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MARINE DATA SYSTEMS

Innovation for Life

Co-Channel Rejection performance of the AIMS MIV

This document is intended as a guide to the Co-channel rejection performance of the AIMS MIV AIS unit. The AIMS MIV unit was tested in accordance with IEC 61993-2 and passed all relevant tests except for co-channel rejection, par 15.3.4 and 15.3.5. The AIMS MIV is applying a limiter-discrimination detection demodulation method, one of the most commonly applied technologies for this purpose to date. Due to the progressive way the IEC61993-2 standard developed, it was afterwards found impossible to meet the required co-channel rejection and other RF parameters such as the inter-modulation distortion (IMD) and blocking, by applying the limiter-discriminator detection method. The trade-off in this respect was to somewhat sacrifice the co-channel rejection in order to maintain the inter-modulation distortion (IMD), blocking (also in accordance with RTCM SC117) and large signal handling requirements. It should further be understood that an IMD by default is a co-channel interferer, if not suppressed. A leading international academic and research institution has verified the above issue. The specific importance of co-channel rejection with respect to AIS is for intentional slot reuse purposes. This is only applicable when the co-channel interferer is another AIS GMSK signal. It should further be understood that co-channel rejection is a function of distance. This document shows that co-channel performance is within acceptable parameters and that the unit will not negatively influence the VHF Data Link (VDL).

15.3.4 Co-channel Rejection – 25 kHz operation

The co channel test as specified in IEC 61993-2 paragraph 15.3.4, requires that the level of the wanted signal be adjusted to 3 dB above the level of the maximum usable sensitivity as specified in 15.3.1 at the receiver input terminals. This requirement is unnecessarily high and is not in accordance with other international receiver tests.

If this test is performed with the wanted signal 6 dB above the level of the limit of the maximum usable sensitivity as specified in 15.3.1 the following results are obtained:

Displacement	-1.0 kHz	-0.5kHz	0 kHz	+0.5kHz	+1.0 kHz
Rejection	-10 dB	-10dB	-10 dB	-9dB	-11 dB

Table 1 - GMSK Interferer – 25kHz

Note: The AIS maximum frequency error under normal condition is 0.5 kHz, therefore a maximum displacement between two AIS signals should be +/- 1 kHz and not +/- 3 kHz as required IEC 61993-2. It should further be noted that maximum displacements are extreme conditions at all times.

