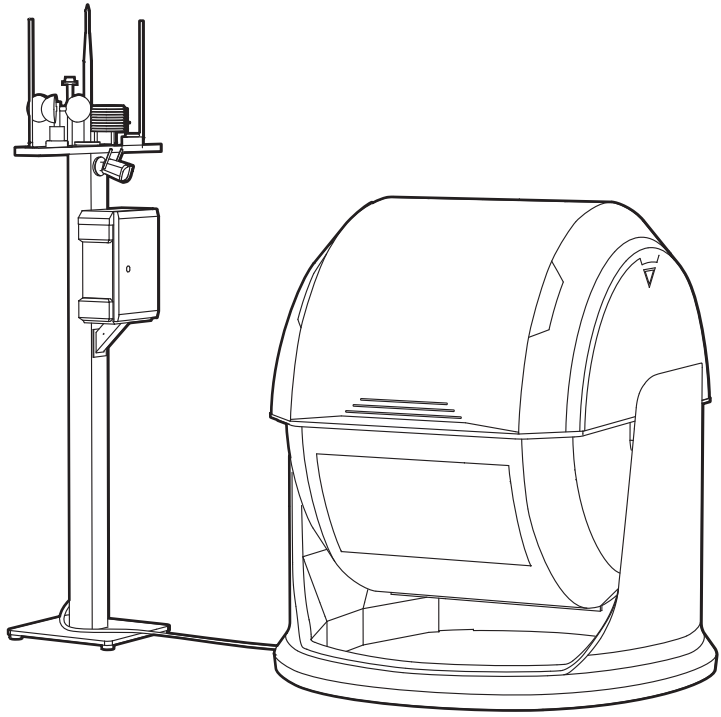
Subject to update without notice.

www.gdu-tech.com



K01 UAV Automatic Docking Station
Product Profile v3.5 2023.12

CONTENTS

User Instructions

WARNING

Thank you for using this product. This product is a special electronic product. Improper operation may result in property damage, personal injury, or even death. The user will bear the legal consequences of these actions. This product must not be used by juveniles under the age of 18. In order to ensure a positive operating experience and to protect your personal safety, please carefully read the following documents before use:

Product Profile of UAV Automatic Docking Station
Operation Guide of Docking Station Version
Item List
This document is subject to updates without notification. Please refer to the latest version at www.gdu-tech.com.

Disclaimer

Before using this product, please carefully read and obey this document and all safety guidelines provided by GDU. Otherwise, it may cause harm to you and people around, or damage this product and surrounding items. By using this product, you have carefully read, understood, recognized, and agreed to this document and all terms and contents in documents related to this product.

You undertake the sole responsibility for using this product and the possible consequences therein. You commit that you will only use this product for purposes that are proper and obey the related rules listed in this article.

Manufacturer is not liable for any damage, injury, or any legal responsibility caused directly or indirectly from the use of this product.

For issues not covered in this disclaimer, please refer to local laws and regulations. In the event of any conflicts between this disclaimer and local laws and regulations, the latter shall prevail.

