

Receiver category 1

Where does it apply?

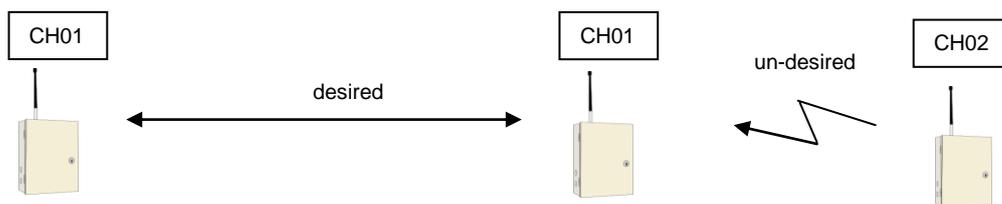
This applies to SRD equipment operating under the standard EN 300 220-1 whose receiver performance meets the requirement for receiver category 1 status.

Receiver category numbers describe how stringent a receiver should operate in the presence of other signals nearby in the same or adjacent bands where such operation of SRD may have inherent safety of human life implications.

Before discussing receiver category 1, it is required to first define the criteria in which to measure receiver performance. These parameters are:

- **Adjacent channel selectivity**
- **Receiver saturation at adjacent channel**
- **Spurious response rejection**
- **Blocking**
- **Behaviour when receiving high desired signal level**

Adjacent channel selectivity



The frequency band received is divided into channels for easy operation by the user. For an ideal receiver an undesired signal present in the adjacent channel would not affect the operation of the receiver. As no receiver is ideal, any undesired signal on the adjacent channel will always have an adverse effect on the receiver. The ability of the receiver to operate without degradation due to the presence of the undesired signal in the adjacent channel is known as adjacent channel selectivity.

To measure this, the level of desired signal is set to the appropriate level for receiver under test*. By gradually increasing level of the undesired signal to the receiver under test, the adjacent channel selectivity is the minimum power (in dBm) reached by the undesired signal just at the point where the wanted performance criterion of the receiver is lost.

Measurements are performed both times when the undesired signal is in the upper or lower adjacent channel.

The limits described in EN 300-220-1 v3.1.1 for receiver category 1 compliance are listed in the table on page 4.

* See EN 300 220-1, 5.15.3.4 for details on determining the appropriate level

Receiver saturation at adjacent channel

Receiver saturation at adjacent channel refers to the ability of the receiver to operate without degradation when there is a strong signal in the wanted channel and another strong signal in the adjacent channel.

The measurement procedure is similar to that for adjacent channel selectivity; however the desired signal is adjusted to 43 dB above minimum level required* for wanted performance criterion of the receiver.

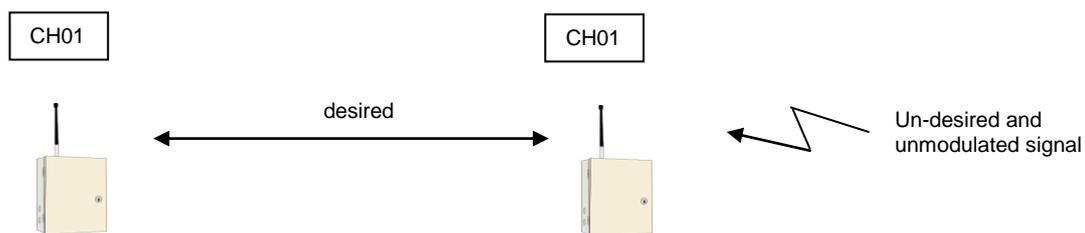
Measurements are performed both times when the signal is in the upper or lower adjacent channel.

The limits described in EN 300-220-1 v3.1.1 for receiver category 1 compliance are listed in the table on page 4.

* See EN 300 220-1, 5.16.3.4 for details on determining the appropriate level.

Spurious response rejection

The spurious response rejection refers to the ability of the receiver to operate without degradation when an undesired signal at frequency $F_{\text{undesired}}$ is allowed to enter the receiver to produce a spurious response. This undesired signal is un-modulated (carrying no information).



For a receiver equipped with one or more IF stages, $F_{\text{undesired}}$ shall be set to a frequency in the range of frequencies that produces a spurious response in the receiver. For details on determining $F_{\text{undesired}}$ refer to 5.17.3.4 of the EN 300-220-1 standard.

