



Davie/Cooper City Amateur Radio Club

We are Radio Active

Meteor-Scatter hands on DX



Jose Carlos

N4IS

VHF DX communication using Meteor-Scatter propagation mode

Basic concepts and practical aspects

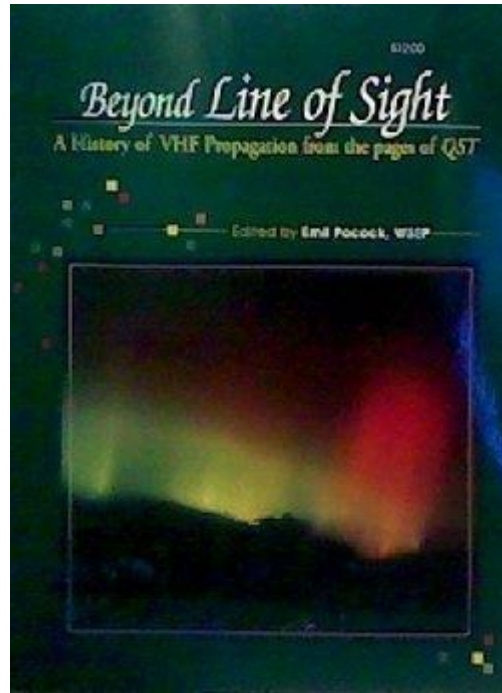
- What is a meteor
- How to use it for DX communication
- DX geometry

Know your enemy “The art of war”

- How to do it.
- What to do it
- When to do it

M/S web resources

- W8WN
- HSCW
- FSK-441 (WSJT)
- MSK-144

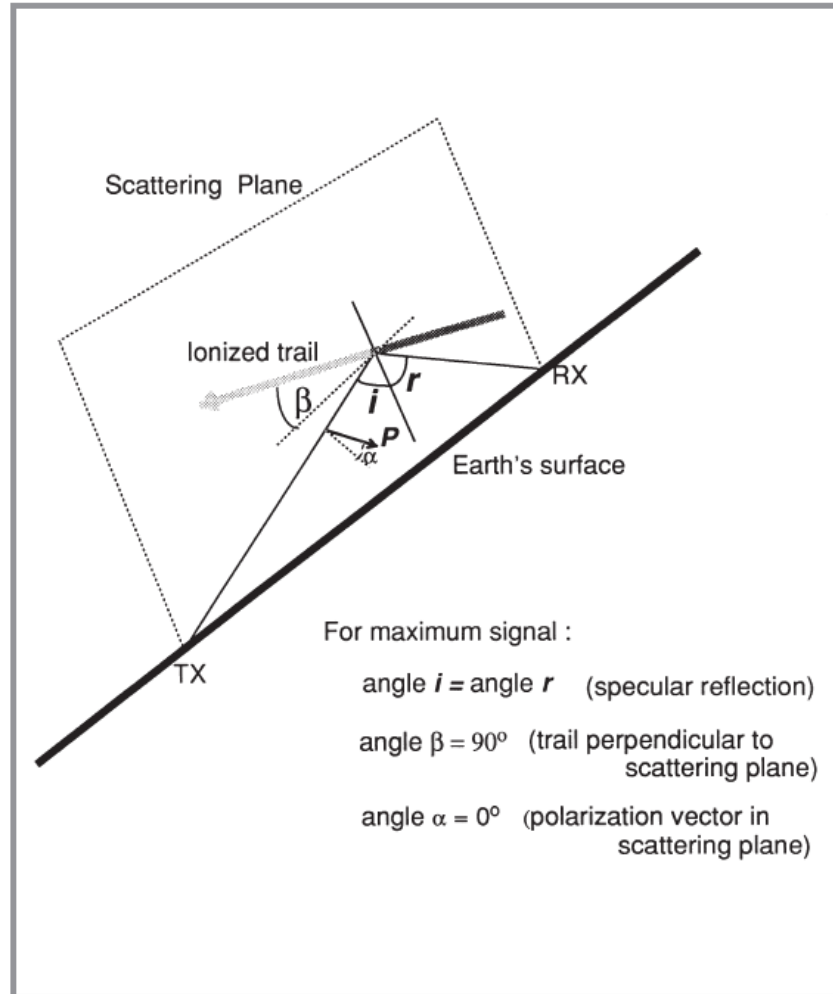


THE VHF/UHF DX BOOK

http://www.trpub.net/assets/applets/VHF-UHF_DX_Book.pdf

Summary of propagations mode

Medium	Propagation mode	Abbrev.
Troposphere	Refraction	Tropo
	Ducting	Tropo
	Forward troposcatter	Tropo
Ionosphere	Temperate-zone sporadic-E	Es
	Auroral sporadic-E	Ar-Es
	Equatorial sporadic-E	
	Field-aligned irregularities	FAI
	Trans-equatorial	TEP
	Equatorial FAI	TEP
	Aurora	Ar
	F2-layer	F2
	Meteor-scatter	M/S
	Ionospheric scatter	
Obstacles	Diffraction	
	Moonbounce	EME
	Reflection from objects	



