PRODUCT INFORMATION

ATM220-UHD │ 24GHz AIR Traffic series

Traffic Management Fusion Sensor
24GHz RADAR + UHD CAMERA + AI

CONTENTS

1. SAFETY INFORMATION

Please read the entire document before using ATM220-UHD

INSTALLATION & OPERATION

Please pay attention to following the detailed guide before installing and operating ATM220-UHD is performed as below:

- Please consider the environmental condition of installation before the operation to prevent overheating, which can be damageable to people and devices.
- The method of installation should be under local safety regulations.
- Only approved and identified sensor devices must be used for installation.
- The sensor must be installed by a skilled person certified to treat electrical voltage and power sources in a safe environment.
- The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.
- A proper aerial work ladder must be accompanied when installing the sensor in a high position.
- It is essential to keep the safety standard and protect the workers, especially when the installation is performed in the moving vehicles.
- Do not use inaccurate voltage of power source to the sensor.
- Do not use damaged or unprotected cable/wire for installation.
- Do not make any electrical contact with the sensor in operation.
- Additional protection devices preventing electrical surges can be used.
- The power and communication connection is complete by one circular connector of the sensor.
- The mounting sensor must be tight against drop and movement.
- The mounting bracket must be solid and sturdy against the movement, vibration, and others to maintain stable sensing performance.
- Using specially designed accessories for the sensor is recommended for properly installing the sensor.
- Radio-frequency waves occur right after the sensor is powered on and in operation.

- Please consider the sensor is designed typically applies commercial or industrial use and it is not suitable for use in locations where children are likely to be present.
- Do not dispose of electronic equipment in household waste bins.

STATEMENT & CAUTION(FCC)

Please pay attention to check the detailed statement and caution as below:

- This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

- FCC Radiation Exposure Statement (Part 2.1091): This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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STATEMENT & CAUTION(IC)

Please pay attention to check the detailed statement and caution as below:

[Eng]

- This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- Industry Canada Radiation Exposure Statement: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

[FR]

- Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

- Déclaration d'exposition aux radiations: Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non con trôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

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RADIATION

ATM220-UHD has been tested and found to comply with the European RED directive, or other national rules, depending on the country where it may be used.

ATM220-UHD is subject to the following conditions:

- It will not cause harmful interference.
- It generates radio frequency energy. There are strict limits on continuous emission power levels to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- It has a preventive interference function for other devices using the same frequency band.

SERVICE

Only authorized and approved technicians should connect the sensor to escape any safety risk by incorrectly handling the network and power supply.

The sensor can be connected to an Ethernet communication network using an IP address and may create conflict without the network manager's correct configuration.

Please only use provided or approved sensor for operation. Do not attempt to repair this device without guidance or technical support:

- Any kind of maintenance parts or tools is not contained in the device package.
- Do not remove and try to open the cover of the sensor.
- It is not liable for any damages or harms caused by unauthorized attempts to open or repair the device. An unauthorized opening will void all warranties.

2.   GENERAL DESCRIPTION

ATM220-UHD comprises a 24GHz FMCW radar, UHD video camera, Artificial Intelligence Processor (GPU for AI), and GPS technology in one device housing for measuring traffic management information such as multiplying lanes, objects, and events.

2.1. PRINCIPLE OF FUSION SENSOR

ATM220-UHD measures range, radial speed, horizontal angle, reflected power, and more parameters of multiple moving and stopped target objects simultaneously and supports UHD video.

The 24GHz radar and UHD video camera can act as both independent and combined devices. The radar sensor mainly carries out the detection data, and in housing AI analysis video data and eventually both become fusion for more accurate detection.

It provides stable, accurate, and robust sensing performance for intelligence traffic systems by unique fusion technology through MIMO antenna operation, UHD video capability, and NVIDIA® JETSON™ graphic processor for AI processing.

Specially designed signal processing and analyzing algorithms for ITS (Intelligence Traffic System) operate independently inside the sensor. It supports a general traffic monitoring system and a new system using edge computing technology.

ATM220-UHD also has powerful hardware features, and its operation is not affected by weather, temperature, and lighting conditions.

2.2. MEASUREMENT DATA

ATM220-UHD detects high precision of traffic amount and vehicle occupancy rate with function of various event detection by object and detection group & zone.

