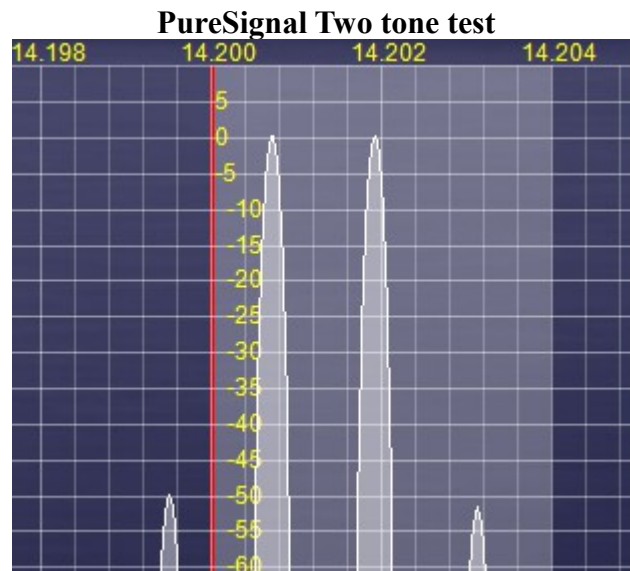


ANAN-100 and ANAN-100D PureSignal Operation (Beta)



For more info about OpenHPSDR PowerSDR see

<https://apache-labs.com/index.php>

<http://openhpsdr.org/>

<http://groups.yahoo.com/neo/groups/apache-labs/files/KC9XG%20App.%20Notes%20and%20user%20doc/>

ANAN-100/ANAN-100D PureSignal Operation (Beta)

Introduction.....	2
PowerSDR/PureSignal Setup.....	3
Feedback sample.....	4
PureSignal Two-Tone Test adjustments.....	6
Appendix.....	8

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

Introduction

Warren Pratt, NR0V has developed the “PureSignal” adaptive pre-distortion algorithm for OpenHPSDR PowerSDR which can reduce Inter-modulation products in transmitted signals.

PureSignal can continually sample the transmitter or amplifier output for distortion products and adjusts the transmit waveform to reduce these products.

Warren has stated: "Our predistortion algorithm is "adaptive" meaning that it is designed to automatically compare the input and output of the amplifier and repeatedly calculate and optimize the correction."

PureSignal requires the PowerSDR mRX PS 3.2.7 release or later. Required Firmware versions are Hermes 2.5 (including ANAN-10 and ANAN-100) or later and Angelia 2.2 (ANAN-100D) or later.

This document details the methods needed to implement the PureSignal adaptive pre-distortion algorithm using either a barefoot ANAN-100 / ANAN-100D, or a sample derived from an external coupler on the output of an amplifier (DC6NY coupler for example).

An external watt meter and dummy load is required to set your PA “Gain per Band” before PureSignal calibration is attempted.