Line of sight ~ 30 miles

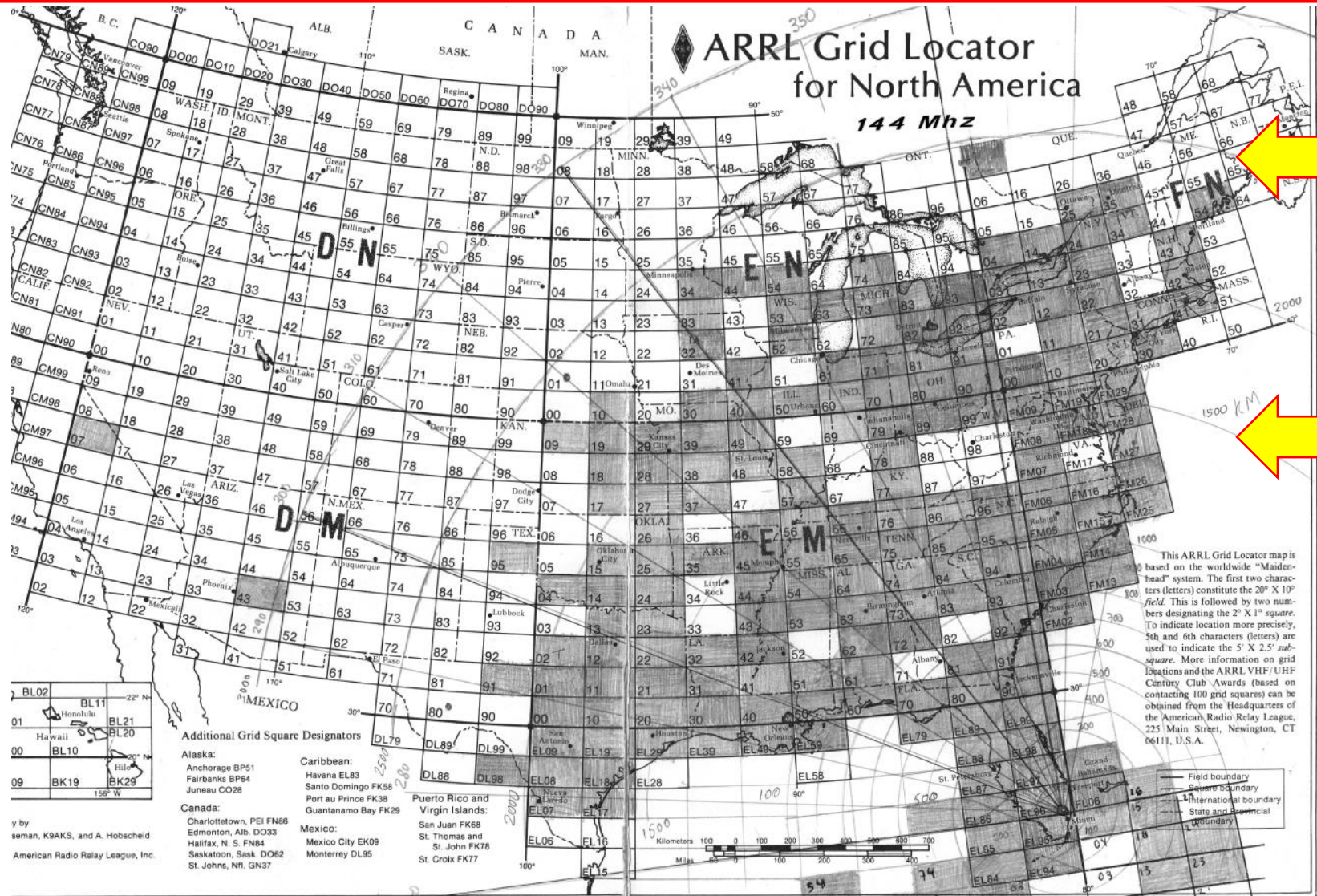
TROPO 1500 miles

Es 1500 - 3000 miles

Ducting 5000 miles

M/S 300 to 1500 miles

N4IS North America grids 144 MHz



M/S QSL's

PRINCETON, NEW JERSEY 08540
272 HARTLEY AVENUE

K1JT

EX: K2ITP, WA1LXQ, W1HFV, VK2BJX

CONFIRMING QSO WITH	DATE	UTC	MHz	RST	MODE	
DAY	MONTH	YEAR			2-WAY	
N4IS	29	7	00	0600	144 26	WSJT

PSE QSL TNX Many thanks for HSMS QSO, Carlos 73 - Joe 73, JOE TA)

MERCER COUNTY GRID FN20 A STAR 73-Joe

MONROE COUNTY
GRID: EM39wo

NØPB

EX: AA0EO, NØFOW

CONFIRMING QSO WITH	DATE	UTC	MHz	RST	MODE	
DAY	MONTH	YEAR			2-WAY	
N4IS	6	10	01	14:19	144.130 27	WSJT FSK441

73, Phil

PHILLIP BALDWIN
Rte 1, Box 80-A
Holiday, MO 65258
U.S.A.

PSE QSL TNX QSL A WAMPY QSL

W1ZC

CONFIRMING QSO WITH	DAY	MONTH	YEAR
N4IS	23	1	2002

UTC	MHz	RST	2-WAY	QSL
1200	144.122	R-23	FSK 441	PSE

NEW HAMPSHIRE The Beautiful

73, DICK WILBORG
791 Brookline Road
Mason, NH 03048-4407
U.S.A.

GRID FN42

Hi8ROX
REPUBLICA DOMINICANA

MISSISSIPPI VALLEY DX/CONTEST CLUB

The DX Hog

KWØA

JEFFERSON COUNTY

KEN KRESKI
6645 ST. JOHN'S LANE
HOUSE SPRINGS, MO 63051

CONFIRMING QSO WITH	DATE	UTC	MHz	RST	MODE
DAY	MONTH	YEAR			2-WAY
N4IS	20	SEP	01		
	0248		144.123	26	WSJT

EM-48

PSE QSL TNX QSL

KØVSV

DATE	UTC	RST	MHz	2-WAY
DAY	MONTH	YEAR		
13	Aug	02	0228	R27 144 WSJT

Thomas L. Kramer
905 Leroy St.
scatine, Iowa 52761 Muscatine County
EN - 41 - LK

NP4X

SAN JUAN, PUERTO RICO

Jose Freytes
Fairview Q1
Pedro Margarit
San Juan, PR 00926

Grid Square: FK68xi

MULLEN COUNTY - EN50

W9SE

8 BAND DXCC

CONFIRMING QSO WITH	DATE	UTC	MHz	RST	MODE	
DAY	MONTH	YEAR			2-WAY	
N4IS	22	5	04	1400	144 27	FSK 441A

1500W TEL 618491825

JOHN A. FLINN
207 Concord Drive
Normal, IL 61761
U.S.A.

