

McMurdo F1 DSC VHF marine transceiver

Measurements in accordance with 47 CFR section 2.1046 to 2.1057

2.1046: RF Power Output

(Maximum rated power 25W.)

See Telefication B.V. report 98747630, table in section 8.2. "Transmitter Carrier Power".

Report number: **98747630**

TEST FORM

TYPE TEST OF RADIO EQUIPMENT ACCORDING TO EN 301 025-1 V1.1.2 Issue August 2000

Radio Equipment and Systems (RES); Technical characteristics and methods of measurement for VHF radiotelephone equipment for general communications and associated equipment for Class "D" Digital Selective Calling (DSC)

Date of test: 13-12; 19-12; 20-12-2001 Ambient temp.: 23 °C R.H.: 50 %

8.2 TRANSMITTER CARRIER POWER.

Rated output H.P.: 25.0 W
L.P.: 1.0 W

TEST CONDITIONS		CARRIER POWER (W)					
		156.050 MHz		Channel 16		157.425 MHz	
Temperature	Voltage	H.P.	L.P.	H.P.	L.P.	H.P.	L.P.
$T_{nom}(+20\text{ }^{\circ}\text{C})$	$V_{nom}(12.0\text{V})$	20.0	0.56	20.0	0.56	20.7	0.59
$T_{min}(-15\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{V})$	22.0	0.65	22.5	0.68	21.5	0.70
	$V_{max}(15.6\text{V})$	20.4	0.65	21.6	0.68	21.5	0.70
$T_{max}(+55\text{ }^{\circ}\text{C})$	$V_{min}(10.8\text{V})$	14.4	0.40	15.4	0.42	15.4	0.43
	$V_{max}(15.6\text{V})$	12.9	0.41	13.3	0.43	13.6	0.44
Measurement uncertainty		0.61 dB					
Limits (8.2.3)		<u>Normal test conditions:</u> => H.P.: - between 6 and 25 W - max. of ± 1.5 dB from rated outp. power => L.P.: between 0.1 and 1 W <u>Extreme test conditions:</u> => H.P.: - between 6 and 25 W - within +2 & -3 dB from rated outp.power => L.P.: between 0.1 and 1 W					

