

UWB15F Ultra-wideband devices operating under Part 15 Subpart F § 15.519.

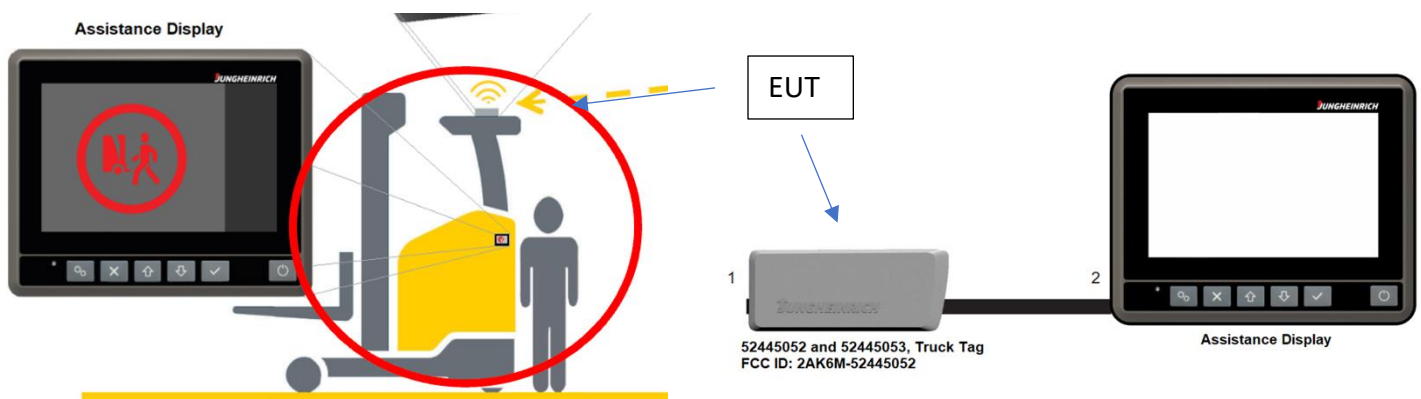
**1. Show that the device mode operation is permissible under the Part 15 subpart.**

FCC Part 15.519 requires the device to be hand held. It will be located on a forklift truck that is not intended to drive on public roads or highways. The device is small enough to fit in the palm of a hand and will connect directly to the user control panel so the user has control over it at all time. It is not part of a fixed infrastructure.

KDB 393764 D01 UWB FAQ v02r01 Q5/A5 provides guidance on what kinds of devices can be considered “hand held” under rule Part 15.519:

*“A small size UWB device that is intended to operate outdoors on a frequent basis and is capable of operating without the need for fixed infrastructure installation (e.g., antennas mounted on poles or towers). Where it is not practical for the device to actually be held in a person’s hand during operation, it is sufficient to show that the operator can exercise control over the device, or the object to which the device is affixed, while the device is operating.”*

The device is small and fits within the palm of the hand. It is self-contained and requires no additional tower or pole-mounted antennas. We therefore believe that it can be considered hand-held and certified under Part 15.519.



**2. Specify if § 15.250 (15C) is used as alternative to § 15.519.**

A: § 15.250 is not used as alternative nor can be used because it utilizes frequencies other than the band 5925–7250 MHz which are allowed under provision of this section.

**3. Show that KDB 393764 Q6 is being followed.**

Question 6: What compliance information should be included with an application for certification?

A: We provide all necessary documentation:

- UWB Application category: **hand-held device / 15.519**
- Lower and upper -10 dB frequencies: **3993.6 – 6489.6 MHz**

3.1.6 Results

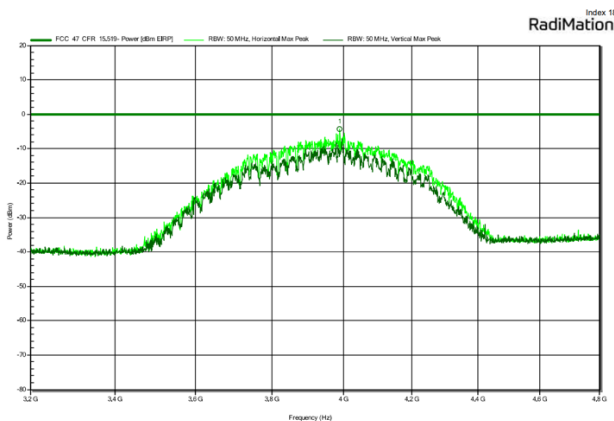
| Test Results - Antenna 1 (UWB1) |             |             |                 |             |             |                   |         |
|---------------------------------|-------------|-------------|-----------------|-------------|-------------|-------------------|---------|
| Channel [MHz]                   | $f_M$ [MHz] | $f_C$ [MHz] | $B_{-10}$ [MHz] | $f_L$ [MHz] | $f_H$ [MHz] | $\mu_{-10}$ [MHz] | Verdict |
| 3993.6                          | 3967.09     | 3986.745    | 509.49          | 3732        | 4241.49     | 0.1277            | PASS    |
| 6489.6                          | 6459.64     | 6494.14     | 652.28          | 6168        | 6820.28     | 0.1004            | PASS    |

