WIRELESS MICROPHONES AND INTERCOMS IN THE UHF-TV BAND POST-AUCTION; A SUMMARY

Users of wireless microphones and intercoms at the close of FCC Auction 1000 have significant options for continued access to the UHF television band. The auction closed formally on March 30, 2017. On April 13, 2017, the FCC released a "*Closing and Reassignment Public Notice*" which determined the order in which television stations that participated in the Auction should move to the spectrum below TV Channel 37 (i.e. below 608 MHz). The issuance of that *Public Notice* started the beginning of a 39-month transition period, at the end of which (July 13, 2020) all television stations which participated in the auction will have cleared the spectrum between 614 MHz and 698 MHz. During this 39-month period, wireless mics and intercoms can continue to operate normally in the entire 614-698 MHz band. However, it will be necessary to protect any broadband systems that begin operations during the transition time. And there will be some of those, because the TV station relocation during this 39 month period, vacating the band 614-698 MHz for broadband use, will occur in stages. The early stages of TV station "repacking" will occur in TV markets such as Salt Lake City, Utah; markets which are isolated from other markets. Adjacent markets, such as Washington, D.C. and Baltimore, MD will be later in the process.

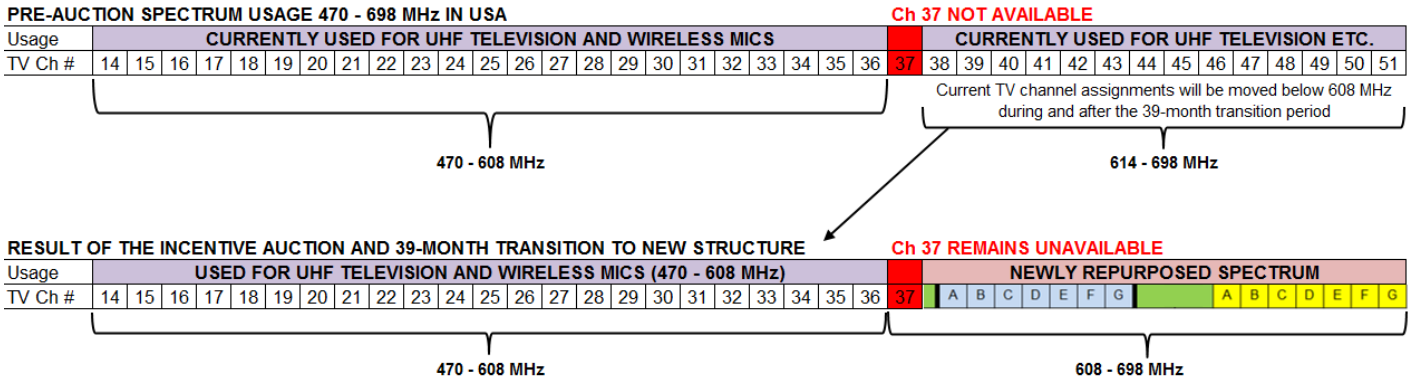
The good news for wireless mic and intercom users, however is that even after the 39-month transition period, there will still be significant spectrum at UHF available; well more than was originally expected. First of all, the band 470-608 MHz (TV Channels 14-36) will continue to be available without interruption, though TV stations that migrate from above Channel 37 to below channel 37 will gradually make some of that spectrum unusable. Wireless mics, however, can operate as close as 4 km outside the actual service contour of a TV station, regardless of the location of the TV antenna. Licensed microphone users are permitted to operate closer or even within the service contour, if they are indoors and the TV signal strength is less than -84 dBm. TV Channel 37 (608-614 MHz) is not and never has been available for wireless mic and intercom use; that channel is used for radio astronomy and medical telemetry devices. However, wireless microphones will after the transition period operate in the "duplex gap" between the broadband uplink and downlink bands. This is a ten megahertz segment at 653-663 MHz. This ten megahertz will be divided between *licensed* wireless mics and intercoms (4 megahertz at 653-657 MHz) and *unlicensed* wireless mics and intercoms and TV white spaces devices (6 megahertz at 657-663 MHz). Finally, wireless mics and intercoms can operate in the guard band just above TV Channel 37 on an unlicensed basis (two megahertz between 614 and 616 MHz). The power limit for wireless mics operating in the duplex gap and in the guard band *after the transition period* is 20 milliwatts (mW) effective isotropic radiated power (EIRP). There will be no operation permitted in the 1 megahertz segments just below and above the broadband downlink segment (616-617 MHz and 652-653 MHz) after the transition period. So, to summarize, here are the UHF bands still available for wireless mics and intercoms.

