Review

YAESU FT-710

HF, 50 and 70MHz transceiver

Continuing the approach by Yaesu to upgrade its HF transceiver product range to employ full SDR techniques and touch-screen spectrum displays, the latest member of the family is the FT-710.

PHOTO 1: FT-710 front view.

PHOTO 3: FT-710 Rear view.

It is broadly aimed as a budget class radio but shares most of the same features and functions as its siblings, the top of the range FTDX101 and mid-range FTDX10. As with the FTDX10, it is a 12V operated radio containing a single receiver covering 1.8 to 50MHz at 100W transmit output power and 50W on 70MHz.

Basic functions

The FT-710 measures 239mm(W) x 247mm(D) x 80mm(H) and weighs 4.5kg. This is similar in size to the FT-991A and slightly smaller than the FTDX10. The receiver tunes from 30kHz to 75MHz and the transmitter is enabled on the amateur bands only. Full transmit coverage of the 5MHz band (5.250 – 5.406MHz) as well as 70MHz (70.0 – 70.5MHz) in the UK is provided in firmware version C2(UK) and if not already activated by the dealer is simple to achieve by appropriate button presses. There is no provision for a low-level output to drive transverters or for LF band operation.

The usual modes are provided: SSB, CW, RTTY (FSK), PSK, AM and FM, with wide or narrow operation on AM and FM, reverse sidebands selectable on SSB, CW and RTTY and with AFSK data on SSB and FM. Ideally, operation on the various newer data modes, such as FT8 or FT4, requires many of the parameters such as receive and transmit bandwidth to be set differently to the more traditional modes for optimum results. To avoid having to change these parameters manually by multiple key presses for each mode change, Yaesu introduced the PRESET function. This provides tailoring of some 17 different settings selectable by a single key press and there are five separate stores for different modes that may be name-tagged. Unlike the FTDX10, the FT-710 does not include built-in decoders for CW, RTTY or PSK modes.

There are the usual twin VFOs (A/B) allowing split operation with the ability to check and tune the transmit frequency via TXW. There are 100 easily accessed and name-labelled memory channels that can be ordered into groups if desired. Single button access to 5 or 10 quick access memories is provided, and there are the usual scan functions included. A novel curved LED illumination either side of the tuning knob shows immediately whether VFO or memory is in use, which VFO and whether in split mode or the clarifier is active, all by different colours. This is termed the VFO mode indicator (VMI).

The radio is provided with a separate external matching speaker (SP-40) that can clip on to either side of the main unit. This forward-facing speaker provides much better sound quality and a wider frequency response, and is used together with the built-in speaker in the top of the case to provide the Yaesu Acoustic Enhanced Speaker System (AESS).

The radio is also provided with a power cable and the SSM-75E hand microphone. This microphone is the same as that supplied with the FTDX10 and is fitted with an RJ-45 connector. As well as up/down keys, the microphone has an audio mute button and four function keys that can be assigned to provide alternative access to a number of front panel buttons. The instruction manual is fairly comprehensive and well written and runs to 112 pages but a more comprehensive index would be helpful. No circuit diagrams are included.

Radio design and architecture

The FT-710 uses direct digital sampling in the receiver as used in recent Icom radios and does not employ a down-conversion to an IF with roofing filters as adopted in the hybrid SDR approach used in the FTDX10 and FTDX101. Two A/D converters operating at signal frequency take their input from the front-end unit. The front-end comprises a selection of bandpass filters, similar to the FTDX10, two switchable preamplifiers for 20dB or 10dB gain and three levels of input attenuation, 6/12/18dB.

The output from the A/D converters feeds into the custom FPGA device. This provides three functions. Firstly it generates an IF signal at 18kHz on CW/SSB or 24kHz on AM/FM by a process of decimation to feed the following

PHOTO 2: FT-710 front-top view.

DSP circuit. Secondly it processes the data to provide the spectrum and waterfall displays. Thirdly it generates a dither signal at the A/D converter inputs to reduce or even eliminate low-level intermodulation distortion products that are inherent in the sampling process. The 32-bit DSP following the FPGA provides all further processing – channel filtering, demodulation, noise reduction, audio processing, AGC functions and more. These functions are the same as for the FTDX10, which uses a Texas Instruments DSP. The FT-710 uses a more powerful device from NXP Semiconductors.