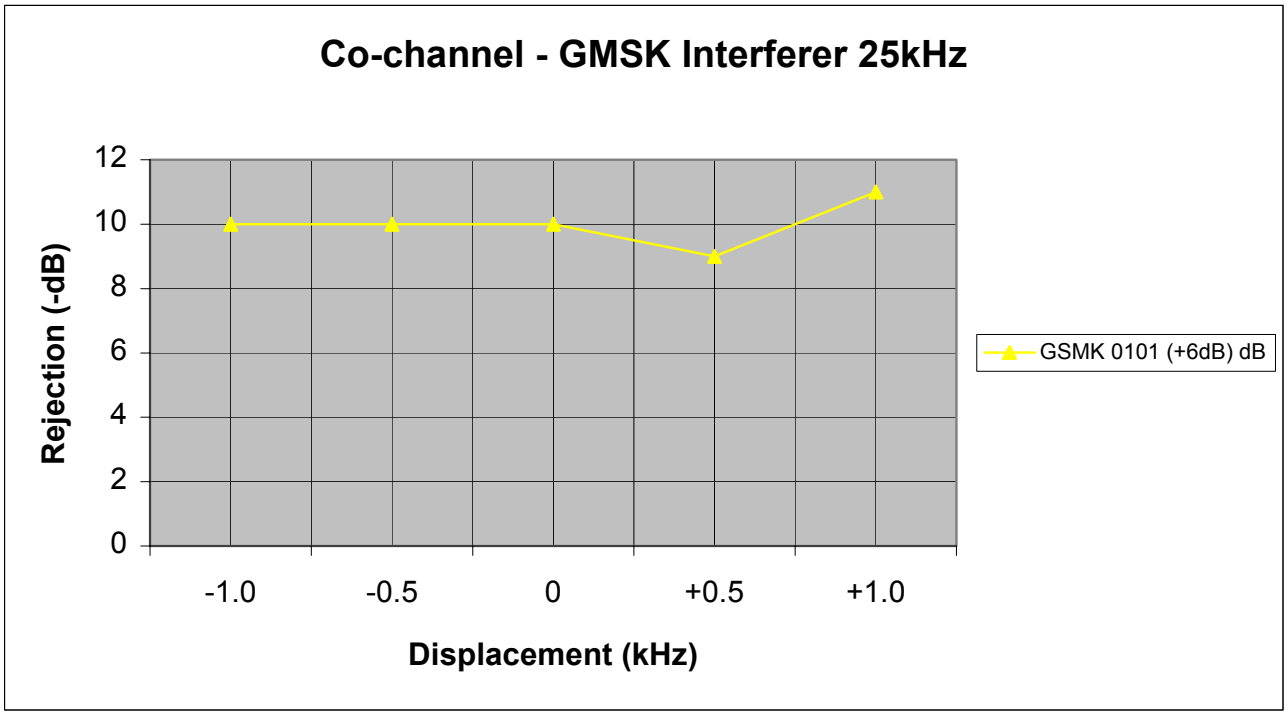

Figure 1 – GMSK Interferer – 25kHz

The above results indicate that the receiver performs within acceptable parameters if the wanted signal is 6 dB above the maximum usable sensitivity.

Part i) of test 15.3.4 requires that a FM interferer be used instead of the previous GMSK signal (A GMSK signal is similar to another AIS unit transmitting at the same time) The FM Interferer is an illegal and abnormal operation at all times. As the RF environment is regulated and controlled, this type of operation will generally never occur. Therefore this test has very little, if any, significance in real operational terms.

