HQ300K20W User Manual

1. Product Overview

Highly integrated, modular design

Adopt TDD- COFDM modulation technology , space-time coding, space diversity, TX/RX Beamforming, spatial multiplexing

All-round two-way communication, no need to worry about being blocked by buildings or walls

High-speed on-the-go communication, with a maximum moving speed of 7, 200 km /hour

Heat sink aluminum housing, shockproof and impact-resistant

Non-line-of-sight (NLOS) mobile transmission, the distance under line-of-sight conditions is not less than 350km (MP300K20W)

The bottom program distance is set by itself, and the maximum distance is set to 520km

Standard automatic frequency selection (with spectrum sensing)

No center ad hoc network

Automatic frequency-different networking (avoiding the shortening of transmission distance caused by interference between different frequencies of multiple terminals)

Full customization available

2. Product Technical Parameters

1: RF parameters

Model	HQ300K20W
Waveform	Mobile Network MIMO (MN-MIMO)
MIMO Technology	Space-time coding, spatial diversity, TX/RX beamforming, spatial multiplexing
Receiving sensitivity	-103dBm@5MHz BW
Working channel bandwidth	2.5/5/10/20MHz configurable , dual antennas with different frequency transmission and reception
Transmission rate	1-100Mbps(20MHz BW)/
Modulation	TD-COFDM, BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM adaptive
RF output power	10W ×2 (actual output power 14W)
Single hop communication distance	>300 km (visual range), 1-30 km (urban area)
Way of communication	Distributed and decentralized point-to-point/point-to-many/many-to-many, Layer 2 or 3 dynamic routing, multi-hop relay, star/line/mesh/hybrid dynamic
Single hop delay	Average 7ms (20MHz BW)
Secure encryption	DES, AES128/256,
Anti-interference working mode	Manual spectrum scanning channel selection, full-band enhanced intelligent frequency selection (spectrum sensing)/

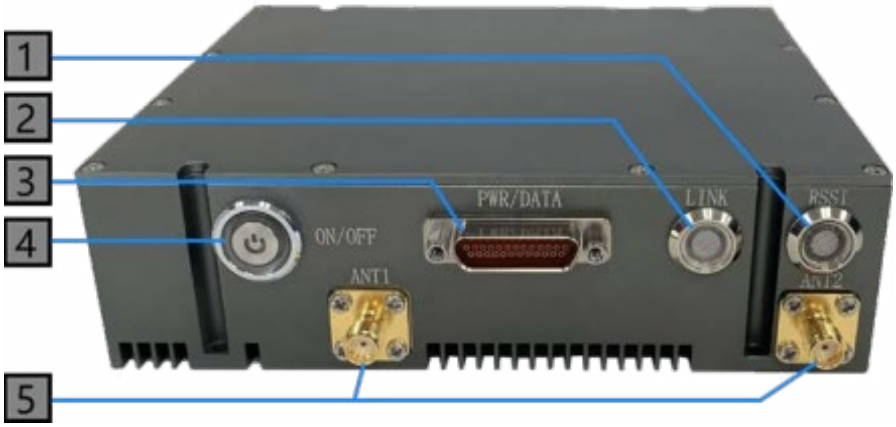
Local/Remote Management	Parameter settings such as operating frequency, channel bandwidth, network ID, transmit power, etc. Spectrum scanning, network topology, link field intensity signal to noise ratio, upload download flow, the distance between the nodes, and real-time display and record, GPS/ Beidou electronic map, temperature/voltage/interference monitoring, software upgrade
Other	The boot time is less than 28 seconds, and the network access/update/switch time is less than 1 second. There is no limit on the user capacity of a single system (more than 256), no limit on the number of self-organizing network hops (15+ hops for data, 10+ hops for voice, and 8+ hops for video), and the total multi-hop bandwidth loss is less than 70%. Automatic carrier tracking, adapting to Doppler frequency shift of ±6kHz frequency deviation, supports mobile communications at speeds above 7200 kilometers per hour (Mach 6, 2000 meters/second).

Working frequency band selection (70M-6GHz) , the factory default working frequency band is 1300-1500.			
Frequency band customization	Frequency range(MHz)	Frequency band	Frequency range (GHz)
UHF customized)	350-450/450-550/570-700/800-950	S Band (Customized)	1.6-1.8/1.8-2.0/ 2.0-2.2/2.2-2.5
L Band (Customized)	1000-1200	C Band (Customized)	4.4-5.0/5.0-6.0
Environment			
Operating temperature	-40℃ ~+80℃		
Protection level	Default rain and dustproof housing design.		

