



Mobile Maritime

Multiple Wireless Routing Paths with Mobile Mesh

Hypercable

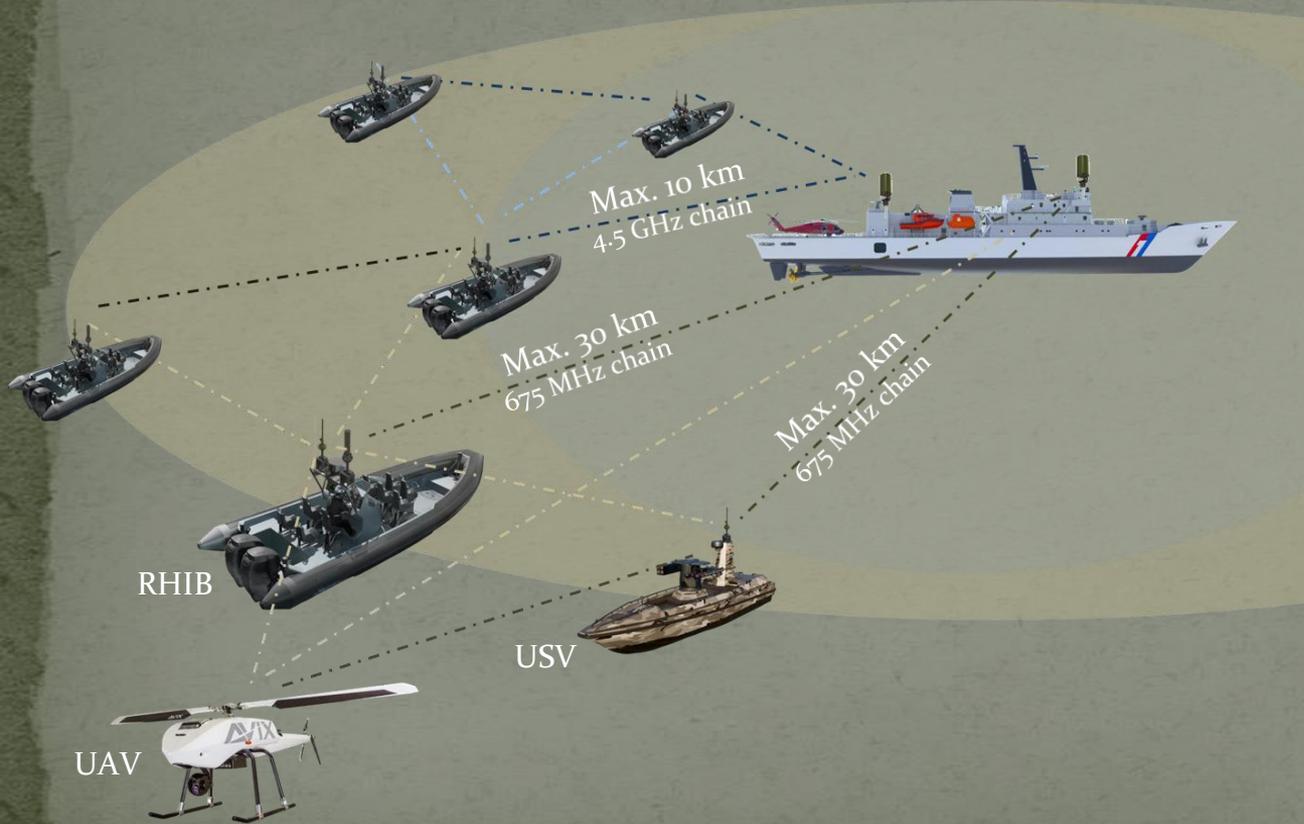
Why Multiple Wireless Routing Paths of mesh system

More choices of wireless mesh routing paths when parts of the communication quality is poor, or each wireless path is given different tasks to achieve tactical network applications. The purpose is to optimize the routing path of the mesh system and increase the wireless routing path flexibility to reduce environmental interference to the system.