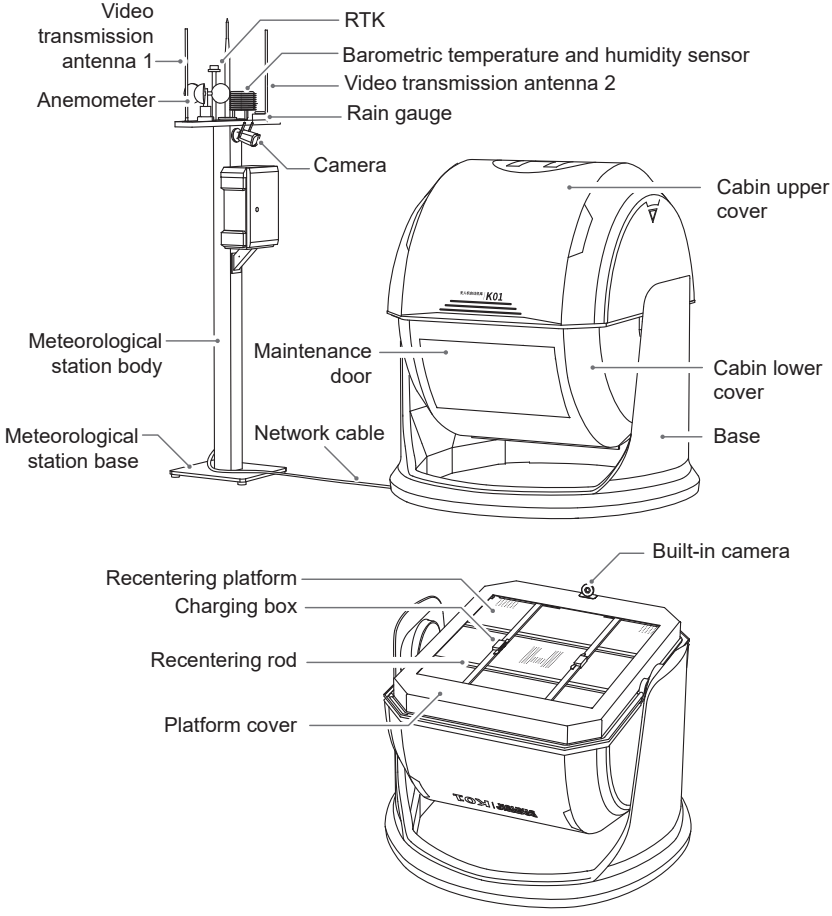
The final interpretation right for this document and other documents related to this product shall be owned by GDU. This document is subject to updates without notification.

Product Profile

The docking station is an automatic ground facility that assists in UAV full-process operation. Without manual operation interference, this greatly improves full-automatic operation capacity of the UAV. It can be deployed in specific areas including field ground, on top of buildings and pylons.

The UAV is stored in the docking station. When there is a flight request, the UAV automatically takes off from the docking station, and automatically lands in the docking station following completion of the mission. In the docking station, the UAV can automatically charge in preparation for the next mission. With the docking station, the UAV can take off, execute flight missions, land, and return data for storage automatically without manual interference. Ground-to-air communication allows for fully-automatic operation and facilitates UAV routine inspection, 3D mapping, detail inspection and other operations in an unattended manner.

Introduction of Product Components



Product features

The docking station weighs about 255kg and can carry a UAV with a maximum inspection radius of 8km. Charging time is about 1 hour, and it can operate at least 12 times each day. The docking station comes with a meteorological station that determines whether to execute a mission based on actual weather conditions. It has an aluminum alloy and steel structure. It is easy to deploy and features a UPS and industrial air conditioner. The product has an IP54 protection rating, and is fire-, water-, lightning- and theft-proof.

1. **Weather-resistant and wholly-covering top cover**
   The docking station is designed with a rotatory and wholly-covering top cover. This protects the product against freezing rain and snow, and ensures fast startup and operation in severe conditions.
2. **Highly-integrated technology system of UAV and docking station**
   Using the same technology system, the UAV and docking station modules are highly integrated to fully optimize the link.
3. **Accurate landing day and night**
   Fusion computing of accurate landing and flight control on an onboard platform achieves a higher landing accuracy. Automatic auxiliary light assists with accurate landing.
4. **Unattended and automatic operation**
   The UAV can automatically complete complex missions on the operation site in an unattended manner, greatly cutting manpower costs.
5. **Onsite monitoring with cloud management**
   Operate as scheduled and return results automatically to command center to manage everything on site thousands of miles away.
6. **Up to one hour of single flight time**
   The optimized UAV propulsion system ensures up to one hour of single flight time.
7. **Robust operation and compatible with different payloads**
   The UAV's maximum payload is 2.8kg, and supports a wide range of payloads, including laser radar, 8K visible camera, thermal & visible dual camera, 1K thermal & visible dual camera, quad-sensor camera, etc.
8. **8-km operation radius**
   The system operation radius reaches 8km. In addition, the UAV has a 4G backup link to ensure the flight safety.
9. **Powerful environmental adaptation**
   The product features an IP54 protection rating, a working temperature range from -35°C~50°C, and automatic temperature control as well as rain and lightning protection to ensure normal operation in severe conditions. The UAV can operate for 5 hours after it is not connected to a power supply.
10. **Private deployment**
    Open cloud API control port, abstract UAV underlying logic, and support of third-party development and private deployment.
11. **Open edge computing**
    The docking station has edge computing extension interfaces in reserve enabling the user's pre-processing of operation data and further improving operation efficiency.

