

DWAVE S.r.l. FLIGHT HARDWARE PRODUCT



VHF Diplexer for VDES

DipDax Project: Next-Gen Ultra-Compact & High-Isolation Space VHF Diplexer

Product Overview

The DipDax project introduces a high-performance VHF Diplexer optimized specifically for VDE-SAT satellite payloads. Designed to meet stringent space flight qualifications, this module directly answers the industry's demand for aggressive SWaP (Size, Weight, and Power) minimization.

By achieving an exceptional 50% mass reduction and 40% volume reduction compared to existing best-in-class market solutions, the DipDax Diplexer delivers pristine TX-RX isolation (≥ 80 dB) and extremely low insertion loss, safeguarding link budgets for critical VDE-SAT space missions.

Applications and characteristics

- VDE-SAT (VDES) diplexer
- Supports time-division transmission in upper and lower legs (Option 1 and 2)
- Enables simultaneous AIS and ASM reception during VDE-SAT transmission
- Satisfies regulatory compliance requirements for the protection of adjacent radio astronomy service bands
- Enables the VDE-SAT full duplex satellite (see M.2092-2, A5-2.8)
- Provides three bidirectional ports: antenna (or common), UL (VDE-SAT, AIS1/2 and ASM1/2) and LL (VDE-SAT and AIS3/4)

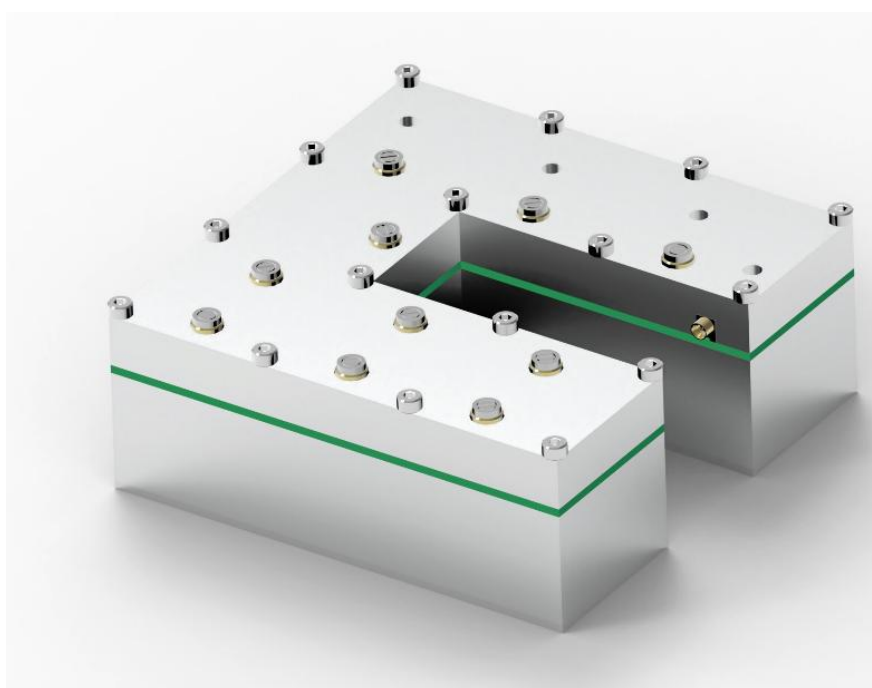


Figure 1: DipDax VHF Diplexer

Technical Specifications & Compliance Matrix

Parameter	Target Technical Value	Status / Notes
Operational Frequency	Option 1: • RX (LLB): 157.1875-157.3375 MHz • TX (ULB): 161.7875-161.9375 MHz Option 2: • TX (LLB): 157.1875-157.3375 MHz • RX (ULB + EXULB): 161.7875-162.0375 MHz	Applicable across LLB, ULB, and EXULB bands
Insertion Loss	< 1.5 dB typical < 1.7 dB under worst-case conditions	Designed with additional margin built-in
IL Variation	< 0.35 dB peak-to-peak	Within EXULB/LLB bands
TX-RX Isolation	≥ 80 dB	LLB/ULB TX/RX port isolation
Group Delay Variation	< 400 ns peak-to-peak	Within EXULB/LLB bands
Maximum Input Continuous/Peak Power	4.3W / 30W	
Out-of-band rejection	Provides strong rejections in the following bands: RAsB1 150.05-153MHz, RAsB2 322-328.6MHz and RAsB3 406.1-419MHz	The out-of-band rejection enables the regulatory compliance
Component Mass	560 g	
Dimensions / Volume	95x95x37 mm / 1/3 liter	
Space environment	Compatible with LEO space environment for vacuum, radiation and mechanical conditions.	

Mechanical Interfaces & Trade-Off Analysis

Per rigorous space qualification protocols, the highly optimized structural envelope of the DipDax Diplexer is validated through an extensive thermal, mechanical, and high-power engineering framework. The design incorporates advanced thermal analysis and structural vibration modeling to guarantee mechanical integrity under extreme launch and orbital conditions. Furthermore, critical high-power RF risk vectors, including multipactor and corona phenomena, are thoroughly analyzed and mitigated. All analyzed phenomena are subjected to specific, dedicated environmental and power test campaigns, ensuring uncompromised reliability and seamless integration alongside customer payload requirements.

SPACE FLIGHT QUALIFICATION

DWAVE S.r.l. designs space-grade hardware registered in the Italian Space Agency (ASI) official capability matrix. Our engineering pipelines fulfill strict international aerospace baselines for worst-case analyses and part stress safety lines.

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