1. 470-608 MHz (with flexible restrictions to protect television broadcast reception)

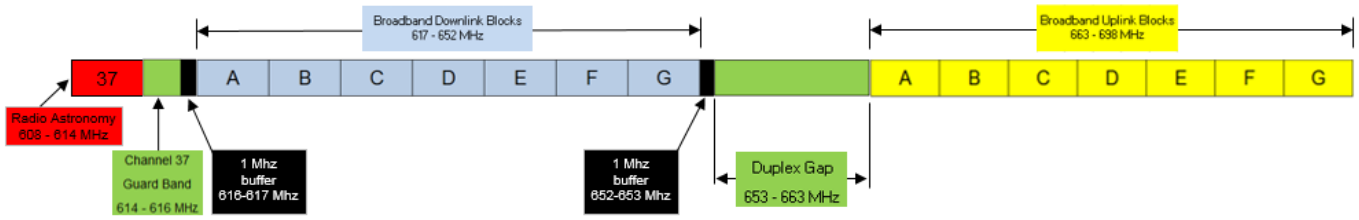
2. 614-616 MHz (20 mW EIRP limit, unlicensed only)

3. 653-663 MHz (20 mW EIRP limit, licensed at 653-657 MHz, unlicensed at 657-663 MHz)

4. 614-698 MHz (from now to July 13, 2020)



Detail of new spectrum usage between 608 – 698 MHz (green areas allow wireless microphones)



SPECIAL NOTE ON TRANSMITTER OUTPUT POWER:

Electro-Voice and Telex RF engineering uses the ERP (effective radiated power) scale for measures and licensing, which is different from the EIRP (equivalent isotropic radiated power) scale which the FCC has cited as the measurement the post-auction usage of 614-616 MHz and 653-663 MHz will be limited to beyond July 13, 2020 (20 mW EIRP). Electro-Voice stock RE-2, RE-2 PRO, and Telex FMR500 30 mW transmitters emit <20 mW EIRP, thus will comply with this FCC regulation.

The RE-2 PRO WTU-2 bodypack transmitter in low power mode emits 5 mW (ERP) and complies with the 20 mW EIRP limit, however in high power mode, it emits 50 mW (ERP), exceeding the 20 mW EIRP limit. See notes below.

FCC auction impact on Electro-Voice branded RE-2 and RE-2 PRO, and Telex branded FMR-500 systems:

G BAND

Current and future users in the USA of RE-2, RE-2 PRO (PHTU-2 handheld transmitter), and FMR-500 G band (614-642 MHz) systems may continue operating their systems per the new FCC guidelines as described throughout the aforementioned 39-month transition period and beyond. Stock RE-2 PRO G band WTU-2 bodypack transmitters in high power mode will no longer meet all legal requirements for use in the USA beyond the end of the 39-month transition period due to the 20 mW EIRP (transmitter output) limit, however in the low power mode, this 20 mW EIRP will be met.

DURING THE 39-MONTH TRANSITION PERIOD:

At the point in time during the 39-month transition period when new spectrum owners commence operation, it will be the responsibility of RE-2, RE-2 PRO, and FMR-500 G band users not to operate their systems in a manner which will interfere with the reception of the new spectrum owner's signal. RE-2, RE-2 PRO, and FMR-500 G band users will become aware of the presence of the new spectrum owner's signal due to the significant system interference that new spectrum owner's signal will cause. Because the RE-2, RE-2 PRO, and FMR-500 tuning bandwidth may be wider in spectrum than the new spectrum owner's signal, those affected RE-2, RE-2 PRO, or FMR-500 system users should use the ClearScan feature to locate and tune their system to an unaffected frequency should one exist. Should your RE-2, RE-2 PRO, or FMR-500 system ClearScan action deliver no clean frequency options, it should be assumed that new spectrum owners are now blocking all of your RE-2, RE-2 PRO, or FMR-500 system available frequencies.

