

# Cross Band Repeat

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# TOPICS

- What is Cross Band Repeat?
- How do you set it up?
- What can you use it for?



# What is Cross Band Repeat?

Crossband Repeating is a process where a Ham transmits one signal on one band (typically UHF), and it is received by another radio with a better antenna/power installation, and re-transmitted (typically on VHF) to another radio system, or a repeater.

- Christian KCØARF, June 2004

<http://www.513repeater.org/elmer/xbandrepeat/xbandindex.html>



# What do I need?

- Dual-band radio capable of cross-band repeat
  - Yaesu FT-8800r/8900r, Icom IC-2820H, Kenwood TM-D700A/V708A, Alinco DR-635T
- Second radio to use with your new repeater
  - Typically a hand-held, but doesn't have to be
- Patience



# Cross Repeat Concepts

## • The Easy Way

- Very basic setup
- First setup that comes to your mind

## • The Better Way

- Reduces duty cycle on cross-band repeater
- Little more difficult to understand and set up
- Requires dual-band HT or one that can use custom offsets



# Legal Considerations\*

## Station Control

The FCC requires that a repeater be under the control of an operator who controls the repeater and can intervene in the event of a problem. Control can either be local (i.e., "the use of a control operator who directly manipulates the operating adjustments in the station to achieve compliance with the FCC rules") or remote ("the use of a control operator who indirectly manipulates the operating adjustments in the station through a control link to achieve compliance with the FCC Rules"). In the scenarios described above, the user is likely to be within fairly close proximity to the CBR and able to directly monitor and control it. In this case, the CBR could be considered locally-controlled, satisfying the station control requirements.

<http://www.qsl.net/wb3gck/cbr.htm>

\*I am not a lawyer



# Legal Considerations\*

## Station Identification

An unattended station needs to be identified on all frequencies on which it transmits. When the user identifies on the UHF uplink, the CBR is also identifying itself on the VHF side. However, many radios do not have the capability in CBR mode to identify on the UHF downlink (transmit) side (or the VHF side, for that matter). Additionally, when another operator transmits on the UHF uplink, the CBR won't be correctly identified on the VHF side, either. So, depending on your radio, some sort of add-on device for automatic identification may be required for full FCC compliance.

<http://www.qsl.net/wb3gck/cbr.htm>

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# The Easy Way – Cross Band Repeater Setup

- HT side
  - Choose a quiet simplex frequency from the band plan
  - Set up CTCSS Tone and activate with squelch\*
- Output side
  - Choose your favorite transmit frequency or repeater setting
  - Ensure you have all tones set, if necessary

