

# The “New” FCC RF Exposure Rules: *A Practical Methodology*



**Larry Banks, W1DYJ**

**First licensed: 1962 (KN1VFX)**

**W1DYJ since 1966 – Amateur Extra**

**33 Blueberry Hill Road Woburn MA**

**W1DYJ ~ Larry Banks**



**INDEXA**

# The “New” FCC RF Exposure Rules ~ **Abstract**

The FCC has changed the "rules" about RF Exposure:

- The **exposure criterion** have not changed
- The **rules** about assessing your station have.

There is no longer a simple exemption:

- We are **required** to do this assessment **by 3 May 2023**,  
*and whenever you make a significant change.*
- I recently assessed my station here in Woburn MA,  
and it turned out to be much less an issue than I expected.

This talk describes the process I used. It could be a model for your own evaluation. And as I was doing this, I learned some other interesting stuff!



# Agenda

- The Rules
- Definitions
- Assessment Methodologies
- Assessment @ W1DYJ
- Additional Observations
- Conclusions & Resources

## Disclaimer:

I am not an expert.

These are my best understandings of the science and the requirements of the FCC at this time: *January 2023.*



# The Rules

- What has not changed
- What has changed



# The Rules

## What has Not Changed?

- Ham radio has been **required** to meet RF exposure rules for 25 years.
- An **evaluation** of your station is required.
- You may use **any valid method** you feel appropriate.
- You must **certify** on license application form 605 that you comply.
- Compliance **records** do not need to be kept.
- The FCC can ask for your **evidence** if they wish, e.g. due to a complaint.

QST January 1998

Jan 1998 QST - Copyright © 2022 American Radio Relay League, Inc. - All Rights Reserved

By Ed Hare, W1RFI

### FCC RF-Exposure Regulations—the Station Evaluation

Most hams can easily meet the requirements in the rules. The good news is that many amateur stations will not have to be evaluated at all!

**It's** been a long road, but Amateur Radio now has a clear light at the end of the tunnel leading us toward the implementation date of the RF exposure rules. The FCC has released "Supplement B," the Amateur Radio supplement to "OET Bulletin 65." This answers our questions about the "routine environmental evaluation" required by the rules. The actual requirements are not nearly as onerous as they sound!

The rules were discussed in previous 1997 articles in QST. Reading those articles is a "must" to understanding this one.<sup>1,2</sup>

#### The Sky Is Not Falling!

Most hams will not have difficulty meeting the requirements. In fact, most hams are already in compliance with the maximum permissible exposure (MPE) levels. Some fear, however, that they'll have to do difficult measurements, perform extensive calculations or file paperwork with the FCC. Wrong on all counts. The evaluation is often as easy as using tables to determine that your antenna is far enough away from people.

#### An Overview of the Rules

The rules set limits on the RF exposure levels people may be subjected to. The MPE limits vary with frequency. The MPE levels represent the amount of energy that can be present where and when people are being exposed. They do not limit the permitted radiated strength from a radio station and do not change the maximum power levels permitted to Amateur Radio operators. The actual MPE limits were explained in the January 1997 QST article.

The rules define two exposure environments, each with different MPE levels. The uncontrolled environment applies to areas where people would not normally know they are being exposed. This includes "public" areas such as your property line or a neighbor's yard.

boring apartment.

Controlled environments apply where people are aware of their exposure and have the ability and knowledge to control it. Greater MPE levels are permitted in controlled areas. A good rule of thumb is that the controlled exposure limit can be applied to those areas in which you can control access. An example of this is your fenced-in backyard. Your own household can also be a controlled environment if your family or guests have been given instruction about RF exposure and safety. (You could show them the information on ARRL's Web page<sup>3</sup> or in the "ARRL RF Exposure" package.)

The rules also require that some amateur stations be evaluated to verify that they are in compliance with the MPE levels. It's this aspect of the rules that raises eyebrows among hams.

#### Who Needs to Do an Evaluation?

The good news is that most amateur stations do not need to be evaluated. The following classes of amateur stations are exempt from the evaluation requirement because their power levels or operating duty cycles are low enough that they are presumed to be in compliance with the MPE limits:

- Stations using the power levels or below those shown in Table 1.
- Most mobile or portable stations (hand-held).<sup>4</sup>
- Amateur repeaters using 500 W effective radiated power (ERP) or less, if they meet certain antenna-separation requirements.

The power levels in Table 1 are expressed in PEP input to the antenna, except for the repeater specification, which is in terms of ERP. To determine the PEP input to the antenna you will need to include the transmitter PEP output and any feed line losses. Hams whose power levels exceed these limits must perform an evaluation.

#### Who Can Do the Evaluation?

The FCC is relying on amateurs to perform their own station evaluations. Other than a simple statement on Form 610, the FCC does not require any paperwork from amateurs; once the evaluation is complete, the amateur can begin operation.

#### What Is in Bulletin 65?

Let's take a look at what is found in Bulletin 65 and Supplement B. This article can't

**Table 1**  
You must perform an RF environmental evaluation if the peak-envelope-power (PEP) input to the antenna exceeds these limits. (Use 500 W ERP for repeater stations.)

Band	Power (W)
160 meters	500
80	500
75	500
40	500
30	425
20	225
17	125
15	100
12	75
10	50
6	50
2	50
1.25	50
70 cm	70
33	150
23	200
13	250
SHF (all bands)	250
EHF (all bands)	250

**Repeater, Non-building-mounted antennas:** If the distance between ground level and the lowest point of the antenna is less than 10 meters and the power is greater than 500 W ERP.

**Building-mounted antennas:** If the power exceeds 500 W ERP.

<sup>1</sup>Notes appear on page 55.

50 January 1998 QST.



# The Rules

## What has Changed?

- Ham Radio used to be (for most stations) “exempt” from a complete assessment.
- Now, all radio services **must** use the same “**formula-based criterion**” to determine whether an **evaluation** is required.
  - Takes into account transmit power, antenna gain, and frequency
- If you were “OK” before under the old rules **will still be “OK”** under these new criterion.
- If **nothing has changed** at your station **you have until 3 May 2023** to perform this new assessment.



# Agenda

- The Rules
- **Definitions**
  - **Effective Radiated Power [ERP]**
  - **Near field / far field boundary**
- Assessment Methodologies
- Assessment @ W1DYJ
- Additional Observations
- Conclusions & Resources



# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.





# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.

- 100 watts CW key-down into a dipole = 100 watts ERP
  - *Assumes zero loss in the feed system*



# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.

- 100 watts CW key-down into a dipole = 100 watts ERP
- 100 watts CW key-down into a 3 dB gain antenna = 200 watts ERP



# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.