2: Other parameters

Size and weight	127x110x33mm /0.635kg (can be modified for forced heat dissipation when used on the ground)
Mounting/ Color	4 mounting holes, ears/ grey (black optional)
Powered by	
Supply voltage	DC:14.8-28V
Power consumption	Working current 3-6A/standby 0.7-0.9A
Power Supply Selection	Main cable power supply (XT30)
Interface	

Basic Interface	2-SMA RF, 2- RJ45 Ethernet 100/1000BaseT, 1- WiFi, 2- RS23 , DC input
Video expansion options	Low latency HDMI/SDI/CVBS, 4K/2K/1080P/720P/D1 (optional)
Link Status Indicator	Red light is constant on - Not connected to the network Flashing red light - Booting / Not connected to the network Green light is always on - Already connected to the network Green light flashing - voice PTT Pressed
RSS I Link indicator	Green light is always on - Excellent link quality Blue light is always on - Link quality is good Yellow light is always on - Link quality is average Purple light is always on - Link quality is slightly poor Red light is always on - Poor link quality Lights off - Link down
Management interface/control interface	Web-based network management
RF	SMA



3: Status Indicator

1: LED status indication

指示灯定义 Indicator light definition	对应灯颜色 Corresponding light color	设备对应状态 Device corresponding state
Link 状态指示灯 Link status light (双色灯 RG) Two-color light RG	红灯常亮 The red light is always on	未入网 off network
	红灯闪烁 / The red light is blinking	开机中 / 未入网 Booting /off network
	绿灯常亮 The green light is always on	已入网 Already connected to the network

2: Link signal status indication

链路质量 Link quality	颜色 Color
优 Excellent	深绿色 Bottle-green
良 Well	浅绿色 Laurel-green
好 Good	黄色 Yellow
中 Medium	橙色 Orange
差 Poor	红色 Red
断开连接 Disconnect	无连接线 No connecting wire

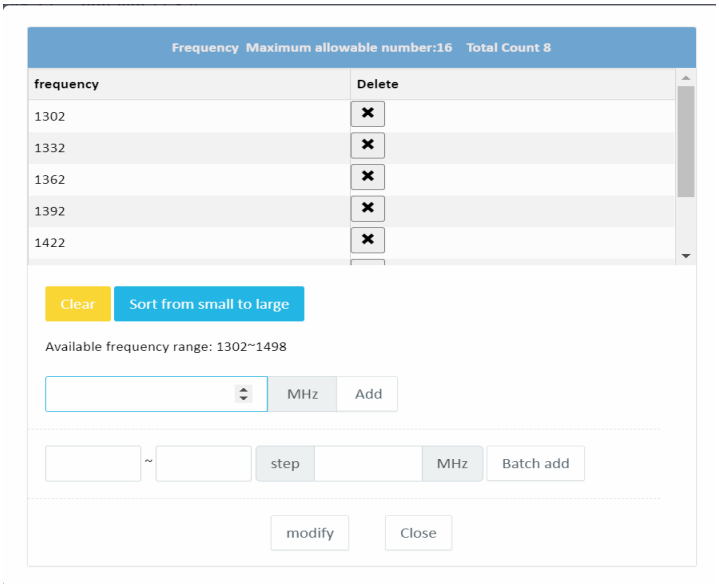
4: Connection

Before connecting the device, please carefully check whether the antenna is connected properly and whether the power supply for the device is within the range of DC14.8-28V. MP300K20W can be connected to the device through the WiFi built into the PC, or through a network cable. When connecting to WiFi, first make sure that the device is turned on, and find MP300K20W-APXX in the searched WiFi list. The login password is 12345678

5. Data Monitoring And Configuration

1: Configuration parameters

HQ300K20W wireless broadband self-organizing network terminal system software can remotely configure the parameters of the entire network. The parameters with " * " in the settings can be configured uniformly . To ensure the normal network after configuration, please change "Modify the consistency parameters of the entire network" to "Configure the entire network" . If you choose enhanced intelligent frequency selection (**factory default is enhanced intelligent frequency selection**), if you need to reconfigure, you need to clear the original frequency list, add the start and end frequencies, and enter the IP address of the local connected radio station during configuration to log in, as shown in the figure



This page is used for basic settings. A brief description of each parameter is given below . The parameters must be consistent, otherwise you will not be able to access

the network.

Modify the consistency parameters of the entire network: If this parameter is configured separately, only the local radio station can be modified

When setting the whole network uniformly, select "Whole Network Settings". This function can only be used when the link quality of the whole network is good to avoid the situation where some nodes fail to modify the configuration successfully and thus fail to access the network.

