

# T-MARC

*The Mid-Atlantic Repeater Council, Inc.*

<http://www.tmarc.org>

## Frequency Coordination Policies and Procedures

The Middle Atlantic Repeater Council (T-MARC) coordinates Amateur VHF and UHF repeater, control, and link frequencies in Washington, D.C., Delaware, Maryland, northern Virginia (that portion north of a line formed by the 38 Degree parallel of latitude extending from the Atlantic Ocean west to US Route 33, then following said US Route 33 to the West Virginia State line), and the eastern five (5) counties of West Virginia (i.e. Berkeley, Hardy, Hampshire, Jefferson, and Morgan). These coordinating policies have been developed from practical experience over the years, reinforced by action of the T-MARC Board of Directors, and affirmed by the General Membership.

1. No coordination's shall be issued or continued when the proposed or existing station operation is in conflict with FCC Rules and Regulations, Title 47 CFR Part 97.
2. All applicants must complete an Application for Frequency Coordination before any action is taken by T-MARC to coordinate a frequency. Incomplete applications will not be acted upon until all requested information is received.
3. The general process for coordination is as follows:
  - o Application received and reviewed for completeness.
  - o Coverage area of a repeater is calculated by means of guidelines in Table 1 below and/or propagation analysis.
  - o A preliminary frequency search is done based on available pairs in T-MARC area and adjacent coordination groups' areas (SERA, ARCC, WPRC, etc.). This step comprises looking at co-channel spacing, adjacent channel spacing, and other co-site or nearby systems in terms of geographic location and frequency.
  - o Upon the preliminary selection of an available pair, a Notice of Proposed Coordination may be sent to adjacent coordination groups for their review. If objections are received, the reasons are considered. If reasons are valid, the proposed coordination is withdrawn and another frequency is selected as done in the previous step. Co-channel, adjacent channel and co-site or other nearby systems may be notified if deemed appropriate.
  - o If no objections are received, a Construction Coordination is sent to the applicant.
  - o Once applicant notifies TMARC that repeater is operational at the coordinated parameters, the Final Coordination is sent to the applicant.
  - o The coordination process may take some time to complete.

4. Repeater geographical spacing will be determined by a repeater's "service radius", i.e., the area within which effective communications can be maintained through the repeater under normal propagation conditions. Abnormal propagation conditions WILL NOT be considered when formulating a coordination. Each repeater's service radius will be determined by factors such as height of the transmitting antenna above ground, height of the transmitting antenna above average terrain (HAAT), and the effective radiated power (ERP) of the transmitter. Satellite receiver location(s) will not be considered in determining the service radius. Simulcast transmitter sites (co-channel) are coordinated independently.

AS A GUIDE, Service Radius will be based upon the criteria of Table I:  
Based on 300 Watts ERP from repeater with .25 uV signal at mobile

HAAT (feet)	50 Mhz	144 Mhz	220 Mhz	440 Mhz	900 Mhz
50	40 Miles	25 Miles	22 Miles	15 Miles	10 Miles
100	47 Miles	32 Miles	29 Miles	20 Miles	15 Miles
200	52 Miles	39 Miles	35 Miles	25 Miles	20 Miles
400	65 Miles	45 Miles	42 Miles	32 Miles	26 Miles
800	80 Miles	55 Miles	48 Miles	39 Miles	32 Miles
1600	120 Miles	65 Miles	53 Miles	45 Miles	39 Miles

