

# Software Defined Radio

Listening to the Bleeps and Bloops around you

# Software Defined Radio in a nutshell

- Like a FM radio, but can receive a wider radio spectrum range



[< Back to search results for "rtl2832"](#)[Click to open expanded view](#)

## DVB-T DAB FM,RTL2832U & R820T Tuner,Mini USB RTL-SDR & ADS-B Receiver Set,Radio Compatible,MCX Input,Easy Intall,25 - 1700 MHz,Support Windows XP/2000/Vista/Win7/Win8

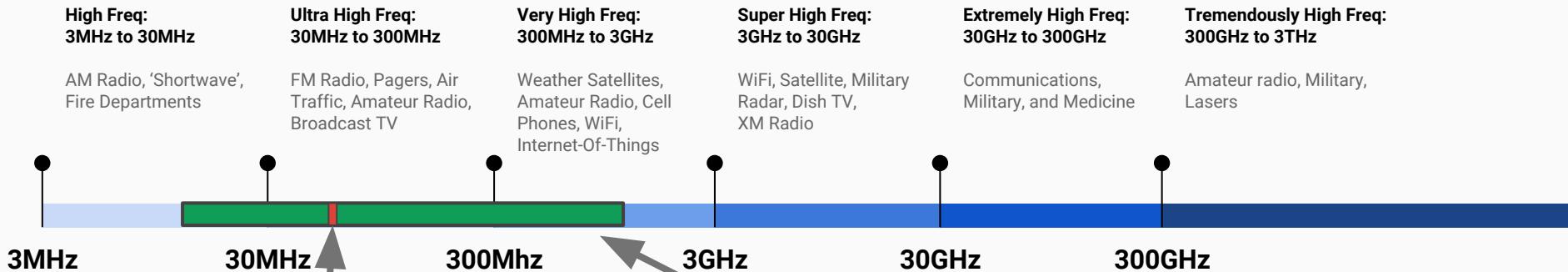
by [Mesinton](#)

35 customer reviews

[| 8 answered questions](#)Price: **\$8.50** & **FREE Shipping** on orders over \$35. [Details](#)[In Stock.](#)Next Sunday, Jan. 10? Order within **10 hrs 26 mins** and choose **Two-Day Shipping** at checkout. [Details](#)Sold by [NooElec](#) and **Fulfilled by Amazon**. Gift-wrap available.

- Digital Terrestrial Video and Radio Programs Recording
- Real Time Digital Video Recording, Still Image Capture, PIP (Picture In Picture)
- One touch channel auto-scan at 6/7/8 MHZ
- On-The-Fly Decode software technique
- Multi-Language in stallation and application program

# Quick Peek at Radio Frequencies



FM Radio is here

Out-of-the-Box  
SDR Coverage

# You can receive...

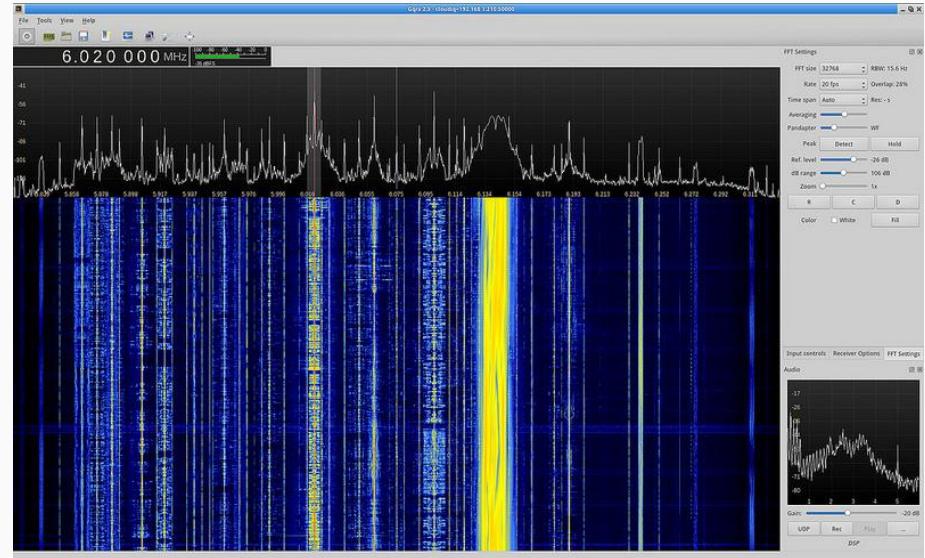
- HF (3-30MHz)
  - AM Radio
  - Morse Code
  - 'Shortwave' stations from other countries
  - Numbers Stations
- Broadcast FM (88-108MHz)
  - Standard FM radio, like in your car
- Satellite transmissions (130-150MHz)
  - NOAA Weather
  - International Space Station
- FCC Registered Comms (130-160MHz)
  - Mall Security
- IoT Devices (433MHz & 915MHz)
  - Tire Pressure Monitoring System
  - Wireless Temperature sensors
- Amateur Radio (Varies)
- Aircraft Tracking (1090Mhz)
- Ship Tracking (161MHz)
- Pager Messages (Varies)
- Baby Monitors (Varies)

## Other applications include...

- Tracking and receiving meteorological agency launched weather balloon data.
- Tracking and receiving rocket launch telemetry.
- Tracking your own self launched high altitude balloon for payload recovery.
- Sniffing GSM cell phone signals.
- Receiving GPS signals and decoding them.
- Spectrum analyzer.
- Radio astronomy.
- Receiving RADAR signals like over the horizon (OTH) radar, and HAARP signals.
- Monitoring meteor scatter.
- Decoding taxi mobile data terminal signals.
- A high quality entropy source for random number generation.
- A noise figure indicator.
- Reverse engineering unknown protocols.
- Triangulating the source of a signal.
- Searching for RF noise sources.
- Characterizing RF filters and measuring antenna characteristics.

# FM Radio - GnuRadio Companion / GQRX

Make a simple FM Radio frequency viewer



# POCSAG

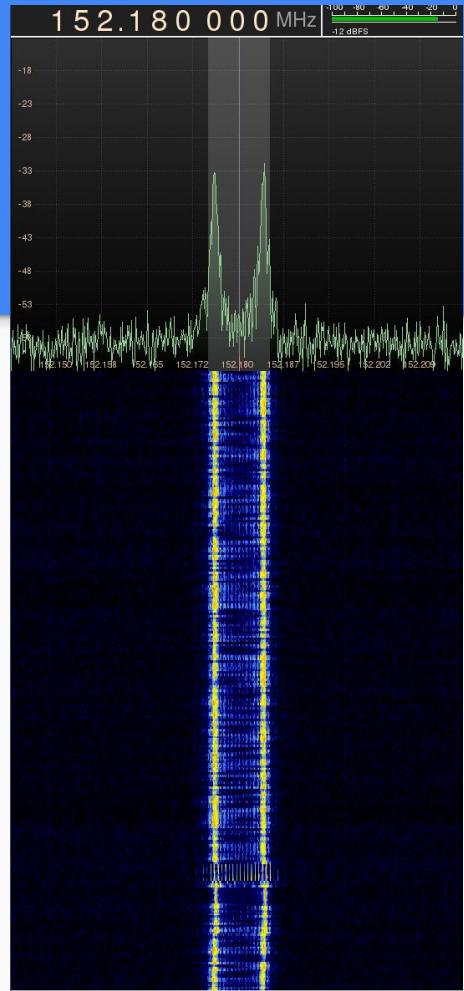
Pagers are still a thing, apparently.

