

Engineering Report  
**Survey of Radiofrequency Energy Exposure Levels**  
**Oakbrook Terrace Tower Building**  
19 & 22 May 2017  
Prepared by Univision Communications, Inc.  
WVIX(FM) Lemont, IL

**A. Introduction and Background**

The new WVIX (FM) transmitting facility, atop the Oakbrook Terrace Tower building, was surveyed to evaluate compliance with the RFE guideline values set forth in the FCC's Office of Engineering and Technology (OET) Bulletin No. 65. The building interior was surveyed on 19 May 2017 and the rooftop was surveyed on 22 May 2017, due to rain on the 19<sup>th</sup>.



**Photo 1: Oakbrook Terrace Tower, FM Antenna at Top Center**

WVIX(FM)'s new transmitting facility shares the antenna of WJKL(FM), licensed to serve Glendale Heights, IL on 94.3 MHz. The antenna is mounted at the peak of the eastern portico of the Oakbrook Terrace Tower building, with Both stations were operating within 5% of their licensed effective radiating powers at the time of the measurements reported herein.

## **B. Nature of the Building and Site**

The Oakbrook Terrace Tower building is a square structure, with 31 finished floors and an equipment penthouse located above. Its upper floors and roof comprise porticos, oriented north, east, south, and west. The WJKL/WVIX shared antenna is mounted at the eastern end of the eastern portico. The auxiliary antenna of WLEY-FM is mounted near the building center, where the horizontal axes of the porticos meet. The heavy aluminum-clad roofs slope downward from the portico axes, extensively bonded and grounded for lightning protection and RF shielding purposes. Walls below are metal framed and clad except for window spaces. This construction inherently limits RFE levels within the building structure, since it is effectively a box fully shielded above and partially shielded along its sides.

The shared WJKL/WVIX antenna is an ERI SPX-2AE-HW model, with half-wave bay spacing. The array factor for any half-wave spaced antenna minimizes downward radiation, as does the element pattern for the "Rototiller™" radiating elements. Consequently, downward radiation, into the building and along its sides, is minimal.

Strict access controls are in effect at the building. Entry to the penthouse area, containing the WJKL main and WLEY-FM auxiliary transmitters, is restricted by a locked door, with an RFE advisory notice sign prominently displayed. The roof is accessed by a locked hatch at the end of a climbing ladder, inside that penthouse. The hatch is marked with RFE warning signs and interlocked to disable the WLEY-FM auxiliary transmitter, should the hatch be opened. Workers seeking roof access must register at the building security desk, before they are given keys to the penthouse, must sign an advisory/waiver document, and carry personal RFE monitoring devices whenever they are on the roof.



**Photo 2: Penthouse Entry Door**



**Photo 3: Interlocked Roof Access Hatch**

The penthouse and rooftop comprise a “controlled area”, while the office spaces on the 31<sup>st</sup> floor and lower are “uncontrolled areas”

There is no open space on the rooftop. Upon exiting the access hatch, there are narrow walkways down each portico’s roof apex, with adjacent roof sides reaching a height of approximately 1.2 meters above the walkway floor. Given that the roof is aluminum, a significant degree of shielding exists to workers attending to equipment on the porticos and RFE levels are attenuated along those axes, as measured data demonstrate. See Photo 5.

### **C. Results Summary:**

On the roof, only one area, immediately surrounding the WJKL/WVIX antenna pole, was found to have an measured RFE level approaching and exceeding the protection guideline value. While spatial maxima slightly in excess of that value were found elsewhere on the roof, the fields were found to be highly scattered and spatial average measurements showed levels well within the guideline value. The boundary of the area on the east portico of the roof, where RFE levels became exceed the protection guideline value, was temporarily marked with red

electrical tape. The site lessor will be advised to install permanent marking. At no location surveyed within the building was the measured RFE level found to exceed ten percent (10%) the FCC's guideline values for "uncontrolled" (general public) areas.

#### **D. Controlled Area: East Portico Roof**

The east portico roof supports the WJKL/WVIX antenna and multiple communications antennas, many of which have been retired from service but not removed.



**Photo 4: Eastern Portico**

The RFE levels in the immediate vicinity of the 2-element WJKL/WVIX antenna, mounted on a pole located just before the eastern edge of the portico, exceed the protection guideline value for controlled areas. Specifically, the area from the microwave dish antenna, visible in line with the bottom of the WJKL/WVIX pole, to the eastern end of the portico, cannot be entered when the stations are in operation. The inner boundary of this area was temporarily marked with red vinyl tape and can be seen on the next picture. At the point marked by red tape, the bidirectional spatially averaged RFE level measured 63% of the protection guideline value.



