

Paolo Paolucci

Da: MONKA-mcHF@yahoogroups.co.uk per conto di Clint Turner turner@ussc.com [MONKA-mcHF] [MONKA-mcHF@yahoogroups.co.uk]
Inviato: giovedì 22 ottobre 2015 21:20
A: MONKA-mcHF@yahoogroups.co.uk
Oggetto: Re: [MONKA-mcHF] mcHF selectivity [1 Attachment]

[Attachment(s) from Clint Turner included below]

The QSD (mixer) used in the mcHF is, itself, is capable of quite good dynamic range, so I suspect the culprit to be the input preamplifier.

To be certain of this, I need someone to do the following test:

- 1 - Tune in an amateur signal on a band on which overload/QRM is occurring. Do not tune the signal directly, but simply "experience" the interference. (e.g. QRM from a broadcast transmitter on 7250 kHz while one is listening on 7080 kHz)
- 2 - Observe if the lower (white) portion of the S-meter turns red more than occasionally: It is perfectly normal for it to (very momentarily) turn red as the codec gain is adjusted.
- 3 - Take an oscilloscope with a known-accurate probe calibration and measure the peak-to-peak voltage (AC-coupled) on EITHER pin 4 OR 5 of the 30 pin connector (e.g. "Demod I Out" or "Demod Q Out"). It may take some very careful watching to see this occur and in such situations analog 'scopes are sometimes better than digital ones! (If you use a digital scope, make sure that you have averaging turned off.)
- 4 - Take the same oscilloscope and measure the signal at R4.
- 5 - If you are experiencing distortion and have not done so, do the "optional" installation of the components in the lower-left corner of the "Bandpass Filters" page of the RF board schematics (e.g. R1a-R1d, R2a-R2d, R3a-R3d, etc.) to bias the selector switches (U1, U2) "farther" away from the supply rails and the protection diodes and note if this offers any improvement. (Testing on this very topic is discussed on this page: www.xs4all.nl/~martein/pa3ake/hmode/)

(Please report the findings on this group.)

On point 2: If it flashes red only occasionally, the A/D and codec are not being overloaded - at least after the codec gain adjustment.

On point 3: The absolute maximum input voltage permissible at the input of the codec is approximately 3 volts pk-pk (approximately its power supply voltage) and as long as the voltage coming from the QSD amplifiers/filters is below this, the hardware-based anti-aliasing filters/codec should not be being overloaded - at least with signals that are more than 24 kHz away from the local oscillator frequency (30 kHz or more to simplify the math if "frequency translate" mode is activated.) In bench testing I have observed that the codec hardware does not actually overload until the signal gets closer to -10dBm: This amount of signal will demolish reception on almost any other radio that is not specifically designed to cope with very strong signals (e.g. FT-817, IC-706, TS-2000, FT-757, TS-440/450, TS-940/950, etc.) If the voltage at the "Demod I/Q Out" point is safely below, say, 2 volts then the culprit is very likely Q1.

(I doubt that the problem is the PIN diodes: The carrier time of these diodes is rather lengthy and they are biased quite well - particularly if the resistor values have been changed. It should be observed that, like many FET-based QRP transceivers that the receive input is in parallel with the PA output when in receive mode and that, in theory, the PA FETs could have nonlinearity, but this is unlikely since their Drain-Source junctions are firmly reverse biased when the gate voltage is removed and the substrate diode has little/no chance of playing any part!)

Concerning Q1, a search of the archives of the Yahoo Group will reveal a lengthy discussion about a year ago: It was observed then that the amplifier itself was rather "weak", but the the biggest problem at the time was that the early code did not have provisions to use the built-in codec gain adjustment: Adding this feature improved the dynamic range of the mcHF's receiver by a bit more than 35dB (it would "overload" on signals +/-24 kHz the LO at around -55dBm - now it overloads on signals +/-24 kHz the LO at somewhere around -19 to -15 dBm - much stronger than that if they are outside this range) and allowing the removal of Q2.

Even though Q2 has been removed, the hardware is still available should it be necessary that it be implemented once again. The problem was that in order to "turn off" a typical depletion-mode JFET (N-Channel) it is necessary for the gate to be negative with respect to the source, but this is not possible so the FET was always at least partially "on". What may be done instead is to use an enhancement-mode FET as an RF switch to shunt RF from Q1 - a technique commonly done nowadays on low-power transceivers in lieu of PIN diodes to protect the receiver, but the "problem" with this is that this shunting would disrupt the input impedance of Q1 (which isn't very close to 50 ohms, anyway) and cause even more loss when on - but because it is loss that one is seeking and since the bandpass filters are rather "loose", this isn't really much of a problem.

The other solution is to rework the Q1 amplifier. By adding some degenerative/negative feedback the existing device can be made "stronger" and better-controlled, losing less one S-unit of gain (likely not noticed unless you are using a very small antenna, anyway!): I have attached a schematic of such a circuit. I have not tested *this* particular implementation, but I have used this same circuit many times before. If the above tests (1-5) show no obvious improvement, I'd be interesting in hearing about someone's results after trying this (fairly simple!) modification to the Q1 amplifier circuit. (If this circuit modification doesn't offer "enough" improvement, set "R36" to 470 ohms and "R36a" to 4.7k: This will lose a bit over 1 S-unit, but should improve linearity and strong-signal handling even more.)

73,

Clint
KA7OEI

On 10/22/2015 1:45 AM, tonrijnen@telfort.nl [M0NKA-mcHF] wrote:

Hi group,

with some other ham's we build 4 mcHF transceivers.

At this moment we are in test phase and notice 40 meter broadcast interference.

Especially in the evening powerfull broadcast stations covers the whole span of 40 meter band.

Seems selectivity is not high enough or maybe a menu setting must be adjusted?

Your ideas / input are appreciated!

73's Ton PA1PXL

Attachment(s) from **Clint Turner** | [View attachments on the web](#)

1 of 1 Photo(s)



[mchf_alt_q1_rf_amplifier.gif](#)

Posted by: **Clint Turner** <turner@ussc.com>

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