



# LASER RADAR

## NEXT-GENERATION BODY-IN-WHITE INSPECTION



**A PARADIGM SHIFT IN  
CAR BODY QUALITY CONTROL**

# A BEST IN CLASS INLINE INSPECTION SYSTEM

Laser Radar is a fully automated, versatile system that brings non-contact measurement to the production line. It is a novel approach that includes direct surface and feature measurement with the capacity to perform 100% inspection checks.

The Laser Radar system is surface independent, i.e., it can inspect most surfaces and is not sensitive to lighting or temperature. The latter is a big advantage of Laser Radar, especially for measurements in the production line. The system can operate without measurement targets and measures with a CMM-level of accuracy. The ease of programming, no surface preparation, fast measurement and absolute accuracy make it an ideal tool to inspect both pre-series and production car bodies.

## € WHAT CUSTOMERS GAIN

With the need for shorter and more flexible production cycles, automotive manufacturers are continuously looking to cut time and costs whilst maintaining quality. For automotive inline inspection, the Laser Radar offers the right capabilities to meet the need for flexible and absolute measurements directly on the shop floor. For car manufacturers this results in:

- ✓ **Shorter startup of new production line or upon vehicle model changes:** During the startup phase of a production line, the first produced vehicles can be completely measured and compared to CAD in a short time. More measurement data, early in the process provide better insight into product conformance and enables faster fine tuning of the production process.
- ✓ **Improved process control:** Dimensional quality control at the Body-in-White assembly line, when supported by data-driven analytics, detects product and process anomalies earlier in the production process. It also helps to control the assembly process in such a way that dimensional tolerance targets are hit consistently. The result is not only better fitting of closures, trim, seating and other components in downstream assembly resulting in less downtime, but also a production process that continuously improves.
- ✓ **Future proof data:** Measurements in absolute coordinates fit in the digital manufacturing process where big data is used as a reference to compare data over time and enabling enhanced insight, decision making, process automation and to speed up future product development.



# ADVANTAGES

## ABSOLUTE ACCURACY ON THE SHOP FLOOR

The Laser Radar on robot introduces an innovative approach to body-in-white (BIW) inspection. This shop floor system provides accurate, dimensional measurements in the car coordinate system allowing direct comparison to CAD without the need for a reference part.

## 6x FASTER MEASUREMENT

Traditional touch probe CMM inspection is very time-consuming with up to 20 seconds per feature required. It also requires a dedicated, environmentally controlled metrology room where the vehicle needs to be manually loaded onto the measurement fixture. The Laser Radar can typically measure features in less than 3 seconds and can be installed on the shop floor allowing for fully automated measurements directly from the production line, saving transport, setup and measurement time.

## ROBOT-INDEPENDENT ACCURACY

After repositioning the robot, the Laser Radar automatically realigns to the part by measuring tooling balls on the fixture. As such all measurements are collected in the vehicle coordinate system and feature accuracy is independent of the robots ability to accurately locate the Laser Radar.

## CMM-QUALITY DATA

Features such as holes, slots, pins, studs can be quickly inspected using the Laser Radar. The measurement accuracy and repeatability of the Laser Radar is comparable to measurements taken with a traditional horizontal arm touch probe, while it is many times faster.

## NO PART PREPARATION NEEDED

The non-contact Laser Radar is surface independent and can inspect almost any material, color or texture. Without any surface preparations, any need to apply measurement markers or feature adapters, complex surfaces and features such as holes, slots, pins and studs can be quickly and accurately inspected.

## WHAT INDUSTRY RESEARCH COMPANY "FROST & SULLIVAN" REPORTS ON QUALITY 4.0 IN BODY-IN-WHITE INSPECTION:

Quality 4.0 deals with the paradigm shift of making dimensional inspections move from being a mere qualifier of quality compliance to one that controls and regulates the manufacturing process.

"As Body-in-White inspection moves in the direction of Quality 4.0, it will become a fully automated, non-contact, absolute measurement process integrated into the production line. Traditional inspection approaches, such as horizontal arm CMMs, are being replaced by newer, automated approaches like Laser Radar systems."

Frost & Sullivan.