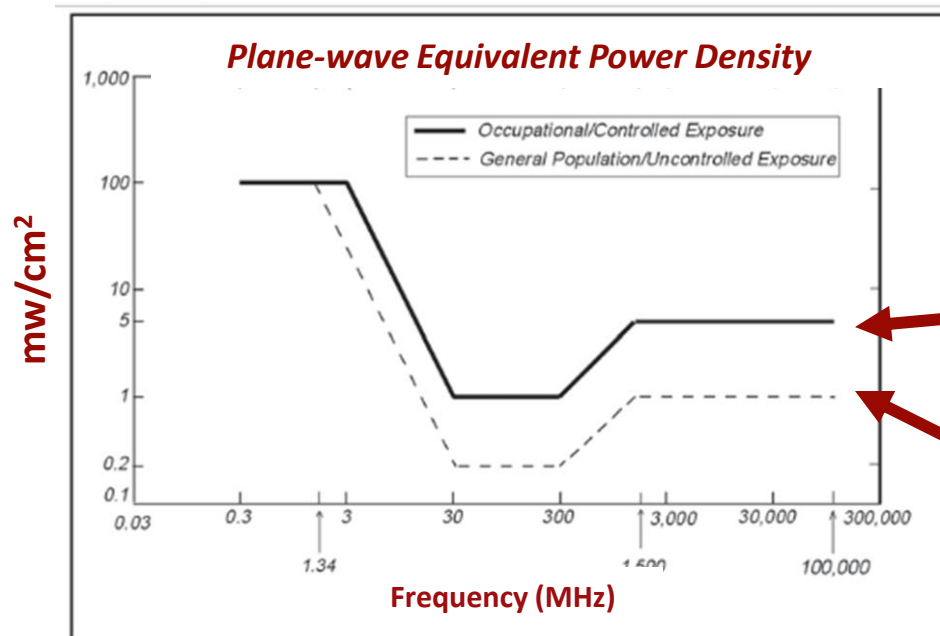
- 100 watts CW key-down into a dipole = 100 watts ERP
- 100 watts CW key-down into a 3 dB gain antenna = 200 watts ERP
- 100 watts PEP SSB into a dipole = 20-50 watts ERP, based on speech processing



# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.



The graph that is important to the FCC

Reference: C95.1-2005: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

Controlled (6 minute) Exposure:  
*you and your family*

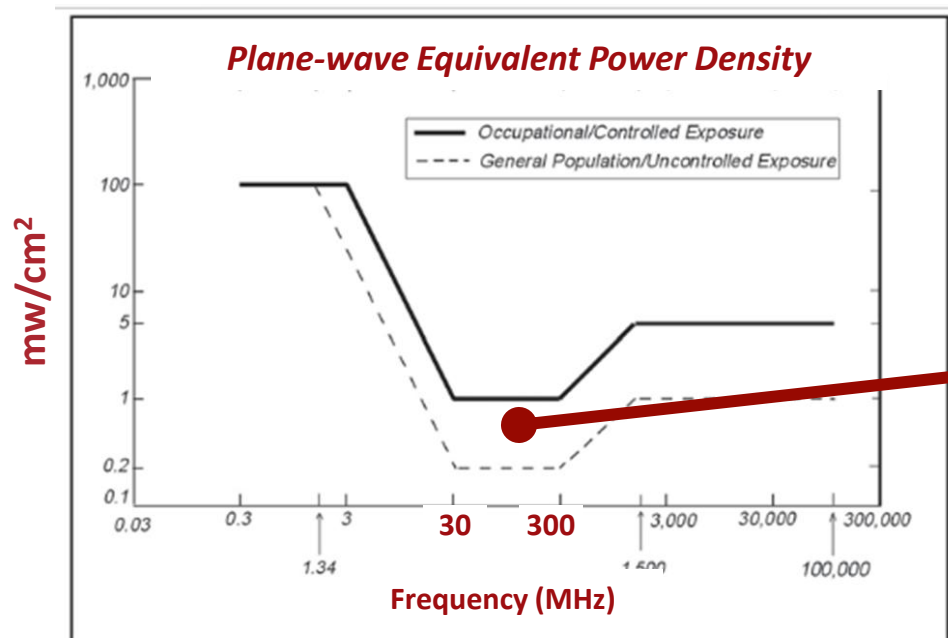
Uncontrolled (30 minute) Exposure:  
*everyone else*



# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.



**My Own Interpretation!**

Where the human body is “sort-of” a salt-water filled bag  $\lambda/2$  long.

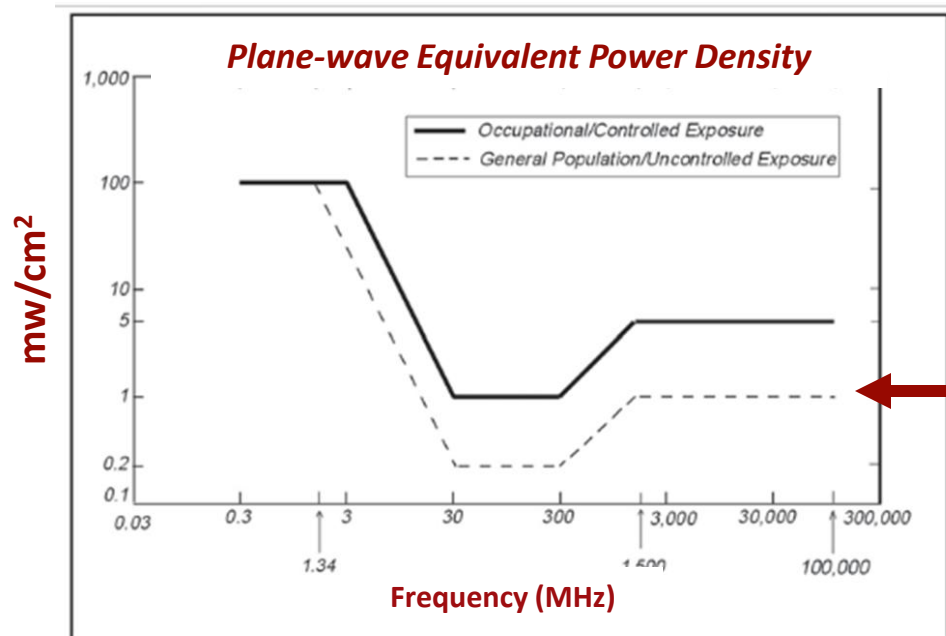
[ $\lambda/2$  @ 100 MHz =  $1\frac{1}{2}\text{M} \sim 5'$ ]



# Definition I - ERP

- **Effective Radiated Power [ERP]**

The time-averaged power radiated by a transmitter in any direction relative to the power from a half-wave dipole.



## The “Uncontrolled” Equations

Freq MHz	Threshold ERP
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2 / F^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 F$
1.5G-100G	$19.2 R^2$

R = Distance (M) between the body and the antenna



# Definition II – Near/Far Field

- **Near Field /Far Field boundary** [Wikipedia]  
The near field and far field are regions of the electromagnetic field...around an object, such as a transmitting antenna...

