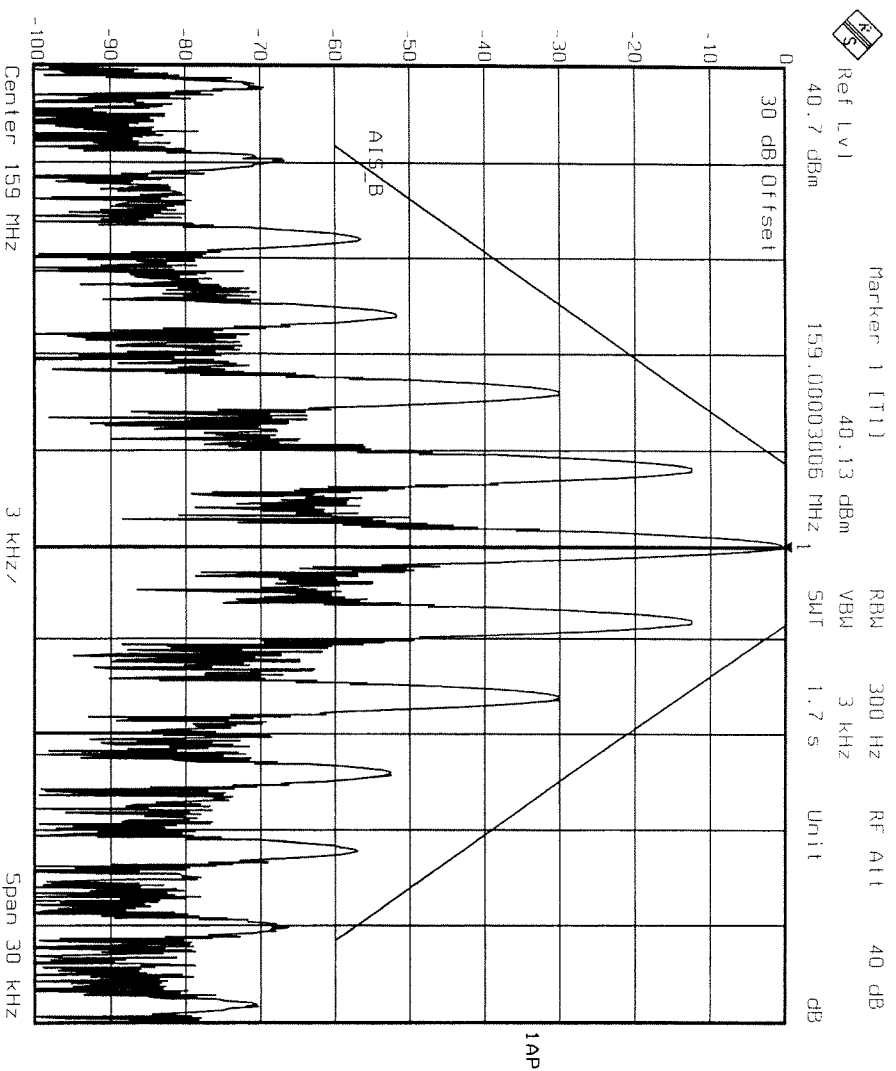


Modulation Spectrum 12.5 kHz channel mode

TX freq.: 159.000 MHz

Carrier power: H. P.

Spectrum obtained during continuous transmission; modulation: 110011 – sequence



Limit: within the mask specified in figure 5, Clause 15.1.4, IEC 61993-2.

(Emission mask):

At ± 12.5 kHz removed from the carrier, the modulation sidebands is below -60 dBc.

In the region between ± 2.5 kHz and ± 12.5 kHz removed from the carrier, the modulation sidebands is below a line starting at 0 dBc / ± 2.5 kHz and ending at -60 dBc / ± 12.5 kHz without any need to be below 0.25 μ W.