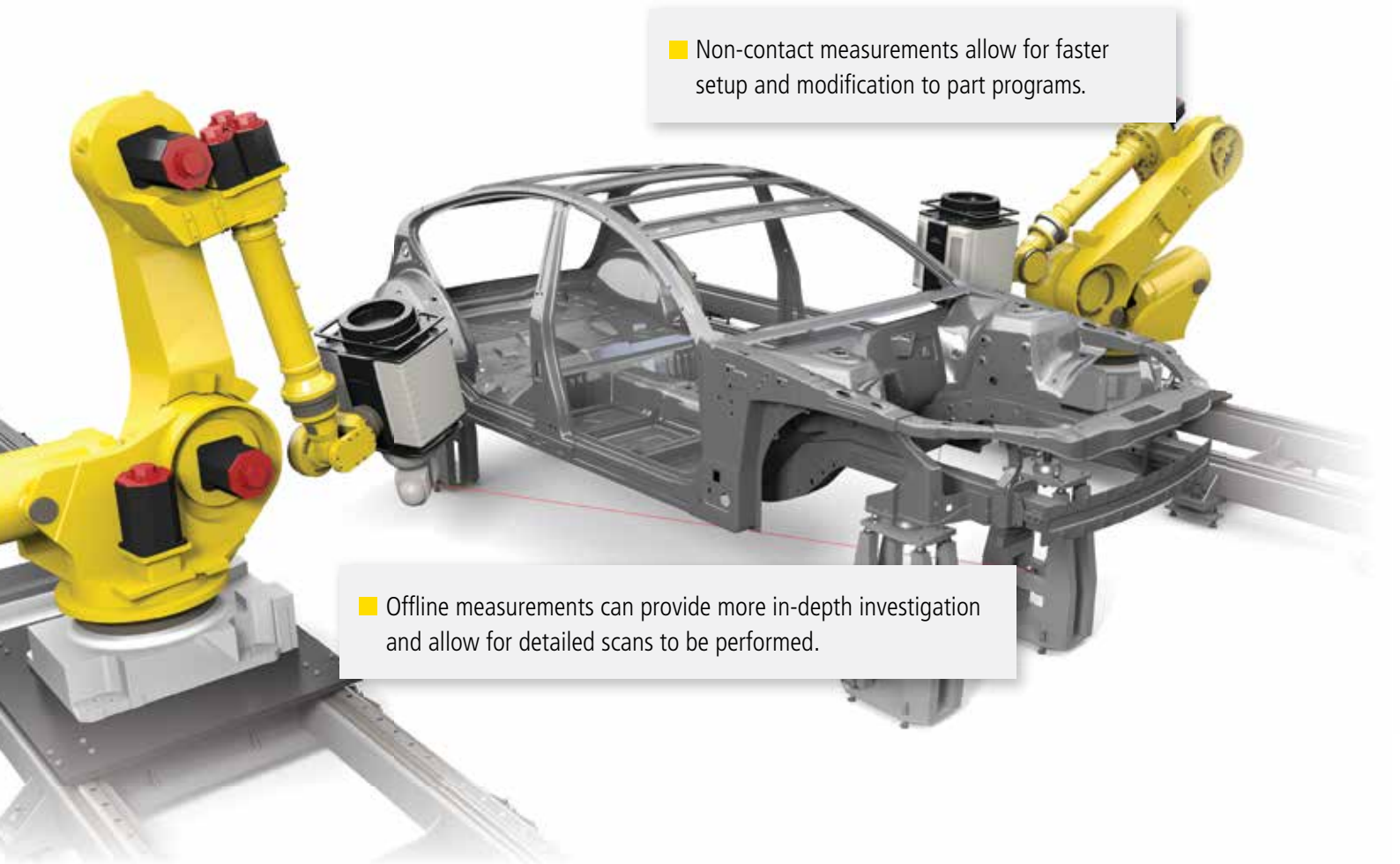
Scan the QR code to download the Frost & Sullivan white paper:  
**Quality 4.0: A Paradigm Shift of Inline Inspection in Body-in-white**



# METROLOGY ROOM

## BOOST PRODUCTIVITY INSPECTION STRATEGIES IN THE METROLOGY ROOM

Using Laser Radar technology in the CMM room, the off-line facility ceases to be a bottleneck due to faster measurements allowing quicker problem solving.