\* DCS can also be used



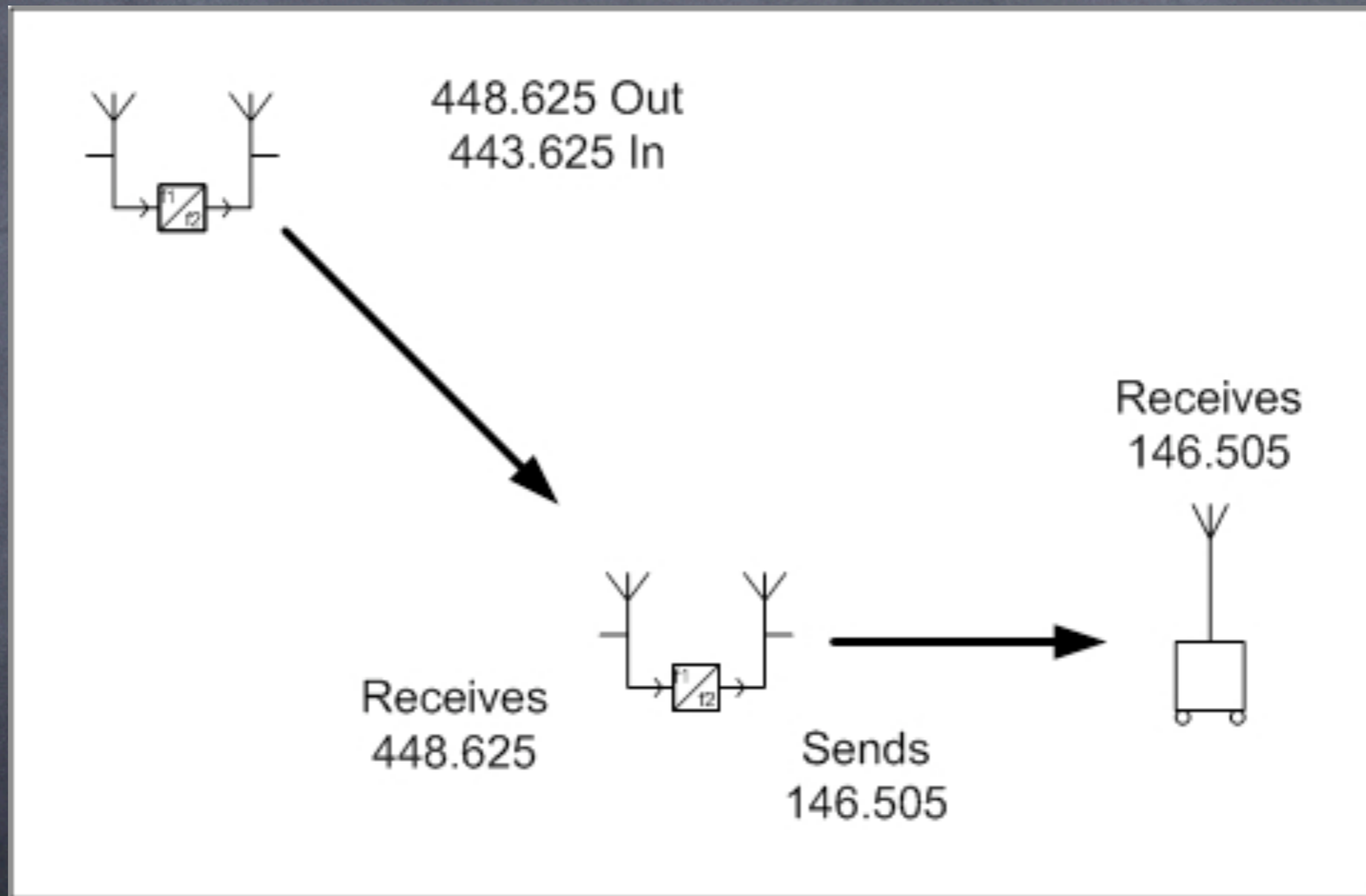
# The Easy Way - HT Setup

- Set to match the simplex frequency you set for the HT side on your cross band repeater
- Be sure to set your CTCSS tone\* and activate with squelch