Disabled frequency range: You can add unnecessary frequencies. After adding, the disabled frequencies cannot be selected.

Center frequency: used to modify the currently used frequency; the frequency list setting can customize the frequencies within the working range of the radio station.

Channel bandwidth: defines the RF bandwidth of the signal. The channel bandwidth can be appropriately reduced according to the maximum rate required for actual transmission, thereby increasing the transmission distance.

Network ID: It is used to identify the local area network ID formed between radio stations. Networking can be carried out only when the network ID is consistent;

Maximum distance: Adjust the maximum distance according to the actual distance used. The maximum distance should be slightly larger than the actual distance. If the maximum distance is set too large, mid-air collisions and performance degradation may occur. The larger the maximum distance is set, the longer the delay will be to protect the air interface transmission time.

Total transmit power: Set the transmit power of antenna 1 and antenna 2 respectively. Generally, the maximum power is used by default. If you test at a close distance indoors, lower the power appropriately and keep the power of antenna 1 and antenna 2 the same.

Multi-antenna transmission mode:

1. Automatic selection: (default automatic selection) Diversity, MIMO, It is automatically selected by the node according to the situation. The principle is which of the two modes has the highest available transmission rate.
2. Diversity: Fixed diversity operation can effectively ensure stable data transmission, and the maximum rate is slightly lower than that of MIMO .
3. MIMO: Forced MIMO, unless the signal-to-noise ratio is too low and the underlying layer believes that MIMO cannot be transmitted correctly. There are many factors that affect the effectiveness of MIMO , mainly the propagation environment. The more independent (low correlation) the signals received by the two receiving antennas, the higher the probability of working in MIMO mode; conversely, if the correlation of the signals received by the two receiving antennas is stronger, the probability of working in MIMO mode is lower or even unable to support MIMO transmission.

Working mode: (It is recommended to use the whole network configuration for parameters here, and modify the whole network with one click)

Single frequency mode: This mode is used by default, and a single frequency is used. After this mode is turned on, all devices in the network use a unified frequency list for sequential frequency hopping communication.

Frequency hopping mode: Ensure that this mode is enabled on all nodes, and the frequency value, sequence, and number of frequency points in the frequency list must be consistent. It is best to select relatively clean frequencies before configuration and add them to the frequency list in order. After enabling this mode, all network devices use a unified frequency list for sequential frequency hopping communication.

Enhanced intelligent frequency selection: All nodes must enable this mode, and the frequency values, arrangement order, and number of frequency points in the frequency list must be consistent. After enabling this mode, when MM/SM devices transmit data to each other, they will select a relatively clean frequency to transmit data to each other based on the environmental noise of the destination node. That is, each node maybe send data and receive data at different frequencies (that is, Different frequency network).

Roaming mode: Assume that two subnets of different frequencies are fixed, and a mobile Mesh vehicle station is constantly shuttling between the two subnets, then the mobile Mesh vehicle-mounted station needs to be configured in roaming mode and use mobile station mode .

Save and Apply: Apply and save the latest configuration parameters.

Note: Enhanced intelligent frequency selection

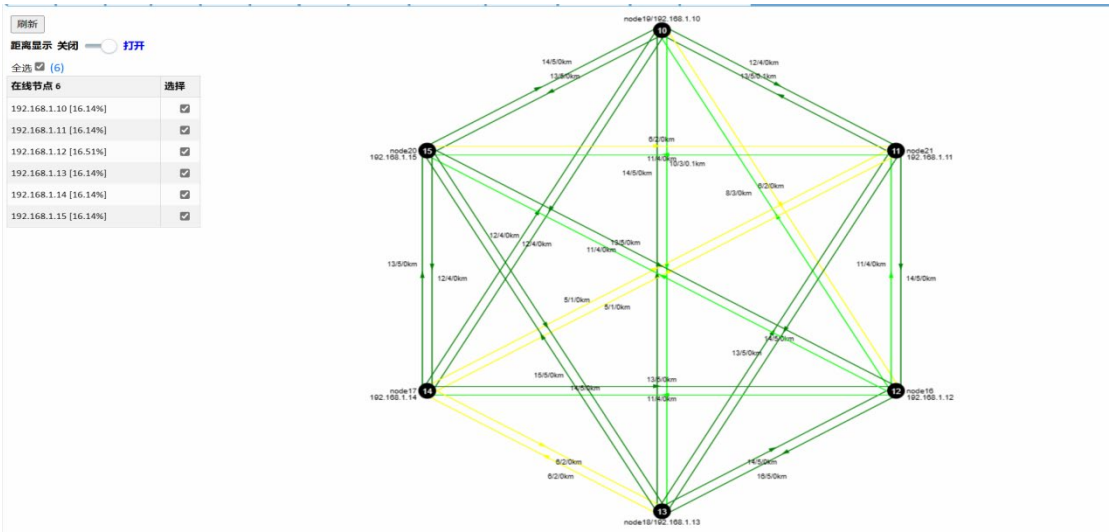
When setting the working frequency of the current mainstream wireless ad hoc network , in order to avoid interference, it is necessary to manually intervene to select a relatively good frequency based on the spectrum scanning results of each node in the entire network. On the one hand, this manual intervention method is very inefficient and has high requirements for users. On the other hand, due to the differences in geographical location, it is often impossible to select a frequency point with less interference in the whole network for networking and transmission.

