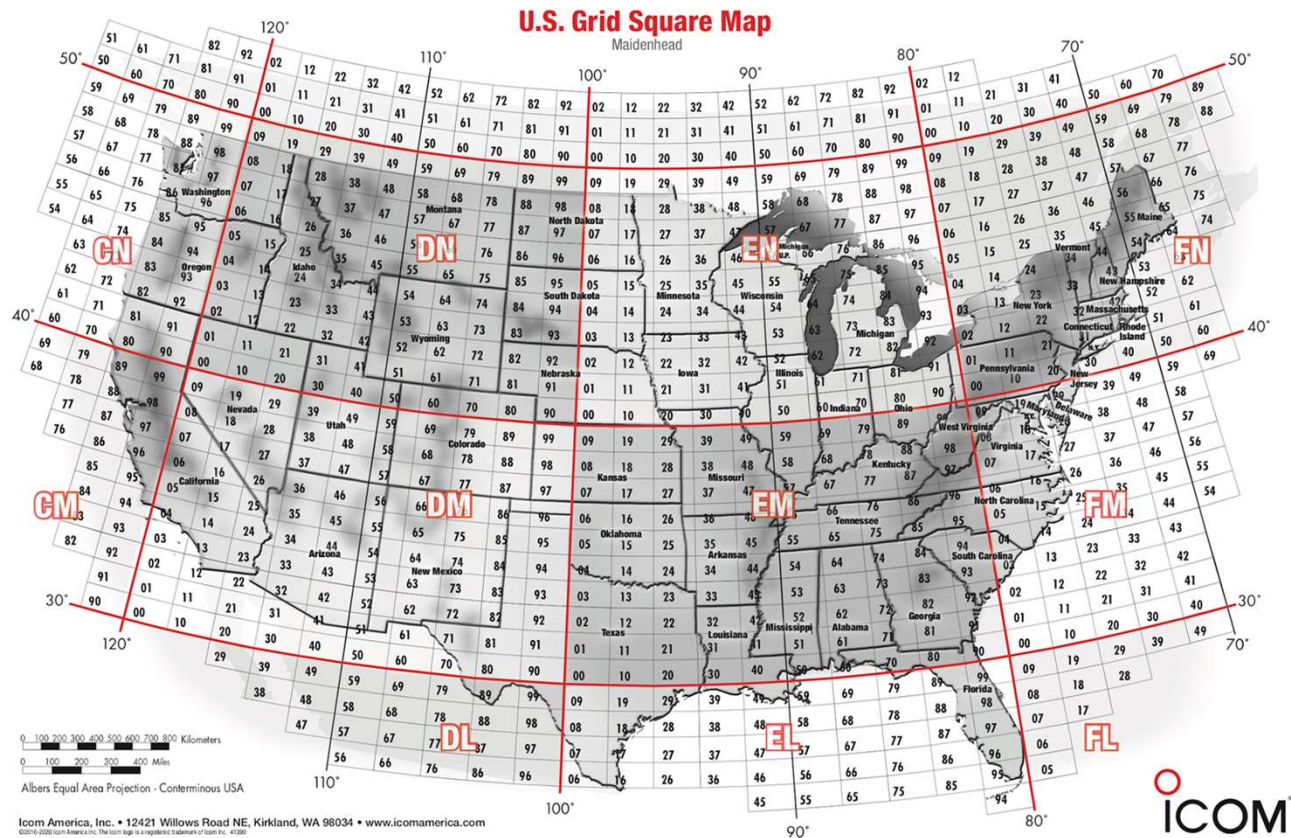


# 6m & Meteor Scatter Radio Sports Take Aways

- 6m Radio Sports are grid-centric and unique
- 6m is modest station friendly
- 6m Propagation Types
  - Sporadic E & Meteor Scatter are primary
  - “Tropo” and TEP are secondary
- 6m Meteor Scatter is involved but exciting
- 6m is ***The Magic Band***

# 6m Radio Sports

- Grid-centric
  - 488 US Grid Squares
- VHF/UHF Century Club (VUCC)
  - Entry at 100 grids
  - 25-grid steps
- VHF Contests
  - Several each year
  - Grid count focus
- Fred Fish Memorial Award (FFMA, discussed next)
- WAS, DXCC, and max distance still important



## Fred Fish Memorial Award (FFMA)

- Awarded for working all 488 grids in the contiguous US
- “Rovers” (mobiles) play important role
  - “Activate” grids not populated with fixed stations
  - Popular with hams that can’t have fixed stations
  - Radio Sports Sub-genre

FFMA #	Call	Name	QTH	Last Grid	Award Date
1	W5FF (SK)	Fred Fish	DM64 (NM)	FN64	2008-Oct-25*
2	W5OZI	Pat Rose	EM00 (TX)	CM79	2010-Jul-08
3	K5UR	Rick Roderick	EM35 (AR)	FN57	2010-Jul-29
4	KMØA	Mark Ammann	EM48 (MO)	CM93	2011-Jun-29
5	WD5K	Thomas Johnson	EM12 (TX)	CN77	2011-Jul-28
6	NØLL	Larry Lambert	EM09 (KS)	FN67	2015-Oct-12
7	W7GJ	Lance Collister	DN27 (MT)	FN67	2015-Oct-13
8	AA5AM	Scott Armstrong	EM13 (TX)	CN81	2019-Jul-10
9	W4UDH	Ralph Smith	EM52 (MS)	DN24	2019-Jul-17
10	NDØB	Bill Ockert	EN07 (ND)	CM93	2020-Jun-10
11	W0FY	Joseph Fleagle	EM48 (MO)	CM93	2020-Jun-25
12	K9CT	Craig Thompson	EN50 (IL)	DM02	2020-Jul-09

## 6m Is Modest Station Friendly

- Had long heard about **6m**, but considered it unattainable / HOA unfriendly
  - *“The Magic Band”*
  - *“When 6m is open, you can work the band with 5W and a wet noodle”*
- 5/5/2019: First 6m QSO (FT8), on a whim
  - 1/4-wave vertical on back porch table, <100W
  - Worked AZ within first few minutes
- 5/18/2019: 2-element “Moxon” beam on tripod in 2nd-story hallway
  - Worked Canary Islands (4753 mi) on 5/30/2019
- 6/25/2019: Moxon on TV-rotator in attic
  - Worked 20 states in one day, 100 grid squares in under 2 months
- 8/13/2019: First 6m Meteor Scatter QSO



# WB5GVY Farm

12/10/6m Vent Pipe Vertical      2m/1.25m Vertical      10-element 2m Beam V-Pol. Armstrong      6m Moxon H-Pol. Remote Ctl Rotator      10m Halo H-Pol. Omni      2m - 1G Discone (V-Pol.)



6m Moxon on tripod in upstairs hall, 5/18 - 6/25/2019. Worked Canary Isl.

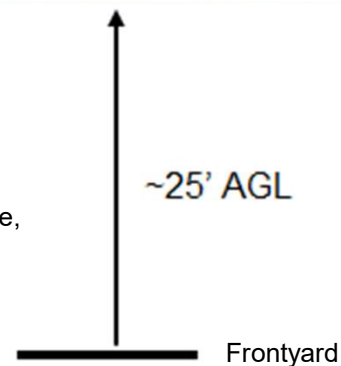
2nd Floor



6m vertical w/ radials, on back porch table, 5/5/2019. Worked AZ in minutes.

1st Floor / Backyard

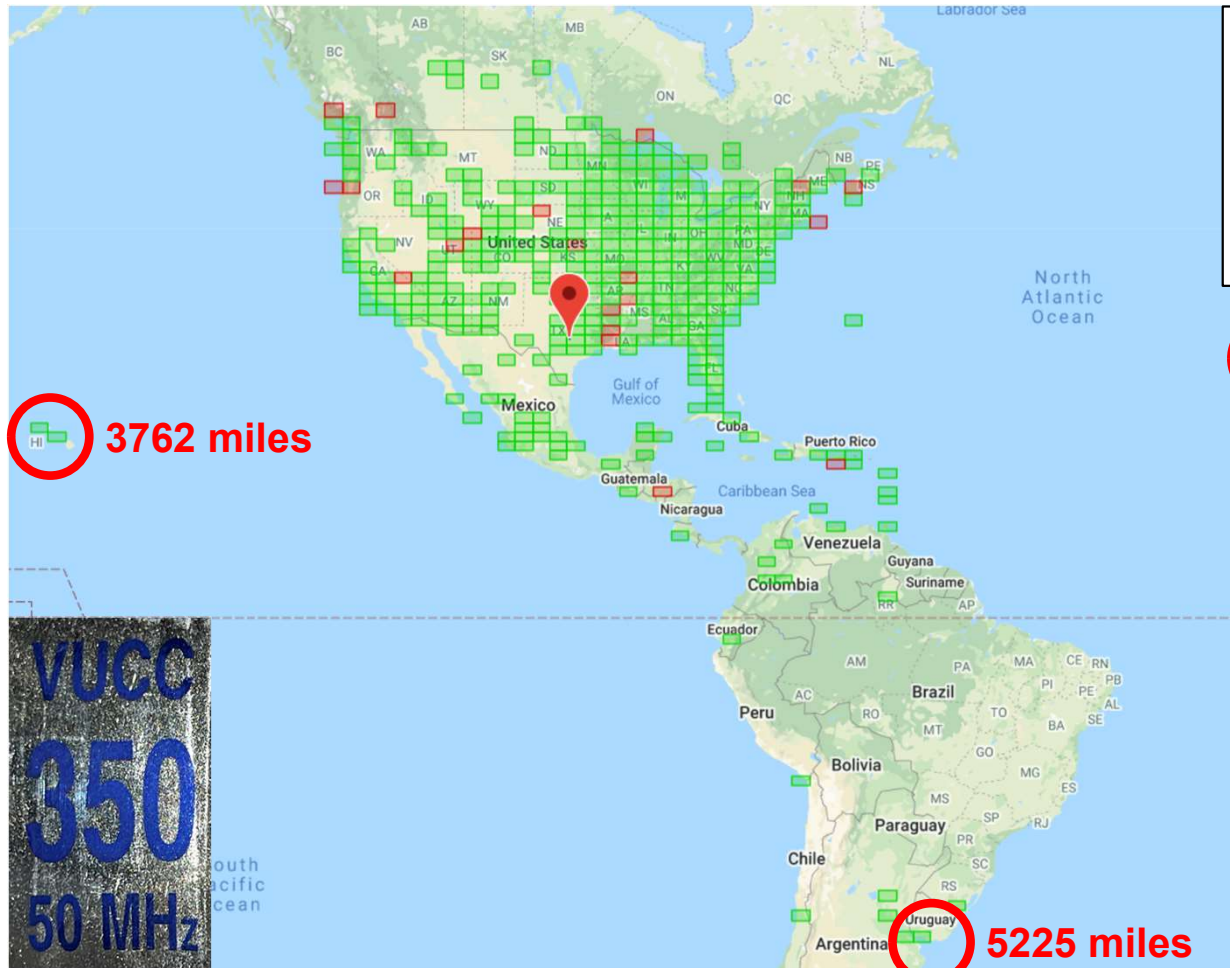
~25' AGL



Frontyard

"Dormers" are not to scale -- image distorted due to street POV

# WB5GVY 6m Grids Worked

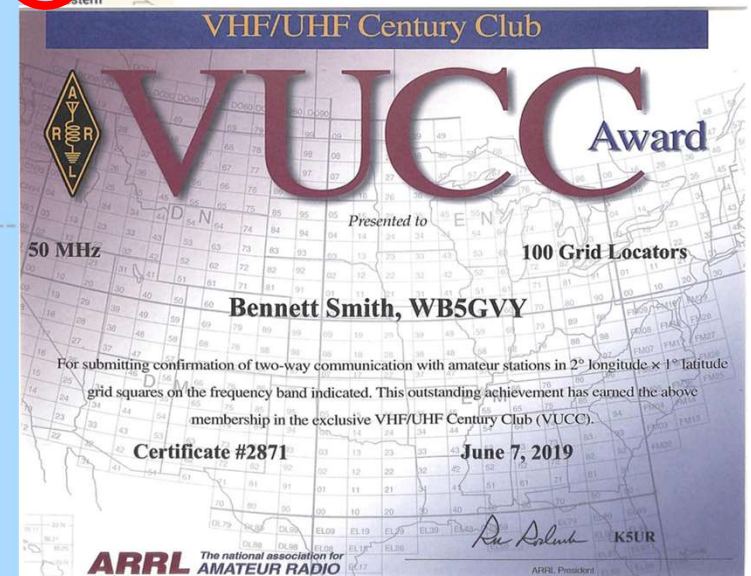


## WB5GVY 6m Status as of 5/9/2021

(LoTW confirmed, FT8 except as noted, all <100W)