Pipe signal through GQRX multimon-ng via nc

Decode POCSAG messages

Lots of hospitals, sometimes drug dealers

```
nc -l -u -p 7355 | sox -t raw -esigned-integer -b16 -r  
48000 - -esigned-integer -b16 -r 22050 -t raw - |  
multimon-ng -t raw -a SCOPE -a POCSAG512 -a POCSAG1200  
-a POCSAG2400 -f alpha -
```



# POCSAG1200 Messages

Alpha: ASSGN RTM: [REDACTED] E 79 Medical #: 612620 F Targeted Unit: 4B Dest Room-Bed: 4B20-D Dest Bed Status: Clean Origin Unit: GLH ED Attending: DASARI, AVIN  
ASH Service: Hospitalist (GLHHOS) Diagnosis: Chest pain, unspecified<ETB>  
Numeric: 2391 27730

Alpha: Please call Neuroradiology at 570-214-2447, thanks, Dr. Millar  
Numeric: 23U- 26130  
Alpha: (Szczypa,Toni) Please place [REDACTED] in 840 bed 1 at 1840 hrs from ecu<ETB>

Alpha: CLEAN RTM: TRAUMA, FORTYTHREE 146 MN 7751004 F UNIT:SCU4 DRM:SCU410 DCS:Clean ORGN:GMC ED ATN:GREGORY, JAMES SCOTT HS:Trauma Surgery GMC DX:Nontraumatic int  
racerebral hemorrhage, unspecific<ETB><ETB>

Alpha: CLEAN RTM: TRAUMA, FORTYTHREE 146 MN 7751004 F UNIT:SCU4 DRM:SCU410 DCS:Clean ORGN:GMC ED ATN:GREGORY, JAMES SCOTT HS:Trauma Surgery GMC DX:Nontraumatic int  
racerebral hemorrhage, unspecific<ETB><ETB>

Alpha: FR:modelsystem@epic.com >Order for [REDACTED] .>Epic In Basket: Orders<LF>From: [REDACTED]<ETB>  
Alpha: its CT, I think we fixed the issue. any questions call 16502 thanks<ETB>  
Numeric: 6U-9-66710

Alpha: CVU 373 - Patient moved to 4 room 402. Family would like to speak to you.<ETB>  
Alpha: [REDACTED] @lyco.org >CAD Page for CFS 091617-152 >Sat Sep 16 2017 18:41 MED<LF>E WEAKNESS<LF>1980 ROUTE 405 HWY<LF>MUC<LF>APT: LOT 1<LF>Cross Street  
ts : SAWMILL RD \* VAN HORN BLVD <LF>http://maps.google.com/maps?q=+41.22165%20-76.74460

Alpha: Page:90: [REDACTED] A 63 Visit #: 0591993237259 F Origin Unit: \*ED (ALT) Admitting: NIZZA, KENNETH ANDREW Attending: CHAUDHRI, IMRAN I Level of Care: b.  
Numeric: 646-5502  
Alpha: FR:"CHI.LIVE.[REDACTED]@lyco.net >BED REQUEST<LF>This email and attachments contain information that may be confidential or privileged.  
If you are not the intended recipient, do not read, copy, forward or distribute this message. Instead, please delete this message.

Alpha: nd delete this messa  
Alpha: Placed routine consul  
return call required!<ETB><ETB>  
Numeric: 610-628-8384  
Numeric: 2391-46710

Alpha: [REDACTED] M4 Visit #: 059073757259 F Origin Unit: \*ED (ALT) Admitting: NIZZA, KENNETH ANDREW Attending: CHAUDHRI, IMRAN I Level of Care: b.  
Monitored Bed Diagnosis: HIGH BLOOD PRESSURE, HYPERTENSION  
Alpha: MICU 4-3 : BLS- Routine (1) Transfer from Hershey Med Center - to LifeCare Hosp of Mechanicsburg1709-1092-A [REDACTED] . Additional: Medical Necessity  
Completed

Alpha: [REDACTED] M4 Visit #: 059073757259 F Origin Unit: \*ED (ALT) Admitting: NIZZA, KENNETH ANDREW Attending: NIZZA, KENNETH ANDREW Level of Care: b.  
Monitored Bed Diagnosis: HIGH BLOOD PRESSURE, HYPERTENSION  
Alpha: NEW JOB: BED: W017A BED IP: 9/17/17 STATUS: Dirty<ETB><ETB>

Alpha: 9/16/17 6:41P PRIO [REDACTED] 7 D [REDACTED] BLEEDING  
Numeric: 7U95 07710  
Numeric: 8395 27710

Alpha: From: [REDACTED] 2105 S.P. Pt received 1 unit blood and then was to have hgb done 1 hr post. Hgb now 8.2. Do you want 2nd unit transfused?<ETB><ETB>  
Numeric: 8395 27710

Alpha: [REDACTED] @pinnacleairmethod.org >End of Break >Break: Lunch Break<LF>Length: 30 minutes<LF>has ended.<LF>Sign in for your next assignment.<ETB><ETB>  
Alpha: FR:noreply@airmethod.org >RESPOND for PA ME 07 Revenue - Scene #17-1777... >RESPOND for PA ME 07 <LF>Revenue - Scene #17-177761<LF>Distance: 10.68nm Headi  
ng: 105M<LF>Schuylkill County Miles to 40 40.47'N 075 58.59'W<LF>Location: Schuylkill HZ 234 , Sc

Alpha: RQSTD: [REDACTED] A 63 Visit #: 0591993237259 F Origin Unit: \*ED (ALT) Admitting: NIZZA, KENNETH ANDREW Attending: CHAUDHRI, IMRAN I Level of Care: d. Non  
-Monitored Bed Diagnosis: SCIATICA, ABD PAI

Alpha: FR:CAD\_Notification@lyco.org >CAD Page for CFS 091617-152 >Sat Sep 16 2017 18:42 MED<LF>E WEAKNESS<LF>1980 ROUTE 405 HWY<LF>MUC<LF>APT: LOT 1<LF>Cross Street  
ts : SAWMILL RD \* VAN HORN BLVD <LF>http://maps.google.com/maps?q=+41.22165%20-76.74460

Alpha: RQSTD: [REDACTED] A 63 Visit #: 0591993237259 F Origin Unit: \*ED (ALT) Admitting: NIZZA, KENNETH ANDREW Attending: CHAUDHRI, IMRAN I Level of Care: d. Non  
-Monitored Bed Diagnosis: SCIATICA, ABD PAI

Names + Email Addrs

Name + SSN

Very personal medical info

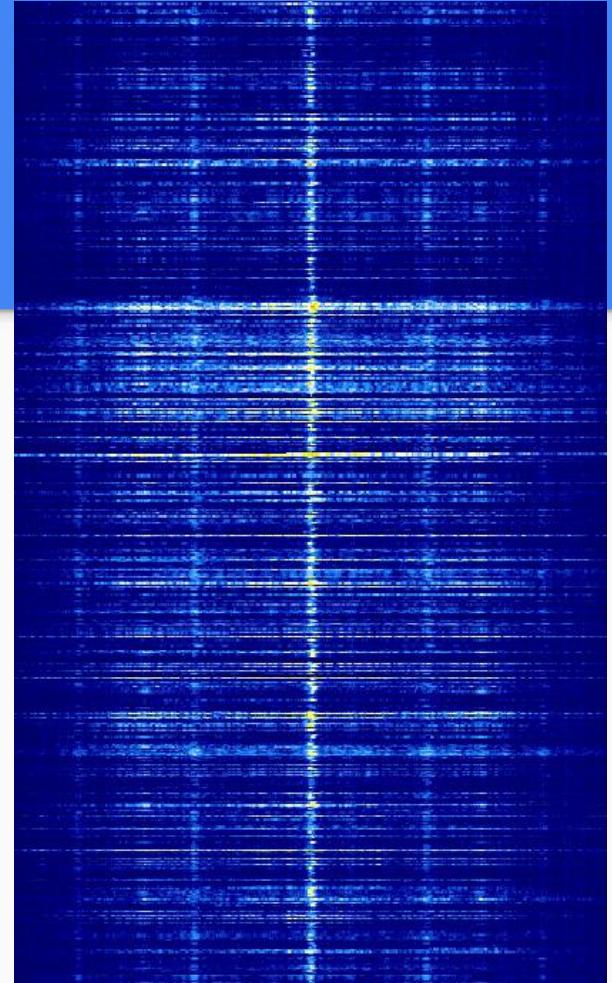
# ADS/B

Automatic Dependent Surveillance / Broadcast

Decode Mode S, Mode A, and Mode C

Not mandatory until 2020

Aircraft Communications Addressing and  
Reporting System (ACARS)

