GomSpace A/S
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NANOMIND HP MK3

Qualification Certificate

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Revision	Date	Initials	Description
0.1	2022-12-14	DTN	Initial draft
1.0	2023-01-30	DTN	Reviewed and approved
1.1	2023-05-17	DTN	Added Thermal Stress Test
1.2	2025-08-22	LAV	Flight Heritage information updated

References

Reference	Document title	Document number	Revision, Date
[RD-1]	GomSpace Qualification Program	1012670	Rev. 2.3, 2023-03-24
[RD-2]	gs-qtrp-NanoCom SDR HP MK3 Structural and Mechanical Vibration Test Report	1042055	Rev. 1.0, 2022-08-09
[RD-3]	gs-qtrp-NanoCom SDR HP MK3 Mechanical Shock Test Report	1046352	Rev. 1.0, 2022-11-28
[RD-4]	gs-qtrp-NanoCom SDR HP MK3 TVAC Test Report	1044571	Rev. 1.0, 2022-11-09
[RD-5]	gs-qtrp-NanoCom SDR HP MK3 Radiation TID Test Report	1043889	Rev. 1.0, 2022-11-17
[RD-6]	gs-qtrp-NanoCom SDR HP MK3 Thermal Stress Test Report	1047119	Rev. 1.0, 2023-03-14

TABLE OF CONTENTS

1. Qualification Tests

1.1 Purpose

This document describes the environmental qualification tests which is carried out on this specific product(s). In the following sections, the tests and the corresponding test results are described. The qualification of this product is a subset of the NanoCom SDR HP MK3 qualification.

1.2 Product

Manufacturer Name: GomSpace
Product Name: NanoMind HP MK3
Product Number: 108770

Product variants can consist of the following subproducts:

Product Name	Product Number
NanoDock MK3	108687
NanoMind Z7045 MK3	108688
NanoMind Z7030 MK3	108689

1.3 Vibration Tests

The product has been subjected to the following tests.

Tests: Random Vibration
Sinusoidal Vibration
Quasi-static / Sine burst

Conditions: Product is mounted in a 6U GomSpace structure which is mounted inside a GomSpace Qualification POD. It is tested under the following test conditions.

Test Description	Test Requirements
Random Vibration	20Hz, 0.026G2/Hz 20-50Hz, +6 dB/oct 50-800Hz, 0.16G2/Hz 800-2000Hz, -6 dB/oct 2000Hz, 0.026G2/Hz Overall, 14.1Grms
Sinusoidal Vibration	5-8Hz, 20mm pp 8-100Hz, 4.5G
Quasi-static / Sine burst	30Hz, 15G, 19 cycles / 7 loaded cycles

Remarks: None

Conclusion: The NanoMind HP MK3 is tested according to the above-mentioned conditions. The visual mechanical inspection and electrical / functional tests are passed with no remarks. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.4 Shock Tests

The product has been subjected to the following tests.

Tests: Shock

Conditions: Product is mounted in the fixture for the GomSpace shock bench. The device is exposed to three impacts at each axis, X, Y and Z. It is tested under the following test conditions.

Test Description	Test Requirements
Shock Response Spectrum (SRS):	100Hz, 40G 1000Hz, 1000G 2000Hz, 1500G 10000Hz, 1500G +/- 6db from the nominal shock >50% of the measured shock are above nominal shock

Remarks: None

Conclusion: The NanoMind HP MK3 is tested according to the above-mentioned conditions. The visual mechanical inspection and electrical / functional tests are passed with no remarks. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.5 Thermal Vacuum Tests

The product has been subjected to the following tests.

Tests: Thermal Vacuum (TVAC)

Conditions: Product is mounted in a 6U GomSpace structure, prepared with thermocouples and harness, installed in the TVAC chamber for test. The temperature range defined in the table below refers to the thermal interface of the product during test to ensure its operating temperatures are within specifications. It is tested under the following test conditions.

Test Description	Test Requirements
Temperature	-40 to 53°C
Pressure	1e-5 mbar
Cycles	8
Dwell time	2 hours

Remarks: None

Conclusion: The NanoMind HP MK3 is tested according to the above-mentioned conditions and is fully functional and have the expected performance. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.6 Radiation TID Tests

The product has been subjected to the following tests.

Tests: Radiation TID (Total Ionizing Dose)

Conditions: Product is mounted at plate for TID testing, prepared with harness and necessary logging equipment.
It is tested under the following test conditions.

Test Description	Test Requirements
Method	Direct (Online)
Rate	Low dose – 36 to 360 rad(Si)/hour
Total dose	>20 krad
Condition	Biased at room temperature
Annealing	>24 hours
Ageing	>168 hours

Remarks: Actual dose - 3.04Gy/h, total dose 210Gy (21krad) is to ensure all components at PCBAs has reached the level of 20krad.

Conclusion: The NanoMind HP MK3 is tested according to the above-mentioned conditions. The electrical / functional tests performed the are passed. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.7 Thermal Stress Test

The product has been subjected to the following tests.

Tests: Thermal Stress (Accelerated Lifetime)

Conditions: Product is prepared with thermocouples and installed at the shelf of the Thermal Stress chamber. It is tested under the following test conditions.

Test Description	Test Requirements
Temperature – hot plateau	100°C +5 /-0°C
Temperature – cold plateau	-55°C +0 /-5°C
Cycles	150
Dwell time	15 minutes

Remarks: None

Conclusion: The NanoMind HP MK3 is tested according to the above-mentioned conditions. The visual mechanical inspection and electrical / functional tests are passed with no remarks. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.8 Flight Heritage

The NanoMind HP MK3 is at TRL 9 passing the qualifications tests and have flight heritage since August 2024 on various customer missions.
The product is an update of the existing NanoCom SDR V2, which has extensive flight heritage.
Furthermore, a prototype of the NanoCom SDR MK3 has flight heritage since June 2021, flying on a customer mission.