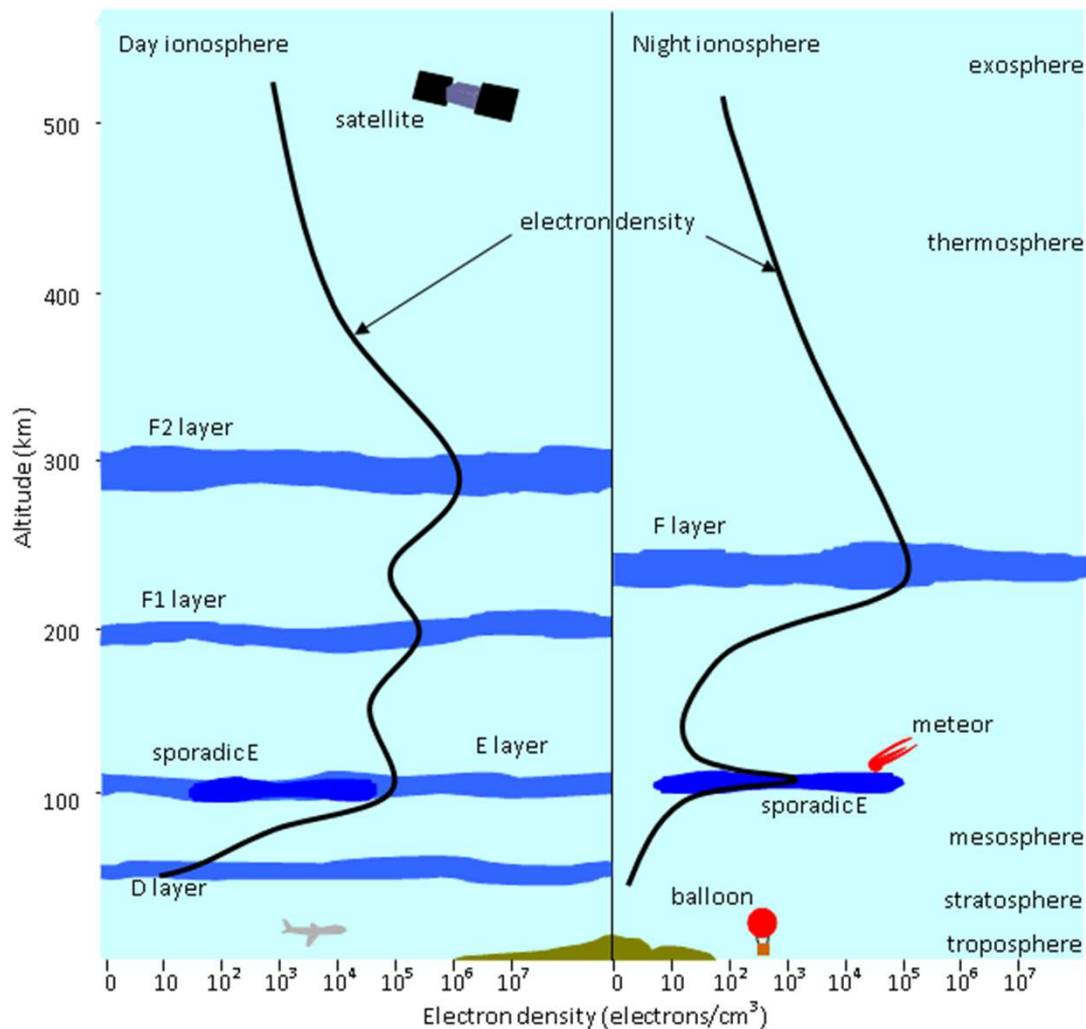
- 304 FFMA grids + 74 DX grids
- 49 states; need AK
- 27 DXCC entities (incl. US and HI)
- 15 states on Meteor Scatter (MSK144)

4737 miles



# 6m Propagation





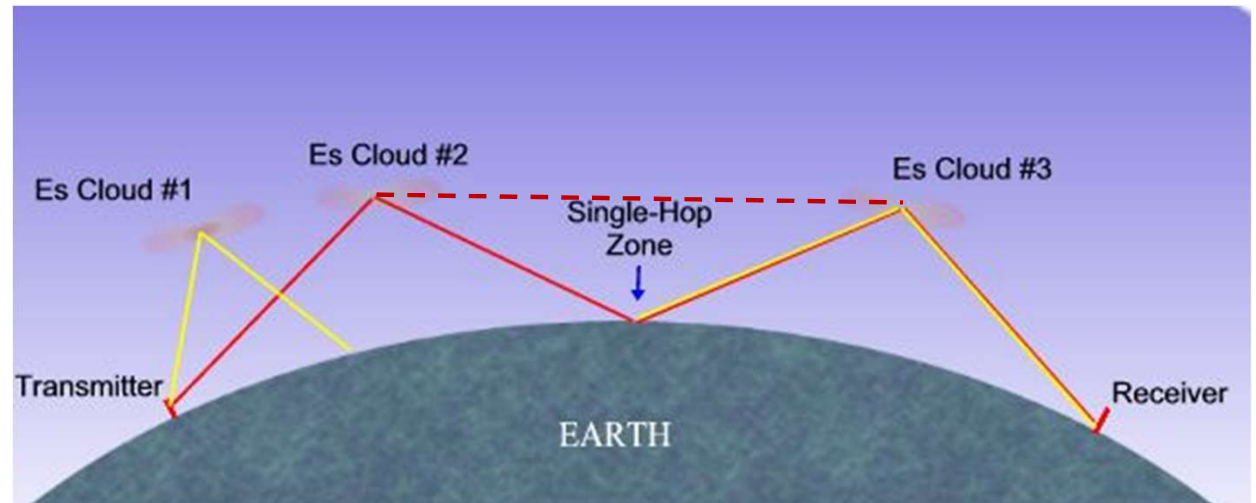
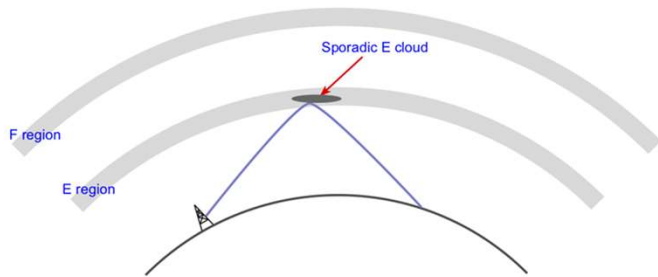
## Ionospheric Propagation Recap

- Continuous electron density variations in ionosphere, abstracted as various regions / layers (D, E, F)
- Skywave refraction a function of the extent of ionization and frequency
- F-layer ionization a strong function of solar activity (11-yr sunspot cycle)
- F2 & F-layer Refraction is key for HF skywave (skip) propagation
- Maximum Usable Frequency (MUF) -- above which refraction ceases to be useful for skywave propagation
- Even at solar maxima, the MUF rarely reaches 6m
- 6m propagation generally happens at the E-layer or below

# Sporadic E (Es)

2/28/2021

<https://www.electronics-notes.com/images/propagation-ionospheric-sporadic-es-01.svg>

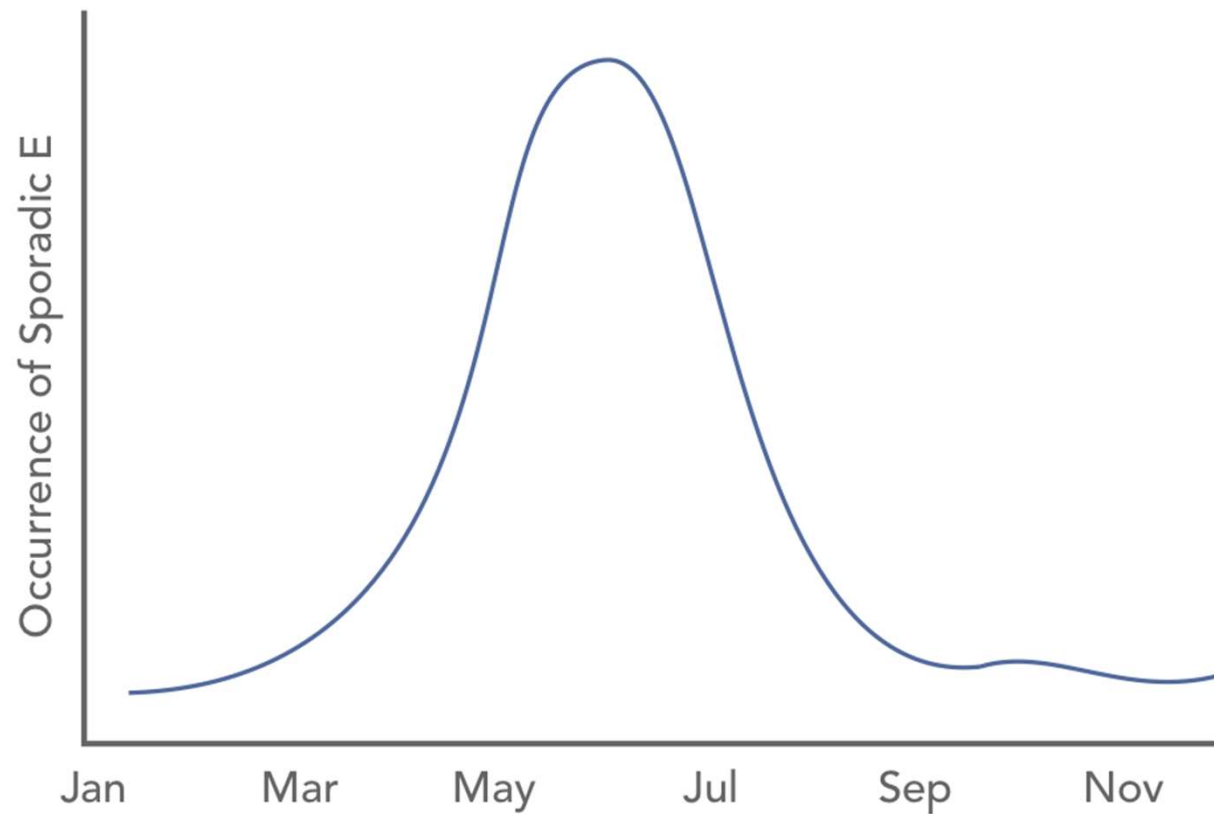


- **Seasonal & sporadic, but a very big deal for 6m propagation**
- Es Clouds not well understood
  - Many theories: meteor dust; upper level winds and Low pressure; geomagnetism
- Wide range of signal strengths; sometimes very strong; can last for hours
- Canary Island FT8 QSO on 5/30/2019, 4753 mi, probably via multi-hop / chordal Es
- Significant regional advantages
  - Europe > East of the Rocky Mountains > NW > parts of SW

