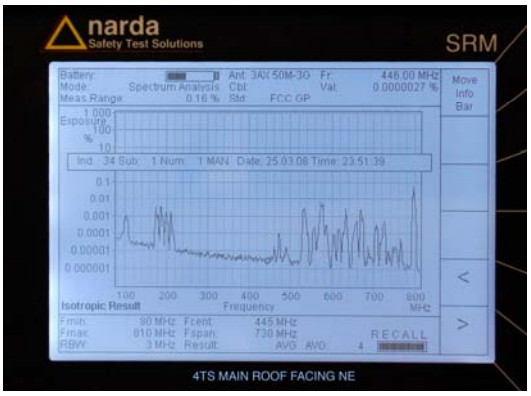


Figure 9. 4TS roof measurement facing northeast.

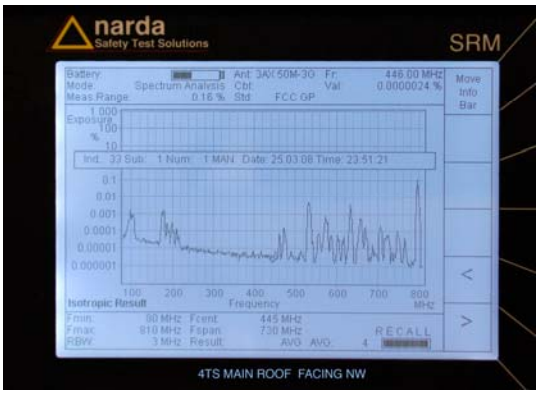


Figure 10. 4TS roof measurement facing northwest.

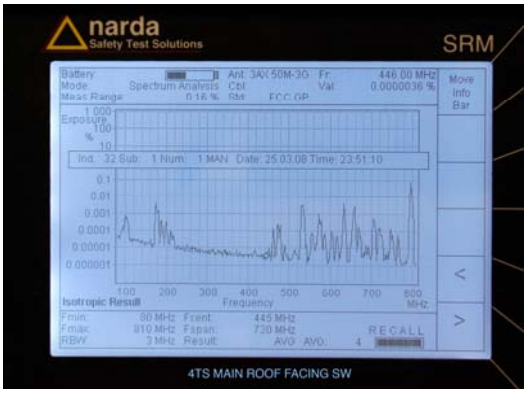


Figure 11. 4TS roof measurement facing southwest.

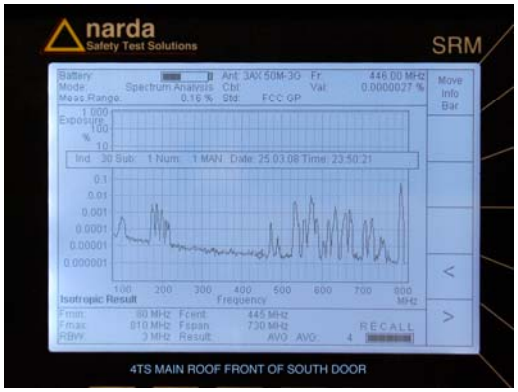


Figure 12. 4TS roof measurement front of south door.

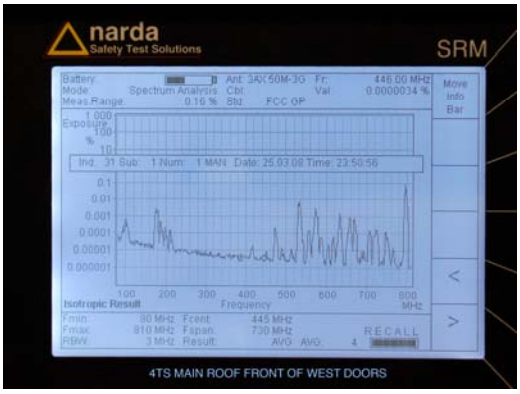


Figure 13. 4TS roof measurement front of west door.

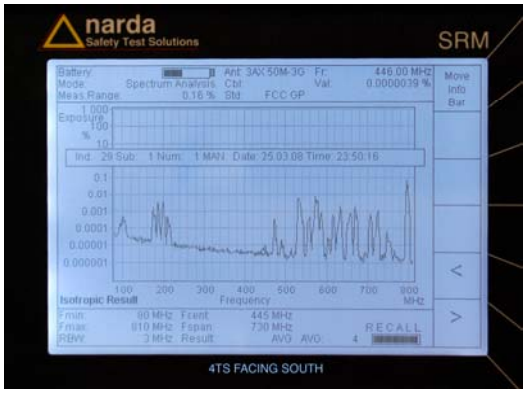


Figure 14. 4TS roof measurement facing south.

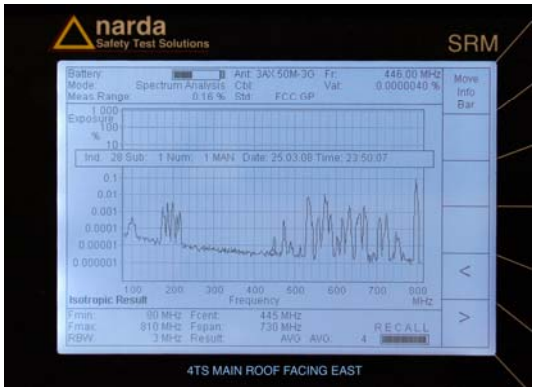


Figure 15. 4TS roof measurement facing east.