HASCO | RF

PERFORMANCE BRIEF / UAV & UAS ENGINEERING

Cable Routing Effects on Installed Blade Antenna Performance

Measured results show why the feed cable and mounting geometry must be treated as part of the antenna system

The installation is part of the RF system.

A measured-performance reference for the HAD-1325-O1M1B-01 blade antenna.



1.35-2.50 GHz
Measured range

3 cable routes
Controlled configurations

7 frequencies
Direct far-field testing

November 2026

01 / THE MEASURED TEST CASE

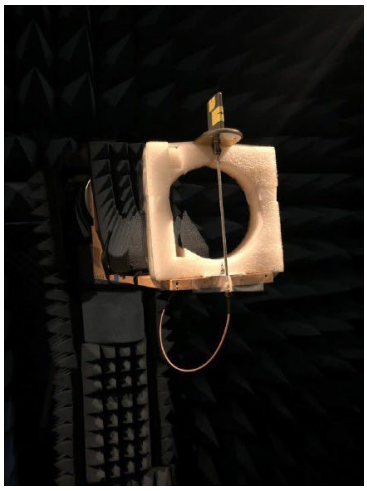
Evaluate the installation, not just the antenna.

A blade antenna can meet its standalone electrical requirements and still perform differently after installation on an aircraft or unmanned platform. The reason is straightforward: at RF frequencies, the antenna does not operate independently of its feed cable, mounting surface, and nearby conductive structures. Those elements become part of the installed electromagnetic environment and can change current distribution, impedance, peak gain, and radiation-pattern shape.

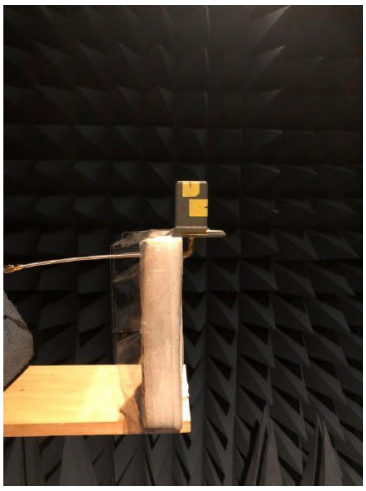
Recent direct far-field chamber testing illustrates the size of this effect. One blade antenna was measured from 1.35 to 2.5 GHz in three feed-cable configurations: with the cable extending straight away from the antenna, routed along the baseplate, and routed orthogonally to the baseplate. Measurements included calibrated gain, three principal-plane cuts, and three-dimensional radiation patterns. The results show that cable routing can produce meaningful performance differences and should be controlled early in a UAV or airborne-platform design.

DIRECT FAR FIELD	ALLWAVE CHAMBER A	AUGUST 6-8, 2025
Measurement method	Test facility	Measurement dates

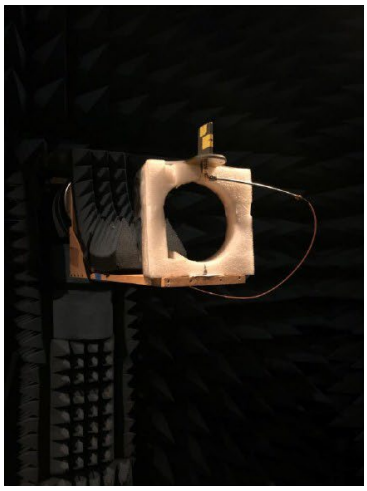
THREE CONTROLLED FEED-CABLE ARRANGEMENTS



1 **Straight cable**



2 **Along the baseplate**



3 **Orthogonal to the baseplate**

Figure 1. Measured chamber configurations for HAD-1325-O1M1B-01. Source: Radiation Pattern Test Report, p. 5. Photos retain the original test geometry.