OBJECT MEASUREMENT

ATM220-UHD has the multi-target capability and can detect many objects within the field of view at a time (maximum of 256 traffic objects). It measures and track road status, and finally gathers object data such as:

- Object Identification
- Object coordinate position (x, y)
- Object absolute velocity
- Object heading angle
- Object length
- Object Class*: Pedestrian, Bicycle, Car, Bus, Truck, Long Truck, Motorcycle, Van

DETECTION ZONE

All of measured data also can be rearranged by its detection zone which is a customized virtual territory of all mearsured area.

ATM220-UHD can have a maximum of 64 virtual zones for 7 kind of event trigger function.
- Virtual zone: specific detection zone for 7 kind of event trigger

Number of Customizable Detection Zone	
Number of customizable zones	64
Number of event types	7

Each detection zone measures information such as:

- Object presence of zone
- Average speed of zone
- Estimated time of enter of zone
- Estimated time of exit of zone

* The number of object class can increase for more precise detection if there is specific database for AI machine learning.

EVENT DETECTION

Each detection zone also can detect various events such as:

- Incoming vehicle detection (object presence excluding pedestrian)
- Stopped vehicle detection
- Speed violation detection
- Specific object class detection (refer to "2.2, OBJECT MEASUREMENT")
- Reverse driving detection
- Queue length excess detection
- Jaywalking pedestrian detection

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2.3. CHARACTERISTIC PERFORMANCE

ATM220-UHD is the next-generation smart traffic radar delivering the ultimate reliability and accuracy for real-time traffic management.

The sensor accelerates establishing the complete smart city infrastructure with a safer, more convenient driving experience.

ADVANCED AI PERCEPTION

ATM220-UHD's advanced AI perception technology brings a new level of performance, accuracy, and precision for a more reliable, smart traffic experience.

POWERED BY NVIDIA® JETSONTM

ATM220-UHD is the All-in-One Powerhouse to first ever integrate an AI computing device into an ITS radar solution, allowing the most stable, accurate, and powerful performance.

RADAR + CAMERA SENSOR FUSION

ATM220-UHD's cutting-edge design of sensor fusions with AI solutions delivers the most reliable and accurate data. It can detect up to 256 vehicles running up to 320km, spanning eight lanes, optimized for a broad range of traffic environments.

HIGH EFFICIENCY

With the integration of a GPU system, the solution eliminates the complex process of external PCs and cables, enabling simple, easy installation and management.

This single system speeds up the procedure from data collection to analysis, providing a more convenient experience for the driver and traffic supervisor.

GPS REAL-TIME MANAGEMENT

ATM220-UHD includes GPS features that allow supervisors to track each sensor's location and time for effective real-time management.

3. TECHNICAL DATA

3.1. SENSOR DIMENSIONS & WEIGHT Hardware dimensions

are as below: all values are given in [mm].

Mechanical Specification	
Weight	1,800g
Dimensions	158 x 244 x 47 mm(h/w/d)
Connector	Circular M12.5 x 0.5P (12 pin, Female)

3.2. SENSOR GLASS

The galss of ATM220-UHD is treated with water repellent chemical material to have more powerful strength against bad weather condition especially rain and snow. the treatment makes glass surface to have lower angle of water contact.

Principle of lower water contact angle of the repellent treatment
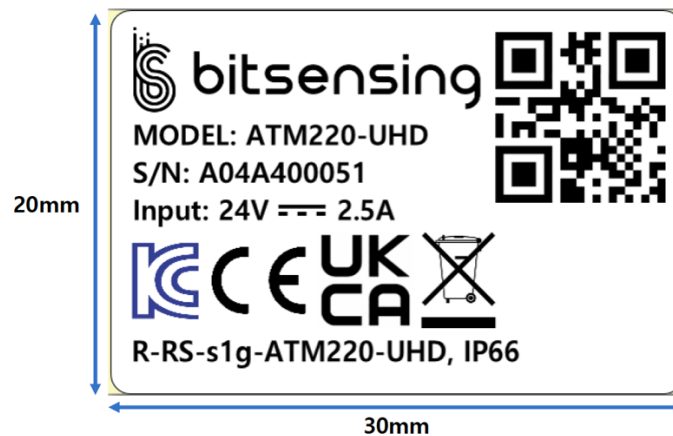
The detailed information of material is as below:

Material	CAS No.	KE No.	UN No.	EU No.	Contain(%)
	71631-40-8	-	-	-	73
OR-112/SN	7440-02-0	KE-25818	KE-25818	231-111-4	13
	86508-42-1	KE-28146	KE-28146	-	14

3.3. SENSOR IDENTIFICATION

ATM220-UHD is identified by a tagging sticker containing model information, serial number, input power value, and certificates.