■ Non-contact measurements allow for faster setup and modification to part programs.

■ Offline measurements can provide more in-depth investigation and allow for detailed scans to be performed.

### CMM-QUALITY MEASUREMENTS

Robot mounted Laser Radars supersede traditional offline CMMs in dedicated metrology rooms. Holes, slots, studs, surface points and edges are measured to CMM comparable accuracy in just a fraction of the time. This meets the needs of automotive manufacturers in cutting time, cutting costs and improving product quality.

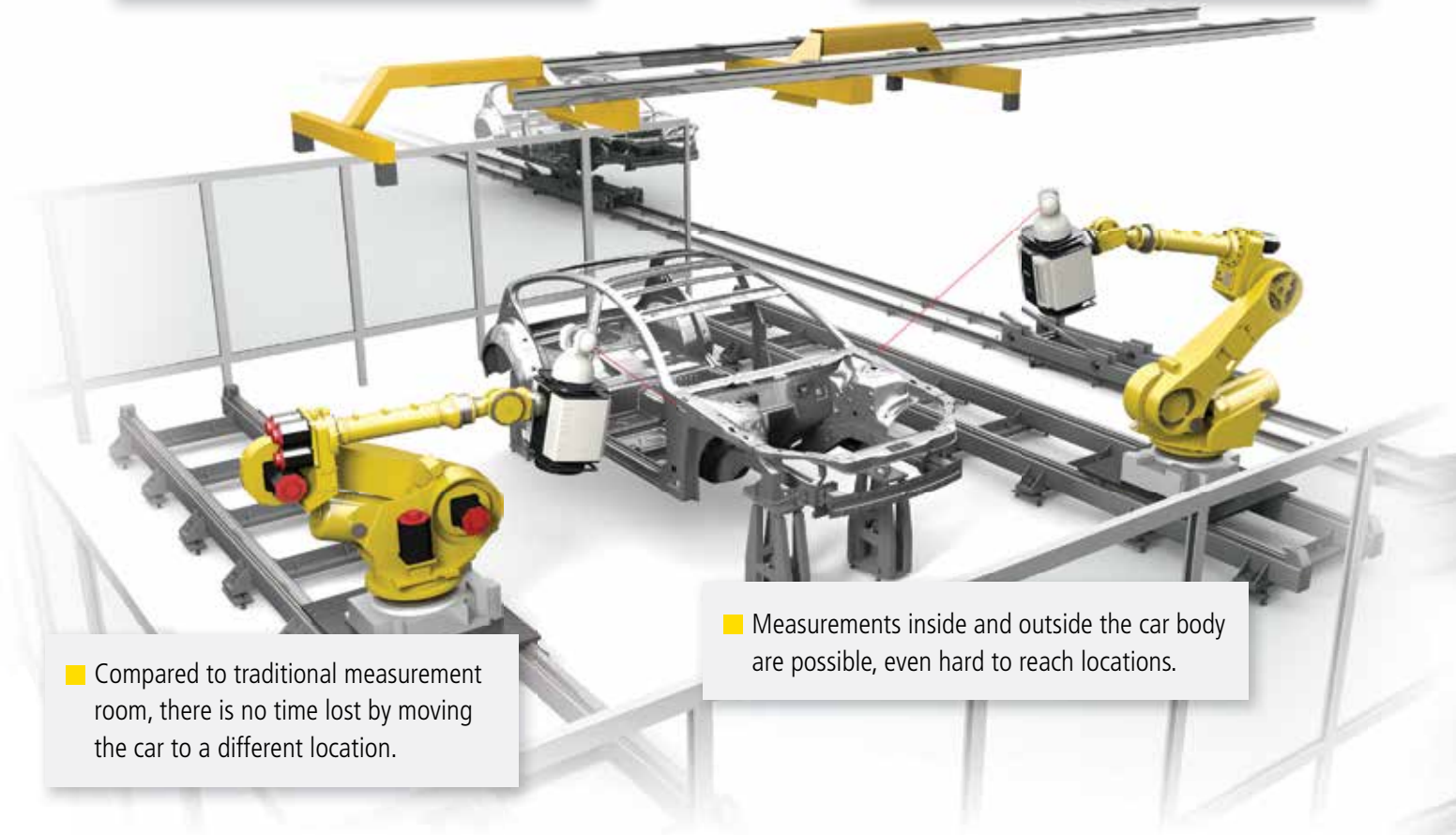
# BYPASS INSPECTION

## INNOVATING NEXT-TO-THE-LINE CAR BODY INSPECTION

A car body is taken from the line and fully inspected. Simultaneous measurements guarantee the highest inspection productivity to CMM accuracies. After inspection the body is re-inserted into the production line.