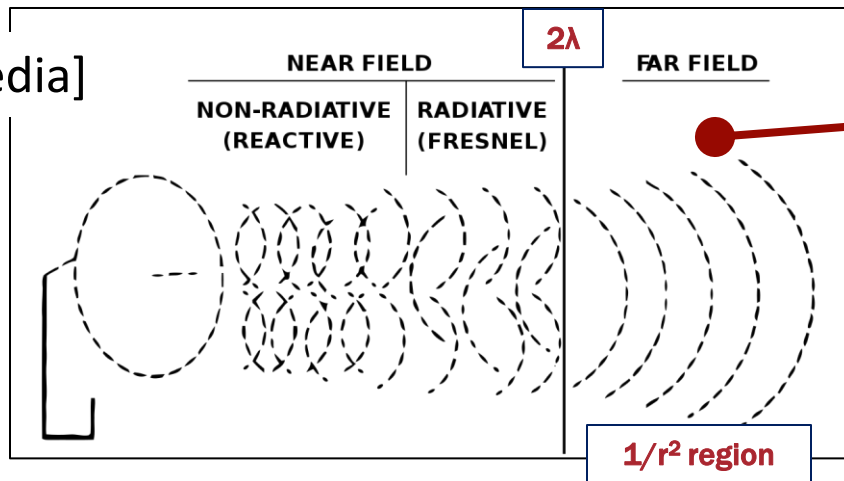
Non-radiative near-field behaviors dominate close to the antenna... while electromagnetic radiation far-field behaviors dominate at greater distances.



# Definition II – Near/Far Field

- Near field /far field boundary

[Wikipedia]



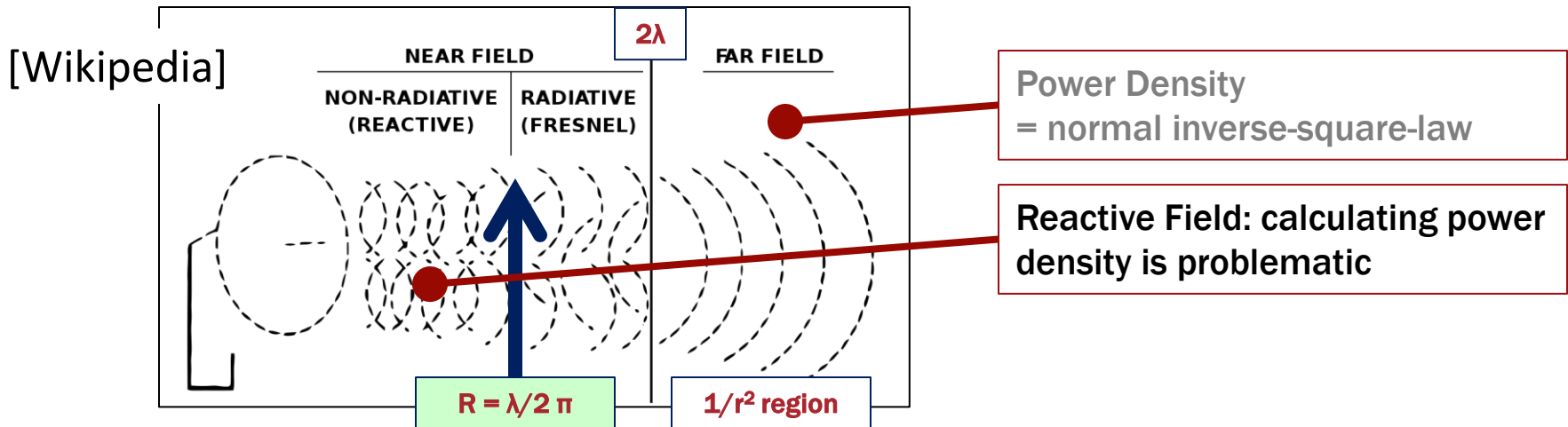
Power Density  
= normal inverse-square-law





# Definition II – Near/Far Field

- Near field /far field boundary [  $R = \lambda/2 \pi$  ← ← FCC's concern ].

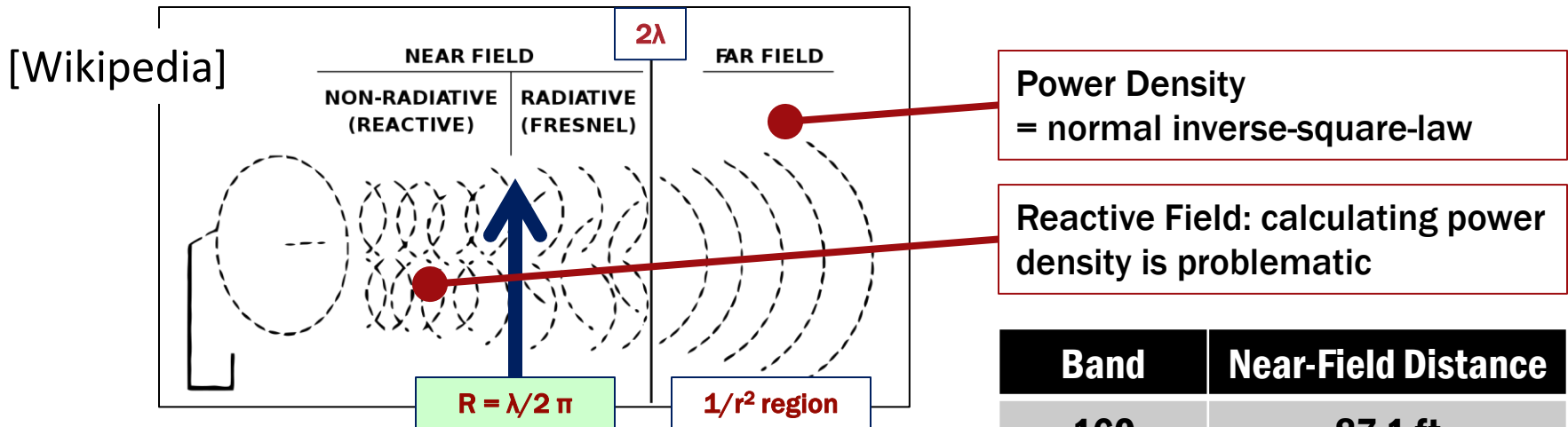


Note: these boundaries are “fuzzy”



# Definition II – Near/Far Field

- Near field /far field boundary [  $R = \lambda/2 \pi$  ← ← FCC's concern ].



Note: these boundaries are “fuzzy”

$< R = \lambda/2 \pi$   
FCC's concern

Band	Near-Field Distance
160	87.1 ft
80	44.8 ft
40	22.4 ft
20	11.2 ft
10	5.6 ft

Minimum = 20 cm.



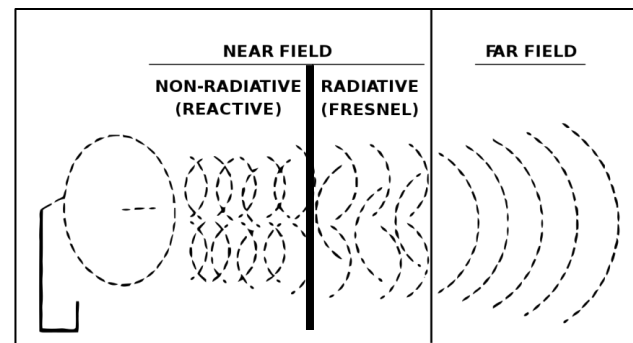
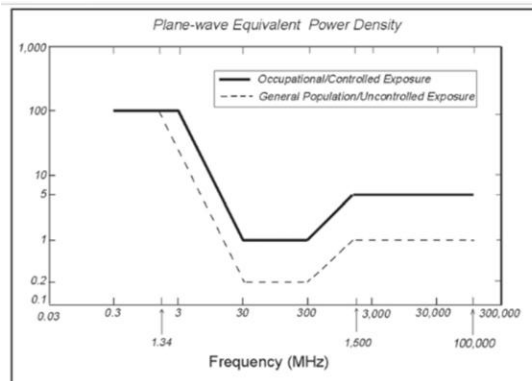
# The Two Important Definitions

