



FT8:

Digital Dxing for alle!

EDR Frederikssund Afd.

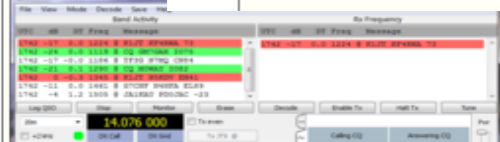
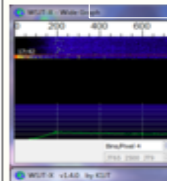
15.November, 2017

Peter Frenning, OZ1PIF/Larry Gauthier, K8UT

FT8: DXing for alle

Quicker-Turnaround Digital Modes in Experimental Stage for WSJT-X Suite

Recent sporadic-E propagation openings on 6 meters and elsewhere have demonstrated a faster turnaround than previous versions. A slow 'JT mode' can take nearly 1-minute to establish a contact whereas certain E-skip openings with much shorter duration were among the best to skip on 6 meters.



New FT8 Mode Included in WSJT-X Beta Release

A beta release of WSJT-X, version 1.8.0-rc1, includes a new FT8 mode, featuring a faster turnaround, and it's already showing up on the HF bands. According to

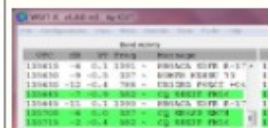


radio, improved CA, and MSK144 decoder p

FT8 Mode is Latest Bright Shiny Object in Amateur Radio Digital World

It's still in beta testing, but FT8 — the latest digital bauble to capture the imagination of the Amateur Radio community — has been luring away

many of those already using other digital modes. FT8 is included in the latest beta release. Among its biggest selling points is its meaning quicker contacts. FT8 offers "several times" faster turnaround than other modes. Contacts are four times as fast as other modes. FT8 contact can take



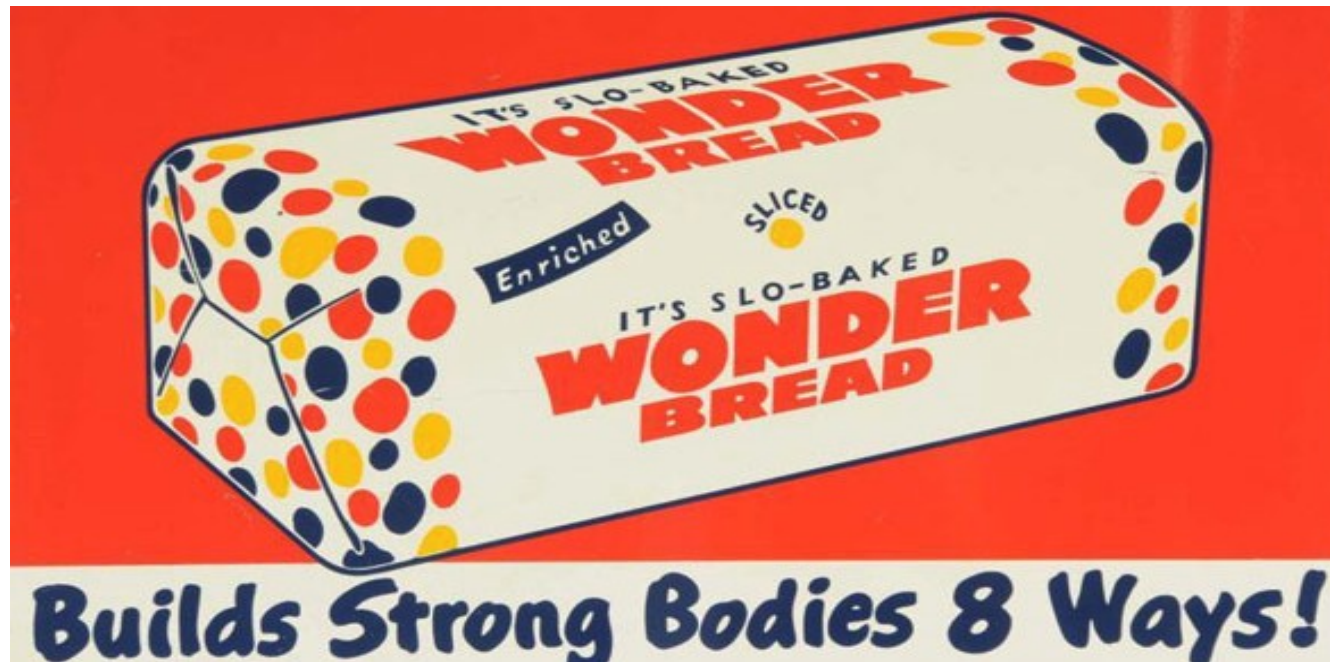
Unless you live under a rock, you've heard about FT8

New Digital Modes Changing Complexion of HF Bands and Perhaps of Ham Radio

The wave of software-based digital modes over the past several years has altered the atmosphere of the HF bands. Some suggest the popularity of modes that make it possible to contact stations neither near nor far has resulted in fewer CW and SSB signals on bands like 6 meters and 160 meters. Traditional modes require far more interaction and effort on the part of the operator; the newer digital modes, not so much. The recent advent of the still-beta "quick" FT8 mode, developed by Steve Franke, K9AN, and Joe Taylor, K1JT — the

FT8: DXing for alle

Nogle siger: Det bedste siden brød i skiver...



FT8: DXing for alle

Andre mener: Slut med Ham Radio som "i de gode gamle dage"



FT8: DXing for alle

- ▶ Hvad er FT8?

- **For teknikeren:**

- En kommunikationsprotokol baseret på
 - Multi-Tone Frequency Shift Keying (MFSK)
 - Bruger 8 toner
 - 5.86 Hz adskillelse
 - Optager 47 Hz båndbredde
 - Sender i $(79 \cdot 1920 / 12000) = 13.48$ sec.

Beskrivelse <https://sourceforge.net/p/wsjt/wsjt/8021/>

- Indeholder 75 bit message + 12 bit CRC, and LDPC FEC*

*Cyclic Redundancy Check og Low Density Parity Check Forward Error Correction

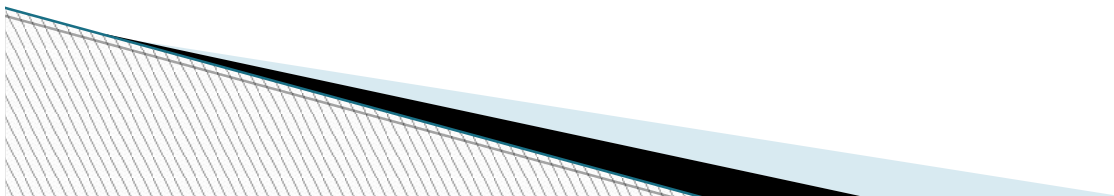
Reference: QST, November 2017, page 34 *Work the World with WSJT-X, Part 2: Codes, Modes, and Cooperative Software Development*

FT8: DXing for alle

- T/R sequence length: 15 s
- Message length: 75 bits + 12-bit CRC
- FEC code: LDPC(174,87)
- Modulation: 8-FSK, keying rate = tone spacing = 5.86 Hz
- Waveform: Continuous phase, constant envelope
- Occupied bandwidth: 47 Hz
- Synchronization: three 7x7 Costas arrays (start, middle, end of Tx)
- Transmission duration: $79 \times 2048 / 12000 = 13.48$ s
- Decoding threshold: -20 dB (perhaps -24 dB with AP decoding, TBD)
- Operational behavior: similar to HF usage of JT9, JT65
- Multi-decoder: finds and decodes all FT8 signals in passband
- Auto-sequencing after manual start of QSO

Comparison with slow modes JT9, JT65, QRA64:* FT8 is a few dB less sensitive but allows completion of QSOs four times faster. Bandwidth is greater than JT9, but about 1/4 of JT65A and less than 1/2 QRA64.

