Contributors

Bryan Nehl, K0EMT, MO ARES, Moniteau County EC
Wayland McKenzie, K4CHS, Missouri Repeater Council, Coordinator
Joseph Counsil, K0OG, MO ARES, Former Digital Communications Coordinator
Stephen Devine, KC0BXQ, MO State HP, Frequency Coordinator, SIEC Chair
Steve Makky, Sr., KA2AYR, Missouri SIEC, Secretary
Kurt Bleich, KB0HNR, Moniteau County EMA, Director
Mel Whitten, K0PFX, MO Amateur Packet Society (MOAMPS)
Richard Stump, N0QOI, MO SEMA, Communications Officer
Gene McGahey, AL7GQ, NPSTC Amateur Radio Service Work Group

Reading this document

Please make note of your questions as you read the document.
As you continue reading through some of the examples will make more sense as additional terms/contexts are defined.
If terms/concepts are still not clear, please contact the author(s).

On going development of this document is being done in the MO-ARES yahoo group. Alternately, you may email your comments/suggestions to Bryan at k0emt@arrl.net.

Why

Interoperability in this document refers to the ability of ARES groups and individuals involved in a coordinated response to communicate with each other.

In the event of an emergency or exercise, an interoperability plan can address connectivity issues and increase the effectiveness and speed of the response.

The idea is if you have these VHF frequencies in your rig, you will be able to start working as a communicator no matter where you are in the state. This plan is designed to augment your existing structure, not totally replace it. If you have an operational repeater or simplex net, by all means utilize it. However, please continue to monitor HVCall.

The APRS/Packet/DATA frequencies are meant to supplement your existing plan and the Missouri Emergency Packet Network (MEPN).

Example:
Instead of having one Moniteau ARES op contacting Cole ARES to pass traffic for MARS on one freq and another Moniteau op contacting Morgan ARES to pass MESN traffic on a different freq (both with active directed nets- assuming we know the frequency on which to contact them). One op could go to "HVCall" and contact the Liaison stations for Cole and Morgan. Once they have made contact they could QSY to HVTac6 to pass the traffic, leaving the call freq clear. *"Morgan, QSY to HVTac6, I'll call you. Moniteau, K0EMT."*

Neighboring Districts only need to know the one frequency to contact each other.

Naming

Public Safety (PS) Interoperability frequencies are VTAC # and UTAC #. The ARES/Ham Radio frequencies are prefixed with an H to distinguish them from the PS freqs.

To alleviate confusion, standard mnemonics shall be used in all equipment to refer to individual channels. These are listed in the table below. Should the equipment not be capable of alphanumeric channel mnemonics, the radio should be placarded to indicate the channel mnemonic and its corresponding position on the radio's selector switch.

Naming Guide

V refers to 2M VHF
U refers to 70cm UHF
L refers to 6M 'Low Band' VHF, scene ops
M refers to 6M 'Mobile Low Band' VHF, wide area/mobile

Frequencies

These frequencies were determined by cross referencing the ARRL band plan with the Missouri Repeater Council band plan.

VHF 'Wide Area' Frequencies

Mnemonic	Freq	TX CTCSS	Primary MSHP District
HVCall	146.550	CSQ	Statewide
HVStage	147.555	100.0	Statewide
HVAPRS	144.990	CSQ	Statewide
HVData	144.910	CSQ	Statewide
HVPacket	144.950	CSQ	Statewide
HVTac0	147.495	100.0	Primary Digital Voice Frequency
HVTac1	145.600	100.0	Alpha
HVTac2	145.650	100.0	Bravo
HVTac3	145.700	100.0	Charlie
HVTac4	146.400	100.0	Delta
HVTac5	146.445	100.0	Echo
HVTac6	146.505	100.0	Foxtrot
HVTac7	146.595	100.0	Golf
HVTac8	147.405	100.0	Hotel
HVTac9	147.450	100.0	India

UHF 'Scene' Frequencies

Mnemonic	Freq	TX CTCSS
HUCall	446.000	CSQ
HUAPRS	446.150	CSQ
HUData	446.200	CSQ
HUTac1	445.900	100.0
HUTac2	445.925	100.0
HUTac3	445.950	100.0
HUTac4	445.975	100.0
HUTac5	446.025	100.0
HUTac6	446.050	100.0
HUTac7	446.075	100.0
HUTac8	446.100	100.0