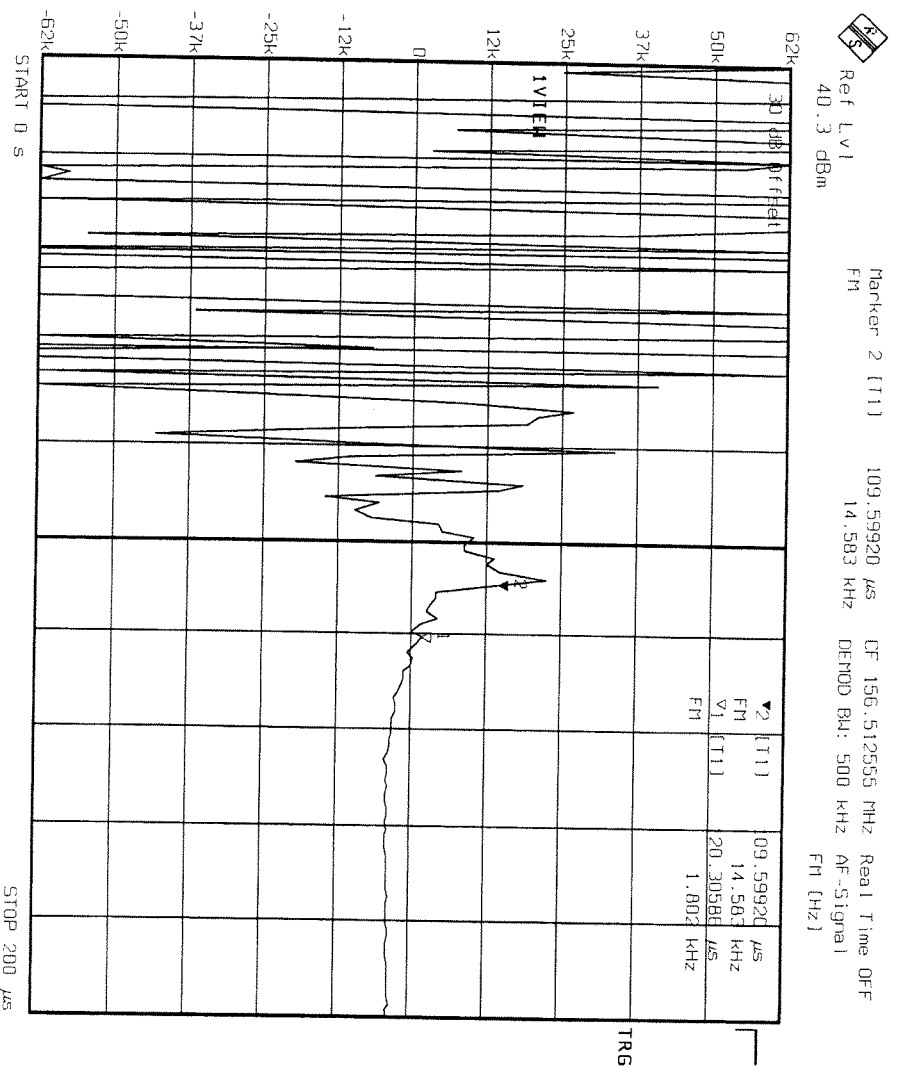
Test equipment used: (Item numbers)	10, 25
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Test results module

2.4.5 15.15 Transmitter Attack Time

TX freq.: 156.5125 MHz
Carrier power: H. P.