We plan to implement signal subtraction, two-pass decoding, and use of "a priori" (already known) information as it accumulates during a QSO. NB! Er implementeret i Release version.



FT8: DXing for alle

- ▶ Hvad er FT8?
 - **For os andre:**
 - Er multi-platform SW, (Windows, Linux and Mac)
 - Ej “sludrekanal” (rag-chewers ingen adgang)
 - Auto-sequencing (fingrene af tastaturet)
 - Digital mode (a’ la JT65, PSK31, Olivia, Hell... et al)
 - Relativt korte transmissioner i 15 sec. perioder
 - Designet for low signal conditions (døde HF bånd)

Kort sagt – WSJT X/ FT8 er sjovt på den fede måde!

FT8: DXing for alle

- ▶ Hvem har fundet på det?
 - Fra grunden
 - Steve Franke K9AN
 - Joe Taylor K1JT
 - ...vedligeholdes af world-wide team af udviklere
 - FT8 står for “**F**ranke-**T**aylor **8**” MFSK modulation
- ▶ Tidslinie?
 - WSJT-X med FT8 blev først released 29’ Juni, 2017 (beta)
 - Flere beta Release Candidates (RC) de næste par måneder
 - Endelig frigivet den 27’ Oktober, 2017
- ▶ Allerede nu den hyppigst anvendte Digi-mode på HF

FT8: DXing for alle

- ▶ Hvor får jeg fat i det?
 - FT8 (protokollen) er en del af WSJT-X (programmet)
 - WSJT-X v1.8.0 hentes her:
<https://physics.princeton.edu/pulsar/k1jt/wsjt.html>
- ▶ Skal jeg ha' hjælp?
 - Måske. Sikkert...
 - RTFM (Read The Fucking Manual!)
 - Deltag i Yahoo User Group: *wsjtgroup*
 - Se *Youtube* videoer
 - Bare se at komme igang med eksperimenterne...
 - Du vil kvaje dig, det har jeg også gjort!

FT8: DXing for alle

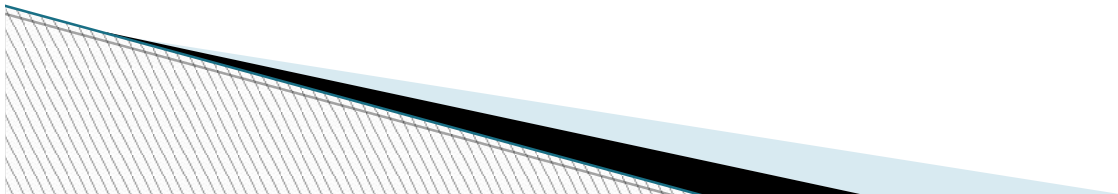
FT8 indgår også i den seneste udgave af MSHV (1.55) sammen med en række andre WSJT og WSJT-X protokoller, og er allerede fuldt anvendelig her.

Download: <http://lz2hv.org/mshv>

- MSK144 For meteor scatter. Message frame duration is 72 ms and with Sh option 20 ms. Character transmission rate for standard messages is as high as 250 cps.
- JTMS For meteor scatter. Character transmission rate 197 cps.
- FSK441 For meteor scatter. Character transmission rate 147 cps.
- FSK315 For meteor scatter. Character transmission rate 105 cps.
- ISCAT Optimized for meteor and ionospheric scatter at 6 meters. Character transmission rate 16.15 or 32.3 cps.
- JT6M Optimized for meteor and ionospheric scatter at 6 meters. Character transmission rate 14.4 cps.
- FT8 Designed for fast tropospheric QSOs.
- JT65 VHF/UHF For EME and troposcatter.
- PI4 PharusIgnis4 A digital modulation (MGM) for beacon purposes.

FT8: DXing for alle

- ▶ Hvad mere behøves der?
 - Transceiver og antenne(r)
 - PC med lydkort/radio med lydkort; SignalinkUSB el. Lignende interface
 - Audio / CAT / PTT interface between PC and rig
 - Time synchronization – vigtigt! Bedre end 1s, f.eks med “Meinberg NTP” (Win)
- ▶ Anbefalet: JTAlert-X companion software (Win)
 - Audio and visual alerts, assists DXCC award hunting
 - Can forward QSOs to your general logging program
 - HRD, Logger32, DXLab, N1MM+... og andre i Windows
 - CQRlog og Fldigi i Linux



FT8: DXing for alle



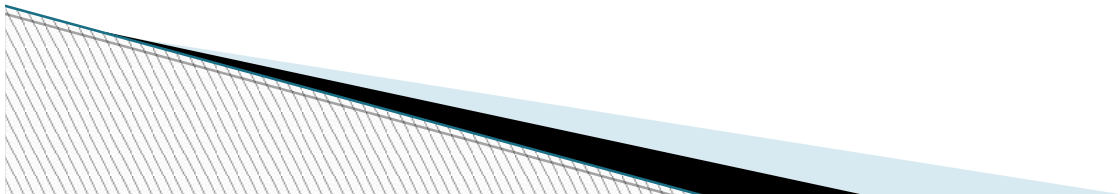
Kan sættes op til at vise hvilke stationer der hører dig!

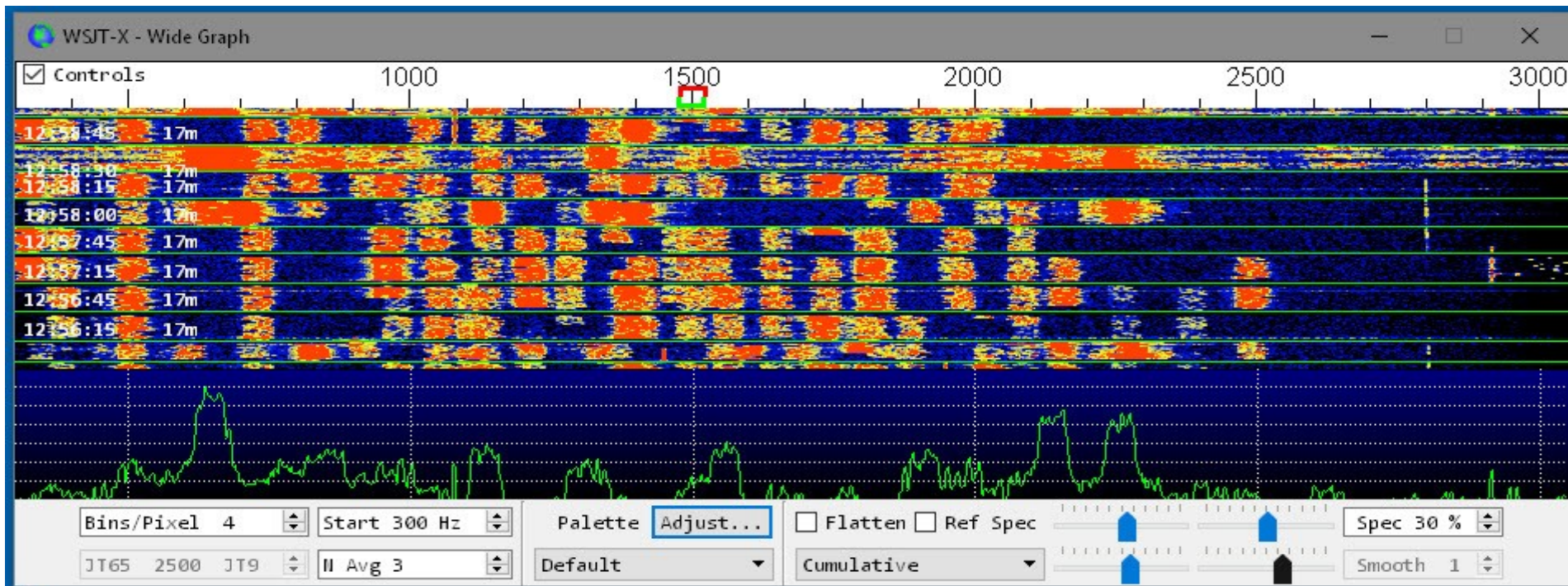
FT8: DXing for alle

Hvor lytter jeg?