**Photo 5: East Portico Excessive RFE Threshold Location**

From the access hatch to the boundary point marked by the red vinyl tape and back, the following measured RFE levels were found:

1. 2 meter constant elevation spatial maximum: 83%
2. 2 meter vertical sweep spatial maximum: 96%
3. 2 meter vertical sweep average: 33%

These data were obtained for walks out to the boundary point and back to the roof hatch. It is notable that the RFE levels were highly scattered – the stored maxima could not be duplicated by probing the instrument around with its display in real-time data mode.

### **E. Controlled Area: Rooftop South Portico**

The east portico roof supports the multiple communications antennas, many of which have been retired from service, but no broadcast transmitting antennas.



**Photo 6: South Portico**

From the access hatch to the outer edge of the portico, the following measured RFE levels were found:

1. 2 meter constant elevation spatial maximum: 93%
2. 2 meter vertical sweep spatial maximum: 57%
3. 2 meter constant elevation average: 17.5%

### **F. Controlled Area: West Portico**

Like the south portico, the west portico roof supports the multiple communications antennas, many of which have been retired from service, but no broadcast transmitting antennas.



**Photo 7: Western Portico**

From the access hatch to the outer edge of the portico, the following measured RFE levels were found:

1. 2 meter constant elevation spatial maximum: 25%
2. 2 meter constant elevation average: 4.8%
3. 2 meter vertical sweep spatial maximum: 25.6%
4. 2 meter vertical sweep average: 3.6%

The differences between maximum and average values are indicative of the scattered fields atop the portico.

#### **G. Controlled Area: North Portico**

The north portico roof supports the WLEY-FM auxiliary antenna and multiple communications antennas, many of which have been retired from service but not removed.



**Photo 8: Northern Portico**

From the access hatch to the outer edge of the portico, the following measured RFE levels were found:

1. 2 meter constant elevation spatial maximum: 115%
2. 2 meter constant elevation average: 20%
3. 2 meter vertical sweep spatial maximum: 113%
4. 2 meter vertical sweep average: 13%

The differences between maximum and average values are indicative of the scattered fields atop the portico. With the exception of a location near a land-mobile antenna, the excessive spot RFE levels noted above could not be replicated with the instrument in the real-time display mode. At the land-mobile antenna location, shown in the following photo, bidirectional spatial average measurements were conducted, yielding a measured RFE level of 44% of the protection guideline value.



**Photo 9: Land Mobile Antenna – Spatial Average Measurement Location**

#### **H. Controlled Area – Equipment Penthouse**

The equipment penthouse, between the 31<sup>st</sup> floor and the roof, houses elevator machinery, HVAC ductwork and fans, broadcast equipment, and land mobile radio equipment. There are essentially no open spaces on this floor, with equipment placements restricting floor space throughout. Here, discrete pathways were surveyed for RFE levels. The elevator machinery space was not accessible during the survey, but, given the construction of the building, the results found elsewhere, and that room's greater distance from the WJKL/WVIX antenna, no excessive RFE levels are expected therein.

The eastern side of the major HVAC ductwork, which includes the WJKL transmitter and associated equipment and the WJKL/WVIX combiner equipment, was surveyed using the swept-probe, spatial maxima recording method. The maximum RFE level encountered was 7.7% of the protection guideline value for uncontrolled areas. The western side of the major HVAC ductwork, which includes the WLEY-FM auxiliary transmitter and associated equipment, was similarly surveyed, with a spatial maximum RFE level of 6.6% of the uncontrolled area protection guideline value found. The spatial maximum RFE level within the land-mobile equipment and motor control space was found to be 1.8% of the guideline value for uncontrolled areas. Catwalks leading out the portico axes from the equipment penthouse were inaccessible and not surveyed. However, given the shielding of the metal roof structure above them, no excessive RFE levels are expected there.

#### **I. Uncontrolled Areas: 31<sup>st</sup> Floor Office Spaces**

As noted above, the upper floors of the building are shaped as porticos, aligned on the 4 primary compass bearings and perpendicular to each other. The WJKL/WVIX transmitting antenna is located at the eastern end of the eastern portico, so the highest RFE levels are expected to be in those office spaces located on the eastern side of the building.