USING THE TV CHANNEL 37 GUARD BAND FOR WIRELESS MICROPHONES:

RE-2, RE-2 PRO, and FMR-500 G band has a tuning bandwidth of 614-642 MHz. Television channel 38 (614-620 MHz) may be currently-unused in a local area, and users may already be using a channel group containing frequencies which fall within that space. As the restructuring and repacking process proceeds, the possibility exists that television channel 38 may already be, or will become unoccupied by an active television signal. RE-2, RE-2 PRO, and FMR-500 G band users must also be aware that once the new spectrum owner of Broadband Downlink Block A in your area commences operation, portions of television channel 38 (614-620 MHz) will become unusable by wireless microphones, however a small portion will remain available for wireless microphone usage according to the new rules set forth by the FCC. Going forward, this small portion of spectrum is referred to as the channel 37 guard band between 614-616 MHz. During (and beyond) the 39-month transition period, RE-2, RE-2 PRO PHTU-2 handheld transmitter, and FMR-500 G band users will be allowed to use frequencies within the usable channel 37 guard band between 614-616 MHz, however, beyond the end of the transition period, legally-allowed wireless microphone signals will be limited to 20 mW EIRP, and stock RE-2 PRO G band WTU-2 bodypack transmitters in high power mode will no longer meet that legal usage requirement. Should local spectrum usage cause an RE-2, RE-2 PRO, or FMR-500 G band system operation to become limited to frequencies within the usable channel 37 guard band between 614-616 MHz before the end of the 39-month transition period due to local conditions, it is recommended that users limit their system tuning according to the following grouping chart (Chart G-1). Frequencies in green cells fall within the usable channel 37 guard band between 614-616 MHz, and those in red cells are above. Users are also reminded that mixing frequencies from more than one group will result in intermodulation interference, and a multi-channel RE-2, RE-2 PRO, and FMR-500 G band system must contain frequency assignments from only one group.

Chart G-1

G BAND (614 – 642 MHz)

CH	Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 11	Gp 12

1	615.200	614.450	614.300	614.150	614.300	614.400	614.200	614.350	614.100	615.600
2	~~617.200~~	615.650	~~616.750~~	615.150	615.100	615.800	615.200	614.900	615.125	~~616.400~~
3	~~620.600~~	~~617.050~~	~~617.400~~	~~616.800~~	~~622.200~~	~~617.600~~	~~619.800~~	~~616.150~~	~~616.875~~	~~619.525~~
4	~~621.400~~	~~618.850~~	~~620.950~~	~~619.650~~	~~624.250~~	~~619.800~~	~~621.000~~	~~617.600~~	~~619.275~~	~~622.225~~
5	~~627.200~~	~~622.650~~	~~624.950~~	~~621.500~~	~~629.500~~	~~620.600~~	~~623.600~~	~~619.950~~	~~623.000~~	~~624.075~~
6	~~632.000~~	~~627.450~~	~~634.500~~	~~631.050~~	~~635.300~~	~~632.400~~	~~635.400~~	~~625.750~~	~~626.525~~	~~626.625~~
7	~~635.800~~	~~633.250~~	~~636.350~~	~~635.050~~	~~637.650~~	~~635.000~~	~~636.200~~	~~631.000~~	~~629.475~~	~~630.100~~
8	~~637.600~~	~~634.050~~	~~639.200~~	~~638.600~~	~~639.100~~	~~636.200~~	~~638.400~~	~~633.050~~	~~631.500~~	~~633.025~~
9	~~639.000~~	~~637.450~~	~~640.850~~	~~639.250~~	~~640.350~~	~~640.800~~	~~640.200~~	~~640.150~~	~~634.825~~	~~636.325~~
10	~~640.200~~	~~639.450~~	~~641.850~~	~~641.700~~	~~640.900~~	~~641.800~~	~~641.600~~	~~640.950~~	~~637.050~~	~~638.425~~

A BAND

Current and future users in the USA of RE-2, RE-2 PRO (PHTU-2 handheld transmitter), and FMR-500 A band (648-676 MHz) systems may continue legally operating their systems per the new FCC guidelines as described throughout the aforementioned 39-month transition period and beyond. Stock RE-2 PRO A band WTU-2 bodypack transmitters in high power mode will no longer meet all legal requirements for use in the USA beyond the end of the 39-month transition period due to the 20 mW EIRP (transmitter output) limit, however in the low power mode, this 20 mW EIRP will be met.

