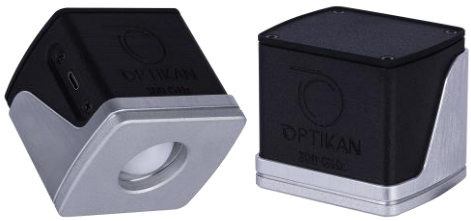
# uCore

## Description



uCore is the standalone version of the radar-equipped sensors found in uSense and uSense LITE product lines. Designed for maximum versatility, uCore is meant for OEM whose main concern are integration of sensors alongside existing non-destructive testing solutions, quality control equipment and analysis software all the while keeping a low acquisition cost.

## Features

- Available in four unique center frequency ($f_c$) and bandwidth (BW) based on uSense and uSense LITE :
  - 57.4 → 63 GHz ($f_c \approx 60$ GHz)
  - 113.9 → 135.9 GHz ($f_c \approx 120$ GHz)
  - 222.5 → 267.5 GHz ($f_c \approx 240$ GHz)
  - 287 → 328.5 GHz ($f_c \approx 300$ GHz)
- Unique collimation lens
- USB-C connectivity for maximum compacity and compatibility with controlling devices
- Comes alongside Optikan's Software Development Kit to facilitate implementation inside existing quality control ecosystems

## Applications

- See-through non-intrusive sensing for foreign body detection such as wet spots, delamination, glue, metallic or plastic objects or knots in wood
- Thickness measurement
- Material properties characterization in research and development
- Process validation and quality control
- Integration of multi-sensor devices for Original Equipment Manufacturers

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# Electrical specifications

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Comment |
|---|---|---|---|---|---|---|
| Input voltage | $V_{in}$ | 4.75 | 5 | 5.25 | V | uCore is powered using USB[1]. |
| Power draw[2] | $P_{in}$ | - | TBA | 4.725 | W | For the 60 GHz uCore. |
| | | - | 3.709 | 4.725 | W | For the 120 GHz uCore. |
| | | - | TBA | 4.725 | W | For the 240 GHz uCore. |
| | | - | TBA | 4.725 | W | For the 300 GHz uCore. |

**Note :**

[1]uCore connects to the tablet using a USB-C connector and is designed to work with third-party computers and tablets aside from Optikan's. It is therefore theoretically compatible with any compliant USB-C port (that is : featuring support for USB 2.0 communication protocol and capable of delivering 900 mA of current).

[2]Typical values measured on a test bench. Maximum values computed from theoretical maximum voltage and current draw.

# Mechanical specifications

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Comment |
|---|---|---|---|---|---|---|
| Length | L | - | - | 75 | mm | - |
| Width | W | - | - | 61 | mm | |
| Height | H | - | - | 65 | mm | |
| Weight | m | - | - | 244 | g | |

# Optical performance

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Comment |
|---|---|---|---|---|---|---|
| Acquisition rate | $f_{acq}$ | 32 | - | 71 | Hz | - |
| Depth resolution[1] | $R_Z$ | 1 | 7 | - | mm | Typ. measured on the 120 GHz chip. |
| Signal to Noise Ratio | SNR | 40 | 50 | 60 | dB | Different for each chip. Max. at 120 GHz.- |
| Optical power[2] | $P_{opt}$ | - | -1.375 | 7 | dBm | Different for each chip. Max. at 60 GHz. |
| Maximum range | $R_{max}$ | - | TBA | - | mm | For the 60 GHz uCore. |
| | | - | TBA | - | mm | For the 120 GHz uCore. |
| | | - | TBA | - | mm | For the 240 GHz uCore. |
| | | - | TBA | - | mm | For the 300 GHz uCore. |
| Beam divergence[3] | θ | - | 2.8 | - | ° | Half-angle after the collimation lens. |

**Notes :**

[1]Depends on the bandwidth of each radar. In-depth resolution is inversely proportional to bandwidth such that : $R_Z = \frac{c_0}{2n_i BW}$ where $c_0$ is the speed of light, $n_i$ is the index of the optical path from the chip antennas to the n°i interface, and BW is the bandwidth.

[2]Maximum power transmitted by an antenna among all provided chips. Typ. power averaged from all Typ. values of all chips. For reference, -1.375 dBm ≈ 0.729 mW, and 7 dBm ≈ 5 mW.

[3]The included collimation lens is made from HDPE and has an index of 1.53. It is designed to compensate for the natural divergence of the radar chip, but does not compensate fully to account for manufacturing tolerances and avoid overconvergence of the beam. Please note that a focalization lens is recommended for best performance.

# Computer requirements

The user computer should meet the following requirements in order to control the uCore and run the included Software Development Kit adequately :

- Operating system : Windows 11 with administrative privileges
- Memory : At least 16 GB of RAM
- Storage : At least 2 GB for the SDK, with 120 GB recommended for storing the measurements
- Connectivity : at least one USB-C port with USB 2.0 capability or better
- Monitor size : for a better experience, it is recommended to use a monitor with at least a 1920x1080 resolution
- Any code writing or IDE software of your choice from which to open, edit, and recompile the SDK according to your needs

# Others

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Comment |
|---|---|---|---|---|---|---|
| Humidity | HR | 40 | - | 50 | % | Non-condensing. |
| Operating temperature | $T_{op}$ | 0 | - | 50 | °C | - |
| Storage temperature | $T_{sto}$ | 0 | - | 50 | °C | - |

For more information, please contact Optikan at : support@optikan.com.