

Station Automation

--W3SZ

The screenshot displays a comprehensive radio station automation interface. The top section features several signal monitoring windows with waterfall plots and frequency meters, showing active signals at 50280.000, 144140.000, and 144200.000. A central window displays a call log with columns for date, call sign, frequency, mode, and name. Below this, a system status window shows various operational parameters and a digital display for 1:08:20 PM. The bottom left corner includes a taskbar with icons for various applications, and the bottom right corner shows a Windows taskbar with the date 2017 Feb 24 and time 18:08:20.

YYYY-MM-DD HH:MM	Call	Freq	Mode	Snt	Rcv	Pfx	Name	Comment
2017-01-22 06:52	WSZN	50276.50	MSK144	59	59	K	David	
2017-01-22 07:03	KESRV	50288.50	MSK144	59	59	K	Marshall	
2017-01-22 07:21	K5QE	50266.50	MSK144	59	59	K	Jim	
2017-01-22 08:29	K0RA	50286.50	MSK144	59	59	K	Larry	
2017-01-22 08:19	W0TPP	50281.50	MSK144	59	59	K	Larry	
2017-01-22 08:50	VA3ELE	144173.50	J765	59	59	VE	Peter	
2017-01-22 09:27	VA3ELE	129607...	J765	+00	59	VE	Peter	
2017-01-22 09:57	VA3ELE	432071.50	J765	+00	59	VE	Peter	
2017-01-22 10:03	VA3ELE	222071.50	J765	+00	59	VE	Peter	
2017-01-22 12:00	VEZDSS	144128.70	J765	59	-15	VE	Dany	
2017-01-22 12:25	N8RA	50286.50	MSK144	59	-15	K	John	
2017-01-22 12:32	K1SIX	50281.50	MSK144	59	-15	K	John	
2017-01-22 18:45	WA3GFZ	230410...	J765	59	-15	K	Jeff	
2017-02-16 13:24	VE3VEY	50281.50	MSK144	+04	+06	VE	Larry	
2017-02-16 13:35	W3OFD	50281.50	MSK144	+08	+10	K	Larry	
2017-02-16 13:46	KAR8BW	50281.50	MSK144	+07	-02	K	Larry	
2017-02-16 13:46	K0TPPP	50281.50	MSK144	+02	+00	K	Larry	
2017-02-16 13:46	K0TPPP	50281.50	MSK144	+02	+00	K	Larry	
2017-02-16 14:01	K0TPPP	50281.50	MSK144	+7	+2	K	Larry	
2017-02-16 14:10	W8A7WV	50281.50	MSK144	+06	+06	K	Larry	
2017-02-16 14:14	N3ALN	50281.50	MSK144	+10	+12	K	Larry	
2017-02-16 14:26	WA1EAZ	50281.50	MSK144	+01	-01	K	John	

The Future

- “Do Everything in Software” so that only mechanical connections to radio are for:
 - power
 - Ethernet
 - RF In/Out (to preamp, PA)
 - T/R control for preamp, PA
 - 10 MHz GPS-locked signal for frequency locking
- One Radio for 50 MHz thru 10 GHz
 - Just add mast-mounted preamps and PA for each band
 - No need for transverters

The Future

Where are we today with these goals?

Do Everything in Software

The image displays a comprehensive suite of software tools for radio communication, organized into several main sections:

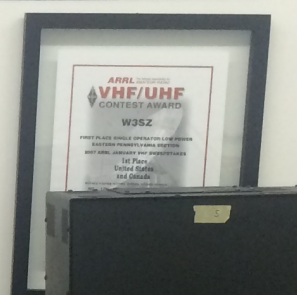
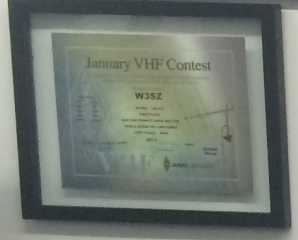
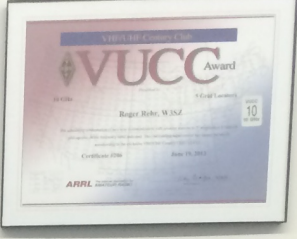
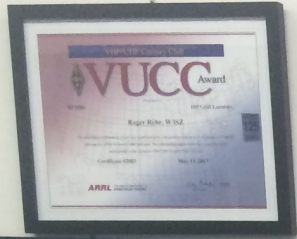
- Top Left:** A desktop environment showing a Windows taskbar with icons for Recycle Bin, Phone, and various applications. Below it are several windows displaying spectrum analyzer data with frequency and power scales.
- Top Center:** A window titled "50280.00" showing a call log with columns for "Call", "Freq", "Node", "Snt", "Rcv", "Pfx", "Name", and "Comment". It lists various call logs with call signs like "N2076", "N2077", "N2078", etc.
- Top Right:** A window titled "144140.00" showing a call log with columns for "Call", "Freq", "Node", "Snt", "Rcv", "Pfx", "Name", and "Comment". It lists call logs with call signs like "N2079", "N2080", "N2081", etc.
- Middle Left:** A window titled "50280.00" showing a spectrum analyzer with a frequency range from 50,210 to 50,240 kHz. It includes a "Spectrum" plot and a "Call History" window.
- Middle Center:** A window titled "144140.00" showing a spectrum analyzer with a frequency range from 144,160 to 144,200 kHz. It includes a "Spectrum" plot and a "Call History" window.
- Middle Right:** A window titled "2017 Feb 24 19:08:20" showing a call log with columns for "Call", "Freq", "Node", "Snt", "Rcv", "Pfx", "Name", and "Comment". It lists call logs with call signs like "N2082", "N2083", "N2084", etc.
- Bottom Left:** A window titled "System Status" showing system information like CPU, Memory, and Disk usage. It also includes a "System Status" window with a "System Status" window.
- Bottom Center:** A window titled "2017 Feb 24 19:08:20" showing a call log with columns for "Call", "Freq", "Node", "Snt", "Rcv", "Pfx", "Name", and "Comment". It lists call logs with call signs like "N2085", "N2086", "N2087", etc.
- Bottom Right:** A window titled "2017 Feb 24 19:08:20" showing a call log with columns for "Call", "Freq", "Node", "Snt", "Rcv", "Pfx", "Name", and "Comment". It lists call logs with call signs like "N2088", "N2089", "N2090", etc.

Do Everything in Software - DONE

- Virtual CAT ports connect to N1MM, WSJTX
- Mic and headphones are USB headset plugged into USB port on computer
- CW keying is via USB port
- PTT is via USB port and/or software PTT
- All frequency / mode / other radio parameter changes are made via N1MM and radio software interface
- No knobs on radios, which are not even at operating position
 - Radios connected by ethernet to computer
 - Remote operation is no different than local operation
- <http://www.nitehawk.com/w3sz/CSharpsdrclientANDserverVersion2pt0.html>

One Radio for 50 MHz thru 10 GHz In Progress

- LOOKS like one radio to N1MM
- OPERATES like one radio
- But...