TUX NEW STATE GRID
ON 2 WAY 2 MTR HERE
73 Phil

PSE QSL TNX QSL The QSL MAN® - WAMPY

ABØSD

ALLEN R. L. LAKNER
26646 610th STREET
EXLINE, IA 52555

APPANOOSE COUNTY
GRID EN30

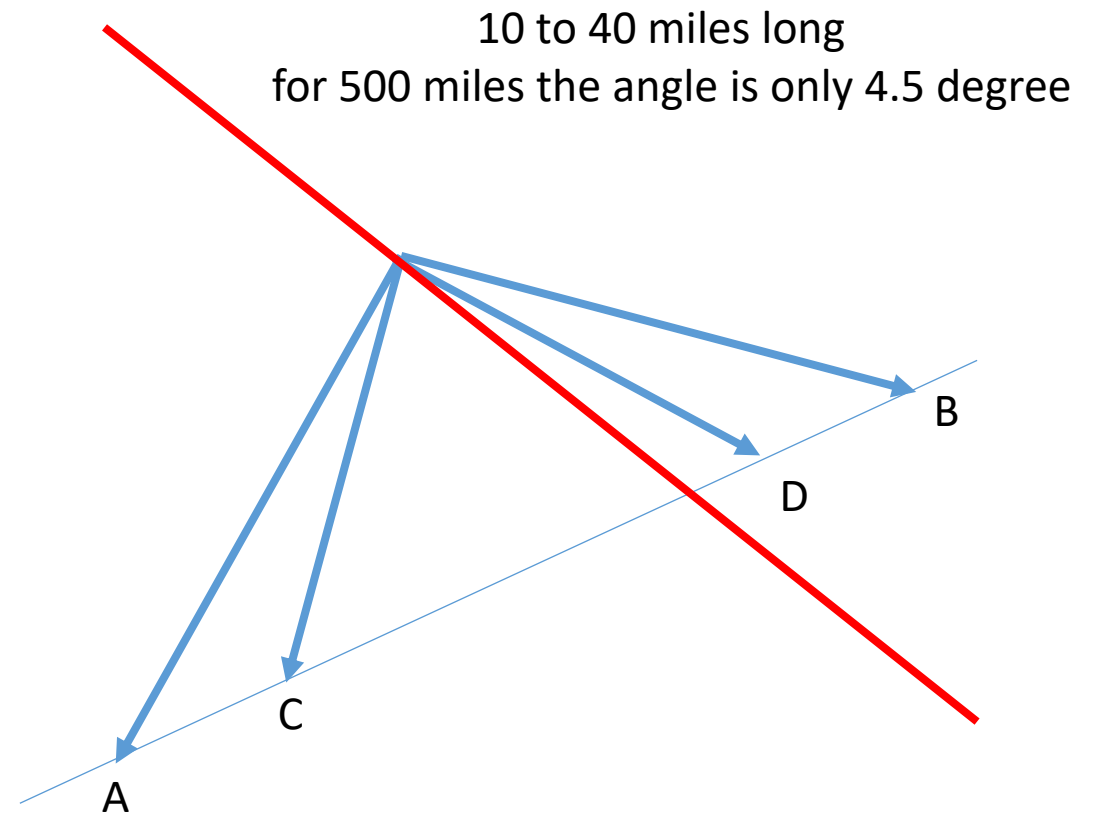
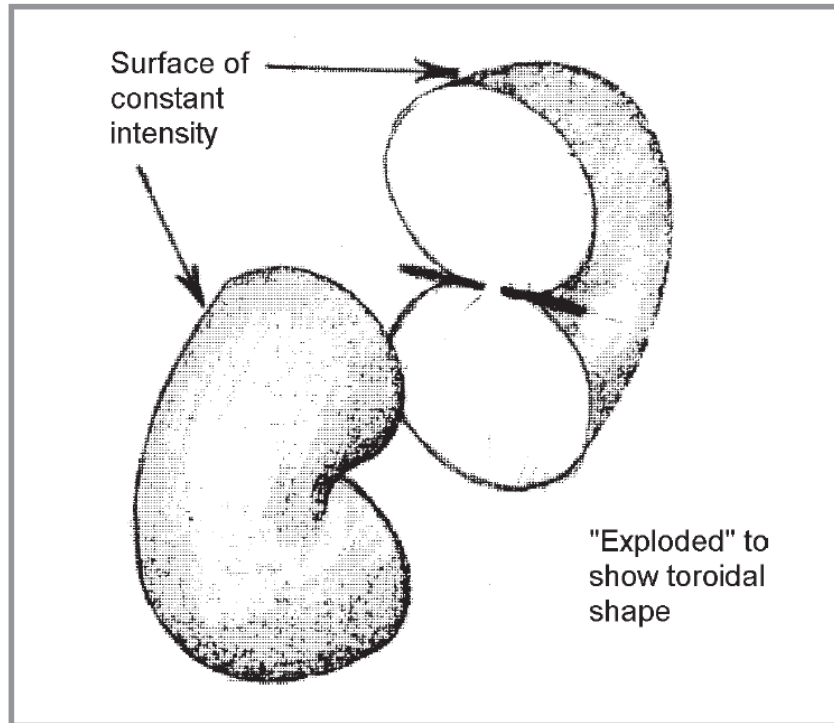
METEOR-SCATTER What a f^%\$ing it is!

The name 'meteor-scatter' is misleading. It is not the meteors themselves which scatter signals beyond the horizon, but the trails of ionization which are left behind as these high velocity fragments burn up.

Variations in mass, composition and velocity result in trails between 10 and 40 miles long and about 3 FT in diameter. The trail rapidly expands as the electrons diffuse into the surrounding space