# Sporadic E is Strongly Seasonal

2/28/2021

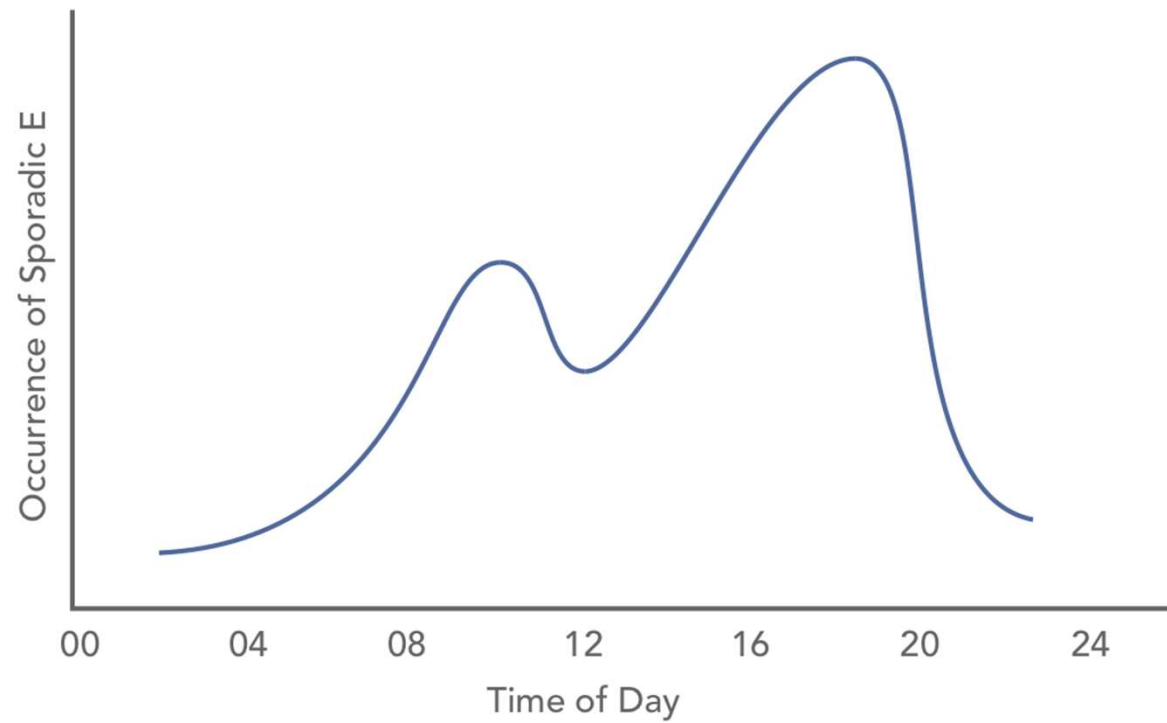
<https://www.electronics-notes.com/images/propagation-sporadic-e-temperate-regions-01.svg>



# Sporadic E Daily Trend

2/28/2021

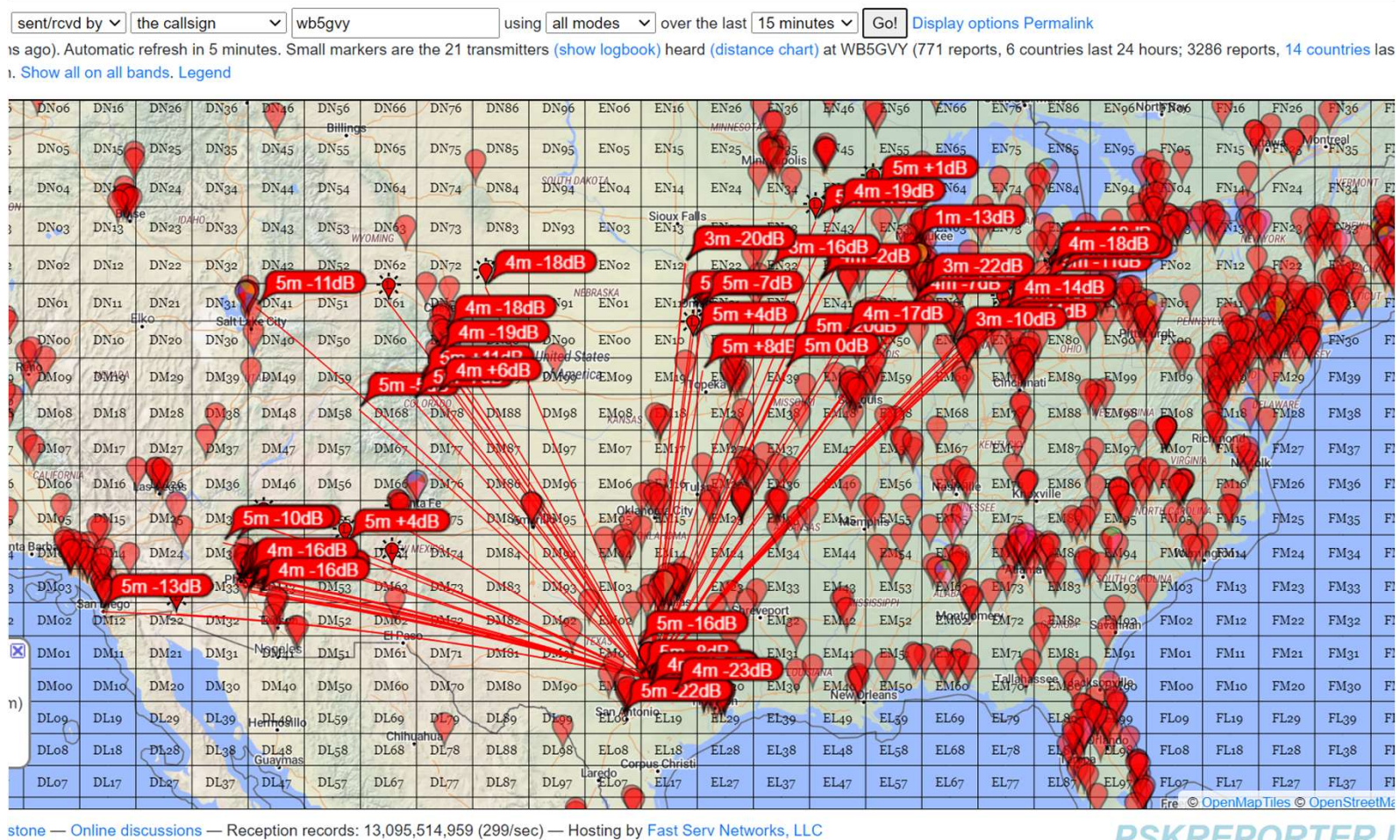
<https://www.electronics-notes.com/images/propagation-sporadic-e-temperate-regions-02.svg>







Es on a  
Another  
Good Day  
6/11/2020

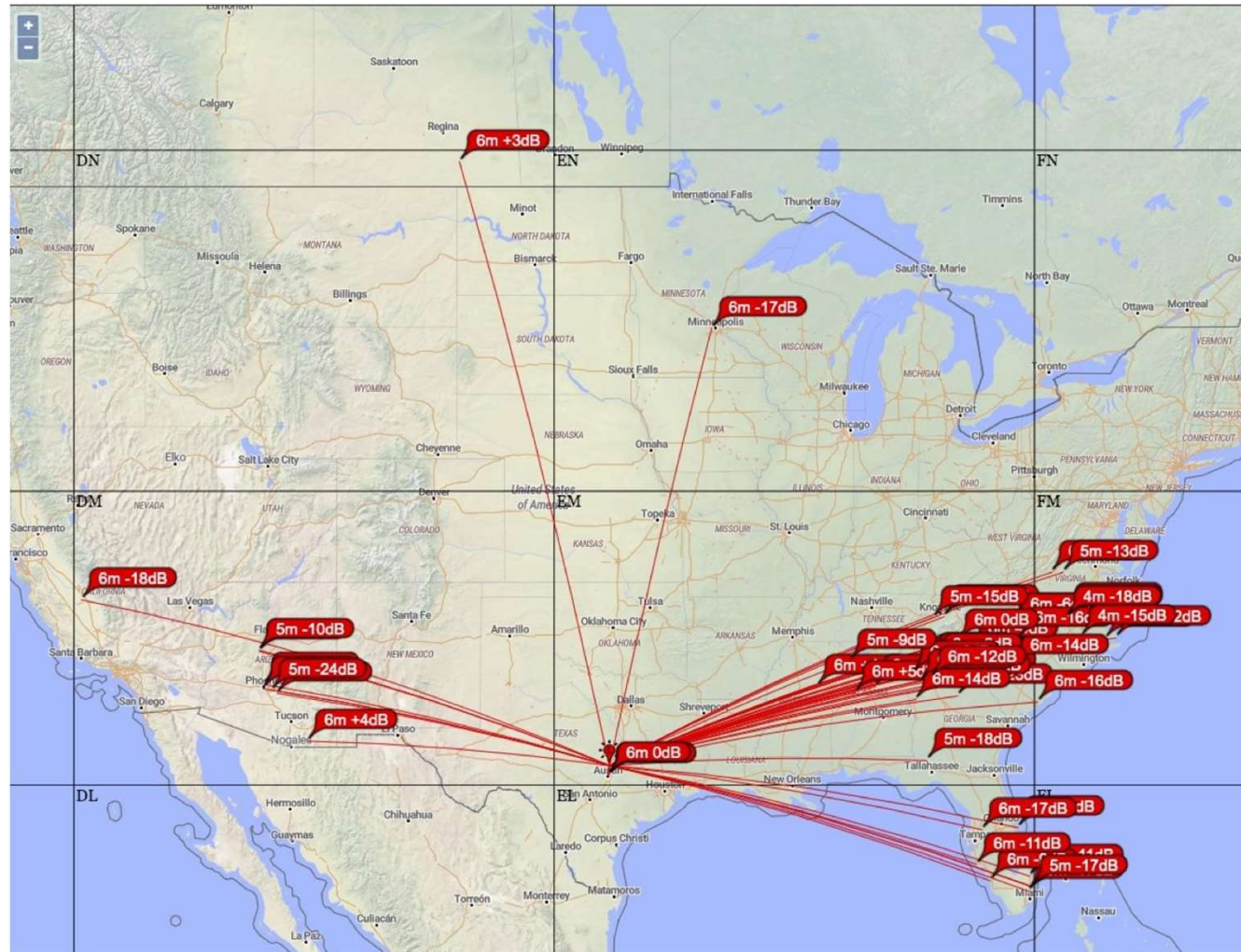


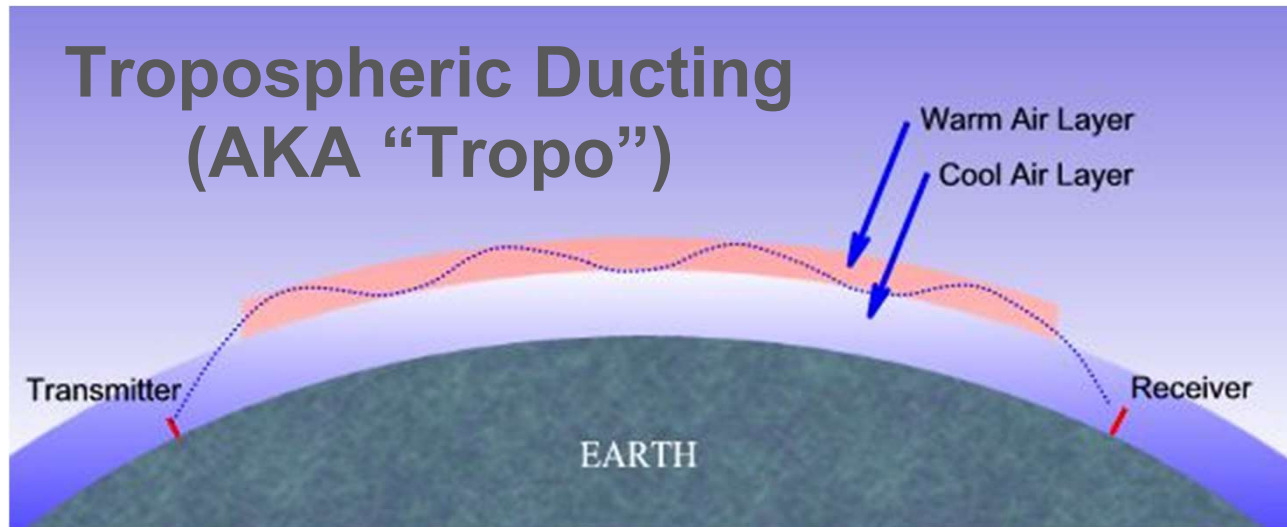


Es on a  
Another  
Good Day  
7/22/2019

Vent-pipe  
Vertical

On 6m show signals sent by the callsign WB5GVY using FT8 over the last 15 minutes Go! Display options Permalink  
Monitoring WB5GVY (last heard 4 mins ago). Automatic refresh in 4 minutes. 60 reception reports for WB5GVY are shown as times (show logbook).  
There are 1179 active FT8 monitors on 6m. Show all FT8 on all bands. Show all on all bands. Legend