PLOT OF FREQUENCY BEHAVIOUR



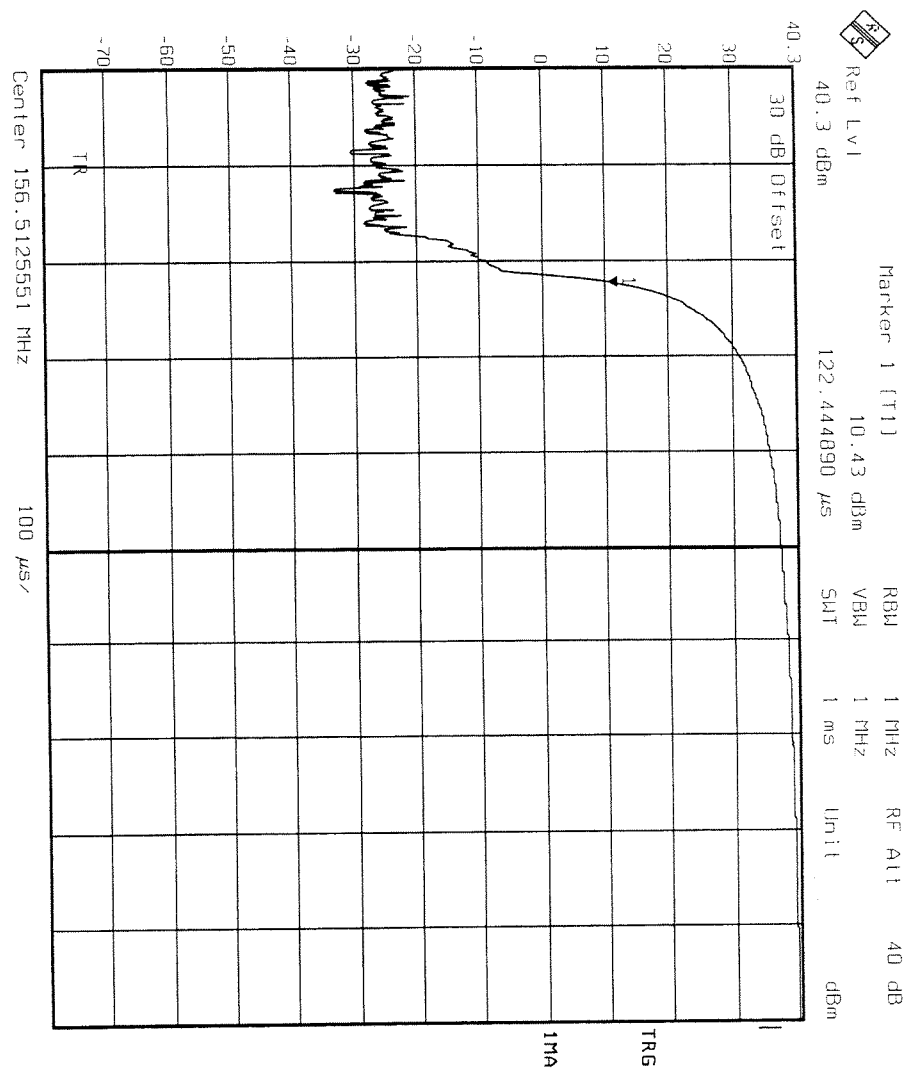
Test equipment used: (Item numbers)

10, 25

Test results module

TX freq.: 156.5125 MHz
Carrier power: H. P.

PLOT OF RF POWER BEHAVIOUR



Measurement Uncertainty: ± 0.02 ms
Limit:
- Transmitter attack time T_0 : within 1 ms,
- Transient power level: within ± 1.5 dB of its final value at any time,
- Carrier frequency F_c : within ± 1 kHz of its required value after 1 ms.

Test equipment used: (Item numbers)	10, 25
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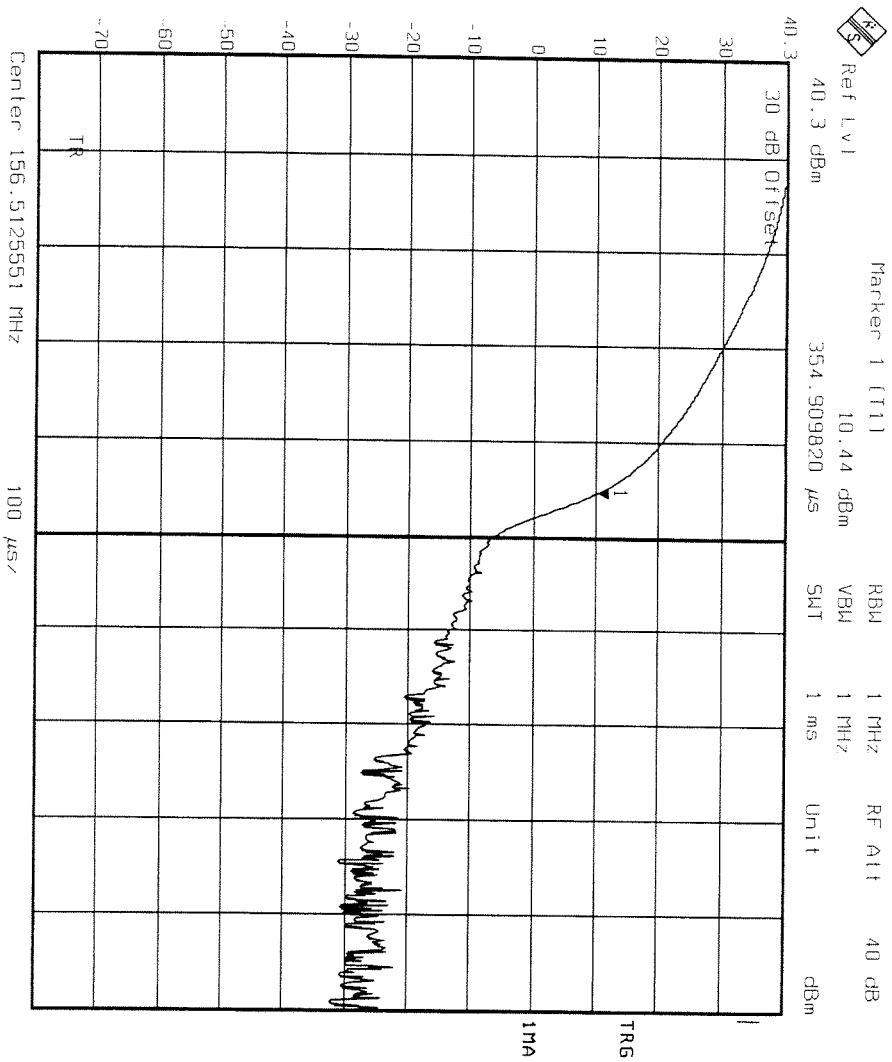
Test results module