Docking station LED indicators

LED indicators	Description
Solid green	Docking station status is normal.
Solid red	Docking station status is abnormal.
Blink red alternately	Aircraft reports an abnormal alert.
Blink green alternately	Aircraft is executing a mission.
Blink red, blue, and green alternately	Aircraft is in the takeoff stage, and user is prompted to keep away.
Blink red, blue, and green alternately	Aircraft is in the accurate landing stage, and user is prompted to keep away.
Blink blue alternately	Aircraft battery is being charged.

Product deployment

The docking station system deployment includes the arrangement and construction of the docking station, meteorological station, and remote control center.

1. **Docking station deployment**

   The docking station can be deployed on the ground, on pylons or on buildings, and must meet the following requirements:

   a. Device handling and installation

      The device weighs about 255kg, and has push tugs. Coordination is required during handling. The device is shipped in a wooden box, which must be handled with a pallet truck or a forklift. If the device is to be deployed on a building top, a crane is required for hoisting. The ground should be installed with fences.

   b. Device deployment space

      The installation space of the docking station and meteorological station is 4.5m×2.2m; and 5m×5m space must be reserved as the point of diversion field for UAV. There are no obstructions at the top of the device deployment space, and the docking station and UAV flight area must be mutually visible.

   c. Power supply

      220V mains supply (grounded) is required. The device's maximum peak power is 1700W (including charging, air conditioner, and device operation).

   d. Network

      For a better usage experience, upstream and downstream network bandwidth rates no lower than or equal to 20Mbps are recommended. Use the standard RJ45 network ports for connection.

   e. Docking station installation and deployment

      1. There are four φ14 holes on the bottom of the docking station body and four φ13 holes on the bottom of the meteorological station body. Fix the docking station and meteorological station on a flat ground/cement ground with piers. Select a flat and hard ground for punching and installation.
      2. After fixing, connect the meteorological station cable to the corresponding interface of the docking station, and connect the power cables and network cables to the docking station.
      3. After the system is powered on, debug the cabin door and place the UAV inside.

2. Remote control center deployment

Configuration requirements for the remote control center:

Device	Components	Requirements
Server computer	CPU	Above 8 core and 16 threads
	Internal storage	Above 16GB
	Solid state disk	256G
	Mechanical hard disk	Above 2T
	Operation system	Above CentoOS 7.5
Console computer	CPU	Above I5
	Graphics card	2G discrete graphics card
	Display	Dual-screen or triple-screen display
	Internal storage	Above 8GB
	Hard disk	Above 500GB
	Operating system	Windows 10

Use of a local area network (LAN) or special network is recommended to connect the remote control center and the docking station device for stable connection and lower latency.
The required bandwidth for each docking station is no less than 20Mbps.

UAV Automatic Docking Station Management System login

The user can visit the UAV Automatic Docking Station Management System through a browser at http://nest.gdu-tech.com/webNest/, enter the distributed account password and enterprise number, then enter the verification code for login.

Docking station control

The platform mainly displays the videos inside and outside of the docking station, weather, status and other information, and monitors the UAV's flight videos. It can also assign Control and Management commands at any time, such as turning on/off the docking station, one-button take-off or return of the UAV, control of the gimbal payload, etc. Uniform access and management of the docking station devices and real-time positioning of device location are therefore made available. The device ledgers, operating logs, fault logs, and other data is automatically generated for connected devices.

Device list

Click the Device Name button in the top left corner of the Docking Station Control page, and the popped-up drop-down list will display all docking stations. Select the docking station to view its real-time information at the current position. The map display interface will skip to the deployment location of the current docking station.

Real-time video

After a docking station is selected, the interface will display its flight mission, real-time video from UAV and real-time video inside and outside the docking station (note: When the UAV is not powered on, real-time video from UAV is not displayed; when there is no payload, no-payload status will be displayed). Surrounding the video box are the Refresh, Enlarge and Fold buttons. Click once to refresh the real-time video; click once to fold the real-time video interface; and click to switch the map interface to the real-time video interface.

