

## RF EXPOSURE COMPLIANCE WORKSHEET/INSTRUCTIONS

### Who may use these worksheets?

1. A directional AM station (i.e., one using a multiple tower array) that does not share its towers with any other non-excluded RF sources (including, but not limited to FM or TV transmitting antennas) and is located more than 315 meters (1,034 feet) from any other tower or non-excluded RF radiation sources; or
2. A non-directional AM station located on a single-use tower more than 315 meters (1,034 feet) from any other tower or other non-excluded RF radiation sources; or
3. An FM station on a single tower that may or may not support other FM stations (including FM translators and boosters) and that is more than 315 meters (1,034 feet) from any other tower or non-excluded RF sources.
4. An FM translator on a single tower that may or may not support other FM stations (including FM translators and boosters) that is more than 315 meters (1,034 feet) from any other tower or other non-excluded RF sources.

### Ineligible Sites

Please note that the applicant cannot use these worksheets if any of the following apply:

1. The application is for a television or digital television facility;
2. There are other towers or supporting structures with non-excluded RF sources within 315 meters of the tower (see 47 C.F.R. § 1.1307(b)(
3. There are TV antennas and/or other RF sources on the tower other than AM or FM antennas that are not categorically excluded from environmental processing by 47 C.F.R. § 1.1307;
4. There is an FM, TV or other non-excluded RF source co-located within a multiple tower AM array;
5. The tower is located at a site where the terrain or a building or other inhabited structure (other than a transmitter building) within a 315 meter radius is higher than the level of the terrain at the base of the tower. **(Note:** Sites with transmitter buildings at the base of the tower are considered “eligible” provided that procedures are established in accordance with the methods described in OET Bulletin 65 to protect persons with access to such buildings from RF exposure in excess of the FCC-adopted limits.); or
6. AM towers where access is not restricted by fencing or other barrier that preclude casual or inadvertent access to the site and warning signs are not included at appropriate intervals describing the potential for RF exposure.

**The above categories have been excluded from the RF worksheets not because of a propensity to cause excessive RF radiation, but because a determination of their compliance involves more complex calculations and measurements.** If you are not eligible to use the RF worksheets, or elect not to use them, before reaching a determination with respect to your facilities you should review **OET Bulletin 65 and Supplement A** in order to properly evaluate your facility for compliance with the RF guidelines. The bulletin provides information and assistance on the RF guidelines, prediction methods, measurement

procedures and instrumentation, methods for controlling exposure, and reference material. It will instruct the applicant on the type of data which may demonstrate compliance with the Commission's RF guidelines in support of your response. If you continue to have trouble evaluating your site after consulting the Bulletin, you may want to seek the assistance of a qualified engineer in determining whether these facilities meet the FCC RF exposure guidelines.

### **Other Evaluations**

These worksheets represent "worst case" calculations, and as such, should be used in your initial attempt to determine compliance. If use of the worksheet indicates that you exceed the RF guidelines, levels may still be acceptable based on more detailed evaluation of variables such as antenna type and vertical radiation patterns. In this case you may submit a statement explaining why your facilities do not exceed the RF exposure guidelines at locations where humans are likely to be present, or describing those measures or circumstances which will prevent or discourage humans from entering those areas where the RF levels exceed the guidelines or which will otherwise control access in accordance with the time-averaging limits described in the guidelines. See OET Bulletin 65 and Supplement A. This statement may include:

- (i) antenna radiation patterns showing that the site complies with the guidelines described in OET Bulletin 65;
- (ii) measurements that show the site to comply with the FCC-adopted guidelines;
- (iii) a description of what warning signs, fences or other barriers preclude excessive RF exposure;
- (iv) any other statement necessary to demonstrate compliance with the RF guidelines.

## How to Use RF Worksheets

### Attached are:

Worksheet #1 – FM, FM translator & FM booster  
Worksheet #1A-Multiple FM User Tower  
Worksheet #2 – AM  
Worksheet #2A – Multiple Tower AM Array  
AM Fence Distance Tables

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#### **FM Contributors:**

- a. **Single Use FM or FM translator tower** – Use **Worksheet #1** to determine compliance with the FCC RF exposure limits.
  - b. **Multiple – use FM (including translator & booster)** – Use **Worksheet #1A** for each FM facility on the tower to obtain an approximate power and antenna height and complete **Worksheet #1** as above.
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#### **AM Contributors:**

- a. **Single Tower Site:** Use **Worksheet #2** to determine if the distance to the fence or other restrictive barrier provides adequate protection to the general public pursuant to FCC guidelines.
- b. **Multiple Tower Site** – Use **Worksheet #2** for each tower in the array to determine if the tower is adequately distanced from the fence (or other restrictive barrier). This determination may be made by either of the following methods:
  - i. a “worst case” prediction could be made by assuming that all transmitted power is radiated from each tower. Use **Worksheet #2A** to list the power and fence distance for each tower. Then use **Worksheet #2** for each tower to determine compliance with the FCC guidelines for the single tower.
  - ii. use the actual transmitted power for each tower. Use **Worksheet #2A** to list transmitted powers and restriction distances for each tower. Then, use **Worksheet #2** for each tower to determine compliance with the FCC guidelines for the single tower.