For example, a mesh node with 2 frequency bands has 2 wireless routing paths, and the system can achieve:

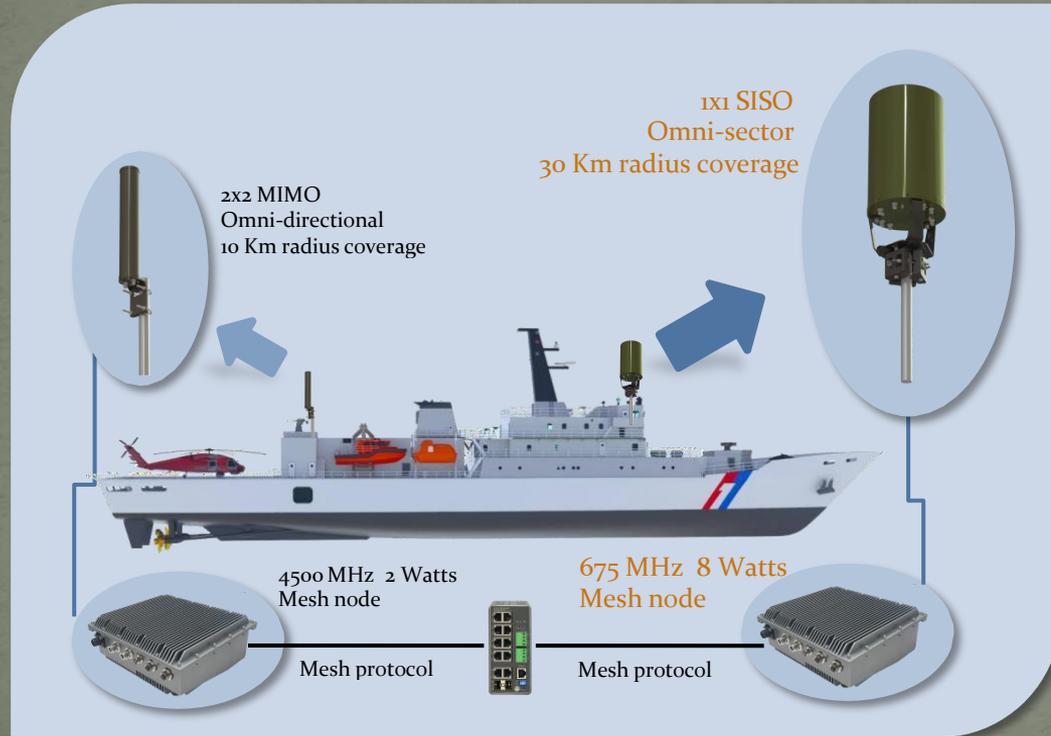
- 1, When one of the frequency signals be with poor quality, or interfered, and still has the 2nd frequency band that can be effectively transmitted.
- 2, The 2 frequency bands can perform 2 different tasks respectively to achieve a tactical network architecture.

Architecture & distance coverage



- A. Omni-directional wireless coverage design @ mother ship.
- B. Both 675 MHz and 4.5 GHz wireless chains support vessels and drones middle and long distance mobility.
- C. 2 Wireless routing paths to be achieved tactical mesh applications.
- D. The system supports multiple RHIB, USV and UAV on the move.