Meteor scatter radiation

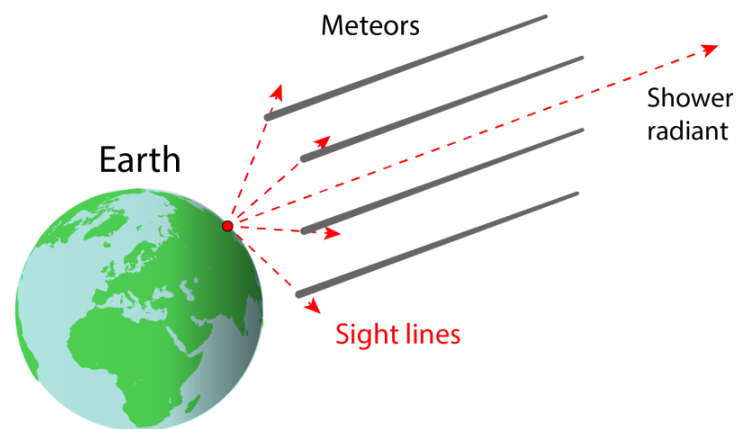
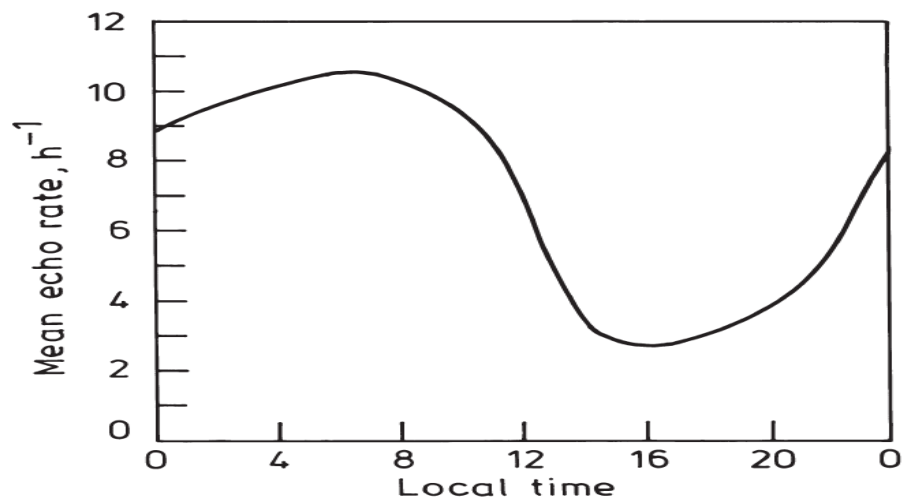
Fig. 2.2. The toroidal radiation pattern produced by an oscillating electron is identical to that of a short dipole antenna



Pings and Bursts

How to do it!

Meteors	Pings	Bursts
Trail and size	Under dense grain of sand	Coherent reflection small pebble
From and Mode	Sporadic Random WSJT	Showers CW SSB
Arrive duration	All the time mS -Seconds	Specific date seconds to minutes
Direction and visibility	All directions not visible	Specific direction or Radiant visible
Hourly rate ZHR	> 300	20 - 100



Principal Meteor Showers and favored directions

Shower name	Limits	Max	ZHR	N-S	NE-SW	E-W	SE-NW
Quadrantids	1-6 Jan	3-4 Jan	60	02-06(W) 11-16(E)	11-17(SE)	23-03(S) 15-17(S)	00-05(SW)
Lyrids	19-25 Apr	22 Apr	10	22-02(W) 06-10(E)	23-03(NW) 08-11(SE)	03-06(N)	22-01(SW) 05-08(NE)
Eta Aquarids	24 Apr – 20 May	5 May	35	03-04(W) 10-11(E)	04-09(NW)	05-11(N)	08-12(NE)
May Piscids	4-27 May	12 May	10	03-08(W) 12-16(E)	05-09(NW) 14-16(SE)	08-11(N)	04-08(SW) 10-14(NE)
Arietids	22 May – 2 July	8 June	60	04-08(W) 11-15(E)	05-09(NW) 14-16(SE)	08-12(N)	04-06(SW) 10-14(NE)
Zeta Perseids	20 May – 5 July	13 June	40	05-10(W) 13-17(E)	06-11(NW) 15-17(SE)	09-14(N)	06-07(SW) 11-15(NE)
Nu Geminids	9-15 July	12 July	60	06-10(W)	07-11(NW)	10-14(N)	11-17(NE)
Delta Aquarids	15 July – 20 Aug	29 July, 7 Aug	20 10	Equatorial and southern hemisphere only			
Perseids	3 July –	12-13 Aug	75	23-04(W) 09-13(E)	08-17(SE)	11-01(S)	18-04(SW)
Orionids	16-27 Oct	22 Oct	25	00-03(W) 07-09(E)	00-04(NW)	03-06(N)	05-08(NE)
Taurids	20 Oct – 30 Nov	4 Nov	10	02-05(E) 20-22(W)	20-01(NW)	22-03(N)	00-05(NE)
Geminids	7-15 Dec	13-14 Dec	75	04-09(E) 20-01(W)	22-02(NW) 05-09(SE)	01-04(N) 03-07(S)	03-07(NE) 19-23(SW)
Ursids	17-25 Dec	23 Dec	5		07-01(SE)	00-24(S)	16-09(SW)