One Radio for 50 MHz thru 10 GHz Getting Closer: LimeSDR

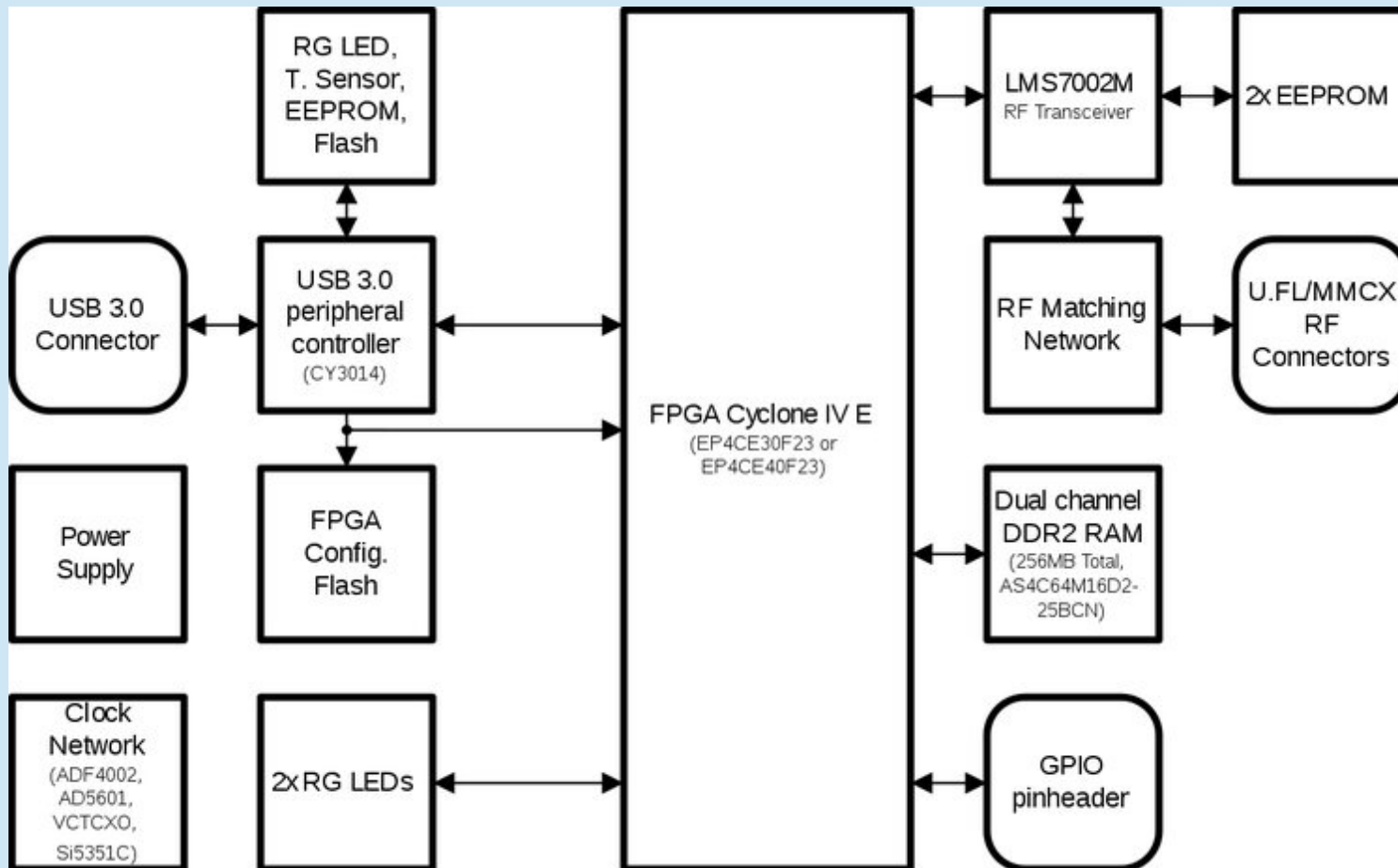


One Radio for 50 MHz thru 10 GHz

Getting Closer: LimeSDR

- Current board covers 100 kHz – 3.8 GHz
 - <https://www.crowdsupply.com/lime-micro/limesdr>
- New chip LMS8001+ → 100 kHz -12 GHz coverage
 - Missed first delivery promise (March 2017)
 - Will be available as add-on to current board
 - RF bandwidth 120 MHz
 - ADC sampling rate 160 Msps
 - DAC sampling rate 640 Msps
 - <https://discourse.myriardrf.org/t/lms8001-100-khz-to-12-ghz-transceiver-schedule-info/1020/4>

LimeSDR



LimeSDR

- Features & Specifications
- RF Transceiver: Lime Microsystems LMS7002M MIMO FPRF
- FPGA: Altera Cyclone IV EP4CE40F23 - also compatible with EP4CE30F23
- Memory: 256 MBytes DDR2 SDRAM
- USB 3.0 controller: Cypress USB 3.0 CYUSB3014-BZXC
- Continuous frequency range: 100 kHz – 3.8 GHz
- Bandwidth: 61.44 MHz
- RF connection: 10 U.FL connectors (6 RX, 4 TX)
- Power Output (CW): up to 10 dBm
- Full Duplex
- Power: micro USB connector or optional external power supply
- Status indicators: programmable LEDs
- Dimensions: 100 mm x 60 mm