The transmit signal is generated directly at final frequency from a D/A converter and then amplified through to the final PA. A high-resolution direct digital synthesiser is used to provide a low-noise clocking source and this operates at 250MHz. This is the same arrangement as is used in the FTDX10. A 0.5ppm TCXO reference ensures high stability.

The radio is solidly constructed in typical Yaesu style using a substantial and well-shielded diecast frame and integral heatsink with a fan on the rear panel. This is quiet and only operates when the temperature rises. A 65mm loudspeaker fits into the case top, and the same speaker is also fitted into the SP-40 external speaker unit. There is no acoustic shrouding used with either speaker. Extensible front feet tilt the front panel to improve visibility and operating ease and a wrap-around case completes the unit. A side-carrying handle and a mounting cradle for mobile or under-shelf mounting are available as accessories.

Front panel and controls

With the display occupying half of the front panel area, the space available for the conventional pushbuttons and rotary controls becomes quite limited and as a consequence many functions are accessed from the touch-screen display and menu. The physical controls are all placed around the tuning drive, including a group of five pushbuttons set into the top face. The main tuning drive is 45mm in diameter with adjustable torque. Two rotary controls, not the usual dual concentrics, provide AF and RF gain/squelch and two click-step rotary controls set other functions. One of these accesses the function menu and the other doubles to provide rapid step tuning and memory scrolling or to set the bandwidth controls, width/shift/notch/APF/contour filtering. Other top-level functions are selected via pushbuttons. Single buttons select the band or mode via the touch-screen display with a triple band-stack allowing three separate combinations of frequency, mode and other settings available for each band. 70MHz is included under the general coverage button and is best stored to memory as it can be overwritten if other general coverage frequencies are later selected.

The main tuning drive has up to 200 steps per revolution with various mode dependant channel step sizes. Tuning in 1MHz or 1kHz steps is achieved by touching the relevant decade digits on the display and the frequency may also be entered directly from a pop-up numeric keypad. A separate button allows fast tuning at x10 speed or fine tuning in 1Hz steps.

Most remaining functions are selected directly from the display or from the function menu using the FUNC selector click-step rotary control. These functions and their selection are largely similar to the FTDX10.

The high resolution TFT colour touch-screen LCD measures 4.3-inch diagonal, somewhat smaller than the FTDX10, and is clear, sharp and bright with a good viewing angle. All areas of the screen are touch-sensitive for setting displayed functions, often showing pop-up menus for choice selection. The upper part of the display shows the receiver set functions including both A and B VFO frequencies, a graphic indication of the channel bandwidth settings and a single analogue-style S meter. The meter indicates one function on transmit, usually power output but SWR, ALC and compression level are also available.

The lower part of the display is devoted to the spectrum scope in its different formats. Six touch buttons along the bottom of the display select the various options. This provides a spectrum scan and waterfall display centred on the receive frequency or between fixed limits, and an audio waveform scope and spectrum display for both the receiver and the transmitter audio. Both scans may be displayed together in normal or expanded formats. The waterfall may be conventional or in pseudo 3-dimensional format (3DSS) and various colours may be selected. These are all similar to the FTDX10. The receiver can be tuned to any frequency on the spectrum display either by touching the screen or with an external mouse connected.

As with all recent radios the set-up menu system is extremely comprehensive with over 200 items split into five categories of every conceivable parameter available for user selection and adjustment. The display makes access very easy, straightforward and unambiguous albeit rather busy.

A headphone jack (3.5mm) and a microphone socket (RJ-45) are provided on the front panel but the key jack is on the rear panel.

Rear panel

There is a single antenna socket on the rear panel but there is no provision for connecting a receive antenna or an additional receiver. A single CW key jack is configurable for paddles, straight keys or external keying and there are 3.5mm jacks for external speaker and FH-2 remote keypad. A 6-pin mini-DIN connector provides audio and interfacing lines for the Data modes. An 8-pin mini-DIN connector is multipurpose. It provides band data and control lines for the FC-40 external

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auto ATU or alternatively interface lines for connecting linear amplifiers. There are no phono jacks to provide alternative methods of connection. The FTDX10 uses a 10-pin mini-DIN for linear amplifier connection and plugs are difficult to obtain so fortunately this has been avoided in the FT-710.