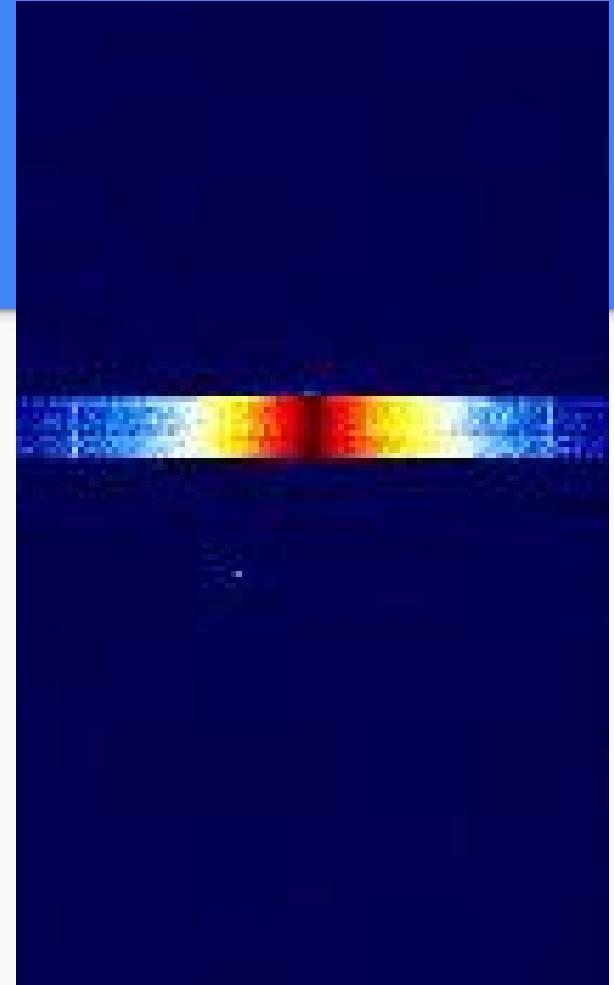




# ISM Band

Industrial Scientific Medical band

- 433MHz
- 915Mhz
- 2.4GHz
- 5.8GHz
- Thermometers
- Energy meters
- **Tire Pressure Monitoring System**
- Wireless security cameras



016.01.18  
22:23:11

016.01.18  
22:22:44

016.01.18  
22:22:16

016.01.18  
22:21:49

016.01.18  
22:21:22

016.01.18  
22:20:54

016.01.18  
22:20:27

016.01.18  
22:20:00

016.01.18  
22:19:33

016.01.18  
22:19:05

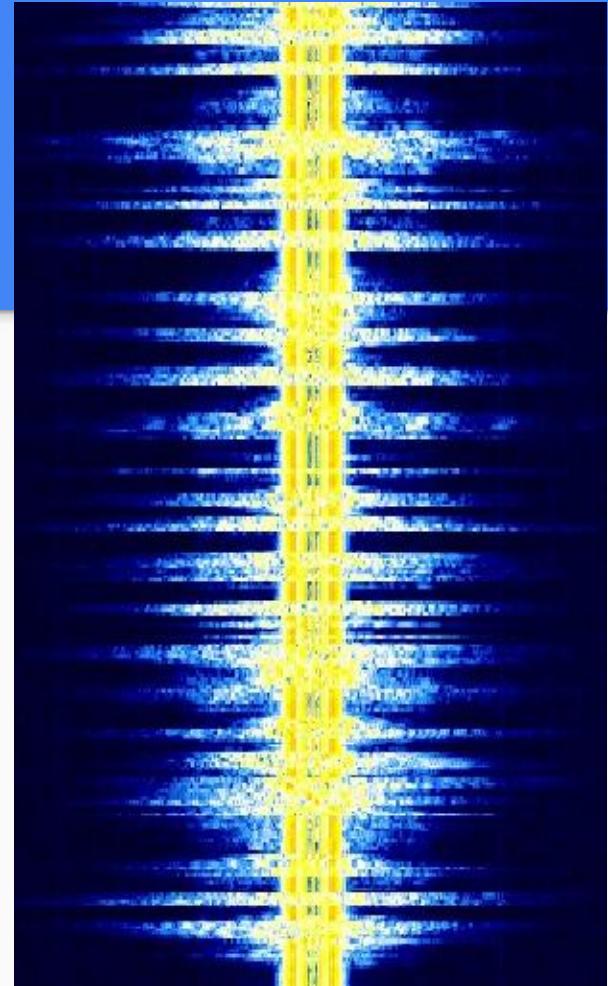
433.40 433.45 433.51 433.56 433.62 433.67 433.73 433.78 433.84 433.89 433.95 434.00 434.06 434.12 434.17 434.23 434.28 434.34 434.39 434.45 434.50 434.56 434.61 434.68 MHz

