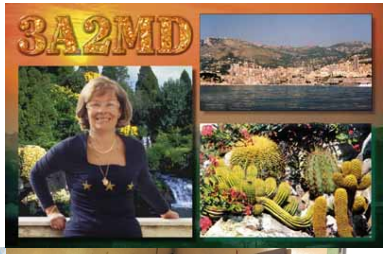
DXing with Digital Modes

Davis County Amateur Radio Club
May 11, 2019

John Mitton (KK7L)

Why Chase DX

- Make life-long friends in far away places



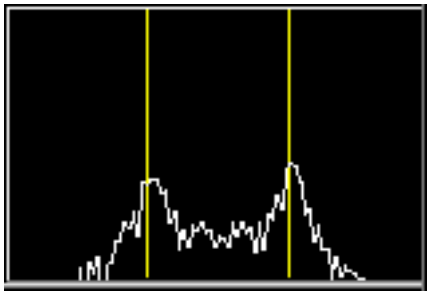
- Earn awards
  - DXCC – DX Century Club
  - WAC – Worked all Continents
  - WAZ – Worked all Zones

- Hone skills in station/antenna design, operating practices
- Challenge of contacting & confirming rare locations
- *2019 is bottom of solar cycle minimum*
  Weak signal digital modes to the rescue!

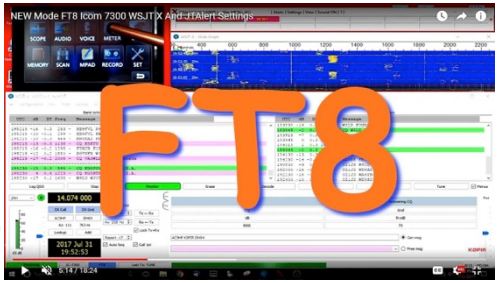
DX & Digital Modes

- CW: the original weak signal digital mode!
  - Occupies only 150 Hz
  - Very fast QSOs = more stations work the DX
  - Remains a mainstay DX & contesting mode

- RTTY: the original keyboard digital mode
  - DXpeditions continue to offer this mode
  - Fast QSO rates, sometimes inaccurate decoding



- FT-8
  - By far the most popular HF digital mode today
  - Slow QSO rates: up to 60 seconds each
    - New Fox/Hound DXpedition mode speeds this up



- EME (moon bounce) modes, satellites on VHF

Technician Class? Get Your Feet Wet!

- CW & digital modes allowed on 10 meters (200 watts)
- Frequent daytime cross-equatorial band openings:
  - Central America & Caribbean
  - South America

10 Meters

Novice and Technician classes:

28.000-28.300 MHz: CW, RTTY/Data--Maximum power 200 watts PEP
28.300-28.500 MHz: CW, Phone--Maximum power 200 watts PEP

- Learn CW ☺
  - CW segments on most bands (200 watts)
  - DXpeditions often “listen up” into this allocation
  - Free CW training: online, on-air, & the Utah DX Association
    - Join the fun @ 3.555 mHz Tuesday nights @ 8:00pm Mountain

But Isn't This Required for DXing?

My Antenna: 24’ Flagpole Vertical

Zero to DXCC (100 entities confirmed) in just 152 days
Accomplished it “barefoot” (100 watts), mostly CW & digital

CLUBLOG	Worked	Confirmed	Log Search
KK7L	244	235	Go

N7VZ Indoor (G5RV-Jr) Antenna

Here's what I've managed to accomplish on DXCC and WAS with 100W and a Wire:

DXCC Award	New LoTW QSLs	LoTW QSLs in Process	DXCC Credits Awarded	Total (All)	Total (Current)
Mixed *	19	0	163	182	182
CW	65	0	0	65	65
Phone *	12	0	155	167	167
Digital	17	0	57	74	74
80M	0	0	3	3	3
40M	10	0	19	29	29
30M	5	0	10	15	15
20M	36	0	68	104	104
17M	30	0	42	72	72
15M	15	0	96	111	111
12M	2	0	68	70	70
10M *	3	0	105	108	108
6M	0	0	4	4	4
Challenge	101	0	415	---	516