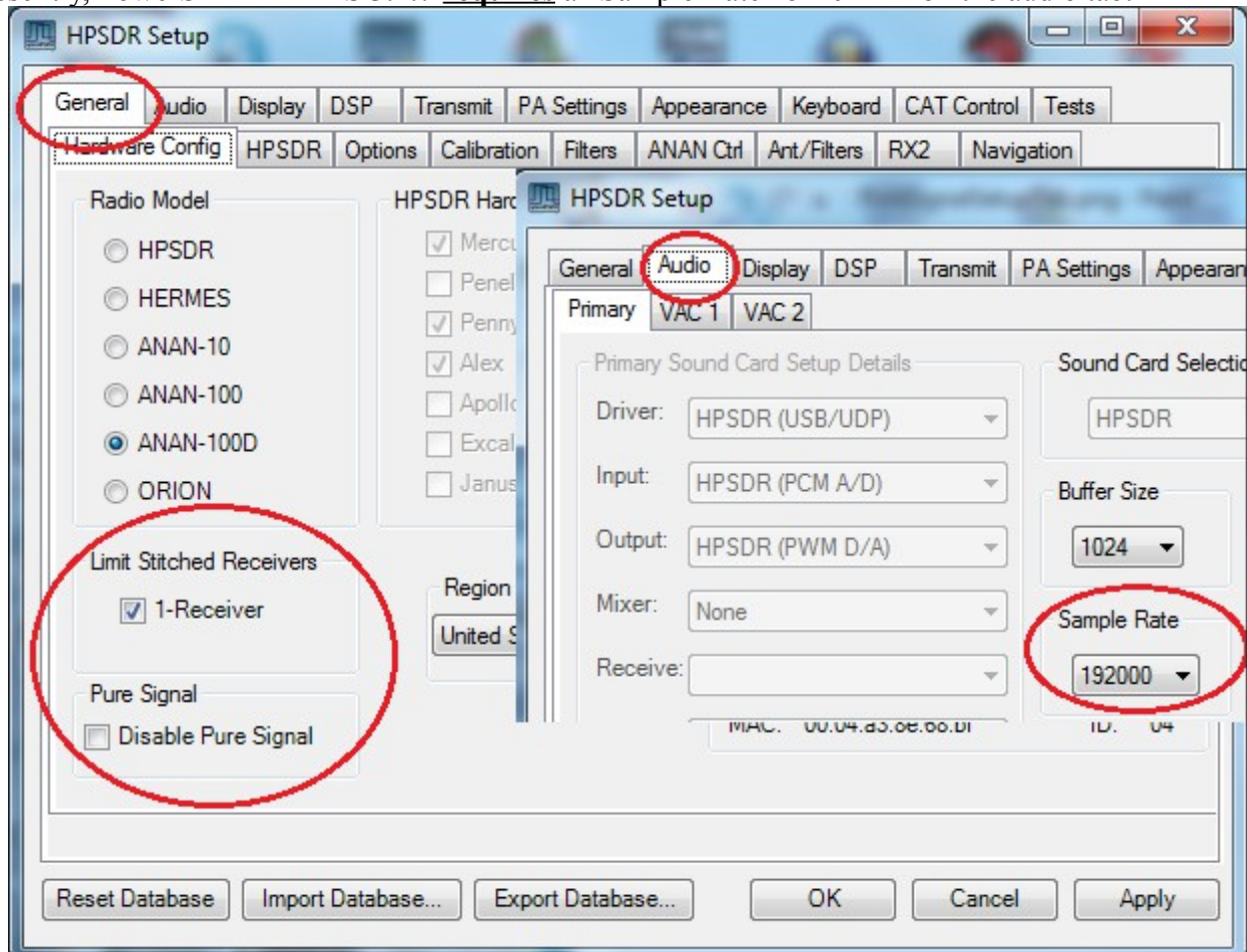
See appendix for ANAN-10, ANAN-100 and ANAN-100D PureSignal diagrams.

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

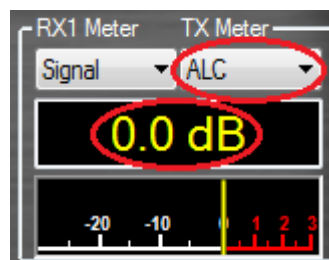
PowerSDR/PureSignal Setup

The Menu Selection Setup, General tab must have the “1-Receiver” check box checked and the “Pure Signal, Disable Pure Signal” unchecked.

Presently, PowerSDR mRX PS 3.2.7 **requires** a “Sample Rate” of 192khz on the audio tab.



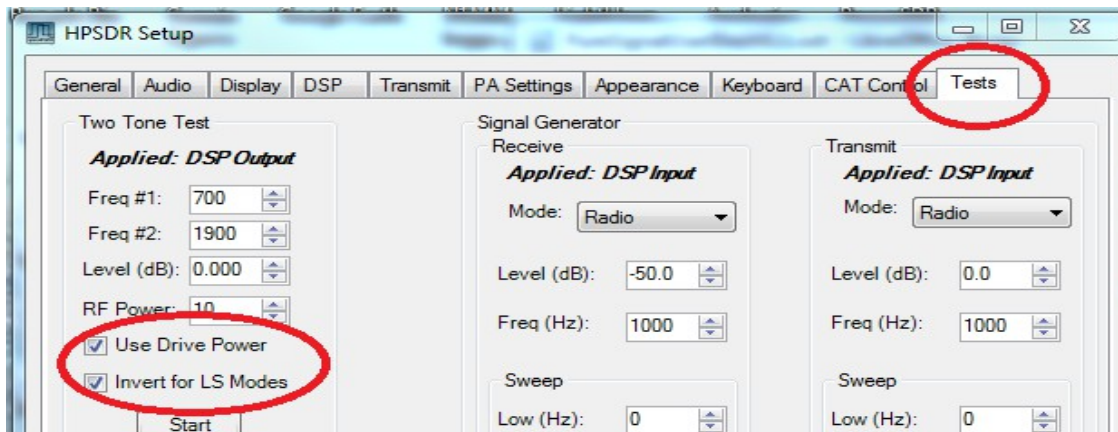
Mic Audio should also be adjusted for 0 db on voice modulations peaks while viewing the TX Meter ALC Meter during transmit.