Attached hereto is an accurate plan of the building's 31<sup>st</sup> floor, showing the office spaces surveyed and the spatial maxima results obtained in each. In the east portico, the measured RFE levels ranged from 0.6% to 2% of the guideline value for uncontrolled areas. In the south portico, the measured levels were lower. Access to the northern portico was not possible, however, the nature of the antenna location and building construction is such that RFE levels within the north portico spaces are likely to mirror those of the south portico. The western portico area was surveyed, but the RFE levels encountered were of such low value and great scattering that they were considered inconsequential and not quantified.

The construction of the building is such that office spaces lacking windows, between porticos, can be expected to have far lower RFE levels. A general scan of these offices and other interior spaces confirmed this. Throughout all measured areas, field strengths were extremely scattered. Spatially averaged RFE levels would undoubtedly be well below the spatial maxima.

## **J. Measurement Survey Techniques**

Several different measurement techniques were used, depending on the nature of the area surveyed.

### 1. Spatial Maxima with Constant Probe Elevation

The instrument probe was carried at an elevation of approximately 2 meters while the surveyor walked pathways along the roof peaks. This method was used to determine if there were any locations where field levels approached the guideline value and detailed measurements should be conducted. Paths were walked in two directions, to lessen the influence of the surveyor's body on results obtained.

### 2. Data Average with Constant Probe Elevation

The instrument probe was carried at an elevation of approximately 2 meters while the surveyor walked pathways along the roof peaks. Data was recorded continuously by the instrument and averaged progressively. This method was used to evaluate the degree of scatter in the spatial maximum measurements noted above. Paths were walked in two directions, to lessen the influence of the surveyor's body on results obtained.

### 3. Spatial Maxima with Swept Probe

The instrument probe was swept vertically from near the floor to an elevation of 2 meters while the surveyor walked pathways atop the roof porticos and through the equipment penthouse area, between obstructing features. Atop the roof, this method was used to confirm that spatial maxima at elevations below 2 meters did not exist. In the penthouse, this method was used to determine if there were any locations where field levels approached the guideline value and spatially-averaged detail measurements

should be conducted. No such locations were found. Paths were walked in two directions, to lessen the influence of the surveyor's body on results obtained.

#### 4. Average with Swept Probe

The instrument probe was swept vertically from near the floor to an elevation of 2 meters while the surveyor walked pathways along the rooftop axes , with the instrument averaging data progressively during the walk. The purpose of this measurement was to evaluate the degree of scatter and the average exposure that a worker would encounter walking out the portico and back.

#### 5. Bidirectional Spatial Average

These measurements were conducted at two locations, one on the east portico apex near the WJKL/WVIX antenna, and the other adjacent to a land-mobile antenna on the north portico apex. At each, the instrument probe was slowly swept from an elevation of approximately 2 meters to approximately 0.3 meter above the floor and back, while the instrument continuously recorded and averaged the data. Two data sets were taken at each location, with the surveyor's orientation 180° different, to minimize the impact of the surveyor's body on the result obtained. The instrument averages the two data sets taken at each defined point to obtain the final spatial average.

### **K. WLEY-FM Auxiliary Facility**

WLEY-FM has an auxiliary transmitter at the site, with its antenna located a few meters north of the roof top access hatch, on the north portico. That facility was not activated during the measurements taken, for the following reasons:

- The rooftop access hatch is interlocked to the WLEY-FM transmitter, disabling its operation if the hatch is opened.
- The physical construction of the hatch prevents a worker from passing through it and then locking it down, to close the interlock switch and enable the WLEY-FM transmitter.

- Therefore, it is not possible for workers on the rooftop to be exposed to excessive RFE levels from the WLEY-FM transmitter and the sole relevant operating mode is WJKL plus WVIX.
- The high degree of shielding apparent for the WJKL/WVIX operation, with an antenna located at the portico edge, makes significant RFE levels in uncontrolled environments extremely unlikely when WLEY-FM might be operating from the site, since the latter station's antenna is located near the center of the overall roof structure.

#### **L. Instrument Used**

A NARDA Safety Test Solutions NBM-550 survey meter with EA5091 shaped broadband electric field probe was used to perform the measurements reported herein. Both components were calibrated by NARDA in February of 2017.

#### **M. Engineer's Certification**

The measurements reported herein were conducted by the undersigned. The data is true and valid to the best of my knowledge and belief.