## Effective Radiated Power

Freq MHz	Threshold ERP
0.3-1.34	1,920 R <sup>2</sup>
1.34-30	3,450 R <sup>2</sup> /F <sup>2</sup>
30-300	3.83 R <sup>2</sup>
300-1.500	0.0128 R <sup>2</sup> F
1.5G-100G	19.2 R <sup>2</sup>

## Near field / far field boundary

Band	Near-Field Distance
160	87.1 ft
80	44.8 ft
40	22.4 ft
20	11.2 ft
10	5.6 ft



# Agenda

- The Rules
- Definitions
- **Assessment Methodologies**
  - **The FCC Formula**
  - **Field Strength Measurement**
  - **Antenna Modeling**
  - **On-Line Calculator**
- Assessment @ W1DYJ
- Additional Observations
- Conclusions & Resources



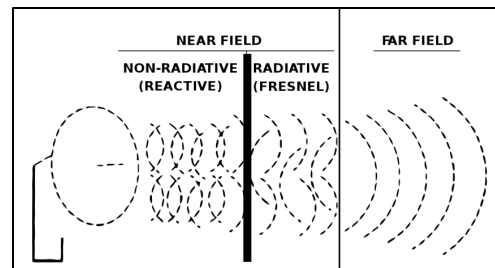
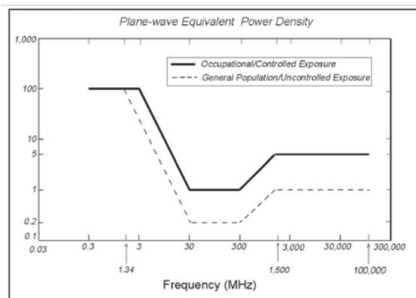
# Assessment Methodologies – FCC Formula

## Using ERP and the near field /far field boundary

*The Complicated Way to Determine  
if you Must Perform an Evaluation*

Freq MHz	Threshold ERP
0.3-1.34	1,920 R <sup>2</sup>
1.34-30	3,450 R <sup>2</sup> /F <sup>2</sup>
30-300	3.83 R <sup>2</sup>
300-1.500	0.0128 R <sup>2</sup> F
1.5G-100G	19.2 R <sup>2</sup>

Band	Near-Field Distance
160	87.1 ft
80	44.8 ft
40	22.4 ft
20	11.2 ft
10	5.6 ft



**IF**  
**you are below the**  
**ERP threshold**  
**AND**  
**outside the**  
**Near-Field boundary**  
**THEN**  
**you need not do a**  
**full evaluation.**  
[Minimum = 20 cm.]

You still have to document  
this, but not necessarily  
keep the document.



# Assessment Methodologies – FCC Formula

Freq MHz	Threshold ERP
0.3-1.34	1,920 R <sup>2</sup>
1.34-30	3,450 R <sup>2</sup> /F <sup>2</sup>
30-300	3.83 R <sup>2</sup>
300-1.500	0.0128 R <sup>2</sup> F
1.5G-100G	19.2 R <sup>2</sup>

Band	Near-Field Distance
160	87.1 ft
80	44.8 ft
40	22.4 ft
20	11.2 ft
10	5.6 ft

**IF**  
you are below the  
ERP threshold  
**AND**  
outside the  
Near-Field boundary  
**THEN**  
you need not do a  
full evaluation.  
[Minimum = 20 cm.]

**Example: 100 watts to antenna @ 33' on 28MHz**

33' (=10M) is outside the near-field boundary → use only ERP

ERP Threshold :  $3450 \times 10^2 / 28^2 = 440$  watts ERP >> **Dipole → OK**



# Assessment Methodologies – FCC Formula

Freq MHz	Threshold ERP
0.3-1.34	1,920 R <sup>2</sup>
<b>1.34-30</b>	<b>3,450 R<sup>2</sup>/F<sup>2</sup></b>
30-300	3.83 R <sup>2</sup>
300-1.500	0.0128 R <sup>2</sup> F
1.5G-100G	19.2 R <sup>2</sup>

Band	Near-Field Distance
160	87.1 ft
80	44.8 ft
40	22.4 ft
20	11.2 ft
<b>10</b>	<b>5.6 ft</b>

**IF**  
you are below the  
**ERP threshold**  
**AND**  
outside the  
Near-Field boundary  
**THEN**  
you need not do a  
full evaluation.  
[Minimum = 20 cm.]

## Example: 100 watts to antenna @ 33' on 28MHz

33' (=10M) is outside the near-field boundary → use only ERP

ERP Threshold:  $3450 \times 102 / 28^2 = 440$  watts ERP >> Dipole → OK

5el 10M Yagi (8 dBd = x6.3):  $(100 \times 6.3) = 630$  watts ERP → Problem!



# Assessment Methodologies – Evaluation

## Field Strength Measurement [mw/cm<sup>2</sup>]

- Requires calibrated equipment
- Usually done by specialists
- Requires knowledge of allowed exposure levels

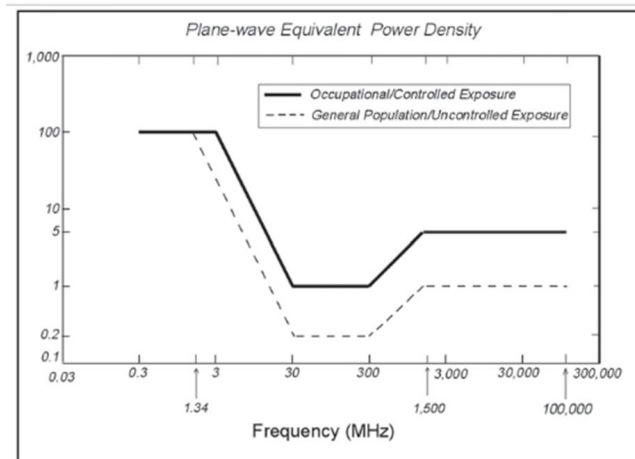


Figure 1. FCC limits on RF exposure, based on frequency, for both "controlled" (occupational or immediate family members) and "uncontrolled" (neighbors and the general public) settings.





# Assessment Methodologies – Evaluation

## Antenna Modeling

- Allows you to predict and model actual field strength
- Requires expertise in modeling with EZNEC, etc.
  - Difficulty with your local environment: buildings, house wiring, etc.
- ARRL does have extensive charts in:

*RF Exposure and You* (ARRL PDF: 316 pages)

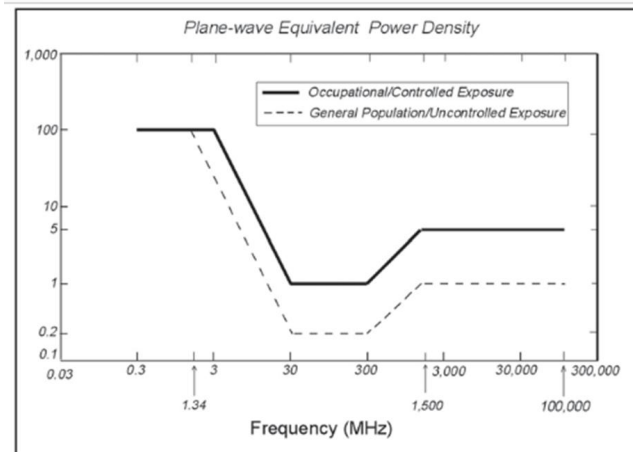


Figure 1. FCC limits on RF exposure, based on frequency, for both "controlled" (occupational or immediate family members) and "uncontrolled" (neighbors and the general public) settings.



