Intro to Winlink

SASTAR

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What is Winlink?

Winlink is a worldwide network administered by hams that provides email where the Internet is not present

- Built, operated and administered by licensed ham radio volunteers
- Support is provided by the Amateur Radio Safety Foundation, Inc. (ARSF), - a US-based, non-profit, public benefit entity
- Winlink Global Radio Email® is a US registered trademark of the ARSF

Who Uses Winlink?

- **Amateur Radio Operators**
  - Email over HF/VHF
  - Requesting wx forecasts and machine-readable GRIB files (GRIdded Binary)
  - Participating in traffic nets
- **Emergency communications organizations**
  - ARES (Amateur Radio Emergency Service)
  - RACES (Radio Amateur Civil Emergency Service)
  - Local emergency management agencies and NGOS involved in disaster response
- **Offshore sailors**
  - Wx forecasts, GRIB wx files, email, position reporting
- **Remote Operating**
  - DXpeditions, scientific field stations
- **Government auxiliary radio services**
  - MARS (Military Auxiliary Radio System)

Use of Winlink via RF requires amateur radio operator certification

Brief History

- Grew out of key technologies: Packet radio (AX.25) on VHF/UHF, HF AMTOR for long-distance messaging and BBS-style packet mailboxes
- In ***early 1980s***, Victor Poor (W5SMM) developed APlink that connected HF AMTOR and VHF/UHF packet BBS networks ➔ Winlink Classic in early 1990s
- ***Netlink*** component added that allowed radio messages to be gatewayed into Internet email and Internet email to be delivered back over ham radio
- ***Winlink 2000*** was a complete redesign that introduced
  - Global server network
  - ***Automatic RMS gateway stations***
  - Internet backbone linking radio gateways
  - Improved client software
- ***Soundcard modes*** and Open Access (2010s) – **WINMOR,ARDOP, VARA HF/FM**
- **Modern Winlink (Today) – Thousands of RMS gateways**
  - Radio email
  - Wx file retrieval
  - Position reporting
  - Bulletin distribution
  - Emergency messaging

What is an RMS Gateway?

An *RMS gateway* is a key component of Winlink. It stands for "*Radio Message Server*" and acts as a bridge between amateur radio and the Internet (like a "post office" that moves email to and from ham radio operators).

The RMS allows hams to send/receive email without a direct Internet connection:

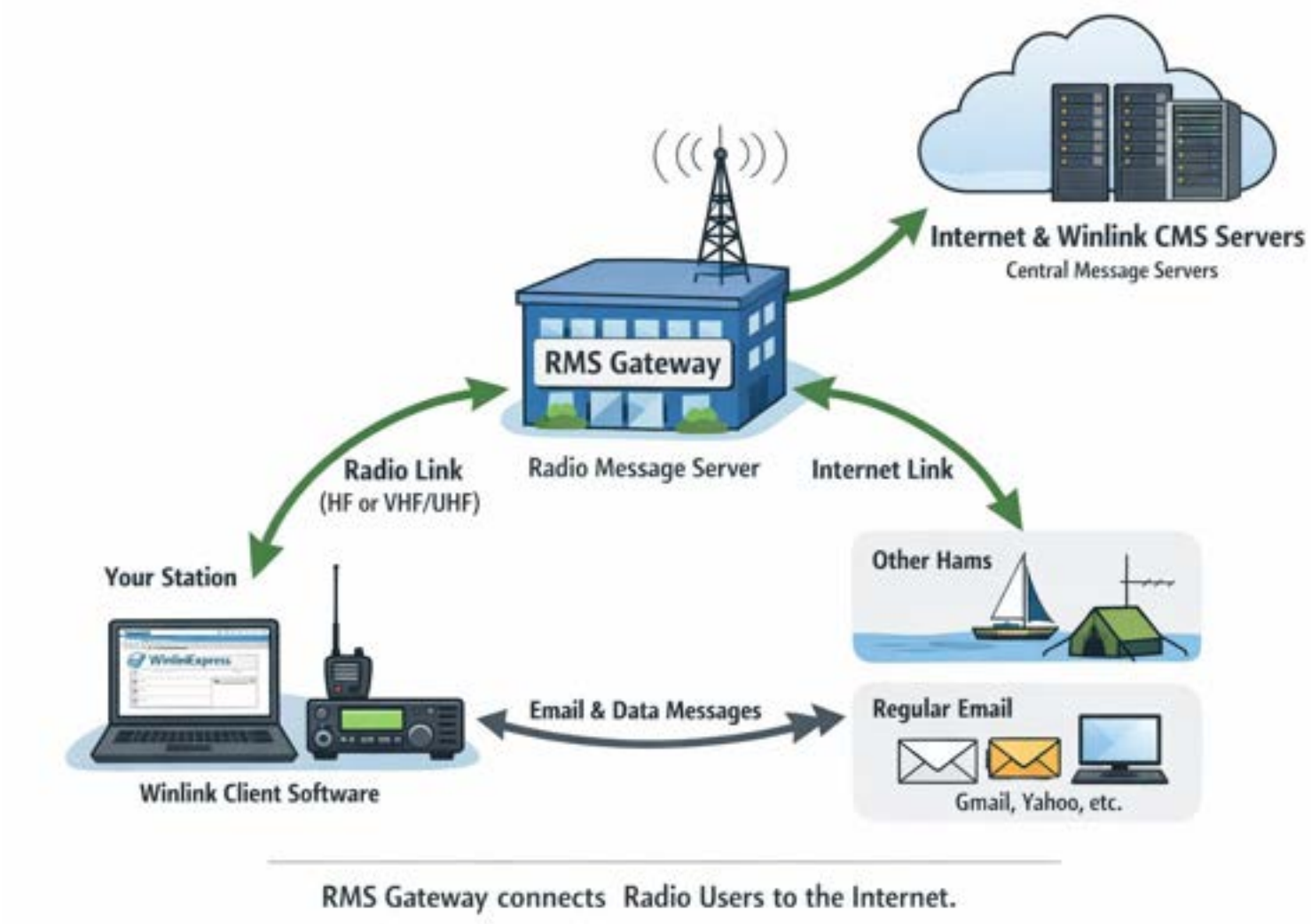
1. **It receives messages from users over radio**
   - HF/VHF/UHF using modes like PACTOR/WINMOR/ARDOP/VARA
2. **It routes the messages to the Winlink network**
   - Can send emails to Gmail, Outlook, etc. or another Winlink user
3. **Delivers messages back to users over radio**
   - Acts like a "mail drop" for offline operators (at sea, remote, etc.)