TABLE 2

Minimum Repeater Spacing			
A = Wideband (+/- 5 khz Deviation)			
B = Narrowband (+/- 2.5 khz Deviation)			
CHANNEL SPACING	A-A SPACING	B-B SPACING	A-B SPACING
Co-Channel	Comb. Service Radii	Comb. Service Radii	Comb. Service Radii
10 kHz Adjacent	90% of Comb. Srvc Radii	50% of Comb. Srvc Radii	75% of Comb. Srvc Radii
12.5 kHz Adjacent	75% of Comb. Srvc Radii	25% of Comb. Srvc Radii	60% of Comb. Srvc Radii
15 kHz Adjacent	60% of Comb. Srvc Radii	10% of Comb. Srvc Radii	50% of Comb. Srvc Radii
20 kHz Adjacent	50% of Comb. Srvc Radii	0	30% of Comb. Srvc Radii
25 kHz Adjacent	20% of Comb. Srvc Radii	0	10% of Comb. Srvc Radii

Example: Repeater X is an existing UHF analog system that has a service radius of 25 miles. Repeater Y is a proposed UHF analog system with a service radius of 35 miles. The combined service radii is 60 (25 + 35). The minimum distance for 25 khz adjacent channel protection should be 12 miles (60 x 20% = 12).

Spacing guidelines may be amended under appropriate circumstances such as unusual terrain. A propagation analysis program may also be used to determine predicted coverage.

Most proposed coordinations need to be reviewed by neighboring coordination groups. Any proposed repeater that would have coverage into another coordination groups' area or any proposed repeater within the T-MARC area that would be co-channel with a repeater in another coordination groups' area that has coverage extending into the T-MARC area must be presented to the adjacent area coordination group for review. Other coordination groups have criteria for geographic spacing that may differ from T-MARC. Those criteria will be considered in coordination decisions.

5. On bands where adjacent-channel repeater inputs and outputs are inverted (440), the same criteria as described in Table 2 above for 20 khz adjacent-channel spacing will apply.
6. Coordination's will only follow the band plans adopted by the membership.
7. A Sponsor is a person, club, or group that is responsible for a repeater. It is the entity that applies for and is issued a coordination. A club or group must designate an individual to be the spokesperson who is responsible for maintaining communication with T-MARC. Coordinations may be issued to an individual whom may be associated with a club or group. However, any correspondence concerning coordination will only be made to the individual.
8. Applicants for coordination will be issued a "Construction Coordination" that will expire 6 months after issue. This will give time for the sponsor to construct the repeater and place the system in-service. A "Certification of Operational Status" accompanies the "Construction Coordination". This form must be signed by the trustee, licensee, or designated authorized person and returned to T-MARC indicating that the system is operational at the parameters specified on the coordination. A "Final Coordination" will be issued after receipt of the "Certification of Operational Status". If the sponsor is unable to construct the system within the 6 months, a 3 month extension may be requested. This request must be made prior to the expiration date. If granted, the additional 3 months will start on the expiration date of the "Construction Coordination". If the system is still not operational after the additional 3 months, the TMARC Board of Directors will determine if additional time will be allowed for the construction. Supporting documentation from the applicant indicating the reasons for the delay must be submitted.
9. A coordination will be dependant on the availability of frequencies. Applicants may be placed on a waiting list for repeater pairs. This waiting list will be reviewed periodically as frequencies become available. This waiting list will be posted on the T-MARC website in the order of the date received by T-MARC. It should be understood that depending on the locations of proposed systems, it may be possible that a system may be coordinated out of order in which the applications are received.
10. A coordination shall consist of: Name and address of sponsor, name and address of trustee, station call sign, mode (analog, P25, D-Star, etc.), exact station location (lat/long within 1 second), computed service radius, operating frequencies (including receive, transmit, control and link), ERP, antenna HAAT, frequency tolerance, maximum deviation for the appropriate mode, coded access and effective date of the coordination. Directional antenna radiation pattern and other operating parameters may be required under certain circumstances.