# Assessment Methodologies – Evaluation

## On-Line Calculator

- <http://www.arrl.org/rf-exposure-calculator>
- This essentially does the assessment and evaluation at the same time.

**EASY → My Method**

**IF**  
you are below the  
ERP threshold  
**AND**  
outside the  
Near-Field boundary  
**THEN**  
you need not do a  
full evaluation.  
[Minimum = 20 cm.]

***Motivation for you!!!***



# The ARRL Calculator <http://www.arrl.org/rf-exposure-calculator>

**Parameters**

- Power at Antenna: (Need help with this?)  (watts)
- Mode duty cycle:
- Transmit duty cycle: (time transmitting)  
You transmit for  minutes then receive for  minutes (and repeat).
- Antenna Gain (dBi): (Need help with this?)
- Operating Frequency (MHz):

☒ Include Effects of Ground Reflections

If you would like to receive future announcements of any FCC news related to RF-exposure or the requirements for amateurs to evaluate their stations, you may **optionally** provide an email address.

Email Address:	<input type="text"/> (optional)
Comments:	<input type="text"/> (optional)

---

**Results for a controlled environment:**

Maximum Allowed Power Density (mw/cm<sup>2</sup>):

Minimum Safe Distance (feet):

Minimum Safe Distance (meters):

---

**For an uncontrolled environment:**

Maximum Allowed Power Density (mw/cm<sup>2</sup>):

Minimum Safe Distance (feet):

Minimum Safe Distance (meters):

**Power @ Antenna**

**Mode Duty Cycle**

**SSB, no speech processing** → 20%  
**SSB, heavy speech processing** → 50%  
**FM** → 100%  
**FSK/RTTY** → 100%  
**AFSK (e.g. FT8)** → 100%  
**CW** → 40%  
**Key-down** → 100%

**Transmit/Receive Ratio**

**Be sure that this reflects reality!**  
[Form limitation: min. of 1 minute]

**Examples (your mileage will vary):**  
**Ragchew during net:** 5 xmt / 10 rcv  
**CW Traffic Net:** 2 xmt / 10 rcv  
**Contest "running":** 1 xmt / 1 rcv  
**Contest "S&P":** 1 xmt / 3 rcv  
**FT8 worst case:** 1 xmt / 1 rcv



# The ARRL Calculator <http://www.arrl.org/rf-exposure-calculator>

**Parameters**

- Power at Antenna: (Need help with this?)  (watts)
- Mode duty cycle:
- Transmit duty cycle: (time transmitting)  
You transmit for  minutes then receive for  minutes (and repeat).
- Antenna Gain (dBi): (Need help with this?)
- Operating Frequency (MHz):

☒ Include Effects of Ground Reflections

If you would like to receive future announcements of any FCC news related to RF-exposure or the requirements for amateurs to evaluate their stations, you may optionally provide an email address.

Email Address:	<input type="text"/> (optional)
Comments:	<input type="text"/> (optional)

**Calculate**

---

**Results for a controlled environment:**

Maximum Allowed Power Density (mw/cm<sup>2</sup>):

Minimum Safe Distance (feet):

Minimum Safe Distance (meters):

---

**For an uncontrolled environment:**

Maximum Allowed Power Density (mw/cm<sup>2</sup>):

Minimum Safe Distance (feet):

Minimum Safe Distance (meters):

Antenna gain **dBi**

Frequency **MHz**

**Ground Effects?**

**CHECKED = most conservative.**  
Assumes the effect of reflections from ground. Use for low or non-directional antennas.

**Controlled (6 min. exposure)**

Assumes people are aware of your RF emissions.

**Uncontrolled (30 min. exposure)**

Most conservative. Assumes people are not aware of your RF emissions.



# Agenda

- The Rules
- Definitions
- Assessment Methodologies
- **Assessment @ W1DYJ**
  - **Data Gathering – Model your Station**
  - **Calculate or Determine Info for web form**
  - **Document the results from the web form**
- Additional Observations
- Conclusions & Resources