H.P. = Output power switch set at its maximum

L.P. = Output power switch set at its minimum

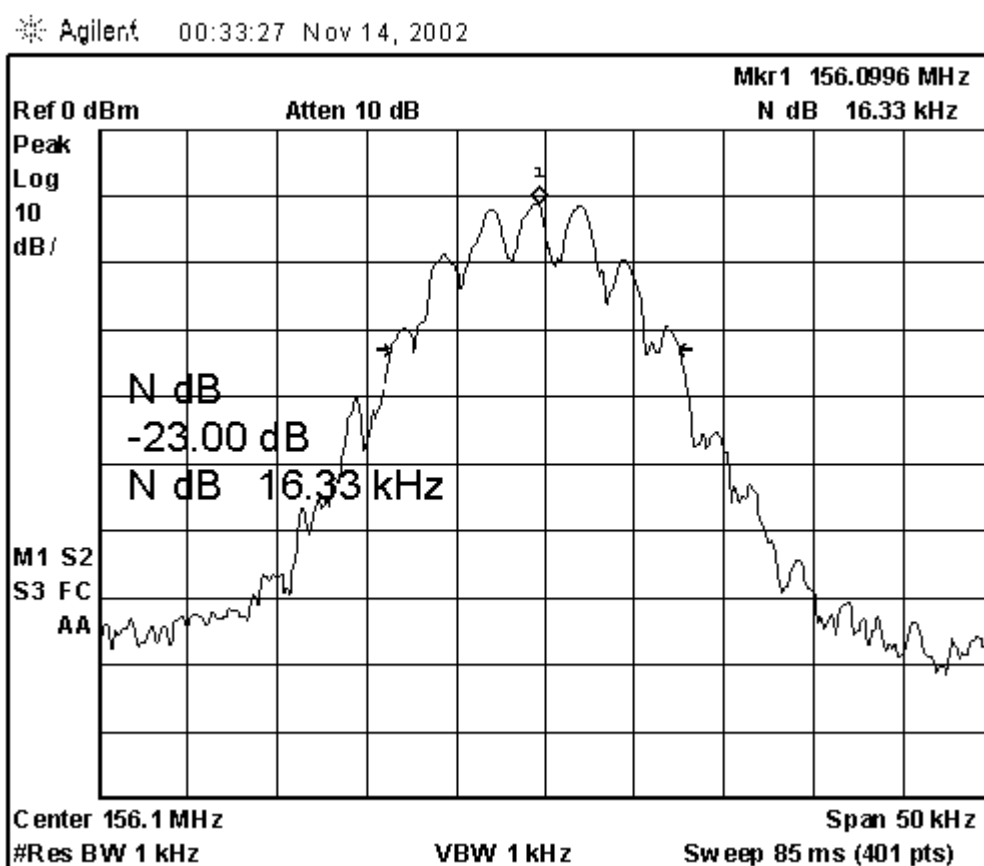
2.1047: Modulation Characteristics

See Telefication B.V. report 98747630,
section 5.2."Class of Emission and Modulation Characteristics".

G3EJN for telephony
G2B for DSC

2.1049: Occupied Bandwidth - Channel (Fixed tone modulation)

The FCC definition of occupied bandwidth is '...the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 per cent of the total mean power radiated'. This corresponds to the 23dB bandwidth ($10\log 0.005$).

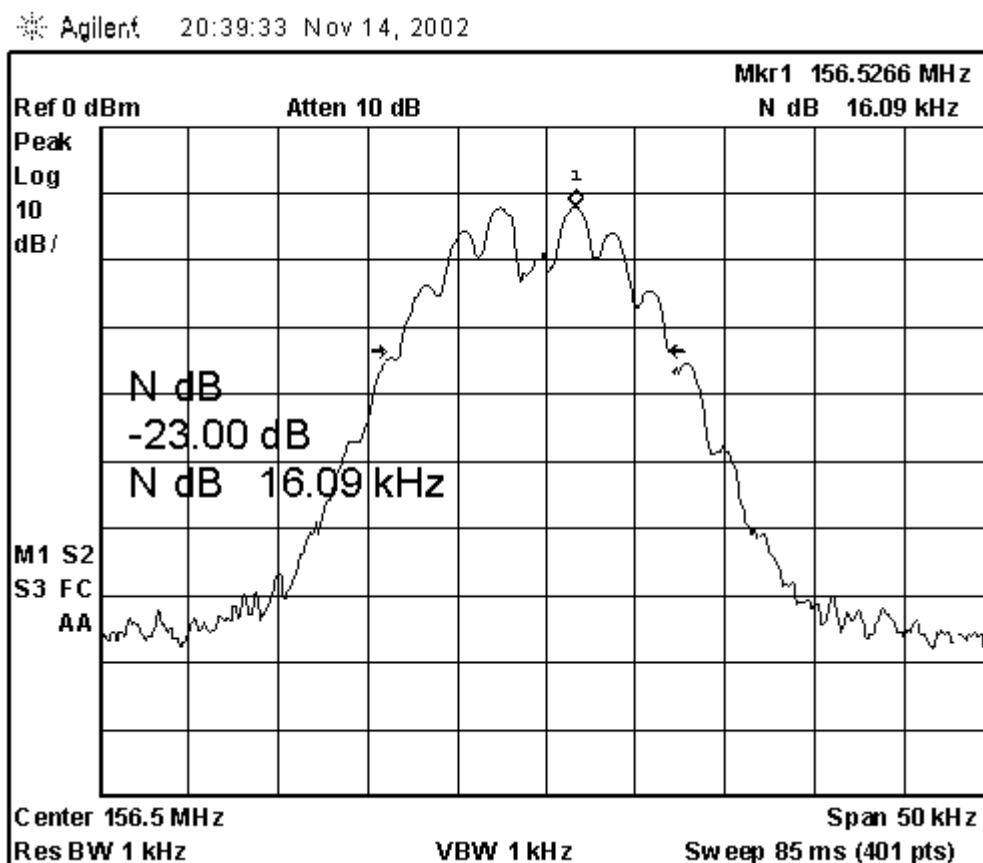


Occupied Bandwidth is 16.3kHz.

2.1049: Occupied Bandwidth

- DSC (2 tone, dot pattern modulation)

The FCC definition of occupied bandwidth is '...the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 per cent of the total mean power radiated'. This corresponds to the 23dB bandwidth ($10\log 0.005$).