Mission list

After the docking station is selected, the left side of the interface will display the mission list. Click the top right corner of the mission list and the interface will display all missions of the selected docking station, such as mission name, track length, track type, etc. When the mission list interface is unfolded, click to hide the current interface.

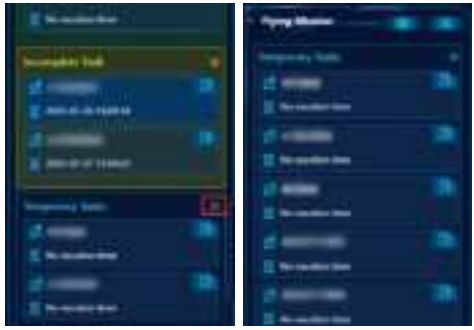
Check mission

Click the mission name and the map display interface will display the details and track of the selected mission. On the map display interface, click the waypoint to display its detailed information.

Fixed mission: On the flight mission interface, click the Setting button to set the required flight route to a fixed mission.

Unfinished mission: Display interrupted or failed missions.

Temporary mission: Display all missions except for fixed missions and unfinished missions. Click the drop-down list to expand all flight missions.



Execute mission

Click “Execute mission” and the platform will enter the configuration page and self-checking status. After the self-check is successful, the UAV can take off and execute the mission.

Aircraft control

By default, the right side of interface displays the docking station operation parts, where the user can open/close the cabin door, disable recentering, power on the aircraft and enable battery charging. Click the bottom right corner to expand the aircraft control list. When the list interface is unfolded, click to hide the current interface.

Aircraft control can be switched between automatic and manual control modes. Under automatic control mode, the user can perform one-button take-off, emergent hovering, accurate return and one-button landing, make the aircraft ready to land and return, and control the rights. When the mode is switched to manual control mode, it is necessary to control the aircraft with the manual keyboard.

Other functions

Place the mouse arrow on the map and scroll up/down with the mouse to adjust the map's size; left click and hold to move the map.


:The blue icon indicates the location of the docking station on the real-time map.


: The yellow-black icon indicates the location of the landing point.


: The red arrow indicates the aircraft's real-time location.

On the top right corner of the map, the user can perform zoom-in, zoom-out and ranging operations on the map, and automatically position to the selected docking station location. The user can also switch to view no-fly zones, operation mode and map type.

Flight route management

On the Flight Route Management page, the user can create a docking station flight route, including waypoint flight, orthographic image, oblique photography, etc. Enter the flight route type and flight route name to search.

Description of adding a flight route

Click “Flight route management” -> “Add a flight route” to enter the Track Adding page; after mapping the track, click “Confirm”.

Selection of docking station

Click the “Docking station” drop-down button and select the docking station to execute the flight route mission.

Flight route name

Click the text box to enter the basic information.

Flight route type

Waypoint flight: After planning a waypoint, the UAV can automatically fly to all waypoints to complete the preset flight track and flight actions.
Orthographic image: It is used for flight route planning when the area requires 2D mapping.
Tilt model: It is used to conduct flight route planning when the area requires 3D modeling.

Plan flight routes

For a waypoint flight mission, the flight route is the one formed by the waypoints.
For a mapping mission, the software will automatically plan a flight route based on the parameter settings within the area formed by the boundary points added by the user. The user may add these points based on the methods below:
a. Directly click the location on the map to add a point.
b. Click “Upload file” on the “Add a flight route” interface to import a file. The data in the file will then be changed to points and displayed on the map.

Add a flight route

Upload the flight route file or map to add a flight route.

Flight route settings

Enter the basic flight route information.

Flight altitude: The flight altitude when the aircraft executes a mission in the flight route ranges from 10 m to 1,500 m, and defaults to 60 m

Flight speed: The flight speed when the aircraft executes a mission in the flight route ranges from 3 m/s to 15 m/s, and defaults to 5 m/s;

Pitch angle: The pitch angle when the aircraft executes a mission in the flight route ranges from -90° to 10°.

