NEMO-2 2041

High-End Non-Volatile Mass Memory

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The NEMO-2 2041 is a compact solid-state recorder that provides high-end mass memory storage and performance to Earth observation missions. This product is the result of over 30 years, where Airbus Defence and Space has gained a strong flight heritage on solid-state technologies.

First model of NEMO-2's modular and scalable architecture, it is based on qualified building blocks packaged in a slice form factor.

This mass memory provides straightforward and simultaneous record and replay capability using Flash technology.

NEMO-2 2041 is a redundant unit, made of two identical MEMORY slices with their dedicated DC/DC converters.

The NEMO's 2041 configuration has a user capacity of 4Tbits.

First Flight Models by End 2023.

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Architecture and key features

- The unit is composed of an assembly of 2 identical cold-redundant slices
- Each slice is self-contained and with its own external interfaces for inputs, outputs, power and control
- Each slice embeds a memory bank of 4Tbits and state-of-the-art processing capabilities built on a rad-tolerant FPGA coupled with a rad-hard processor

INTERFACES	
FROM/TO SATELLITE MANAGEMENT UNIT	Primary power input, unregulated redundant power bus 22-38V
	Redundant MIL-STD-1553B for TM/TC command and telemetry purpose
	Power on/off status, secondary voltage telemetry and thermistor telemetry interface
RECORD INTERFACES	2x Nominal + 2x Redundant High Speed WizardLink Instrument Record Interfaces, data rate up to 2Gbps on each link
	2x Nominal + 2x Redundant SpW Instrument Record Interfaces, data rate up to 200Mbps on each link
	1x Nominal + 1x Redundant SpW links for housekeeping, data rate up to 100kbps
REPLAY INTERFACES	3x High Speed Wizardlink Replay interfaces with flow control, 2 active at a time, data rate up to 2Gbps on each link

MAIN FUNCTION

√ Non volatile Payload and Platform Data Storage (spacecraft housekeeping/ancillary,...)

√ Simultaneous record & replay are possible at highest data rates

√ Provision of discrete telemetries (power status, internal temperatures & secondary operating voltages

PERFORMANCE PARAMETERS

User memory capacity: 4Tbits EOL

Aggregated record + replay data rate: up to 8Gbits/s

RELIABILITY & PERFORMANCE VS ENVIRONMENT

Life time:	7.5 years in LEO orbit
EEE Quality:	Class 1 or Class 2
Operating range:	-30°C to +60°C
NAND flash endurance:	Minimum 60K Program/ Erase cycles
Residual Bit error rate:	$<5.3 \times 10^{-17}$ error/bit/day for mission
Vibration:	24g sine; 15g rms random out of plane
Shock:	1000g at 1600Hz

Reliability: 0.997 covering 7.5 years in-orbit at 35°C

KEY FEATURES

GENERIC SERVICES	PUS-C services
MEMORY	Large capacity non-Volatile Flash Memory Array composed of the second generation of Airbus qualified flash components
	CCSDS files based operations (FBO)
PROCESSING	High performance FPGA
	SCOC3 System-On-Chip based on the LEON3 sparc v8 core
CHANNEL CODING	CCSDS Packet Telemetry Standard Transmission over Virtual Channels
	CADU generator for Formatting of playback TM files
	CFDP (CCSDS File Delivery Protocol) Class 1 & 2 for downlink
ARCHITECTURE LEVEL	Unit free of single point failure
	2x cold-redundant identical slices
	Record and replay interfaces externally cross-strapped
DESIGN LEVEL	Flash wear levelling & bad blocks management
	The memory array is designed to allow the loss of up to two memory components
	Protected from data errors induced by SEU/MEU by symbol error correction
PART LEVEL	Radiation hardened Processor
	Radiation tolerant FPGA
	Usage of latch up free parts
	High efficiency internal DC/DC converter with protected features

BUDGETS

Mass: 9kg
Size L x H x W (mm): 365 x 225 x 176
Power dissipation: <30W peak (with simultaneous Record & Replay at maximum data rate)

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