11. Coordinations are issued to a sponsor and are not normally assignable or transferable to other sponsors. However, in the event of the demise, incapacitation or resignation of a repeater sponsor, the T-MARC Board of Directors may transfer the coordination to another sponsor provided suitable documentation or communication is provided to T-MARC to support the request.
12. No new coordinations will be issued for carrier squelch systems. Some form of coded access, CTCSS, DCS, or other suitable form of controlled access will be required. It is strongly recommended that existing systems adopt some form of coded access.
13. Request for changes to existing coordinated systems, such as changes to antenna height, location, ERP increase, mode, etc., shall be submitted on the Application for Frequency Coordination prior to the changes being made. Merely notifying T-MARC of any changes does NOT automatically grant the sponsor a revised coordination. The effects of any changes will be analyzed to determine their effect on co-channel, adjacent channel, or co-located systems. If approved, a revised coordination may be sent with a six month expiration date depending on the magnitude of the change. Otherwise a revised coordination will be sent. Systems will be considered un-coordinated if changes are made prior to the issuance of a revised coordination.
14. A new coordination request for a repeater that is planned to have a low HAAT, or a low ERP, or be located in a location with high surrounding terrain or have any other factor that would cause it to have a small coverage area (e.g. 5-10 mile radius) will not be coordinated. Instead it will be recommended that the owner use one of Shared Non-protected Pairs (SNP). This would make more efficient use of the spectrum and allow more opportunity for coordinating new, higher profile systems. The applicant will be clearly informed of the meaning, and use, of the SNPs.
15. Any repeater sponsor that provides a false statement on an application for frequency coordination or other correspondence with T-MARC, shall have any prior or pending coordination request(s) denied or cancelled. Further, new requests for coordination from any sponsor for a repeater at the same location and desired operating frequency band may have a minimum of a one (1) year delay before the new request will be considered.
16. Repeater listings are posted on the T-MARC website. This information contains frequency, state, city, call sign, sponsor, geographic location, and features (i.e.: open, closed, coded access, emergency power, etc.). If it is desired that certain information not be listed, this can be communicated to T-MARC on an Application for Frequency Coordination.
17. All equipment is assumed to be technically comparable to the specifications listed in Addendum 1. Coordinations are derived based on these specifications to keep interference issues to a minimum.

18. For the purposes of testing proposed systems, supporting emergency operations, public service drills, etc., the Shared Non-Protected (SNP) pairs have been designated. These frequency pairs are:
- o 145.1700 out / 144.5700 in
  - o 223.8000 out / 222.2000 in
  - o 442.9000 out / 447.9000 in
  - o 447.875 out / 442.875 in
  - o 920.000 out / 908.0000 in
  - o 927.700 out / 902.700 in
  - o 1283.0000 out / 1271.0000 in

Repeaters operating on the SNP pairs can not expect any interference protection from coordinated co-channel or adjacent channel repeaters or other repeaters operating under the SNP policy. Those repeaters operating on a SNP pair must not cause interference to fully coordinated systems. If any interference occurs, the system operating on the SNP pair must cease operation until the problem can be resolved. Some form of coded access is required for repeaters operating on the SNP pairs.

Linking of SNP repeaters is discouraged to minimize transmitter on time as a courtesy to other co-channel users. This includes linking through RF, wireline, any form of radio over IP (EchoLink, IRLP, Asterisk, DMR networks, etc.)

It should be noted that there may be coordinated repeaters on these frequencies in adjacent coordination areas. Those repeaters will have priority in the use of these frequencies.

19. Harmful interference is defined as: "interference which seriously degrades, obstructs or repeatedly interrupts the operation of a radio communication service" (FCC 97.3)
20. T-MARC shall be notified by the sponsor / trustee in some form of non-verbal communication (email, mail, etc) if an off-the-air condition that is expected to last more than 30 days. Coordinations will be cancelled if a repeater is off the air for more than 90 days regardless of notification. An additional period of 3 months will be considered on a case-by-case basis by the T-MARC Board of Directors if requested by the repeater sponsor or trustee. If a repeater coordination is cancelled, all associated links will also be cancelled and those frequencies will be made available for other applicants.
21. When it has been determined by means of research that a repeater has been inactive for a period of 90 days, frequency coordination will be canceled if the sponsor fails to respond to written inquiries from T-MARC. T-MARC will attempt to contact a sponsor by email and telephone. If those attempts are un-successful, then an attempt will be made by certified mail, return receipt. T-MARC will try all reasonable means of communication to solicit a response. If no response is received from all attempts, then the coordination will be canceled. All T-MARC correspondence will be addressed to the most recent address of record. It is the responsibility of the sponsor to keep T-MARC apprised of its correct mailing address.