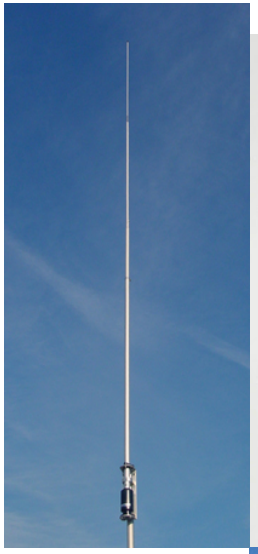
WAS Award	New LoTW QSLs	LoTW QSLs in Process	WAS Credits Awarded	Total
Mixed *	0	0	50	50
80M	41	0	0	41
40M *	0	0	50	50
30M *	0	0	50	50
20M *	0	0	50	50
17M	49	0	0	49
15M	47	0	0	47
12M	44	0	0	44
10M	47	0	0	47
6M	24	0	0	24
CW	41	0	0	41
Phone *	0	0	50	50
Digital *	0	0	50	50

Antenna Considerations

- The most important component!
- From simple wire diploes on up
- Bigger with gain and higher is (usually) better
- Small and low can be very effective however
- Resonant SWR provides greatest efficiency
- External tuner generally required for > 3:1 SWR
- Digital modes have changed the game for “little pistols”

Stealth Antennas

- Many HOA-friendly multi-band resonant options:
  - End-fed
  - Off-center-fed (OCF)
  - Dipole
  - Vertical
  - Loop



- Directional is ideal:
  - Low-profile SteppIR “Urban Beam”
  - Other stealthy directional antennas
    - Wire dipole arrays

Transceivers & Digital Devices

- Any HF rig with “data” or “ACC” socket will do
- PC soundcard interface:
  - Keys rig (PTT)
  - Modulates TX & RX
  - Sets delay (if needed)
  - Sets TX & RX levels
- Rigs with internal sound cards are ideal:
  - Most all newer rigs have this
  - USB cable all that is needed

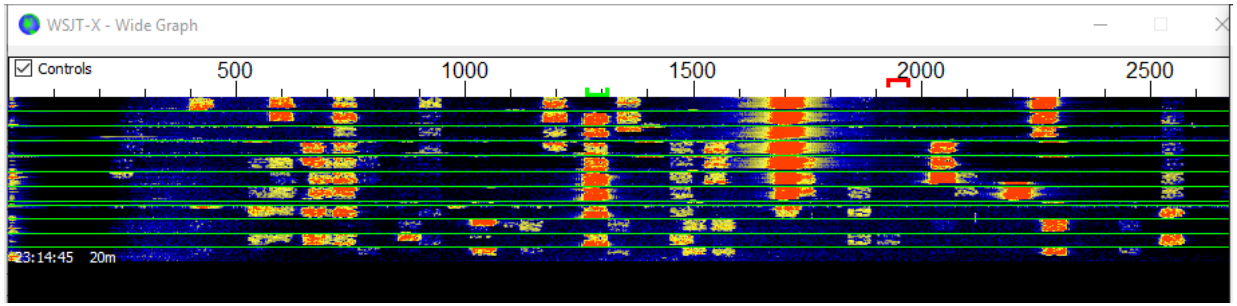
ACC(1)	PIN	PIN NAME	DESCRIPTION	SPECIFICATIONS
 Rear panel view	1	CWK	CW and FSK keying input.	Input level: Less than 0.6 V for transmit.
	2	GND	Connects to ground.	Connected in parallel with ACC(2) pin 2.
	3	SEND	Input/output pin. Goes to ground when transmitting. When grounded, transmits.	Ground level: –0.5 to 0.8 V Input current: Less than 20 mA Connected in parallel with ACC(2) pin 3.
	4	MOD	Modulator input. Usable when pin 3 is grounded.	Input impedance: 10 kΩ Input level: Approx. 100 mV rms
	5	AF	AF detector output. Fixed, regardless of the [AF] position.	Output impedance: 4.7 kΩ Output level: 100–300 mV rms
	6	SCAN	Starts scan when grounded.	Scan operation: Less than 0.6 V
	7	13.6 V	13.6 V output when power is ON.	Output current: Max. 1 A Connected in parallel with ACC(2) pin 7.
	8	ALC	ALC voltage input.	Control voltage: –3 to 0 V Input impedance: More than 10 kΩ Connected in parallel with ACC(2) pin 5.