How Does it Work?

- **USER SIDE:**
  - You use a client (e.g., Winlink Express) to compose your email on a Windows PC (Note: WoAD is a Winlink alternative for Android but does not support VARA. There is no iOS version of Winlink as of yet.)
- **Radio Link:**
  - Your message is transmitted over HF/VHF to a nearby RMS gateway by linking to an application that generates the tones and is connected to a transceiver (TNC)
- **Gateway:**
  - The RMS receives the message and forwards it over the Internet to the recipient
- **Incoming Mail:**
  - If someone sends you email, the RMS stores it and waits for you to connect over radio to pick it up (Note: retention of emails is about 21 days)

This is called "**store-and-forward messaging**", which is perfect for intermittent or low bandwidth connections.

How Does it Work?



RMS Gateway connects Radio Users to the Internet.

VHF Example

I'm doing a SOTA activation and need to email for help. Fortunately, I'm within range of a 70cm node running an RMS Packet gateway and TNC. I've brought my dual band HT and a small laptop. How do I send an email via Winlink?

Having planned ahead, I've already installed and configured the Winlink Express and VARA FM software on my laptop.

VHF Example – Cont'd

Step 1: Connect radio's spkr/mic to interface (Signalink, TNC) and connect Signalink to laptop (USB)

Step 2: Configure Winlink Express (callsign & grid square),

Step 3: Set up a VHF session by selecting "VARA FM" (or the soundcard mode supported by interface)

Step 4: Choose the RMS gateway you can reach on your VHF frequency (Winlink's RMS list shows which ones are VHF/FM)

Step 5: Open Winlink Express and click "New Message"

Step 6: Enter recipient email address, subject, body text

Step 7: *Connect to RMS gateway by clicking "Connect"*

Step 8: Once connected, the RMS gateway receives your email, forwards it over the Internet to the recipient and if there are any stored emails for you, you will receive them.

Step 9: Disconnect.

VHF Example – Cont'd

Before heading out, I've already checked out the nearest RMS

Go to: *https://winlink.org/RMSChannels* And up pops a map of the world.

NOTE: VE6FAR is not a repeater so it doesn't show up in Repeaterbook.
It runs VARA FM in AX.25 packet mode on 431.000 MHz.

HF Example

I'm now camping in the back country (no cell coverage) but have my HF rig, laptop and solar batteries with me. An emergency arises and I need to contact someone for help.