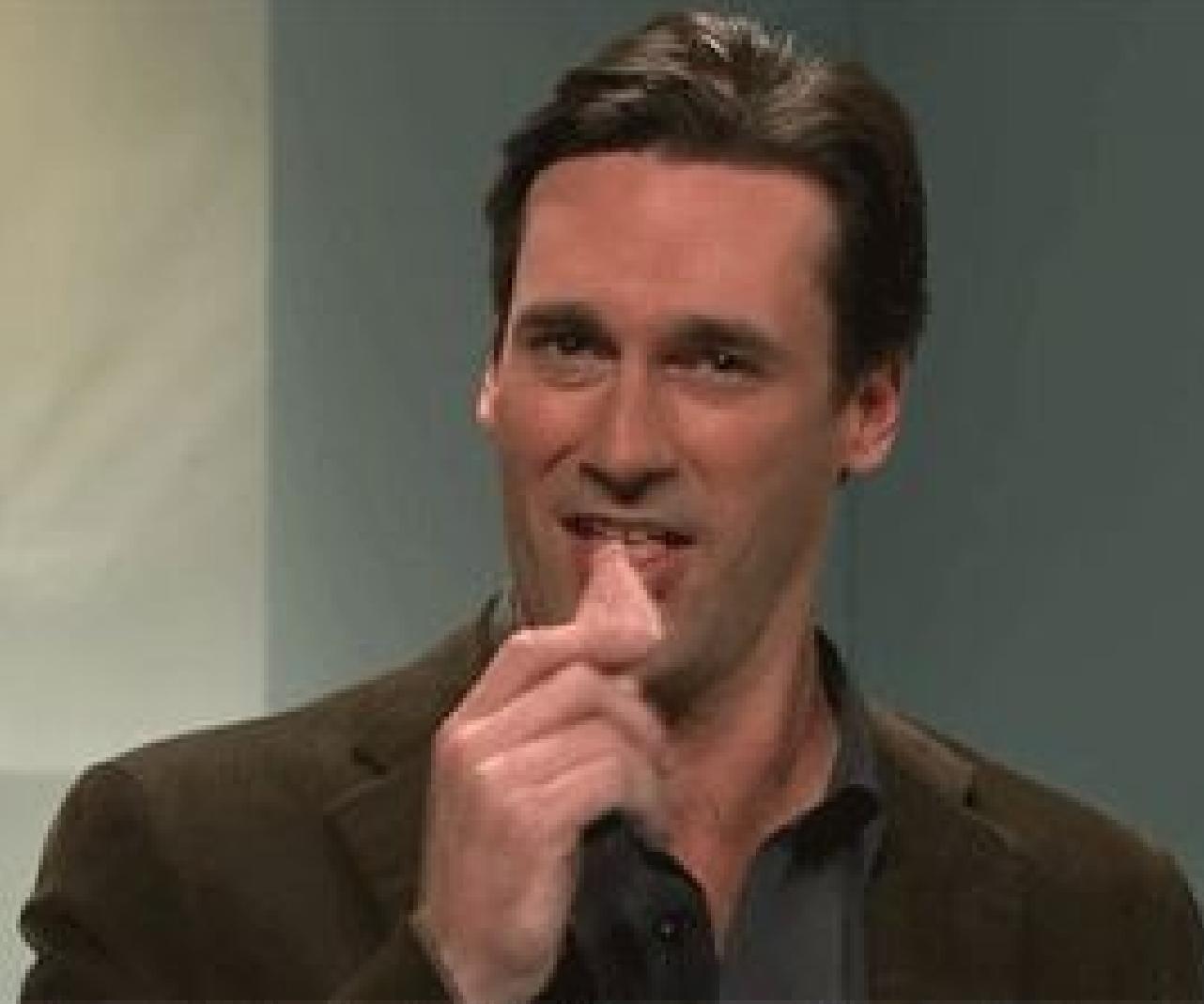
# Amateur Radio / Ham Radio

Greybeards talking about illnesses from three states away

Need a license from FCC to transmit

- Continuous Wave (CW - Morse Code)
- Digital Packet Radio
  - APRS
  - RTTY
- Phone/Voice
- Images/Video
- Data/Satellite



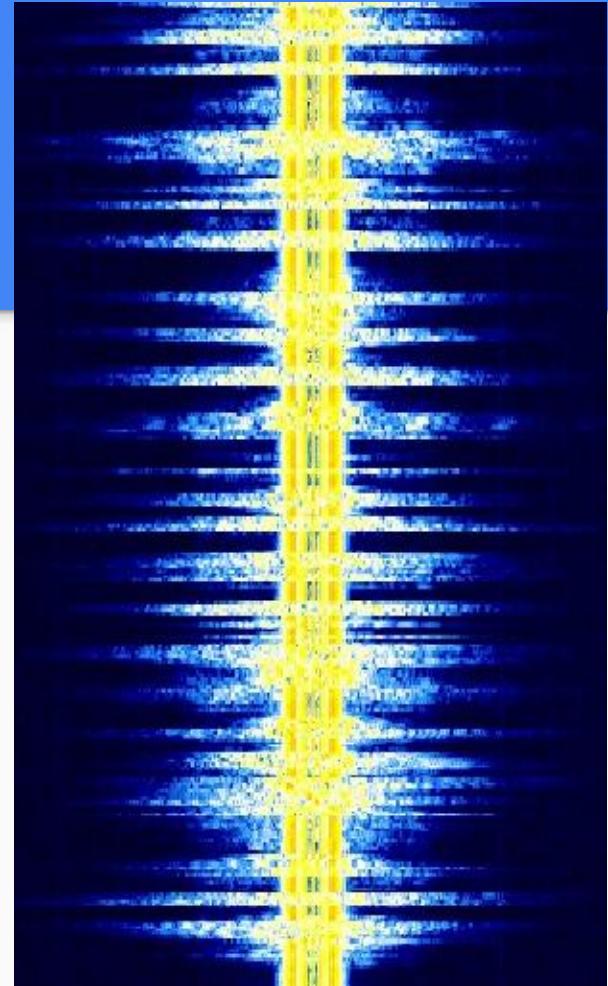


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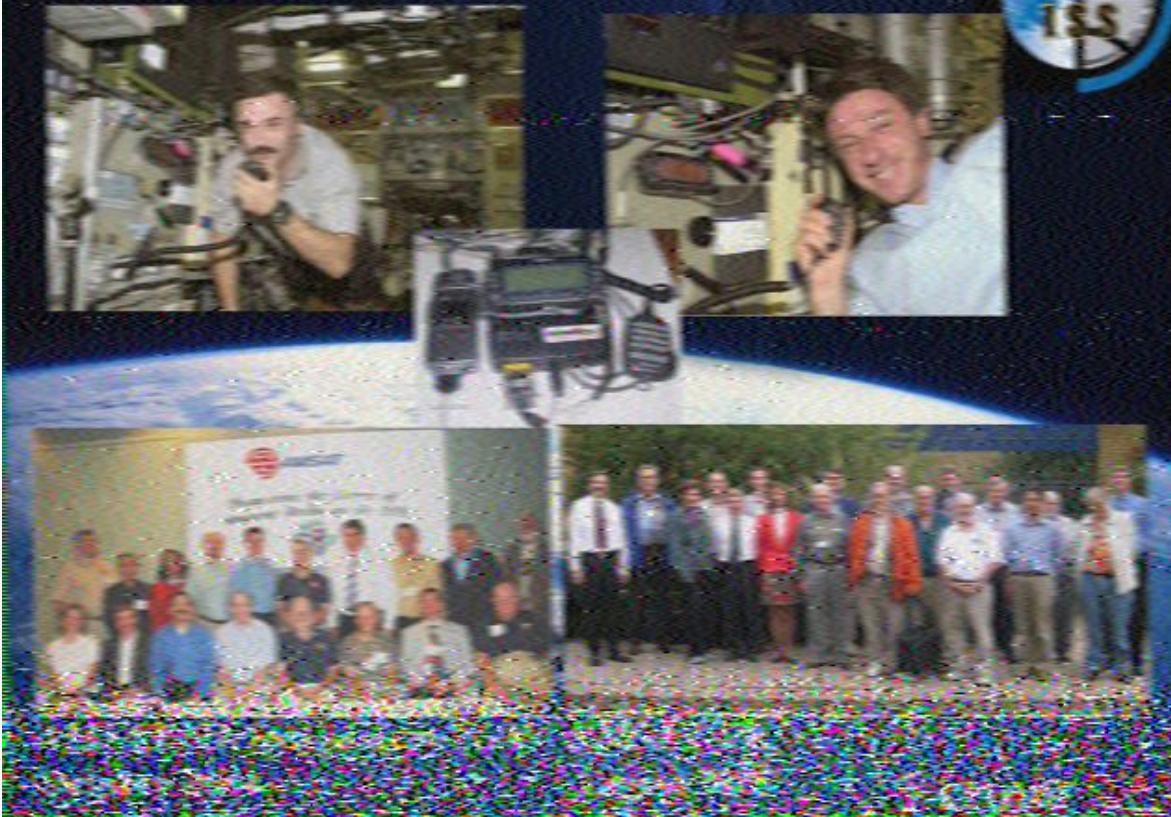
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# ARISS 20<sup>th</sup> Anniversary Celebration

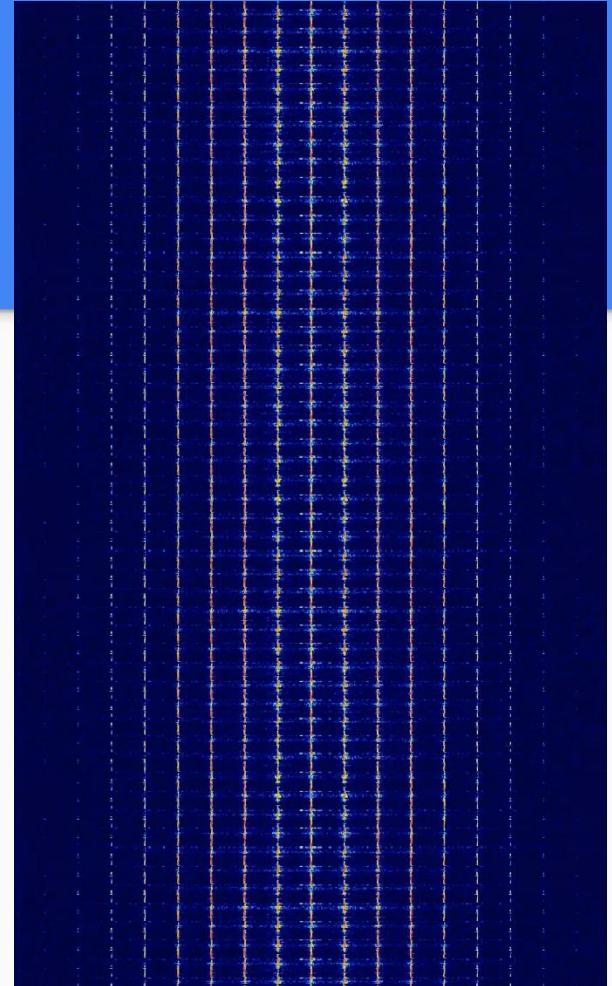


# Satellite

Thousands of satellites, most encrypted

Interesting ones that are not encrypted:

- NOAA 15/18/19
  - Weather
  - Search-and-Rescue
- International Space Station
  - NFM voice
  - SSTV images
- Iridium/InMarSat
  - Global telecom
  - Airplane Tracking (ADS/B via Satellite)



# NOAA Weather Satellites

Extremely easy to receive

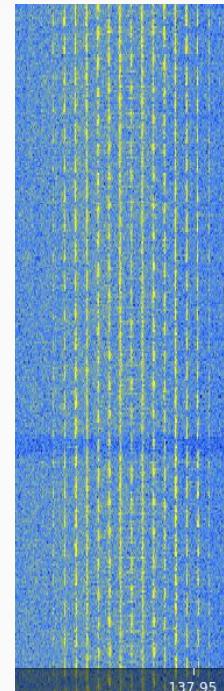
Provides real-time(ish) images of the planet

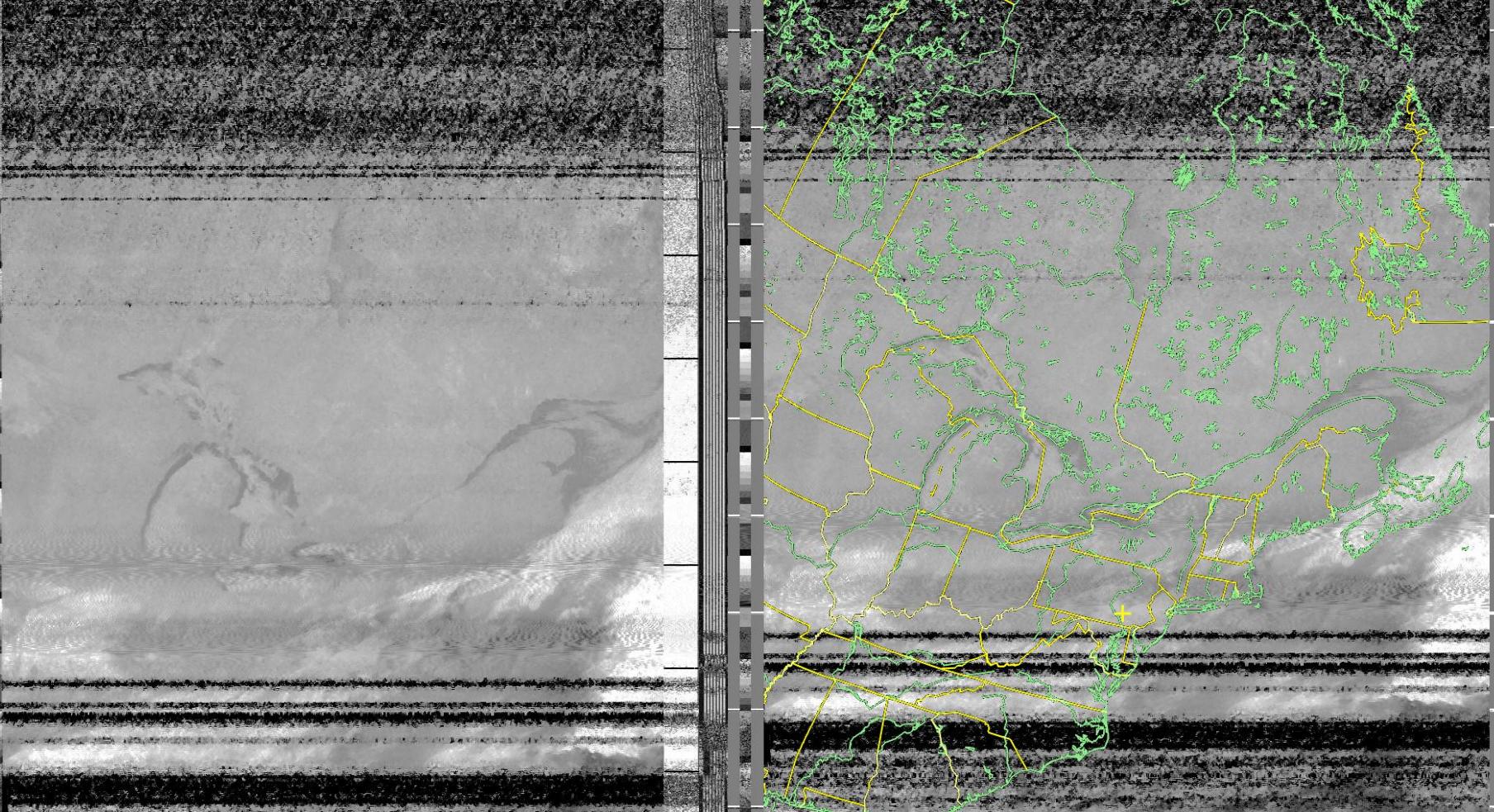
Various Satellites:

- NOAA 15, 18, 19
- GOES
- METEOR M2

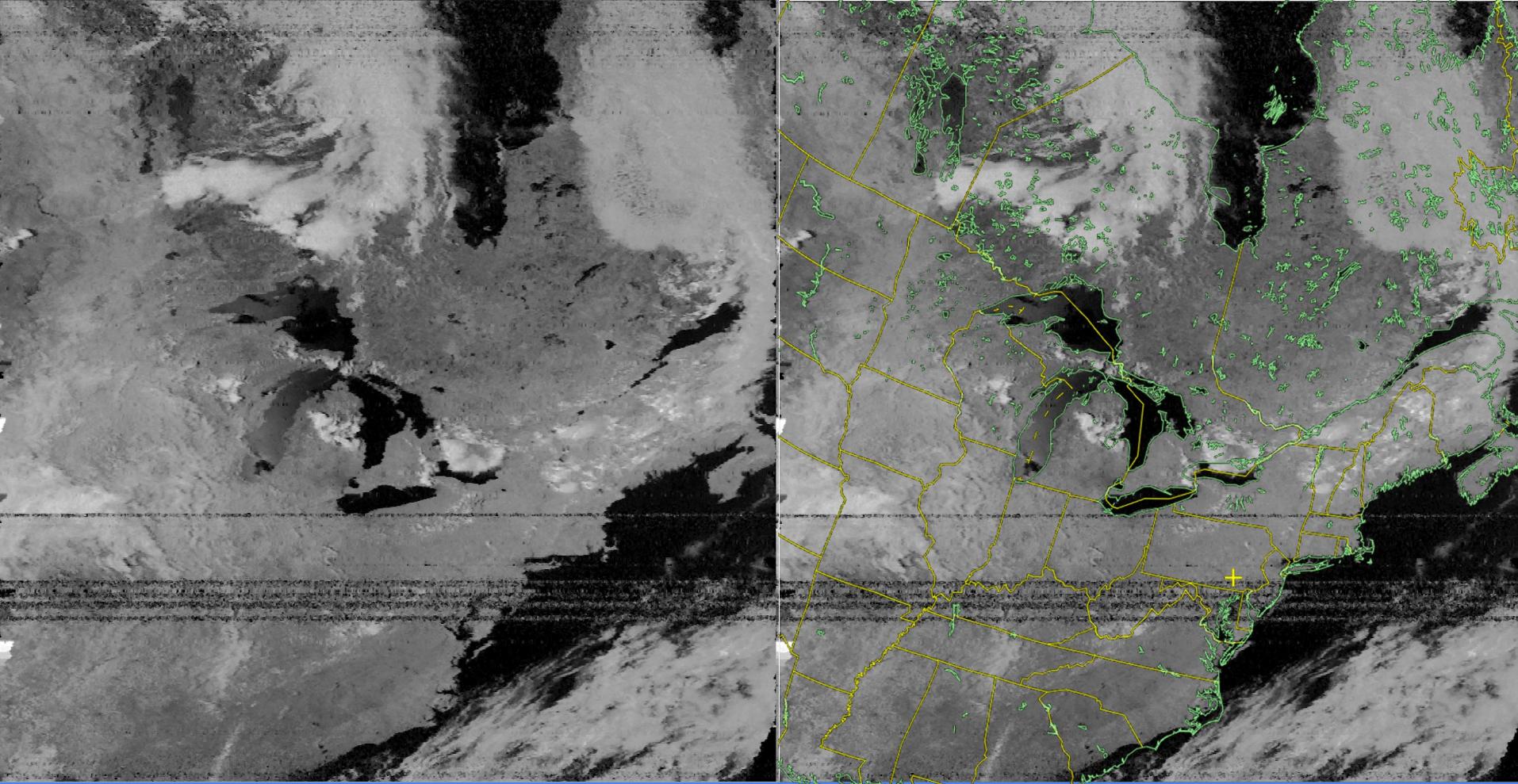
Various Protocols:

- Automated Picture Transmission (APT)
- Low-Resolution Picture Transmission (LRPT)
- High-Resolution Picture Transmission (HRPT)

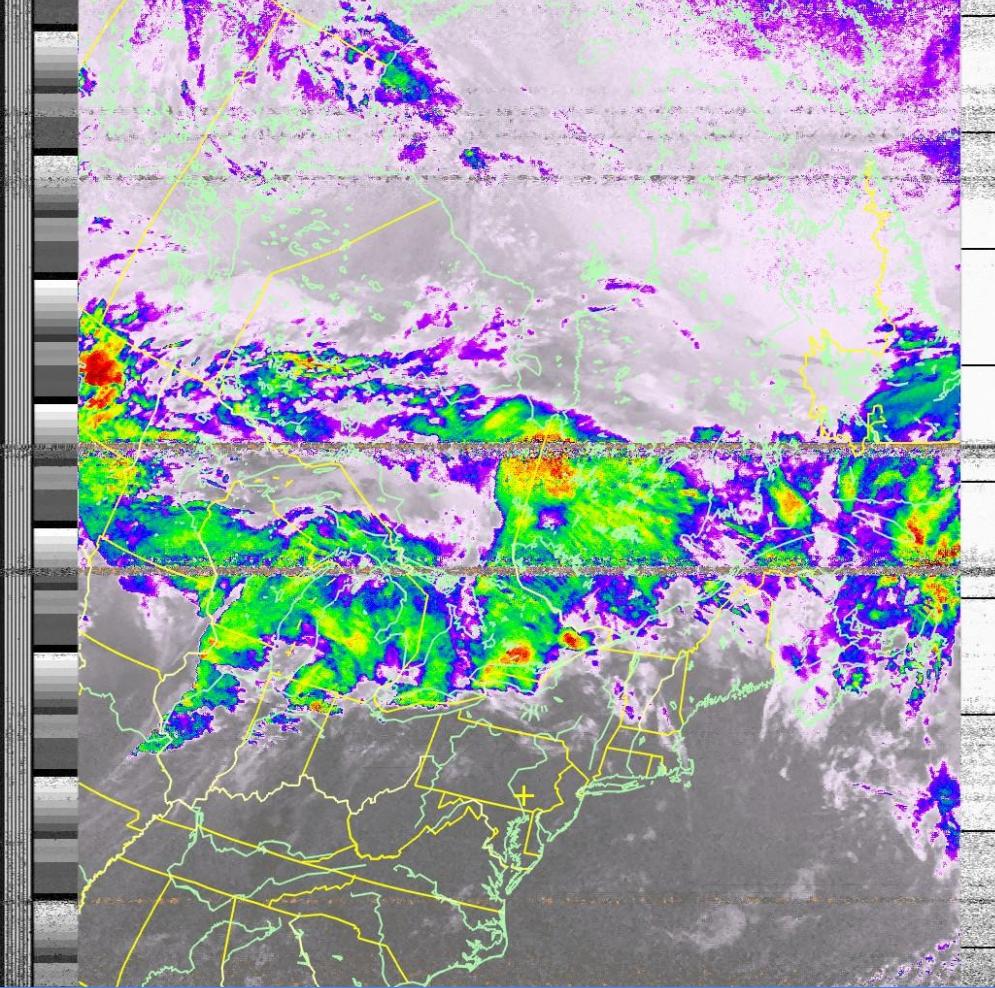




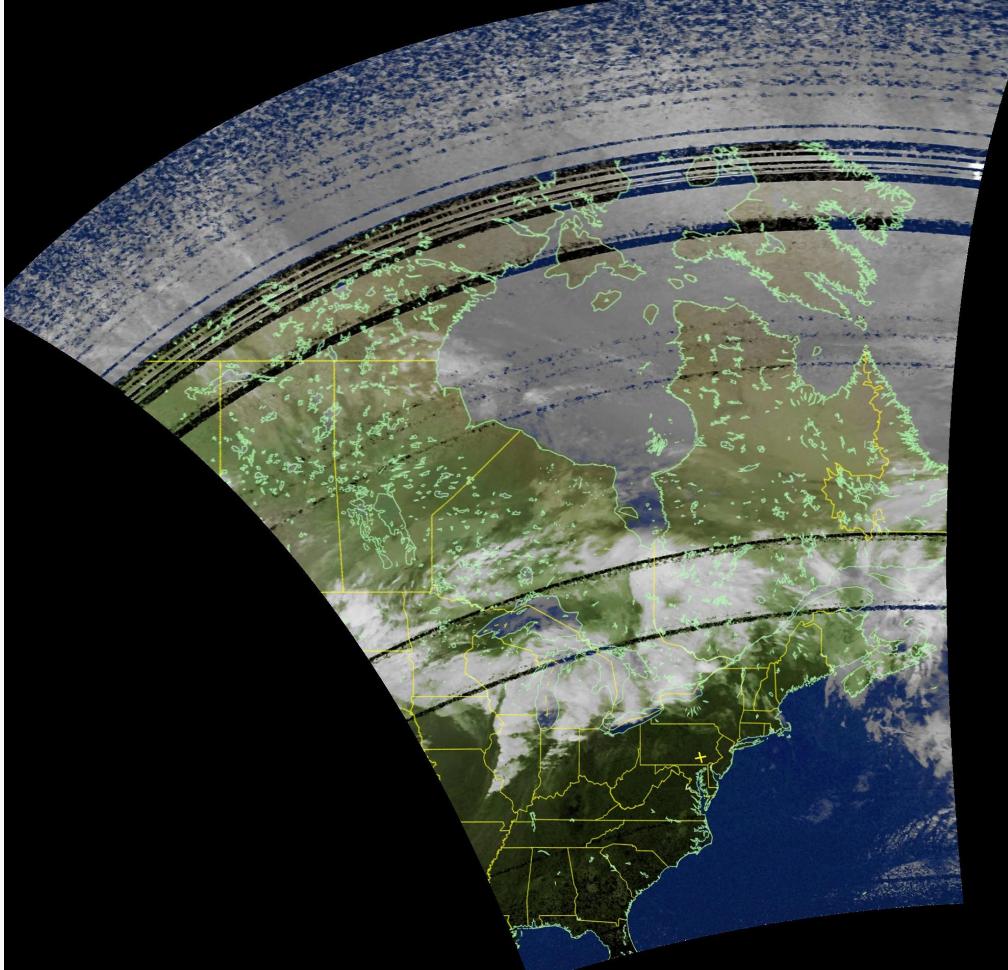
Raw LRPT Image (left) and Raw LRPT Image with Overlay (right)