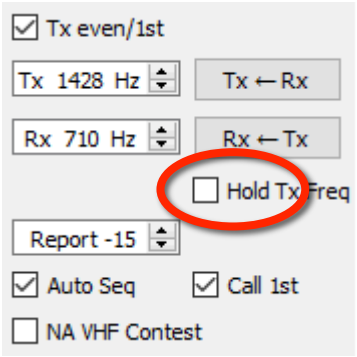
Software

- WSJT-X (free – Windows, Mac, Linux)
  - Foundational: K1JT's team develops this open source code set
  - Provides in addition to popular FT-8 mode:
    - WSPR – weak signal propagation reporting
    - Modes for EME (moonbounce), meteor scatter
- JT-Alert (free, donations accepted)
  - Alerts you to missing DXCC, states, grids when stations are on air
- JTDX (free)
  - Derivative of WSJT-X. Intuitive and very popular with DXers
- Ham Radio Deluxe ($100)
  - Integrated software for logging, rig control, digital modes, satellites
- Hamalert (app for iOS, Android)
  - Auto alerts when needed stations are heard on air: DX, States, SOTA
- FIdigi (free)
  - Multi-mode program for RTTY, PSK and other traditional modes

Common Setup Mistakes

- PC's "speaker" & "mic" confusion with rig's TX & RX ports
- Windows / Mac system sounds going out on TX
- Inaccurate computer clock (check time.is & use Meinberg NTP app)
- Over-modulation





- Failure to check the "Hold TX Freq" box
  (best not to TX on your contact's same freq.)
- RF in the shack: shield & ferrite everything!

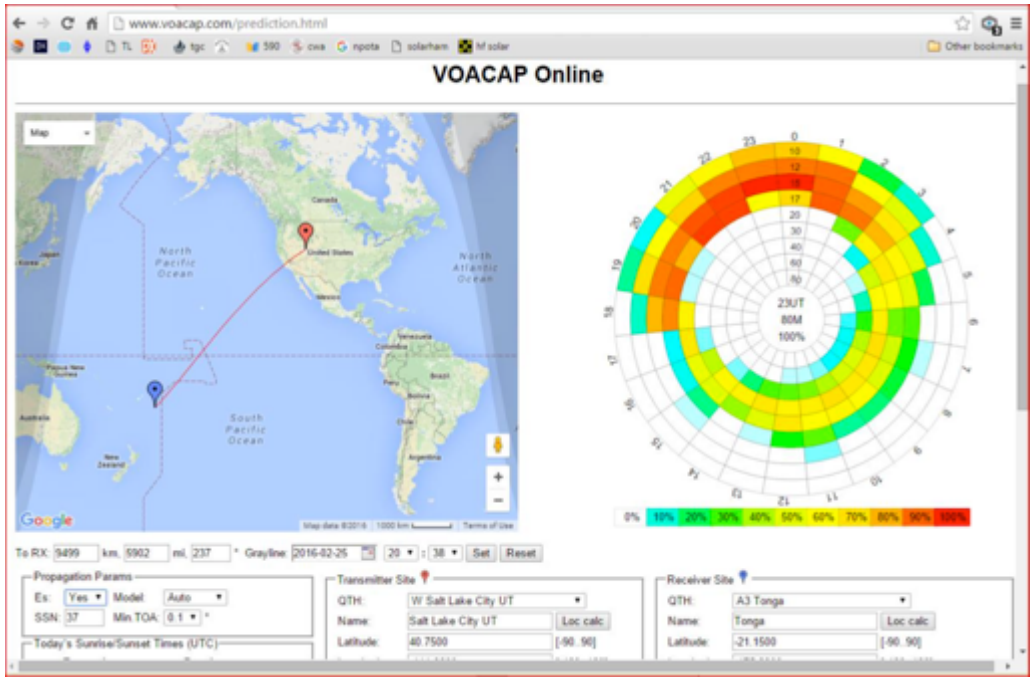
WSJT-X Software

On-screen demonstration – WSPR & FT8 modes

Online Tools: Propagation

- Know when propagation favors your location to the DX (especially during DXpeditions)
- Many free and low-cost prediction tools are available
  - www.voacap.com
  - www.solarham.net
  - www.k6tu.net

Become familiar with your "Grey Line" opportunities!