The adaptive enhanced intelligent frequency selection technology currently used in the system, based on the frequency point list configured during system operation, conducts real-time perception and spectrum monitoring of the wireless environment of the entire network for these frequency points during operation. Each node dynamically adjusts its own working frequency point based on external electronic environment, interference situation, and other factors, and dynamically selects the working frequency point for each node, Based on the optimal receiving performance of the frequency point, each node is selected independently and not dependent on each other, so as to realize intelligent dynamic cross-frequency networking, achieve the purpose of avoiding interference, improving the overall network transmission performance, and achieve

the optimal performance of the whole network. At the same time, because no human intervention is required, the network configuration and use complexity are greatly reduced, and the network usability is enhanced.

2: **Real-time monitoring of system topology changes**

MM/SM wireless broadband ad hoc network can monitor the topology changes of MESH ad hoc network in real time. As shown in Figure 3-3 , the real-time ad hoc network topology diagram will be displayed on the MESH terminal system software interface.



6: Serial port settings

Open the browser of your computer or mobile phone, enter the IP address of the radio, enter the web page, and set the parameters of the radio.

After entering the radio Web, click "Serial Port" to set parameters.

Ground terminal
The serial port 0 settings are as follows:
Working mode: UDP

Baud rate: 115200

Peer IP: **IP address of the air-end**

Port: Consistent with the air terminal port (default 1024)

Air-end

The serial port 0 settings are as follows:

Working mode: UDP

Baud rate: 115200

Peer IP: **Host computer IP address** (such as a computer)

Port: Same as the ground terminal port (default 1024)

Note: The upper computer IP address and the air-end radio IP address must be in the same network segment!

As shown below:

Ways of identifying:

Use the serial port assistant to test or directly connect to the device

7. Bandwidth_Sensitivity_Distance_Rate Comparison Table

Encoding format	Modulation	Coding efficiency
2	QPSK	1/3
3	QPSK	2/3
4	16QAM	1/3

5	16QAM	2/3
6	64QAM	1/3
7	64QAM	2/3
8	256QAM	1/3
9	256QAM	2/3
10	1024QAM	1/3
11	1024QAM	2/3
12	1024AM	3/4

20M 带宽

编码格式		2	3	4	5	6	7	8	9	10	11	12
编码模式		QPSK		16QAM		64QAM		256QAM		1024QAM		
编码效率		1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	3/3
2x2 灵敏度(dBm)		-95	-92	-88	-86	-84	-81	-78	-77	-75	-73	-71
信噪比(dB)		3	9	12	14	17	19	23	25	27	29	30
UDP业务速率(Mbps)	10km距离模式	13.73	16.17	20.98	30.60	44.20	57.80	71.40	84.20	88.52	93.71	97.30
	25km距离模式	12.52	15.14	19.43	29.03	41.82	54.62	67.41	79.45	83.21	88.14	93.72
	40km距离模式	12.10	14.22	18.22	27.64	39.73	51.82	63.91	75.28	77.13	83.82	88.31
	70km距离模式	8.33	13.41	17.19	25.28	36.16	47.04	56.92	68.16	72.53	77.22	80.44
	100km距离模式	7.57	12.52	16.20	23.34	35.23	43.12	52.01	62.32	66.12	71.65	73.57
	160km距离模式	6.16	11.85	14.72	20.39	28.76	37.14	43.52	53.40	58.10	60.42	63.09
	220km距离模式	5.02	7.22	13.78	18.19	25.00	32.71	37.96	45.79	50.23	53.82	55.32
	520km距离模式	4.34	6.75	11.48	12.51	16.86	21.22	23.57	28.66	31.21	33.90	35.18