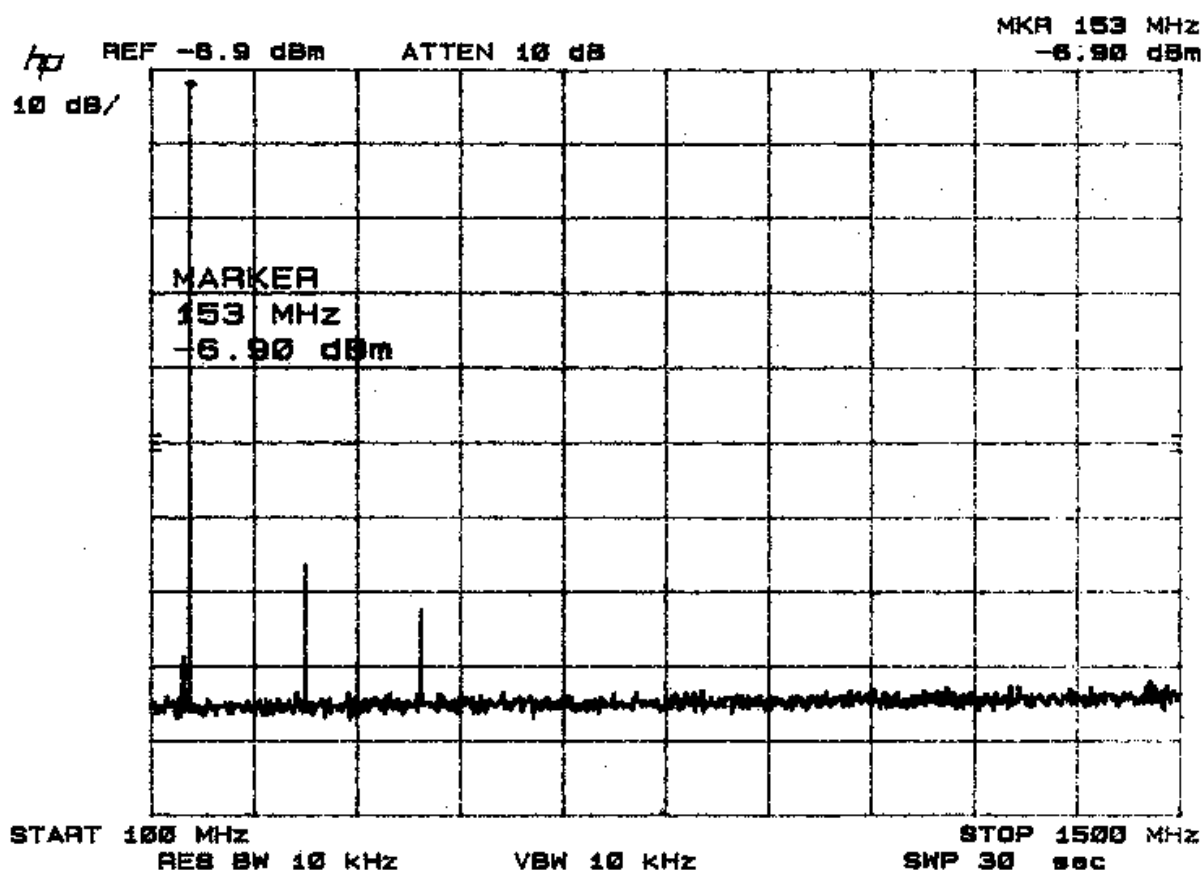


The Occupied Bandwidth with DSC modulation is 16.1kHz.

2.1051: Spurious Emissions at Antenna Terminals

Measurements performed at full power into a 50ohm load, with 50dB external attenuation. Limit of available measuring equipment is 1.5GHz.

Transmit frequency = 156.1MHz.



Marker measurements using expanded scale listed below:

Carrier frequency: 156.100MHz:

2nd harmonic @ 312.2MHz / -64.7dBc, 3rd harmonic @ 468.3MHz / -70.1dBc.

Floor = -90dBm.

2.1053: Field Strength of Spurious Radiation

See Comlab report 00/08216/6 section 5.1 (included here):

5 EMISSION MEASUREMENTS

5.1 Cabinet Radiation Transmitter operating Clause 8.9

EN 301 025-1

Power level 20W. Ch. 16.

Spurious Emission Level			
Frequency MHz	Polariz. V/H	BW kHz	Level μ W
940,4	H	15	0,025
30 - 1000	V/H	15	< 0,025
1097,6	V	15	0,06
1000 - 2000	V/H	15	< 0,025
Measurement Uncertainty : +2,1dB / -2,5dB _s (25-1000 MHz) +1,6 dB / -1,8 dB (1-8 GHz)			

Reference antenna: Up to 1 GHz: dipole. Above 1GHz: isotropic.
Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

A prescan has been performed in order to detect possible spurious emissions (30 - 2000 MHz)

Limits Clause 8.9.3

Frequency	Level
30 MHz - 2 GHz	< 0,25 μ W

Test Equipment Used: LR 0061, LR 282, LR 1062, LR 1178, LR 1230, LR 1237, LR 1330

Please refer to the report from Comlab for more details.
(Report included with this submission).