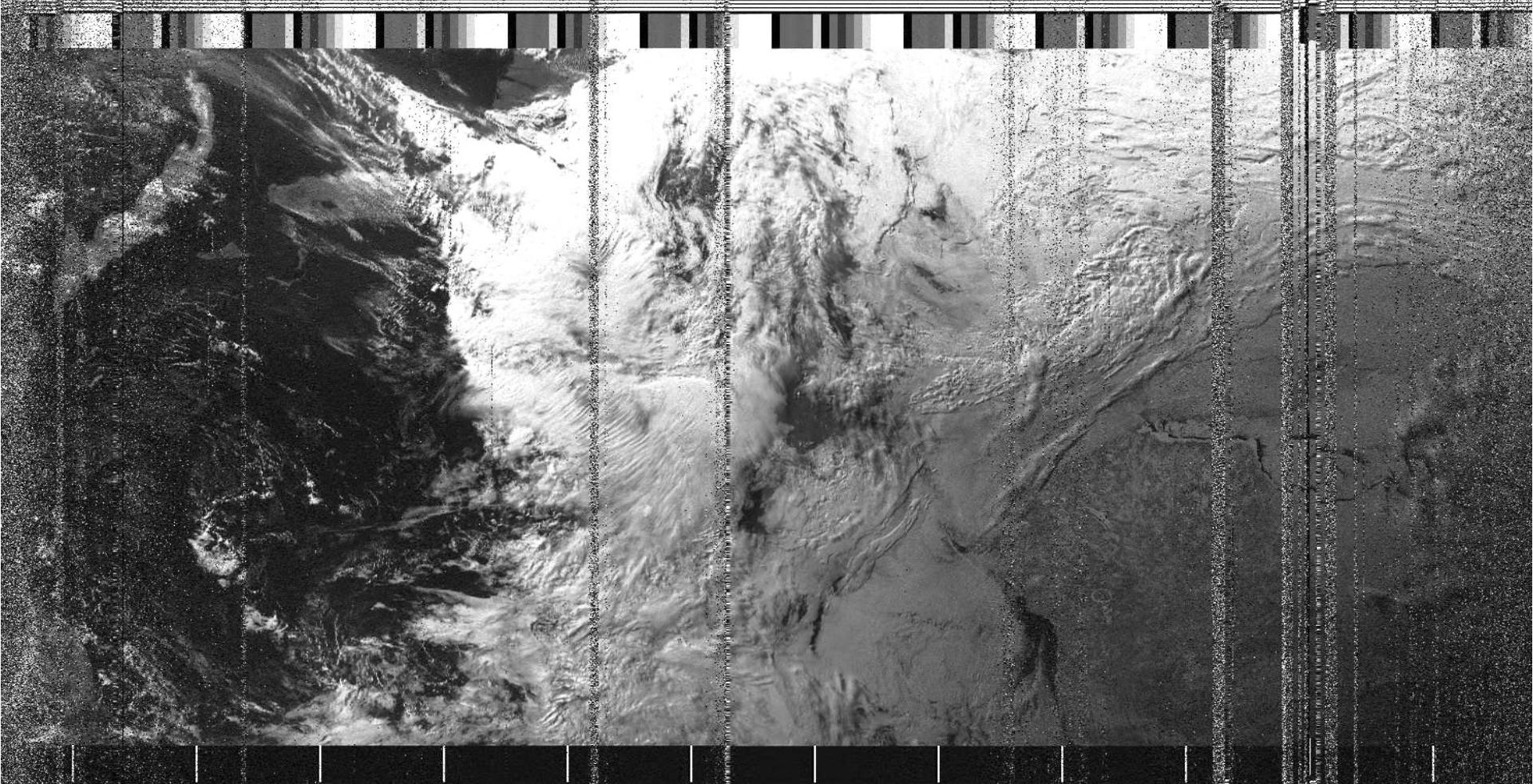
NOAA 19 Channel A - August 2017



NOAA 19 Radar



NOAA 19 False Color, Miller Projection



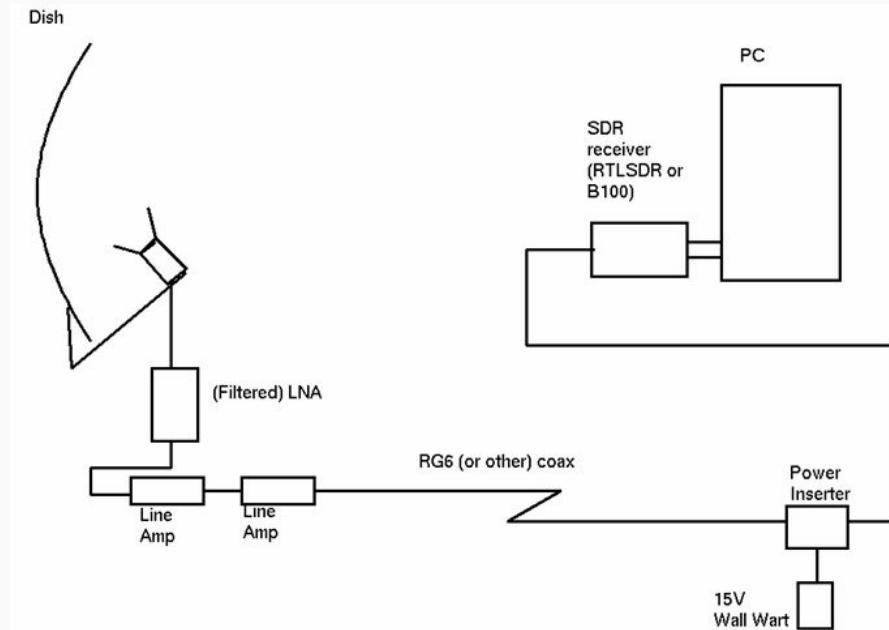
NOAA 19 Channel A - January 2017

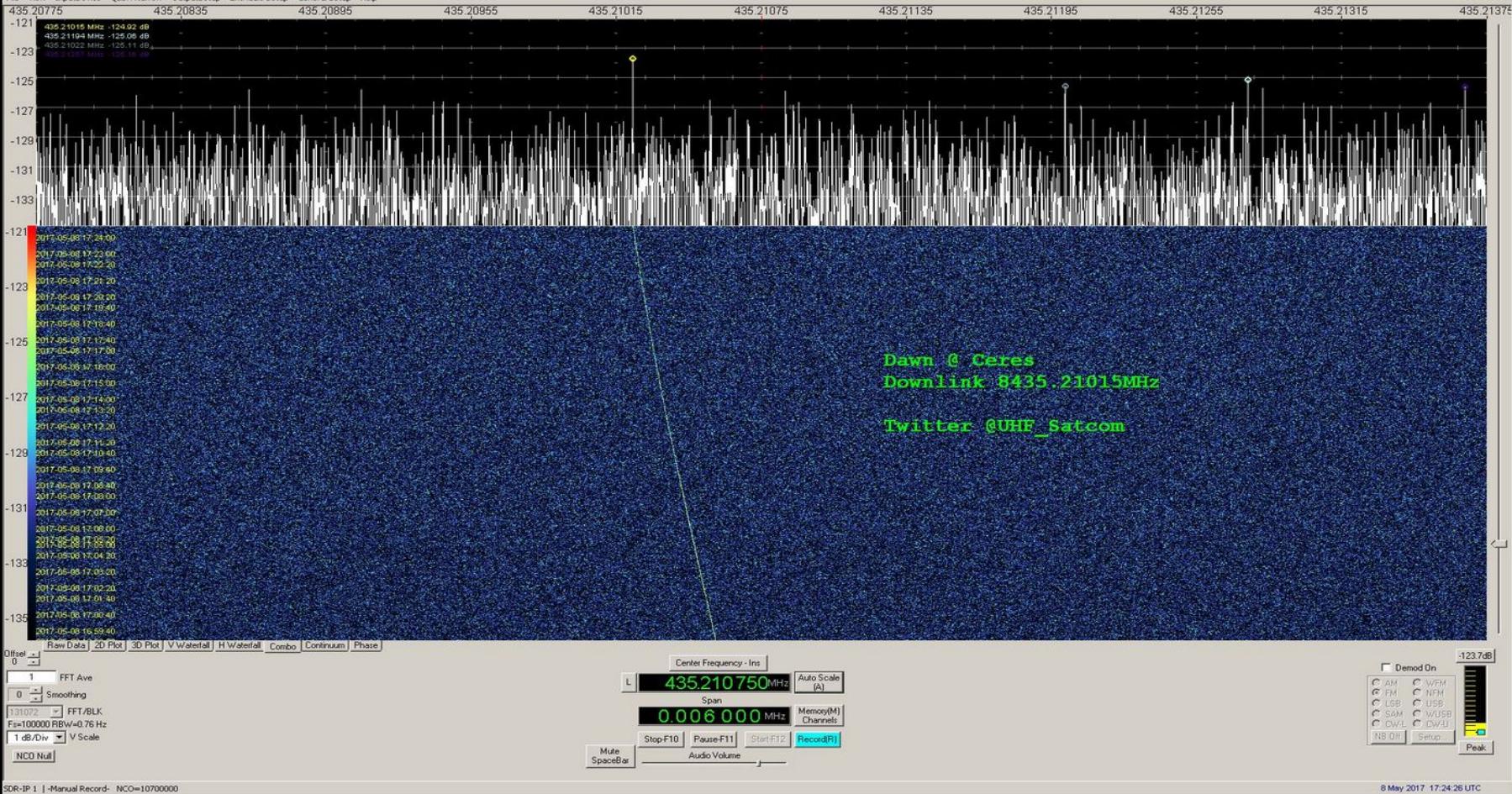
# Radio Astronomy

Super Inexpensive Radio Astronomy  
(Comparatively)

Point at a direction in the sky, let the Earth's rotation do the scanning for you

Use old DirecTV dish





 UHF Satcom @uhf\_satcom · 7h

NASA DAWN spacecraft [dawn.jpl.nasa.gov](http://dawn.jpl.nasa.gov) x-band downlink signal, spacecraft 30.691131 light minutes away [pic.twitter.com/DsLnZxdC51](https://pic.twitter.com/DsLnZxdC51)



# JLENS

The blimp!

Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System  
Army based project to 'monitor for threats'

Narrow FM, several signal fingerprints

- Early: Simple encoded messages
- Some RTTY
- Call-Response
- RADAR

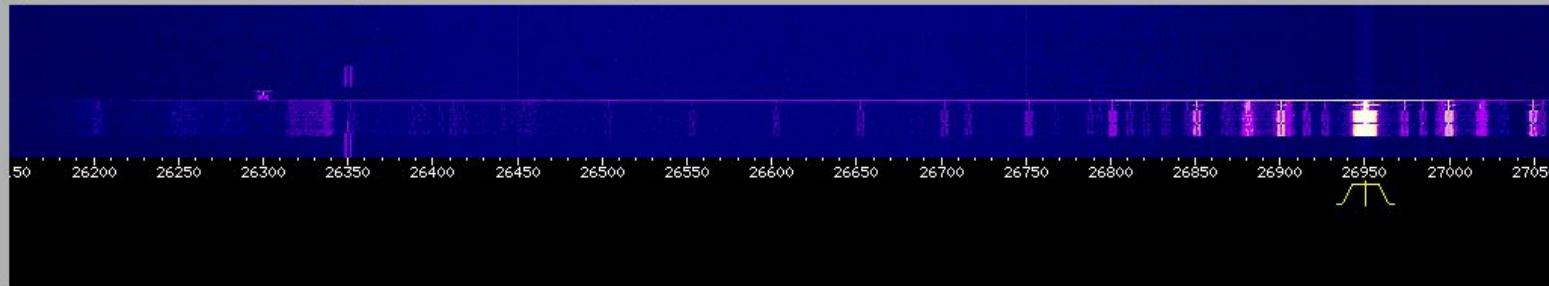




Please log in by typing your name or callsign here (it will be saved for later visits in a cookie):

View:  waterfall  blind

Allow keyboard:



26950.03 kHz A/B A=B