Meteor collision head-on & rear-end **When to do it!**

**25,000 to
160,000 mph**

Meteors approaching
head-on – add orbital
and rotational velocity



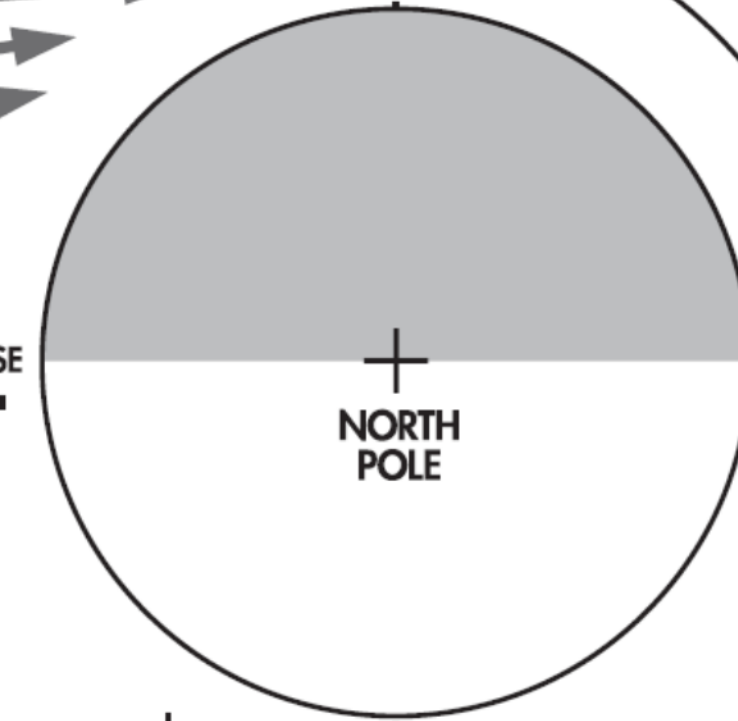
MIDNIGHT

ROTATIONAL
VELOCITY



**67,000
mph**

SUNRISE
ORBITAL
VELOCITY



SUNSET



Meteors overtaking
earth seem slower

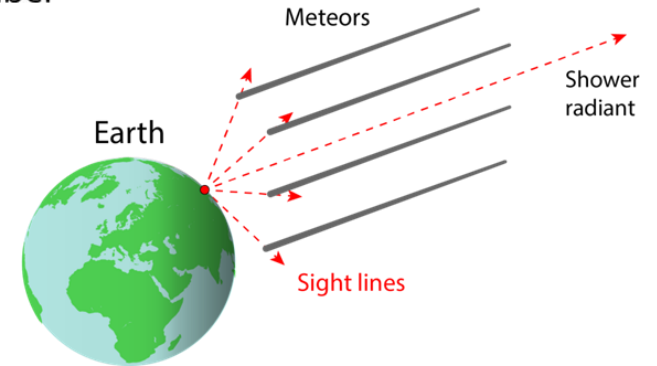
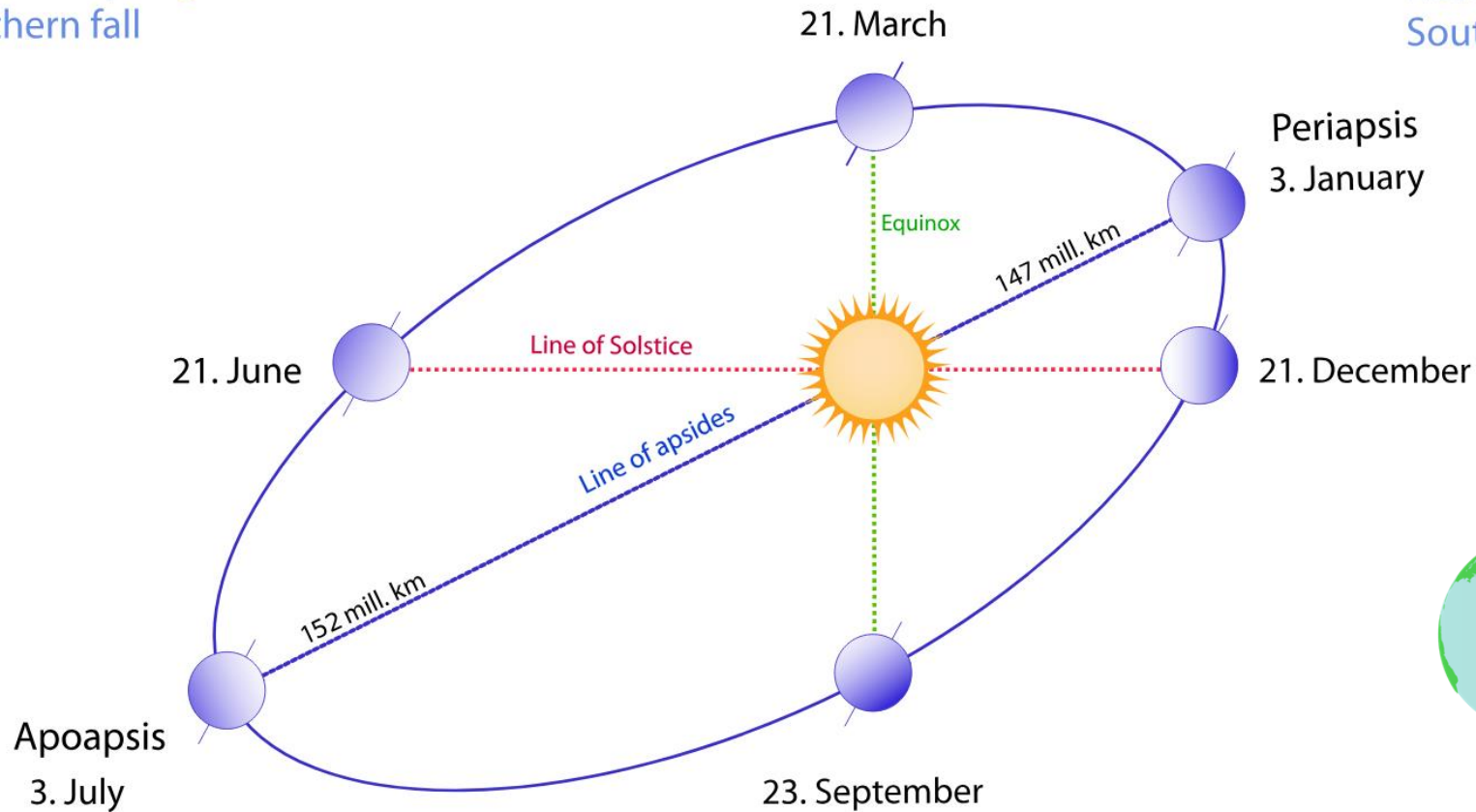
TO SUN

NOON

Understanding meteor collision

Northern spring/
Southern fall

Northern winter/
Southern summer



Northern summer/
Southern winter

Northern fall/
Southern spring

M/S QSO's

What to do!