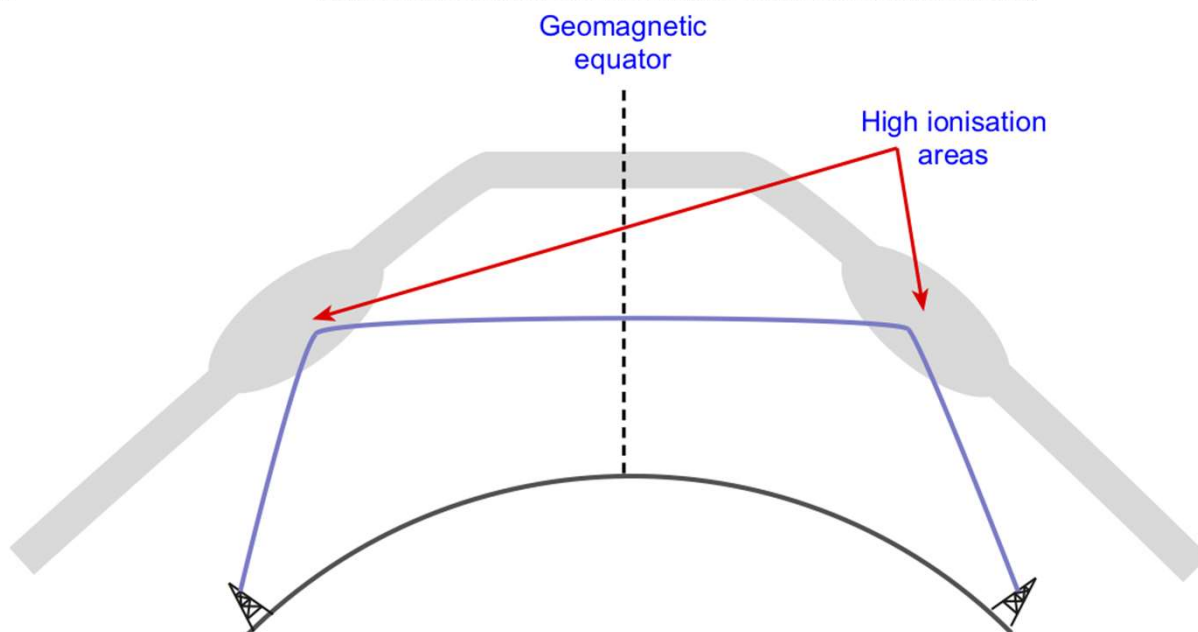
- Weather related; more often in morning
  - Many times per yr; Random to the casual observer
  - There are prediction models based on winds aloft
- Can last for hours, then end suddenly
- Generally strong signals, sometimes very (“parked outside”)
- Can track w/ 2m-APRS Tropo, but not reliably
- Local to me near Austin, TX: tends to be in-state, but AR, LA happen with regularity
- Frequent strong paths between TX and FL

# Transequatorial Propagation (TEP)

- Provides openings to South America on 6m many times each year, but not reliably
- Double hop with equatorial symmetry; afternoon peak
- Chile (4720 mi) and Argentina (5178 mi) 6m FT8 QSOs on same afternoon on 4/13/2020, probably via TEP
- May result from multiple processes
  - A special case variation of F-Layer refraction
  - A variation of Ionospheric Scatter
- Aside: 10m Es & TEP can track w/ 6m, but not reliably

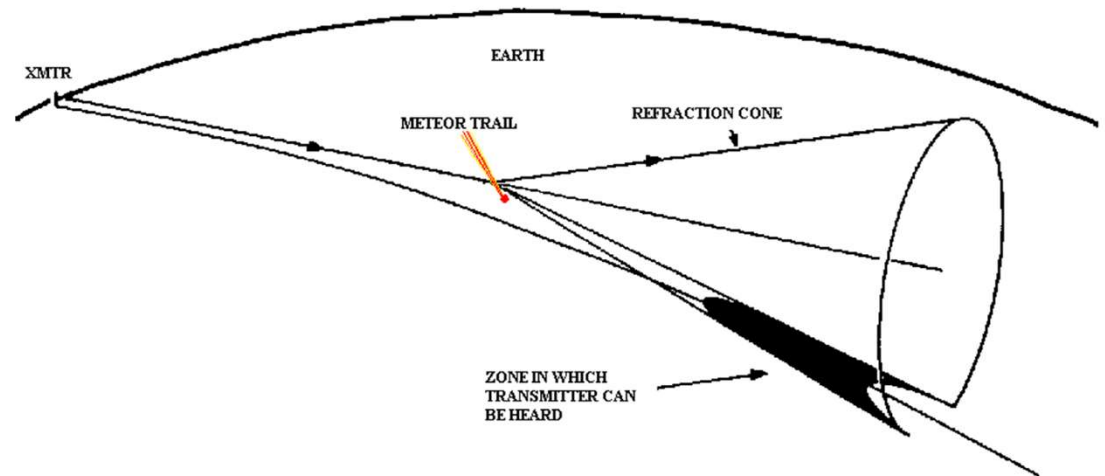
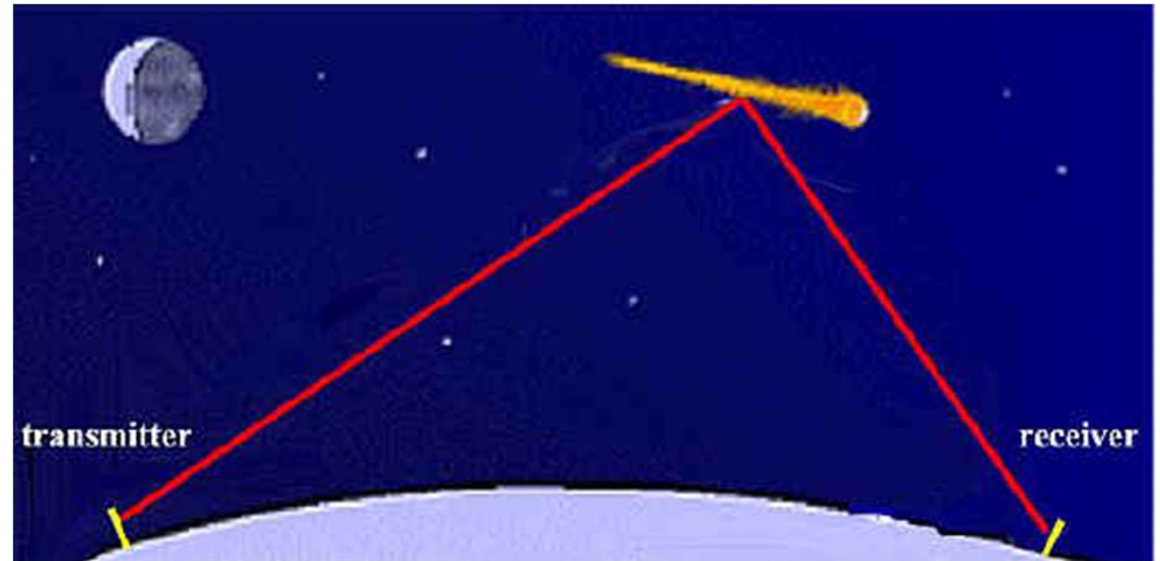
3/1/2021

<https://www.electronics-notes.com/images/propagation-ionospheric-transequatorial-tep-01.svg>



# Meteor Scatter Basics

- Earth constantly randomly bombarded by meteors that are vaporized in the ionosphere
- The vaporized trails are transiently ionized, often providing a fleeting radio scattering surface for burst mode data exchanges
  - > 5-10 per hour usable
- 6m usable burst lengths: most < 1s; 15s considered long
- 700-1000 mile paths are typical
  - Anything more or less is more difficult





# Meteor Scatter QSOs - Basics

- Minimalist QSO
  - Must accomplish the mutual interchange (sharing, trading) of
    - Call signs
    - Signal reports / Grid squares (e.g., EM10)
    - Rogers
  - Done via sequence of back-and-forth exchanges (transmissions)
    - 5 exchanges typically; 4 in contest mode (CM)
    - CQ W4IMD EM84; W4IMD WB5GVY EM10; WB5GVY W4IMD -1; W4IMD WB5GVY R+09; WB5GVY W4IMD RR73
- Each of the exchanges in the sequence normally occur on different meteor trails
  - a random and intermittent process; timing of trails is unknowable
- Each exchange is sent very quickly as many times as possible per Tx interval
  - E.g., MSK144 uses 144-bit packets, lasting 72ms, repeated ~200x in a 15s interval
  - As appropriate to the progress of the QSO
- Each station transmits within alternating set intervals (turns)
  - 15s (MSK144, SSB)
  - 30s (FSK441, HSCW); 60s (HSCW CQs)
- East/West Even/Odd Convention to reduce QRM between multiple locals
  - Tx in “first”(even) intervals, when beaming 0-180 (East)
  - Tx in “second”(odd) intervals, otherwise

## Meteor Scatter QSOs - Length & Difficulty

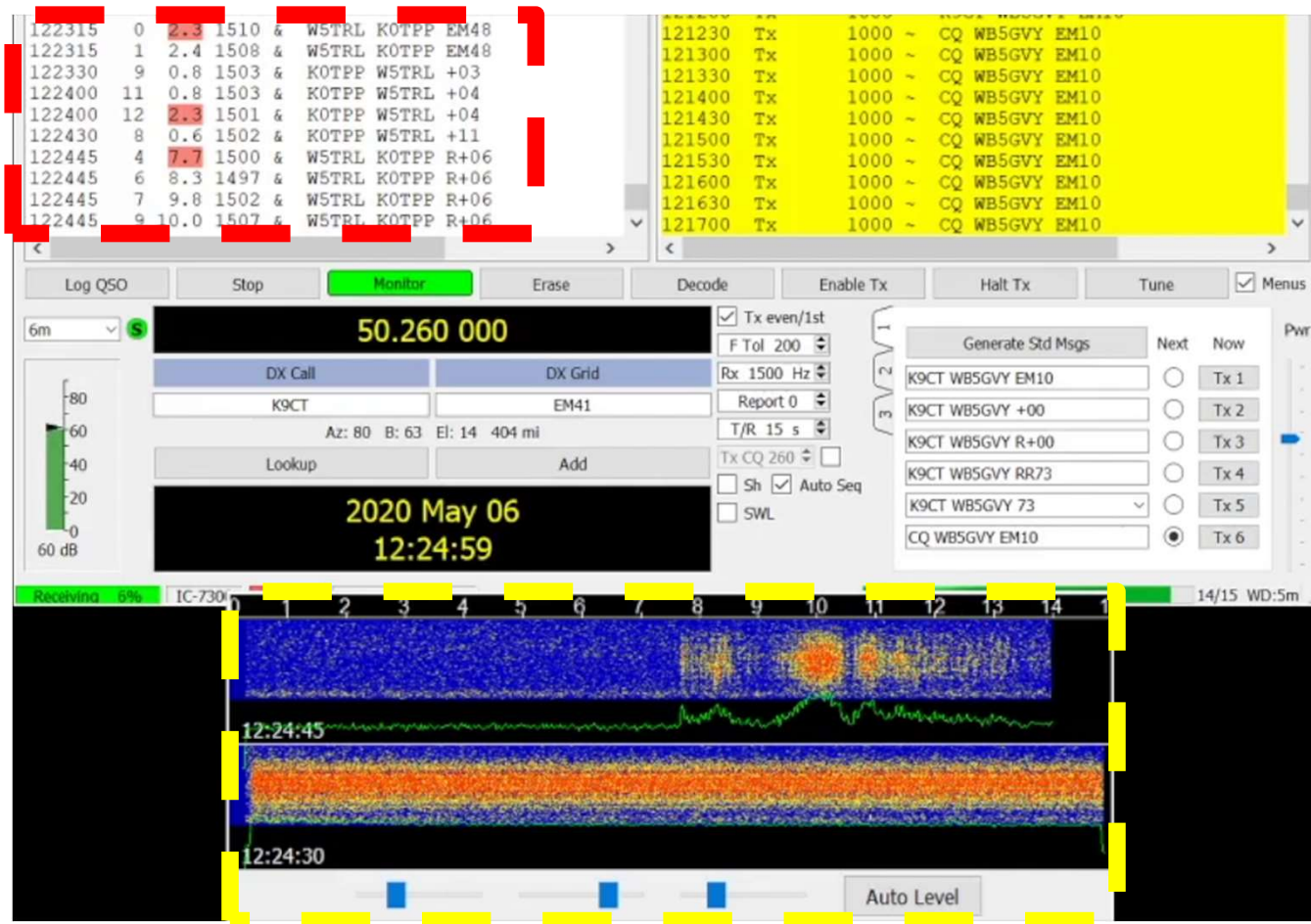
- Generally requires a lot of patience / dedication
- Very high rate of abandonment before completion
- Can be completed quickly
- QSOs Typically take 2-15 minutes to complete (if at all)
- An hour or more to complete is not unheard of
  - It's up to the patience / dedication of the Ops
  - Other QSOs may be completed in between
- Call CQ for 5-10 minutes, give it a break for 10-20