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2.4.6 15.1.6 Transmitter Release Time

TX freq.: 156.5125 MHz
Carrier power: H. P.

PLOT OF RF POWER BEHAVIOUR



Measurement Uncertainty: ± 0.02 ms

Limit:

Transmitter release time T_r : within 1 ms,

Test equipment used: (Item numbers)

10, 25

2.5 15.2 DSC Transmissions

2.5.1 15.2.1 Frequency error of the DSC Signal

CHANNEL 70 Fn = 156.525 MHz

TEST CONDITIONS		FREQUENCY ERROR (Hz)	
Temperature	Voltage	B-STATE (2100 Hz)	Y-STATE (1300Hz)
T_{nom} (+20 °C)	V_{nom} (24.0 V)	+ 0.1	+ 0.1
T_{min} (-15 °C)	V_{min} (21.6 V)	+ 0.1	+ 0.1
T_{max} (+55 °C)	V_{max} (31.2 V)	+ 0.1	+ 0.1
Measurement uncertainty		± 0.1 Hz	
Limits		≤ ±1%	

Test equipment used: (Item numbers)	11, 12, 13, 14, 21, 22, 25, 31, 32, 33, 34, 35
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Test results module

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2.5.2 15.2.2 Modulation Rate

CHANNEL 70

$F_n = 156.525 \text{ MHz}$

TEST CONDITIONS		Modulation Rate Error (ppm)
Temperature	Voltage	
T_{nom} (+20 °C)	V_{nom} (24.0 V)	
Limit		1200 bit/s ± 30 ppm

Test equipment used: (Item numbers)	11, 12, 13, 14, 21, 23, 25, 31, 33, 34, 35
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Test results module

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2.6 15.3 TDMA Receivers

2.6.1 15.3.1 Sensitivity - 25 kHz Operation

TEST CONDITIONS		SENSITIVITY LEVEL	
Temperature	Voltage	F _m : 156.025 MHz RF level (dBm)	F _m : 162.025 MHz RF level (dBm)
<i>T_{nom}</i> (+20 °C)	<i>V_{nom}</i> (24.0 V)	- 109 dBm at 6% PER	- 109 dBm at 7% PER
<i>T_{min}</i> (-15 °C)	<i>V_{min}</i> (21.6 V)	- 108 dBm at 7% PER	- 108 dBm at 7% PER
<i>T_{max}</i> (+55 °C)	<i>V_{max}</i> (31.2 V)	- 107 dBm at 16% PER	- 107 dBm at 17% PER
Measurement uncertainty		± 1.2 dB	
Limits		≤ - 107 dBm with a PER of 20% under normal test conditions, ≤ - 101 dBm with a PER of 20% under extreme test conditions,	

Test equipment used: (Item numbers)	4, 5, 9, 13, 14, 21, 22, 25, 31, 32
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Test results module

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2.6.2 15.3.2 Sensitivity - 12.5 kHz Operation