LimeSDR

	HackRF One	Ettus B200	Ettus B210	BladeRF x40	RTL-SDR	LimeSDR
Frequency Range	1MHz-6GHz	70MHz-6GHz	70MHz-6GHz	300MHz-3.8GHz	22MHz-2.2GHz	100kHz-3.8GHz
RF Bandwidth	20MHz	61.44MHz	61.44MHz	40MHz	3.2MHz	61.44MHz
Sample Depth	8 bits	12 bits	12 bits	12 bits	8 bits	12 bits
Sample Rate	20MSPS	61.44MSPS	61.44MSPS	40MSPS	3.2MSPS	61.44MSPS (Limited by USB 3.0 data rate)
Transmitter Channels	1	1	2	1	0	2
Receivers	1	1	2	1	1	2
Duplex	Half	Full	Full	Full	N/A	Full
Interface	USB 2.0	USB 3.0	USB 3.0	USB 3.0	USB 2.0	USB 3.0
Programmable Logic Gates	64 macrocell CPLD	75k	100k	40k (115k avail)	N/A	40k
Chipset	MAX5864, MAX2837, RFFC5072	AD9364	AD9361	LMS6002M	RTL2832U	LMS7002M
Open Source	Full	Schematic, Firmware	Schematic, Firmware	Schematic, Firmware	No	Full
Oscillator Precision	+/-20ppm	+/-2ppm	+/-2ppm	+/-1ppm	?	+/-1ppm initial, +/-4ppm stable
Transmit Power	-10dBm+ (15dBm @ 2.4GHz)	10dBm+	10dBm+	6dBm	N/A	0 to 10dBm (depending on frequency)
Price	\$299	\$686	\$1,119	\$420 (\$650)	~\$10	\$299 (\$289 pre-order)