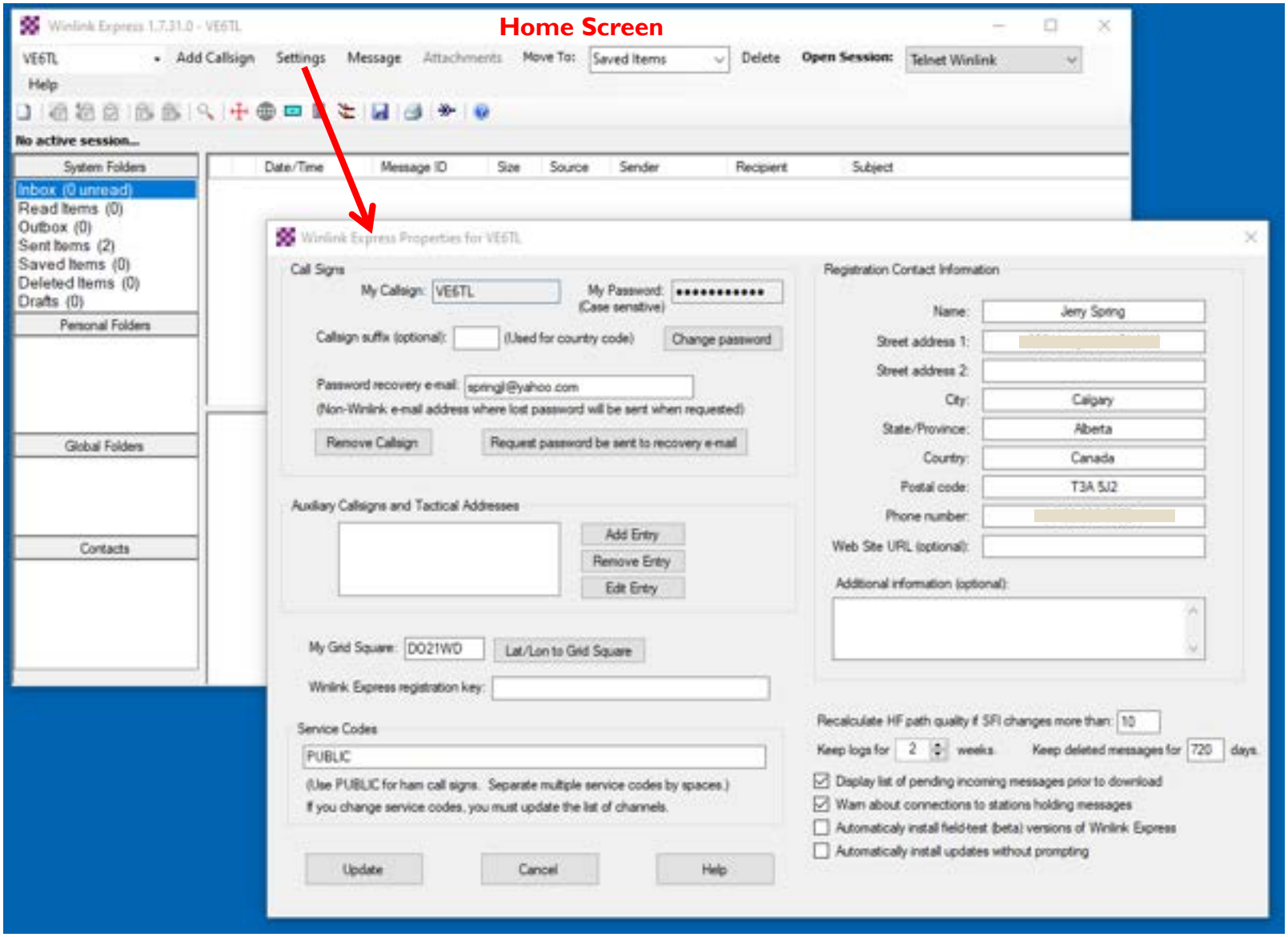
Having planned ahead, I've already installed and configured the Winlink Express and VARA FM software on my Windows laptop.

Basic configuration:

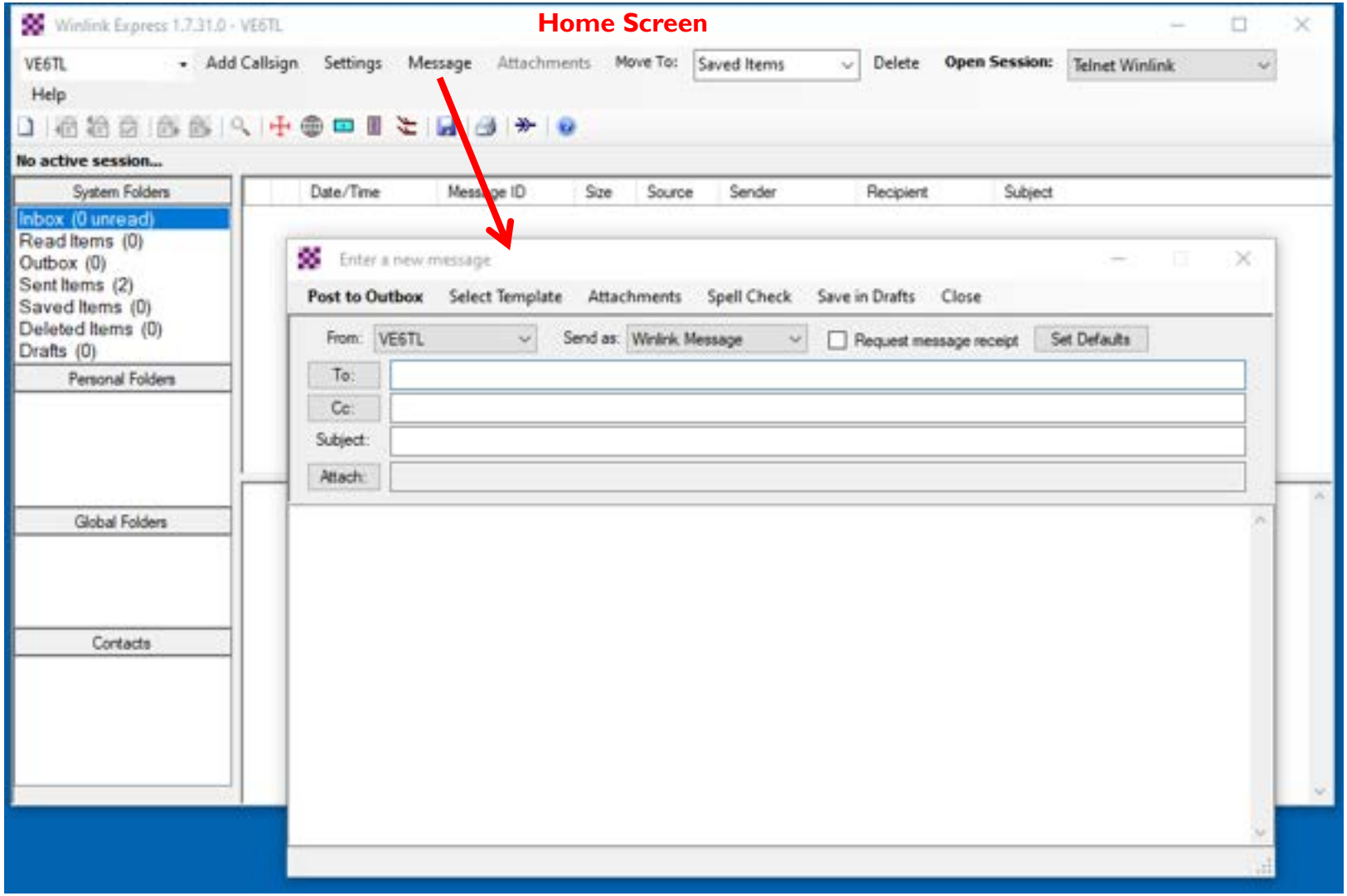
Freq found on website, listing VARA

Callsign:	VE7RUR
Frequency:	7102.800 KHz
Gridsquare:	CN89QC
Antenna:	Omni
Operating Mode:	VARA / VARA
Operating Hours:	00-23
Last Status Received:	2026-03-24 14:08 -06:00