TEST CONDITIONS		SENSITIVITY LEVEL	
Temperature	Voltage	Fn: 157.4125 MHz RF level (dBm)	Fn: 160.6375 MHz RF level (dBm)
T_{nom} (+20 °C)	V_{nom} (24.0 V)	- 102 dBm at 9% PER	- 102 dBm at 7% PER
T_{min} (-15 °C)	V_{min} (21.6 V)	- 101 dBm at 18% PER	- 101 dBm at 18% PER
T_{max} (+55 °C)	V_{max} (31.2 V)	- 100 dBm at 3% PER	- 100 dBm at 19% PER
Measurement uncertainty		± 1.2 dB	
Limits		≤ - 98 dBm with a PER of 20% under normal test conditions, ≤ - 92 dBm with a PER of 20% under extreme test conditions,	

Test equipment used: (Item numbers)

4, 5, 9, 13, 14, 21, 22, 25, 31, 32

2.6.3 15.3.3 Error Behaviour at High Input Levels

TEST CONDITIONS		Packet Error Rate (%)	
Standard Test Signal		Fn = 156.025 MHz (CH 60) as described in clause 15.3.1	
Input signal (dBm)		-77	-7
Temperature <i>T_{nom}</i> (+20 °C)	Voltage <i>V_{nom}</i> (24.0 V)	0	0
Measurement uncertainty		0.1 %	
Limits		Difference < 1%	

Test equipment used: (Item numbers)

4, 5, 9, 13, 14, 21, 22, 25, 31, 32

Test results module

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Report number : 99368530**2.6.4 15.3.4 Co-channel Rejection - 25 kHz Operation**

TEST CONDITIONS		CO-CHANNEL REJECTION RATIO (dB)	
Temperature	Voltage	Fn = 156.025 MHz	
T_{nom} (+20 °C)	V_{nom} (24.0 V)	Fn +3 kHz	- 9 dB at 18% PER
		Fn	- 9 dB at 11% PER
		Fn -3 kHz	- 9 dB at 18% PER
Measurement uncertainty		± 1.1 dB	
Limits		Between -10.0 dB and 0 dB. Any positive value is also acceptable.	

Remark: Unwanted signal modulated with 400Hz / 3kHz deviation

TEST CONDITIONS		CO-CHANNEL REJECTION RATIO (dB)	
Temperature	Voltage	Fn = 156.025 MHz	
T _{nom} (+20 °C)	V _{nom} (24.0 V)	Fn +3 kHz	- 9 dB at 16% PER
		Fn	- 9 dB at 7% PER
		Fn -3 kHz	- 9 dB at 15% PER
Measurement uncertainty		± 1.1 dB	
Limits		Between -10.0 dB and 0 dB. Any positive value is also acceptable.	

Remark: Unwanted signal modulated with GMSK test signal #2, 2.4 kHz deviation, BT 0.4

Test equipment used: (Item numbers)	2, 4, 5, 8, 9, 13, 14, 21, 25, 31, 37
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2.6.5 15.3.5 Co-channel Rejection - 12.5 kHz Operation

TEST CONDITIONS		CO-CHANNEL REJECTION RATIO (dB)	
Temperature	Voltage	Fn = 157.4125 MHz	
T _{nom} (+20 °C)	V _{nom} (24.0 V)	Fn +1.5 kHz	- 15 dB at 15% PER
		Fn	- 14 dB at 12% PER
		Fn -1.5 kHz	- 16 dB at 12% PER
Measurement uncertainty		± 1.1 dB	
Limits		Between -18.0 dB and 0 dB. Any positive value is also acceptable.	

Remark: Unwanted signal modulated with 400Hz / 1.5 kHz deviation

TEST CONDITIONS		CO-CHANNEL REJECTION RATIO (dB)	
Temperature	Voltage	Fn = 157.4125 MHz	
T_{nom} (+20 °C)	V_{nom} (24.0 V)	Fn +1.5 kHz	-14 dB at 13% PER
		Fn	-14 dB at 12% PER
		Fn -1.5 kHz	-16 dB at 16% PER
Measurement uncertainty		± 1.1 dB	
Limits		Between -18.0 dB and 0 dB. Any positive value is also acceptable.	