DURING THE 39-MONTH TRANSITION PERIOD:

At the point in time during the 39-month transition period when new spectrum owners commence operation, it will be the responsibility of RE-2, RE-2 PRO, and FMR-500 A band users not to operate their systems in a manner which will interfere with the reception of the new spectrum owner's signal. RE-2, RE-2 PRO, and FMR-500 A band users will become aware of the presence of the new spectrum owner's signal due to the significant system interference that new spectrum owner's signal will cause. Because the RE-2, RE-2 PRO, and FMR-500 tuning bandwidth may be wider in spectrum than the new spectrum owner's signal, those affected RE-2, RE-2 PRO, and FMR-500 system users should use the ClearScan feature to locate and tune their system to an unaffected frequency. Should your RE-2, RE-2 PRO, or FMR-500 system ClearScan action deliver no clean frequency options, it should be assumed that new spectrum owners are now blocking all of your RE-2, RE-2 PRO, or FMR-500 system available frequencies.

USING THE DUPLEX GAP (653-663 MHz) FOR WIRELESS MICROPHONES:

The new rules set forth by the FCC allow a space where wireless microphone systems will be allowed to continue operations long-term with some restrictions. RE-2, RE-2 PRO, and FMR-500 A band has a tuning bandwidth of 648-676 MHz. All, or some, of television channels 44, 45, and 46 (650-668 MHz) may be currently-unused in a local area, and users may already be using a channel group containing frequencies which fall within that space. As the restructuring and repacking process proceeds, the possibility exists that all, or some of television channels 44, 45, or 46 may already be, or will become, unoccupied by an active television signal. RE-2, RE-2 PRO, and FMR-500 A band users must also be aware that once the new spectrum owner of Broadband Downlink Block G in your area commences

operation, portions of what is now television channel 44 (650-656 MHz) will become unusable by wireless microphones. Likewise, once the new spectrum owner of Broadband Uplink Block A in your area commences operation, portions of what is now television channel 46 (662-668 MHz) will become unusable by wireless microphones. However a portion of spectrum between the Broadband Downlink Block G and Broadband Uplink Block A will remain available for wireless microphone usage. Going forward, this portion of spectrum between 653-663 MHz is referred to as the **duplex gap**. During (and beyond) the 39-month transition period, RE-2, RE-2 PRO, and FMR-500 A band users will be allowed to use frequencies within the duplex gap between 653-663 MHz, however, beyond the end of the transition period, legally-allowed wireless microphone signals will be limited to 20 mW EIRP, and stock RE-2 PRO A band WTU-2 bodypack transmitters in high power mode will no longer meet that legal usage requirement.

Should local spectrum usage cause an RE-2, RE-2 PRO, or FMR-500 A band system operation to become limited to frequencies within the duplex gap between 653-663 MHz before the end of the 39-month transition period due to local conditions, it is recommended that users limit their system tuning according to the following grouping chart (Chart A-1). Frequencies in green cells fall within the gap between 653-663 MHz, and those in red cells are outside of it. Users are also reminded that mixing frequencies from more than one group will result in intermodulation interference, and a multi-channel RE-2, RE-2 PRO, or FMR-500 A band system must contain frequency assignments from only one group.

Chart A-1

A BAND (648 – 676 MHz)

CH	Gp 1	Gp 2	Gp 3	Gp 4	Gp 5	Gp 6	Gp 7	Gp 8	Gp 9	Gp 10	Gp 11	Gp 12
1	~~649.200~~	~~648.250~~	~~648.300~~	~~648.150~~	~~648.300~~	~~648.400~~	~~648.200~~	~~648.350~~	~~648.800~~	~~650.225~~		
2	~~651.200~~	~~649.450~~	~~650.750~~	~~649.150~~	~~649.100~~	~~649.800~~	~~649.200~~	~~648.900~~	~~649.300~~	653.800		
3	654.600	~~650.850~~	~~651.400~~	~~650.800~~	656.200	~~651.600~~	653.800	~~650.150~~	~~650.050~~	658.750		
4	655.400	~~652.650~~	654.950	653.650	658.250	653.800	655.000	~~651.600~~	656.200	661.750		
5	661.200	656.450	658.950	655.500	~~663.500~~	654.600	657.600	653.950	660.525	~~667.075~~		
6	~~666.000~~	661.250	~~668.500~~	~~665.050~~	~~669.300~~	~~666.400~~	~~669.400~~	659.750	~~665.050~~	~~671.825~~		
7	~~669.800~~	~~667.050~~	~~670.350~~	~~669.050~~	~~671.650~~	~~669.000~~	~~670.200~~	~~665.000~~	~~671.400~~			
8	~~671.600~~	~~667.850~~	~~673.200~~	~~672.600~~	~~673.100~~	~~670.200~~	~~672.400~~	~~667.050~~	~~674.775~~			
9	~~673.000~~	~~671.250~~	~~674.850~~	~~673.250~~	~~674.350~~	~~674.800~~	~~674.200~~	~~674.150~~				
10	~~674.200~~	~~673.250~~	~~675.850~~	~~675.700~~	~~674.900~~	~~675.800~~	~~675.600~~	~~674.950~~				
11											~~652.025~~	656.850
12											653.600	658.125
13											661.325	~~665.625~~
14											662.725	~~667.275~~