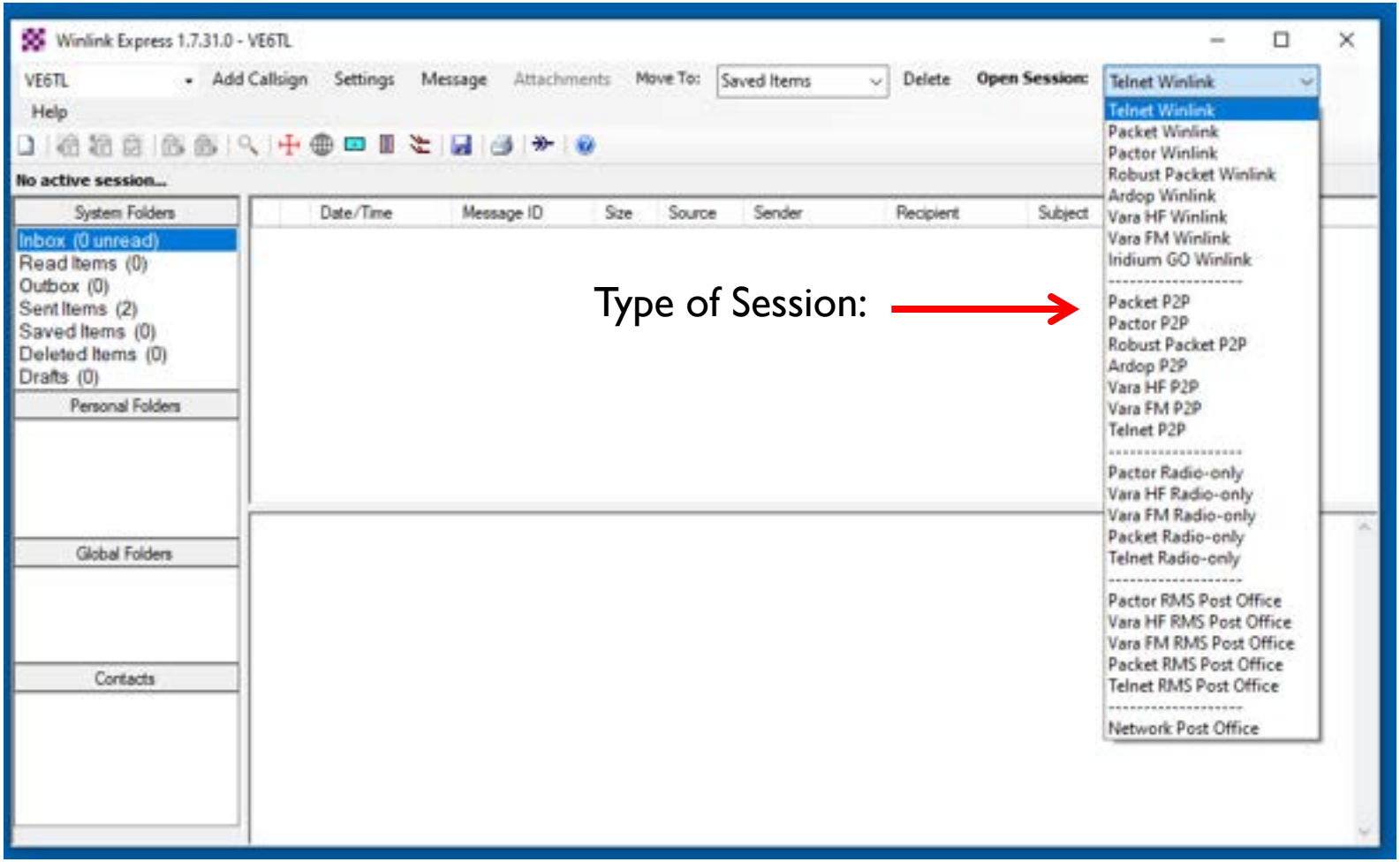
Winlink Express - Settings



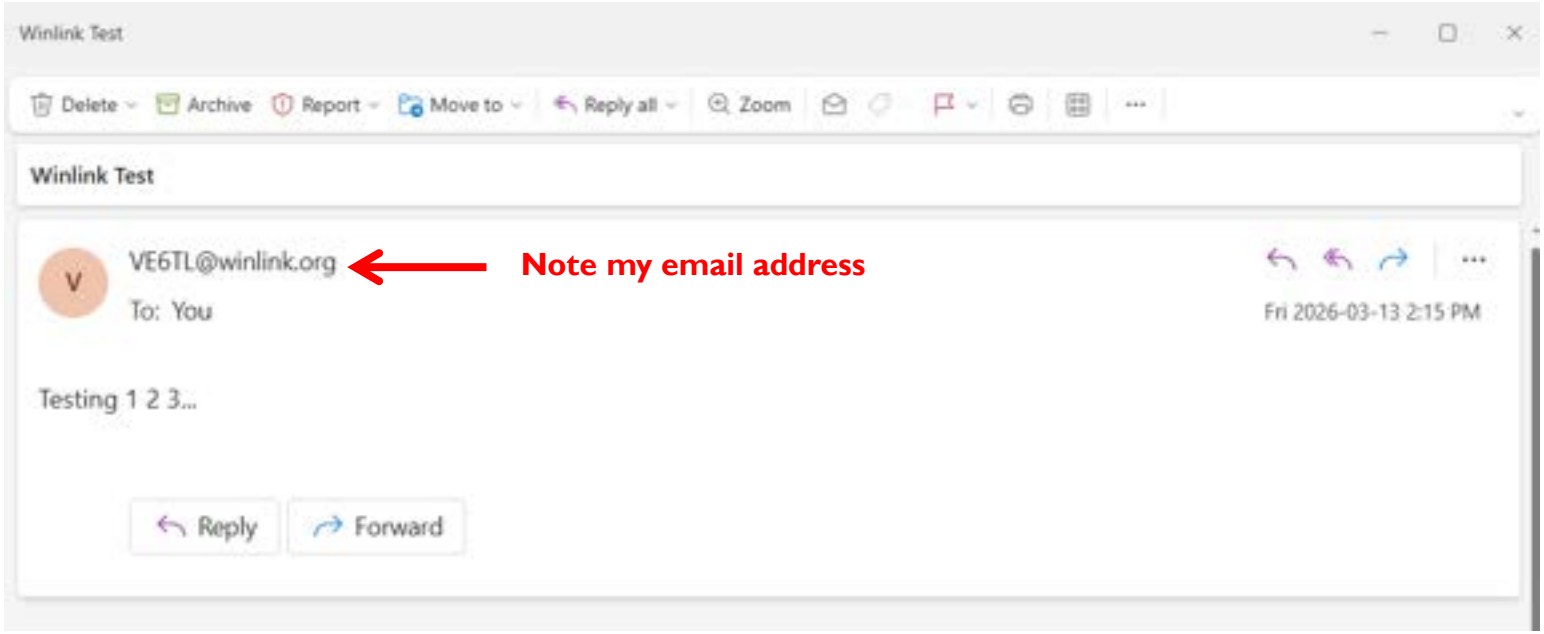
Winlink Express - Message