Remark: Unwanted signal modulated with GFSK, test signal #2, 1.2 kHz deviation, BT 0.3

Test equipment used: (Item numbers)	2, 4, 5, 8, 9, 13, 14, 21, 25, 31, 37
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2.6.6 15.3.6 Adjacent Channel selectivity - 25 kHz Operation

TEST CONDITIONS		ADJACENT CHANNEL SELECTIVITY (dB)	
		Fn: 156.025 (MHz)	
Temp.	Voltage	Unwanted signal - 25 kHz	Unwanted signal + 25 kHz
T_{nom} (+20 °C)	V_{nom} (24.0V)	72 dB at 8% PER	72 dB at 5% PER
T_{min} (-15 °C)	V_{min} (21.6 V)	68 dB at 14% PER	74 dB at 12% PER
T_{max} (+55 °C)	V_{max} (31.2 V)	73 dB at 12% PER	73 dB at 19% PER
Measurement uncertainty		+ 2.3 / - 2.8 dB	
Limits		> 70.0 dB @ ≤20% PER under normal test conditions, > 60.0 dB @ ≤20% PER under extreme test conditions.	

Test equipment used: (Item numbers)	2, 4, 5, 8, 9, 13, 14, 21, 22, 25, 31, 32, 37
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2.6.7 15.3.7 Adjacent Channel selectivity - 12.5 kHz Operation

TEST CONDITIONS		ADJACENT CHANNEL SELECTIVITY (dB)	
		Fn = 157.4125 MHz	
Temp.	Voltage	Unwanted signal - 12.5 kHz	Unwanted signal + 12.5 kHz
T_{nom} (+20 °C)	V_{nom} (24.0V)	58 dB at 5% PER	57 dB at 6% PER
T_{min} (-15 °C)	V_{min} (21.6 V)	57 dB at 15% PER	57 dB at 13% PER
T_{max} (+55 °C)	V_{max} (31.2 V)	58 dB at 16% PER	59 dB at 6% PER
Measurement uncertainty		+ 2.3 / - 2.8 dB	
Limits		> 50.0 dB @ ≤20% PER under normal test conditions, > 50.0 dB @ ≤20% PER under extreme test conditions.	

Test equipment used: (Item numbers)	2, 4, 5, 8, 9, 13, 14, 21, 22, 25, 31, 32, 37
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Test results module

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2.6.8 15.3.8 Spurious Response Rejection

Tested frequencies : 156.025 MHz; 162.025 MHz; RX1 and RX2

Funw (MHz)	SPURIOUS RESPONSE REJECTION RATIO (dB)
*	> 80 dB
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Measuring uncertainty	+ 2.4 / - 2.9 dB
Limit	70.0 dB

Funw = unwanted frequency

* : Rejection on all spurious responses is better than 80 dB @ $\leq 20\%$ PER for RX1 and RX2.

- (1) Frequency of the Receiver (f_R): 156.025 MHz; 162.025 MHz
- (2) Local oscillator frequency (f_{LO}): RX1: (f_R) + (f_F) MHz; RX2: (f_R) - (f_F) MHz
- (3) Intermediate frequency (f_F): RX1: 45.0 MHz; RX2: 45.1 MHz
- (4) Switching range of the Receiver (sr): 156.025 to 162.025 MHz

Test equipment used: (Item numbers)

2, 4, 13, 14, 21, 25, 31, 37

Test results module

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2.6.9 15.3.9 Intermodulation response rejection and blocking

TEST CONDITIONS		PACKET ERROR RATE (%)	
		Fn = 156.025 MHz	Fn = 162.025 MHz
Temperature	Voltage	Test #1	Test #2
T_{nom} (+20 °C)	V_{nom} (24.0 V)	9	9
Measurement uncertainty		+ 2.4 / - 2.8 dB	
Limits		≤20% PER	

Remark: test configuration for above result

	Generator A wanted -101 dBm	Generator B unwanted -27 dBm Mod. 400Hz / 3 kHz	Generator C unwanted -27 dBm unmodulated	Generator D unwanted -15 dBm unmodulated
Test #1	156.025MHz (Fn)	Fn + 1000 kHz	Fn + 500 kHz	Fn + 5.725

Remark: test configuration for above result

	Generator A wanted -101 dBm	Generator B unwanted -26 dBm Mod. 400Hz / 3 kHz	Generator C unwanted -26 dBm unmodulated	Generator D unwanted -15 dBm unmodulated
Test #2	162.025MHz (Fn)	Fn - 1000 kHz	Fn - 500 kHz	Fn - 5.725