Should local conditions require limiting system tuning options solely to the duplex gap, and a user's RE-2, RE-2 PRO, or FMR-500 A band system configuration requirements exceed the maximum quantity of usable coordinated channels (green cells in chart A-1), the below chart (Chart A-2) is a custom frequency coordination plan that will provide the maximum quantity of compatible frequencies within the 10 MHz-wide duplex gap.

Chart A-2

A BAND Custom Grouping Within 653 - 663 MHz (Duplex Gap)

Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6	Channel 7	Channel 8
653.200	655.000	658.100	659.150	660.500	661.400	662.100	662.600

INSTRUCTIONS:

To manually enter these custom frequencies into your system's receiver and transmitter separately, press SET and UP at the same time and the group and channel will go blank and the frequency will start flashing. Use UP/DOWN to scroll in 25 kHz steps to the desired frequency. Press SET and the frequency will be selected and stop flashing. Press SET and UP at the same time to return to group and channel operation. Hint: holding in the UP or DOWN key will increase the speed of the scroll. Just release and press again for fine control.

FCC auction results impact on Electro-Voice R300 systems:

R300 A band and B band

Current and future users in the USA of R300 A band (618-634 MHz) and R300 B band (678-694 MHz) systems may continue legally operating their systems per the new FCC guidelines as described until the end of the aforementioned 39-month transition period. Because neither R300 A band nor R300 B band tuning bandwidths span any of the duplex gap of 653-663 MHz (which will be allowed for wireless microphone operation during and after the 39-month transition period), operation of R300 A band and R300 B band systems will no longer be legal in the USA after the 39-month transition period ends.

DURING THE 39-MONTH TRANSITION PERIOD:

At the point in time during the 39-month transition period when new spectrum owners commence operation, it will be the responsibility of R300 A band and R300 B band users not to operate their systems in a manner which will interfere with the reception of the new spectrum owner's signal. R300 A band and R300 B band users will become aware of the presence of the new spectrum owner's signal due to the significant system interference that new spectrum owner's signal will cause. Because the R300 tuning bandwidth may be wider in spectrum than the new spectrum owner's signal, those affected R300 system users should use the ClearScan and Sync features to locate and tune their system to an unaffected frequency should one exist. Should your R300 system ClearScan action deliver no clean frequency options, it should be assumed that new spectrum owners are now blocking all of your R300 system available frequencies.

R300 C band

Current and future users in the USA of **R300 C band** (516-532 MHz) systems **will not be impacted** directly by these spectrum changes as those changes are limited to the UHF spectrum between 614-698 MHz. R300 C band will continue to be a legal and viable wireless microphone system band option now, and into the unforeseen future*. R300 C band users should be aware that those television broadcasters

who will be relocating their 600 MHz range signal down into the 500 MHz range may cause interference with your R300 C band system due to UHF spectrum congestion. At some point during the 39-month transition period, a newly-relocated television broadcaster's signal may appear, possibly causing interference with your system. Should this occur, those affected R300 system users should use the ClearScan and Sync features to locate and tune their system to an unaffected frequency should one exist. Should your R300 system ClearScan function deliver no clean frequency options, it should be assumed that television broadcast signals are now blocking all of the R300 C band system available frequencies.

* **NOTE:** As of July 1, 2017, the FCC has made no mention of plans for future actions which may limit wireless microphone usability in the UHF spectrum between 470-608 MHz.