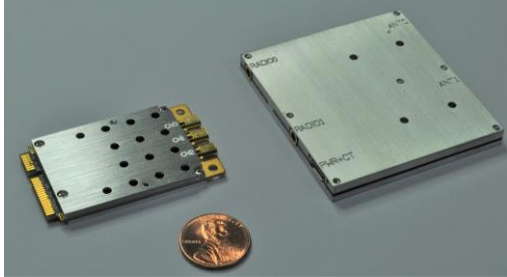


## NM-915-2H

900 MHz, Rugged, Long Range 2 Stream Broadband Radio Transceiver



### Features

- 2 stream option to maximize data throughput
- 30 dBm of RF power to push downstream data at higher modulation rates
- Integrated LNA for best-in-class Rx sensitivity
- High Q band pass filters provide interference immunity from strong Pager/GSM signals in the neighbouring 900 MHz bands
- Supports 5 MHz channels to maximize spectrum efficiency
- AP and STA modes to implement Point to Point, Infrastructure Point to multi Point, and Ad-hoc/Mesh networks
- High wireless data security with up to 128 bit AES encryption
- Dynamic Link adaptation to optimize throughput depending on channel conditions
- Modular architecture allows a variety of mounting and heat management possibilities.
- Reliable design for outdoor and vehicular environments. MMCX connectors, Electrical Stress protection, -40°C to +85°C operating environment.
- Supports spatial multiplexing, cyclic-delay diversity (CDD), low-density parity check (LDPC), maximal ratio combining (MRC), Space Time Block Code (STBC)

### Target Applications

The NM-915-2H, Long range transceiver is ideal for applications that require operation in rugged environments, medium data throughput with deep penetration through walls and tree/vegetation.

- HD Video streaming from UAV/Drones

TECHNICAL SPECIFICATIONS				
Model No.	<b>NM-915-2H</b> (Rugged, Long Range applications, 802.11n, ath9k driver)			
MAC Chipset	Qualcomm Atheros QCA9590-BR4B with Extended Temperature range			
Software Support	Open Source Linux Drivers <u>ath9k</u> for 11n models <u>OpenWRT</u> (Wireless Router/Linux OS)			
Center Frequency Range	902 MHz ~ 928 MHz			
Channel Bandwidth*	5 MHz			
Radio Modulation (Auto Adjust)	CCK, BPSK, QPSK, 16 QAM, and 64 QAM			
Data Rates Supported	<u>802.11 b/g</u> : 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48 and 54 Mbps (2.4 GHz) <u>802.11n</u> : MCS0-15			
802.11n version 2.0 Capabilities	Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Tx/Rx), Maximal ratio combining (MRC), Cyclic shift diversity (CSD), Frame aggregation, block ACK, 802.11e compatible bursting, Spatial multiplexing, cyclic-delay diversity (CDD), low-density parity check (LDPC), Space Time Block Code (STBC)			
Operating Modes	AP, STA and Adhoc modes to implement Point to Point, Point to multi Point, and Mesh networks			
MAC Protocol	TDD with Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)			
Wireless Error Correction	FEC, ARQ			
Wireless Data Security	128 bit AES, WEP, TKIP and WAPI hardware encryption. Support for IEEE 802.11d, e, h, i, k, r, v, w and time stamp standards			
FIPS Certification	Loop back mode to facilitate FIPS AES certification, Small packet size (96 bytes) in AES encryption at full packet rate			
Tx/Rx Specification	Radio Modulation	Coding Rate	Tx Power ( $\pm 2$ dBm)**	Rx Sensitivity (Typ)
<b>5 MHz Channel</b>				

802.11n	BPSK	1/2	27	-98
802.11n	16 QAM	3/4	27	-89
802.11n	64 QAM	3/4	21	-82

\* It is advantageous to use the smallest Channel Bandwidth that can support the Throughput requirements. Smaller bandwidths provide more channels to choose and help avoid interference issues. The system's SNR is higher at smaller Channel Bandwidths and Range is longer.

Antenna Signal Strength	-35 to -85 dBm (Recommended), Absolute Maximum=+12 dBm
Receiver LNA Gain	>10 dB
Receive chain Noise Figure	6 dB
RF Power control by Driver	In 0.5 dBm steps. Accuracy of power calibration loop $\pm 2$ dBm. Each transceiver individually calibrated and tested.
RF Hardware Disable (RF Kill)	Pin 20 of miniPCI-E interface. (Required for FAA compliance)
Control for External Power Amp	Available as an optional configuration
Receiver Adjacent Channel Rejection (ACR)	>18 dB @ 11a, 6 Mbps (Typ)
Receiver Alternate Channel Rejection (ALCR)	>35 dB @ 11a, 6 Mbps (Typ)
Transmitter Adjacent Channel Leakage power Ratio (ACLR)	45 dB ( $F_c \pm ChBW$ )
Transmitter Spurious Emission Suppression	-40 dBc

#### PHYSICAL, ENVIRONMENTAL AND OTHER SPECIFICATIONS

Antenna Ports	2 Ports (50 Ohms) with MMCX connectors
Integrated Antenna Port Protection	>20 KV (Human Body Model)
Host Interface	miniPCI-Express 1.2 Standard

Host CPU Board	Any CPU board with Industry standard miniPCI-Express interface with minimum 6 mm connector height
Operating Voltage	3.3 Volts from miniPCI-E interface for radio 6~42V for FES
Power Consumption	Total 6W (4W @ Max power for FES + 2W for radio module) in data transfer mode Total 2.5W (1.3W for FES + 1.5W for radio module) in data receive mode
Shield case temperature range (Operating)	-40°C to +85°C (Rugged, Long range NM-915-1G model) The System's thermal design should ensure that the transceiver's shield case temperature is maintained within these specifications. Prism-FES can be mounted away from the host CPU board for better thermal design
Cable Assembly	Assembly drawing available upon request. (Includes the harness with RF cable and DC power for initial samples)
Dimensions	1x 30 x 50 x 6 mm Radio module, 1x 60 x 56 x 6 mm FES module, Total 54 grams (1x14 + 1x40) Mechanical drawing and 3D-CAD files available upon request
Humidity (Operating)	0% – 95% (Non-condensing)
Regulatory Requirements	Designed and Verified to meet various regulatory requirements. Formal testing and approval is required based on the System Integrator's particular host platform and antenna type. The System Integrator is also responsible for obtaining all required regulatory approvals in target markets for the finished product. Doodle Labs can offer assistance for compliance testing of the System Integrator's host platform.
RoHS/WEEE Compliance	Yes. 100% Recyclable/Biodegradable packaging

\* Specifications are subject to change without prior notice.

## **FCC Statement**

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

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

## **IC Statement**

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The term "IC:" before the certification/registration number only signifies that the Industry Canada technical specifications were met. This product meets the applicable Industry Canada technical specifications.

Le présent appareil est conforme aux CNR d'Industrie Canada applicable aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage,

et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

## **FCC Radiation Exposure Statement**

The modular can be installed or integrated in mobile or fix devices only. This modular be installed in any portable device, for example, USB dongle like transmitters is forbidden. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be collocated or operating in conjunction with antenna or transmitter. If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display label referring to the enclosed module. This exterior label can use wording such as the following:

"Contains Transmitter Module FCC ID: 2AG87NM-915-2H Or Contains FCC ID: 2AG87NM-915-2H when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. 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.
- (2) This device must accept any interference received, including interference that may undesired operation.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and user.

2) The transmitter module may not be co-located with any other transmitter or antenna. And the Antenna Gain is 2dBi, the Antenna Type is R-SMA antenna.

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