When the pitch angle is -90°, the camera faces downwards; when the pitch angle is 10°, the camera faces forwards. The default angle is -90°.

Hover: After a mission is completed, the aircraft will hover at the last waypoint.

Complete mission: The action that the aircraft executes when a flight mission completes.

Lost communication: Select whether lost communication is responded during a flight mission.

Waypoint settings

Click and select a waypoint or a boundary point. The selected point is orange, and the non-selected point is white. The user may drag a point to change the flight region's shape or flight route. For a mapping mission, click a blank area on the map to insert a new point.

⚠ • The distance between two boundary points in the flight area must not be too close. Otherwise, flight route creation may fail.

Mission management

Mission creation

1. On the Mission Management interface, click “Create a Mission” to enter the Edit mode.

2. On the Mission Creation interface, the user can select the mission name, docking station, flight route type and flight route name, and enter the execution method. Execution methods include immediate execution and timed execution.

Mission list

The Mission Management page displays the search box where the user can search for the docking station, mission type, mission status, mission name and flight route name.

Data center

The data center mainly displays images and videos taken and recorded by different docking stations during each flight for uniform management. The user can enter the start time, end time and docking station name to search.

Deletion and download buttons

By clicking the button, the user can delete and download the result files.

Docking station settings

The user can click the Settings button on the top right corner to skip to System Settings.

Aircraft settings

Flight settings

Set the aircraft's altitude limit, distance limit, return altitude, return speed and lost communication action.

Sensor settings

Set the aircraft's obstacle avoidance strategy, including braking enabling/disabling, horizontal obstacle avoidance, vertical obstacle avoidance, landing assistance and obstacle detection during return.

IMU calibration

The user can click “Start calibration” and follow the prompts to complete the UAV’s attitude setting and complete the calibration.

Compass calibration

The user can click “Start calibration” and follow the prompts to complete the UAV’s attitude setting and complete the calibration.

Advanced networking mode

The user can select the control mode: one-control-one and two-control-one, and display the current pairing status.

4G backup video transmission

Set the video transmission mode and related parameters, of which manual and automatic modes are available.

Docking station settings

Display the ready-to-land point setting, electric fence, authorization setting, operation and maintenance management, and power supply management (docking station enabling/disabling).

Battery settings

Display the low battery alert and emergency low battery alert value.

Payload settings

Display the current payload of the UAV.

⚠ • Notes: This option is not displayed when the UAV has no payload.

RTK settings

In this interface, the user can set the parameters and modes related to RTK.

Version information

Display the current docking station and UAV version information.

Docking station logs

Click to obtain and upload logs to the platform. Downloading and deletion are supported.

Aircraft logs

Click to obtain and upload logs to the platform. Downloading and deletion are supported.

System update

On this interface, the user can update the platform and hardware system.

Setting Advanced Networking Mode (GDU UVER Intelligent Management and Control Platform)

When the S400 is used with the docking station, the docking station can control the aircraft (one-control-one mode), or the docking station and remote controller can control the aircraft (two-control-one mode). After pairing, obtain operation permission.

1. Run the GDU UVER Intelligent Management and Control Platform.
2. Enter the Docking Station Settings page, and select “UAV Settings” → “Advanced Networking Mode” to start pairing the docking station with the aircraft, and then pairing with the remote controller
3. Power on the unpaired aircraft, and press the aircraft’s power button 8 times continuously (ensuring that the dial button on the aircraft is in STA Status). Select the docking station aircraft, and remote controller, and click “Start Pairing” to complete pairing.
4. After pairing the docking station and the aircraft, the remote controller can be paired additionally. After that, use the remote controller to operate the aircraft. Change the networking mode to “two-to-one mode”, and select to pair the remote controller. Click “Start Pairing”. Simultaneously press and hold both the remote controller’s power button and the return button for 5 seconds. At this point, the remote controller’s status indicator lights blink alternately, indicating that the remote controller has entered the pairing status. Complete pairing.