Winlink Express - Sessions



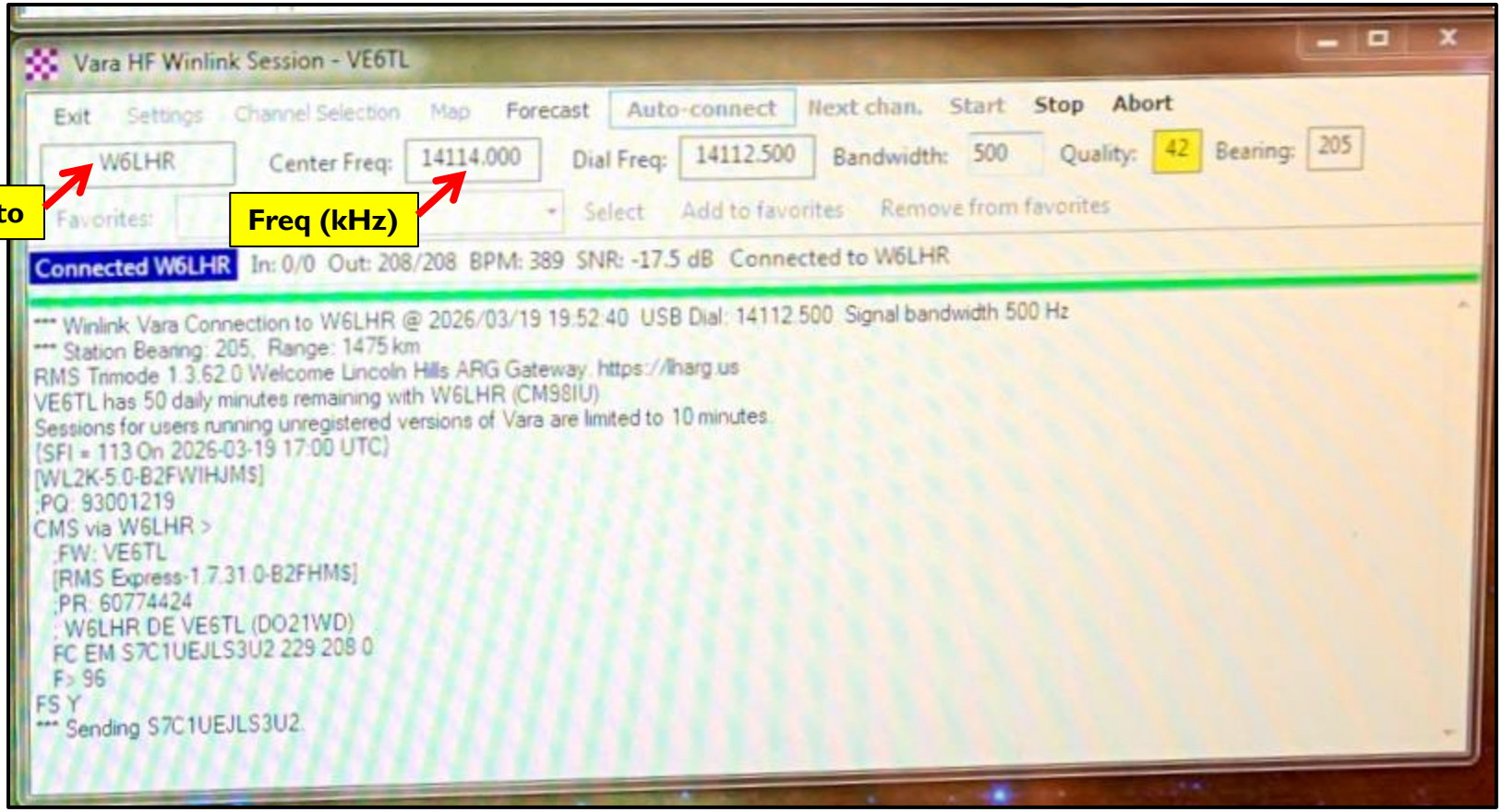
Winlink Express – Received Email via Telnet