- Maximum radiated emissions: pg 33 of report

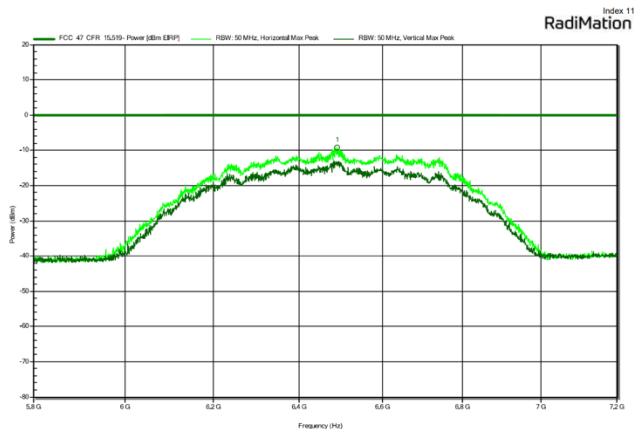
**Highest emissions with respect to limit**

**6489.8 GHz, emission level = -42.9 dBm peak. Limit = -41.3 dBm Margin = 1.6 dB**

- If applicable, noise-floor measurements: **Not applicable**
- If applicable, digital circuitry emissions that exceed UWB limits: **Not applicable**
- Frequency vs. amplitude plots depicting
  - o fundamental emission



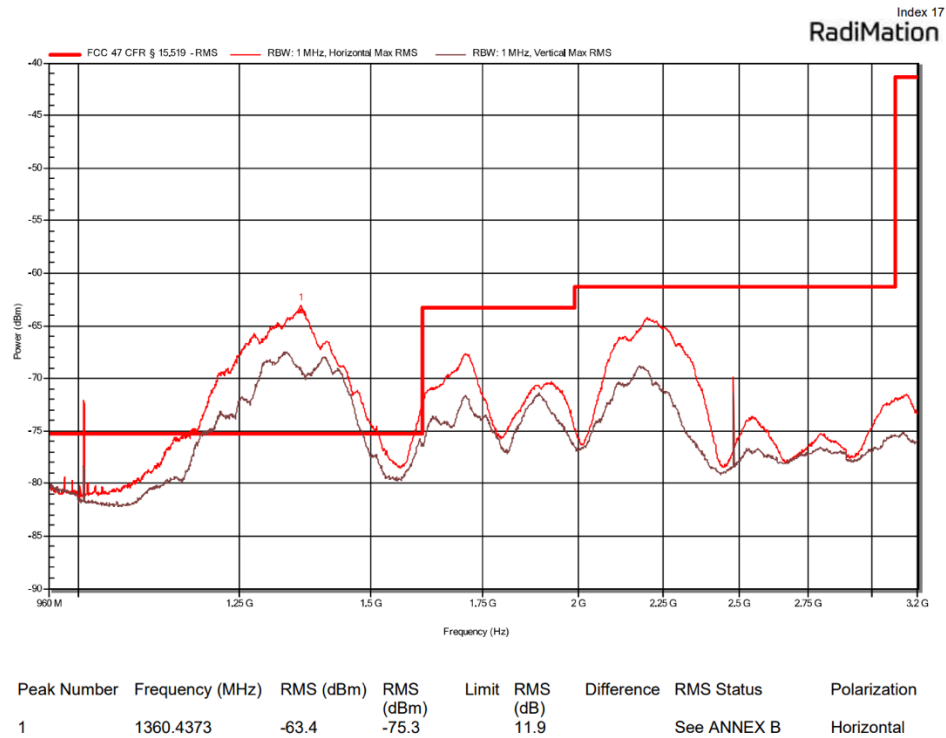
| Peak Number | Frequency (MHz) | Peak (dBm) | Peak (dBm) | Limit (dB) | Peak Difference | Peak Status | Polarization |
|-------------|-----------------|------------|------------|------------|-----------------|-------------|--------------|
| 1           | 3988.2133       | -4.3       | 0          | -4.32      |                 | Pass        | Horizontal   |



| Peak Number | Frequency (MHz) | Peak (dBm) | Peak (dBm) | Limit (dB) | Peak Difference | Peak Status | Polarization |
|-------------|-----------------|------------|------------|------------|-----------------|-------------|--------------|
| 1           | 6491.74         | -9.3       | 0          | -9.26      |                 | Pass        | Horizontal   |