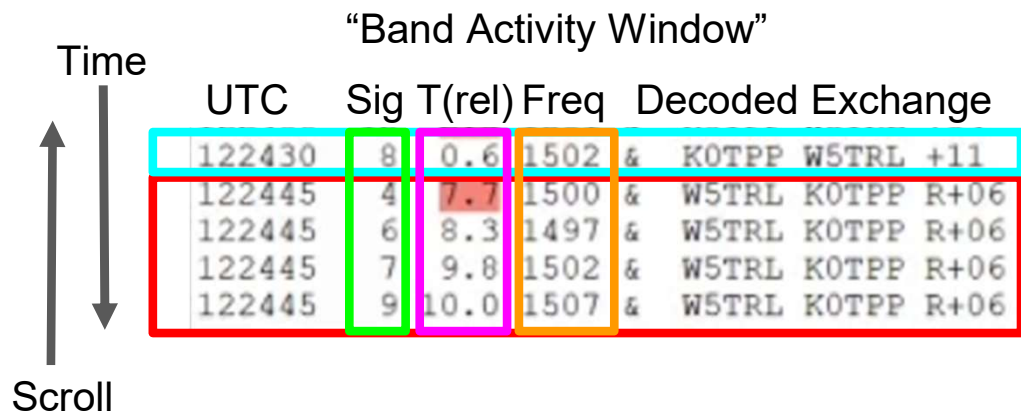
# Example MSK144 QSO

<https://www.youtube.com/watch?v=j1YS72-Tlvk>

# Upcoming Video Focus Areas

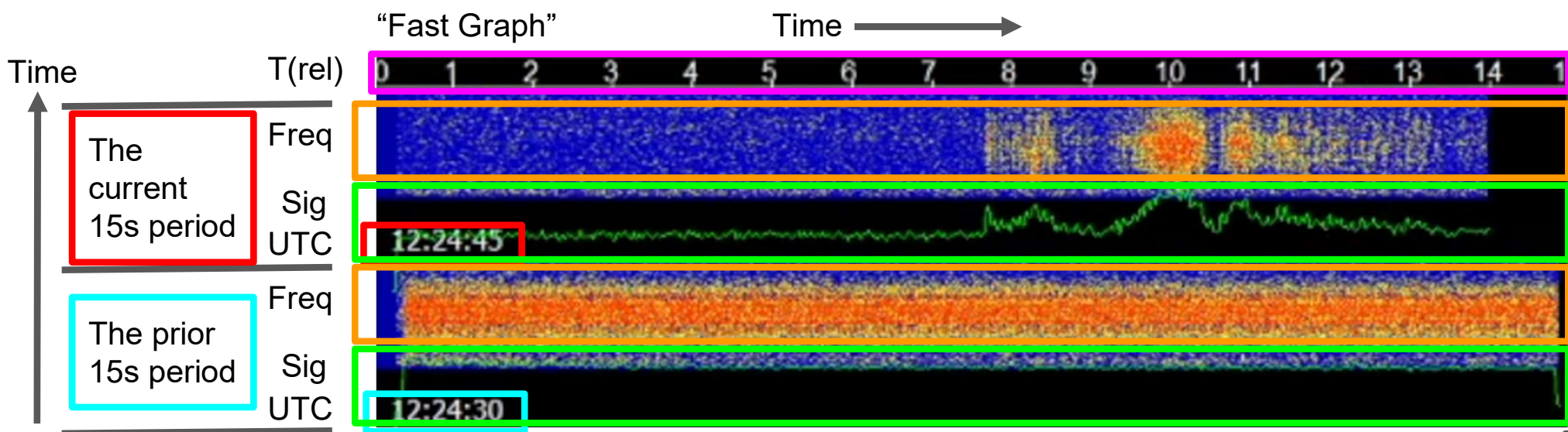
- Video is of a QSO between W5TRL and K0TPP
- “Band Activity” is in the upper left
- The “Fast Graph” is at the bottom
- Pay attention to these areas and ignore the rest
- These areas won’t be highlighted in the video



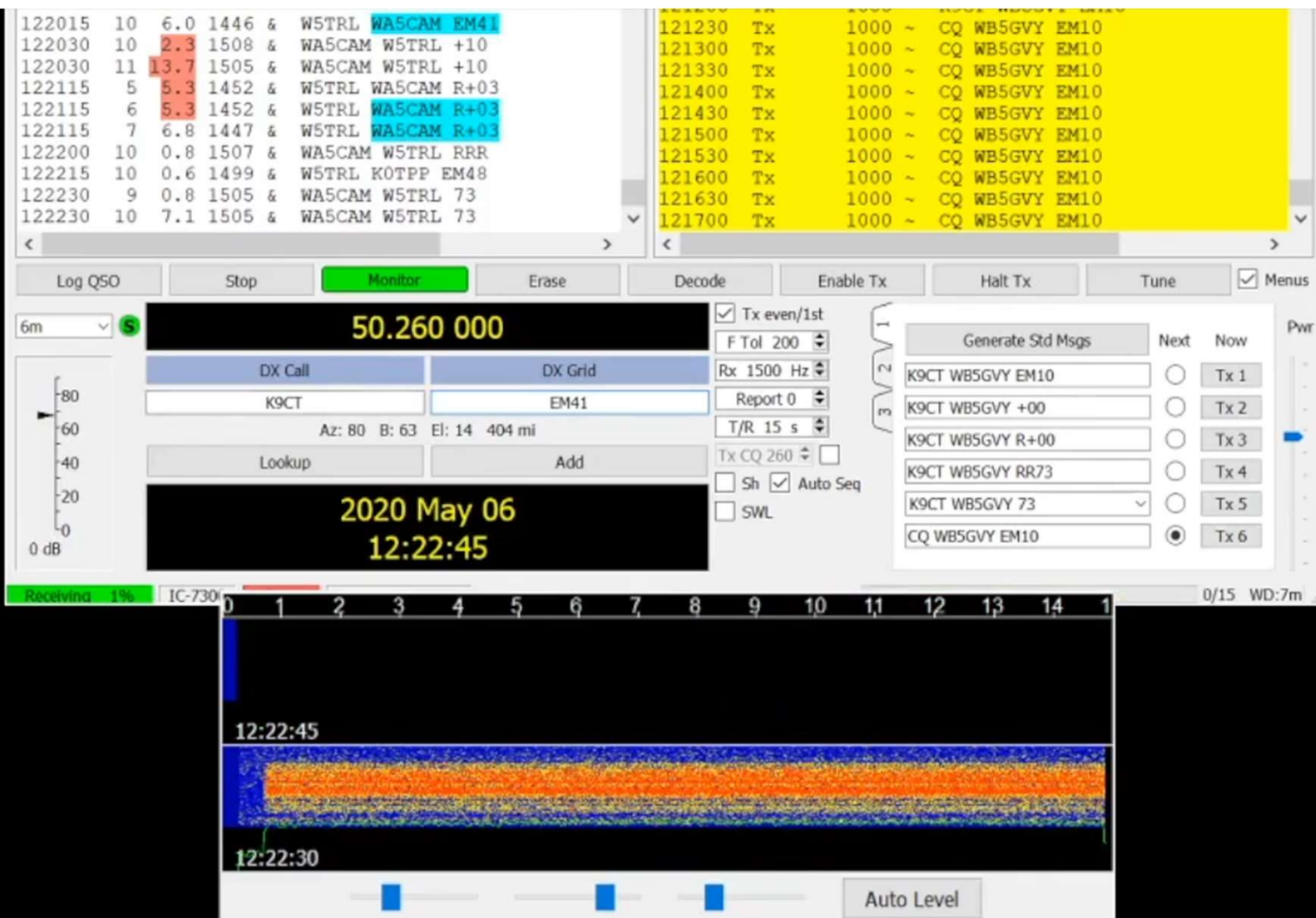


# What's Going On

The WSJT-X Fast Graph is a "horizontal waterfall" providing an analog display of both Frequency and Signal Strength vs. time







# Meteor / QSO Rate -- Seasonal Trend

- QSOs can occur any day of the year
- Non-shower (AKA Sporadic, AKA Random) meteor rates are seasonal (gray bars)
- **Major showers** can **sometimes** help a lot
  - On average, rates are **only modestly enhanced**
  - But in record years, peak rates can be much higher: 500-700+ per hour
- Some Ops schedule their vacation days around major showers
  - **Perseids (8/12) are the most famous – and the most reliable peak rate**

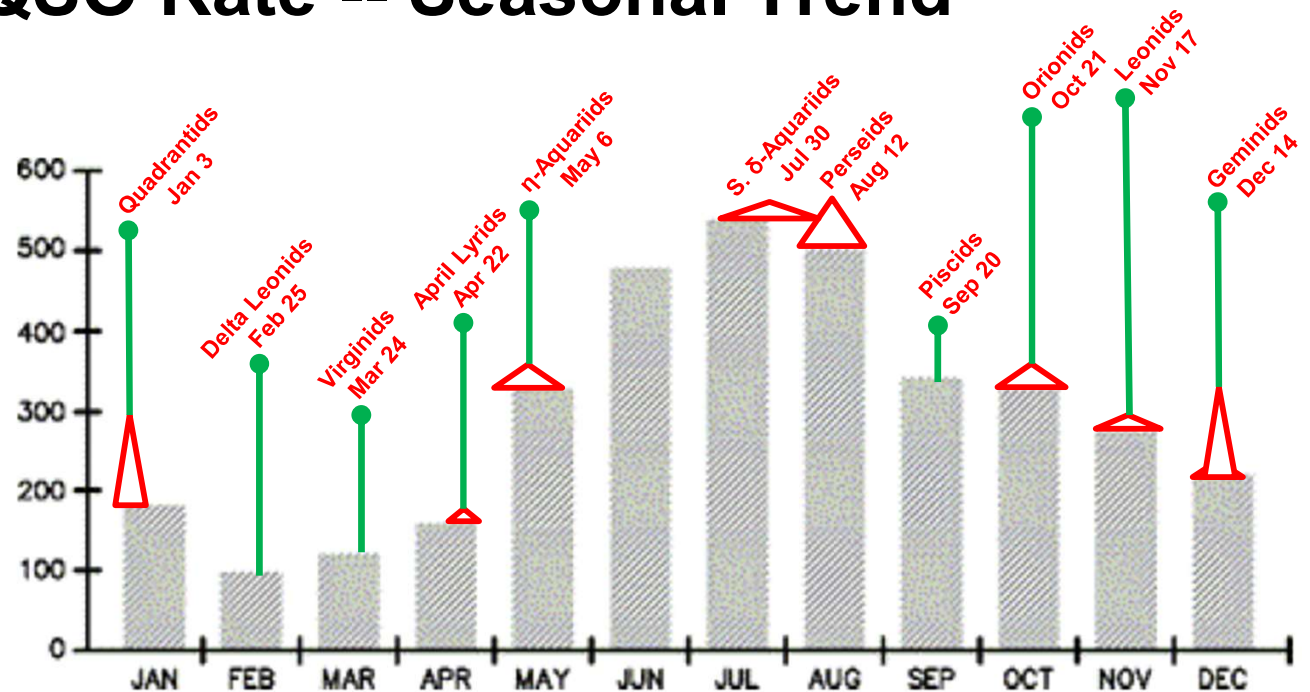


Figure 3—Sporadic meteor rates by season.