2.1055: Frequency Stability

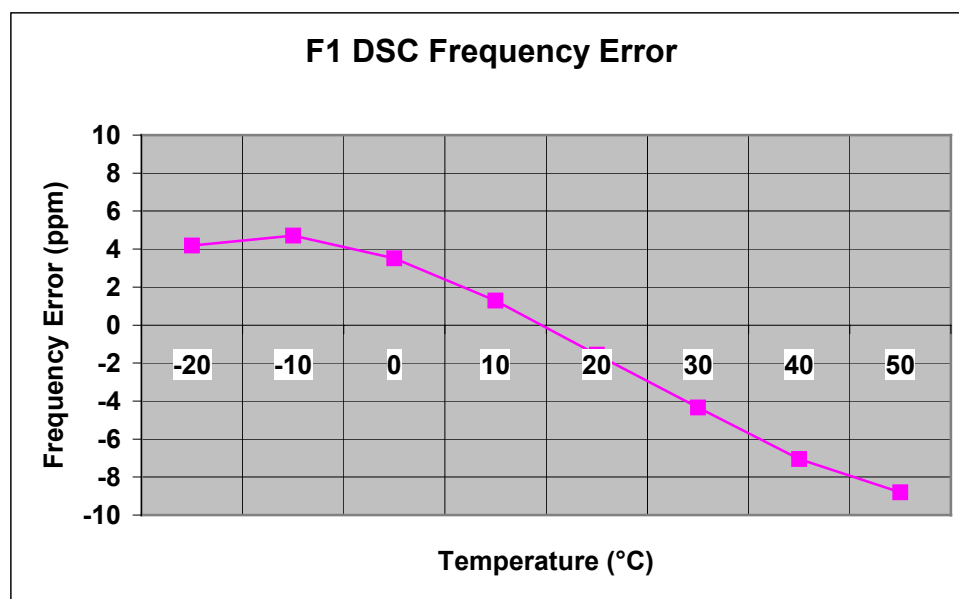
McMurdo F1 DSC VHF marine transceiver.

Frequency Stability (47 CFR Part 2.1055).

a) Frequency Stability over temperature:

Frequency (MHz)	Temperature (°C)	Error (ppm)
156.1006540	-20	4.189622
156.1007344	-10	4.704676
156.1005476	0	3.508008
156.1002002	10	1.282511
156.0997568	20	-1.557976
156.0993219	30	-4.344010
156.0989004	40	-7.044202
156.0986264	50	-8.799488

(1 hour stabilizing time between each temperature step and reading.)



b) Frequency Stability vs. power supply variation:

Nominal supply 12V ($\pm 15\%$)

Frequency (MHz)	Voltage (V)	Error (ppm)
156.0998590	13.8	0.903267
156.0997025	10.2	0.905830

Equipment used (in house tests):

Equipment Type	Manufacturer/ Description / Designation	Serial Number	Test equipment reference	Other information
UUT	McMurdo / Marine DSC radio / F1	844100018	N/A	S/W build 1.1.2.30
Power Supply	Topward / 30V, 6A DC Linear / TPS-2000	868858	TE1199	
Spectrum Analyzer	Agilent / 9kHz-1.5GHz E4401B /	MY41440157	N/A	
Spectrum Analyzer	Hewlett Packard / 100Hz-1.5GHz 8566B	2729A00813	E1335	
Radio Communications Analyzer	Marconi Instruments / Radio Communication Analyzer/ 2955	132122	TE4025	
Function Generator	Philips / Audio Generator / PM5134	LO4568	TE1300	
Dummy Load	Hewlett Packard / 50Ω, 30W	2703A043	N/A	30dB attenuation
Oscilloscope	LeCroy / Digital Oscilloscope / LT322	00443	TE3001	
Attenuator	Generic / 50Ω Attenuator	N/A	N/A	10dB & 20dB used.
Frequency Counter	Philips / Counter Timer / PM6680	551 983	E1428	High resolution counter.
Frequency Standard	Ball-Efratom / Rubidium Freq Std. / MRT	N/A	E800-1	
Programming Interface	McMurdo / Data interface / 84-590	046	N/A	Custom interface.
Test PC	Taran / Pentium	18931	N/A	Generic "IBM" PC DSC test only.

* Test equipment used by type approval bodies is listed in the respective type approval reports.