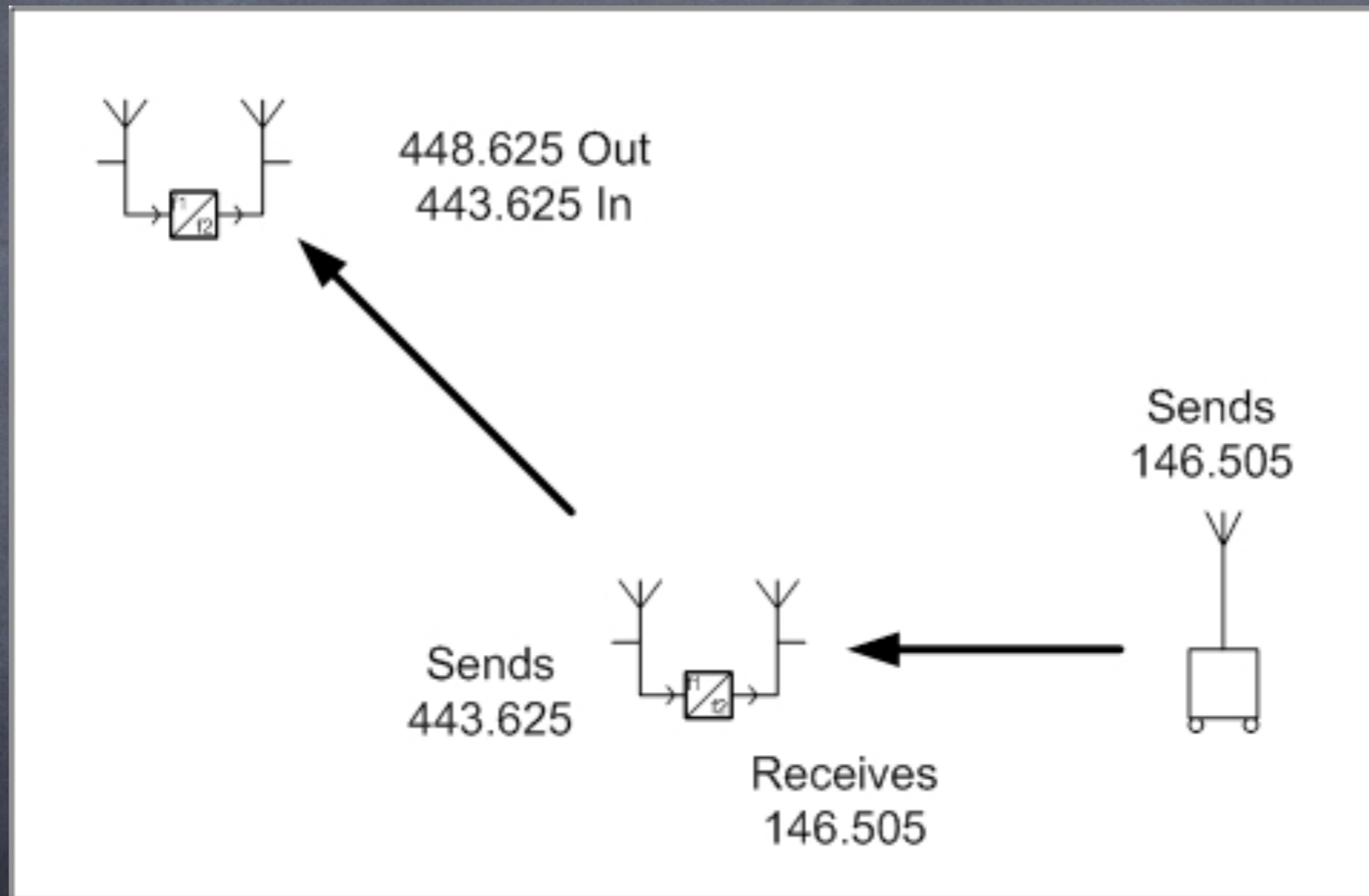
\* Or DCS



# The Easy Way – Receive



# The Easy Way - Send



# The Easy Way - Station Identification

- Only a problem from the cross band repeater to the HT
- ARPS using DCS with CWID
  - Transmits call sign automatically every 10 minutes
- On the HT, set second channel or memory location to the repeater output frequency and manually identify every 10 minutes



# The Easy Way – Issues

- Cross-band repeater doing double duty
  - Re-transmitting your signals out
  - Re-transmitting incoming signals to you
- Station identification can be tedious
- Doesn't utilize the features of most handhelds
  - Why use cross-band to listen if the HT can receive the signals I want to listen to?



Is there a better way?

YES!



# The Better Way – Things to Know

- Takes a little more planning and thought
- Utilizes non-standard offsets
- Cuts the duty cycle of the cross-band repeater significantly
- Requires a dual-band HT or one that can do large, weird offsets



# The Better Way - Concepts

- Use your HT to receive on desired listen frequency and transmit on a different frequency (to the cross-band repeater)
- Cross band repeater only used to retransmit HT transmission back out to the repeater
- HT and cross band repeater configured to do so while eliminating possible interference



# The Better Way – Cross Band Repeater Setup

- HT Side
  - Choose a quiet simplex frequency from the band plan
  - Set up CTCSS tone and activate with squelch\*

\* DCS can also be used



# The Better Way – Cross Band Repeater Setup

- Output side
  - Choose your desired repeater. Record the input offset and direction.
  - Figure out what the output frequency would be if the offset was in the opposite direction but had the same offset and input frequency
  - Set the band for this new output frequency and opposite offset
  - Input frequency should end up being the same as the original repeater input.
  - Set CTCSS tone and activate with squelch
    - We don't want anything coming into this side of the cross-band repeater!



# The Better Way – Cross Band Repeater Setup

- Output side – Example
  - 448.625 repeater, 5MHz negative offset
  - Input frequency would be 443.625
  - To input this frequency with a 5MHz positive offset, we would be listening on 438.625.
  - Set band for 438.625 with 5MHz positive offset
  - Input frequency would then be 5MHz above 438.625, or 443.625, matching the repeater input frequency.