## Meteor / QSO Rate -- Daily Trend

- QSOs can occur any time of day, but ...
- Most activity in a 2+ hour window centered around dawn
- At this time your part of the earth is turning into the direction the earth is orbiting the sun
  - Increasing both rate and velocity
- Rapid fall during day;  
Slow rise after midnight

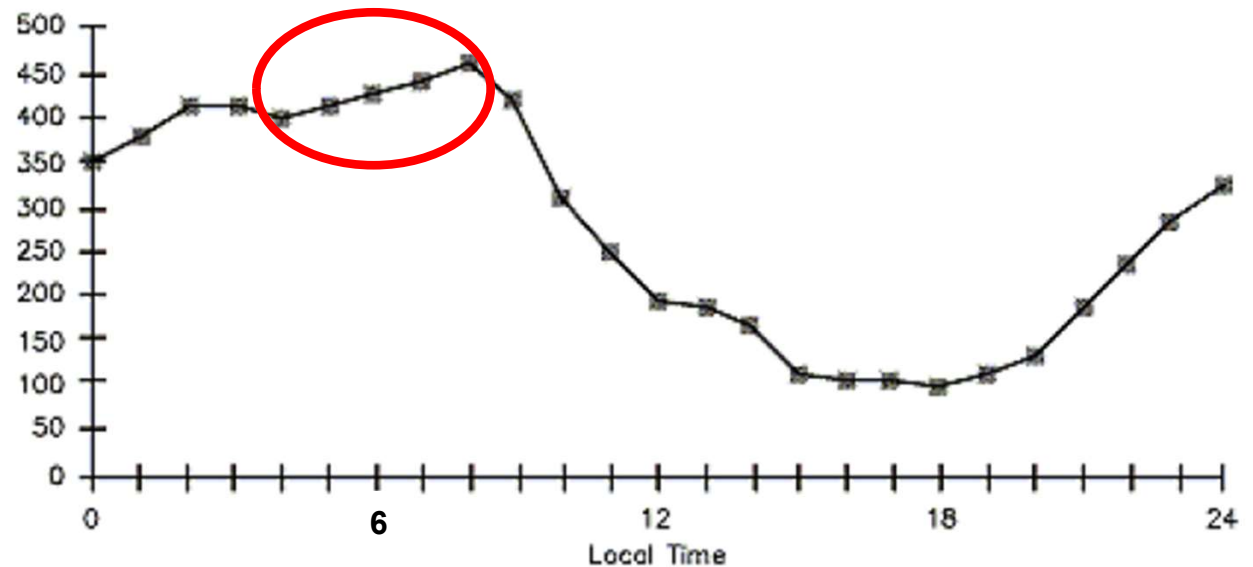
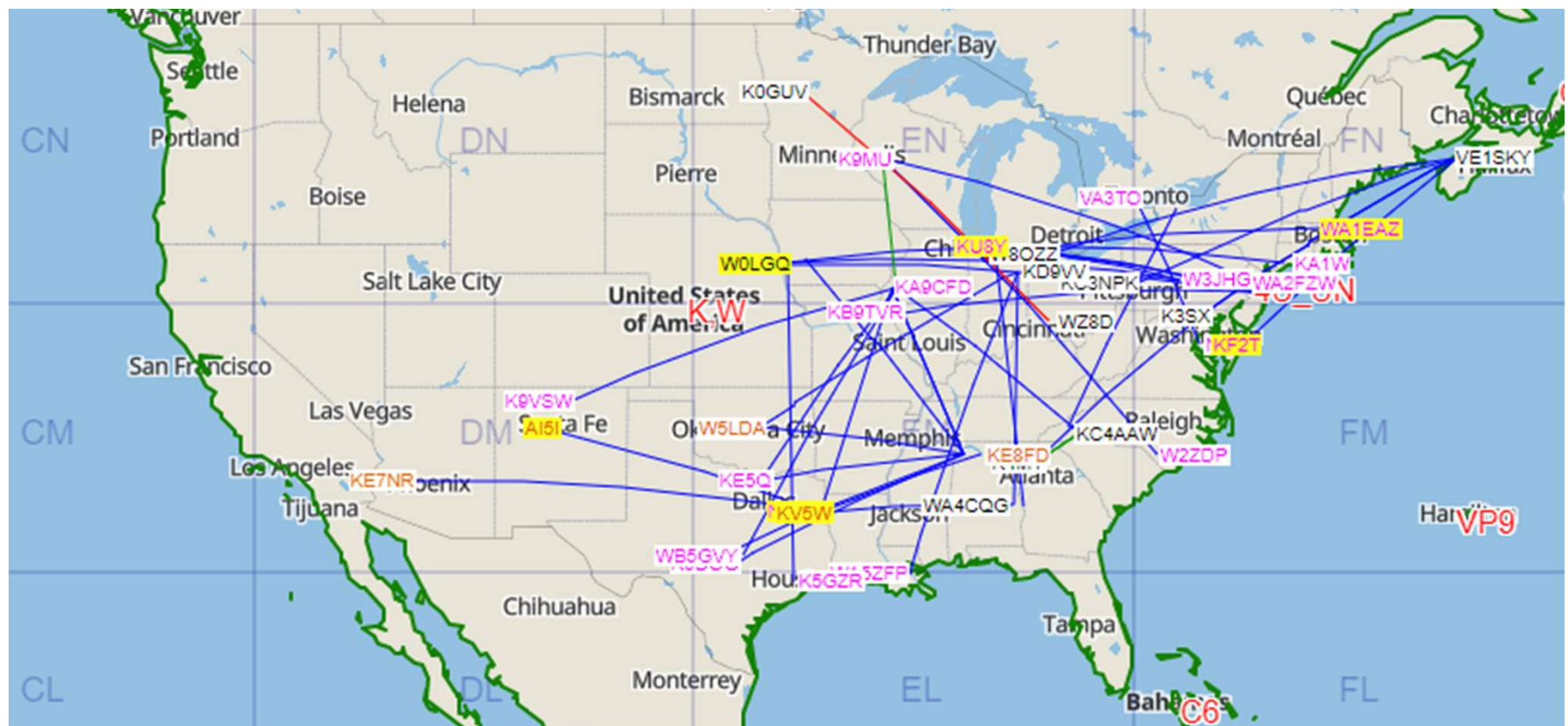


Figure 2— Average daily meteor rates (relative) by the hour.

# Example Late Morning Meteor Scatter Activity

12/8/2019, 7:37AM; DXMaps; Blue = Meteor Scatter; Red = Es



# 6m Meteor Scatter Modes Over Time

- 1953 -- first QST article -- Meteor Scatter on 15 & 20m
  - CW
  - AM Phone
- 1960s
  - High Speed CW (HSCW): 200-1200+ wpm; 1 – 2.5 minute T/R periods
    - Tx: CW “memory keyer” with speeded up playback
    - Rx: audio-cassette tape recorders with modified slow playback
  - SSB
- 2001 -- Weak Signal Joe Taylor (WSJT) debut
  - FSK441 (4-tone Freq. Shift Keying; 441 baud; 30s T/R periods)
- 2017 -- WSJT-X
  - MSK144 (Minimum Shift Keying; 144 bit frames @ 2000 baud; 48 bits of LDPC error-correcting redundancy in each frame; 15s T/R periods)



# MSK144 Mode Overview

- Optimized for Fast, Deep Fading appropriate for 0.1s meteor bursts (pings)
  - Contrast with FT8, optimized for Slow, Shallow Fading for Es
- QSOs have alternating 15s intervals of Transmit (T) and Receive (R)
- Exchanges are FEC encoded by the software into a 72ms long packet
  - callsigns + grid, callsigns + SigRpt, callsigns + RR73, etc.
  - 144-bit frames; includes 48 bits of error-correcting redundancy (LDPC coded)
- The 72ms encoded exchange packet is sent ~**200** times during each 15s
  - Think Navy Gatling gun for anti-ship missiles -- badda-badda-badda ... for 15s
  - The Rx decoder tries to decode each of these 72ms packets into the original exchange
- **Only exchanges decoded without any errors are displayed** in each R interval
  - In FSK441, decodes with errors are displayed
    - the Op decides what's valid, not the S/W
    - FSK441 advocates say this makes for more confirmed contacts

# Meteor Scatter QSOs - Practical Matters #1

- Use horizontal polarization
  - Cross polarization penalty
- Use a beam
  - beams help with noise problems (more later)
- Use MSK144 (on 6m and up)
  - 6m is considered the optimal MS band, and by far the most active
    - 2m is popular, but far less than 6m
    - Above 2m is done, but increasingly more difficult and far less active
      - Scattering signal strength and duration decrease w/ incr. freq.
  - “JT9G Fast” reportedly used on 10m (not further discussed)
    - MSK144 2000 baud exceeds 300 baud limit on 10m data modes sub-band

## Meteor Scatter QSOs - Practical Matters #2

- Effective Beam Width is much narrower than for Es or Tropo; this is true for both ends of the QSO
- Because of the narrow beam width, except for major showers, it's problematic to make QSOs by just calling CQ unannounced
- Generally, you need to make a sked or announce that you are calling CQ via “social media”
  - Ping Jockey Central (AKA PJ, more on this later)
  - ON4KST 50 MHz IARU Region 2 chat
  - VHF-Chat workgroup on Slack
  - JTAlert messaging

## Meteor Scatter QSOs - Practical Matters #3

- Weak-signal S/N limits (dB, 2.5kHz BW)
  - SSB +10
  - FSK441 -01
  - MSK144 -08
  - CW(human) -15
  - FT8 -21
- Noise that is a non-issue for FT8 Es work can be a big issue for MSK144 Meteor Scatter work
- Local noise is a big deal
  - Can effectively limit workable bearings
  - Daytime activities can bring showstopper noise

## Meteor Scatter QSOs - Practical Matters #4

- “It Takes Two to Tango”
  - Strengths and weakness of both QSO partners matters
- “Network Effect” (#Ops working MSK144 at the moment)
  - Up: Major showers, Contest weekends, Holidays
  - Dn: Breakfast, Major Es opening
- Strongly influenced by 2 types of “success factors”
  - Tangible factors that improve SNR
  - Intangible factors that increase “Chair Time”

# **Tangible Success Factors That Improve SNR - I**

## **The More the Merrier -- On Both Sides of the QSO**

- ❑ Beam ant. (5-element Loop Fed Arrays (LFAs) are quite popular)
- ❑ Outside ant.
  - ❑ Avoid roof attenuation, lots of near field metal
  - ❑ Increased distance from home / attic noise sources
- ❑ HAAT of 30'+
  - ❑ Effective Radiation Angle Matters
    - ❑ Higher is not always better
    - ❑ Function of local terrain, height, ant. details
    - ❑ Software available to evaluate



## **Tangible Success Factors That Improve SNR - II**

### **The More the Merrier -- On Both Sides of the QSO**

- ❑ 500W+
  - ❑ 100W is considered QRP on MSK144
- ❑ Mast-mounted LNA (Low Noise Amplifier -- for Rx path)
  - ❑ “VOX” operated at low-power; w/ “Sequencer” above 500W
- ❑ Low-noise QTH
  - ❑ Farm / ranch country best
  - ❑ Not near to Industrial, Scientific, Medical (ISM)
    - ❑ ISM beginning of day = MSK144 end of day
- ❑ Scheduling HVAC and other home noise sources

## **Intangible Success Factors That Increase “Chair Time” The More the Merrier -- On Boths Sides of the QSO**

- ☐ Up before dawn is easy
- ☐ Patience
- ☐ Household perturbation
- ☐ Flexible work schedule / semi-retired

## Getting Ready for MSK144

- Your PC clock should be accurate w/i 2s
- Your rig should be accurate w/i 200 Hz
- WSJT-X is the most popular software
  - Alternates include the older WSJT-10 (w/ FSK441) and MSHV
    - I have not used these alternates
- Select the MSK144 mode

# MSK144 Mode Settings in WSJT-X

- Set F Tol to 200 Hz (assumes a fast PC); with confidence, reduce to 50
- Set Rx to 1500 Hz
- Set T/R interval to 15s, unless negotiated otherwise with a QSO partner

The screenshot displays the WSJT-X software interface for MSK144 mode. The top menu bar includes buttons for Log QSO, Stop, Monitor (highlighted in green), Erase, Decode, Enable Tx, Halt Tx, Tune, and a checked Menus button. The main display area shows the frequency 50.260 000 MHz. Below the frequency, the DX Call is W4IMD and the DX Grid is EM84. The T/R interval is set to 15 s. The status bar at the bottom indicates 'Receiving 0%' and 'Last Tx: W4IMD WB5GVY 73'.