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FCC ID: 2AK6M-52445052

○ Out-of-band-emission



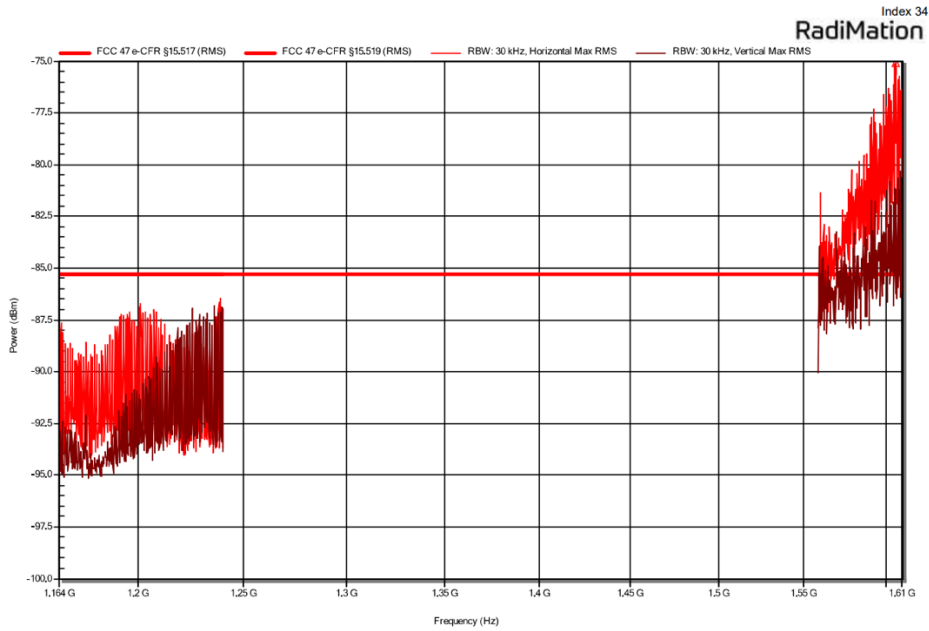
3.4.6 Results

| Test Results - below 960 MHz |                |                |      |      |                |             |
|------------------------------|----------------|----------------|------|------|----------------|-------------|
| Channel [MHz]                | Emission [MHz] | Level [dBμV/m] | Det. | Pol. | Limit [dBμV/m] | Margin [dB] |
| 3993.6                       | 0.018          | -17.3          | pk   | ver  | 62.4           | -79.64      |
| 3993.6                       | 0.018          | -17.7          | avg  | ver  | 42.4           | -60.08      |
| 3993.6                       | 0.018          | -14.8          | pk   | ver  | 62.3           | -77.15      |
| 3993.6                       | 0.018          | -15.4          | avg  | ver  | 42.3           | -57.68      |
| 6489.6                       | 0.018          | -17.5          | pk   | ver  | 62.4           | -79.84      |
| 6489.6                       | 0.018          | -17.9          | avg  | ver  | 42.4           | -60.29      |
| 6489.6                       | 579.94         | 27.4           | pk   | ver  | 46             | -18.62      |

| Test Results - above 960 MHz |                |             |      |      |             |             |
|------------------------------|----------------|-------------|------|------|-------------|-------------|
| Channel [MHz]                | Emission [MHz] | Level [dBm] | Det. | Pol. | Limit [dBm] | Margin [dB] |
| 3993.6                       | 2478.048       | -66.9       | RMS  | hor  | -61.3       | -5.56       |
| 3993.6                       | 3993.6         | -43.5       | RMS  | hor  | -41.3       | -2.17       |
| 3993.6                       | 7987.2         | -62.2       | RMS  | ver  | -41.3       | -20.94      |
| 3993.6                       | 39897.4        | -67.5       | RMS  | ver  | -61.3       | -6.17       |
| 6489.6                       | 6489.6         | -42.9       | RMS  | hor  | -41.3       | -1.6        |
| 6489.6                       | 17835.6667     | -65.2       | RMS  | ver  | -61.3       | -3.85       |
| 6489.6                       | 39899.2        | -67.6       | RMS  | ver  | -61.3       | -6.29       |