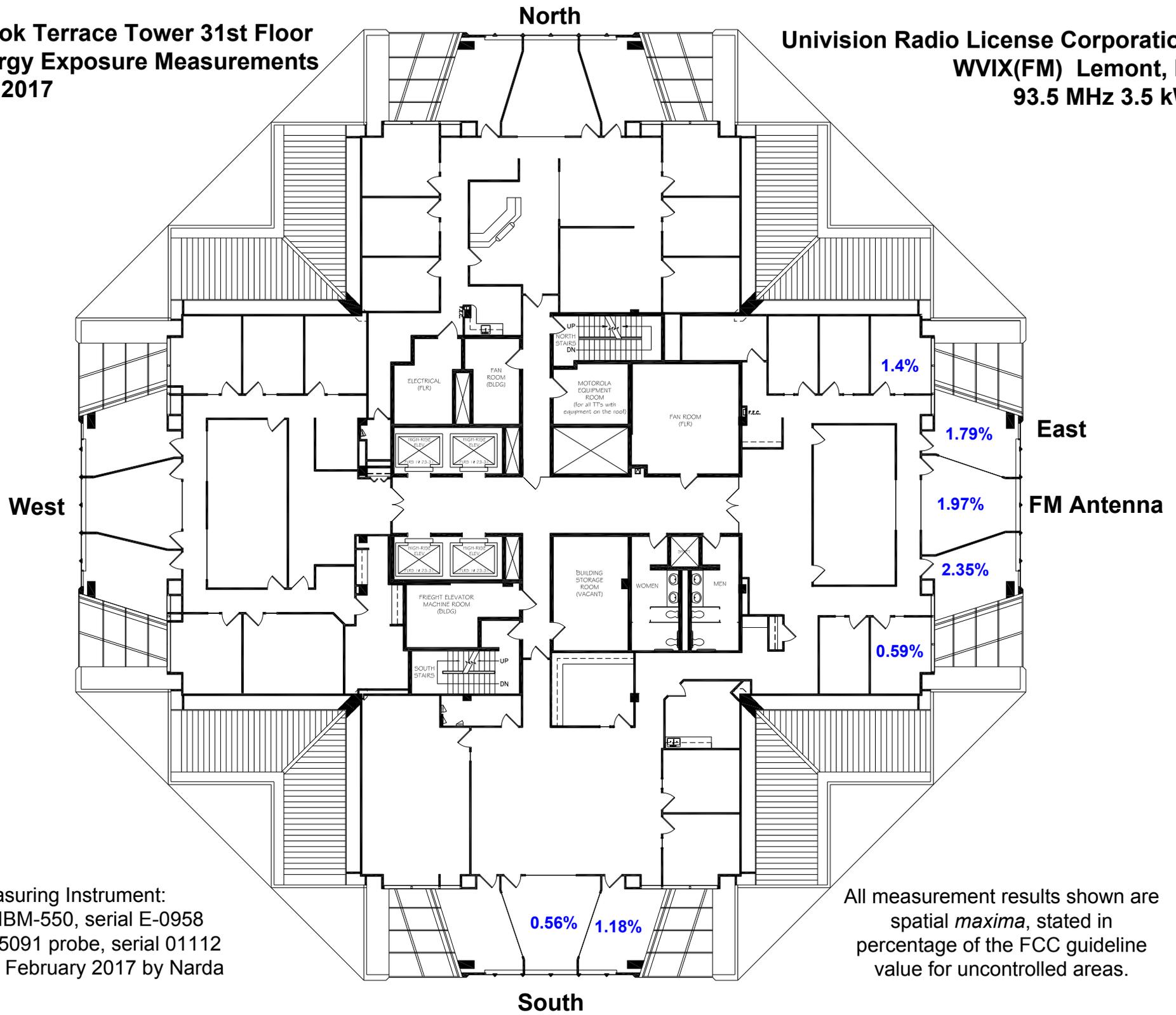


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**Oakbrook Terrace Tower 31st Floor  
RF Energy Exposure Measurements  
19 May 2017**

**Univision Radio License Corporation  
WVIX(FM) Lemont, IL  
93.5 MHz 3.5 kW**



Measuring Instrument:  
Narda NBM-550, serial E-0958  
Narda EA5091 probe, serial 01112  
Calibrated February 2017 by Narda

All measurement results shown are spatial *maxima*, stated in percentage of the FCC guideline value for uncontrolled areas.