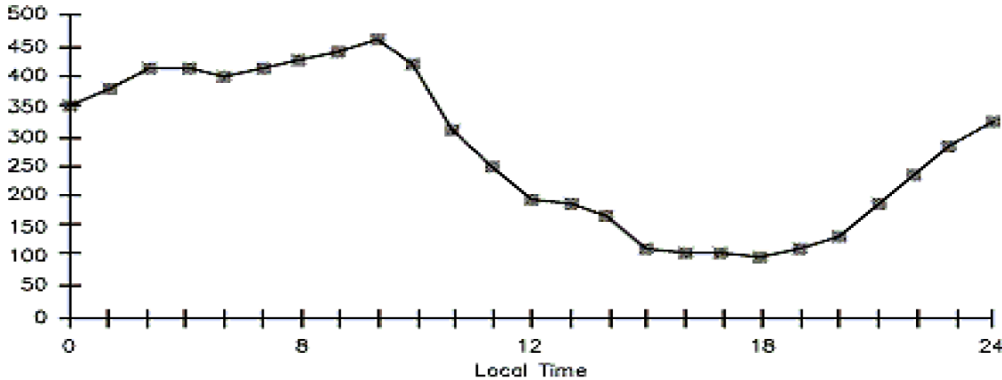
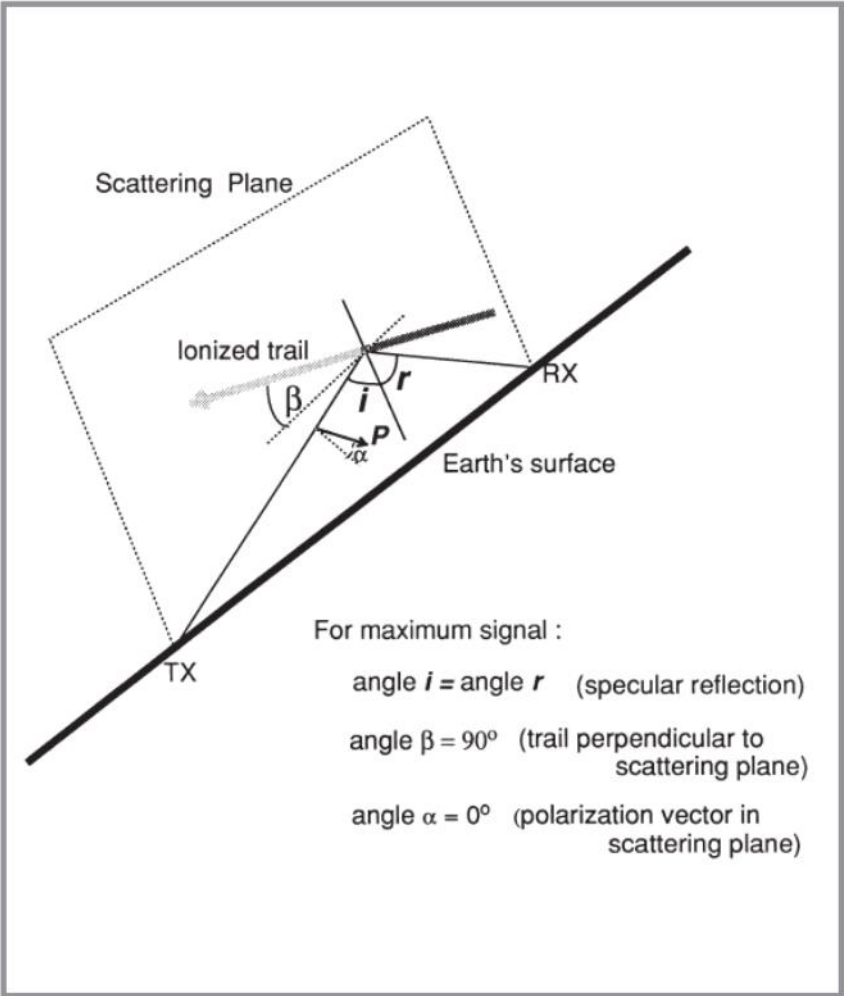
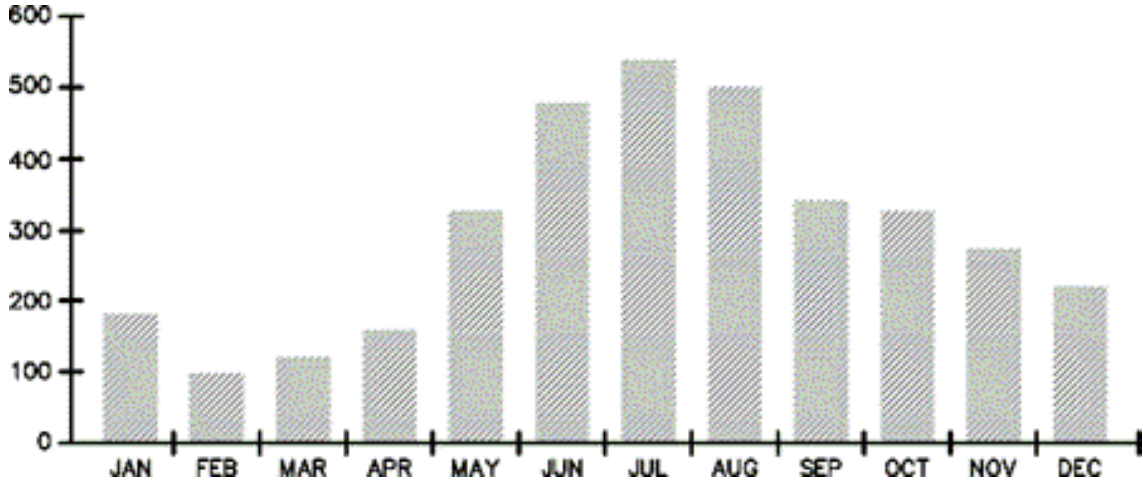


Figure 2—Average daily meteor rates (relative) by the hour.

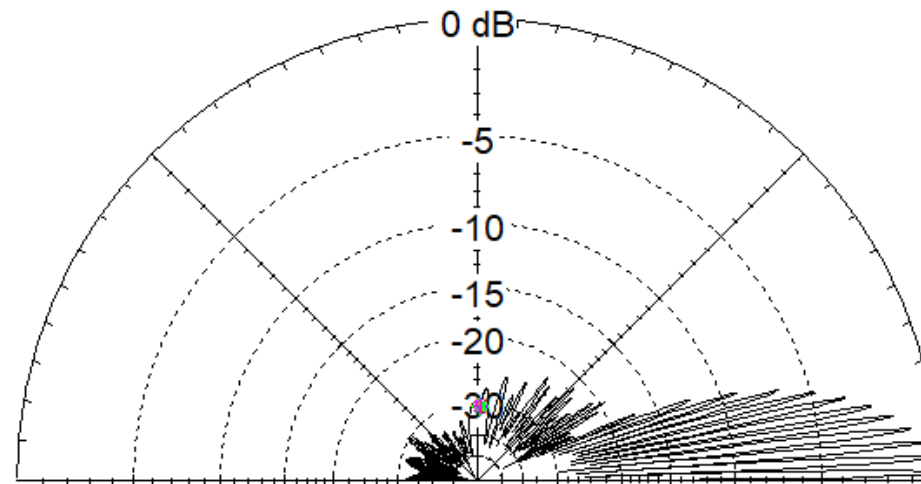


Antenna take off angle for M/S QSO's

QSO distance miles	Take off angle	Antenna height FT
300	18°	10
600	8°	20
1000	4°	30
1250	1°	90
1500	0.1°	120