675 MHz Wireless Chain Design



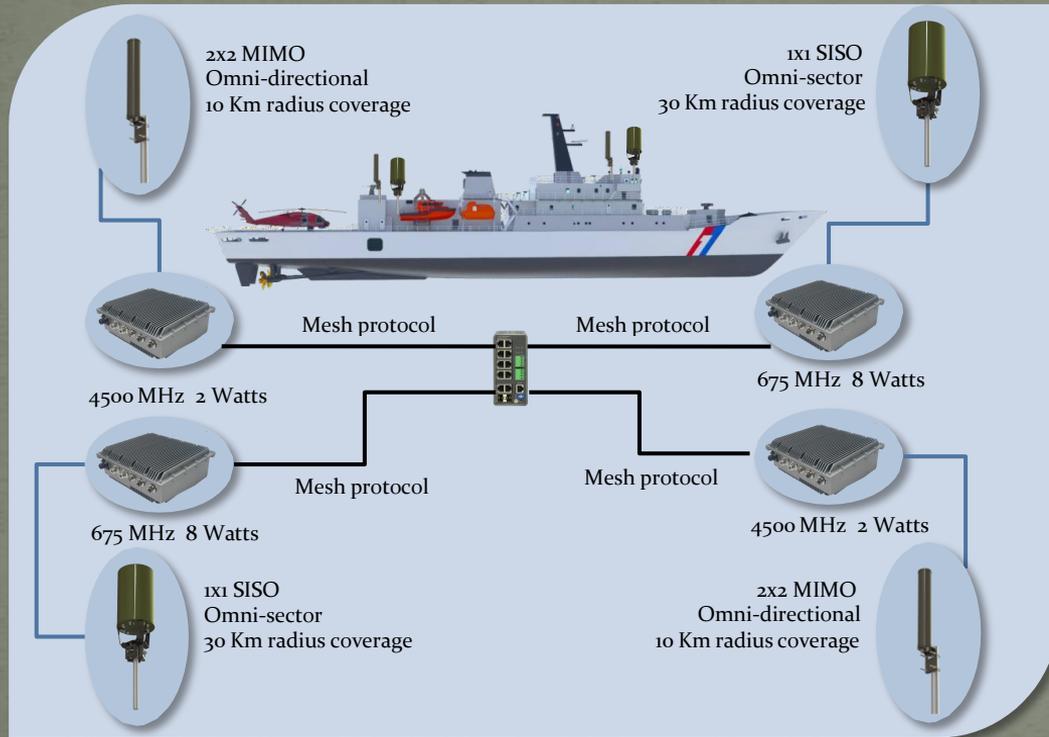
- A. 675 MHz 8 Watts Radio setting in a single operating channel & mesh peer-to-peer mode.
- B. 675 MHz 10 dBi Omni-sector Array Circular RHCP polarization antenna, 360° coverage with 25° HPBW-Elevation.
- C. EIRP 42 dBm of the radio system @ mother ship. (600 MHz chain)
- D. Supports RHIB, USV and UAV 30 Km radius wireless transmission (600 MHz chain)

4500 MHz Wireless Chain Design



- A. 4500 MHz 2 Watts Radio setting in a single operating channel & mesh peer-to-peer mode.
- B. 4500 MHz 10 dBi Omni-directional antenna, 360 ° coverage with 10 ° HPBW-Elevation.
- C. EIRP 43 dBm of the radio system @ mother ship. (4500 MHz chain)
- D. Supports RHIB, USV and UAV 10 Km radius wireless transmission (4500 MHz chain)

Design of LARGE Mother Ship



- A. The hull itself shields wireless signals. The wireless mesh nodes are deployed in the four corners of the hull, and the same frequency mesh nodes are installed diagonally.
- B. The two mesh nodes diagonally opposite to each other maintain the wireless channel has highest speed 64 QAM.
- C. Supports RHIB, USV and UAV with non-directional tactical mesh network architecture.

Design of RHIB

- A. Each RHIB supports 2 wireless routing paths connects to other mesh nodes. One is in 675 MHz chain and one is in 4.5 GHz chain.
- B. 2 Wireless routing paths, one is hot standby when one is active. And always running in the optimized one.
- C. The 4.5 GHz wireless chain supports higher throughput performance under 10 Km radius distance, and the 675 MHz chain fully supports 30 Km radius high-faster vessels mobility.

Dual UHF and NATO band IV
Tactical MESH IP Radio
(Concepts of outlooks)

Operating frequency	Node to Node	Expected RSSI	Distance	Link margin
600 MHz	RHIB to MS	-80 dBm	30 Km	10 dB
4500 MHz	RHIB to MS	-80 dBm	10 Km	
600 MHz	MS to RHIB	-80 dBm	30 Km	4 dB
4500 MHz	MS to RHIB	-80 dBm	10 Km	

* MS (Mother Ship)



Design of UAV

- A. UAV directly transmits back to mother ship from a distance of 30 Km.
- B. UAV send back the mother ship through relay of any RHIB nodes.
- C. A 10 Km recommended distance between UAV and RHIB to extend communication coverage or tactical applications.