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○ Emission in GPS band



| Peak Number | Frequency (MHz) | RMS (dBm) | RMS (dBm) | Limit (dB) | RMS Difference | RMS Status  | Polarization |
|-------------|-----------------|-----------|-----------|------------|----------------|-------------|--------------|
| 1           | 1606.1087       | -75.1     | -85.3     | 10.21      |                | See ANNEX B | Horizontal   |

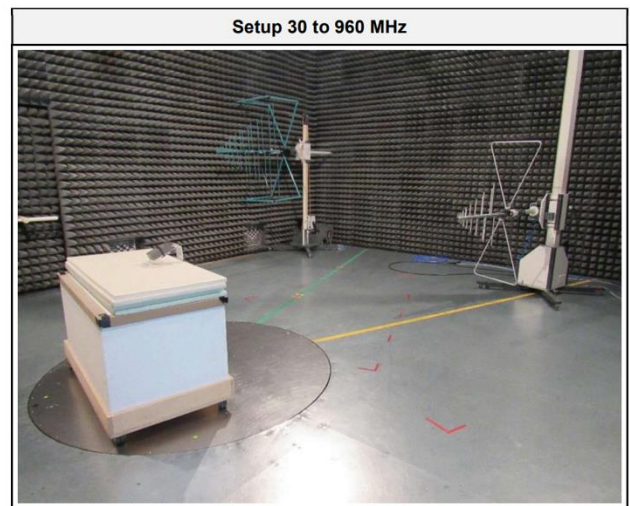
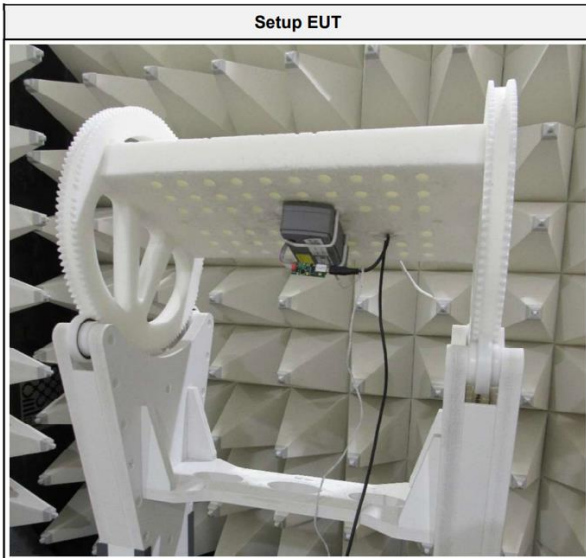
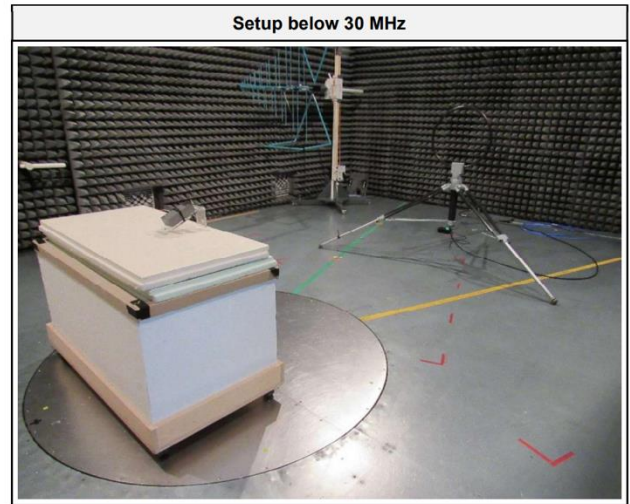
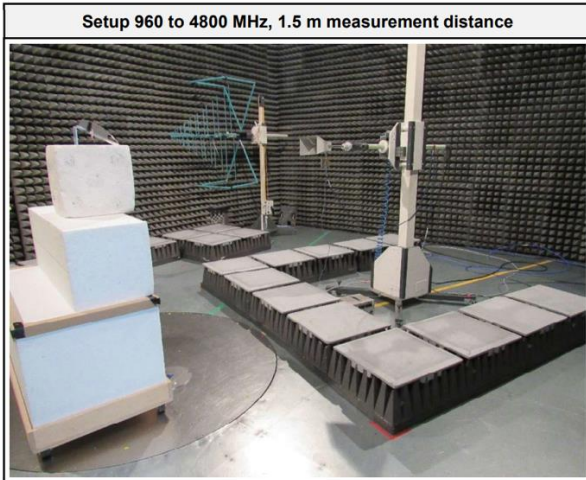
| Limits - GPS Band |           |          |                  |                            |                            |
|-------------------|-----------|----------|------------------|----------------------------|----------------------------|
| Frequency [MHz]   | Bandwidth | Detector | Power [dBm EIRP] | Field Strength [dBμV/m@3m] | Field Strength [dBμV/m@1m] |
| 1164-1240         | 1 kHz     | RMS      | -85.3            | 9.9                        | 19.5                       |
| 1559-1610         | 1 kHz     | RMS      | -85.3            | 9.9                        | 19.5                       |