■ Automated extraction and re-insertion improves productivity.

■ Global feature measurements give true position variations in absolute coordinates.



■ Compared to traditional measurement room, there is no time lost by moving the car to a different location.

■ Measurements inside and outside the car body are possible, even hard to reach locations.

## CAPTURE ISSUES EARLIER AND FASTER

Scanning at less than 3 seconds per feature means the Laser Radar achieves much faster throughput than traditional methods. Up to 3 surface points per second can be taken to enable fast inspection of surfaces. Edges and gap & flush can also easily be inspected. Overall, the Laser Radar greatly increases measurement productivity directly at the production line.

# INLINE 100% INSPECTION

## FLEXIBLE SOLUTION FOR INLINE INSPECTION

Measure critical features in the takt time of the line or a sampling strategy to cover more features over a set of car bodies.

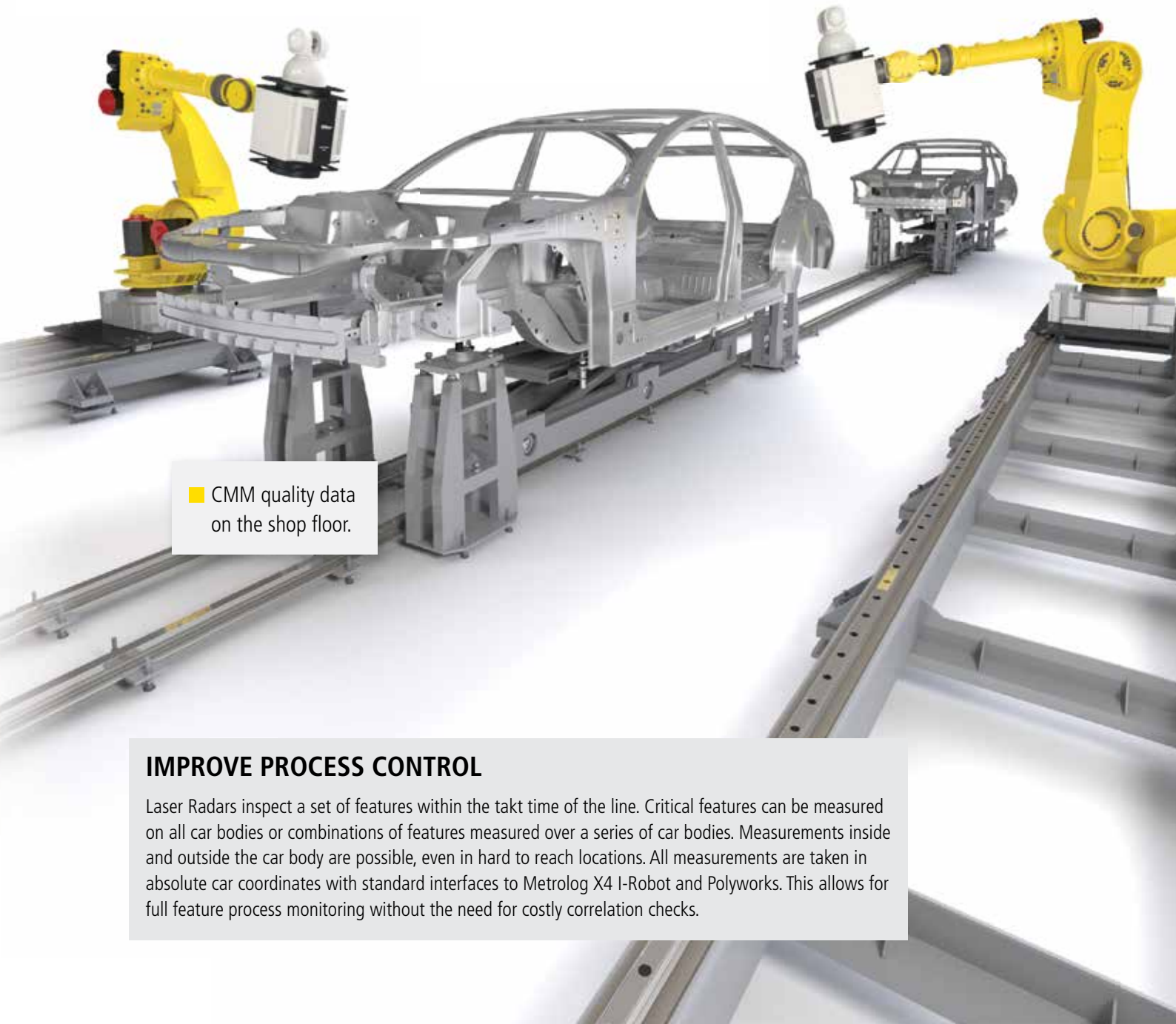
■ Measurement independent of robot accuracy and drift.