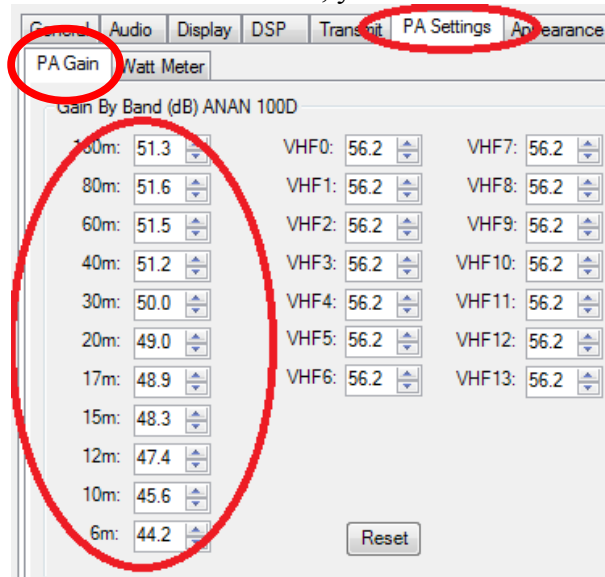
ANAN-100 and ANAN-100D PureSignal Operation (Beta)

Initial 2 tone test properties need to be set on the Setup, Tests tab.

1. Place a check mark in the “Use Drive Power” check box. The Two Tone test procedure will then use the “Drive” setting on the main PowerSDR window.
2. Place a check mark in the “Invert for LS modes: checkbox. This inverts the test tones during Lower Sideband operation.



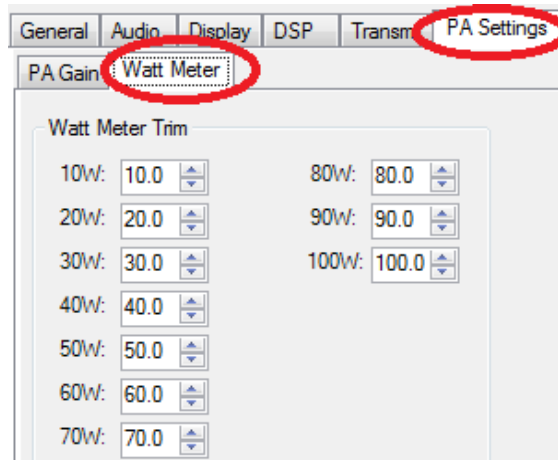
If you have not already done so for PowerSDR 3.2.7, you need to set Gain By Band :



1. Connect an external watt meter and dummy load to the selected ANT port.
2. Each band PA gain must be adjusted for 100 watts on the external watt meter.
3. Select the desired band on the PowerSDR main page and set the drive control to 100 for each band.
4. Increasing the PA gain number, DECREASES power output.
5. Adjust PA gain on every band from 160 thru 6 meters with the drive level set to 100.

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

Once your PA Gain is calibrated for all bands, you need to check and adjust your PowerSDR Tx Meter watt meter trim.

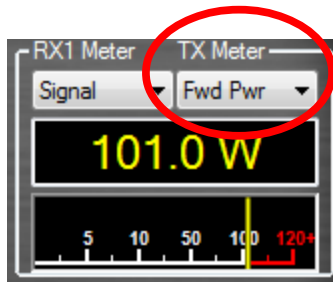


CAUTION: IN MAKING THESE ADJUSTMENTS, DO NOT USE POWER (AS INDICATED BY A CALIBRATED EXTERNAL METER) THAT EXCEEDS THE RATING OF YOUR RADIO!

Note: Do NOT adjust any spinner values until you have completed measurements for all spinners.

For each spinner:

1. Adjust drive so that your output power (as indicated by a calibrated meter) matches spinner label.
2. Record the reading of the 'Fwd Pwr' meter on the console.



3. When you've done all levels, enter your recorded values in the corresponding spinners.

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

1. The PowerSDR “DUP” button must be active to **view** the sampled signal.
2. Drive should be adjusted to 100 watts for a barefoot ANAN-100/ANAN-100D, or the appropriate drive level for an attached external amplifier and coupler.
3. Adjust the yellow numeric dBm markers as shown below.
4. Select a voice modulation mode such as USB or LSB.