Using the Docking Station’s Management System for Firmware Upgrades

1. Ensure that the aircraft and the docking station are connected and powered on.
2. Enter the GDU UVER Intelligent Management and Control Platform, and select the aircraft to be upgraded. Click “Settings” → “System Upgrade”, and upgrade various firmware based on the interface prompts.

Online Update

Online updates are available for the aircraft’s platform, visual system, and flight control co-processor. Click “” one by one to start updating. Ensure that the Internet is connected during updates.

Offline Update

When the Internet is not available, obtain the offline firmware update package from GDU. Then, upload various firmware packages through the GDU UVER Intelligent Management and Control Platform. Click “Update” to complete the update.

Appendix

Technical specifications of docking station

Entire machine	
Model	K01
Total weight	255KG
External dimensions	With cabin cover closed: 1460 × 1460 × 1670mm With cabin cover opened: 1460 × 1460 × 1110mm
Installation port	Bolt fixing
External interface	RJ45 network interface
Power supply mode	AC220V. The power supply has over current protection, over temperature protection, and short circuit protection.
Cabin	
Communication mode	Ethernet access (10/100/100Mbps Adaptive Ethernet port)
UAV and docking station video transmission delay	<300ms
Charging mode	Contact automatic charging
Charging time	70 minutes Notes: The aircraft's battery level will be charged from 10% to 90% in an ambient temperature of 25°C.
Industrial air conditioning	Fitted. The function can be automatically enabled or disabled within a set temperature range.
Video transmission and control distance	8km
UPS	Emergency usage >4H
Power dissipation	1700W (peak value)
Operating life	Up to 2000 flights or 5000 hours of failure-free operation
Loud-speaker	Fitted
Remote controller	Optional
Operation	
Operation attendance	Support 24 hours uninterrupted operation
Startup time	≤3 minutes
Preparation time for operation	≤2 minutes
Accurate landing	Feature RTK, accurate landing vision system, and landing accuracy: Landing error ≤±10cm (in windless environments); ≤±20cm (Level-5 wind conditions)
Night landing function	Fitted with a nighttime precise landing function.
Landing time	≤3 minutes
Automatic data return	UAV images/videos/POS and other operation results, internal and external monitoring and real-time videos of UAV, real-time status of the UAV, and docking station status

Meteorological station	
Wind speed	Fitted
Precipitation level	Fitted
Temperature and humidity	Fitted
Atmospheric pressure	Fitted
Camera	
External camera	Fitted, 1080p
Built-in monitoring camera	Fitted, 1080p
Sensor	
Smoke sensor	Fitted. Automatic alarm in the event of fire.
Water logging sensor	Fitted. Automatic alarm in the event of water logging.
Indicator	
Status indicator	Fitted
Landing platform light band	Fitted
Switch control	
Emergency maintenance switch	Fitted
Cabin cover manual switch	Fitted
Recentering and extending manual switch	Fitted
Control and Management platform	
Background control mode	WEB platform
Remote control power off/on	Fitted
Task management	Flight route planning and task creation, receiving and executing, including manual tasks
Safe take-off self check	Fitted
Display of real-time status information of the docking station	Fitted, including internal and external real-time monitoring video.
Display of UAV real-time status information	Fitted, including real-time videos of payloads.
Display of weather status information	Fitted
Control and Management function	Control and Management functions related to the docking station, UAV, and gimbal, including sensor error alert, maintenance prompt, and other information
Result management and history playback	Fitted. Stores images/videos taken by the UAV and other operation results, docking station status, UAV status, real-time monitoring video of docking station, and real-time flight video of the UAV.
SDK development	Available

Environmental adaptation	
Installation environment	Ground, buildings
Maximum working altitude	5000m
Operating temperature	-35°C to 50°C
Operating humidity	≤95%, without condensation
Anti-icing	Fitted
Anti-thunder	40 KA (8/20μs waveform)
Anti-aging	Fitted. Material and electrical systems can function free of failure for 3 years.
Resistance to shock and vibration	According to the national standard vehicle transport weight
IP rating	IP54
Safety and certification	
EMC	Conduct anti-electromagnetic interference performance tests based on the DL/T1578-2016 standards, and the test meet the class requirements.
FCC ID	2A8WC-K01

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with minimum distance 20cm between the radiator & your body.