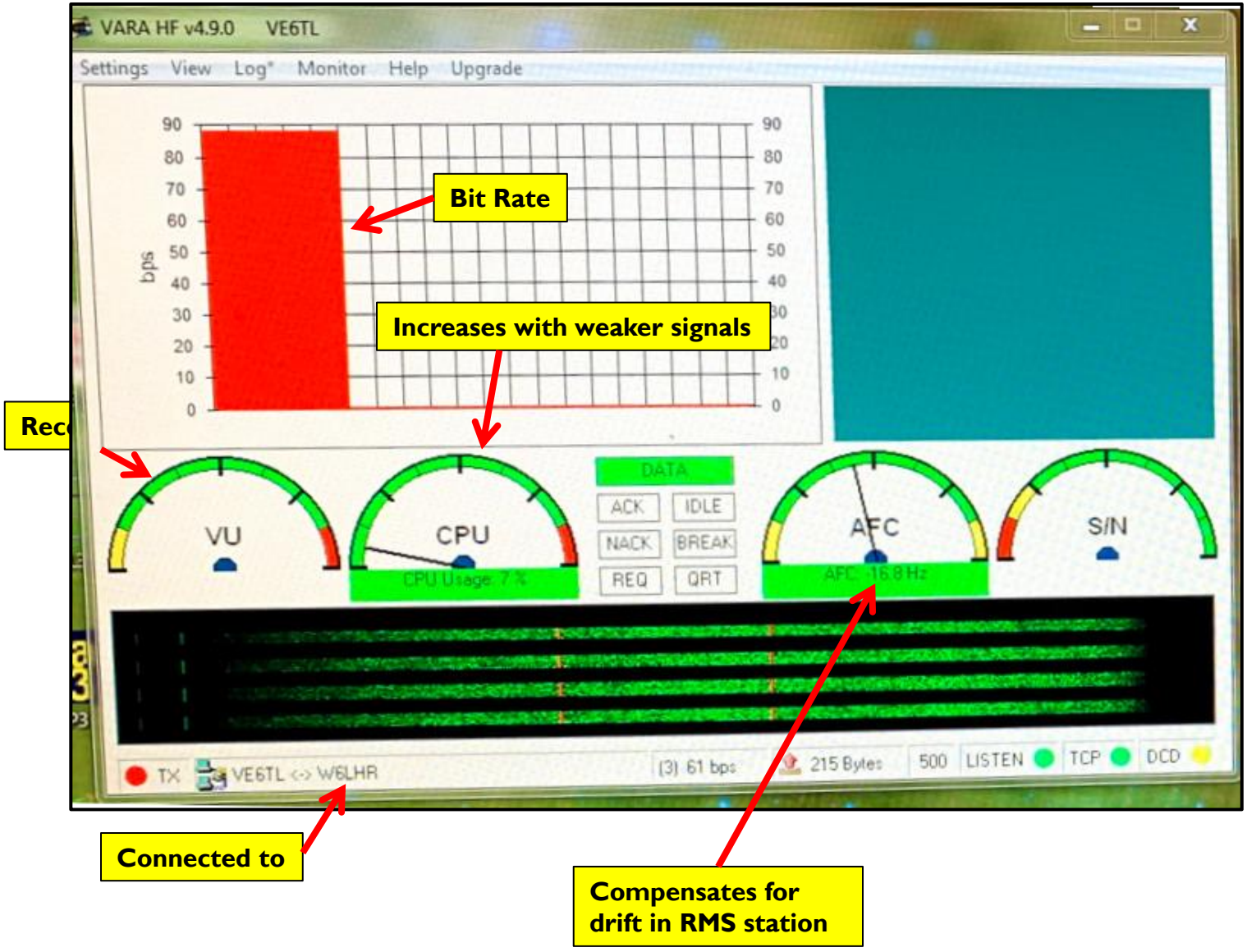
Winlink Express – VHF/UHF

- Typically uses Packet (AX.25) or VARA FM
- VARA FM is much faster than packet
- This requires a USB soundcard interface or TNC
  - Popular soundcard interfaces include the Signalink USB, the RIGblaster nomic, and the RIGblaster Plug & Play
  - Yaesu also sells the SCU-17 Wireless USB Interface Unit that gives USB audio (and Bluetooth for some functions) so you can connect to a PC without separate soundcard interface
- Some radios have a built-in TNC (Kenwood TH-D74A/TH-D75A)
- Most VHF/UHF radios cannot be directly connected to a PC
  - Do not expose baseband audio over USB
  - No CAT + audio integration
  - No internal modem usable by external software
- Icom IC-705 and Icom IC-7100 are not HTs but they can connect to a PC via a USB cable and have a built-in sound card. These work directly with Winlink, VARA, and WSJT-X

Winlink Express – With VARA HF



Winlink Express – With VARA HF



How does VARA HF work?

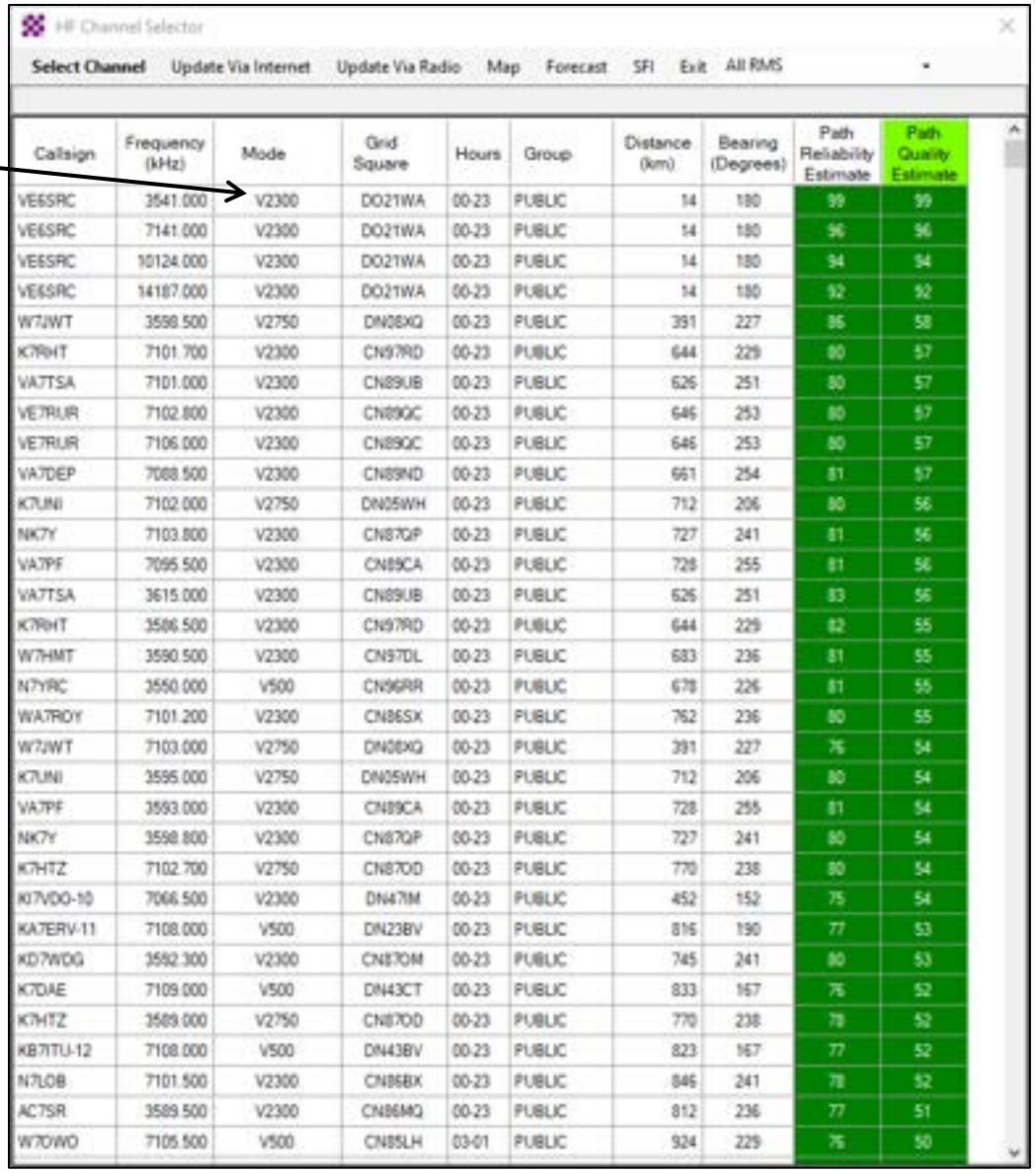
- **From received signal:**
  - Measures SNR
  - Measures Error Rate
  - Measure stability (QSB)
- Based on these measurements, **dynamically sets data rate, FEC level, interleaving (counteract QSB) and packet size**
- **Does not:**
  - Predict ionospheric propagation (no HF modeling)
  - Does not use solar data or MUF predictions
  - Estimate band openings
- Will not transmit if the frequency is “busy” (cannot decode the RF energy in its passband (like CW)