A USB-B connector provides the CAT computer interface for logging programs as well as audio lines for data modes. A single USB-A connector allows the connection of a keyboard or a mouse. The mouse provides an alternative to touching the screen and is more precise and accurate. The keyboard can be used for inputting text into the message stores or for memory labelling. There is no 9-pin D RS-232 jack, it has finally reached the end of the road, but RXD and TXD lines are available on the 8-pin mini-DIN jack. An external display can also be linked via a DVI-D connector

PHOTO 4: Top view with covers removed showing Tx, PA and ATU.

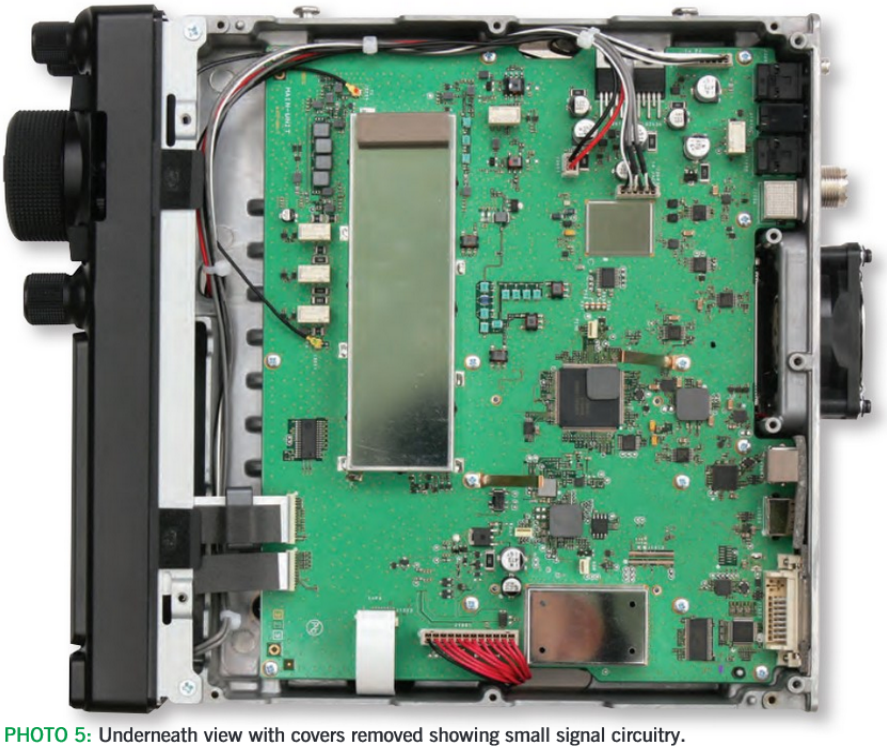

PHOTO 5: Underneath view with covers removed showing small signal circuitry.

Receive features

The usual receive functions are all provided in a similar fashion to the FTDX10 or indeed in most other radios these days.

Two settings for channel bandwidth are immediately accessible, normal and narrow, by toggling the NAR button. The bandwidth for each can be set independently for each mode over quite wide limits from 4000Hz down to 50Hz on CW and data modes. On AM and FM, two fixed bandwidths are provided. There is no control over the shape or the slope as seen on some radios but the Yaesu contour system provides a rolling peak or cut over the passband and this can be effective in some difficult situations.

An IF notch filter is provided with adjustable centre frequency and width. Operating inside the AGC loop, desensitisation with strong carriers is prevented. Implemented at audio is the auto-notch (DNF), a beat cancellation filter. This automatically locates and removes multiple tones but does not prevent strong carriers from desensitising the receiver and is activated from the menu system. Notches and Contour settings are graphically displayed most effectively on the display together with their effect on the passband spectrum.

The audio bandwidth can be tailored separately for each mode and on CW an audio peak filter can be enabled. This has three selectable bandwidths and is tuneable across the pitch frequency. Also included are a digital noise reduction system and a noise blanker. Both are adjustable.