**If any single tower is not adequately distanced from the fence or restrictive barrier, you may not continue to use these worksheets.**

**CAUTION:** Even if you conclude from the use of these worksheets that human exposure to RF electromagnetic fields is consistent with our guidelines, be aware that each site user must also meet requirements with respect to “on-tower” or other exposure by workers at the site (including RF exposure on one tower caused by sources on another tower or towers). These requirements include, but are not limited to the reduction or cessation of transmitter power when persons have access to the site, tower, or antenna. Such procedures must be coordinated among all tower users. **See OET Bulletin 65 for further details.**

**RF Worksheet #1 – FM (including translators & boosters)**

**PLEASE COPY BEFORE USING. THE DETERMINATION OF COMPLIANCE MAY INVOLVE REPEATED CALCULATIONS. IF LOCATED ON A MULTIPLE FM USER TOWER, PLEASE COMPLETE RF WORKSHEET 1A BEFORE PROCEEDING.**

**EFFECTIVE RADIATION CENTER HEIGHT**

Enter proposed “height of radiation center above ground” OR as listed in Line 1 \_\_\_\_\_ m (1)  
of Worksheet 1A.

Is antenna supporting structure located on the roof of a building? (check one)  Yes  No (2)

If Line 2 is “Yes” enter the building height measured at the base of the antenna supporting structure in Line 3

If Line 2 is “No” enter “0” in Line 3..... \_\_\_\_\_ m (3)

Subtract Line (3) from Line (1)..... \_\_\_\_\_ m (4)

Subtract the value 2.0 from Line (4)..... \_\_\_\_\_ m (5)

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**TOTAL EFFECTIVE RADIATED POWER**

(If “beam tilt” is utilized, list maximum values)

List Effective Radiated Power in the Horizontal Plane..... \_\_\_\_\_ kW (6)

List Effective Radiated Power in the Vertical Plane..... \_\_\_\_\_ kW (7)

Add Lines (6) and (7) OR list value from Line 2 in Worksheet 1A..... \_\_\_\_\_ kW (8)

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**PERCENTAGE OF FCC RF LIMIT(S) FOR MAXIMUM PERMISSIBLE EXPOSURE**

Multiply Line (8) by 33.41 ..... \_\_\_\_\_ (9)

Multiply the value listed in Line (5) by itself..... \_\_\_\_\_ (10)

Divide Line (9) by Line (10) ..... \_\_\_\_\_ (11)

Multiply Line (11) by (100) ..... \_\_\_\_\_ (12)

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**DETERMINATION OF COMPLIANCE WITH CONTROLLED/OCCUPATIONAL LIMIT**

Does Line (12) exceed 100%.....  Yes  No (13)

**IF YOU ANSWERED “YES” IN LINE (13), THE WORKSHEETS MAY NOT BE USED IN THIS CASE.\***

**IF YOU ANSWERED “NO” IN LINE (13), THEN THE SITE SHOULD COMPLY WITH THE FCC’S CONTROLLED/OCCUPATIONAL RF EXPOSURE LIMITS FOR GROUND LEVEL EXPOSURE**

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**\*In this case, you may need to prepare an Environmental Assessment.** See Instructions for Section III-C FCC Form 301.

**DETERMINATION OF COMPLIANCE WITH THE UNCONTROLLED/GENERAL POPULATION LIMIT**

Does Line (12) exceed 20%.....  Yes  No (14)

**IF YOU ANSWERED “NO” IN LINE (14), THEN THE SITE SHOULD COMPLY WITH THE FCC’S UNCONTROLLED/GENERAL POPULATION RF EXPOSURE LIMITS FOR GROUND LEVEL EXPOSURE. NO FURTHER STUDY REQUIRED.**

**IF YOU ANSWERED “YES” IN LINE (14), CONTINUE.**

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**ROOFTOP WITH RESTRICTED ACCESS.**

If you answered “YES” in Line (14) and “YES” in Line (2) (indicating that the tower is located on the roof of a building), and the general public is not allowed access to the rooftop level, repeat lines 5 through 12, entering the value in Line (1) directly in Line (4). (If Multiple FM Use tower, recalculations should be in accordance with instructions on Worksheet #1A.) **Otherwise, go to the next section.**