Total Field

EZNEC+



222 MHz

Meteor Scatter modes

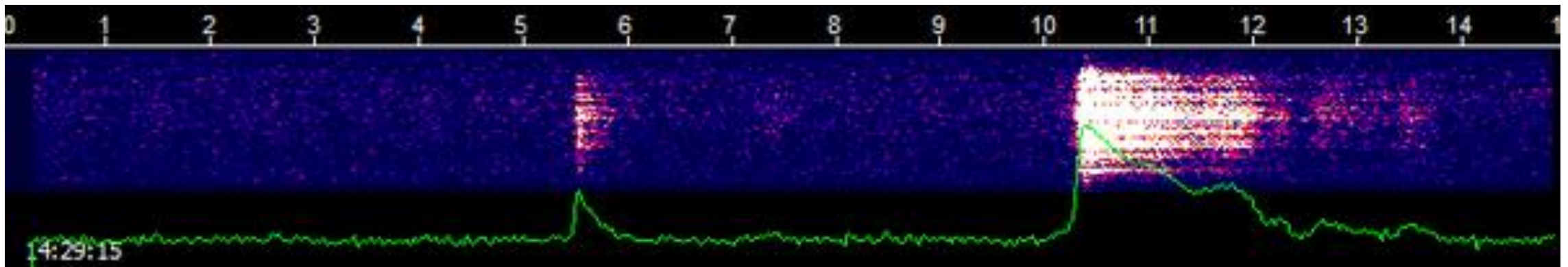
Military use



"COMET" (*Communication by Meteor Trails*), used for long-range communications with [NATO's Supreme Headquarters Allied Powers Europe](#) headquarters. COMET became operational in 1965, with stations located in the Netherlands, France, Italy, West Germany, the United Kingdom, and Norway. [\[citation needed\]](#) COMET maintained an average throughput between 115 and 310 bits per second, depending on the time of year.

Meteor burst communications faded from interest with the increasing use of satellite communications systems starting in the late 1960s

Amateur radio use



M/S web resources HSCW to MFK441

<https://www.qsl.net/w8wn/>

<https://www.qsl.net/w8wn/>

[HSCW high speed CW](#)

hear a 0.065 second ping at 1600 wpm



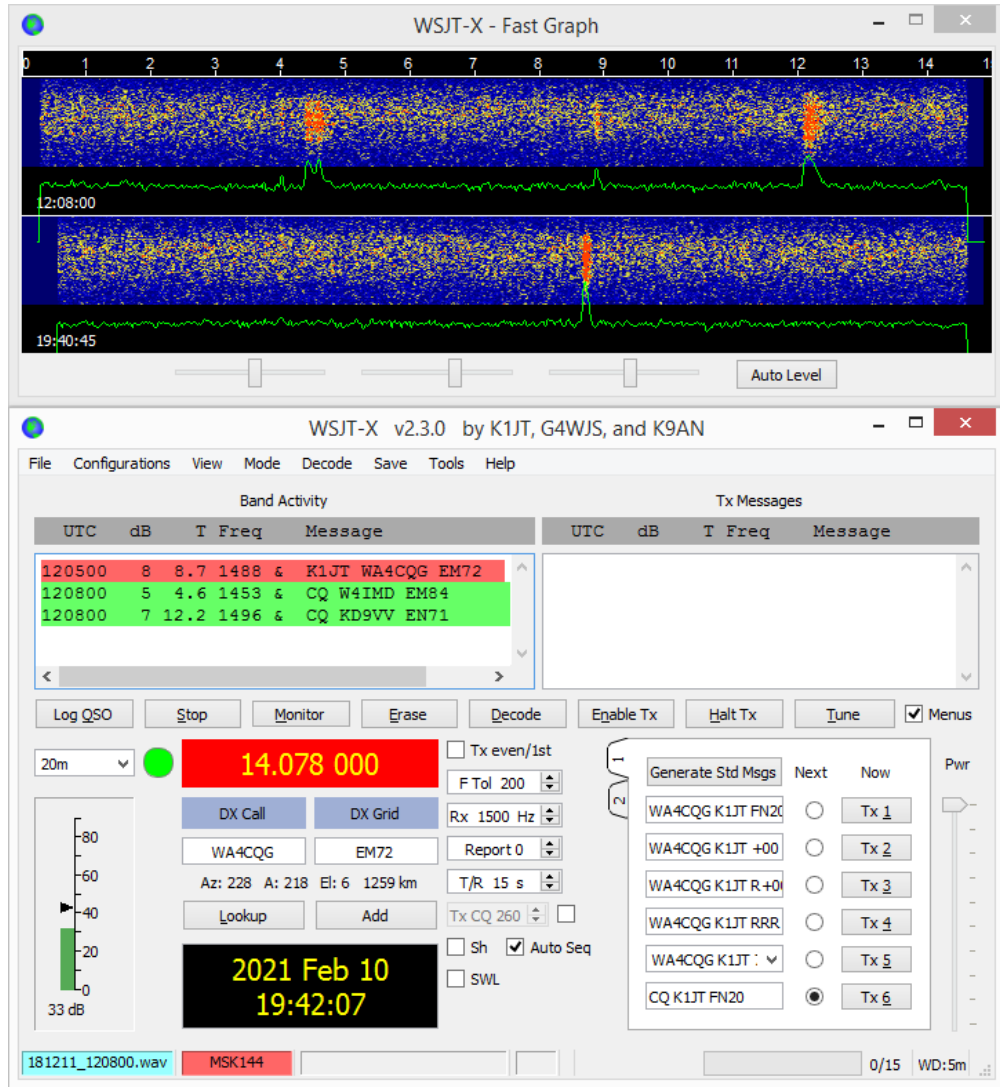
slow it down 100 times



The screenshot shows the WinMSDSP software interface. The title bar reads "WinMSDSP Version V0.09 [Alpha] by 9A4GL (Registered to W8WN)". The interface includes a menu bar (File, RX, TX, Buffer, Tools, Help), a "Main Buffer" display with 10 slots, and a central spectrogram area showing a green signal. Below the spectrogram is a large digital display showing "19:04:29" and "1999-05-12". The bottom section contains a list of TX messages and a "Send" button.