02 / RESULTS ACROSS THE BAND

What the gain measurements showed

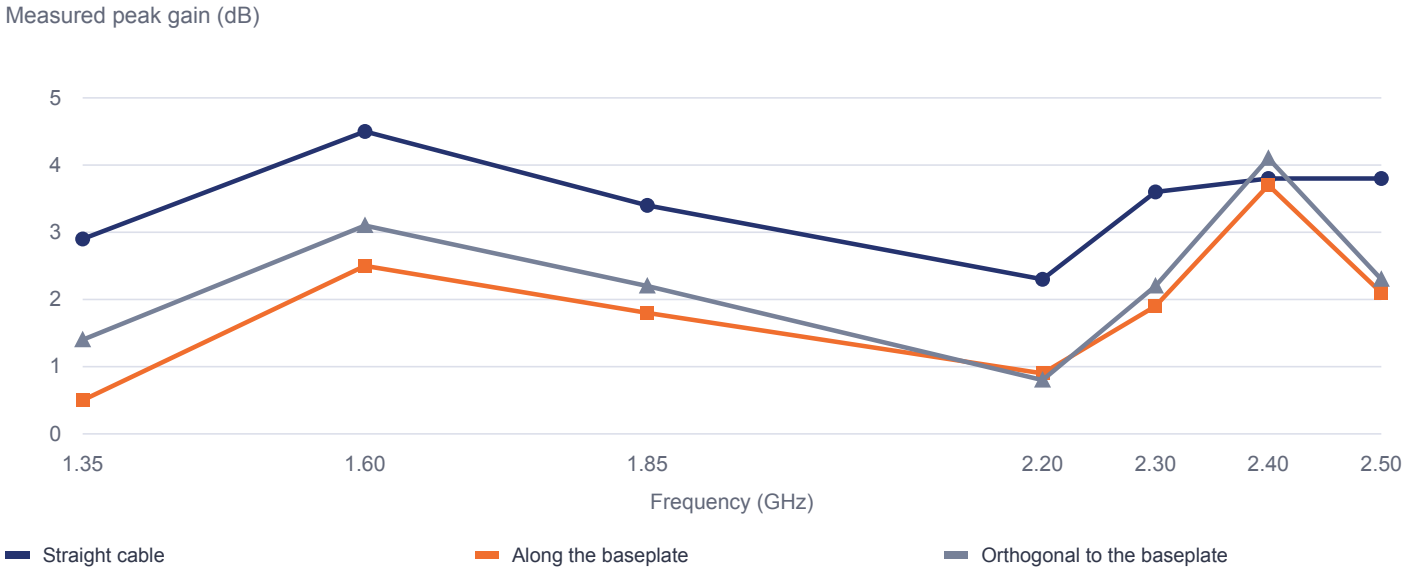


Figure 2. Measured gain at seven test frequencies. Lines guide the eye between reported points. Source: Radiation Pattern Test Report, p. 8.

Frequency	Straight cable	Along baseplate	Orthogonal
1.35 GHz	2.9 dB	0.5 dB	1.4 dB
1.60 GHz	4.5 dB	2.5 dB	3.1 dB
1.85 GHz	3.4 dB	1.8 dB	2.2 dB
2.20 GHz	2.3 dB	0.9 dB	0.8 dB
2.30 GHz	3.6 dB	1.9 dB	2.2 dB
2.40 GHz	3.8 dB	3.7 dB	4.1 dB
2.50 GHz	3.8 dB	2.1 dB	2.3 dB

The straight-cable configuration produced the highest measured gain at six of the seven test frequencies. Its advantage was most pronounced below 2.4 GHz. At 1.35 GHz, measured gain was 2.9 dB with the straight cable, compared with 0.5 dB when the cable was routed along the baseplate and 1.4 dB with the orthogonal route. At 1.60 GHz, the results were 4.5, 2.5, and 3.1 dB, respectively.

The same general trend continued at 1.85, 2.2, 2.3, and 2.5 GHz. At 2.2 GHz, for example, measured gain fell from 2.3 dB in the straight configuration to 0.9 dB along the baseplate and 0.8 dB in the orthogonal configuration. The exception was 2.4 GHz, where all three routes performed similarly and the orthogonal cable produced the highest measured value: 4.1 dB versus 3.8 dB straight and 3.7 dB along the baseplate.

Gain units follow the source report. Values are specific to the evaluated antenna and configurations, and are not guaranteed installed-aircraft performance.

03 / INTEGRATION IMPLICATIONS

Why the cable changes antenna behavior

These results do not mean that one cable route is universally correct. They demonstrate that the feed cable can carry common-mode current and interact with the antenna, baseplate, connector region, and platform structure. Changing the cable path changes that interaction. A route parallel to a conductive surface may alter coupling and current return paths, while an orthogonal route may change the effective radiating geometry. The effect is frequency dependent, which explains why the relative performance changed near 2.4 GHz.

Peak gain is only one part of the evaluation. Cable routing may also shift nulls, alter polarization purity, or distort elevation and azimuth coverage. For a UAV, the practical consequence can be reduced link margin during banking, climbing, turning, or changing orientation relative to the ground station. A configuration that looks acceptable at one frequency or in one plane may still create a coverage weakness elsewhere in the operating band.

Implications for UAV and airborne integration

The correct engineering approach is to define the antenna installation as a system. The production cable type, length, shield construction, connector, routing path, bend geometry, ground-plane dimensions, mounting hardware, and nearby equipment should be represented in the test configuration. If the cable will be clamped to the airframe or routed beside a battery, enclosure, carbon-composite structure, or wiring harness, those conditions should be considered before qualification.

Design teams should also avoid assuming that a catalog gain value will be reproduced after integration. Catalog data is useful for comparing antenna candidates, but installed performance depends on the platform. Early prototype testing can identify routing sensitivity while changes are still inexpensive. Once a preferred path is established, the cable location and restraint method should be documented so production aircraft do not introduce uncontrolled variation.

01 DEFINE

Production cable path

02 EVALUATE

Realistic RF environment

03 CONTROL

Repeatable installation

04 / A PRACTICAL VALIDATION PLAN

Build confidence before the design is frozen.

Begin with impedance measurements across the full operating band using the intended cable and mounting surface. Then compare several realistic cable routes rather than optimizing only an ideal laboratory arrangement. Chamber testing should include the principal elevation and azimuth cuts needed to evaluate the operational link, plus three-dimensional pattern data when coverage continuity is critical.

Review peak gain together with pattern shape, null location, front-to-back behavior, polarization, and unit-to-unit repeatability. If the UAV uses multiple radios or antennas, repeat the evaluation with the surrounding equipment installed and operating as appropriate. Finally, lock down the mechanical installation in the drawing or work instruction, including cable routing, bend radius, clamp locations, connector torque, and ground contact.

Treat the antenna, cable and airframe as one RF system.

The chamber data makes the central point clear: the feed cable is not merely a connection between the radio and the antenna. In an installed blade-antenna system, its routing can materially influence measured gain and radiation behavior. Treating the antenna, cable, baseplate, and nearby structure as one RF system reduces integration risk and gives UAV designers a better chance of preserving link margin throughout the aircraft's operating envelope.

Continue your installation review.

Compare blade antenna models, review specifications or discuss your UAV/UAS requirements with HASCO.

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SOURCE & SCOPE

Narrative supplied by HASCO. Measured data and configuration photos: HASCO RF HAD1325-O1M1B-01 Radiation Pattern Test Report, August 12, 2025, pp. 3, 5 and 8. This brief describes the HAD-1325-O1M1B-01 measured test case. Installation-specific performance should be evaluated for the intended platform.