- ▶ Valgte frekvenser fra 160 -til- 6m
1.840, 3.573, 5.357, 7.074, 10.136, 14.074,
18.100, 21.074, 24.915, 28.074, 50.313
- ▶ Er der nogen grund til at huske på det?
 - Næ! Bare klik på “Band” knappen for at vælge bånd!

Sååå... hvordan ser det ud?

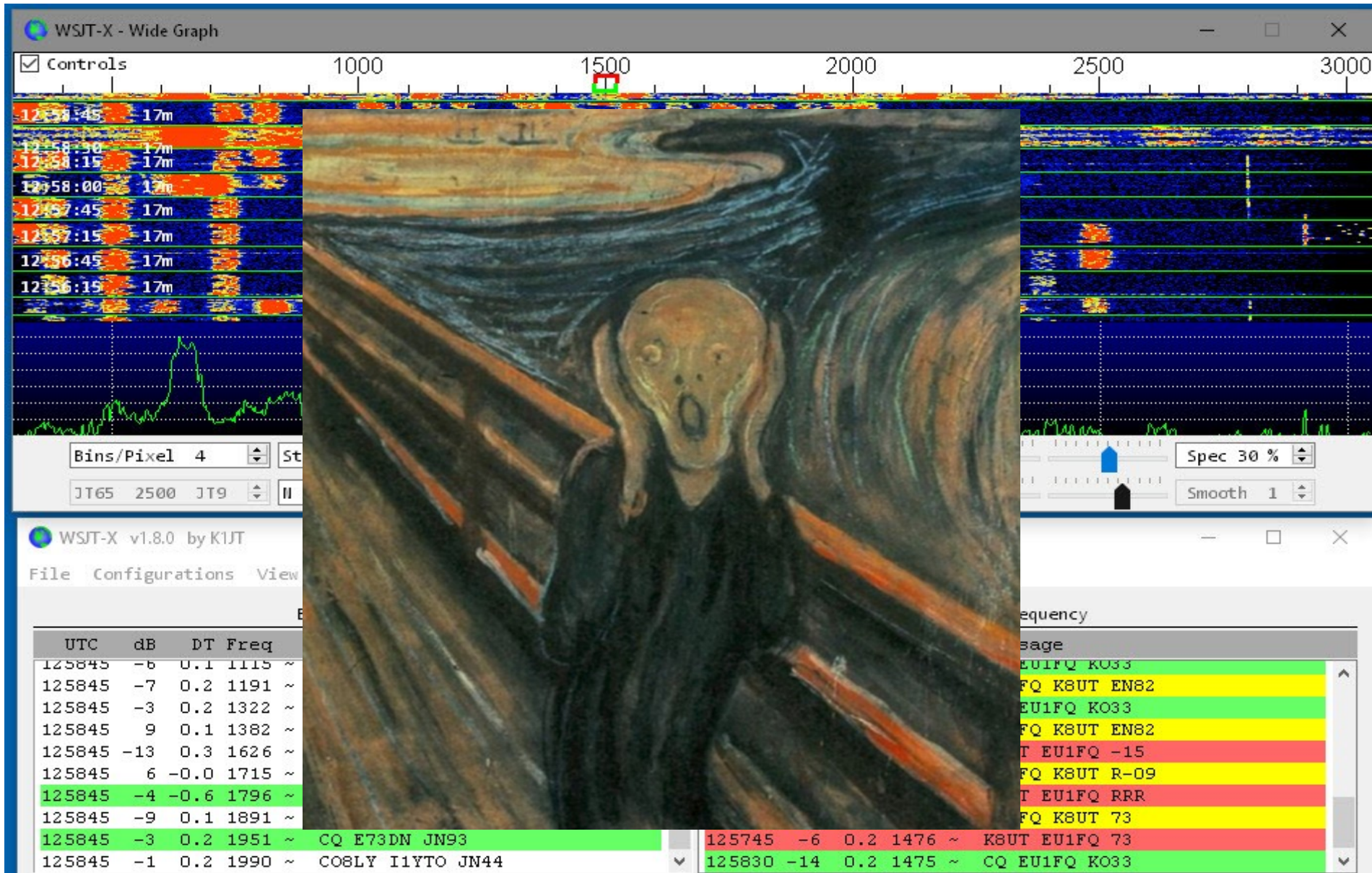




WSJT-X v1.8.0 by K1JT

File Configurations View Mode Decode Save Tools Help

Band Activity					Rx Frequency				
UTC	dB	DT	Freq	Message	UTC	dB	DT	Freq	Message
125845	-6	0.1	1115	~ G6GA K5EK 73	125845	-10	0.2	1477	~ CQ EU1FQ KO33
125845	-7	0.2	1191	~ WB2REM CT1GYD IN51	125608	Tx		1477	~ EU1FQ K8UT EN82
125845	-3	0.2	1322	~ CO8LY ON5SA JN29	125615	-7	0.2	1476	~ CQ EU1FQ KO33
125845	9	0.1	1382	~ R7FC S52D JN76	125630	Tx		1477	~ EU1FQ K8UT EN82
125845	-13	0.3	1626	~ 9Z4A KA1J R-24	125645	-9	0.4	1476	~ K8UT EU1FQ -15
125845	6	-0.0	1715	~ TA1IFV SM6CKU -01	125700	Tx		1477	~ EU1FQ K8UT R-09
125845	-4	-0.6	1796	~ CQ RZ3DZ KO85	125715	-5	0.2	1476	~ K8UT EU1FQ RRR
125845	-9	0.1	1891	~ R6LC VE3PJ -07	125730	Tx		1477	~ EU1FQ K8UT 73
125845	-3	0.2	1951	~ CQ E73DN JN93	125745	-6	0.2	1476	~ K8UT EU1FQ 73
125845	-1	0.2	1990	~ CO8LY I1YTO JN44	125830	-14	0.2	1475	~ CQ EU1FQ KO33