The screenshot shows the PowerSDR software interface with several key elements highlighted and annotated:

- DUP button:** Located in the top-left control panel, circled in red. A red arrow points to it with the text "DUP button must be active".
- Drive level:** A slider in the bottom-left control panel is set to 100, circled in red.
- dBm Markers:** Yellow numeric markers on the spectrum display are circled in red. A text box says: "Place mouse over yellow numbers, when HAND icon appears, left click and drag hand until 0 appears at the top of the display".
- Modulation Mode:** The "LSB" and "USB" buttons in the bottom-right control panel are circled in red. A red arrow points to them with the text "Select voice modulation mode".
- Zoom Control:** A slider in the bottom-center control panel is circled in red. A red arrow points to it with the text "Adjust zoom control as needed to view signal".

The main spectrum display shows a signal at 14.200 MHz with a power level of -163.3 dBm. The interface includes various other controls like VFO A/B, VFO Sync, VFO Lock, and various filter and processing options.

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

Feedback sample

PureSignal requires a sample of the transmitted signal in order to apply the PureSignal pre-distortion algorithm to reduce IMD products. The **feedback level is critical**, and should be adjusted to within 6db (closer is better) of the point where the “**ADC Overload**” message is encountered. The Feedback Level box turns Green at 6db below the ADC overload point.

Helmut, DC6NY has designed a suitable coupler which should provide the needed feedback sample level from an amplifier equipped with his coupler. See http://www.hamsdr.com/data/GlobalFileUploads/9636_RF%20Sampler%20for%20Pre.pdf for more info. The adjustable attenuators in the coupler should be adjusted to provide about -10 db. The “ATT on TX” attenuator can then be used for fine adjustment.

The ANAN-100 and ANAN-100D have been found to have high receive “Leakage or Crosstalk” during transmit. This level has been found to be in excess of the amount needed for PureSignal but can be adjusted to the needed level with the “ATT on TX” control on the Setup, General. Ant/Filters tab.

Whatever the RF sample feedback source, the Setup, Ant/Filters tab “ATT on TX” check box should be enabled and the “ATT” box should be adjusted during **full power** transmit, to a point where “**ADC overload**” just disappears. For example, in the picture below, “ADC overload” appears with an “ATT” setting of 20, but disappears when “ATT” is advanced to 21.

Note: Barefoot ANAN-100 and ANAN-100D will require different “ATT” settings on each band.

The “Ext 1 on Tx” or RX1 on TX check box must be checked when used with an external coupler. It is not needed when using the internal leakage from a barefoot ANAN-100 or ANAN-100D.

Ant/Filters RX2 Navigation

Antenna Control

SWR Protection

- Enable Protection
- Disable on Tune Pwr <10W
- ATT on Tx
- ATT: 22
- BYPASS on Tx
- Ext 2 on Tx
- Ext 1 on Tx

Adjust to point where ADC Overload disappears

Bypass on TX, and EXT2 on TX and EXT1 on TX may be required with external coupler