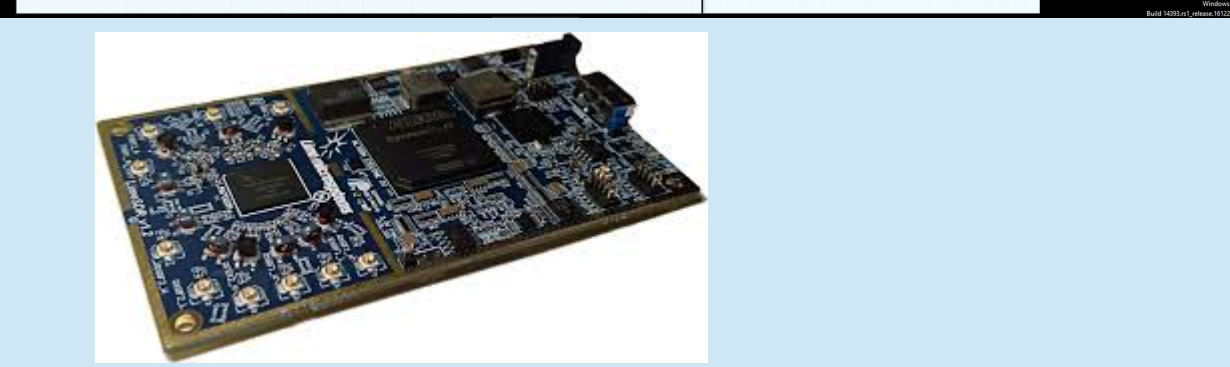
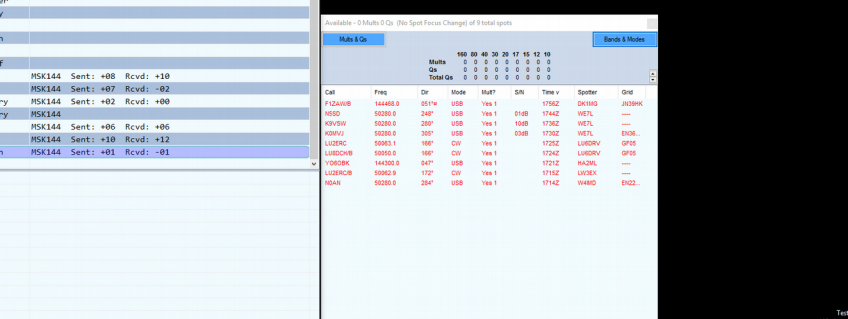
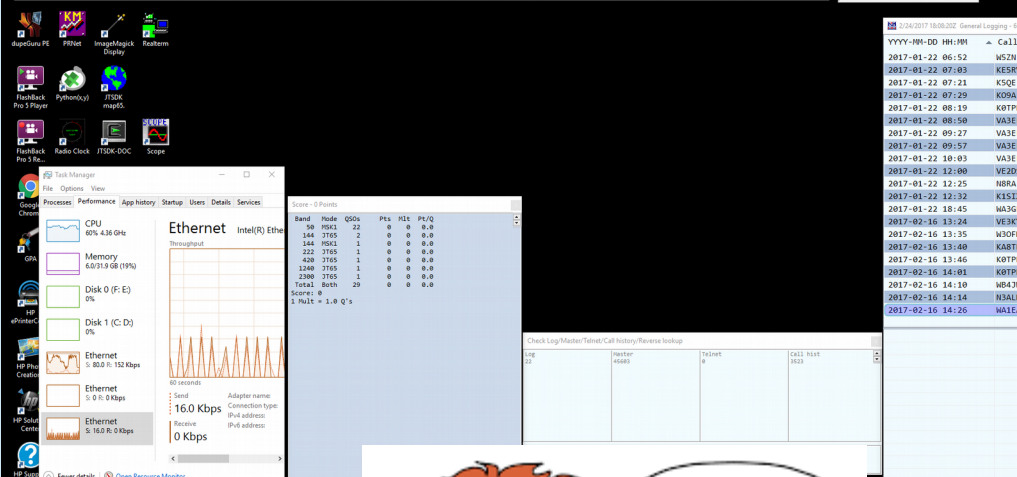
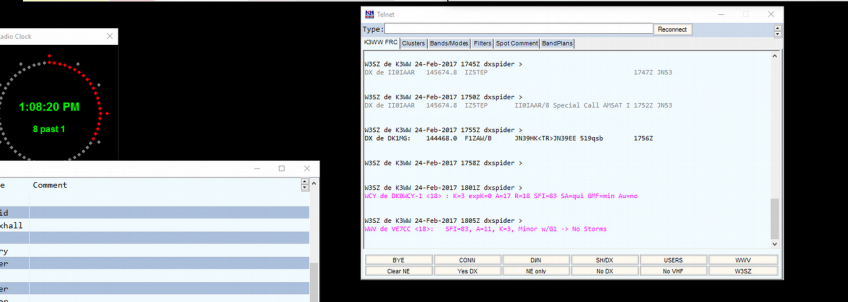
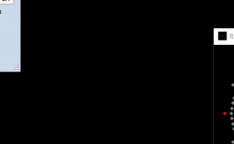
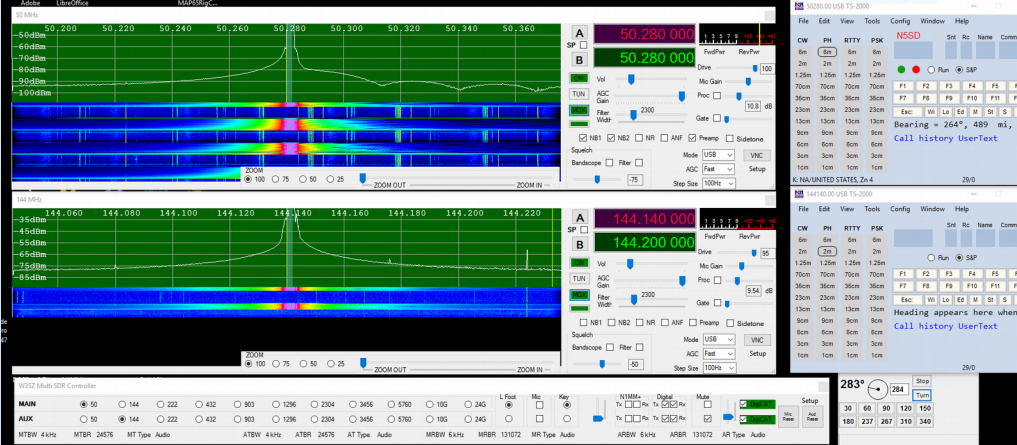
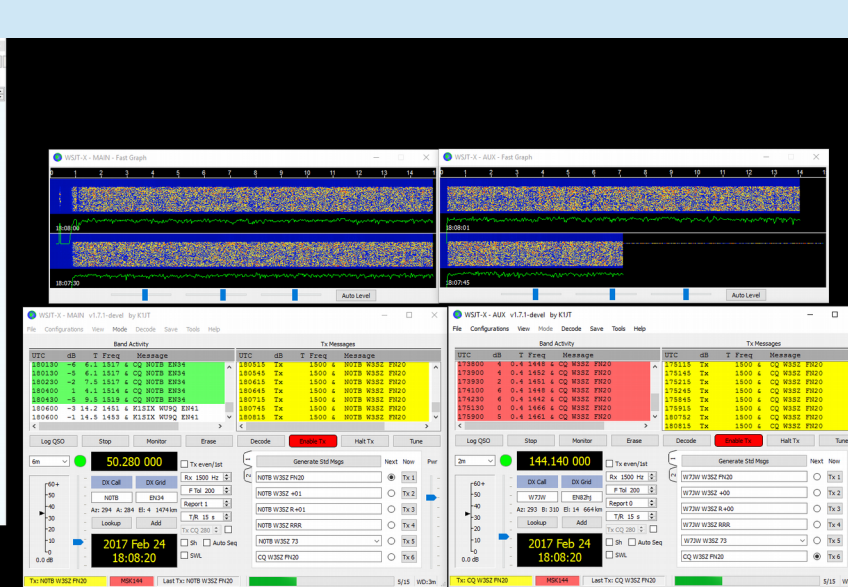
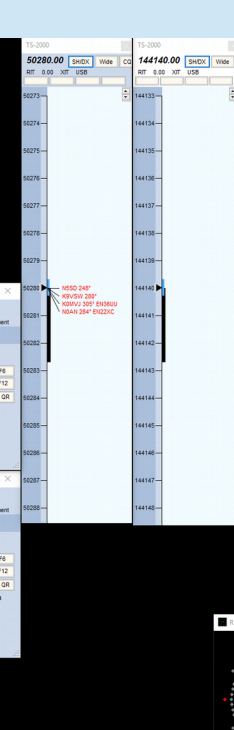
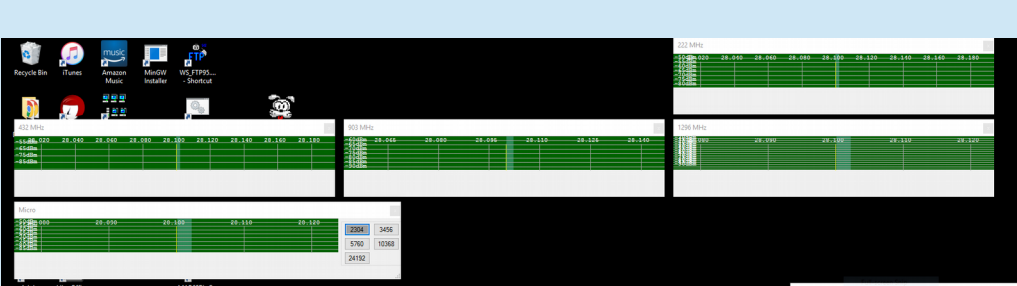
LimeSDR

Growing Pains

- Reduced sensitivity below 400 MHz due to input network design
 - Removing tiny SMD inductor improves sensitivity
- Limited software support at present
 - Simon Brown adding LimeSDR support to SDR-
Radio Version 3.
- Mike, N1JEZ leading the charge

LimeSDR Limitations

- Would prefer Ethernet connectivity over USB
 - Could then put everything at tower and just run power and CAT6A back to operating position
 - Remote operation without need for local computer
- Receive Sensitivity issues not fully resolved
- Currently no Windows OS transmit solution
- 12 GHz capability remains vaporware



What Now?

- Pick a Project
- Choose “best” device for project
- Use Google and code examples from this seminar to get started and write the code
- Have fun!