# The Better Way – HT Setup

- “Main” band
  - Set to match the simplex frequency you set for the HT side on your cross band repeater with CTCSS tone\* and squelch activated
  - Set power to lowest needed to receive on your cross band repeater (saves battery power!)
- “Sub” Band
  - Set to listen on output frequency of the repeater you set up for the output side of the cross-band repeater

\* Or DCS



# The Better Way - How it works

- Receive

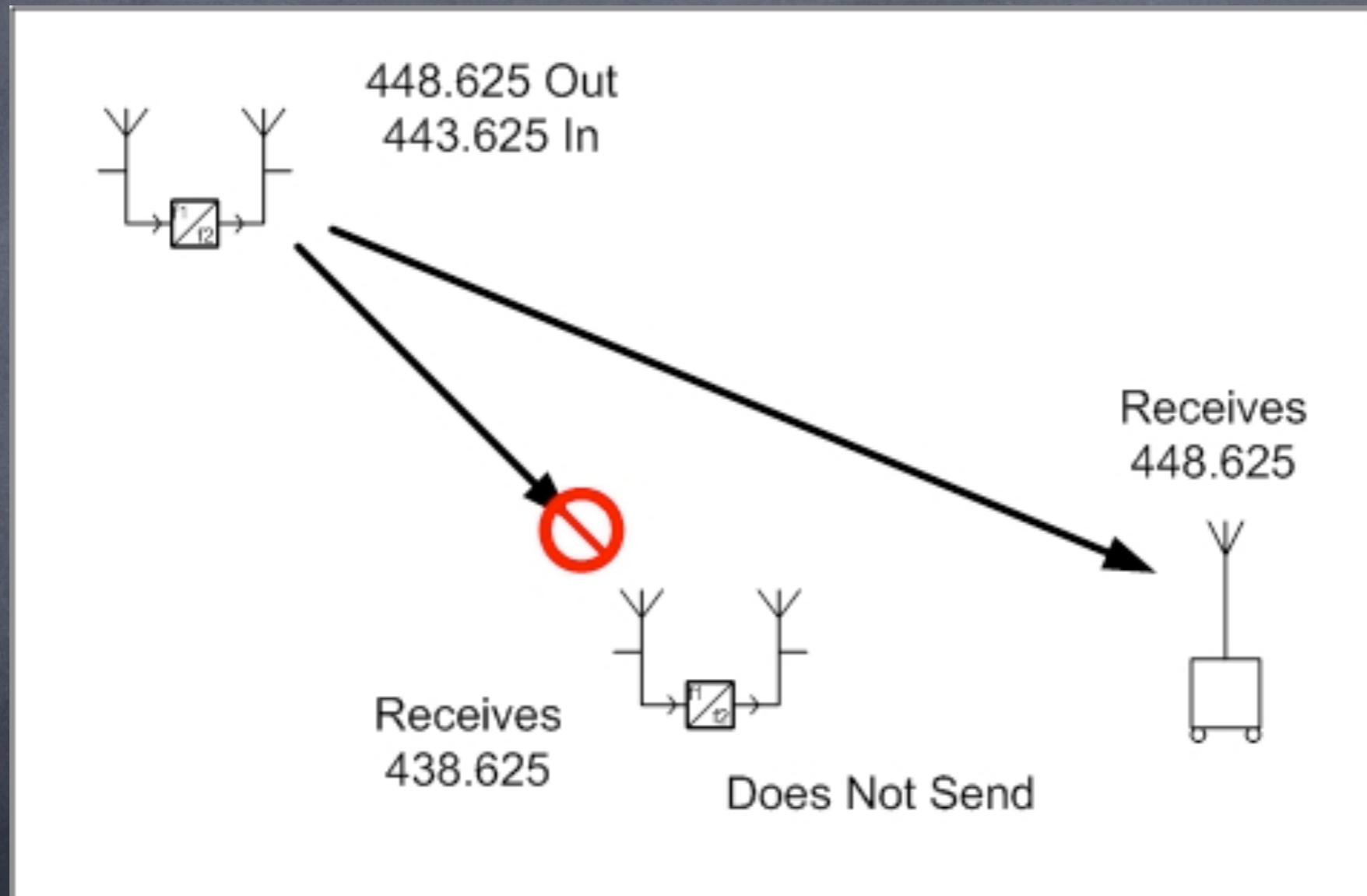
- Output of repeater is received by your HT. You listen to it this way.
- Since output side of cross-band repeater is set to the wrong offset, it doesn't receive it, so it doesn't re-transmit it, saving duty cycle.