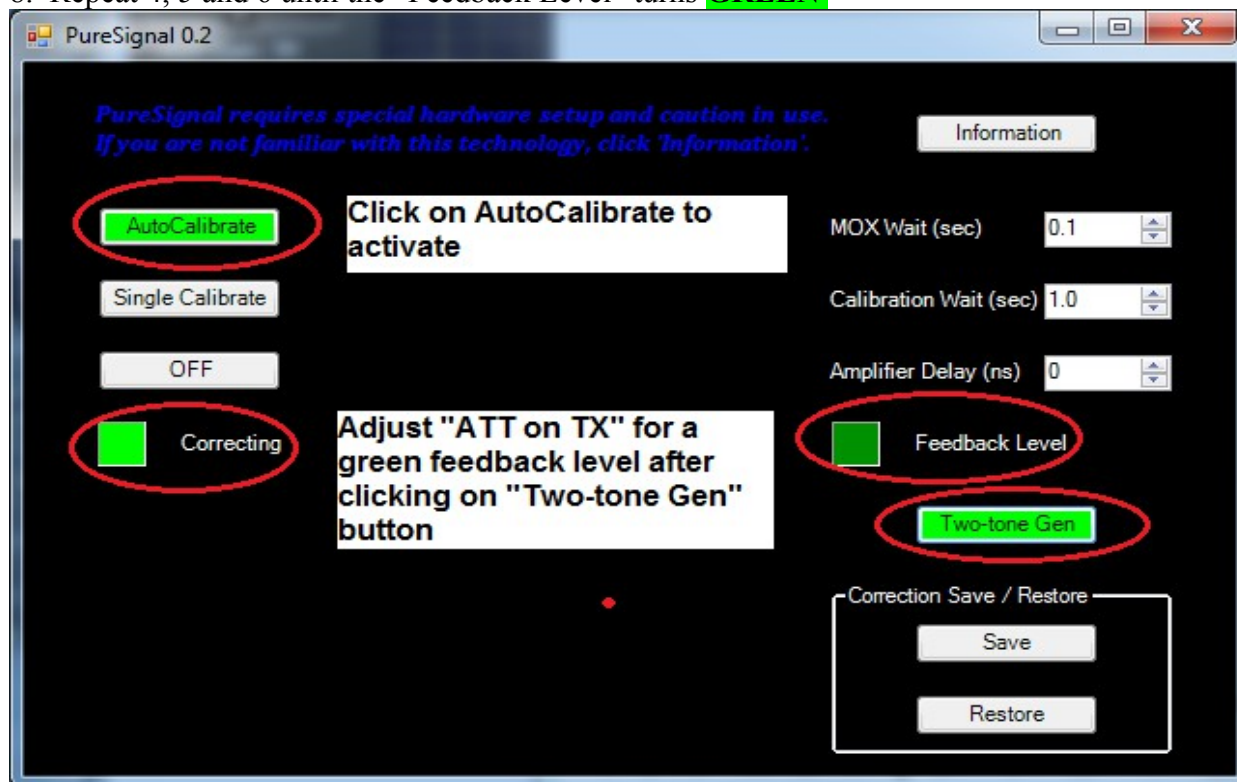
-75
-80
ADC Overload!

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

PureSignal Two-Tone Test adjustments

The PowerSDR 3.2.7 main menu selection “Linearity” displays the linearity form used to setup and to assist in the calibration of the sampled transmitted signal.

1. Click on main menu “Linearity” to display the Linearity form.
2. Click on AutoCalibrate to activate automatic PureSignal calibration routine.
3. Activate PowerSDR Setup, Ant/Filters tab, to adjust the feedback level.
 - A. Preliminary setting should be maximum attenuation or 31db.
 - B. **EXCESSIVE FEEDBACK CAN DAMAGE YOUR RECEIVER**
4. Connect the radio or amplifier to a dummy load.
5. Click on the “Two Tone Gen” to begin transmitting a “Two-Tone” test signal into a dummy load.
6. If Feedback Level is red or yellow click on “Two-Tone Gen” to unkey radio and decrease the “ATT on TX” setting by 1 or 2, then click on “Two-Tone Gen” again to re-key radio.
8. Repeat 4, 5 and 6 until the “Feedback Level” turns **GREEN**



9. Now observe the message pane at the bottom of the Panadapter window with Two-Tone Gen active.
10. Adjust “ATT ON TX” up or down 1 db until the “**ADC Overload**” just disappears, Unkey between adjustments and repeat as necessary. The feedback level box must be green as well.



The goal is to have a **GREEN** Feedback Level and no ADC Overload message displayed

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

If you are using a barefoot ANAN-100/D without an external coupler, the attenuation setting will likely be different on each band. PowerSDR 3.2.7 does **NOT** remember the ATT on TX settings, so you should record the settings for each band for later recall.

Recorded at KC9XG with Barefoot ANAN-100D and no external coupler.