--- -- - + ++ +++

CW LSB USB AM FM AMsync

Volume:   mute

Filter: 13.53 kHz

squelch  autonotch

Audio recording



Waterfall zoom

- +  
band  
>< <>

TRY IT OUT NOW!  
<http://websdr.org>

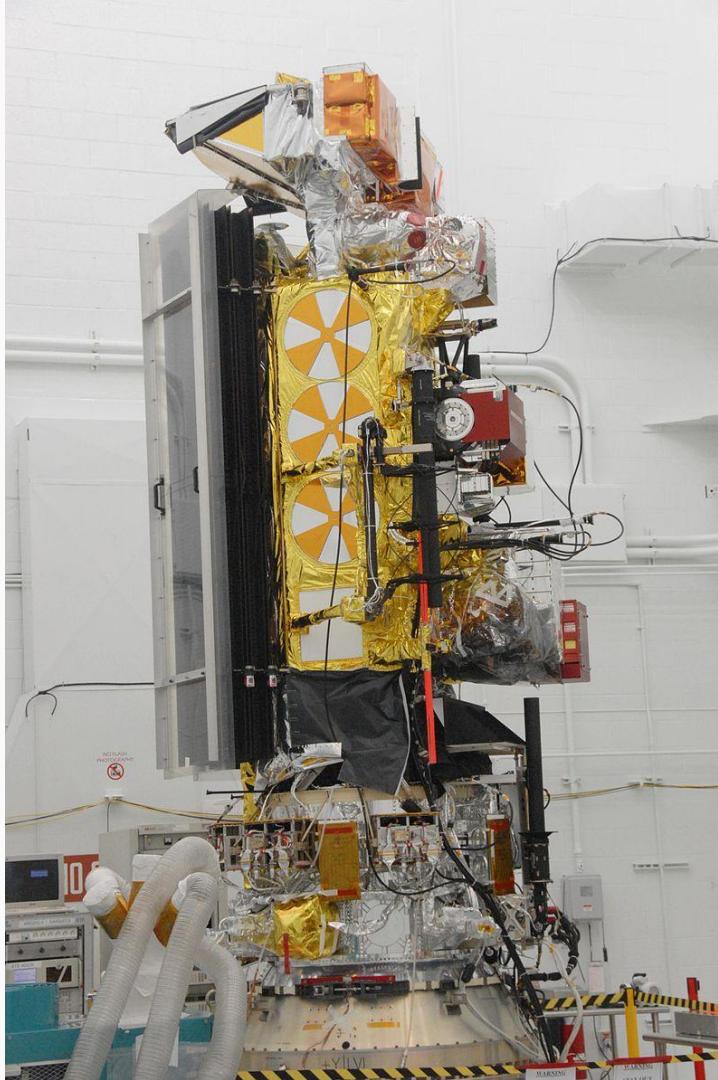
# Going Further...

- Start listening right now: <http://websdr.org/>
- Fancier antennas
  - Pizza pans? 'Long Wire' Antennas? Yagi?
- Low Noise Amplifiers
  - <http://www.rtl-sdr.com/building-homemade-rtl-sdr>
- Up/Down-converters
  - Ham-It-Up  
<https://www.nooelec.com/store/ham-it-up.html>
  - SUP-2400: DirecTV Up/Down converter:  
\$5 gets you 2.4GHz range
- Better SDR hardware
  - AirSpy- \$100
  - LimeSDR- \$250
  - USRP- \$2,500
- Pair your SDR with a Raspberry Pi to transmit:  
<https://github.com/F50EO/rpitz>
- Get your ham license
  - \$15 for the test, allows to transmit on licensed frequencies

# NOAA 19 Demo

Come see a live demo of NOAA  
Weather satellite capture!

4:10 PM to 4:30 PM  
(Just after the Closing Keynote)



# Thank you!

Twitter: @tswartz07

GitHub: <https://github.com/tomswartz07>

Slides and other SDR info: <https://github.com/tomswartz07/CPOSC2017>