Test equipment used: (Item numbers)	2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 21, 25, 31, 37, 38
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Test results module

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2.6.10 15.3.10 Transmit to receive switching time

TEST CONDITIONS		Sensitivity level (dBm)
Temperature	Voltage	$F_n = 156.025 \text{ MHz}$
T_{nom} (+20 °C)	V_{nom} (24.0 V)	- 107 dBm @ 3 % PER
Measurement uncertainty		± 1.2 dB
Limits		≤ -107 dBm @ 20% PER

Test equipment used: (Item numbers)	10
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2.7 15.4 DSC Receiver

2.7.1 15.4.1 Maximum sensitivity

TEST CONDITIONS		SENSITIVITY LEVEL (dBm)		
		Fn: 156.525 MHz (CH 70)		
Temperature	Voltage	Fn	Fn - 1.5 kHz	Fn + 1.5 kHz
T_{nom} (+20 °C)	V_{nom} (24.0 V)	-111 dBm at < 0.5% BER	-111 dBm at < 0.5% BER	-111 dBm at < 0.5% BER
T_{min} (-15 °C)	V_{min} (21.6 V)	-111 dBm at < 0.5% BER	-110 dBm at < 0.5% BER	-111 dBm at < 0.5% BER
T_{max} (+55 °C)	V_{max} (31.2 V)	-109 dBm at < 0.5% BER	-109 dBm at < 0.5% BER	-109 dBm at < 0.5% BER
Measurement uncertainty		±1.2 dB		
Limits		≤ -107 dBm with a BER of 1% under normal test conditions, ≤ -101 dBm with a BER of 1% under extreme test conditions,		

Test equipment used: (Item numbers)	4, 13, 14, 21, 22, 25, 31, 32
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Test results module

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2.7.2 15.4.2 Error Behaviour at High Input Levels

CHANNEL 70:

F₀: 156.525 MHz

TEST CONDITIONS		BIT ERROR RATE (%)
Temperature	Voltage	RF input -7 dBm / Standard Test Signal #1
<i>T</i> _{nom} (+20 °C)	<i>V</i> _{nom} (24.0 V)	< 0.1
Measurement uncertainty		0.1 %
Limits		BER <1%

Test equipment used: (Item numbers)	4, 13, 14, 21, 25, 31
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Test results module

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2.7.3 15.4.3 Co-Channel Rejection

CHANNEL 70:

Fn: 156.525 MHz

TEST CONDITIONS		CO-CHANNEL REJECTION RATIO (dB)	
		Standard Test Signal #1/ -104 dBm	
		Unwanted signal (Fn: 156.525 MHz)	
Temperature	Voltage	Unwanted signal	
T_{nom} (+20 °C)	V_{nom} (24.0 V)	Fn + 3 kHz	- 6 dB at < 0.5 % BER
		Fn	- 6 dB at < 0.5 % BER
		Fn - 3 kHz	- 6 dB at < 0.5 % BER
Measurement uncertainty		±1.1 dB	
Limits		Between -10.0 dB and 0 dB @ BER < 1%	

Test equipment used: (Item numbers)

2, 4, 13, 14, 21, 25, 31, 37

2.7.4 15.4.4 Adjacent Channel selectivity

CHANNEL 70: Fr: 156.525 MHz

TEST CONDITIONS		ADJACENT CHANNEL SELECTIVITY (dB)	
Temp.	Voltage	Upper Channel	Lower Channel
T_{nom} (+20 °C)	V_{nom} (24.0V)	72 dB at < 0.5 % BER	72 dB at < 0.5 % BER
T_{min} (-15 °C)	V_{min} (21.6 V)	73 dB at < 0.5 % BER	74 dB at < 0.5 % BER
T_{max} (+55 °C)	V_{max} (31.2 V)	69 dB at < 0.5 % BER	69 dB at < 0.5 % BER
Measurement uncertainty		+ 2.3 / - 2.8 dB	
Limits		≥ 70.0 dB @ BER < 1% under normal test conditions, ≥ 60.0 dB @ BER < 1% under extreme test conditions.	

Test equipment used: (Item numbers)	2, 4, 13, 14, 21, 25, 31, 37
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