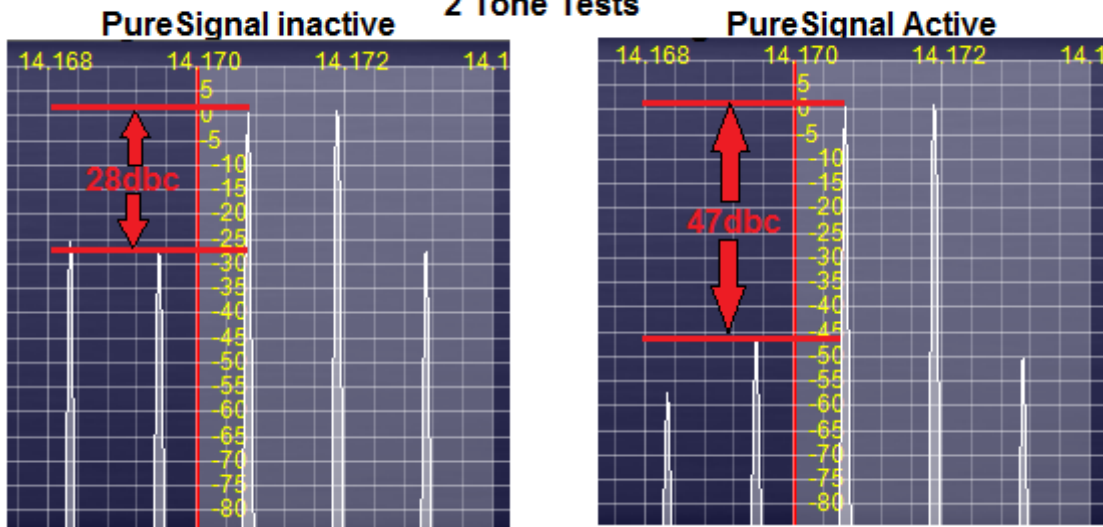
Band	ATT on TX	IMD3
160	9	47dbc
80	14	51dbc
40	18	51dbc
20	20	55dbc
17	21	50dbc
15	24	54dbc
12	23	56dbc
10	23	54dbc
6	30	38dbc

ANAN-100 and ANAN-100D PureSignal Operation (Beta)

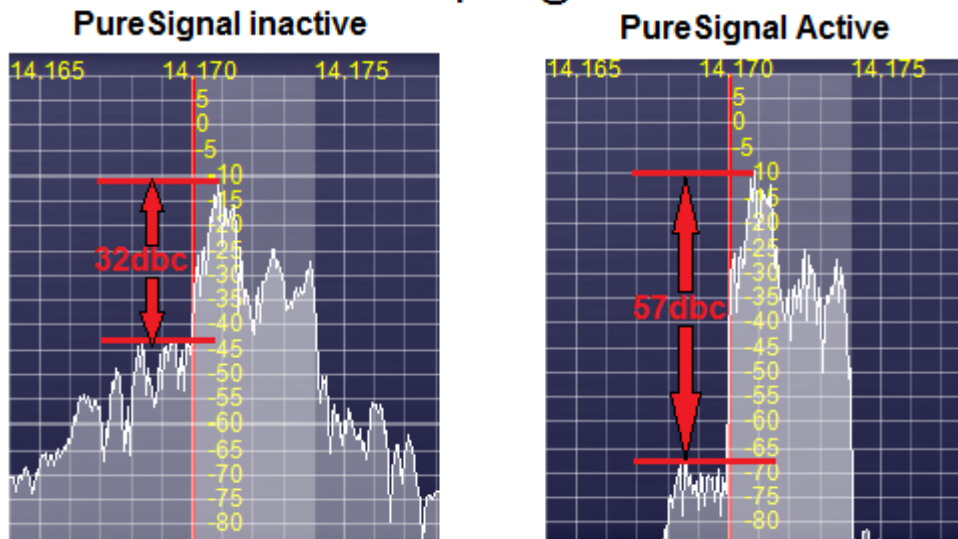
With proper sampled feedback levels @ 100 watts or better, PureSignal IMD3 two tone results may range from 45dbc to 55dbc.