Online Tools: DX Spotting Clusters

- The most satisfying contacts are those you make by simply turning the VFO & listening, or by calling CQ.
- Otherwise, many online tools are available to spot the DX
  - My favorites are dxheat.com and Hamalert.org [with app]
    - provides filters by mode, band, continent of both spotter & spotted

DX de	Freq	DX	Comments	UTC
KG8V	14 256,7	YV5NI	correct call	20:52
K3LUE	21 074,0	PY6MY	FT8	20:51
K3LUE	21 074,0	PY6MY	RTTY	20:51
W3LPL	7 018,8	FY5KE	Heard in VA	20:48
N4CFC	14 074,0	CU7AA		20:48
K5FNQ	24 915,0	E51BQ	FT8 workable from S. Louisiana	20:47
KI5AXG	14 256,7	V5ENI	Thanks 4 qso	20:47
VA2RF	3 763,0	ON4MCL	CQtest good signal here	20:46
N6ED	24 915,0	E51BQ	ft8 tnx	20:46
WK1W	14 175,0	LX2JJ	59+20 Mane USA great audio	20:45

Many logging software packages incorporate the spotting clusters

Don't completely rely on spots! Call signs can be inaccurate

Spotting yourself is bad etiquette

Online Tools: QRZ.com

- Largest online database of worldwide ham calls
- Create your own page for contacts to learn about you

KK7L USA

JOHN P MITTON
1498 COTTONWOOD LN
SARATOGA SPRINGS, UT 84045
USA

QSL: LoTW, Direct, or BURO

Email: Use mouse to view..

Ham Member **Lookups: 3511** Label

Biography | Detail | Logbook

I was first licensed at age 14 as WN7DPU then WB7DPU. Got the call sign KK7L at age 17 when the first 2x1 calls were being issued to Extra Class licenses. Today I mostly work CW on the HF bands running an Icom IC-7300 with KPA 500 amp to the flagpole vertical pictured above. Living next to Utah Lake helps with propagation to the north, east, and south. There are mountains directly behind me to the west. I currently serve as President of the Utah DX Association.
www.udxa.org

The island nation of Tuvalu (T2) is one of my favorite places to visit. Jared, N7SMI and I were there in 2016 assisting the people in developing amateur radio training, licensing, and helping with dontated gear to get to the island residents. Please read up about it in the January 2017 issue of QST and also at www.T2Radio.com then let me know if you would like to help. We are in need of used HF transceivers and waterproof cases.

I also speak and read Japanese quite fluently. 日本語 QSO もぜひ、お待ちしております！

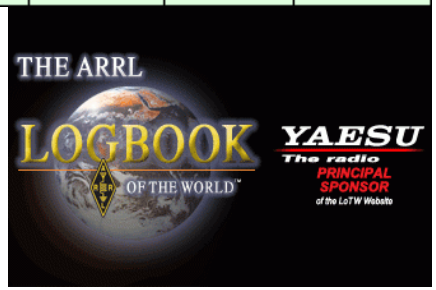
Thanks for looking me up & 73,
John

CLUBLOG	Worked	Confirmed	Log Search
KK7L	240	230	Go

Online Tools: ARRL Logbook of the World

- Electronic QSL system
- Saves QSL print & mailing costs
- 15 year history
- Matches logs of 112,000 users
- Over 1 billion QSO records
- Free for ARRL members & DX
- Simplifies award submissions
  - DXCC
  - Worked all states
  - Worked all zones