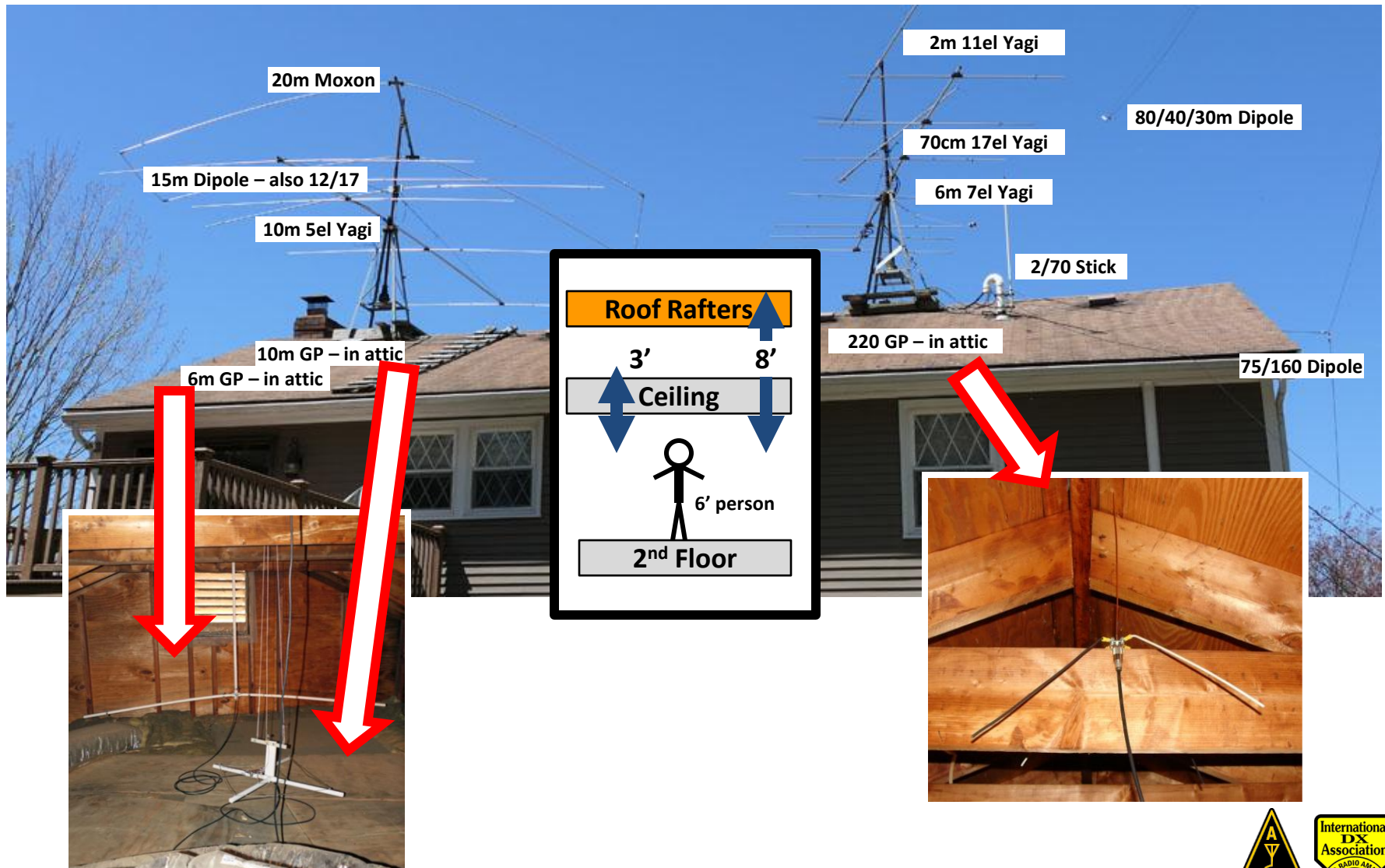


# Assessment @ W1DYJ

- **Data Gathering – Model your Station**
  - For each antenna:
    - Frequency
    - Worst Case Mode & Power @ Transmitter
    - Antenna Type & Distance to People
      - Controlled
      - Uncontrolled
    - *Coax Type & Length (can be ignored for worst-case)*