Barefoot ANAN-100D Two Tone test IMD3 examples

OpenHP SDR PowerSDR PureSignal 2 Tone Tests

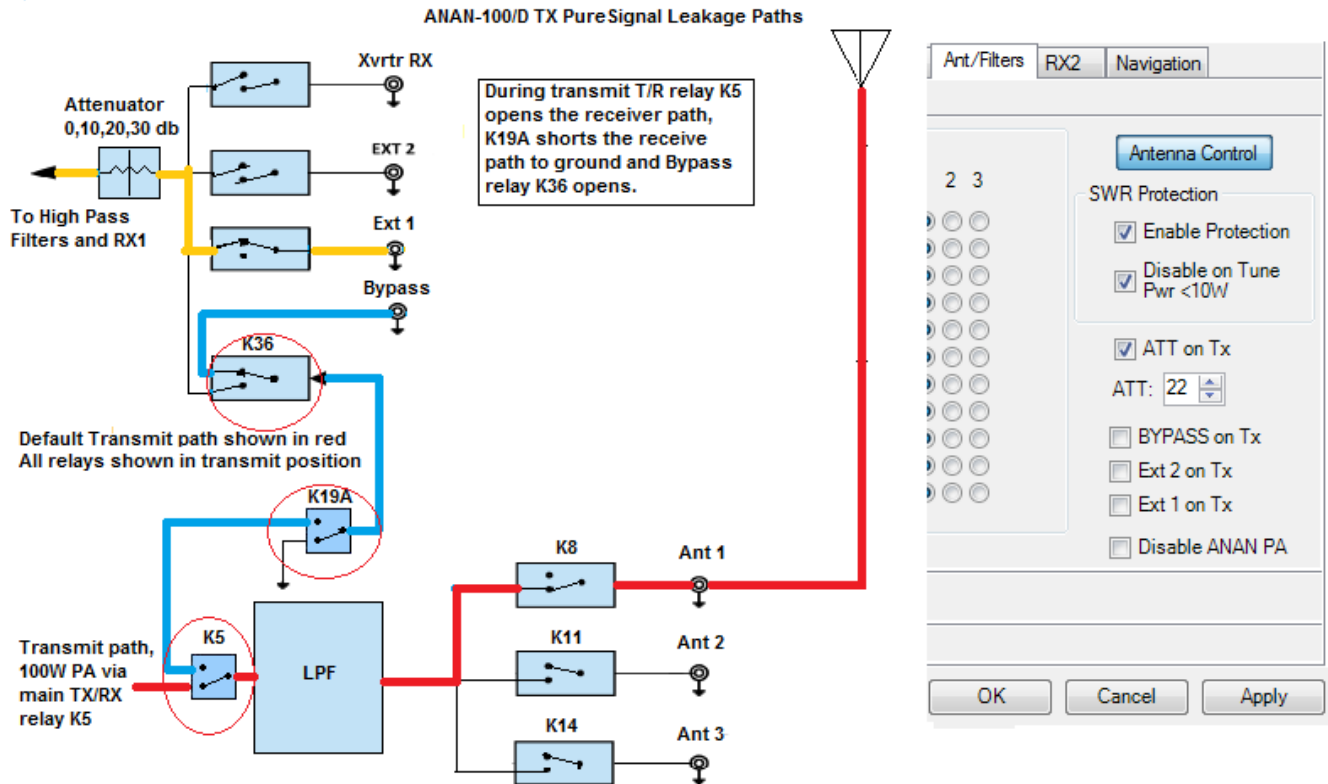


OpenHP SDR PowerSDR with PureSignal Voice peak @100W

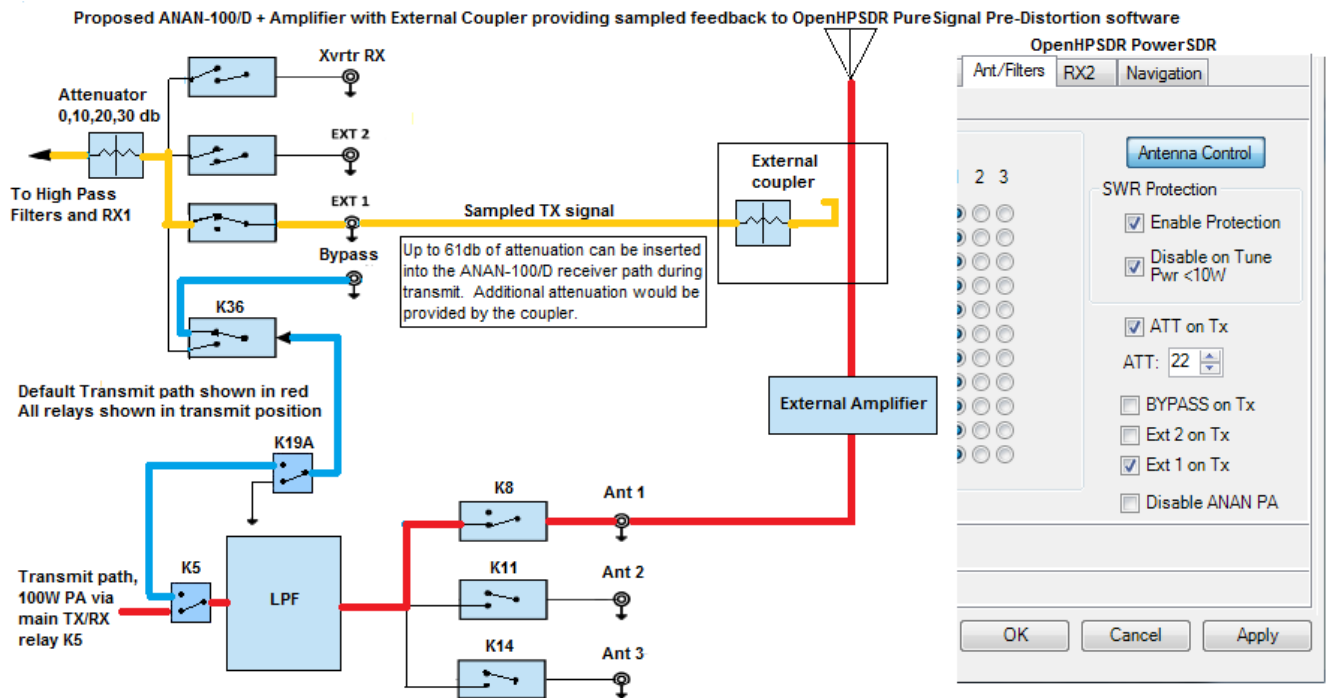