Operating frequency	Node to Node	Expected RSSI	Distance	Link margin
600 MHz	UAV to MS	-80 dBm	30 Km	2 dB
600 MHz	UAV to MS	-75 dBm	20 Km	
600 MHz	UAV to MS	-68 dBm	10 Km	
600 MHz	UAV to RHIB	-76 dBm	10 Km	

* MS (Mother Ship)



600 MHz SISO antenna
EIRP 35 dBm



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Specifications of Radio

Both Mother ship and RHIB/USV

Specifications of MS Radio

Single band Mobile MESH IP Radio

Frequency range:

600 – 620 or 662-688 MHz

Output power: 8 Watts

Modulation: BPSK ~ 64QAM

Channel BW: 2.5~10 MHz

Antenna system: SISO

Operation Mode: Tactical Mesh

GPS coordinates and internet map database

AES128 / MAC access control / Disable SSID / Proprietary protocol

SNMP agents MIB II

Web-based management and setup

DC 36-75V power feed (Mobile Unit)



UHF 8 Watts SISO Radio

Specifications of MS Radio

Single band Mobile MESH IP Radio

Frequency range:

4430-4900 MHz (NATO Band IV)
Or 4900 – 5400 MHz (optional)

Output power: 2 Watts

Modulation: BPSK ~ 64QAM

Channel BW: 2.5~40 MHz

Antenna system: 2x2 MIMO

Operation Mode: Tactical Mesh

GPS coordinates and internet map database

AES128 / MAC access control / Disable SSID / Proprietary protocol

SNMP agents MIB II

Web-based management and setup

DC 36-75V power feed (Mobile Unit)



4.5 GHz 3 Watts MIMO Radio

Specifications of RHIB Radio

Dual band Mobile MESH IP Radio

Frequency range:

RF1: 662-688 MHz (UHF band)

RF2: 4430-4900 MHz (NATO Band IV)

Output power: 675 MHz (8 Watts) / 4.5 GHz (2 Watts)

Modulation: BPSK ~ 64QAM

Channel BW: 2.5~10 MHz (675MHz), 2.5~40 MHz (4.5 GHz)

Antenna system: 675 MHz SISO & 4.5 GHz 2x2 MIMO

Operation Mode: Tactical Mesh

GPS coordinates and internet map database

AES128 / MAC access control / Disable SSID / Proprietary protocol

SNMP agents MIB II

Web-based management and setup

DC 36-75V power feed (Mobile Unit)

Available optional: RF2: 4900 – 5400 MHz range

Dual UHF and NATO band IV



Tactical MESH IP Radio
(Concepts of outlooks)

Specifications of USV/UAV Radio

Single band Mobile MESH IP Radio

Frequency range:

600 – 620 or 662-688 MHz

Output power: 2 Watts

Modulation: BPSK ~ 64QAM

Channel BW: 2.5~10 MHz

Antenna system: SISO

Operation Mode: Tactical Mesh

GPS coordinates and internet map database

AES128 / MAC access control / Disable SSID / Proprietary protocol

SNMP agents MIB II

Web-based management and setup

Dimension/Weight: 160 (L) * 113 (W) * 42 (H) mm, 650 g

Power supply & consumption: DC 12 ~ 24V, 13 Watts (avg.)



600 MHz 2 Watts SISO Radio

Specifications of Antenna

Both Mother Ship and RHIB/USV

Specifications of UHF Omni-Sector Array Antenna (MS)

Electrical Specification

Frequency Band	662 ~ 688 MHz
Gain	≥ 10 dBi
Nominal Impedance	50Ω
VSWR	$\leq 2.0 : 1$
Polarization	Circular, RHCP 80°
HPBW-Azimuth	(Single direction azimuth coverage angle)
HPBW- Elevation	20°
Max. Power Handling	20 W
Operating Temperature	-40 °C~ +70 °C
Lightning Protection	DC Grounded



Mechanical Specification

Connector	N Type Female
Length	≤ 1050 mm (With mounting Bracket)
Diameter	$\leq \Phi 550$ mm
Weight	≤ 15 Kg
Wind Survival	200 Km/h
Wind Load @ 150 Km/h	Side: 810 N (Approx.)
Color	Military Green (Pantone-5474 U) or NATO GREEN # 5864A
Mounting	Pole Mount, on pole $\Phi 40 \sim 60$ mm