Upon recalculation, does Line (12) exceed 20%.....  Yes  No (15)

**IF YOU ANSWERED “YES” IN LINE (15), THE WORKSHEETS MAY NOT BE USED IN THIS CASE. \***

**IF YOU ANSWERED “NO” IN LINE (15), THEN THE AREA AT GROUND LEVEL SHOULD COMPLY WITH THE FCC’S UNCONTROLLED/GENERAL POPULATION EXPOSURE LIMIT. NO FURTHER STUDY REQUIRED.**

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**ACCESS TO BASE OF TOWER RESTRICTED BY FENCING.**

If the tower is not located on the roof of a building, is the base of the tower surrounded by fencing or other restrictive barrier and are appropriate warning signs posted on the fence that adequately detail the nature of the RF exposure environment contained therein?.....

Yes  No (16)

**IF YOU ANSWERED “NO” IN LINE (16), THE WORKSHEET MAY NOT BE USED IN THIS CASE.\***

If you answered “Yes” in Line (16), what is the distance from the base

of the tower to the fence or barrier at its nearest point..... \_\_\_\_\_ m (17)

Multiply Line (9) (as calculated previously) by 5..... \_\_\_\_\_ (18)

Subtract Line (10) (as calculated previously) from Line (18)..... \_\_\_\_\_ (19)

Take the square root of Line (19)..... \_\_\_\_\_ m (20)

Is Line (20) less than or equal to Line (17).....  Yes  No (21)

**IF YOU ANSWERED “YES” IN LINE (21), THEN THE RF FIELD OUTSIDE THE FENCE COMPLIES WITH THE FCC’S UNCONTROLLED/GENERAL POPULATION EXPOSURE LIMIT. NO FURTHER STUDY REQUIRED.**

**IF YOU ANSWERED “NO” IN LINE (21), THE WORKSHEETS MAY NOT BE USED IN THIS CASE.\***

\* In this case, you may need to prepare an Environmental Assessment. See instructions for Section III-C of FCC Form 301.

**RF WORKSHEET #1A –Multiple FM Use Tower**

The procedure below will allow for a “worst-case” determination to be made in situations where several FM stations share a common tower. This determination is based upon the “worst case” assumption that all RF energy is emanating from a single antenna located at the same height (i.e., antenna center of radiation above ground level) as the lowest user on the tower.

**Complete for all call signs.**

For each call sign, **the total** of the Horizontal and the Vertical ERP’s must be used. If “beam tilt” is utilized, list maximum values.

COLUMN 1  CALL SIGN	COLUMN 2  HEIGHT OF ANTENNA RADIATION CENTER ABOVE GROUND LEVEL	COLUMN 3  TOTAL EFFECTIVE RADIATED POWER (HORIZONTAL AND VERTICAL)
	meters	kilowatts
	meters	kilowatts
	meters	kilowatts
	meters	kilowatts
	meters	kilowatts
	meters	kilowatts

List the smallest value in Column 2..... \_\_\_\_\_ m (1)  
 List the total of all values in Column 3..... \_\_\_\_\_ kW (2)

**The value listed in line (1) above must be used in line (1) on Worksheet 1.**  
**The value listed in line (2) above must be used in line (8) on Worksheet 1.**

**Now complete worksheet 1 (except for lines 6 and 7).**

**RF WORKSHEET #2: AM**

**PLEASE COPY THIS WORKSHEET PRIOR TO USING. IN THE CASE OF A MULTIPLE TOWER ARRAY, A COPY IS NECESSARY FOR EACH TOWER LISTED IN RF WORKSHEET #2A. See AM Instruction b. to “How to Use RF worksheets” on page 5 of Appendix A.**

**SINGLE TOWER**

Enter the transmitted power..... \_\_\_\_\_ kW (1)  
Enter the distance from the tower to the nearest point of the fence or other restrictive barrier enclosing the tower..... \_\_\_\_\_ m (2)

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**DETERMINATION OF WAVELENGTH**

**Method 1: Electrical Height**

The tower height in wavelength may be obtained from the electrical height in degrees of the radiator.

Electrical height of the radiator..... \_\_\_\_\_ degrees (3a)  
Divide Line 3(a) by 360 degrees..... \_\_\_\_\_ wavelength (3b)

**Method 2: Physical Height**

Alternatively, the wavelength may be obtained from the physical height of the radiator above the tower base and the frequency of the station.