22. If it has come to the attention of TMARC that a system is operating below the specified operating parameters of its coordination (e.g. low ERP, low height) in a way that significantly reduces the coverage area, the sponsor will be given a reasonable amount of time, not to exceed 6 months, to bring the repeater back to the coordinated operating parameters. If the sponsor cannot meet that deadline, the coordination may be cancelled, or the coordination may be modified to reflect the existing parameters of the system. This also will make more efficient use of spectrum and allow more opportunity for coordinating new, co-channel or adjacent channel systems.
23. If requested, T-MARC will attempt to resolve disputes between affected parties. T-MARC cannot provide interference measuring or data-gathering evidence. However, sponsors of coordinated repeaters will receive the full support of T-MARC should an unresolved interference problem be brought before the FCC. The sponsors and users of uncoordinated systems will not receive any consideration or interference protection from the operation of existing or future coordinated systems.

## Addendum 1 Recommended Technical Guidelines

### Repeater Transmitter

Frequency Stability:	Wideband (+/- 5khz) +/- 0.0005% (5 ppm) Min. +/- 0.0002% (2 ppm) Recommended
	Narrowband (+/- 2.5 khz) +/- 0.00015 (1.5 ppm)
	-30 to +60 degrees Celsius
Transmitter Sideband Noise:	-90db @ 30 khz, and -100db @ 1 MHz
Spurious & Harmonic Emissions:	At least 80db below carrier
Modulation (deviation)-Total:	No more than +/- 5.0 khz (Wideband) No more than +/- 2.5 khz (Narrowband)
Modulation (deviation)-CTCSS:	No less than +/- 500 hz and no more than +/- 800 hz
CTCSS Tone Accuracy:	+/- 1 Hz of EIA Standard Frequency
Modulation (deviation)-DCS:	No less than +/- 500 hz and no more than +/- 800 hz

### Repeater Receivers

Receiver Sensitivity:	0.25 uV @20db quieting 0.20 uV @12db SINAD
Selectivity:	Wideband (+/- 5 khz ) -75 db @ 12.5 khz, -82db @ 25 khz Narrowband (+/- 2.5 khz) -6 db @ 3.0 khz, -55 db @ 9 khz
Spurious & Image Rejection:	85db
Intermodulation Rejection:	75db
Frequency Stability:	Wideband (+/- 5khz) +/- 0.0005% (5 ppm) Min. +/- 0.0002% (2 ppm) Recommended
	Narrowband (+/- 2.5 khz) +/- 0.00015 (1.5 ppm)
	-30 to +60 degrees Celsius

### Mobile Transmitters

Frequency Stability:	Wideband (+/- 5khz) +/- 0.0005% (5 ppm) Min. +/- 0.0002% (2 ppm) Recommended
	Narrowband (+/- 2.5 khz) +/- 0.00015 (1.5 ppm)
	-20 to +60 degrees Celsius
Transmitter Sideband Noise:	-90db @ 30 khz, and -100db @ 1 MHz
Spurious & Harmonic Emissions:	At least 60db below carrier
Modulation (deviation)-Total:	No more than +/- 5.0 khz (Wideband) No more than +/- 2.5 khz (Narrowband)
Modulation (deviation)-CTCSS:	No less than +/- 500 hz and no more than +/- 800 hz
CTCSS Tone Accuracy:	+/- 1 Hz of EIA Standard Frequency
Modulation (deviation)-DCS:	No less than +/- 500 hz and no more than +/- 800 hz

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