ANAN-100 and ANAN-100D PureSignal Operation (Beta)

Appendix



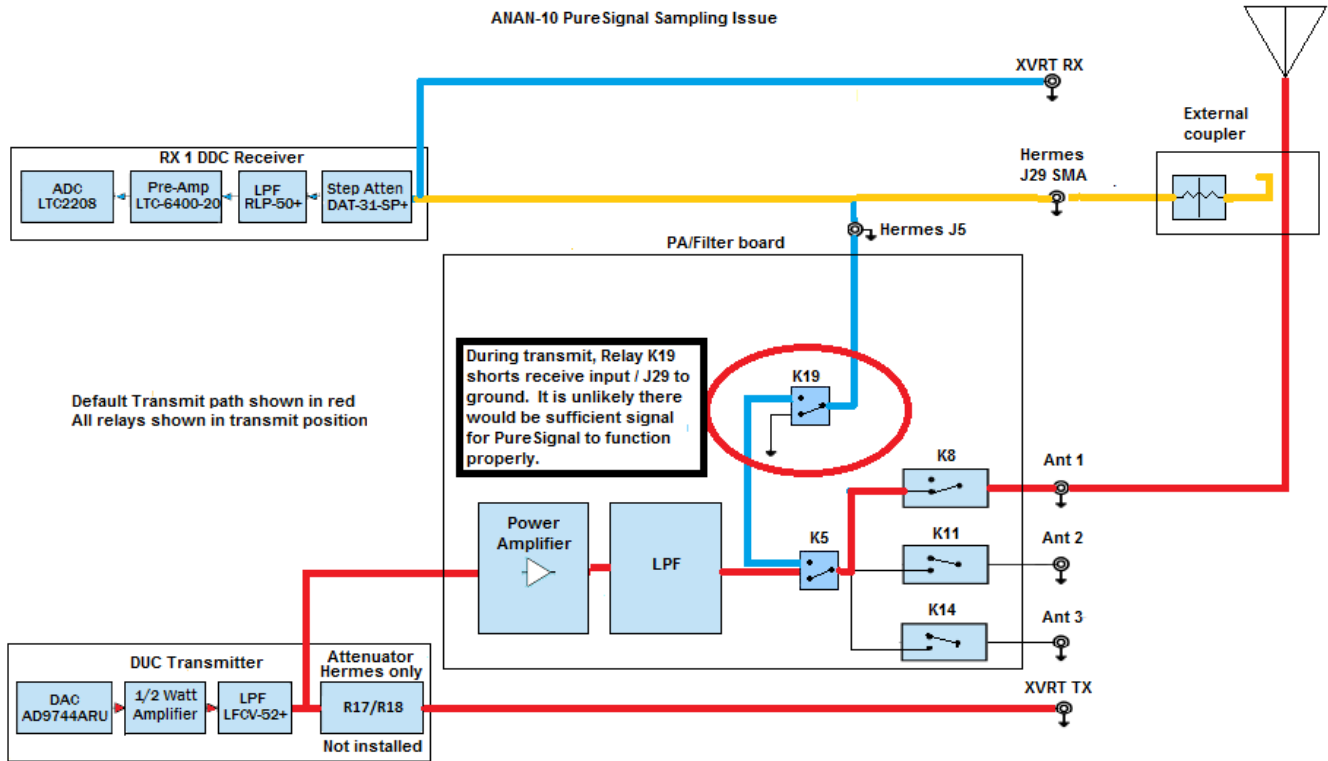
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ANAN-100 and ANAN-100D PureSignal Operation (Beta)



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