6M ' Wide Area/Mobile' Frequencies

Mnemonic	Freq	TX CTCSS	Primary MSHP District
HMCall	52.550	CSQ	Statewide
HMData	52.790	CSQ	Statewide
HMTac0	52.710	100.0	
HMTac1	52.310	100.0	Alpha
HMTac2	52.350	100.0	Bravo
HMTac3	52.390	100.0	Charlie
HMTac4	52.430	100.0	Delta
HMTac5	52.470	100.0	Echo
HMTac6	52.510	100.0	Foxtrot
HMTac7	52.590	100.0	Golf
HMTac8	52.630	100.0	Hotel
HMTac9	52.670	100.0	India

6M ' Scene' Frequencies

Mnemonic	Freq	TX CTCSS
HLCall	52.450	CSQ
HLTac1	52.530	100.0
HLTac2	52.730	100.0
HLTac3	52.690	100.0
HLTac4	52.650	100.0
HLTac5	52.610	100.0
HLTac6	52.570	100.0
HLTac7	52.750	100.0
HLTac8	52.330	100.0

Repeaters

Specifics for repeater use will be determined on a per incident basis. Use the simplex part of the plan to disseminate the repeater frequencies and PL. Operators should be prepared (have manual) to program odd splits if needed, PL's, etc.

Mode of Comms

20K0F3E, standard FM voice.
As NBFM becomes more prevalent in the future, this may be revised.

Tone/CTCSS

Calling frequencies - NO PL, NO CTCSS, NO DCS
Tactical frequencies - PL/CTCSS 100.0

This Tone was chosen to avoid interference from or interfering with Public Safety entities using 156.7.

Do NOT use CTCSS unless needed to help manage QRM.
ALWAYS transmit PL.

Power Output

Users are strongly encouraged to increase antenna gain and directionality before increasing power.

No more power than the minimum needed to establish a near full-quieting circuit.

Adhere to the FCC regs requiring the use of the minimum power needed to establish the circuit and RF Safety limits.

VHF - 2M and 6M

Base Station	200 watts max
Mobile Station	100 watts max
Field Station	50 watts max

Tactical Frequencies used 'On Scene' 5 watts max

UHF

The UHF frequencies are intended for on scene operations. For this reason and to minimize the possibility of interfence with other stations:

Base Station	35 watts max
Mobile Station	35 watts max
Field Station	35 watts max

Tactical Frequencies used 'On Scene' 5 watts max

Time Out Timer (TOT)

When possible, the following TOT guidelines should be followed. All stations not operating in mobile relay mode, where permitted, shall employ a time out timer set to limit transmission duration to a period of no greater than 60 seconds (1 minute).

All stations operating in mobile relay mode, where permitted, shall be configured to immediately drop transmit carrier upon cessation of input signal. Reasonable hysteresis time in squelching action of weak received signals, or in signals that have achieved a critical bit error rate (BER) are permitted. Prolonged "hang time" in excess of 500 ms is not permitted.

Priority Levels

1. Emergency or urgent operation involving imminent danger to life or property;

2. Disaster or extreme emergency operation for mutual aid and inter-agency communications;

3. Special event control, generally of a preplanned nature (including Task Force operations)

4. Joint training evolutions

   To resolve contention within the same priority, assuming all radio equipment is exercising the lowest output and effective radiated power level practicable, the channel should go to the organization with the wider span of control/authority. This shall be determined by the SEC/DEC for the operation or by the levels of authority/government identified in the contention.

Use

How could these frequencies be used?

Calling

Pt to Pt contacts, Administrative level contacts NOT tactical comms

After contact has been established, change frequency to the primary frequency of the calling party or the frequency directed. The calling party will then initiate the exchange.

(See example above and Primary Intra-District Comms below)

Alert paging and SCADA operations are not permitted on Calling or TAC channels. Temporary base station receivers shall not be muted by either selective calling alert mechanisms or DTMF signaling devices.