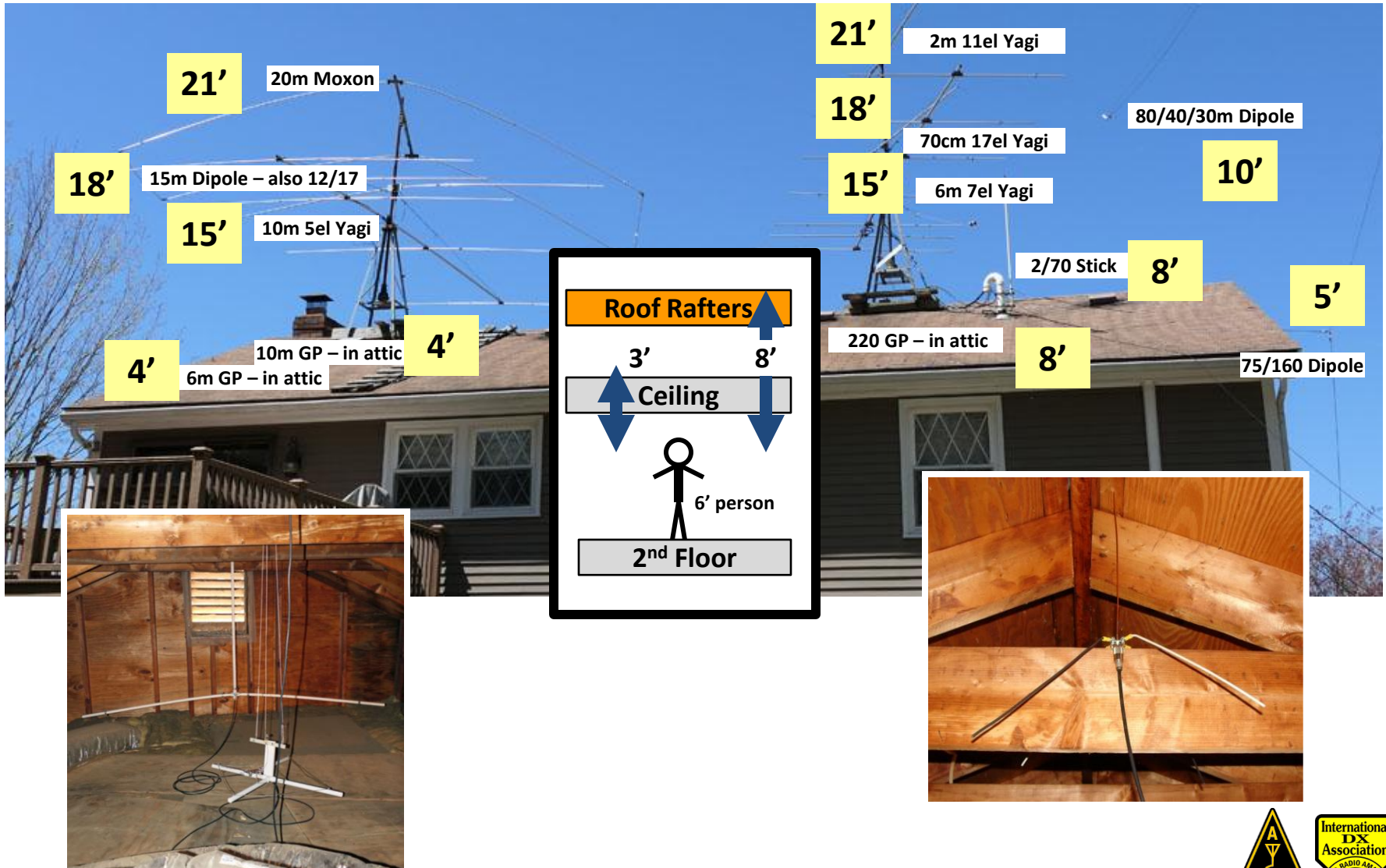


# Assessment @ W1DYJ Data Gathering – Antennas



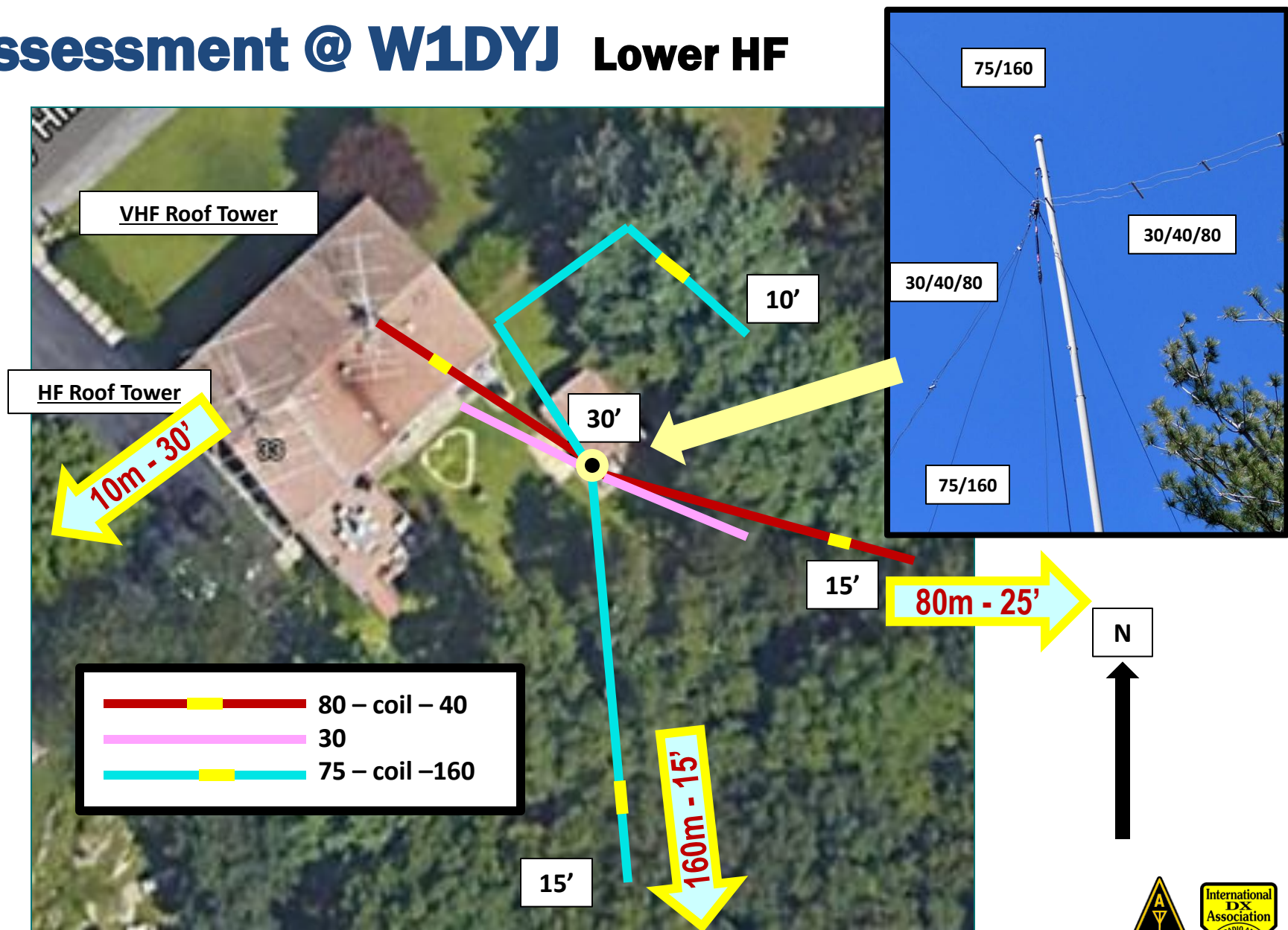


# Assessment @ W1DYJ      Controlled Distances





# Assessment @ W1DYJ Lower HF



# Assessment @ W1DYJ

## First – Data Gathering Result

- Coax Type & Length
- Worst Case Mode & Power
- Antenna Type & distance to people
  - Controlled and Uncontrolled

Band	Antenna	Coax	Feet	Mode	Power	Controlled Distance	Uncontrolled Distance
160	dipole	RG58A	90	FT8	80	5	15
80	dipole	RG58A	90	FT8	80	5	25
40	dipole	RG58A	90	FT8	80	10	25
30	dipole	RG58A	90	FT8	80	15	25
20	Moxon	RG8X	80	FT8	80	21	36
17	dipole	RG8X	73	FT8	80	18	33
15	dipole	RG8X	73	FT8	80	18	33
12	dipole	RG8X	73	FT8	80	18	33
10	5 el yagi	RG8X	70	FT8	80	15	30
10	Grnd Pln	RG8X	56	FM	100	4	35
6	7 el yagi	LMR400	48	FT8	80	15	30
6	Grnd Pln	RG8X	70	FM	100	4	35
2	12 el yagi	LMR400	50	SSB	100	21	36
1.25	Grnd Pln	RG8X	25	FM	25	8	35
0.70	18 el yagi	LMR400	43	SSB	50	18	33


### Mobile -- Audi

2	1/4 wave V	RG58	15	FM	50	5	3
0.7	3/4 wave V	RG58	15	FM	35	5	3



# Assessment @ W1DYJ

## Second – Calculate or Determine Essential Information



Band	Antenna Type	dBi Gain Main Lobe	Coax	Feet	Loss (TLW) dB	Mode	Mode Duty Cycle	Xmt/Rcv Ratio	Power	Power @ Antenna
160	dipole	2.15	RG58A	90	-0.6	FT8	100	1/1	80	70
80	dipole	2.15	RG58A	90	-0.8	FT8	100	1/1	80	67
40	dipole	2.15	RG58A	90	-1.0	FT8	100	1/1	80	64
30	dipole	2.15	RG58A	90	-1.3	FT8	100	1/1	80	59
20	Moxon	6	RG8X	80	-1.0	FT8	100	1/1	80	64
17	dipole	2.15	RG8X	73	-1.0	FT8	100	1/1	80	64
15	dipole	2.15	RG8X	73	-1.1	FT8	100	1/1	80	62
12	dipole	2.15	RG8X	73	-1.2	FT8	100	1/1	80	61
10	5 el yagi	10	RG8X	70	-1.3	FT8	100	1/1	80	59
10	Grnd Pln	2.15	RG8X	56	-1.1	FM	100	1/1	100	78
6	7 el yagi	12	LMR400	40	-0.43	FT8	100	1/1	80	72
6	Grnd Pln	2.15	RG8X	70	-1.9	FM	100	1/1	100	65
2	12 el yagi	14.5	LMR400	50	-0.77	SSB	50	1/1	100	84
1.25	Grnd Pln	2.15	RG8X	25	-1.5	FM	100	1/1	25	18
0.70	18 el yagi	16.5	LMR400	43	-1.18	SSB	50	1/1	50	38
Mobile -- Audi										
2	1/4 wave V	2.15	RG58	15	-1.1	FM	100	1/3	50	39
0.7	3/4 wave V	5.3	RG58	15	-2	FM	100	1/3	35	22



# Assessment @ W1DYJ

## Example – 160 M

### Third – Transcribe from web form

Parameters

- Power at Antenna: (Need help with this?)  (watts)
- Mode duty cycle:
- Transmit duty cycle: (time transmitting)  
You transmit for  minutes then receive for  minutes (and repeat).
- Antenna Gain (dBi): (Need help with this?)
- Operating Frequency (MHz):

☒ Include Effects of Ground Reflections

If you would like to receive future announcements of any FCC news related to RF-exposure or the requirements for amateurs to evaluate their stations, you may optionally provide an email address.

Email Address: (optional)

Comments: (optional)

Results for a controlled environment:

Maximum Allowed Power Density (mw/cm<sup>2</sup>):

Minimum Safe Distance (feet):

Minimum Safe Distance (meters):

For an uncontrolled environment:

Maximum Allowed Power Density (mw/cm<sup>2</sup>):

Minimum Safe Distance (feet):

Minimum Safe Distance (meters):

70w

AFSK

1/1

2.15

2 MHz

YES

0.35'

0.53'



# Assessment @ W1DYJ

Third – Transcribe from web form >> RESULTS

Band	Mode	Ground Effects?	Controlled - 6 min		Uncontrolled - 30 min	
			Antenna Distance	Controlled ft(min)	Antenna Distance	Uncontrolled ft(min)
160	FT8	Y	5	0.35	15	0.53
80	FT8	Y	5	0.46	25	1.04
40	FT8	Y	10	0.79	25	1.77
30	FT8	Y	15	1.09	25	2.42
20	FT8	Y	21	2.49	36	5.56
17	FT8	Y	18	2.04	33	4.55
15	FT8	Y	18	2.34	33	5.23
12	FT8	Y	18	2.65	33	5.93
10	FT8	Y	15	7.51	30	11.56
10	FM	Y	4	3.60	35	8.10
10	FM	N	"	2.26	"	5.06
6	FT8	Y	15	11.26	30	25.18
6	FT8	N	"	7.04	"	15.74
6	FM	Y	4	3.60	35	8.05
2	SSB	Y	21	11.50	36	25.63
1.25	FM	Y	6	1.80	35	4.02
0.70	SSB	Y	18	8.04	33	17.97

Mobile -- Audi

2	FM	Y	5	2.16	3	4.32
0.7	FM	Y	5	1.93	3	3.85

Mostly OK

Potential issues on  
10m FM & 6m FT8

Don't operate  
mobile in a parking  
lot or with people in  
the back seat at  
high power!