- Location of operating labels and/or disable switch



- Test setup photos

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FCC ID: 2AK6M-52445052



See EMC test report GOM-2403-2508-TFC15FUW-V01 for original source of all of the above information,

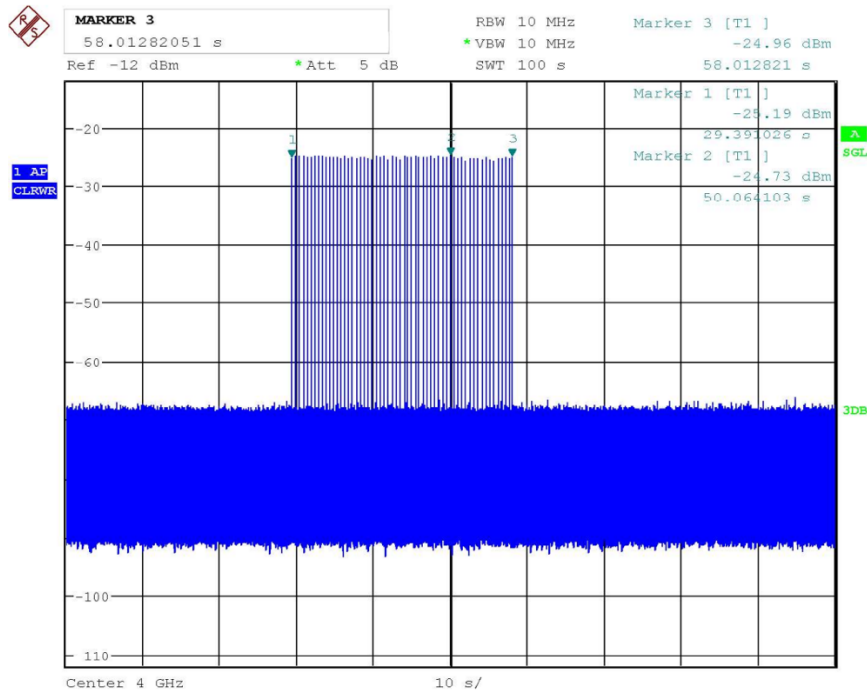
#### 4. Account for all technical requirements specific to each UWB mode of operation.

All technical requirements are met. See operational description.

Especially “§15.519 (1) ... cease transmission within 10 seconds ...” is implemented and tested in Eurofins test report G0M-2403-2508-TFC15FUW-V01 in Section 3.3.

##### Cease of transmitter operation test

Project Number: G0M-2403-2497  
Applicant: Jungheinrich AG  
Model Description: UWB-Location-System is able to measure distances between the UWB components  
Model: 52445055, Person Tag  
Test Sample ID: 48553  
Test Site: Eurofins Product Service GmbH  
Operator: Mr. Siddique  
Mode: Tx; 3993.6 MHz, BPSK, UWB  
Test Date: 2024-08-02