- Transmit

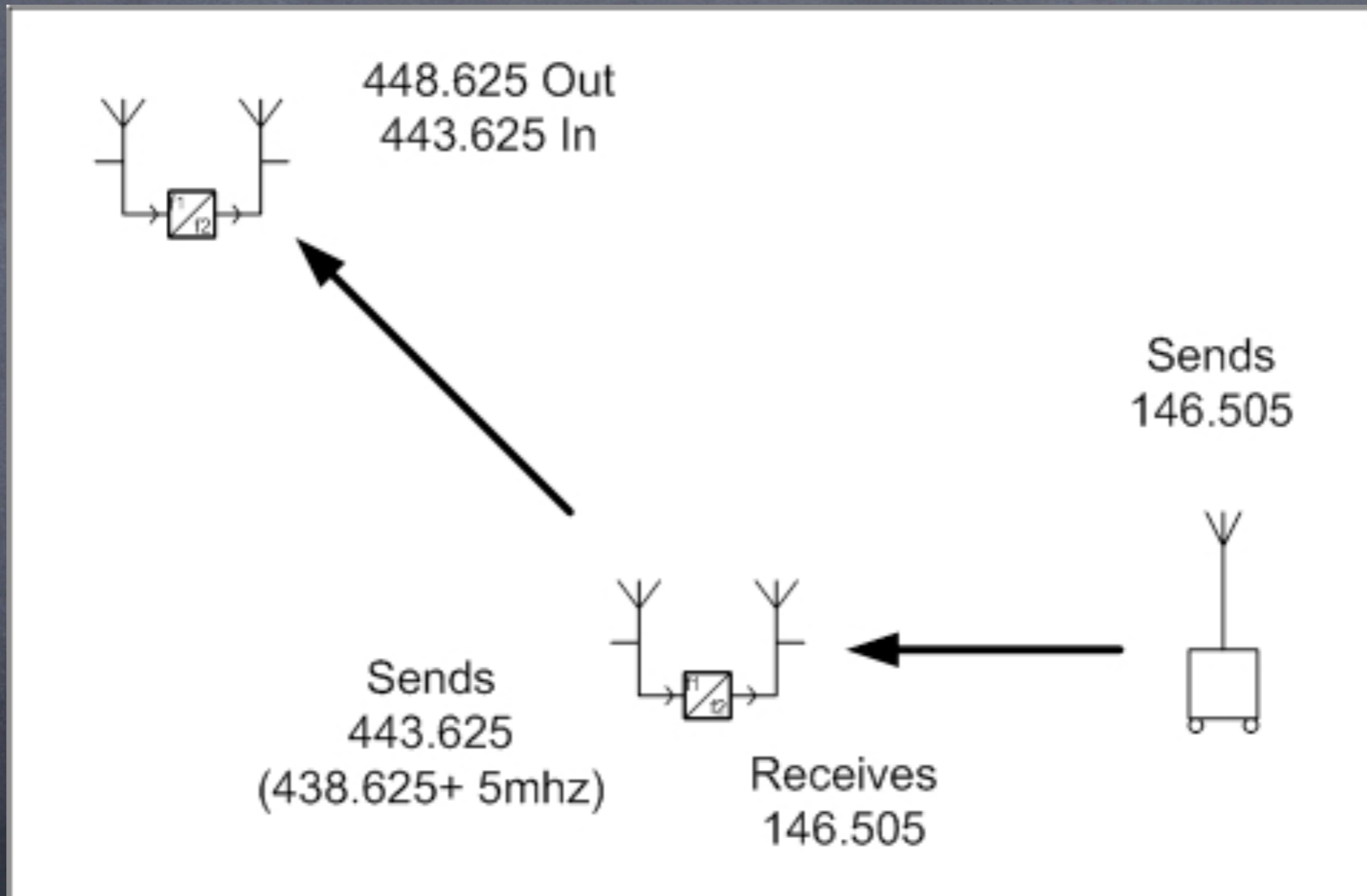
- HT transmit on simplex frequency with CTCSS or DCS tone and squelch.
- Cross band repeater picks this up and retransmits it on the other side. Since that side's output frequency matches the input frequency of the repeater, the repeater receives it and retransmits it.



# The Better Way - Receive



# The Better Way - Send



# Cross Band Repeat

# DEMONSTRATION



# What can I use it for?

- Extending the transmit power of your HT at home
- Extending your range when out and about (standard power/battery considerations apply)
  - Mall
  - Field
  - EmComm?



Q & A

