

EXHIBIT 15**REQUIREMENTS OF ANTENNAS OF PART 15 INTENTIONAL RADIATORS**Section 15.203 ANTENNAS REQUIREMENTS

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. *The use of a permanently attached antenna* or of an antenna that uses a unique coupling to the intentional radiator *shall be considered sufficient to comply with the provisions of this section*. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Section 15.204(c) ANTENNA LIST

An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. An intentional radiator may be authorized with multiple antenna types.

- (1) The antenna type, as used in this paragraph, refers to antennas that have similar in-band and out-of-band radiation patterns.
- (2) Compliance testing shall be performed using the *highest gain antenna* for each type of antenna to be certified with the intentional radiator. During this testing, *the intentional radiator shall be operated at its maximum available output power level*.
- (3) Manufacturers shall supply a list of acceptable antenna types with the application for equipment authorization of the intentional radiator.
- (4) Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator. No retesting of this system configuration is required. The marketing or use of a system configuration that employs an antenna of a different type, or that operates at a higher gain, than the antenna authorized with the intentional radiator is not permitted unless the procedures specified in § 2.1043 of this chapter are followed.

KDB 353028 D01 TECHNICAL INFORMATION REQUIRED FOR ANTENNAS

It summarized rules and policies on technical information and test data to include in equipment authorization applications for antenna(s) used with part 15 intentional radiator devices. It addressed information related to the product antenna needed to demonstrate compliance with the EMC requirements. It may also be necessary to consider the impact of changes to the product antenna on the RF exposure requirements. Other basic guidance for miscellaneous related considerations is also provided in a frequently-asked question and answer format.

A. Antenna Requirements — Section 15.203

The purpose of Section 15.203 is to prevent attaching any other antenna(s) [other than one(s) approved with the device] to a Part 15 transmitter. All antennas for use with the approved device must be listed in the application.

The following describes the three ways that can be used to demonstrate compliance to Section 15.203:

a) Antenna permanently attached.

i) Antenna soldered to a printed circuit board.

ii) Antenna permanently glued with epoxy to a standard connector.

(1) Specify the type of adhesive to be used.

(2) Confirm that the adhesive will be applied at the factory (prior to shipment).

b) Unique (non-standard) antenna connector.

i) Antenna connectors not readily available to general public.

ii) FCC has allowed the following to show compliance with Section 15.203.

(1) Use of permanent, industrial epoxy, “Loctite” or solder to make the connection permanent prior to shipping.

(2) Allow use of standard connectors if the transmitter has a sensing circuitry that disables the transmitter if an unauthorized antenna is used. An application should detail how this is accomplished.

(3) Use of a standard connector is also allowed if the connector is within the transmitter enclosure and can only be accessed by disassembly of the transmitter, where such disassembly is not normally required. The user manual must not show that user has access to the connector.

(4) BIOS lock—Radio card and host (*e.g.*, laptop computer) exchange code to ensure only the authorized transmission system works in the host.

c) Professional installation

i) Professional installation must be justified in the filing, and grant condition must state “This device must be professionally installed.”

ii) Professional installation does not permit use of any antenna with the transmitter; the permitted types of antenna must be specified.

iii) The applicant should address the following items when justifying professional installation.

(1) To qualify for professional installation, the applicant must explain why the hardware is not readily available to average consumer.

(2) Marketing—Device cannot be sold via retail to the general public or by mail order; it must be sold to authorized dealers or installers only.

(3) Filing must show that intended use is not for consumers and general public; rather device is generally for industrial/commercial use.

(4) Explain what is unique, sophisticated, complex, or specialized about the equipment that REQUIRES it to be installed by a professional installer?

iv) Other professional installation requirements.

- (1) Installation must be controlled.
- (2) Installed by licensed professionals (e.g., device sold to dealer who hire installers).
- (3) Installation requires special training (e.g., special programming, access to keypad, field strength measurements made).

Response

WiFi module P632592 comes with an integrated on-board PCB antenna and the compliance with Section 15.202 is demonstrated with the Antenna permanently attached.

ANTENNAS USED FOR RF MODULE P632592 (WiFi)

WiFi module P632592 has an integrated on-board PCB antenna. Its maximum antenna gain is 4.54 dBi.

