

Vesper Cortex

FCC Test Report Summary

Version	Date	Comment	Author
1	01/06/2020	First Release	CBO

Introduction

This document summarizes the test reports provided to show Vesper Marine Cortex System compliance with the FCC requirements for operation in the US.



Cortex V1 System with Cortex M1 (left) and H1 Handset (right)

FCC Technical Test Reports

The Cortex System was tested as both an intentional radiator as a Marine VHF, DSC and AIS device under FCC 47 CFR Part 80. The WiFi and Cellular aspects are pre-certified under modular approvals, however additional testing was performed to ensure compliance within the Cortex system under FCC Part 15. The following provides a summary and cross reference for the technical test reports provided to show compliance.

VHF

Type	Freq Bands (MHz)	Max Power (dBm)	Emission Designator	FCC Rule
VHF Telephony	156.0 - 162.0	44	16K0G3E	47 CFR Part 80
Class D DSC	156.525	44	16K0G2B	47 CFR Part 80.225

Report Name	Test Standards	Description
75943855-19 Issue 01	FCC Part 80	VHF Telephony
75943855-13 Issue 01	ITU 493-13	Class D DSC Functional Testing
75943855-08 Issue 02	IEC 62238	Class D DSC Physical Layer
200309_2	IEC 62238	Class D DSC Adjacent Channel Power

AIS

Type	Freq Bands (MHz)	Max Power (dBm)	Emission Designator	FCC Rule
Class B SO-TDMA AIS	156.0 -162.025	37	16K0GXW	47 CFR Part 80.231

The AIS functionality is by design autonomous in operation, and as such its operation is encapsulated by the Cortex M1 Hub and does not require the presence of the handset in order to function.

Report Name	Test Standards	Description
75943855-12 Issue 01	IEC 62287-2	Class B SO-TDMA AIS Functional
75943855-18 Issue 01	IEC 62287-2	Class B SO-TDMA AIS Physical Layer
75943855-05 Issue 01	IEC 61108	Marine GNSS
454_1_1	IEC 61108	Marine GNSS
454_1_2	IEC 61108	Marine GNSS
75943855-04 Issue 02	IEC 60945	Environmental EMC
75943855-10 Issue 01	IEC 60945	Environmental Temperature and Vibration

Note, the USCG Type Approval 165.156/51/0 is also provided.

WiFi

The WiFi functionality in both the M1 and the H1 use pre-approved modules. Some additional testing was performed to verify radiated disturbance limits were maintained. In both cases the antenna gains do not exceed that of the original module certification.

Type	Freq Bands (MHz)	Power (dBm)	Emission Designator	FCC Rule
WiFi	2400-2480	5-17	20M0G7D	47 CFR Part 15B

Device	Module	FCC ID	Supporting Documentation
M1	TI WL1801MODGB	Z64-WL18SBMOD	https://fccid.io/Z64-WL18SBMOD
H1	Qualcomm 410	2AFDI-ITCOQ410S	https://fccid.io/2AFDI-ITCOQ410S

Report Name	Test Standards	Description
75943855-13 Issue 01	FCC 47 CFR Part 15.109	Cortex M1 & H1 Radiated Disturbance
75943820-03 Issue 1	FCC 47 CFR Part 15.109	Cortex H1 Radiated Disturbance

Testing for simultaneous transmissions of WiFi and the other intentional radiators in the M1 was covered while testing each of the other intentional radiators (LTE, VHF, AIS) since WiFi was always enabled during these tests.

LTE

A cellular data modem is integrated into the Cortex M1 for LTE Cat-1 and 3G fallback using a pre-approved module. The antenna gains do not exceed that required by the original module certification.

Type	Freq Bands (MHz)	Max Power (dBm)	Emission Designator	FCC Rule
LTE Cat-1, UMTS	B2, B4, B5, B17	23	5M00G7D	47 CFR Part 15B, 15, 22, 24 and 27

Device	Module	FCC ID	Supporting Documentation
M1-LTE	Sierra HL7688	N7NHL7688	https://fccid.io/N7NHL7688

Report Name	Test Standards	Description
75946817-01 Issue 01	FCC 15B	Radiated Disturbance
75946817-02 Issue 01	FCC 47 CFR Part2.1093	Radiated Spurious Emissions

Note, there are two variants of the M1. The only difference between the two is the Sierra Module. The North American variant M1-LTE uses the HL7688.

RF Exposure

The RF Exposure for the M1 and H1 have been treated independently. Since the handset is designed to be held in the hand and operated close to the face (~25cm) SAR testing was performed on the H1. An RF exposure assessment for the general public was performed for the M1. A separate report on both H1 and M1 summarizing this is provided, *Cortex RF Exposure Evaluation.pdf*.

Report Name	Test Standards	Description
75943820-03 Issue 1	FCC 47 CFR 2.1093	Specific Absorption Rate on H1 Handsets

Naming Conventions

Note that the Cortex project was internally referred to by Vesper Marine as Project Marlin. The M1 was also referred to as the Pod and the Handset as the Remote. Some reports may reference these project names. The Cortex Hub and Handset are the final marketing names used.

International Compliance

Cortex was simultaneously tested to international standards for FCC, ISED and RED and where there was crossover between each regions' requirements the worst case limits were applied, and in the interests of efficiency the product was tested to these worst case limits. This also applies where there is cross over within each regions' requirements for each sub-system e.g. radiated emissions requirements of VHF and WiFi. A complete summary of the global test standards is provided at *Vesper Cortex Test Specification Summary.pdf*. Test reports applicable to another region that are not included in this submission are available on request.