

# OSDome

## Hemispherical View High-Resolution Imaging Lidar

*Preliminary Datasheet, specifications subject to change*

**FIRMWARE VERSION: 3.0**

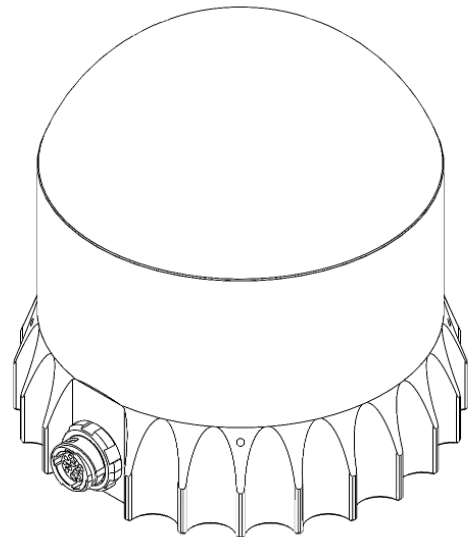
**HARDWARE VERSION: REV7**

### SUMMARY

The OSDome offers a complete 180° hemispherical field of view, up to 20 m of range at 10% reflectivity, and high resolution. The OSDome delivers full coverage for indoor people tracking, and near-range detection for mobile robots and vehicles.

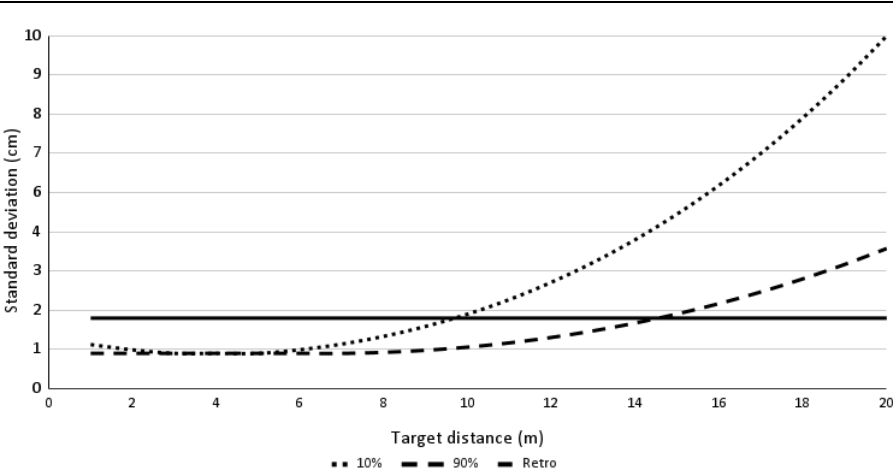
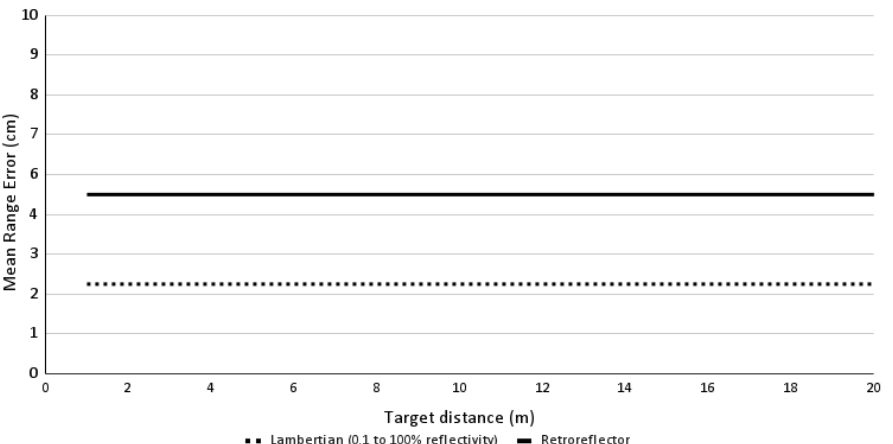
### HIGHLIGHTS

- Full 180° hemispherical coverage
- 100% increase in range with the new L3 Chip
- Dual Return mode
- Calibrated reflectivity
- Fixed resolution per frame
- Camera-grade near-infrared and signal data
- Multi-sensor crosstalk suppression
- Open source ROS and C++ drivers
- [Ouster SDK](#) for software development