The product (sensor) identification sticker example is as below picture:

An example of a product (sensor) identification sticker

The sticker also can be printed with its identifiable QR code.
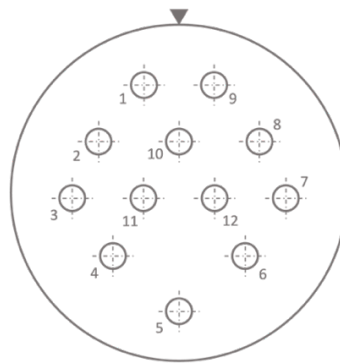
3.4. SENSOR DATASHEET

ATM220-UHD has sensor performance specifications as below.

Parameters		Values
Radar Operating Frequency		24.15 GHz
Radar Transmission Power(EIRP)		14 dBm
GNSS Operating Frequency		1,559 ~ 1,610 MHz
Radar Speed	Maximum Detection Speed	320 km/h
	Speed Resolution	1.2 km/h
Radar Distance	Maximum Detection Distance	300 m
	Distance Resolution	0.8 m
Radar Angle	Angular Resolution	+2°
	Filed of View(FoV) - Azimuth	-50…+50°
	Filed of View(FoV) - Elevation	-15…+15°
Power Supply	Input Voltage	24 Vdc (21 ~ 27 Vdc)
	Power Consumption(Watt)	27 W (Min.15 ~ Max.40 W)
Camera Specification	Video Resolution	UHD (3,840 x 2,160 pixels)
	Video Frame Rate	30 fps
	RTSP(Real Time Streaming Protocol)	Support(O)
Additional Specification	Operation Temperature	Min. -40…Max. +80°C
	Communication Interface	Gigabit Ethernet (100/1,000 BaseT)
	Detect updating time	50 msec
	Number of Detectable Object	256
	Water/Dust Protection	IP66

4. INSTALLATION

4.1. SENSOR CONNECTOR

ATM220-UHD has 12 pins of circular type connector on the back side of the sensor. The detailed pin map of the connector is as below:

Connector socket diagram showing the pin numbers
(Female socket on the sensor)

Pin	Color	Description
1	Purple	Sensor TA+
2	Orange	Sensor TA-
3	Brown	Sensor TB+
4	Blue	Sensor TB-
5	Sky-blue	Sensor TC+
6	Yellow	Sensor TC-
7	Pink	Sensor TD+
8	White	Sensor TD-
9	Black	Sensor RS485_A
10	Gray	Sensor RS485_B
11	Green	GND or AGND
12	Red	VAUX or VAUXINT

4.2. SENSOR OPERATION

GENERAL OPERATION

ATM220-UHD must be connected to a console computer via an interface to set up the device before use. Once the setting is complete, it works automatically in regular operation and requires no additional operator intervention.

General sensing data, measuring ranges, and video data can be shown as a graphical view by specific user interface software for ATM220-UHD. The software is also used for setting the sensor.

Please note that the user interface software cannot display every origin measured value data on a dashboard. It is primarily designed for monitoring purposes for the conditions of data-sensing inflows and to check up on the settings.

POWER SWITCHING ON/OFF

ATM220-UHD does not have a specific power switch on the device, and it is turned on when an acceptable range of input power sources is permitted.

It is recommended to have an external power switch on the power distribution side in case the sensor is turned on and off occasionally.

- Disconnect the device from the voltage supply to switch it off:
  - ✓ The device switches off. The device configuration remains unchanged; sensing values are lost.

- Connect the device to the voltage supply:
  - ✓ The device starts with the last saved configuration data.