CIRCLE = Transmit (red) and Receive (green) positions

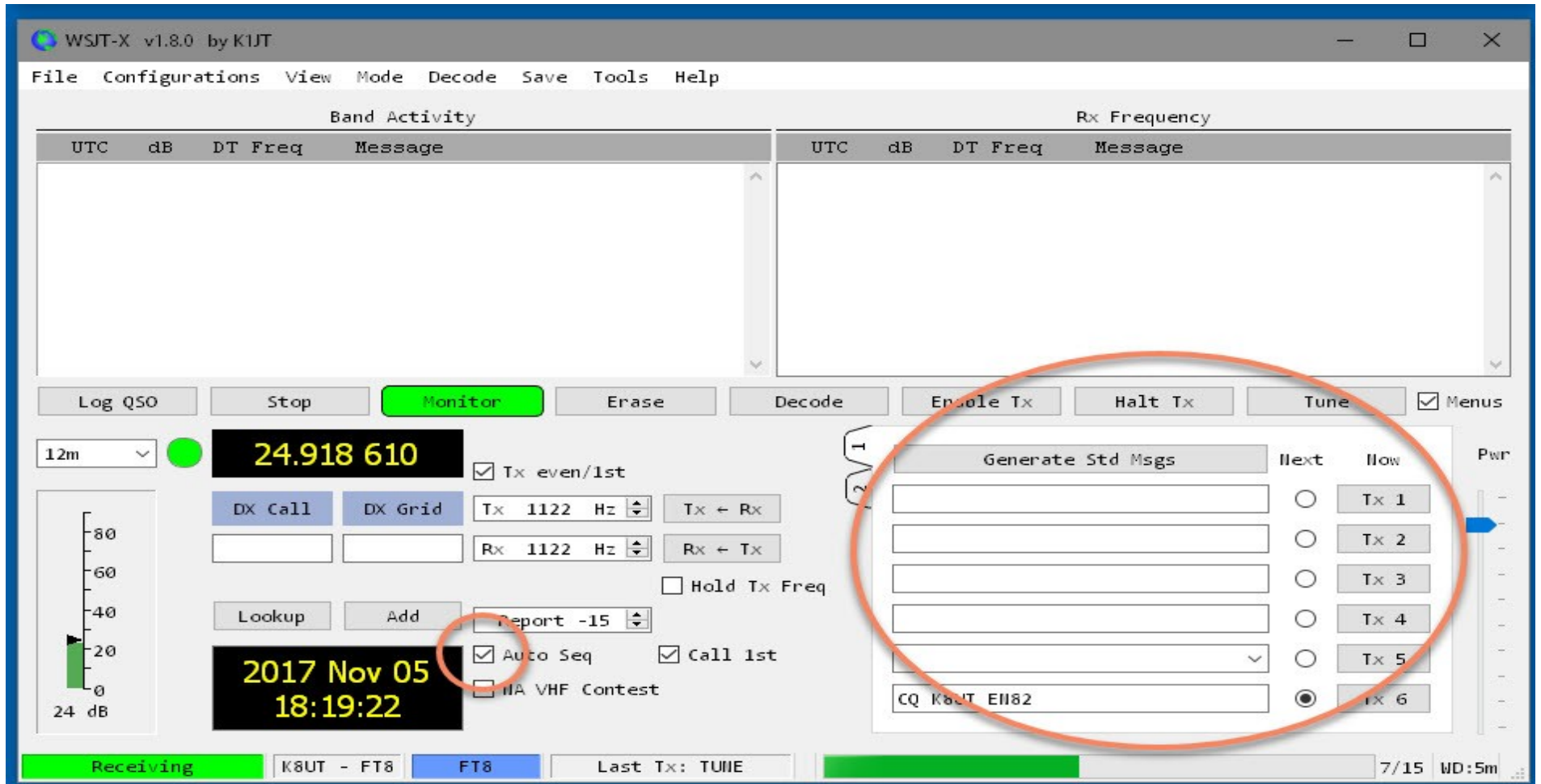
WSJT-X Graphic Display

Drop-Down Menu

The screenshot displays the WSJT-X v1.8.0 software interface. At the top, the title bar reads "WSJT-X v1.8.0 by K1JT". Below it is a menu bar with options: File, Configurations, View, Mode, Decode, Save, Tools, Help. The main interface is divided into several sections:

- Band Activity:** A table with columns UTC, dB, DT Freq, and Message. It contains the text "All decoded signals in audio passband".
- Rx Frequency:** A table with columns UTC, dB, DT Freq, and Message. It contains the text "Only signals on the receive frequency".
- Control Buttons:** A row of buttons including Log QSO, Stop, Monitor (highlighted in green), Erase, Decode, Enable Tx, Halt Tx, Tune, and a checked Menus checkbox.
- Frequency and Mode:** A dropdown menu set to "12m", a green status indicator, and a large display showing "24.918 610".
- TX Settings:** Includes checkboxes for "Tx even/1st", "Hold Tx Freq", "Auto Seq", and "Call 1st". Fields for "Tx 1122 Hz" and "Rx 1122 Hz" are present, along with "Tx + Rx" and "Rx + Tx" buttons.
- Message Panel:** A "Generate Std Msgs" section with a list of message templates (Tx 1 to Tx 6) and a "Pwr" slider on the right. The selected message is "CQ K8UT EN82".
- Bottom Status Bar:** Shows "Receiving" (green), "K8UT - FT8", "FT8" (blue), "Last Tx: TUNE", and "7/15 WD:5m".

WSJT-X Control Display



WSJT-X Auto-Sequence Controls

▶ Auto-Sequence Optioner

- Gennemtving en anden besked
 - Click in the <Now> column
- Eventuelt nyt “shortcut” RR73
- Send et pre-defineret message
 - Fra egen liste
- Send en fri-text message
 - Fra tastatur
 - Max 13 tegn!
Hvor hurtigt kan du skrive?
Du har 15 sekunder!

Generate Std Msgs	Next	Now
K1140K K8UT EI182	<input checked="" type="radio"/>	Tx 1
K1140K K8UT -11	<input type="radio"/>	Tx 2
K1140K K8UT R-11	<input type="radio"/>	Tx 3
K1140K K8UT RRR	<input type="radio"/>	Tx 4
K1140K K8UT 73	<input type="radio"/>	Tx 5
CQ K8UT EI182	<input type="radio"/>	Tx 6

Generate Std Msgs	Next	Now
K1140K K8UT EI182	<input checked="" type="radio"/>	Tx 1
K1140K K8UT -11	<input type="radio"/>	Tx 2
K1140K K8UT R-11	<input type="radio"/>	Tx 3
K1140K K8UT RR73	<input type="radio"/>	Tx 4
HI ED	<input type="radio"/>	Tx 5
CQ K8UT E	<input type="radio"/>	

Enter a free text message (maximum 13 ch or select a predefined macro from the dr Press ENTER to add the current text to t list. The list can be maintained in Sett

WSJT-X Auto-Sequence Detailer

▶ OZ5RZ...



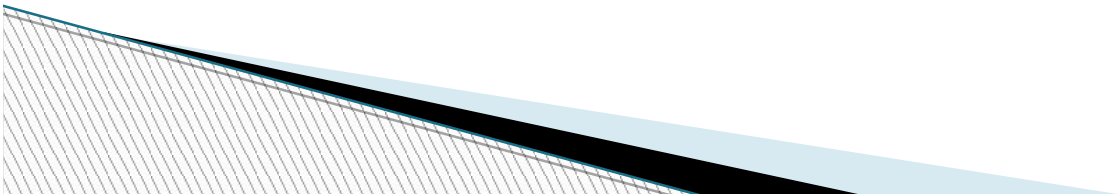
WSJT-X OZ5RZ Video

FT8: Djævlén gemmer sig I detaljen

- ▶ **Time synchronization er Kritisk.** PC uret duer ikke!
 - Tx is 13.48s af de 15 seconds. Tiden skal passe indenfor 1 sec.
 - Du behøver NTP, WWV, GPS, Cellular or ??? lign. løsning
- ▶ Den aldrig afsluttede debat over **Split versus Simplex** operation
 - Det er nødvendigt at mestre begge dele
 - For Run, det giver sig selv når han svarer på CQ (normalt Simplex)
 - For S&P, both. Først kald Simplex, Split hvis QRM eller pile-up
- ▶ Forstå **13 character limit** for free-text messages
 - Men systemet kan nogle gange vise længere messages(??)
- ▶ Vær forberedt på **non-conforming callsigns**: 3XY4D, VX7150
 - De kan ødelægge auto-sequencing, manual operation og free-text
- ▶ **Contest and DXpedition** operation
 - Ikke rigtigt prøvet endnu

FT8: Opsummering

- ▶ Spørgsmål:
Er båndene virkelig helt døde?
- ▶ Svar:
Ikke hvis du kører FT8!