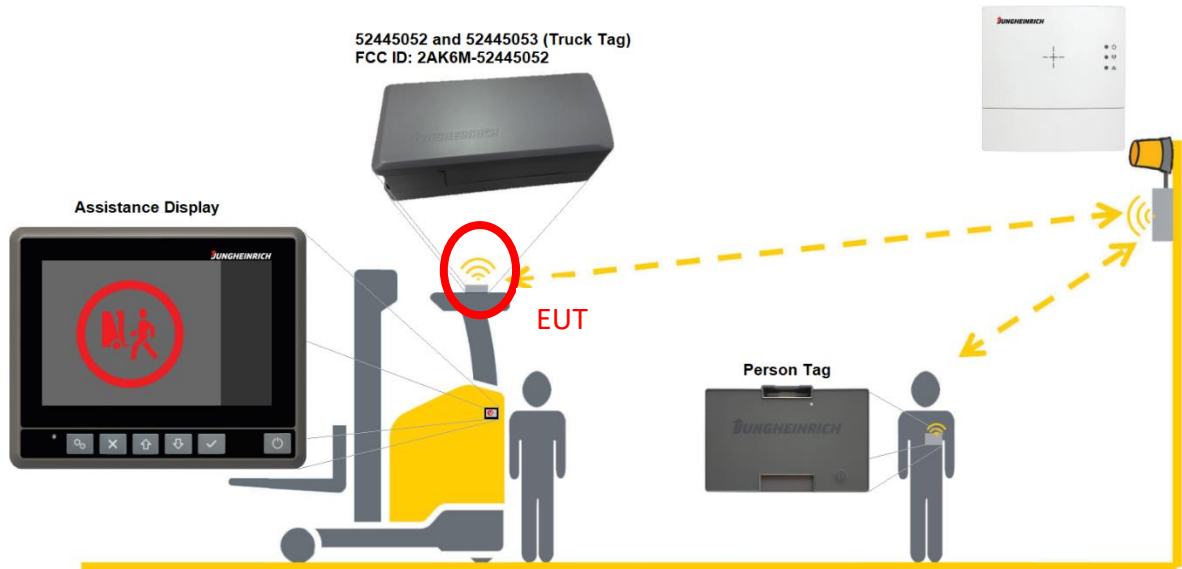
Date: 2.AUG.2024 12:59:37

| Marker Number | Time(s) | Comment                                                 |
|---------------|---------|---------------------------------------------------------|
| 1             | 29.391  | Start of communication between EUT and companion device |
| 2             | 50.064  | Companion device was turned off                         |
| 3             | 58.013  | Cease of transmit from EUT                              |

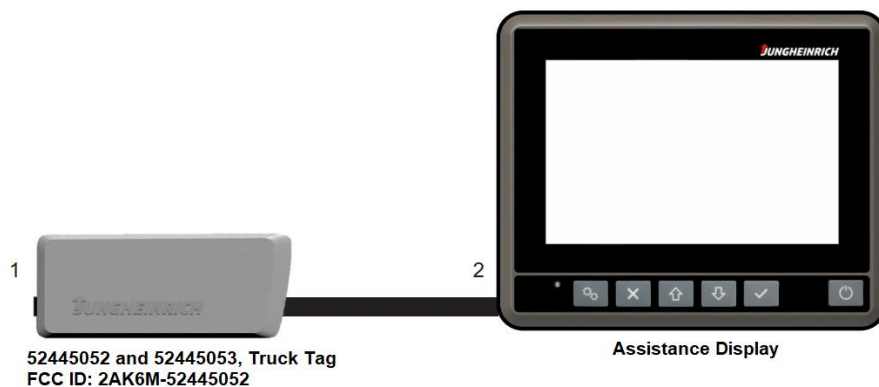
**5. Verify that §15.519 devices do not utilize fixed infrastructure.**

Due to the nature of its design, the product family FCC ID: 2AK6M-52445052 (52445052 and 52445053) is used to track the position of a movable object. Therefore, it is mounted on a **forklift truck** and connected directly to the user interface (assistance display).

In according to §15.519 it cannot be mounted on fixed infrastructure. Furthermore, it makes no sense to mount the device permanently, as its use case is to locate its position when it is indoors.



The product family FCC ID: 2AK6M-52445052 (52445052 and 52445053) is connected to the user interface (Assistance Display) via cable because it has its own user interface.



The device settings can be changed via the control panel, which must be connected for the device to operate and will always be within reach of the user during operation.

**6. Verify requirements and restrictions for UWB modular approvals.**

Not applicable. The product family FCC ID: 2AK6M-52445052 (52445052 and 52445053) is not a radio module nor incorporates a radio module.

**7. TCB to include §15.521(a) statement on Grant Restrictions and verify the required device/user manual for all UWB modes of operation.**

See statement in User Manual at page 42.

**Note**

FCC Regulations §15.521 - Technical requirements applicable for all UWB devices.

(a) UWB devices may not be employed for the operation of toys. Operation onboard an aircraft, a ship or a satellite is prohibited.

*Grant note: "Not for use on fixed infrastructure. UWB devices may not be employed for the operation of toys. Operation onboard an aircraft, a ship or a satellite is prohibited."*



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Christian Fischer  
**Jungheinrich AG**