Three mode-dependant AGC speeds are selectable, programmable over wide limits and AGC can also be switched off. RIT (clarifier) and XIT are both provided and an auto-tune feature that fine-tunes the receiver on clear signals to give the correct CW pitch.

Transmit features

The transmitter power output is variable in 1W steps down to about 5W with different levels on the HF, 50 and 70MHz bands. The radio includes a built-in auto ATU covering bands 1.8 to 50MHz and will tune antennas with VSWR up to 3:1 (2:1 on 50MHz). The tuning settings are stored in memory for rapid recall with a capacity of 100 different settings. For end-fed wire antennas the FC-40 remote auto tuner can be used.

PHOTO 6: FT-710AESS front view.

On SSB, VOX and a transmission monitor are provided. AMC (Automatic microphone gain control) akin to AGC and also known as VOGAD prevents audio overdrive and a conventional compressor raises the average modulation level. The audio bandwidth may be tailored by one of five bandpass filters in conjunction with a three-stage parametric equaliser with separate settings for the processor on or off. On FM, repeater operation on the 29MHz and 50MHz bands is provided with appropriate shifts and CTCSS tone decoders and encoders.

On CW, the usual break-in modes are provided and a full contest message keyer with all the usual options and settings. Five message stores containing up to 50 characters each can be programmed either from the keying paddle or from text entry using an external keyboard or internal pop-up keypad. Messages can be played back from the front panel or more conveniently using the FH-2 remote keypad accessory.

The radio includes a voice store for use in SSB contests. There are 5 message stores, each capable of storing up to 90 seconds of audio and playback is similar to the CW stores, either from the front panel or using the FH-2 remote keypad. The voice store requires an SD card to be plugged in, unlike the CW stores, which do not need an SD card.

Other features

An SD card slot is fitted into the left-hand side of the case and is used to save various settings, memory contents, receive audio, voice memories, screen capture and updating the firmware. Note that if the SP-40 external speaker unit is clipped onto the left-hand side of the radio, this obscures access to the SD card slot.

The voice store can also be used to record and playback the receiver audio. This is stored as WAV files on the SD card at a rate of 64kB/s. This corresponds to 4.3 hours of recording per GB of storage with a maximum file size of 35GB.

To connect the radio to a computer via the USB-B socket for logging or for data modes such as FT8, it is first necessary to download drivers from the Yaesu website if not already installed on the PC. This will install two virtual COM ports and allows audio transfer as well as data control. I quickly had the radio up and running on FT8.

Full remote control of the radio via the internet or locally via a LAN uses the SCU-LAN10 remote control unit. At the time of this review, the software was not yet available. The LAN unit connects to the radio via the USB-B connector only and does not use the additional multiway connector needed with the FTDX10 or FTDX101.

Measurements

The measured performance of the FT-710 is similar to the FTDX10 in most areas and the full set of measurements is given in the table.

The sensitivity figures were excellent as usual. 8dB attenuation is inserted below 1.7MHz and then sensitivity rolls off further below 500kHz. At 200kHz it is down by over 30dB. The S meter calibration showed about 2.5 to 3dB per S unit and was very linear across the whole range. All modes were broadly the same.

Spurious responses and birdies were very low indeed, none of significance. The AGC attack characteristic was clean with no overshoot but a small hole of about 2 to 3ms was inserted in the attack characteristic, typical of most DSP radios.

The strong signal performance of the receiver is excellent. Direct sampling receivers usually suffer from low-level intermodulation products produced with quite modest signal levels and can be audible on quiet bands. It is caused by the quantisation steps within the A/D conversion process and can be reduced by inserting a noise or dithering signal prior to conversion. With Icom radios, this dither signal is usually switchable but in the FT-710 it is in circuit at all times. It is very effective; there was no trace of intermodulation up until the point at which the overload limit was approached. The intermodulation limited dynamic range measured around 100dB in SSB bandwidths or 105dB in CW bandwidths. These dynamic range figures held at close spacings right down to 1kHz or less and represent a very high performance. Inband linearity was also excellent.