Generate Std Msgs	Next	Now
W4IMD WB5GVY EM10	<input type="radio"/>	Tx 1
W4IMD WB5GVY -03	<input type="radio"/>	Tx 2
W4IMD WB5GVY R-03	<input type="radio"/>	Tx 3
W4IMD WB5GVY RR73	<input type="radio"/>	Tx 4
W4IMD WB5GVY 73	<input checked="" type="radio"/>	Tx 5
CQ WB5GVY EM10	<input type="radio"/>	Tx 6

# WSJT-X Calculated Beam Heading

- “Az:xxx” is the “great circle bearing” (direct heading) to your QSO partner
  - WSJT-X calculates this based on the “DX Grid” box
  - Use the Az:xxx value during meteor showers
  - Often works for non-shower meteors too, but it’s not optimal
    - More of an issue for narrow beams and/or short distances

The screenshot shows the WSJT-X software interface. The top bar contains buttons: Log QSO, Stop, Monitor (highlighted in green), Erase, Decode, Enable Tx, Halt Tx, Tune, and a checked Menus button. On the left, there's a frequency display showing 6m and a signal strength meter with a green bar at 76 dB. The main display area shows the frequency 50.260 000. Below this, the DX Call is W4IMD and the DX Grid is EM84. The calculated beam heading is Az: 69, with other values A: 79, El: 4, and 899 mi. The date and time are 2020 Jun 22 03:57:00. On the right, there's a section for Generate Std Msgs with a list of messages and buttons for Tx 1 through Tx 6. The bottom status bar shows Receiving 0%, IC-7300, MSK144, Last Tx: W4IMD WB5GVY 73, and 0. The bottom right corner shows 0/15 and WD:10m.

# WSJT-X Calculated Beam Heading

- WSJT-X calculates an optimal “hot spot” bearing for non-shower meteors
  - Located to the right of “Az:xxx”
  - Prefaced by only one of “A:” or “B:” followed by a calculated bearing
    - “Hot A” (south of direct) and “Hot B” (north of direct)
  - Arises due to Earth’s rotation and movement about the Sun
    - Function of path direction & distance, time of day, ‘50s empirical data

The screenshot displays the WSJT-X software interface. At the top, there are buttons for Log QSO, Stop, Monitor (highlighted in green), Erase, Decode, Enable Tx, Halt Tx, Tune, and a checked Menus button. Below these, a frequency display shows 50.260 000. To the left of the frequency display is a vertical bar graph showing signal strength, with a peak at 80 and a value of 76 dB. Below the frequency display, there are fields for DX Call (W4IMD) and DX Grid (EM84). Below these, there are fields for Az: 69, A: 79 (highlighted with a red box), El: 4, and 899 mi. Below these, there are buttons for Lookup and Add. At the bottom, there is a large black area displaying the date and time: 2020 Jun 22 03:57:00. To the right of the frequency display, there are various settings: Tx even/1st (checked), F Tol 200, Rx 1500 Hz, Report -3, T/R 15 s, Tx CQ 260, Sh (unchecked), Auto Seq (checked), and SWL (unchecked). On the far right, there is a table with columns for Generate Std Msgs, Next, and Now. The table contains six rows of messages: W4IMD WB5GVY EM10, W4IMD WB5GVY -03, W4IMD WB5GVY R-03, W4IMD WB5GVY RR73, W4IMD WB5GVY 73, and CQ WB5GVY EM10. The 'Now' column shows Tx 1 through Tx 6. At the bottom of the interface, there is a status bar showing Receiving 0%, IC-7300, MSK144, Last Tx: W4IMD WB5GVY 73, 0, 0/15, and WD:10m.



# MSK144 Mode Settings in WSJT-X

- Keep Short-format (Sh, AKA SH) off on 6m
  - Sh is sometimes used on 2m, as requested by a QSO partner
  - Sh: Tx3, Tx4, Tx5 sent every 20ms (750 times in 15s)
  - “SWL” enables decode of Short-format messages sent to others

The screenshot displays the WSJT-X software interface for MSK144 mode. The top menu bar includes buttons for Log QSO, Stop, Monitor (highlighted in green), Erase, Decode, Enable Tx, Halt Tx, Tune, and a checked Menus button. The main display area shows a frequency of 50.260 000 MHz, a DX Call of W4IMD, and a DX Grid of EM84. A status bar at the bottom indicates 'Receiving 0%' and 'IC-7300 MSK144'. A red box highlights the 'Sh' and 'SWL' checkboxes in the 'Tx CQ 260' section, both of which are currently unchecked.

Generate Std Msgs	Next	Now
W4IMD WB5GVY EM10	<input type="radio"/>	Tx 1
W4IMD WB5GVY -03	<input type="radio"/>	Tx 2
W4IMD WB5GVY R-03	<input type="radio"/>	Tx 3
W4IMD WB5GVY RR73	<input type="radio"/>	Tx 4
W4IMD WB5GVY 73	<input checked="" type="radio"/>	Tx 5
CQ WB5GVY EM10	<input type="radio"/>	Tx 6

# MSK144 Mode Settings in WSJT-X

- Contest Mode (CM) is occasionally used (even when there's no contest)
  - As requested by a QSO partner; it requires 4 exchanges / meteor trails vs. usual 5
  - "CQ TEST WB5GVY EM10"
  - Toggled via Advanced Tab under Settings
  - On Ping Jockey: CMSH = Contest Mode & Short-format

# MSK144 Calling Frequencies

- 50.260 MHz (AKA 260) is the MSK144 Calling Frequency
  - Most QSOs happen here
- Occasionally, a nearby frequency is suggested (such as on Ping Jockey)
  - Local Noise
  - Local activity, particularly during big meteor showers
- Local to me (EM10), only a few stations are regularly active and heard directly
  - W5TRL is a regular; K5DOG (mostly on 2m MSK144 now)
  - Occasionally hear Ops (mostly during showers) in Dripping Springs, San Antonio
- Local to you (Gwinnett Co.), W4IMD is a regular

# MSK144 Calling Frequencies

- WSJT-X has a “TX CQ xxx” Auto-split-QSY feature
  - E.g., I transmit “CQ 270 WB5GVY EM10” on 260; split-listens on 270
    - Other Ops know you are listening on 270 and Tx there
  - Respond to caller on 270, and rest of QSO happens entirely on 270

The screenshot shows the WSJT-X software interface. At the top, there are buttons for 'Log QSO', 'Stop', 'Monitor' (highlighted in green), 'Erase', 'Decode', 'Enable Tx', 'Halt Tx', 'Tune', and a 'Menus' checkbox. Below these, a frequency display shows '50.260 000' in yellow on a black background. To the left of the frequency is a vertical bar graph showing signal strength, with a peak at 80 and a value of 76 dB. Below the frequency display, there are fields for 'DX Call' (W4IMD) and 'DX Grid' (EM84), along with 'Az: 69 A: 79 El: 4 899 mi'. Below these are 'Lookup' and 'Add' buttons. A large black box at the bottom displays '2020 Jun 22' and '03:57:00' in yellow. To the right of the frequency display, there are settings for 'Tx even/1st', 'F Tol 200', 'Rx 1500 Hz', 'Report -3', 'T/R 15 s', and 'Tx CQ 260' (highlighted with a red box). Below these are checkboxes for 'Sh', 'SWL', and 'Auto Seq'. On the far right, there is a 'Generate Std Msgs' section with a list of messages and buttons for 'Next' and 'Now'. The messages are: 'W4IMD WB5GVY EM10', 'W4IMD WB5GVY -03', 'W4IMD WB5GVY R-03', 'W4IMD WB5GVY RR73', 'W4IMD WB5GVY 73', and 'CQ WB5GVY EM10'. The 'Now' column shows 'Tx 1' through 'Tx 6'. At the bottom, there is a status bar with 'Receiving 0%', 'IC-7300', 'MSK144', 'Last Tx: W4IMD WB5GVY 73', '0', '0/15', and 'WD:10m'.



# “Ping Jockey Central” Chat Room

- <https://www.pingjockey.net/cgi-bin/pingtalk>
  - Registration is required but trivial
  - Your posts will include your name and grid square
- Post e.g., “CQ 260 2nd West”, and hope that folks West will aim your way
  - Follow-up later with “CQ 260 Stopped” when you decide to give up
  - Or initially post e.g., “CQ 260 1st NE (~10 min then Stop)”
- Post **CQ**-spots copied from WSJT-X “Band Activity” window
  - This can more quickly lead to a QSO
- “260” = 50.260 MHz
- “14xxxx” = some 2m frequency (unless it’s a spot at 14xxxx UTC)
  - E.g., 144150 = 144.150 MHz
- There is a 3rd-party freeware desktop client by N5TM that some prefer



## Ping Jockey - Read Bottom Up

- @03:52 W4IMD acks, letting me know I've got his attention, and implies he may be looking for my response. This is kosher pre-QSO.
- The QSO began within a minute after this.

- The QSO was over quickly
- Nothing is posted during the QSO, as that would not be kosher
- This 03:53 post implies that he believes we have both exchanged Rogers, I am in his logbook, and that we can stop. He would not post this otherwise.

DDMMM UTC  
22Jun 03:54 Yes, Most Excellent. 73 ! (WB5GVY Bennett TX EM10dq 47.221.201.254)  
22Jun 03:53 BENNETT 73 TNX GREAT COPY (W4IMD Peter GA EM84ab 73.106.18.83)  
22Jun 03:53 BENNETT 73 TNX GREAT COPY (W4IMD Peter GA EM84ab 73.106.18.83)  
22Jun 03:52 GE BENNETT (W4IMD Peter GA EM84ab 73.106.18.83)  
22Jun 03:50 034445 -1 11.5 1465 & CQ W4IMD EM84 .... GE (WB5GVY Bennett TX EM10dq 47.221.201.254)  
22Jun 03:38 CQ WEST 260 2ND (W4IMD Peter GA EM84ab 73.106.18.83)  
22Jun 03:38 CQ WEST 260 2ND (W4IMD Peter GA EM84ab 73.106.18.83)

Red arrows point from the callouts to the following lines in the log:  
- From the top-left callout to the line: 22Jun 03:52 GE BENNETT (W4IMD Peter GA EM84ab 73.106.18.83)  
- From the top-right callout to the line: 22Jun 03:53 BENNETT 73 TNX GREAT COPY (W4IMD Peter GA EM84ab 73.106.18.83)  
- From the bottom-left callout to the line: 22Jun 03:38 CQ WEST 260 2ND (W4IMD Peter GA EM84ab 73.106.18.83)  
- From the bottom-right callout to the line: 22Jun 03:50 034445 -1 11.5 1465 & CQ W4IMD EM84 .... GE (WB5GVY Bennett TX EM10dq 47.221.201.254)

- @03:38 UTC on 6/22/2020, W4IMD posts that he's calling CQ 2nd seq beaming West on 50.260 MHz
- I aim my beam at the WSJT-X calculated hot-spot for EM84

- @03:50 I post a 03:44 decode of his CQ from WSJT-X; This is considered kosher pre-QSO; GE = Good Evening (GM = Good Morning)
- This let's him know that he's being heard & implies I may be responding to his CQ.
- He may refine his heading in view of my grid

WSJT-X v2.2.1 by K1JT, G4WJS, and K9AN

File Configurations View Mode Decode Save Tools Help

Band Activity

UTC	dB	T	Freq	Message
035215	-1	8.2	1480	CQ W4IMD EM84 U.S.A.
035215	0	9.8	1479	CQ W4IMD EM84 U.S.A.
035215	1	9.9	1478	CQ W4IMD EM84 U.S.A.
035215	4	11.5	1479	CQ W4IMD EM84 U.S.A.
035245	9	0.6	1479	CQ W4IMD EM84 U.S.A.
035245	9	1.4	1480	WB5GVY W4IMD -01
035315	9	0.8	1478	WB5GVY W4IMD RR73
035345	2	0.5	1479	WB5GVY W4IMD RR73
035345	4	2.0	1478	WB5GVY W4IMD RR73
035345	5	2.2	1477	WB5GVY W4IMD RR73
035345	7	4.4	1478	WB5GVY W4IMD RR73
035345	8	4.6	1478	WB5GVY W4IMD RR73
035345	9	7.0	1478	WB5GVY W4IMD RR73
035415	-3	6.2	1479	WB5GVY W4IMD 73
035445	6	0.7	1476	CQ W4IMD EM84 U.S.A.
035445	7	0.7	1476	CQ W4IMD EM84 U.S.A.
035515	9	0.6	1475	CQ W4IMD EM84 U.S.A.
035545	7	0.5	1474	CQ W4IMD EM84 U.S.A.
035545	8	2.5	1473	CQ W4IMD EM84 U.S.A.
035545	9	2.9	1472	CQ W4IMD EM84 U.S.A.
035615	5	0.5	1470	CQ W4IMD EM84 U.S.A.
035615	7	1.4	1472	CQ W4IMD EM84 U.S.A.
035615	8	1.5	1471	CQ W4IMD EM84 U.S.A.
035615	9	2.1	1471	CQ W4IMD EM84 U.S.A.
035645	10	0.8	1471	CQ W4IMD EM84 U.S.A.