Specifications of NATO band IV Antenna (MS)

Electrical Specification

Frequency Band	4400 ~ 5000 MHz
Gain	2 x 9 dBi
Nominal Impedance	50 Ω
VSWR	$\leq 2.0 : 1$
Polarization	Linear, Vertical & Horizontal
HPBW-Azimuth	360°
HPBW- Elevation	10° (Approx.)
Port to Port Isolation	> 30 dB
Max. Power Handling	20 W
Operating Temperature	-40 °C ~ +70 °C
Lightning Protection	DC Grounded



Mechanical Specification

Connector	2 x N Type Female
Length	600 \pm 5.0 mm
Radome Diameter	Φ 76.5 \pm 1 mm
Weight	1.6 Kg \pm 50 g
Material	Stainless Steel & Corrosion-resistant aluminum alloy
Radome Material	ASA
Wind Survival	200 Km/h
Wind Load @ 150 Km/h	Side: 70 N (Approx.)
Color	NATO GREEN # 5864A
Mounting	Pole mount, on pole Φ 40 ~ 60 mm

Specifications of UHF Antenna (RHIB/USV)

Electrical Specification

Frequency Band	662 ~ 688 MHz
Gain	2 dBi
Nominal Impedance	50 Ω
VSWR	$\leq 2.0 : 1$
Polarization	Linear, Vertical
HPBW-Azimuth	360°
HPBW- Elevation	70° (Approx.)
Max. Power Handling	50 W (cw)
Operating Temperature	-40 °C~ +70 °C

Mechanical Specification

Connector	N Type, Female
Length	500 \pm 20 mm
Diameter	Φ 140 \pm 5 mm
Weight	\leq 1.7 Kg
Wind Survival	200 Km/h
Wind Load @ 150 Km/h	40 N
Color	Military Green (Pantone 5467 U) & Black
Mounting	Rigid Base Mount Standard NATO 4-holes, fixed with 4 x M10 or 3/8" Bolts
Dimensions	Φ 140 (OD)x100(H) \pm 5 mm
Weight	810 \pm 50 g



MT-TILT-RHIB-4H
Tiltable mount - optional
(Standard NATO 4-holes Base)



Specifications of UHF Antenna (RHIB/USV)

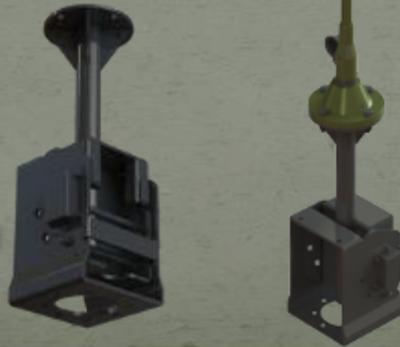
Electrical Specification

Frequency Band	662 ~ 688 MHz
Gain	5 dBi
Nominal Impedance	50 Ω
VSWR	$\leq 2.0 : 1$
Polarization	Linear, Vertical
HPBW-Azimuth	360°
HPBW- Elevation	30° (Approx.)
Max. Power Handling	50 W (cw)
Operating Temperature	-40 °C~ +70 °C

Mechanical Specification

Connector	N Type, Female
Length	≤ 1200 mm
Diameter	$\Phi 140 \pm 5$ mm
Weight	≤ 2.5 Kg
Wind Survival	200 Km/h
Wind Load @ 150 Km/h	70 N
Color	Military Green (Pantone 5467 U) & Black
Mounting	Rigid Base Mount, Standard NATO 4-holes, fixed with 4 x M10 or 3/8" Bolts
Dimensions	$\Phi 140$ (OD)x100(H) ± 5 mm
Weight	810 ± 50 g

MT-TILT-RHIB-4H
Tiltable mount - optional
(Standard NATO 4-holes Base)



Specifications of NATO band IV Antenna (RHIB/USV)

Electrical Specification

Frequency Band	4400 ~ 5000 MHz
Gain	2 x 6 dBi
Nominal Impedance	50 Ω
VSWR	$\leq 2.0 : 1$
Polarization	Linear, Vertical & Horizontal
HPBW-Azimuth	360°
HPBW- Elevation	25° (Approx.)
Port to Port Isolation	> 30 dB
Max. Power Handling	20 W
Operating Temperature	-40 °C~ +70 °C
Lightning Protection	DC Grounded