### OPTICAL PERFORMANCE

Range (80% Lambertian reflectivity, 1024 @ 10 Hz mode)	45 m @ 100 klx sunlight, >90% detection probability
Range (10% Lambertian reflectivity, 1024 @ 10 Hz mode)	20 m @ 100 klx sunlight, >90% detection probability
Minimum Range	0.5 m (to be reduced in FW 3.1)
Vertical Resolution	32, 64, or 128 channels
Horizontal Resolution	512, 1024, or 2048 (configurable)
Rotation Rate	10 or 20 Hz (configurable)
Field of View	Vertical: 90° (+90° to 0°) Horizontal: 360°
Angular Sampling Accuracy	Vertical: ±0.01° / Horizontal: ±0.01°
False Positive Rate	1/10,000
Range Resolution	0.1 cm <b>Note:</b> For Low Data Rate Profile the Range Resolution = 0.8cm
Vertical Angular Resolution	Up to 0.7° angular resolution
# of Returns	2 (strongest, second strongest)

<p>Precision (Lambertian and Retro reflective, 1024 @ 10 Hz mode, 1 standard deviation)</p>	<p>Min: <math>\pm 1.0</math>, Max: <math>\pm 10</math></p>  <table border="1"> <caption>Standard deviation (cm) vs Target distance (m)</caption> <thead> <tr> <th>Target distance (m)</th> <th>10% (dotted)</th> <th>90% (dashed)</th> <th>Retro (solid)</th> </tr> </thead> <tbody> <tr><td>0</td><td>1.0</td><td>1.0</td><td>1.8</td></tr> <tr><td>2</td><td>1.0</td><td>1.0</td><td>1.8</td></tr> <tr><td>4</td><td>1.0</td><td>1.0</td><td>1.8</td></tr> <tr><td>6</td><td>1.0</td><td>1.0</td><td>1.8</td></tr> <tr><td>8</td><td>1.2</td><td>1.0</td><td>1.8</td></tr> <tr><td>10</td><td>1.8</td><td>1.2</td><td>1.8</td></tr> <tr><td>12</td><td>2.8</td><td>1.5</td><td>1.8</td></tr> <tr><td>14</td><td>4.0</td><td>1.8</td><td>1.8</td></tr> <tr><td>16</td><td>5.5</td><td>2.2</td><td>1.8</td></tr> <tr><td>18</td><td>7.5</td><td>2.8</td><td>1.8</td></tr> <tr><td>20</td><td>10.0</td><td>3.5</td><td>1.8</td></tr> </tbody> </table>	Target distance (m)	10% (dotted)	90% (dashed)	Retro (solid)	0	1.0	1.0	1.8	2	1.0	1.0	1.8	4	1.0	1.0	1.8	6	1.0	1.0	1.8	8	1.2	1.0	1.8	10	1.8	1.2	1.8	12	2.8	1.5	1.8	14	4.0	1.8	1.8	16	5.5	2.2	1.8	18	7.5	2.8	1.8	20	10.0	3.5	1.8
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<p>Range Accuracy <b>Note:</b> "Accuracy is calculated based on the error between the mean of 100 measurements on static target at a given range and the true range"</p>	 <table border="1"> <caption>Mean Range Error (cm) vs Target distance (m)</caption> <thead> <tr> <th>Target distance (m)</th> <th>Lambertian (0.1 to 100% reflectivity) (dotted)</th> <th>Retroreflector (solid)</th> </tr> </thead> <tbody> <tr><td>0</td><td>2.2</td><td>4.8</td></tr> <tr><td>2</td><td>2.2</td><td>4.8</td></tr> <tr><td>4</td><td>2.2</td><td>4.8</td></tr> <tr><td>6</td><td>2.2</td><td>4.8</td></tr> <tr><td>8</td><td>2.2</td><td>4.8</td></tr> <tr><td>10</td><td>2.2</td><td>4.8</td></tr> <tr><td>12</td><td>2.2</td><td>4.8</td></tr> <tr><td>14</td><td>2.2</td><td>4.8</td></tr> <tr><td>16</td><td>2.2</td><td>4.8</td></tr> <tr><td>18</td><td>2.2</td><td>4.8</td></tr> <tr><td>20</td><td>2.2</td><td>4.8</td></tr> </tbody> </table>	Target distance (m)	Lambertian (0.1 to 100% reflectivity) (dotted)	Retroreflector (solid)	0	2.2	4.8	2	2.2	4.8	4	2.2	4.8	6	2.2	4.8	8	2.2	4.8	10	2.2	4.8	12	2.2	4.8	14	2.2	4.8	16	2.2	4.8	18	2.2	4.8	20	2.2	4.8												
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### LASER

Laser Product Class	Class 1 eye-safe per IEC/EN 60825-1: 2014
Laser Wavelength	865 nm
Beam Diameter Exiting Sensor	5 mm
Beam Divergence	0.35° (FWHM)

### LIDAR OUTPUT

Connection	UDP over gigabit Ethernet
Points Per Second	1,310,720 (32 channel) 2,621,440 (64 channel) 5,242,880 (128 channel)
Data Rate (Megabits Per Second) (Legacy Mode)	66 Mbps (32 channel) 129 Mbps (64 channel) 254 Mbps (128 channel)
Data Rate (Megabits per second) (Dual Return Profile at highest resolution 2048x10)	up to 86.55 Mbps (32 channel) up to 170.43 Mbps (64 channel) up to 338.20 Mbps (128 channel)