FT8: 12 Meter, lørdag KI 8



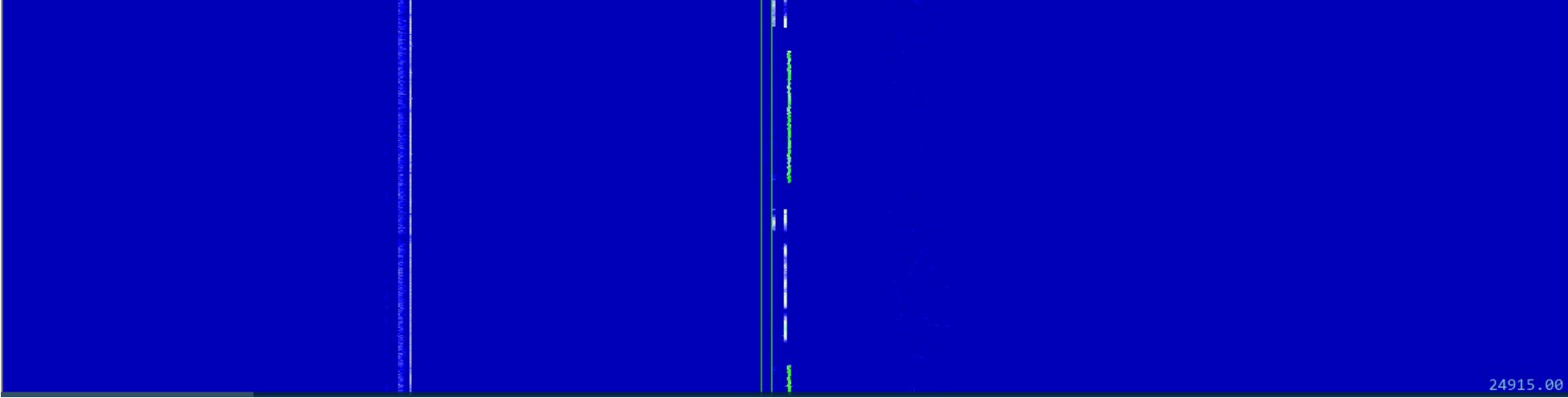
- Avg
- Instant
- Rx Freq
- Spots
- Signals

- Show These Spots at Top
- Non-Dupes
 - Dupes
 - Only spots you can hear

- Show Red Signal Markers at the Base of Traces
- Non-Dupes
 - Dupes
 - Only Unknown Signals

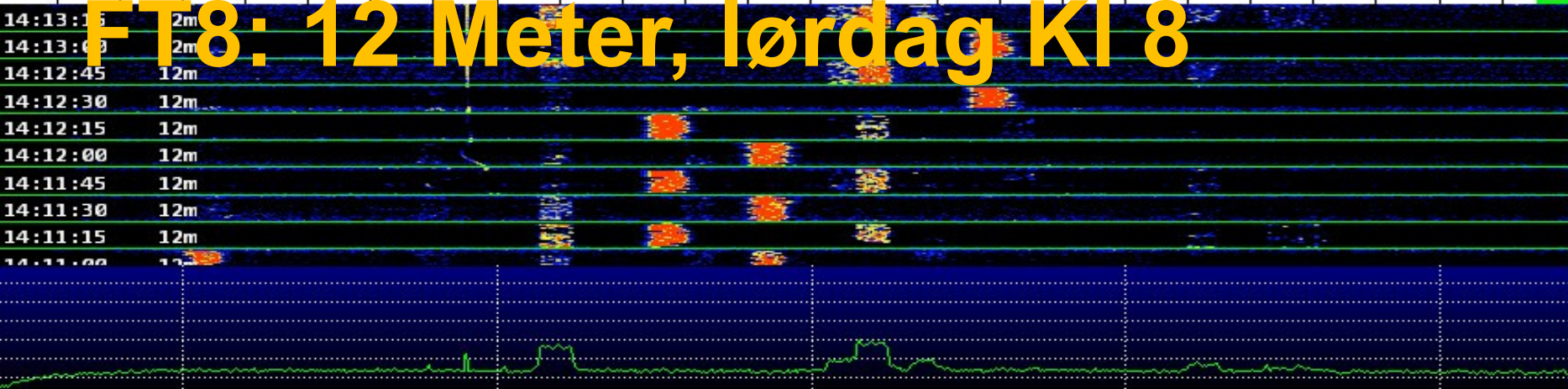
- Self Spot Signals Above Threshold
- Column

Contrast Static



Controls 500 1000 1500 2000 2500

FT8: 12 Meter, lørdag KI 8



Bins/Pixel 4 Start 200 Hz Palette Adjust... Flatten Ref Spec Spec 30 %
 JT65 2500 JT9 Avg 3 Default Cumulative Smooth 1

File Configurations View Mode Decode Save Tools Help

Band Activity

UTC	dB	DT	Freq	Message
141245	-10	-0.2	1530	~ CQ EA511E IM99
141245	5	0.1	1577	~ SV2HZT ZS6UB -14
141245	-17	0.1	2102	~ PA3FMP ZS6WB RRR
141300	-12	0.6	528	~ CQ PA3AIN JO32
141300	-14	0.1	1072	~ CQ 3B8GF LG89
141300	13	0.2	1765	~ 4Z4DX W1VT FN31
141315	-2	0.2	1073	~ 3B8GF EC7AT IM86
141315	2	0.1	1577	~ SV2HZT ZS6UB RR73
141315	-15	0.1	2102	~ PA3FMP ZS6WB 73

Rx Frequency

UTC	dB	DT	Freq	Message

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

FT8: 17 Meter, Mandag KI 8



> 9.0
3
88 Hz

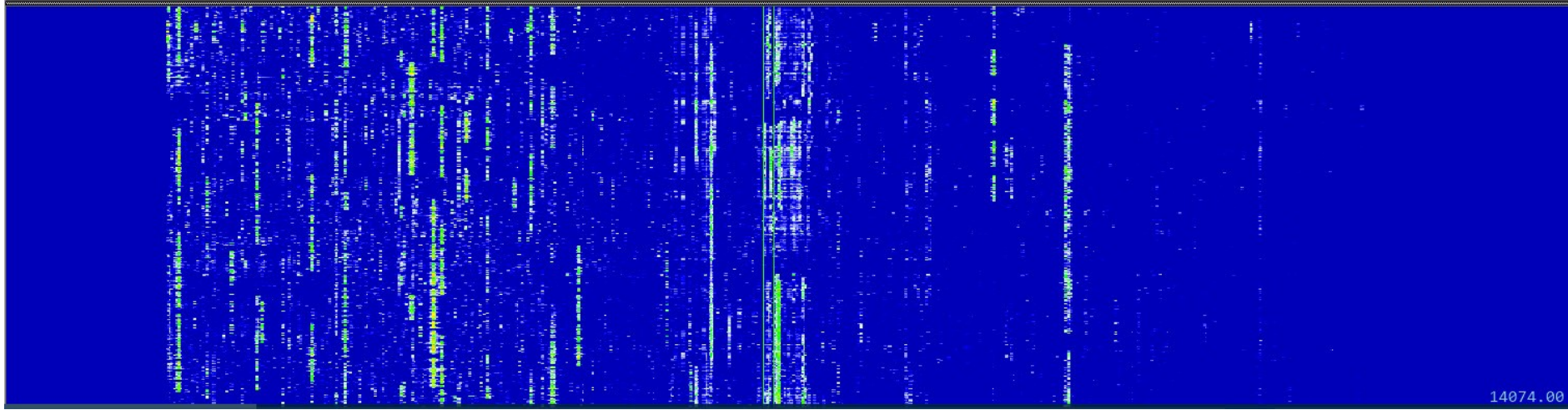
Static [Slider]