VHF

HVCall may be used to INITIATE contacts for:

District to District
County to County
Mobile/Rover to County
Incoming amateur response to IC or amateur section chief

HVCall IS THE PRIMARY CALLING CHANNEL OF THIS PLAN.

Command/NCS should have someone assigned to monitor this frequency.

HUCall, HMCall and HLCall are *secondary* calling channels.

Command/NCS may not be monitoring these frequencies.

UHF

HUCall similar to HVCall

Primarily Intra-County use and on site tactical use.

6M

HMCall similar to HVCall
HLCall similar to HUCall

The 'M' frequencies are for Point to Point and Mobile operations.
The 'L' frequencies are intended for on scene tactical operations.

Staging

HVStage is used by hams responding in to an area to check in to staging. When Mutual Aid Teams have been requested, this is where they will check in.

Primary Intra-District Comms

APRS

HVAPRS is used for VHF APRS networks.
HUAPRS is used for local UHF APRS networks.

Packet

Packet is traditional Packet, NOT APRS.

Data

HMData is used for wide area inter-district networks.
HVData is used for intra-district networks.
HUData is used for 'scene' data links/networks.

Local area determines protocol, DCC guidelines should be followed.
May be used for PSK31, MFSK, 9600baud Packet, APRS, JT44, etc.

Could be modulated with either FM or SSB depending upon stations mode capabilities.

If additional data channels are needed, stations could move up in 10 KHz increments.

VHF

HVTac1-HVTac9 would be primarily for use within the District's Alpha-India for county to county traffic. Counties in District A would primarily change frequency to HVTac1 after making contact on the HVCall frequency.

UHF

Be aware that in your area HUTac1 - HUTac4 may be used as a repeater link frequency. HUTac5 - HUTac8 may be in use for digital comms. Determine this ahead of time so you can adjust your response appropriately.

Since the tactical frequencies are intended for use by low power portable stations within a limited geographic area, you should be able to use the same frequency at multiple locations.

Suggested use of non-primary HVTac frequencies

Note: You may also opt to use an existing repeater to support any of these tasks.

Also, keep in mind that spectrum is a shared resource. **Do not interfere with any existing operation.**

Command/Admin Net

Frequency for Administrative Net
NCS and IC are here
Command or Liaison should also monitor HVCall

Logistics/Resources

Person keeping track of Resources and coordinating procurement of material and personnel is here.

This person will work closely with Staging.
Ideal is to have them co-located.
Staging monitors HVStage.

Digital Modes

A non-primary Tac frequency may be used for digital mode communications. This use should supplement HVPacket and HVAPRS.
HVTac0 would be the ideal frequency to use first.

For instance, you have a team that is equipped with APCO 25 compliant gear. They are assigned to operate on HVTac0. The team leader is also monitoring/checked in to the Command/Admin net.

Tactical Frequencies

Intended for low power portables that have been assigned a specific task. For instance comms may be needed within a shelter location.

The shelter command should be monitoring and checked in to the Admin Net.

Shelter command should:

Determine if a Tactical frequency is needed
Determine a clear Tactical frequency
Advise NCS of the local use of the tac freq, by name

Continue Monitoring their Tactical frequency
Continue Monitoring their NCS assigned Net frequency
Advise NCS when the operation on the Tactical freq has terminated

Security

Frequencies published, same as PS frequencies are published. **No security is implied.** *Systems may be readily monitored.* Participants should recognize that the third man is always listening. Messages, should be brief, to the point and contain no more information than necessary.

Distribution

You are encouraged to distribute this document to all ARES/RACES stations so that they are familiar with the plan and have their radios pre-programmed in the event of an activation.

Interoperability with Public Safety

An ARES/RACES Incident Commander or their designee may use the interoperability frequencies designated by the the Missouri State Interoperability Executive Committee (MO-SIEC) through the authority of their served agency. *The served agency must have completed a MOU with MO-SIEC.* In addition to following the requirements of the SIEC MOU the ARES/RACES station should also follow their served agency's guidelines. The guidelines should be established with an MOU between the ARES/RACES team and the served agency.

Equipment used on these frequencies should be FCC Part 90 type accepted.