Tx Messages

UTC	dB	T	Freq	Message
030645	-8	0.1	1058	NK8O K5LCY R-06
030715	-5	0.1	1052	CQ KE0OG DM68 U.S.A.
030715	-10	0.1	1058	NK8O K5LCY 73
030745	-6	0.1	1052	CQ KE0OG DM68 U.S.A.
030815	-2	0.1	1052	CQ KE0OG DM68 U.S.A.
030845	-3	0.1	1052	CQ KE0OG DM68 U.S.A.
030900	-21	-0.0	1051	KE0OG K3RNR EL87
030915	-3	0.1	1052	K3RNR KE0OG -03
030945	-2	0.1	1051	K3RNR KE0OG RR73
034445	-1	11.5	1465	CQ W4IMD EM84 U.S.A.
034900	Tx	1500		W4IMD WB5GVY EM10
034930	Tx	1500		W4IMD WB5GVY EM10
035000	Tx	1500		W4IMD WB5GVY EM10
035030	Tx	1500		W4IMD WB5GVY EM10
035100	Tx	1500		W4IMD WB5GVY EM10
035130	Tx	1500		W4IMD WB5GVY EM10
035200	Tx	1500		W4IMD WB5GVY EM10
035230	Tx	1500		W4IMD WB5GVY EM10
035245	9	1.4	1480	WB5GVY W4IMD -01
035300	Tx	1500		W4IMD WB5GVY R+09
035315	9	0.8	1478	WB5GVY W4IMD RR73
035330	Tx	1500		W4IMD WB5GVY 73
035400	Tx	1500		W4IMD WB5GVY 73
035415	-3	6.2	1479	WB5GVY W4IMD 73
035430	Tx	1500		W4IMD WB5GVY 73

Log QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune Menus

6m 50.260 000

DX Call W4IMD DX Grid EM84

Az: 69 A: 79 El: 4 899 mi

Lookup Add

2020 Jun 22 03:57:00

Receiving 0% IC-7300 MSK144 Last Tx: W4IMD WB5GVY 73 0

0/15 WD:10m

I decode W4IMD's CQ

I begin calling W4IMD;  
after 1 min I post  
W4IMD's CQ spot on PJ

W4IMD gives -01 rpt

I Roger & give +09 rpt

W4IMD gives Roger+73;  
the QSO is complete

I give optional 73

W4IMD gives courtesy  
73, signalling we can  
stop

# Ping Jockey Etiquette

- Best to observe for few days to see what's normal
- Avoid posting about the progress of an “award credit” QSO, unless you want to end it or start over
  - OK: CQ spots; End-of-QSO spots ending w/ 73
  - Not OK: Mid-QSO spots; End-of-QSO spots ending w/ RR73
  - Similarly, its OK to post “I got your 73!”, but not OK to post “I got your RR73!”
- What's “appropriate banter” varies
  1. newbie – banter high as newcomers are welcomed and are encouraged at each step
  2. “award credit” QSO -- mid-QSO banter is frowned upon
  3. old friends tinkering -- countless QSOs between them, mid-QSO banter is normal

## 6m & Meteor Scatter Radio Sports Take Aways

- 6m Radio Sports are grid-centric and unique
- 6m is modest station friendly
- 6m Propagation Types
  - Sporadic E & Meteor Scatter are primary
  - “Tropo” and TEP are secondary
- 6m Meteor Scatter is involved but exciting
- 6m is ***The Magic Band***

# References / Illustration Credit / Additional Resources - I

- Earwiggling W5TRL video
  - <https://www.youtube.com/watch?v=j1YS72-Tlvk>
- NC6K: Understanding Sporadic-E Propagation on 6 Meters
  - [http://k9yc.com/Understanding%20Sporadic-E%20Propagation%20on%206%20Meters%20-%20Palomar%20ARC%20OLD%20FORMAT%20\(February%202019\).pdf](http://k9yc.com/Understanding%20Sporadic-E%20Propagation%20on%206%20Meters%20-%20Palomar%20ARC%20OLD%20FORMAT%20(February%202019).pdf)
- Work the World with WSJT-X
  - <https://microhams.blob.core.windows.net/content/2018/03/MHDC2018-K1JT.pdf>
- The MSK144 Protocol for Meteor-Scatter Communications
  - [https://physics.princeton.edu/pulsar/k1jt/MSK144\\_Protocol\\_QEX.pdf](https://physics.princeton.edu/pulsar/k1jt/MSK144_Protocol_QEX.pdf)
- WSJT: New Software for VHF Meteor-Scatter Communication
  - [https://physics.princeton.edu/pulsar/K1JT/WSJT\\_QST\\_Dec2001.pdf](https://physics.princeton.edu/pulsar/K1JT/WSJT_QST_Dec2001.pdf)
- VHF contest calendar 2021
  - <https://www.qsl.net/n2sln/contestcalendar.html>

## References / Illustration Credit / Additional Resources - II

- Working DX on a Dead 50MHz Band Using Meteor Scatter
  - <https://www.uksmg.org/content/deadband.htm>
- PROPAGATION ON THE “MAGIC BAND”
  - [https://wa3wsj.homestead.com/6M\\_Propagation.pdf](https://wa3wsj.homestead.com/6M_Propagation.pdf)
- WSJT-X 2.0 User Guide
  - <https://physics.princeton.edu/pulsar/k1jt/wsjsx-doc/wsjsx-main-2.0.0.html>
- WSJT-X@groups.io | Meteor Scatter 10M (short thread on groups.io)
  - [https://wsjtx.groups.io/g/main/topic/meteor\\_scatter\\_10m/75950797?p=](https://wsjtx.groups.io/g/main/topic/meteor_scatter_10m/75950797?p=)
- Catch a Falling Star [incl. images on slides 25 and 26]
  - <http://www.arrl.org/files/file/QST%2520Binaries/nt0z.pdf>
- MSK144 vs FSK441 Meteor Scatter Modes — My Scattered Compilation of Data Points
  - <https://www.k5nd.net/2020/10/msk144-vs-fsk441-meteor-scatter-modes-my-scattered-compilation-of-data-points/>



## References / Illustration Credit / Additional Resources - III

- Sporadic E Propagation
  - <https://3fs.net.au/sporadic-e-propagation/>
- Introduction to HF Radio Propagation [incl. image on slide 9]
  - <http://www.sws.bom.gov.au/Educational/5/2/2>
- Sierra Foothills Amateur Radio Club 2014 Tech Class: Module 8 – Propagation [incl. images on slides 10, 16, 18]
  - <https://www.hsdivers.com/Ham/Mod8.html>
- Transequatorial Propagation, TEP [incl. image on slide 17]
  - <https://www.electronics-notes.com/articles/antennas-propagation/ionospheric/transequatorial-propagation.php>
- Sporadic E, Es Propagation [incl. images on slides 10, 11, 12]
  - <https://www.electronics-notes.com/articles/antennas-propagation/ionospheric/sporadic-e-es.php>

## References / Illustration Credit / Additional Resources - IV

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  - <http://www.n5tm.com/pjclient-quick-start-guide/>
- SLACK VHF-CHAT
  - <http://www.n5tm.com/slack-vhf-chat/>
- MSHV@groups.io | What is Hot A and Hot B? (short thread on groups.io)
  - <https://groups.io/g/MSHV/topic/77753454#2050>
- Spring VHF & Up Sprints
  - <https://sites.google.com/site/springvhfupsprints/home/2021-information>
- Amateur Radio Tools - Icom America [incl. image on slide 3]
  - <https://www.icomamerica.com/en/amateur/amateurtools/default.aspx>
- FFMA
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  - [https://hamsci.org/sites/default/files/publications/2017\\_QST\\_Dzekevich\\_UpperLevelLows.pdf](https://hamsci.org/sites/default/files/publications/2017_QST_Dzekevich_UpperLevelLows.pdf)
- WSJT-X MSK144 Modulator – Scicos Simulation
  - <https://jeremyclark.ca/wp/telecom/msk144-modem-scicos-simulation/>
- Meteorscan
  - <https://meteorscan.com/meteor-live.html>
- Hamspots – MSK144 Mode
  - <https://hamspots.net/msk144/>
- DXMAPS
  - <https://www.dxmaps.com/spots/mapg.php>
- VHF WEAK SIGNAL OPERATION BY MARC C. TARPLEE, PH.D. N4UFP
  - [incl. image on slide 18]
  - <https://vdocuments.site/vhf-weak-signal-operation-by-marc-c-tarplee-phd-n4ufp.html>

## References / Illustration Credit / Additional Resources - VI

- Introduction to Meteor Scatter Operation by Marc C. Tarplee, Ph.D. N4UFP.
  - <http://slideplayer.com/slide/6827971/>
- Meteor Shower Calendar
  - <https://www.timeanddate.com/astronomy/meteor-shower/list.html>
- After Es, why not try meteor scatter with MSK144?
  - <https://web.archive.org/web/20191218133411/http://gm4fvm.blogspot.com/2017/08/after-es-why-not-try-meteor-scatter.html>
- MeteorActive (IOS app) [incl. data for red averages on slide 25]
  - <https://apps.apple.com/us/app/meteoractive/id1205712190>
- Planetary waves and midlatitude sporadic E layers: Strong experimental evidence for a close relationship
  - <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2001JA000212>

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- The ON4KST amateur radio chat
  - <http://www.on4kst.com/chat/start.php>
  - follow “Enter into the 50 MHz IARU Region 2 chat here”
- JTAlert
  - <https://hamapps.com/>
- Virus Total
  - <https://www.virustotal.com/gui/>
- What makes the Pings go Ping?
  - <https://www.youtube.com/watch?v=F6lsYaFxJHc>
  - [http://www.bravoao.co.uk/g4bao/Files/RSGB2015\\_G4BAO.pdf](http://www.bravoao.co.uk/g4bao/Files/RSGB2015_G4BAO.pdf)
- Ping Jockey Etiquette
  - <https://www.qsl.net/wa5ufh/DOS/Etiquette.htm>

## References / Illustration Credit / Additional Resources - VIII

- MSHV
  - <http://lz2hv.org/node/10>
- Evolution of the WSJT Digital Modes
  - <http://www.nmvhf.org/TechFestWB2FKO.pdf>
- 6 Meter Meteor Scatter Communications. by WB8BZK
  - <https://www.youtube.com/watch?v=RJ-kuvOAkGo>
- Meteor Showers (Peak rates) [incl. data for green overlays on slide 25]
  - <https://www.qsl.net/g0isw/g0iswms.htm>
- WG7J's GridMapper v1.7 [incl. maps on slides 1 and 7]
  - <http://wg7j.reinalda.net/gridmapper/gridmapper.php>



*Questions?*

The End

# Extras / Leftovers