The results are however shown below: - WE MAY WANT TO REMOVE ALL IN YELLOW

Displacement	-3.0kHz	0kHz	+3.0kHz
Rejection	-13dB	-13dB	-11dB

Table 2 - FM Interferer – 25kHz

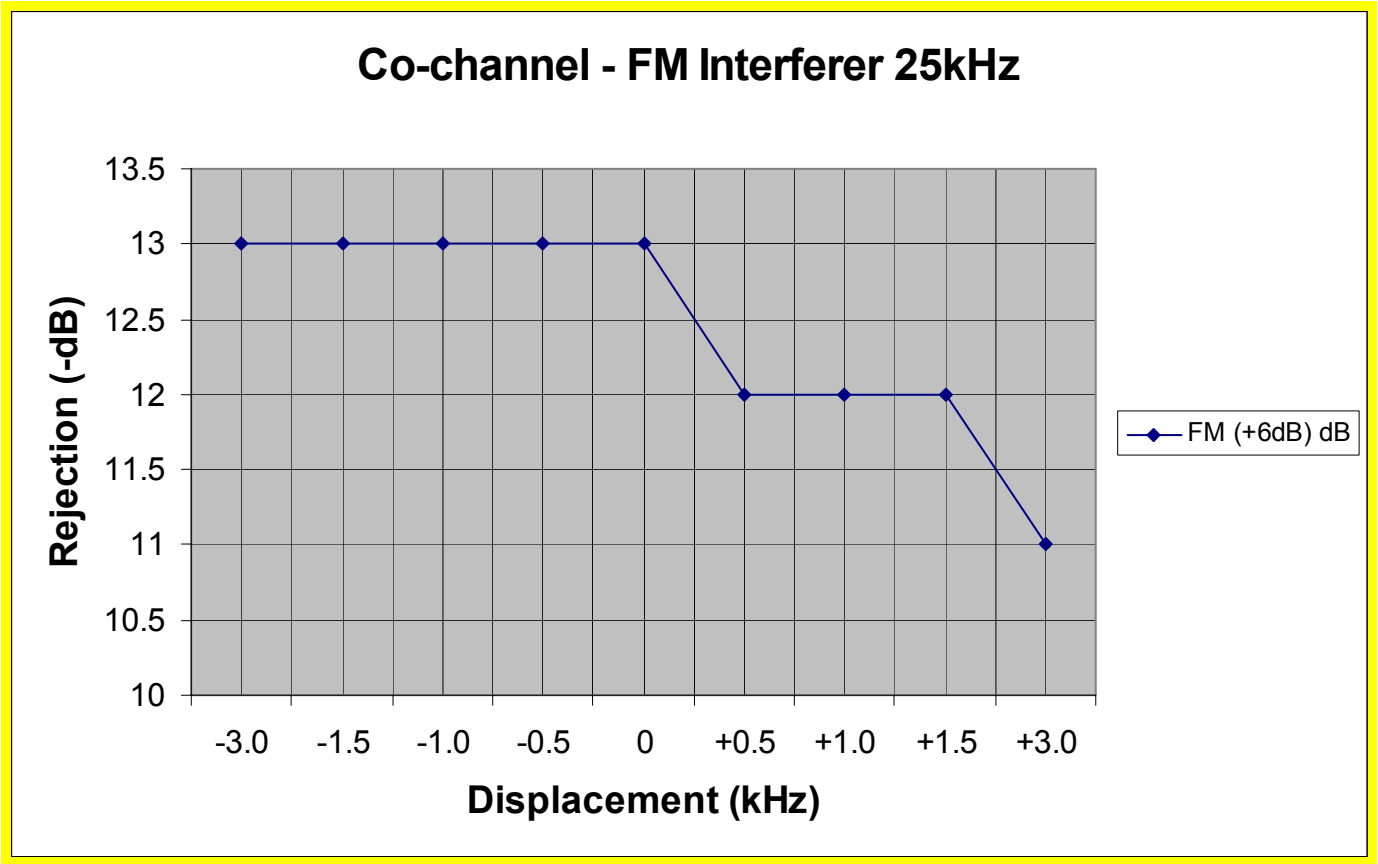

Figure 2 – FM Interferer – 25kHz

The above results indicate that the receiver performs within acceptable parameters if the wanted signal is 6 dB above the maximum usable sensitivity.

15.3.5 Co-channel Rejection – 12.5 kHz operation

The results of test 15.3.5 with a wanted signal that is 6 dB above the level of the limit of the maximum usable sensitivity as specified in 15.3.1 is shown below:

Displacement	-1.0kHz	-0.5kHz	0kHz	+0.5kHz	+1.0kHz
Rejection	-12dB	-12dB	-13dB	-13dB	-15dB

Table 3 - GMSK Interferer – 12.5kHz

Note: The AIS maximum frequency error under normal condition is 0.5 kHz, therefore a maximum displacement between two AIS signals should be +/- 1 kHz and not +/- 1.5 kHz as required IEC 61993-2. It should further be noted that maximum displacements are extreme conditions at all times.

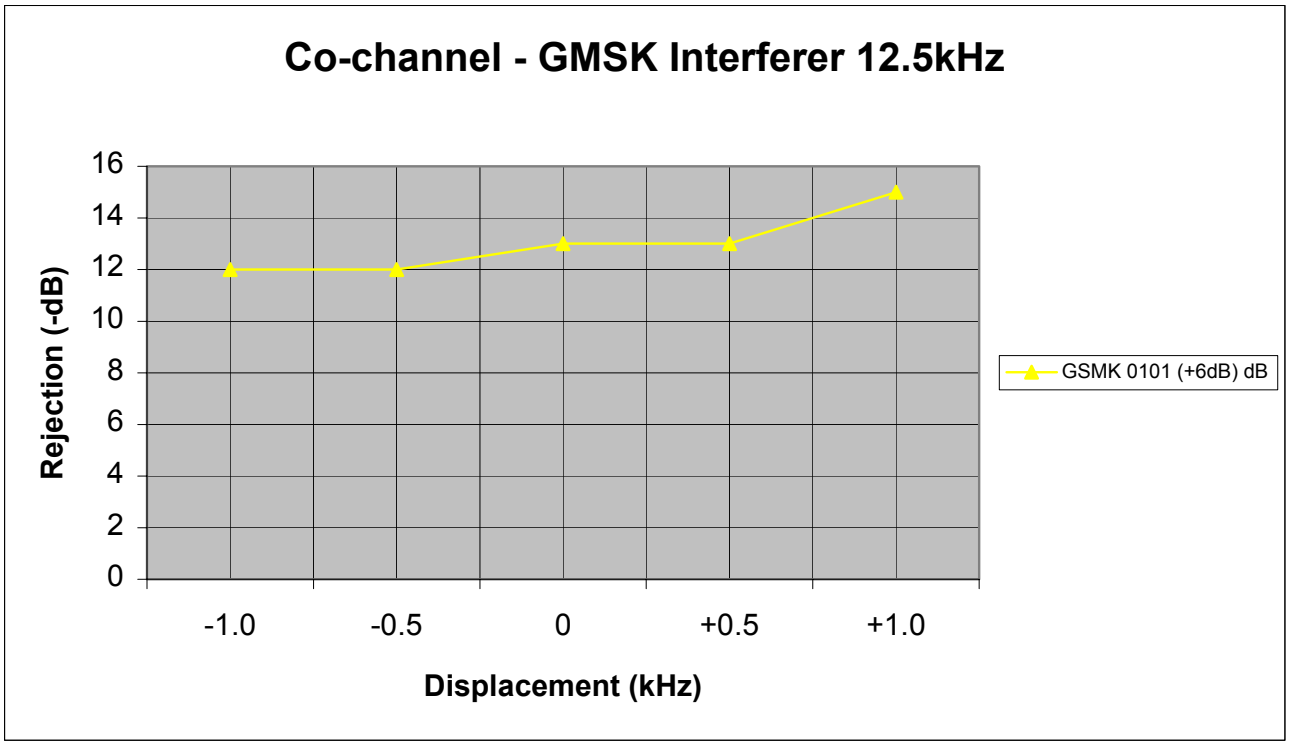

Figure 3 – GMSK Interferer – 12.5kHz

The above results indicate that the receiver performs within acceptable parameters if the wanted signal is 6 dB above the maximum usable sensitivity.