Contrast [Slider]

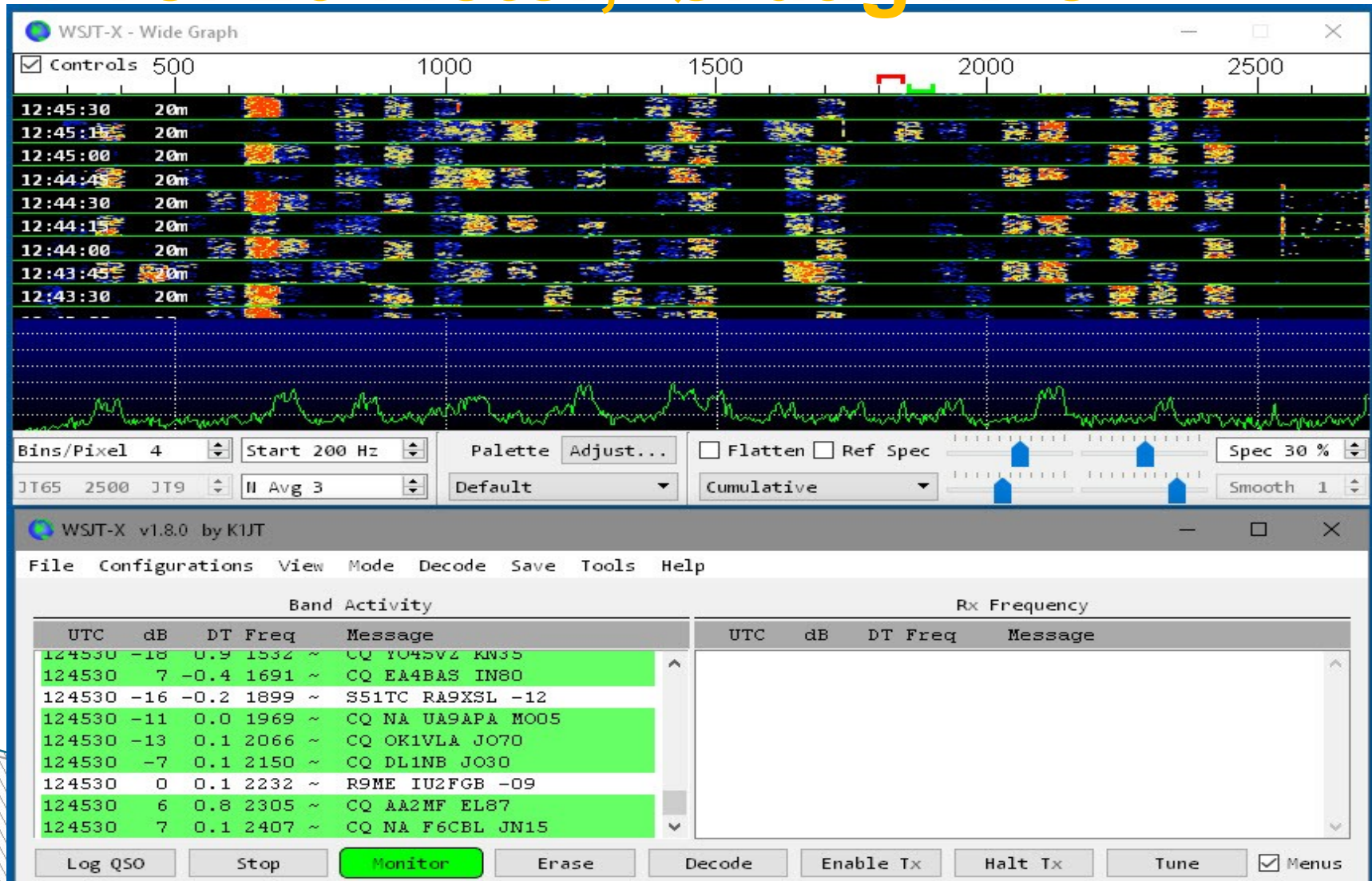
FT8: 17 Meter, Mandag KI 8



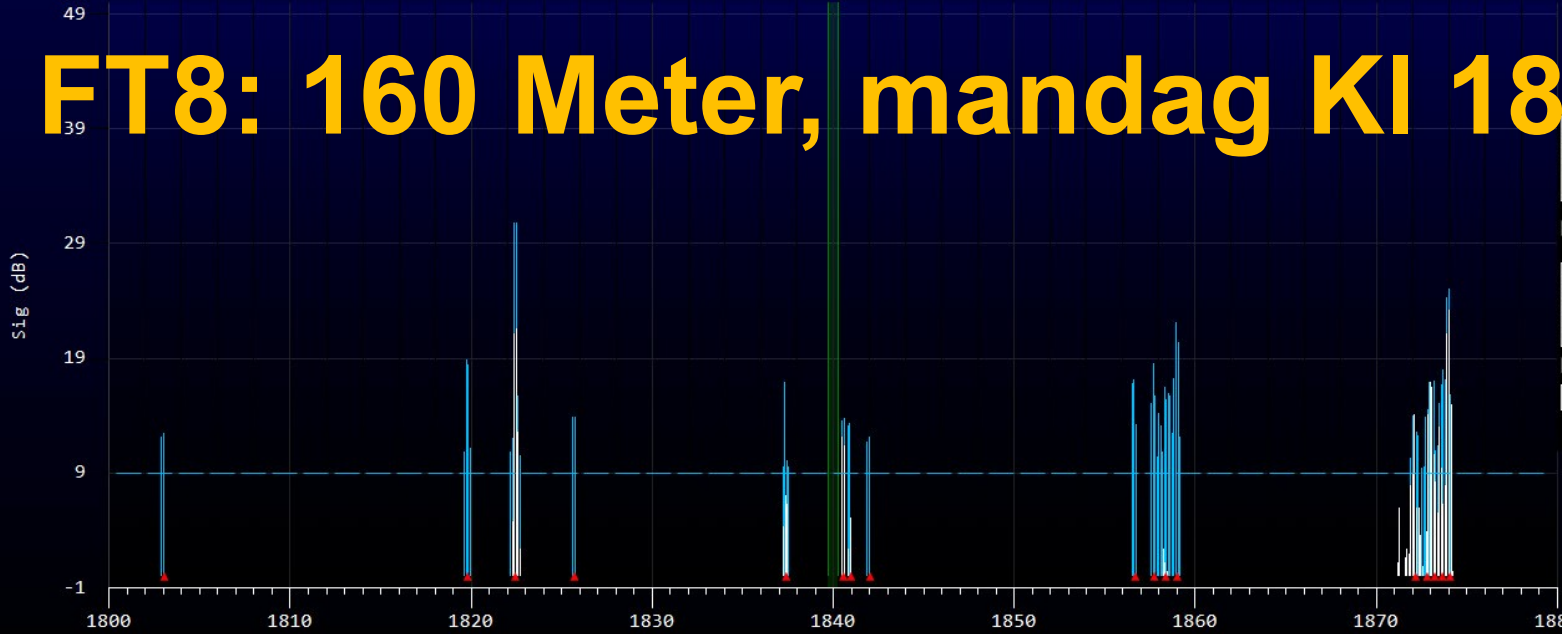
FT8: 20 Meter, lørdag KI 8



FT8: 20 Meter, lørdag KI 8



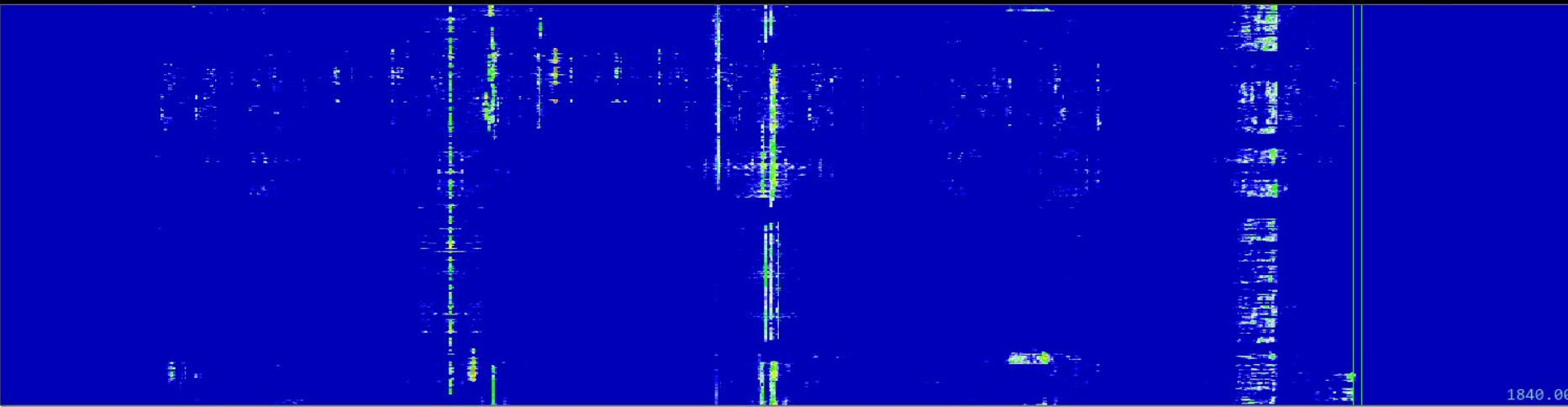
FT8: 160 Meter, mandag KI 18



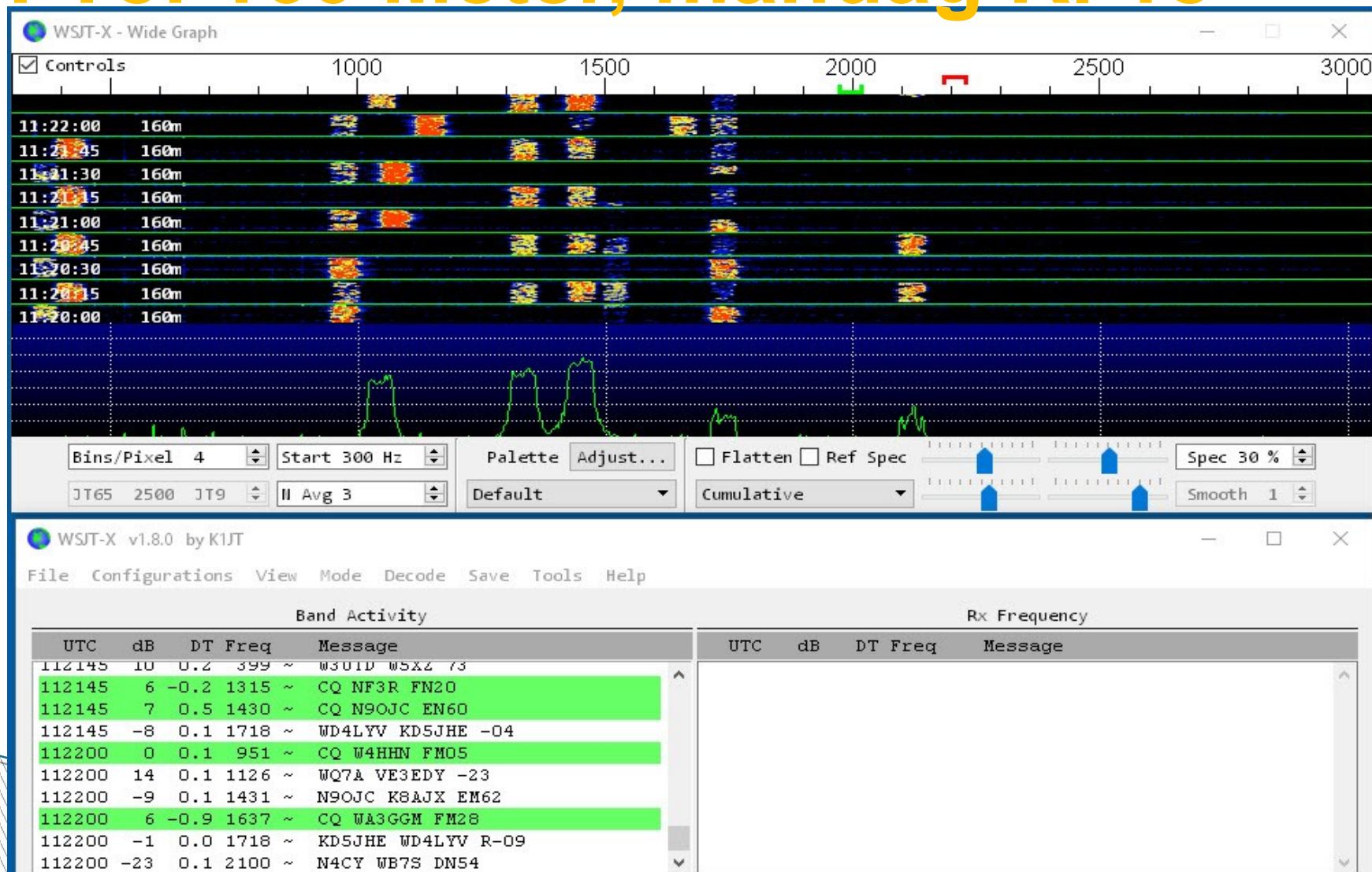
> 9.0
17
105 Hz

- Avg
 - Instant
 - Rx Freq
 - Spots
 - Signals
- Show These Spots at Top
- Non-Dupes
 - Dupes
 - Only spots you can hear
- Show Red Signal Markers at the Base of Traces
- Non-Dupes
 - Dupes
 - Only Unknown Signals
- Self Spot Signals Above Threshold
- Column ▾