DXCC Award	New LoTW QSLs	LoTW QSLs in Process	DXCC Credits Awarded	Total (All)	Total (Current)
Mixed *	11	0	214	225	225
CW *	10	0	198	208	208
Phone	2	0	48	50	50
Digital	4	0	22	26	26
160M	0	0	5	5	5
80M	1	0	18	19	19
40M	9	0	62	71	71
30M	9	0	70	79	79
20M	7	0	81	88	88
17M	3	0	46	49	49
15M	1	0	62	63	63
12M	2	0	14	16	16
10M	0	0	13	13	13
Challenge	32	0	371	---	403



Online Tools: Clublog.org

- Wonderful free online toolkit by G7VJR for DXers
- Organizes your logs, tracking:
  - DXCC & Zones left to work
  - QSLs you need to confirm
- Searchable logs

CLUBLOG	Worked	Confirmed	Log Search
KK7L	213	209	Go

DX Call	Date	Band	Mode	Entity
RM2D	2017-06-11	20M	CW	EUROPEAN RUSSIA
SP3A	2017-06-11	20M	CW	POLAND
RA3DOL	2017-06-11	20M	CW	EUROPEAN RUSSIA
EW7LO	2017-06-11	20M	CW	BELARUS
JA1CG	2017-05-04	20M	Phone	JAPAN
LZ2RS	2017-05-04	20M	CW	BULGARIA
KH6/KU1CW	2017-05-04	20M	CW	HAWAII
ZP6CW	2017-05-03	30M	CW	PARAGUAY
RI1ANC	2017-05-02	30M	CW	ANTARCTICA
ZL2MYT	2017-05-02	20M	CW	NEW ZEALAND

Entity	ADIF	Pfx	160	80	40	30	20	17	15	12	10
DJIBOUTI	382	J2	○	○	○	○	C	○	W	○	○
DODECANESE	45	SV5	○	○	○	C	C	C	○	○	○
DOMINICA	95	J7	○	C	W	C	C	W	C	○	W
DOMINICAN REPUBLIC	72	HI	○	C	C	C	C	W	C	W	C
DPRK (NORTH KOREA)	344	P5	○	○	○	○	○	○	○	○	○
DUCIE ISLAND	513	VP6/D	○	○	○	○	○	○	○	○	○
EAST MALAYSIA	46	9M6	○	○	C	○	C	○	C	○	C
EASTER ISLAND	47	CE0Y	○	○	C	C	C	C	C	C	○
EASTERN KIRIBATI	48	T32	○	W	○	○	C	C	C	C	C
ECUADOR	120	HC	○	C	C	W	W	C	C	C	W
EGYPT	478	SU	○	○	○	○	C	○	W	W	W
EL SALVADOR	74	YS	○	W	W	W	C	C	C	○	W
ENGLAND	223	G	○	W	W	○	C	C	C	C	C
EQUATORIAL GUINEA	49	3C	○	○	○	○	○	○	○	○	○
ERITREA	51	E3	○	○	○	○	C	○	C	○	○
ESTONIA	52	ES	○	○	C	C	C	W	C	○	C
ETHIOPIA	53	ET	○	○	○	○	○	○	○	○	○
EUROPEAN RUSSIA	54	UA	○	W	C	C	C	C	C	C	C
FALKLAND ISLANDS	141	VP8	○	W	○	○	C	W	W	W	W

The Art of QSLing

- Logbook of The World
- OQRS
  - Online QSL Request Service
    - Clublog & Paypal
- Paper QSLs
  - Nested SASE envelopes
  - Foreign postage services
  - International Reply Coupons
  - ARRL bureau service

Resources

- Utah DX Association
  - www.UDXA.org
  - Meets 3rd Wednesdays in Murray from 7:00 pm SelectHealth Building just west of 5300 S freeway exit

- The *New DX'ers Handbook* by Utah's very own K7UA
  http://www.K7UA.com
  http://tinyurl.com/dxhandbook

- FT8 Operating Guide by ZL2IFB
  http://www.g4ifb.com/FT8_Hinson_tips_for_HF_DXers.pdf