■ Non-contact measurements of features up to 6x faster than traditional CMM.

■ CMM quality data on the shop floor.

## IMPROVE PROCESS CONTROL

Laser Radars inspect a set of features within the takt time of the line. Critical features can be measured on all car bodies or combinations of features measured over a series of car bodies. Measurements inside and outside the car body are possible, even in hard to reach locations. All measurements are taken in absolute car coordinates with standard interfaces to Metrolog X4 I-Robot and Polyworks. This allows for full feature process monitoring without the need for costly correlation checks.



# INCOMING PART INSPECTION

## REDUCING ASSEMBLY BOTTLENECKS

Incoming part inspection is critical to avoid assembly issues further down the production line. Laser Radar allows for fast, non-contact feature and surface inspection to have a instant quality report on components from external suppliers.

■ Part rotation allows for inspection of features on all parts.

■ Single Laser Radar services multiple inspection stations for increased throughput.

■ Data used for process control or incoming component validation.

■ Measurements taken in absolute coordinates with CMM-comparable accuracy.

■ Holes, slots, surface points, edges and studs can all be measured accurately.

## ABSOLUTE MEASUREMENTS

The Laser Radar automatically realigns to the part by measuring alignment features or tooling balls on the component or fixture. As such all measurements are collected in the part coordinate system and feature accuracy is independent of the Laser Radar position.

# SPECIFICATIONS

		MV331	MV331 HS	MV331p HS
<b>Range</b>		30 m	30 m	30 m
<b>Measurement speed*</b>	<b>Scanning</b>	2000 pts/s	2000 pts/s	2000 pts/s
	<b>Surface points</b>	0.5 sec	0.2 sec	0.2 sec
	<b>Features (holes, spheres)</b>	7 sec	2.5 sec	2.5 sec
<b>Environmental</b>		Replaceable filters	Replaceable filters	Replaceable filters + attachment for air pressurization
<b>Function</b>		Entry level	Performance	Continuous shop floor operation

\* Measurement speed depends on feature size and settings

## Laser

	Measurement laser (infrared)	Pointing laser (red)
<b>Wavelength</b>	1,550 nm	700 nm
<b>Power</b>	<10 mW	<1.0 mW
<b>IEC Class</b>	Class 1	Class 2

## Environmental

	Operational	Storage
<b>Temperature</b>	5° to 40°C	-10° to 60°C
<b>Altitude</b>	-400 to 3,000 m	-400 to 11,000 m
<b>Humidity</b>	10 - 90% (non-condensing)	

## Distance measurement performance

<b>Range uncertainty (k=1)</b>	5 µm + 1.25 µm/m
<b>Maximum data rate</b>	4000 pts/sec
<b>Working range</b>	2-30 m

## Angle measurement performance

<b>Azimuth uncertainty (k=1)</b>	6.8 µm/m
<b>Elevation uncertainty (k=1)</b>	6.8 µm/m
<b>Azimuth working envelope</b>	±180°
<b>Elevation working envelope</b>	±45°



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