Part i) of test 15.3.4 requires that a FM interferer be used instead of the previous GMSK signal (A GMSK signal is similar to another AIS unit transmitting at the same time) The FM Interferer is an illegal and abnormal operation at all times. As the RF environment is regulated and controlled, this type of operation will generally never occur. Therefore this test has very little, if any, significance in real operational terms.

If a FM interferer is used instead of the GMSK signal the results as shown below are obtained:

Displacement	-1,5kHz	0kHz	+1.5kHz
Rejection	-19dB	-15dB	-20dB

Table 4 - FM Interferer – 12.5kHz

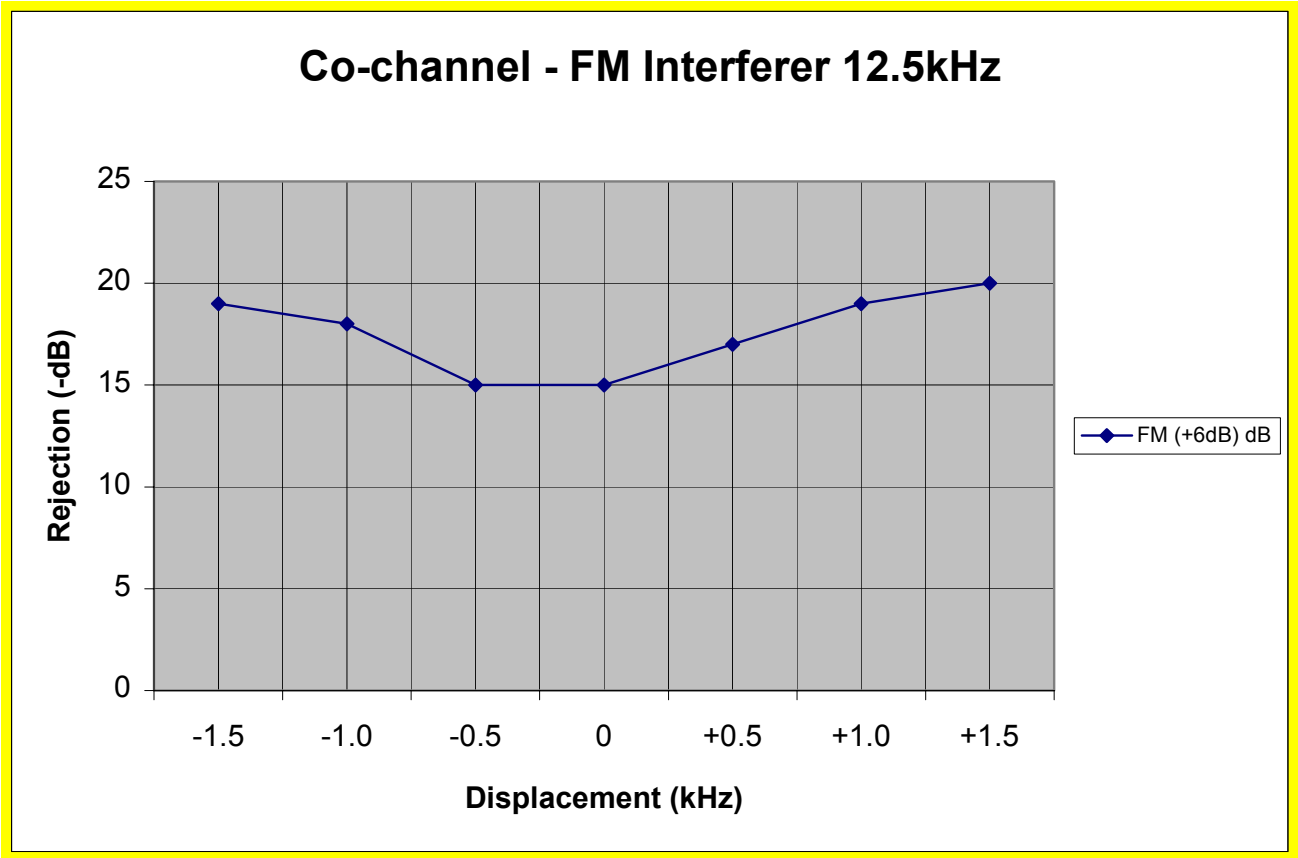

Figure 4 – FM Interferer – 12.5kHz

The above results indicate that the receiver performs within acceptable parameters if the wanted signal is 6 dB above the maximum usable sensitivity.

Conclusion

Considering the above, it can be assed that the AIMS MIV will under normal AIS (Automatic Identification System) conditions operate safely and not impair the use of the AIS VDL (VHF Data Link).