TX	Message	Send
TX 1	KQXP W8WN <	<input checked="" type="checkbox"/> Send 1
TX 2	KQXP W8WN 27 <	<input type="checkbox"/> Send 2
TX 3	RRR 27 <	<input type="checkbox"/> Send 3
TX 4	RRR RRR RRR <	<input type="checkbox"/> Send 4
TX 5	CQ W8WN <	<input type="checkbox"/> Send 5
TX 6	73 <	<input type="checkbox"/> Send 6

WSJT Home Page by K1JT et al. **READ the fr%@&ing MANUAL!**



<https://wsjt.sourceforge.io/index.html>

https://wsjt.sourceforge.io/wsjt-doc/wsjt-main-2.6.1.html#_msk144



Sked page Ping Jockey Central

<https://www.pingjockey.net/cgi-bin/pingtalk>

<https://www.pingjockey.net/>

Ping Jockey Central.

Relief page	Skeds in-progress	CQ Announcements	splat-65 Link
Refresh	Look back	Distance/Bearing Locator	Who's Earwiggling?
Update User details	AA1YN Callsign database	*** UNREGISTERED USER - POSTS DISABLED ***	Refreshed 08Sep 21:47

Due to recent abuse of this system, you will be unable to post any messages until you complete the [User Details](#) page
This page is to be used only for the purposes of discussing matters related to amateur radio meteor scatter communications. **Any** non-meteor scatter use is strictly prohibited.

That means **DO NOT USE THIS PAGE TO WORK splat-65 or for General chit-chat.**

Remember, in North America, 50.260MHz and 144.140MHz are calling not operating frequencies.

Exchanging any contact details on here before you're complete, invalidates the contact, and, if it's not HIGH-SPEED METEOR SCATTER, it doesn't belong here!

Remember, in North America, 50.260MHz and 144.140MHz are calling not operating frequencies.

Enter your message here

Go!

```
DDMMM UTC
08Sep 21:30 F2 is fading away now it seems (KD9VV Pete IN EN71ib )
08Sep 21:30 WA2FZW: Was gonna have ya listen for PO-101..Nada here and a good pass (KD9VV Pete IN EN71ib )
08Sep 21:29 KD9VV Not really here (WA2FZW/6M/2M John NJ FN20tp )
08Sep 21:20 WA2FZW: Not hearing P-101 atm, you? (KD9VV Pete IN EN71ib )
08Sep 21:20 WA2FZW: Still here? (KD9VV Pete IN EN71ib )
08Sep 21:15 K5QE: aww..do we have to? :) (KD9VV Pete IN EN71ib )
08Sep 21:07 K5QE I'll be on and I usually work ya! (WA2FZW/6M/2M John NJ FN20tp )
08Sep 21:00 OH, and the other "requirement" is that you work us....HI (K5QE/6M/QRO Marshall TX EM31cj )
08Sep 21:00 Hello Everyone....you are "REQUIRED" to be on for the VHF contest tomorrow..... (K5QE/6M/QRO Marshall TX EM31cj )
08Sep 20:44 Stopping. It's 5 O'clock somewhere! (W9VHF Ray IN EN71lf )
08Sep 20:42 I see him. decoding him though. (W9VHF Ray IN EN71lf )
08Sep 20:33 W9VHF: Our buddy is on and off by 2 secs! LOL (KD9VV Pete IN EN71ib )
08Sep 19:58 195800 -14 0.1 1867 ~ CQ DX K0TPP EM48 (N0AN/6/700/LFA5 Hasan IA EN22xc )
08Sep 13:19 I'll stop then. GL testing the antenna. Maybe the contest weekend will offer some opportunities. Cheers. (KC0V/6 )
08Sep 13:18 KC0V Jan, trying to work N5DUW now in EM11 (WM5L/QRO/6/2 Jim TX DM91rk )
08Sep 13:18 Same here. Not enough tropo for 70cm. I did work out to EN60 last week though, so it's possible to get some tropo h
08Sep 13:17 KC0V Jan, nada (WM5L/QRO/6/2 Jim TX DM91rk )
08Sep 13:16 Anything showing on your end? (KC0V/6/2/70CM Jan CO DN70kp )
08Sep 13:16 I see that. It's patchy up this way and fading. (KC0V/6/2/70CM Jan CO DN70kp )
08Sep 13:16 KC0V Jan, im gonna swing towards Dallas and call CQ for a bit (WM5L/QRO/6/2 Jim TX DM91rk )
08Sep 13:15 KC0V Jan, there is abig tropo cloud over Texas if I could just find somebody under it (WM5L/QRO/6/2 Jim TX DM91rk )
08Sep 13:13 KC0V Jan, put up a M2 432.9wl. 17.3dbd. (WM5L/QRO/6/2 Jim TX DM91rk )
08Sep 13:12 Nice! Just a 20 el LFA ~Plus~ 180W here. Works well for tropo and even some EME. (KC0V/6/2/70CM Jan CO DN70kp )
08Sep 13:10 KC0V Jan, sending Ill LMBO if this works. Just put up a big 432 antenna last night (WM5L/QRO/6/2 Jim TX DM91rk )
08Sep 13:09 130845 21 12.9 1505 & KE4TH WM5L 73. Awesome finish Jim! (KE4TH/6M Keith UT DN40ll )
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Davie/Cooper City Amateur Radio Club

We are Radio Active

THANK YOU
and
GOOD PINGs



Jose Carlos

N4IS