Overall height of the radiator above the tower base..... \_\_\_\_\_ m (4a)  
List the station’s frequency..... \_\_\_\_\_ kHz (4b)  
Divide 300,000 by Line (4b)..... \_\_\_\_\_ m (4c)  
Divide Line (4a) by Line 4(c) ..... \_\_\_\_\_ wavelength (4d)

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**REQUIRED RESTRICTION DISTANCE**

Use the appropriate AM fence distance table based on the wavelength determined in either Line (3b) or Line (4d) above. If the transmitted power is not listed in the table, use next highest value (e.g., if the transmitted power is 2.5 kW, use the fence value in the 5 kW column).

List the fence distance obtained from the appropriate table..... \_\_\_\_\_ m (5)

Is the value listed in Line (5) less than or equal to the value listed in Line (2)?  Yes  No (6)

If line (6) is “Yes,” are warning signs posted at appropriate intervals which describe the nature of the potential hazard?  Yes  No (7)

IF EITHER LINE (6) OR LINE (7) WAS ANSWERED “NO”, you may need to prepare an Environmental Assessment. However, in order to determine the need for such an Assessment please see the **NOTE** on page 5 of Appendix A. If after consideration of such factors as the antenna radiation pattern, measurement data and the barriers which restrict access you conclude that an Environmental Assessment is required, please see Section I of the instructions to this worksheet entitled “Environmental Assessment.”

IF BOTH LINE (6) AND LINE (7) WERE ANSWERED “YES”, it appears that this tower complies with the FCC guidelines with respect to the general public. Please be aware, that each site user must also meet requirements with respect to “on-tower” or other exposure by workers at the site (including RF fields caused by other facilities on the tower, or RF fields caused by facilities on another tower or towers). These requirements include, but are not limited to the reduction or cessation of transmitter power when persons have access to the site, tower, or antenna. **See OET Bulletin 65 for more details.**



**RF WORKSHEET #2A Multiple Tower AM Array**

Do not use this table if there are FM, TV or other non-excluded RF sources on any single tower of the array.

Tower Number	Transmitted Power (kW)	Distance to Fence (meters)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

If each tower listed above meets the distance requirements of the worksheet #2, it appears this tower complies with the FCC guidelines with respect to the general public. Please be aware, that each site user must also meet requirements with respect to “on-tower” or other exposure by workers at the site. These requirements include, but are not limited to the reduction or cessation of transmitter power when persons have access to the site, tower, or antenna. **See OET Bulletin 65 for more details.**

If the distance from the base of the tower to the fence is less than the value listed above, you may need to prepare an Environmental Assessment. However, in order to determine the need for such an Assessment please see the **NOTE** on page 5 of Appendix A. If after consideration of such factors as the antenna radiation pattern, measurement data and the barriers which restrict access you conclude that an Environmental Assessment is required, please see Section I of the instructions to this worksheet entitled “Environmental Assessment.”

## AM FENCE DISTANCE TABLES

**TABLE 1. Predicted Distances for Compliance with FCC Limits: 0.1-0.2 Wavelength**

Frequency (kHz)	Transmitter Power (kW)			
	50	10	5	1
	Predicted Distance for Compliance with FCC Limits (meters)			
535-740	13	7	6	3
750-940	12	7	5	3
950-1140	11	6	5	3
1150-1340	10	6	5	3
1350-1540	10	6	5	3
1550-1705	10	6	5	3

**TABLE 2. Predicted Distances for Compliance with FCC Limits: 0.21-0.4 Wavelength**

Frequency (kHz)	Transmitter Power (kW)			
	50	10	5	1
	Predicted Distance for Compliance with FCC Limits (meters)			
535-740	4	2	2	1
750-940	4	2	2	1
950-1140	4	2	2	1
1150-1340	4	2	2	1
1350-1540	4	2	2	1
1550-1705	5	2	2	1

**TABLE 3. Predicted Distances for Compliance with FCC Limits: 0.41-0.55 Wavelength**

Frequency (kHz)	Transmitter Power (kW)			
	50	10	5	1
	Predicted Distance for Compliance with FCC Limits (meters)			
535-740	4	3	2	2
750-940	4	2	2	2
950-1140	4	2	2	1
1150-1340	4	2	2	2
1350-1540	4	2	2	2
1550-1705	4	3	2	1

**TABLE 4. Predicted Distances for Compliance with FCC Limits: 0.56-6255 Wavelength**

Frequency (kHz)	Transmitter Power (kW)			
	50	10	5	1
	Predicted Distance for Compliance with FCC Limits (meters)			
535-740	4	3	2	1
750-940	4	2	2	1
950-1140	4	2	2	1
1150-1340	4	2	2	1
1350-1540	4	2	2	1
1550-1705	4	2	2	2