MT-TILT-RHIB-4H
Tiltable mount - optional
(Standard NATO 4-holes Base)



Mechanical Specification

Connector	2 x N Type Female
Length	≤ 420 mm
Radome Diameter	$\Phi 140 \pm 5.0$ mm
Weight	≤ 1.5 Kg
Material	Stainless Steel & Corrosion-resistant aluminum alloy
Radome Material	ASA
Wind Survival	200 Km/h
Wind Load @ 150 Km/h	Side: 70 N (Approx.)
Color	NATO GREEN # 5864A
Mounting	Base mount, Standard NATO 4-holes , fixed with 4 x M10 or 3/8" Bolts

Specifications of NATO band IV Antenna (RHIB/USV)

Electrical Specification

Frequency Band	4400 ~ 5000 MHz
Gain	2 x 9 dBi
Nominal Impedance	50 Ω
VSWR	$\leq 2.0 : 1$
Polarization	Linear, Vertical & Horizontal
HPBW-Azimuth	360°
HPBW- Elevation	10° (Approx.)
Port to Port Isolation	> 30 dB
Max. Power Handling	20 W
Operating Temperature	-40 °C~ +70 °C
Lightning Protection	DC Grounded

Mechanical Specification

Connector	2 x N Type Female
Length	≤ 550 mm
Radome Diameter	$\Phi 140 \pm 5.0$ mm
Weight	≤ 2.0 Kg
Material	Stainless Steel & Corrosion-resistant aluminum alloy
Radome Material	ASA
Wind Survival	200 Km/h
Wind Load @ 150 Km/h	Side: 90 N (Approx.)
Color	NATO GREEN # 5864A
Mounting	Base mount, Standard NATO 4-holes , fixed with 4 x M10 or 3/8" Bolts

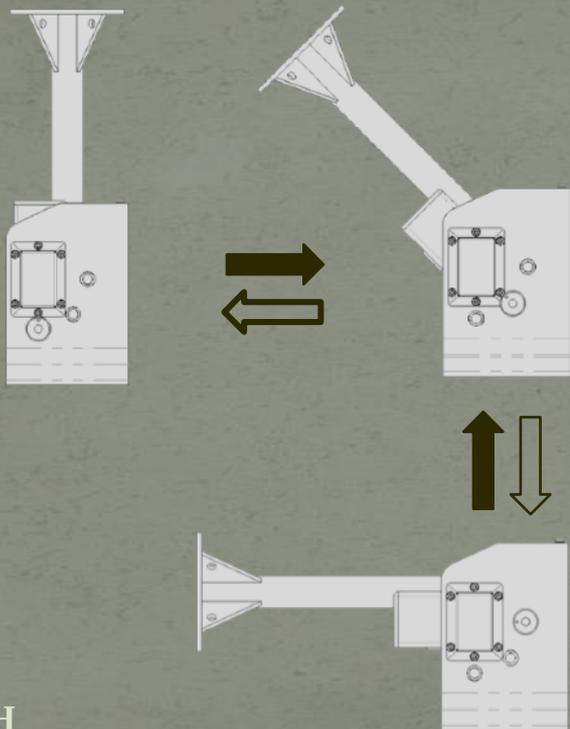


MT-TILT-RHIB-4H
Tiltable mount - optional
(Standard NATO 4-holes Base)

Tiltable Mount for Antenna with NATO 4 holes Base - MT-TILT-RHIB-4H



MT-TILT-RHIB-4H



Mechanical Specification

Function	Antenna fixing and tilting
Color	Matt Black
Weight	4 ± 0.5 Kg
Mounting	Equipped with standard NATO 4 - holes mounting hole mounting base. The tilting angle can be selected as 0, 45, 90°, and it is fixed with a pin
Top mounting interface	Standard NATO 4-holes
Mounting Place	On military vehicles and ships or other suitable plane
Materials	Aluminum alloy、Stainless Steel
Surface Treatment	Powder coating
Dimension	450(L) x 149(W) x 159(H) ± 5 mm