The overload or blocking limit of direct sampling receivers is generally the result of the A/D converter running out of range. In many receivers this point is indicated by an overload display indicator requiring some manual gain reduction by the operator. With the FT-710, overload protection is automatically triggered reducing front-end gain by a subsidiary AGC process so that the A/D converter does not run out of range. This occurs at about +1dBm at the antenna input with the preamp off (IPO) or 10dB/20dB lower with preamplifier 1 or 2 in circuit.

The reciprocal mixing phase noise figures were also excellent, particularly so for radios in this price bracket. The low noise performance allowed the IF filter skirts to be measured down to a level of about –90dB with relative ease and the filters exhibited a clean response with excellent shape factor.

On transmit, the power output was well up to specification and the power reading quite accurate. The two-tone distortion products were generally quite reasonable. The audio was very clean with low distortion and quite tolerant of high ALC levels and overdrive. The processor, similarly, was clean with negligible effect on wideband products.

CW rise and fall shapes were clean with negligible distortion or character shortening at 40wpm even in full break-in mode. Rise and fall times are adjustable and there was no power overshoot at any power level. There is a menu-settable delay on keying (15-30ms) to allow for linear amplifier switching so that the RF is correctly sequenced even for slow linears. This functioned correctly when using the internal keyer, but with external keying this delay time was fixed at 15ms, whatever time is set in the menu. This is a bit too fast

PHOTO 7: Function menu screen view.

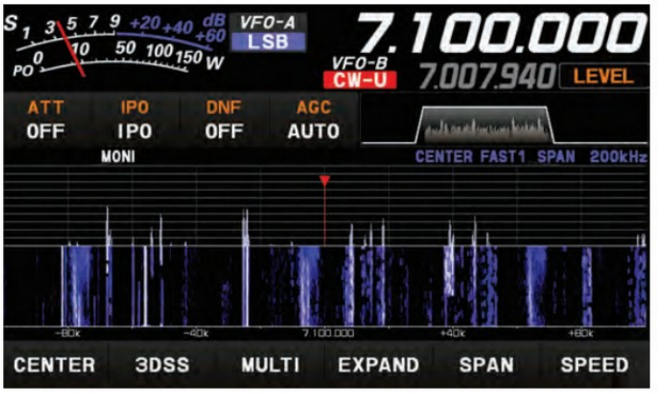

FIGURE 1: Spectrum and waterfall display.

FIGURE 2: 3DSS display.

for older style linears, and needs to be resolved, probably a software fix.

AM transmit was clean with fairly low distortion but modulation was predominately in the downward direction. This resulted in overall power reduction with modulation.

The transmit composite noise output at full power is very similar to the FTDX10 and better than most radios on the bands. The noise at lower power and even key-up on CW does not reduce significantly and this is fairly normal with most radios. The key-up noise on CW measured -93dBm/Hz. This noise is largely AM noise which predominates over the phase noise element quoted in brochures.

On-the-air performance

In many ways the operation of the FT-710 is similar to the FTDX10 with similar display functions, similar menu functions and buttons and controls clustered around the tuning knob. The positioning of the controls and how some functions are accessed is somewhat different though. The tuning drive is smooth and positive but with only 200 steps per revolution the trade-off between step size resolution and tuning speed is more of a compromise. The separate click-step control rapidly ensures larger frequency changes are easily made and this also doubles to change channel bandwidth settings. There is no secondary tuning ring as used on the FTDX10, and button timeouts have been improved (lengthened) so rapid selection is less critical. Most functions are in general fairly easy to use.

The display shows the same information as the FTDX10 but as it is somewhat smaller, touch control becomes that much more critical when selecting items on the various menu screens. An external display used with a mouse can be a great help. I used a 24-inch display with very impressive results. The 3D spectrum display gives a good impression of band activity but overall I personally prefer the conventional spectrum with waterfall scans. **Figures 1** and **2** compare the two spectrum scans for the same band activity, one recorded immediately after the other. Tuning the radio from the spectrum display gave reasonably accurate results providing the span was kept fairly low. Using a mouse for this purpose is much more precise than using fingers and of course works on an external display but it is a shame that Yaesu has still not implemented mouse wheel scrolling to fine tune precisely on wanted signals with one hand.