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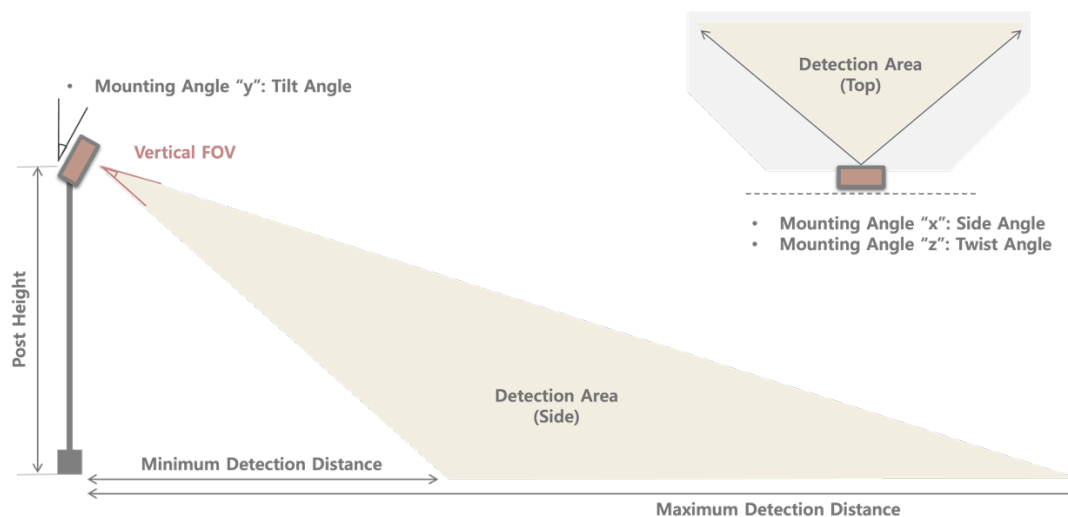Copyright © 2023 bitsensing

4.3. SENSOR MOUNTING

ATM220-UHD must be mounted at proper height and angles such as side, tilt, and twist to have complete measuring and detecting performance.

The sensor can be mounted on pole or post by using specially designed bracket for ATM220-UHD with general clamp parts such as stainless steel band clamp or strength cable tie.

MOUNTING ANGLES

Recommended sensor mounting angles are as below:

Recommend Sensor Mounting	
Mounting angle "x": Side angle	0°(Zero), Center of detection area (Depend on field condition)
Mounting angle "y": Tilt angle	Min. 7°…Max. 12°
Mounting angle "z": Twist angle	0°(Zero)
Mounting height	Min. 5m…Max. 12m

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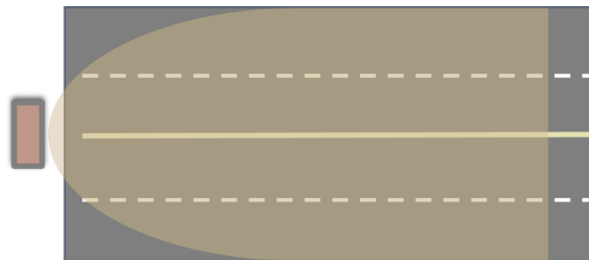Copyright © 2023 bitsensing

MINIMUM DETECTION DISTANCE

Minimum sensor detection distance of mounted sensor in proportion to height and tilt angle is as below:

Tilt	Mounting height(m)														
y(°)	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12
7	12.4	13.6	14.9	16.1	17.3	18.6	19.8	21.0	22.3	23.5	24.8	26.0	27.2	28.5	29.7
8	11.8	13.0	14.1	15.3	16.5	17.7	18.8	20.0	21.2	22.4	23.6	24.7	25.9	27.1	28.3
9	11.2	12.4	13.5	14.6	15.7	16.8	18.0	19.1	20.2	21.3	22.5	23.6	24.7	25.8	27.0
10	10.7	11.8	12.9	13.9	15.0	16.1	17.2	18.2	19.3	20.4	21.4	22.5	23.6	24.7	25.7
11	10.3	11.3	12.3	13.3	14.4	15.4	16.4	17.4	18.5	19.5	20.5	21.5	22.6	23.6	24.6
12	9.8	10.8	11.8	12.8	13.7	14.7	15.7	16.7	17.7	18.6	19.6	20.6	21.6	22.6	23.6

MAXIMUM DETECTION DISTANCE

Maximum sensor detection distance of mounted sensor in proportion to height and tilt angle is as below:

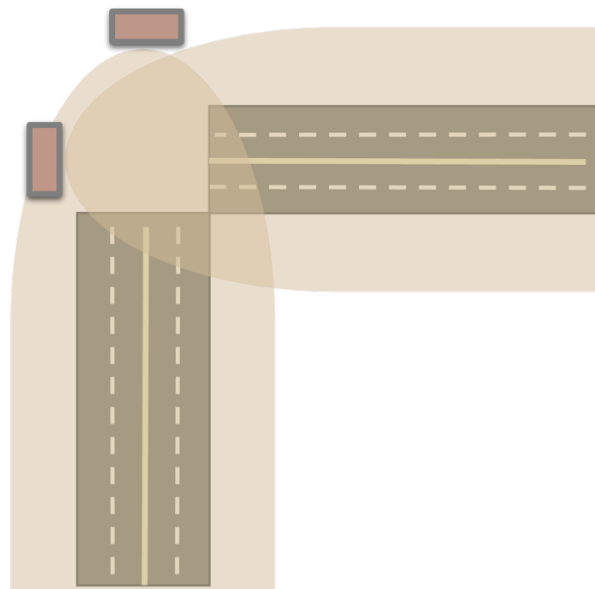| Tilt	Mounting height(m)														
y(°)	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12
7	143.2	157.5	171.8	186.1	200.5	214.8	229.1	243.4	257.7	272.0	286.4	300.0	300.0	300.0	300.0
8	95.4	104.9	114.5	124.0	133.6	143.1	152.6	162.2	171.7	181.3	190.8	200.4	209.9	219.4	229.0
9	71.5	78.7	85.8	93.0	100.1	107.3	114.4	121.6	128.7	135.9	143.0	150.2	157.3	164.5	171.6
10	57.2	62.9	68.6	74.3	80.0	85.7	91.4	97.2	102.9	108.6	114.3	120.0	125.7	131.4	137.2
11	47.6	52.3	57.1	61.8	66.6	71.4	76.1	80.9	85.6	90.4	95.1	99.9	104.7	109.4	114.2
12	40.7	44.8	48.9	52.9	57.0	61.1	65.2	69.2	73.3	77.4	81.4	85.5	89.6	93.7	97.7

MOUNTING CONDITIONS

Mounting of ATM220-UHD sensor must be considered field conditions to escape the wrong measurement.
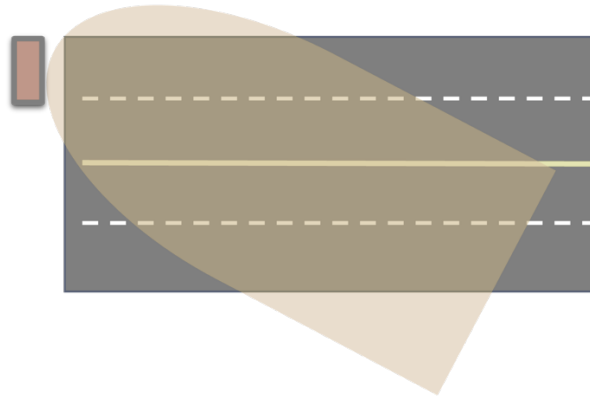
- The best field condition of sensor mounting is when the sensor can be mounted in the Center of the detecting area without any obstacles.
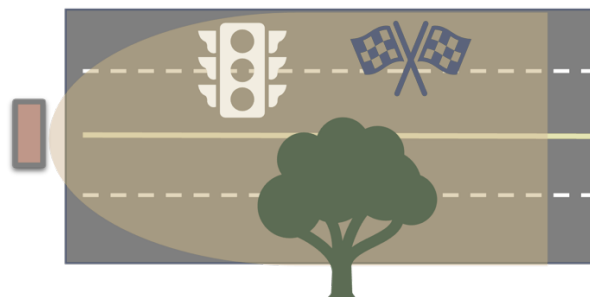

- Using each separated sensor for several different types (directions) of roads in the Center of each road is recommended.
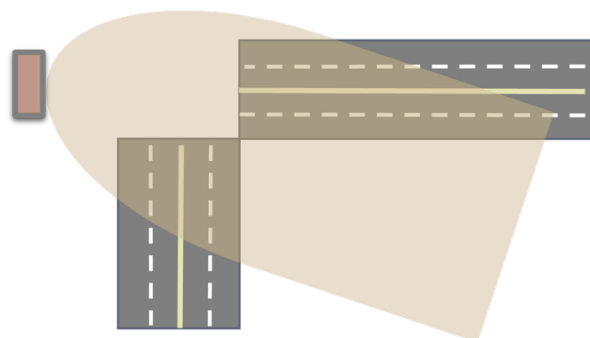
- Mounting the lean side of the road and sensing the road from the warped position is not recommended.

- Sensing roads with obstacles such as traffic lights, traffic signs, and street trees is not recommended.

- Sensing several different types (directions) of roads using only one sensor is not recommended.

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