Data Rate (Megabits per second) (Low Data Rate Profile)	up to 23.6 Mbps (32 channel) up to 44.6 Mbps (64 channel) up to 86.6 Mbps (128 channel)
Data Rate (Megabits per second) (Single Return Profile)	up to 65.6 Mbps (32 channel) up to 128.5 Mbps (64 channel) up to 254.3 Mbps (128 channel)
Data Per Point	Range, signal, reflectivity, near-infrared, channel, azimuth angle, timestamp
Timestamp Resolution	< 1 $\mu$ s
Data Latency	< 10 ms

### IMU OUTPUT

Connection	UDP over 1000Base-T or 1000Base-T1
Samples Per Second	100
Data Per Sample	3 axis gyro, 3 axis accelerometer
Timestamp Resolution	< 1 $\mu$ s
Data Latency	< 10 ms
Additional Details	InvenSense IAM-20680HT; datasheet for more details: <a href="https://invensense.tdk.com/download-pdf/iam-20680ht-datasheet/">https://invensense.tdk.com/download-pdf/iam-20680ht-datasheet/</a>

### CONTROL INTERFACE


Connection	TCP and HTTP APIs
Time Synchronization	Input sources: <ul style="list-style-type: none"> <li>• IEEE1588 Precision Time Protocol (PTP); Accuracy: &lt;1 ms error</li> <li>• gPTP; Accuracy: &lt;1 ms error</li> <li>• NMEA \$GPRMC UART message support</li> <li>• External PPS; Accuracy: &lt;1 ms error</li> <li>• Internal 10 ppm drift clock; Accuracy: &lt;20 ppm error</li> </ul> Output sources: <ul style="list-style-type: none"> <li>• Configurable 1 - 60 Hz output pulse</li> </ul>
Lidar Operating Modes	Hardware-triggered angle firing (guaranteed fixed resolution per rotation): <ul style="list-style-type: none"> <li>• x 512 @ 10 Hz or 20 Hz</li> <li>• x 1024 @ 10 Hz or 20 Hz</li> <li>• x 2048 @ 10 Hz</li> </ul>
Additional Programmability	Multi-sensor Phase Lock Azimuth Masking Low-power Standby Mode Queryable intrinsic calibration information: <ul style="list-style-type: none"> <li>• Beam angles</li> <li>• IMU pose correction matrix</li> </ul>

### MECHANICAL/ELECTRICAL

Power Consumption	14 - 20 W (22 W peak at startup, 28 W peak if operating below -40 °C)
Operating Voltage	9V - 34 V, 12 V or 24 V nominal
Connector	Proprietary pluggable connector (Power + data + DIO)

Dimensions	Pending Results
Weight	377 g (13.3 oz)
Mounting	Bottom: 4x M3 screws, 2x locating 2 mm pin holes

**OPERATIONAL**

Operating Temperature	-40 °C to +60 °C (with mount) Between +53 °C and +60 °C, sensor automatically reduces range (max 20% range reduction)
Storage Temperature	-40 °C to +105 °C
Ingress Protection	IP68 (1m submersion for 1 hour, with I/O cable attached) IP69K (with I/O cable attached)
Shock	IEC 60068-2-27 (Amplitude: 100 g, Shape: 11 ms half-sine, 3 shocks x 6 directions)
Vibration	IEC 60068-2-64 (Amplitude: 3 G-rms, Shape: 10 - 1000 Hz, Mounting: sprung masses, 3 axes w/ 8 hr duration each)
Compliance	<p><b>For US</b> Laser Safety: <i>Currently in process</i></p> <p>Product Safety: • UL 62368-1 • CSA 22.2 No. 62368-1-19</p> <p>EMC: FCC 47CFR Part 15, Subpart B, Class A</p> <p><b>For EU</b> Laser Safety: <i>Currently in process</i></p> <p>Product Safety: EN/IEC 62368-1</p> <p>EMC: • EN 55032:2012/AC 2013; CISPR 32:2015 • EN 55024:2010; CISPR 24:2010 • EN 61000-3-2:2014 • EN 61000-3-3:2013</p> <p style="text-align: center;"></p>

**ACCESSORIES**

Interface Box	Polycarb/FR4, 100 g, 75 mm x 50 mm x 25 mm (LxWxH), 2 m CAT6 cable, 24 V power adapter, 5 m sensor cable
Optional Mount	Aluminum, 530 g, 110 mm x 110 mm x 20.5 mm (LxWxH), 4 x M8 thru holes

**SOFTWARE**

Sample Drivers	Ouster SDK, ROS, C++
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