Contrast Static



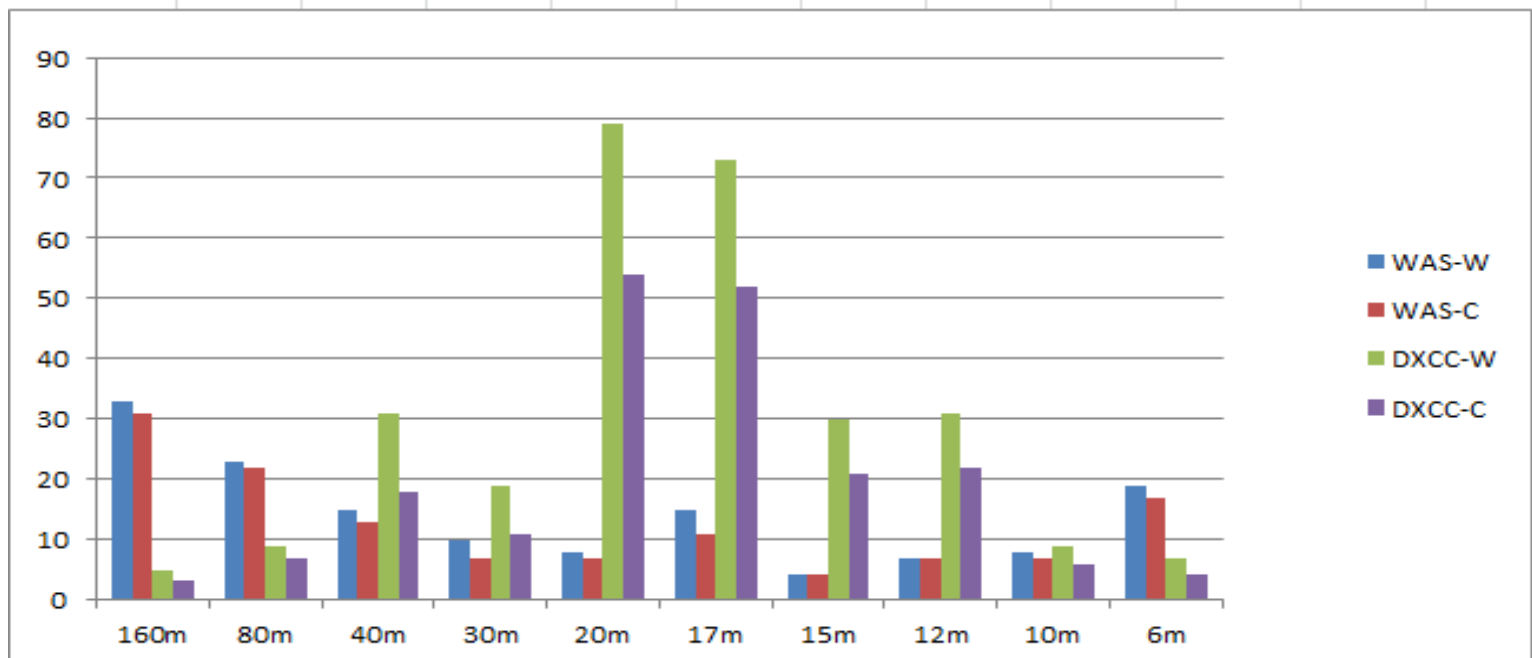
FT8: 160 Meter, mandag KI 18



K8UT FT8 Totals: July to October, 2017

W=Worked, C=Confirmed

BAND	160m	80m	40m	30m	20m	17m	15m	12m	10m	6m	Total
WAS-W	33	23	15	10	8	15	4	7	8	19	50
WAS-C	31	22	13	7	7	11	4	7	7	17	50
DXCC-W	5	9	31	19	79	73	30	31	9	7	137
DXCC-C	3	7	18	11	54	52	21	22	6	4	103



K8UT's 3 Måneders Resultater

Total = 780 FT8 QSOs

FT8: DXing for alle

2195 QSO'er siden 29' juni 2017 FT8, 25-50W, Random wire antenne

	1.8	3.5	7	10.1	14	18	21	24	28	50	144	430	Total
DXCC Count	39	41	49	55	55	60	55	23	42	35	0	0	454
DXCC CFM	34	37	42	52	49	55	42	19	37	30	0	0	397
DXCC PHONE	0	0	0	0	0	0	0	0	0	0	0	0	0
DXCC CFM PHONE	0	0	0	0	0	0	0	0	0	0	0	0	0
DXCC CW	0	0	0	0	0	0	0	0	0	0	0	0	0
DXCCCFM CW	0	0	0	0	0	0	0	0	0	0	0	0	0
DXCC DIGI	39	41	49	55	55	60	55	23	42	35	0	0	454
DXCC CFM DIGI	34	37	42	52	49	55	42	19	37	30	0	0	397

OZ1PIF's 4 Måneders Resultat

Total = 2195 FT8 QSOs

397 bånd/lande bekræftede (LoTW)

20m en onsdag
morgen, masser
af DX:

- ✓ Falklands
øerne
- ✓ Japan
- ✓ Indonesien
- ✓

WSJT-X - Wide Graph

09:13:15 20m
09:13:00 20m
09:12:45 20m
09:12:30 20m

WSJT-X v1.8.0 by K1JT

091300	0	0.1	707	~	CQ DX EA/RG IAB/	~Spain
091300	-23	0.3	841	~	DH1MJ RA90J	-18
091300	-8	0.6	1034	~	BG4NNI Y07CFD	KN14
091300	7	0.1	1095	~	CQ IZ6BXV JN72	~Italy
091300	-24	0.2	1276	~	F5PZ JA4LKB	73
091300	-19	0.9	1618	~	IZ5WSR UV5IO	KN87
091300	3	-0.8	1680	~	CQ FHFP JN28	France
091300	-3	0.0	1765	~	CT1EEQ UA9CK	M009
091300	-12	1.7	2110	~	GM7VFR R4CA	L011
----- 20m -----						
091315	3	0.1	1203	~	JF1FAO F5ADE	RRR
091315	-16	0.0	1091	~	CQ VP8LP GD18	!Falkland Is.
091315	-1	0.1	1353	~	CQ UA3DNK K085	~EU Russia
091315	-5	-0.4	1598	~	YE8XBN CT1EEQ	IM58
091315	8	-0.2	1847	~	RA90L IZ1MKE	73
091315	2	0.1	1903	~	GD0TEP IW0RBS	JN63
091315	-5	0.1	1959	~	DL1A0Q RQ7R	-15
091315	-20	0.5	2271	~	CQ UR5LP KN89	~Ukraine
091315	6	0.1	2370	~	PSE DX NO	EU
091315	-2	-0.3	1202	~	DH1MJ SV1CIF	-07
090845	4	0.1	1204	~	CQ F5ADE JN06	
090900	-24	0.2	1203	~	F5ADE JH1SLW	PM96
090915	7	0.1	1204	~	JH1SLW F5ADE	-15
090930	-24	0.2	1203	~	F5ADE JH1SLW	R-01
090945	15	0.1	1203	~	JH1SLW F5ADE	RRR
091000	-22	0.2	1202	~	F5ADE JH1SLW	73
091015	16	0.1	1203	~	JH1SLW F5ADE	73
091045	14	0.1	1203	~	CQ F5ADE JN06	
091115	6	0.1	1203	~	JF1FAO F5ADE	-12
091145	1	0.1	1203	~	JF1FAO F5ADE	RRR
091215	2	0.1	1203	~	JF1FAO F5ADE	RRR
091215	-3	-0.2	1202	~	CQ DX SV1CIF	KM17
091245	-1	0.1	1203	~	JF1FAO F5ADE	RRR
091300	-15	0.8	1198	~	CQ F4FZR JN25	
091315	3	0.1	1203	~	JF1FAO F5ADE	RRR
091315	-2	-0.3	1202	~	DH1MJ SV1CIF	-07

Log_QSO Stop Monitor Erase Decode Enable Tx Halt Tx Tune Menus

20m 14,074 000 Tx even/1st

DX Call SV5DKL DX Grid KM46 Tx 1203 Hz Rx 1203 Hz

Az: 142 2477 km Hold Tx Freq

Lookup Add Report -15 Auto Seq Call 1st NA VHF Contest

2017 nov. 15 09:13:31

Generate Std Msgs Next Now Pwr

SV5DKL OZ1PIF J065 Tx 1

SV5DKL OZ1PIF -15 Tx 2

SV5DKL OZ1PIF R-15 Tx 3

SV5DKL OZ1PIF RRR Tx 4

SV5DKL OZ1PIF 73 Tx 5

CQ OZ1PIF J065 Tx 6

Receiving FT8 Last Tx: TUNE 1/15 WD:12m



FT8: DXing for alle

Mange Tak!

Peter Frenning, OZ1PIF og Larry Gauthier, K8UT