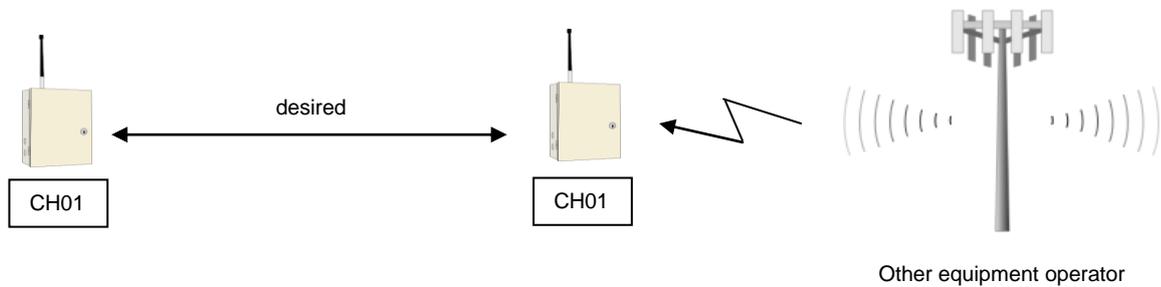
The level of the desired signal shall be set according to the appropriate level for receiver under test* and the level of $F_{\text{undesired}}$ is increased until the point where the wanted performance criterion of the receiver is lost. The level of $F_{\text{undesired}}$ is noted.

The limits described in EN 300-220-1 v3.1.1 for receiver category 1 compliance are listed in the table on page 4.

* See EN 300 220-1, 5.17.3.4 for details on determining the appropriate level

Blocking

Blocking refers to the ability of the receiver to operate without degradation when an undesired signal at any frequency (excluding those at adjacent channels or bands and those which produce spurious response) is present. Examples include users of other equipment operating in nearby frequency bands.



The level of the desired signal shall be set according to the appropriate level for receiver under test*. As before the level of the undesired signal is increased up to the point where the wanted performance criterion of the receiver is lost. This value is then noted.

* See EN 300 220-1, 5.18.6.4 for details on determining the appropriate level

The limits described in EN 300-220-1 v3.1.1 for receiver category 1 compliance are listed in the table on page 4.

Behaviour when receiving high desired signal level

This refers to the receiver being able to function adequately while receiving the desired signal at a high level. For example, if the transmitter and receiver are close to each other, the receiver will experience a high level signal that it was not necessarily designed for and become saturated.

To measure this, the sensitivity level of the receiver under test is established and the desired signal level is increased until the wanted performance criterion is no longer met. The level of the desired signal at this point is noted.

Values specified for Circuit Design modules

The values for each of the above parameters can be found under the specifications in the module's operation guide.

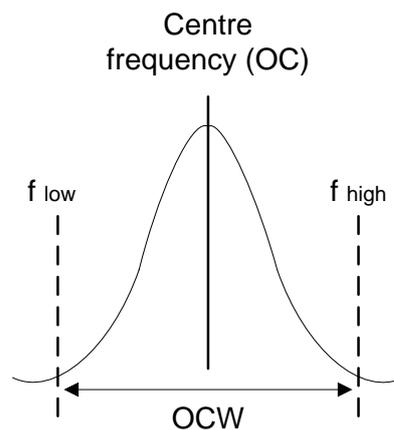
Limits in category 1 compared with those in receiver category 1.5, 2 and 3.0

If we compare receiver category 1 with 1.5, 2 and 3 - for EN300 220 the receiver category 1 has to satisfy much more requirements as seen in the table below (“-“ : not applicable). Also note that blocking performance for receiver category 1 is measured from the channel centre frequency whereas for 1.5, 2 and 3, it is from the channel edges (f_{high} and f_{low}).

Category		1	1.5	2	3
Parameter					
Minimum Adjacent channel selectivity	OCW \leq 25 kHz	\geq - 50 dBm	-	-	-
	OCW $>$ 25 kHz	\geq - 44 dBm	-	-	-
Adjacent channel saturation	OCW \leq 25 kHz	\geq - 20 dBm	-	-	-
	OCW $>$ 25 kHz	\geq - 10 dB	-	-	-
Spurious response rejection	OCW \leq 25 kHz	\geq - 44 dBm	-	-	-
	OCW $>$ 25 kHz	\geq - 34 dBm	-	-	-
Blocking	at ± 2 MHz from OC edge f_{high} and f_{low}	\geq - 20 dBm ^{*1}	\geq - 43 dBm	\geq - 69 dBm	\geq - 80 dBm
	at ± 10 MHz from OC edge f_{high} and f_{low}	\geq - 20 dBm ^{*2}	\geq - 33 dBm	\geq - 44 dBm	\geq - 60 dBm
	at $\pm 5\%$ of Centre Frequency or 15 MHz, whichever is the greater	\geq - 20 dBm	\geq - 33 dBm	\geq - 44 dBm	\geq - 60 dBm
Highest desired signal level at which receiver should function adequately.		- 10 dBm	-	-	-

*1 : at ± 2 MHz from centre frequency
 *2 : at ± 10 MHz from centre frequency

(OCW = Operating channel width)
 (OC = Operating channel)



REVISION HISTORY

Version	Date	Description	Remark
1.0	Nov. 2018	The first issue	