The audio quality using the front facing speaker was very good with much wider frequency response into the bass region than the top-facing speaker alone. This is particularly noticeable on stations who have tailored their transmit audio for a broader bandwidth and, of course, with broadcast stations. The AESS controls did not seem to make much difference to my ears; the improvement was more related to using the external SP-40 speaker.

As with all modern radios, the performance cannot be faulted. It handled strong signals well and in pileup conditions with clean results, and also with weak signals on the higher bands. The filters and notches were excellent and the DNR digital noise reduction system very effective.

On transmit, the audio quality was good using the supplied SSM-75E hand microphone and if needed there is a huge range of tailoring of the audio response available. The processor was clean and added extra punch. On CW, the keying and the sidetone were clean and it was possible to listen between characters up to around 15wpm. As with the FTDX10 and FTDX101, the process for setting the microphone gain and AMC levels as described in the manual is rather ambiguous, but setting these to give a moderate degree of compression (10dB max) with the ALC in the lower half of the meter display gave good results.

During the period that I had the radio for review, a firmware upgrade became available. I downloaded and installed the upgrade easily with no problems. It addressed a number of improvements and bug fixes.

Conclusions

The FT-710 is another Yaesu radio with a real top class performance at a very attractive price. It has an excellent balance of features and functions with good overall user ergonomics. It is currently priced around £1100 from the usual Yaesu stockists and this represents very good value for money.

Acknowledgements

I would like to express my gratitude to Yaesu UK for the loan of this radio.

Yaesu FT-710 Measured Performance

Receiver measurements

	Sensitivity SSB 10dBs+n:n			Input for S9		
Frequency	IPO	Preamp 1	Preamp 2	IPO	Preamp 1	Preamp 2
1.8MHz	0.7μV (-110dBm)	0.25μV (-119dBm)	0.1μV (-127dBm)	90μV	32μV	9μV
3.5MHz	0.63μV (-111dBm)	0.2μV (-121dBm)	0.1μV (-127dBm)	80μV	28μV	8μV
7MHz	0.63μV (-111dBm)	0.22μV (-120dBm)	0.1μV (-127dBm)	90μV	32μV	8μV
10MHz	0.63μV (-111dBm)	0.22μV (-120dBm)	0.1μV (-127dBm)	90μV	28μV	8μV
14MHz	0.63μV (-111dBm)	0.22μV (-120dBm)	0.1μV (-127dBm)	80μV	28μV	8μV
18MHz	0.7μV (-110dBm)	0.25μV (-119dBm)	0.1μV (-127dBm)	80μV	28μV	8μV
21MHz	0.7μV (-110dBm)	0.25μV (-119dBm)	0.11μV (-126dBm)	80μV	28μV	8μV
24MHz	0.63μV (-111dBm)	0.22μV (-120dBm)	0.1μV (-127dBm)	90μV	28μV	8μV
28MHz	0.63μV (-111dBm)	0.2μV (-121dBm)	0.1μV (-127dBm)	80μV	28μV	8μV
50MHz	0.45μV (-114dBm)	0.14μV (-124dBm)	0.11μV (-126dBm)	80μV	28μV	8μV
70MHz	0.56μV (-112dBm)	0.18μV (-122dBm)	0.13μV (-125dBm)	100μV	32μV	9μV

AGC threshold with preamp1: 2μV
100dB above AGC threshold for <1dB audio output increase
AGC attack time: 2-3ms
AGC decay time: adjustable 20ms to 4s
Max audio at 1% distortion: 1.7W into 8Ω, 2.7W into 4Ω
Inband intermodulation products: better than -60dB

S-Reading	Input Level USB		
(7 MHz)	IPO	Preamp 1	Preamp 2
S1	8μV	2.8μV	0.8μV
S3	13μV	4μV	1.1μV
S5	22μV	8μV	2μV
S7	40μV	14μV	4μV
S9	90μV	32μV	8μV
S9+20	1.1mV	400μV	110μV
S9+40	11mV	4mV	1.1mV
S9+60	110mV	40mV	11mV

