



HARDWARE PRODUCT SPECIFICATION

Diversity GNSS Antenna - FPGA Front End

A 25-element static GNSS antenna array: 25 fixed beams, each feeding its own L1 GNSS receiver, with an FPGA mux that aggregates the receiver streams and selects the best position solution across the array.

DRAFT - CONTENT NOT FINAL

Product Specification | Revision 0.1 (draft) | 2026-09-15

DOCUMENT CONTROL

Revision	Date	Author	Change
0.1 (draft)	2026-09-15	Vector Intelligence Labs	Initial document skeleton. Antenna, band and bandwidth figures carried over from the published product text; board-level detail outstanding.

Source: the existing published product text for this system plus the internal design records. Rows marked [TBD] are unresolved; board-level and part-level details are deliberately not stated.

1. Overview

This system is a 25-element GNSS antenna array operated as a static beam array. The 25 elements form 25 fixed beams of differing pattern coverage, and each beam feeds its own L1 GNSS receiver, so every beam yields its own position solution. The beam geometry is set by the array itself: the patterns are not shaped, pointed or adapted at run time.

The 25 beams run in parallel. The FPGA mux aggregates the 25 receiver streams into a single data path to the host while preserving the correspondence between stream and beam, and the best position solution across the 25 beams is selected from that aggregate.

The design is single-band: L1 (1575.42 MHz) only, with the civilian L1 signals. There is no second band, no second-band hardware and no band selection in this project.

The rule the mux applies when choosing between the 25 streams, its update rate and the host interface are not stated anywhere yet and are marked [TBD].

This document is a placeholder skeleton published ahead of the finished specification. Structure, specification-table shape and branding are fixed here; measured performance is not claimed and board-level detail is not stated. Rows that read [TBD] have no settled value.

2. What is settled and what is not

Settled design facts

- 25 antenna elements forming 25 fixed beams - static pattern diversity, with the beam geometry unchanged at run time.
- 25 L1 GNSS receivers, one per beam.
- An FPGA mux that aggregates the 25 receiver streams and selects the best position solution across the array.
- L1 (1575.42 MHz) only - single band, with no band selection.
- Instantaneous bandwidth: up to 10 MHz.
- Supported signals: GPS L1 C/A, Galileo E1, BeiDou B1.
- Intended for UAV, ground-vehicle and fixed-installation integration.

Open - not specified anywhere yet

- Board revision, FPGA part, receiver part and antenna part numbers.
- The selection rule applied across the 25 receiver streams, and its update rate.
- Channel-to-channel phase stability, calibration method and skew budget.
- Noise figure, gain distribution, phase noise and input third-order intercept.
- ADC resolution, power supply and power consumption.
- Host interface and data output format.
- Enclosure, dimensions, weight, antenna connectors and mounting.
- Operating and storage temperature, vibration, shock and ingress protection.
- Regulatory and compliance status.

The FPGA mux is a board-level implementation detail. No pinout, clock plan, interface configuration or board architecture is asserted in this draft.

3. Specification summary

3.1 RF and electrical

Parameter	Min	Typ	Max	Unit	Notes
Number of RF channels	-	25	-		One per beam
RF input frequency (L1)	-	1575.42	-	MHz	Single band
Instantaneous bandwidth	-	10	[TBD]	MHz	Published as "up to 10 MHz"
Noise figure	-	[TBD]	-	dB	Not specified
Gain	-	[TBD]	-	dB	Not specified
Phase noise at 10 kHz	-	[TBD]	-	dBc/Hz	Not specified
ADC resolution	-	[TBD]	-	bits	Not specified
Input third-order intercept	-	[TBD]	-	dBm	Not specified
Phase coherence between channels	-	[TBD]	-	deg	Method and limit not specified
Power supply	[TBD]	[TBD]	[TBD]	V DC	Not specified
Power consumption	-	[TBD]	-	W	Not specified

3.2 Digital, processing and interfaces

Parameter	Min	Typ	Max	Unit	Notes
Beam mux	-	[TBD]	-		FPGA-based; part not stated
Receiver-to-host multiplexing	-	-	-		FPGA mux aggregating the 25 L1 receiver streams
Position selection	-	-	-		Best position solution across the 25 beams; rule not stated [TBD]
Host interface	-	[TBD]	-		USB / Ethernet / PCIe not decided
Data output format	-	[TBD]	-		Not specified
Update rate	-	[TBD]	-	Hz	Not specified
Onboard storage	-	[TBD]	-		Not specified

4. Mechanical and environmental

4.1 Mechanical

Parameter	Min	Typ	Max	Unit	Notes
Dimensions	[TBD]	[TBD]	[TBD]	mm	Not specified

Parameter	Min	Typ	Max	Unit	Notes
Weight	[TBD]	[TBD]	[TBD]	g	Not specified
Enclosure	-	[TBD]	-		Not specified
Antenna connectors	-	[TBD]	-		Connector family not specified
Mounting	-	[TBD]	-		Not specified

4.2 Environmental

Parameter	Min	Typ	Max	Unit	Notes
Operating temperature	[TBD]	[TBD]	[TBD]	degC	Not specified
Storage temperature	[TBD]	[TBD]	[TBD]	degC	Not specified
Vibration / shock	[TBD]	[TBD]	[TBD]		Not specified
Ingress protection	-	[TBD]	-	IP	Not specified

5. Compliance

Item	Status	Notes
EMC / radio certification	[TBD]	No certification is claimed on the published page
GNSS band authorisation	[TBD]	Receive-only operation assumed; not stated
Export / dual-use status	[TBD]	Not stated

6. Open items before this specification can be issued

- Fix the board architecture: FPGA part, per-beam L1 receiver parts, mux configuration and clock plan.
- State the selection rule applied across the 25 receiver streams, with its update rate.
- State the inter-channel calibration and phase-stability budget, with the measurement method.
- Publish RF performance with test conditions (noise figure, gain, linearity, phase noise).
- Decide and document the host interface and output format.
- State mechanical, environmental and power requirements.