Global Map of RMS

- **In Winlink Express:**
  - Open Session ➔ VARA HF Winlink
  - It asks if you would like to update RMS listing
  - Go to Map tab

HF Channel Selector

V2300 = 2.3 kHz audio bandwidth ➔ speed



Callsign	Frequency (kHz)	Mode	Grid Square	Hours	Group	Distance (km)	Bearing (Degrees)	Path Reliability Estimate	Path Quality Estimate
VE6SRC	3541.000	V2300	DO21WA	00-23	PUBLIC	14	180	99	99
VE6SRC	7141.000	V2300	DO21WA	00-23	PUBLIC	14	180	96	96
VE6SRC	10124.000	V2300	DO21WA	00-23	PUBLIC	14	180	94	94
VE6SRC	14187.000	V2300	DO21WA	00-23	PUBLIC	14	180	92	92
W7JWT	3598.500	V2750	DN08XQ	00-23	PUBLIC	391	227	86	58
K7RHT	7101.700	V2300	CN97RD	00-23	PUBLIC	644	229	80	57
VA7TSA	7101.000	V2300	CN89UB	00-23	PUBLIC	626	251	80	57
VE7RUR	7102.800	V2300	CN89QC	00-23	PUBLIC	646	253	80	57
VE7RUR	7106.000	V2300	CN89QC	00-23	PUBLIC	646	253	80	57
VA7DEP	7088.500	V2300	CN89ND	00-23	PUBLIC	661	254	81	57
K7UNI	7102.000	V2750	DN05WH	00-23	PUBLIC	712	206	80	56
NK7Y	7103.800	V2300	CN87QP	00-23	PUBLIC	727	241	81	56
VA7PF	7095.500	V2300	CN89CA	00-23	PUBLIC	728	255	81	56
VA7TSA	3615.000	V2300	CN89UB	00-23	PUBLIC	626	251	83	56
K7RHT	3586.500	V2300	CN97RD	00-23	PUBLIC	644	229	82	55
W7HMT	3590.500	V2300	CN97DL	00-23	PUBLIC	683	236	81	55
N7YRC	3550.000	V500	CN96RR	00-23	PUBLIC	678	226	81	55
WA7ROY	7101.200	V2300	CN86SX	00-23	PUBLIC	762	236	80	55
W7JWT	7103.000	V2750	DN08XQ	00-23	PUBLIC	391	227	76	54
K7UNI	3595.000	V2750	DN05WH	00-23	PUBLIC	712	206	80	54
VA7PF	3593.000	V2300	CN89CA	00-23	PUBLIC	728	255	81	54
NK7Y	3598.800	V2300	CN87QP	00-23	PUBLIC	727	241	80	54
K7HTZ	7102.700	V2750	CN87OD	00-23	PUBLIC	770	238	80	54
KI7VDO-10	7066.500	V2300	DN47IM	00-23	PUBLIC	452	152	75	54
KA7ERV-11	7108.000	V500	DN23BV	00-23	PUBLIC	816	190	77	53
KD7WDG	3592.300	V2300	CN87OM	00-23	PUBLIC	745	241	80	53
K7DAE	7109.000	V500	DN43CT	00-23	PUBLIC	833	167	76	52
K7HTZ	3589.000	V2750	CN87OD	00-23	PUBLIC	770	238	78	52
KB7ITU-12	7108.000	V500	DN43BV	00-23	PUBLIC	823	167	77	52
N7LOB	7101.500	V2300	CN86BX	00-23	PUBLIC	846	241	78	52
AC7SR	3589.500	V2300	CN86MQ	00-23	PUBLIC	812	236	77	51
W7DWO	7105.500	V500	CN85LH	03-01	PUBLIC	924	229	76	50

Winlink – Key Takeaways

- **Email over radio** when Internet is unavailable
- **Global system** using RMS gateways as bridges
- **Multiple modes** (VARA, ARDOP, Packet, PACTOR) for adaptability
- **Store-and-forward** messaging – doesn't require real-time connection
- **Critical for emergency and backup communications**
- **Still requires good radio knowledge** (propagation, setup, tuning)

"Winlink turns a radio into a resilient communications system – one that works when everything else doesn't"