Bandwidth	Bandwidth				
Set To	-6dB	-60dB	-70dB	-80dB	-90dB
USB 2.4kHz	2429Hz	3079Hz	3141Hz	3198Hz	3265Hz
CW 500Hz	508Hz	710Hz	730Hz	748Hz	771
CW 100Hz	104Hz	205Hz	215Hz	225Hz	262Hz
AM	8970Hz	10550Hz	10690Hz	10830Hz	10960Hz
AM-N	5970Hz	7630Hz	7790Hz	7930Hz	8060Hz
FM	15830Hz	17470Hz	17610Hz	17750Hz	19970Hz
FM-N	8980Hz	10550Hz	10690Hz	10830Hz	10960Hz

	Intermodulation Dynamic Range 20kHz spacing, USB 2.4kHz bandwidth		
Frequency	IPO	Preamp 1	Preamp 2
1.8MHz	95dB	95dB	91dB
3.5MHz	98dB	99dB	94dB
7MHz	100dB	99dB	95dB
14MHz	101dB	101dB	97dB
21MHz	100dB	99dB	96dB
28MHz	99dB	99dB	95dB
50MHz	95dB	95dB	89dB
70MHz	92dB	92dB	86dB

Frequency Offset	Reciprocal Mixing Dynamic Range 500Hz Bandwidth		Intermodulation Dynamic Range 500Hz BW 14MHz
	7MHz	21MHz	
1kHz	112dB (-139dBc/Hz)	not measured	105dB
2kHz	114dB (-141dBc/Hz)	not measured	105dB
3kHz	115dB (-142dBc/Hz)	114dB (-141dBc/Hz)	105dB
4kHz	116dB (-143dBc/Hz)	116dB (-143dBc/Hz)	105dB
5kHz	117dB (-144dBc/Hz)	117dB (-144dBc/Hz)	105dB
10kHz	118dB (-145dBc/Hz)	120dB (-147dBc/Hz)	105dB
15kHz	118dB (-145dBc/Hz)	121dB (-148dBc/Hz)	105dB
20kHz	118dB (-145dBc/Hz)	123dB (-150dBc/Hz)	105dB
30kHz	119dB (-146dBc/Hz)	124dB (-151dBc/Hz)	105dB
50kHz	119dB (-146dBc/Hz)	125dB (-152dBc/Hz)	105dB
100kHz	119dB (-146dBc/Hz)	125dB (-152dBc/Hz)	105dB

Transmitter measurements

	CW Power		Intermodulation Products wrt PEP		Transmit Frequency	
Frequency	Output	Harmonics	3rd order	5th order	Offset	Composite Noise 7MHz 100W O/P
1.8MHz	106W	-75dB	-30dB	-38dB	1kHz	-72 dBm/Hz (-122dBc/Hz)
3.5MHz	105W	-65dB	-32dB	-38dB	2kHz	-74 dBm/Hz (-124dBc/Hz)
7MHz	103W	-74dB	-36dB	-36dB	3kHz	-75 dBm/Hz (-125dBc/Hz)
10MHz	103W	-60dB	-34dB	-36dB	4kHz	-76 dBm/Hz (-126dBc/Hz)
14MHz	106W	-75dB	-32dB	-36dB	5kHz	-77 dBm/Hz (-127dBc/Hz)
18MHz	108W	-77dB	-32dB	-36dB	10kHz	-79 dBm/Hz (-129dBc/Hz)
21MHz	108W	-72dB	-34dB	-36dB	15kHz	-80 dBm/Hz (-130dBc/Hz)
24MHz	108W	-80dB	-32dB	-36dB	20kHz	-80 dBm/Hz (-130dBc/Hz)
28MHz	108W	-70dB	-32dB	-36dB	30kHz	-81 dBm/Hz (-131dBc/Hz)
50MHz	105W	-82dB	-28dB	-40dB	50kHz	-82 dBm/Hz (-132dBc/Hz)
70MHz	53W	-70dB	-44dB	-40dB	100kHz	-84 dBm/Hz (-134dBc/Hz)

Intermodulation product levels are quoted with respect to PEP.

Microphone input sensitivity: 0.1mV for full output
Transmitter AF distortion: generally less than 0.1%
FM deviation: 2.0kHz narrow / 4.0kHz wide

Note:
All signal input voltages given as PD across antenna terminal. Unless stated otherwise, all measurements made with receiver preamp switched out (IPO), on USB with 2.4kHz bandwidth and on CW with 500Hz bandwidth.