Low power (5w)  
1.73  
1.82



# Agenda

- The Rules
- Definitions
- Assessment Methodologies
- Assessment @ W1DYJ
- **Additional Observations**
  - **HTs, Cell Phones, Wi-Fi...**
- Conclusions & Resources



# Other Observations: HTs, Cell Phones, Wi-Fi...

HTs → They were officially exempt...

**Old ARRL statement:** Hand-held radios and vehicle-mounted mobile radios that operate using a push-to-talk (PTT) button are *categorically exempt* from performing the routine evaluation.

**IEEE:** An Institute of Electrical and Electronics Engineers standard for recommended EM exposure limits was published in **1991**. The IEEE standard *excludes any transmitter with an output below 7 W* because such low-power transmitters would not be able to produce significant whole-body heating.

---

**BUT! FCC: 2021:** HTs may now potentially require compliance with limits on *specific absorption rate (SAR) “w/kg.”* Amateur HTs have not required certification to SAR in the past; **old HTs will probably be grandfathered.** New ones??? Referenced QEX article suggests that Amateur HTs are OK when compared to existing and compliant public service HTs.





# Other Observations: HTs, Cell Phones, Wi-Fi...

HTs → They were officially exempt... BUT!

**Ed Hare, W1RFI, ARRL Lab Manager:** OET Bulletin 65 (Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields) is going to address specific absorption rate (SAR.)

The FCC has been clear that devices that were previously legally marketed can be used by amateurs. They also agree that amateurs can't test SAR so alternatives are being developed by the ARRL RF Safety Committee in consultation with the FCC.

FCC will publish that in OET Bulletin 65 Supplement B (Additional Information for Amateur Radio Stations), giving it all an “FCC blessing.” (Publication date unknown.)





# Other Observations: HTs, Cell Phones, Wi-Fi...

## Cell Phones → Exempt

**QEX:** *“Because cell phones are used by the general population with no particular expectation that they may be exposed to RF fields, the applicable limit is the more stringent SAR value of 1.6 W/kg. Handhelds used in commercial activities must comply with the less restrictive limit of 8 W/kg.”* *“...the FCC requires all commercially used handhelds including cell phones to be evaluated...before they are allowed to be sold in the US.”*

**Samsung Note 5:** 740MHz (Verizon) at high power 2 watts, digital packets (duty cycle???) A recent study: average Smartphone user in the US is on the phone for **4.1 hours per day!**



# Other Observations: HTs, Cell Phones, Wi-Fi...

## Wi-Fi → ???

100mW (20dBm) on 2.4GHz and 200mW (23dBm) on 5GHz.

Probably not good to have your router on your bedside table!

## Electric Company Smart Meters → ???

The Federal Communications Commission (FCC) has adopted recommended Permissible Exposure Limit (PEL) for all RF transmitters (including smart meters) operating at frequencies of 300 kHz to 100 GHz.

These limits, based on field strength, duty cycle, and power density, are below the levels of RF radiation that are hazardous to human health.

[Wikipedia]



# Other Observations:

*The Navy – and you thought we had it bad!!!*

## HERP, HERO and HERF:

Hazardous Electromagnetic Radiation to Personnel, Ordinance, and Fuel.

The RADHAZ designated areas on ships are required to have signage warning about access to topside RADHAZ areas, (topside doors labeled/ladders chained off) and there are mandatory man aloft procedures (lockout/tagout) if someone needs to be topside in RADHAZ areas/mast. **Typical RADHAZ areas are where exposure from high power emitters (various RADARs) as well as HF deck mounted transmit antennas is possible.** The NAVY conducts shipboard electromagnetic surveys (actual measurements) for RADHAZ.

Most hams probably don't have explosives or fuel laying around the shack which they could touch off with too much RF....very unlikely but then again - **maybe a stray generator gas can near a KW driven low hanging antenna during field day??**



# Agenda

- The Rules
- Definitions
- Assessment Methodologies
- Assessment @ W1DYJ
- Additional Observations
- **Conclusions & Resources**



# Conclusions

## ARRL statement.....

The FCC requires all applicants to read the RF Safety Certification. Unfortunately, FCC has not provided this additional information in any of their instructions. As a courtesy, the ARRL VEC has provided the information you will need to read and must comply with. The certification statement is:

**“I have READ and WILL COMPLY with Section 97.13(c) of the Commission’s Rules regarding RADIOFREQUENCY (RF) RADIATION SAFETY and the amateur service section of OST/OET Bulletin Number 65.”**

***By signing form 605 you are declaring your compliance to, and of reading (and understanding) the subject matter.***

**Having this assessment could be useful if you are approaching a town board for an antenna permit.**



# To Reiterate.....

*By signing form 605 you are declaring your compliance to, and of reading (and understanding) the subject matter.*

**I certify that:**

- I waive any claim to the use of any particular frequency regardless of prior use by license or otherwise;
- All statements and attachments are true, complete, and correct to the best of my knowledge and belief and are made in good faith;
- I am not a representative of a foreign government;
- I am not subject to a denial of Federal benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862;
- The construction of my station will NOT be an action which is likely to have a significant environmental effect [See 47 CFR Sections 1.1301-1.1319 and Section 97.13(c)];
- I have read and WILL COMPLY with Section 97.13(c) of the Commission's Rules regarding RADIO FREQUENCY (RF) RADIATION SAFETY and the amateur service section of OST/OET Bulletin Number 65.

Signature of Applicant:

X

Date Signed:

SECTION 2 - TO BE COMPLETED BY ALL ADMINISTERING VEs

You are required to do this by 3 May 2023 and anytime you make a significant change.

Your station is probably OK.

**So do it!**



# Resources

**ARRL:** <http://www.arrl.org/rf-exposure>

**ARRL Web Calculator:** <http://www.arrl.org/rf-exposure-calculator>

**CQ Magazine:** Understanding and Complying with the FCC's New Rules on  
Analyzing RF Exposure [September 2021]

**QST Magazine:** Understanding the Changes to the FCC RF Exposure Rules  
[September 2021]

**QEX Magazine:** Amateur Portable Radios (Handheld Transceivers): Exposure  
Considerations Based on SAR [July/August 2021]

**FCC OET Bulletin 65:** Evaluating Compliance with FCC Guidelines for Human  
Exposure to Radiofrequency Electromagnetic Fields

**This presentation:** <https://www.qsl.net/w1dyj/>



# Thank You

*By signing form 605 you are declaring your compliance to, and of reading (and understanding) the subject matter.*

You are required to do this by 3 May 2023 and anytime you make a significant change.

Your station is probably OK.

**So do it!**