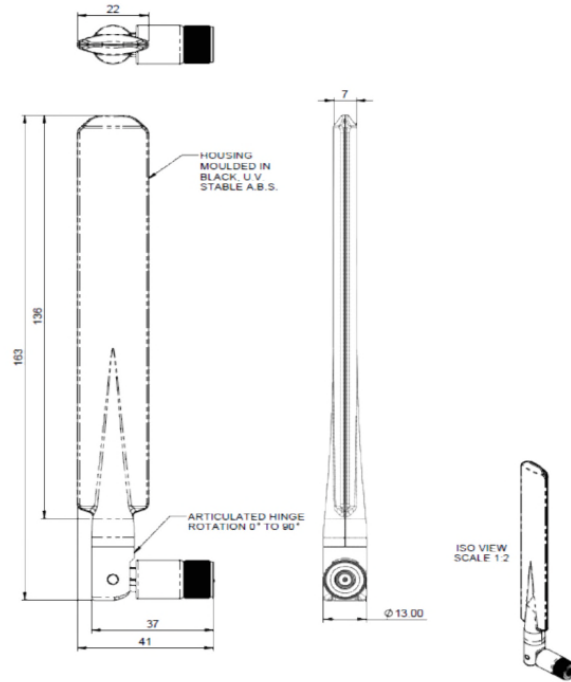
ANTENNAS USED FOR RF MODULE P638893 (LTE & NR)

NDN Electric Drone P591013 is equipped with eight antennas for two RF modules P638893: two External Paddle Antennas P567162 (ANT0, Port 0): 650MHz-4200MHz with peak gain +3.0 ~ +5.0dBi and six Internal Antennas P601003 (ANT1, ANT2 & ANT3, Ports 1, 2,3): 617MHz-4400MHz with peak gain -1.7 ~ +3.7dBi.

External Paddle Antennas P567162



Electrical Data	
Frequency Range	698-960,1710-2170,2396-2700,3400-3800
Peak Gain Isotropic (dBi)	698-960MHz 3dBi
	1710-2700MHz 4dBi
	3400-3800MHz 5dBi
Typical VSWR	< 3:1
Polarisation	Vertical
Pattern	Omni-directional
Impedance	50Ω
Max input power (W)	10
Mechanical Data	
Dimensions (mm)	Length 163 (6.4")
	Width 22 (0.8")
	Thickness 7 (0.27")
Operating Temp (°C)	-40° / +80°C (-40° / 176°F)
Material	ASA



Internal Antennas P601003



FREQUENCY	617-698MHz 698-824MHz 824-960MHz 1420-1520MHz 1710-2200MHz 2300-2400MHz 2500-2690MHz 3300-3800MHz
POLARIZATION	Linear
OPERATING TEMPERATURE	-40°C to +85°C
ENVIRONMENTAL CONDITION TEST	ISO16750-4 5.1.1./5.1.2
IMPEDANCE	50 Ω
WEIGHT	<0.5g
ANTENNA TYPE	FPC Self-adhesive 3M 468MP
DIMENSIONS (ANTENNA)	95.0 x 15.0 x 0.15 (mm)
CONNECTION	I-PEX MHF1 (20278-112R-13)



L	W	T
Length	Width	Thickness
95.0 ±0.2	15.0 ±0.2	0.15 (nominal)

All dimensions in (mm)

	617-698MHZ	698-824MHZ	824-960MHZ
PEAK GAIN	-1.7dBi	1.7dBi	1.7dBi
AVERAGE GAIN (LINEAR)	-4.2dBi	-3.2dBi	-2.3dBi
AVERAGE EFFICIENCY	>40%	>45%	>55%
MAXIMUM RETURN LOSS	-6dB	-5dB	-11dB
MAXIMUM VSWR	2.9:1	3.1:1	1.6:1

	1420-1520MHZ	1710-2200MHZ	2300-2400MHZ
PEAK GAIN	1.9dBi	2.7dBi	3.6dBi
AVERAGE GAIN (LINEAR)	-2.2dBi	-2.1dBi	-1.8dBi
AVERAGE EFFICIENCY	>60%	>60%	>65%
MAXIMUM RETURN LOSS	-11dB	-8dB	-13dB
MAXIMUM VSWR	1.7:1	2.1:1	1.5:1

	2500-2690MHZ	3300-3800MHZ
PEAK GAIN	3.7dBi	3.6dBi
AVERAGE GAIN (LINEAR)	-1.9dBi	-2.2dBi
AVERAGE EFFICIENCY	>65%	>60%
MAXIMUM RETURN LOSS	-9dB	-7dB
MAXIMUM VSWR	2.0:1	2.4:1

All data measured on SRFL061-150 in a loaded condition adhered to a plastic carrier in free space.