10M 带宽

编码格式		2	3	4	5	6	7	8	9	10	11	12
编码模式		QPSK		16QAM		64QAM		256QAM		1024QAM		
编码效率		1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	3/3
2x2 灵敏度(dBm)		-98	-95	-92	-89	-86	-84	-81	-79	-77	-75	-73
信噪比(dB)		2	5	9	11	14	16	21	23	26	27	29
UDP业务速率(Mbps)	10km距离模式	6.44	8.20	10.00	15.70	22.50	28.80	35.10	40.10	42.54	45.21	48.40
	25km距离模式	6.02	7.42	9.82	14.12	20.52	27.44	33.37	35.83	38.52	41.22	45.53
	40km距离模式	5.72	7.05	9.08	13.73	19.77	25.37	30.97	33.08	36.11	39.43	42.80
	70km距离模式	4.15	6.56	8.43	12.36	18.80	23.84	27.88	31.28	34.52	37.15	40.23
	100km距离模式	3.68	6.15	8.01	11.42	17.36	21.94	26.52	29.34	31.71	35.61	37.82
	160km距离模式	2.97	5.43	7.22	10.45	14.64	18.52	21.40	25.33	28.05	31.47	31.55
	220km距离模式	2.44	4.04	6.67	9.25	12.88	16.24	19.60	22.87	25.62	28.33	26.42
	520km距离模式	2.06	3.22	5.40	6.54	8.72	10.74	11.75	14.31	17.91	20.12	23.61

5M 带宽

编码格式		2	3	4	5	6	7	8	9	10	11	12
编码模式		QPSK		16QAM		64QAM		256QAM		1024QAM		
编码效率		1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	3/3
2x2 灵敏度(dBm)		-101	-98	-97	-94	-93	-91	-89	-85	-83	-81	-78
信噪比(dB)		4	9	11	13	15	18	20	23	25	27	29
UDP业务速率(Mbps)	10km距离模式	3.22	4.41	5.78	7.52	11.40	14.80	16.20	20.00	21.77	23.05	24.90
	25km距离模式	3.01	3.70	4.80	7.02	10.43	13.63	15.83	19.34	20.14	21.34	22.07
	40km距离模式	2.71	3.50	4.52	6.73	9.58	12.60	14.62	18.89	19.87	20.24	21.46
	70km距离模式	2.04	3.20	4.17	6.16	9.12	11.84	13.56	17.40	18.55	19.36	20.72
	100km距离模式	1.82	3.06	3.95	5.66	8.94	10.40	12.87	15.36	17.18	18.62	19.47
	160km距离模式	1.47	2.72	3.60	5.13	7.10	9.20	11.29	13.25	15.52	16.15	17.03
	220km距离模式	1.22	2.01	3.32	4.44	6.75	8.57	9.38	11.94	12.81	13.74	15.49
	520km距离模式	1.01	1.55	2.70	3.22	4.25	5.34	6.42	7.96	9.52	11.02	13.89

2.5M 带宽

编码格式		2	3	4	5	6	7	8	9	10	11	12
编码模式		QPSK		16QAM		64QAM		256QAM		1024QAM		
编码效率		1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	1/3	2/3	3/3
2x2 灵敏度(dBm)		-104	-100	-98	-96	-95	-91	-90	-88	-84	-82	-80
信噪比(dB)		4	9	11	12	14	17	19	22	24	26	28
UDP业务速率(Mbps)	10km距离模式	1.68	2.27	2.94	3.73	5.84	7.75	8.66	10.30	11.42	11.98	12.30
	25km距离模式	1.60	1.89	2.46	3.55	5.30	7.15	8.22	9.82	10.22	11.01	11.39
	40km距离模式	1.38	1.73	2.21	3.31	4.90	6.67	7.78	9.33	9.76	10.15	10.60
	70km距离模式	1.10	1.62	2.08	3.06	4.61	5.80	7.25	8.76	9.01	9.71	10.24
	100km距离模式	0.92	1.51	1.91	2.78	4.45	5.09	6.86	7.60	8.15	8.86	9.53
	160km距离模式	0.73	1.35	1.80	2.57	4.98	4.55	5.58	6.60	6.84	7.15	7.42
	220km距离模式	0.61	1.10	1.67	2.20	3.89	4.20	4.74	5.74	5.87	5.94	6.16
	520km距离模式	0.55	0.87	1.35	1.77	2.22	2.70	3.28	3.97	4.21	4.65	4.90