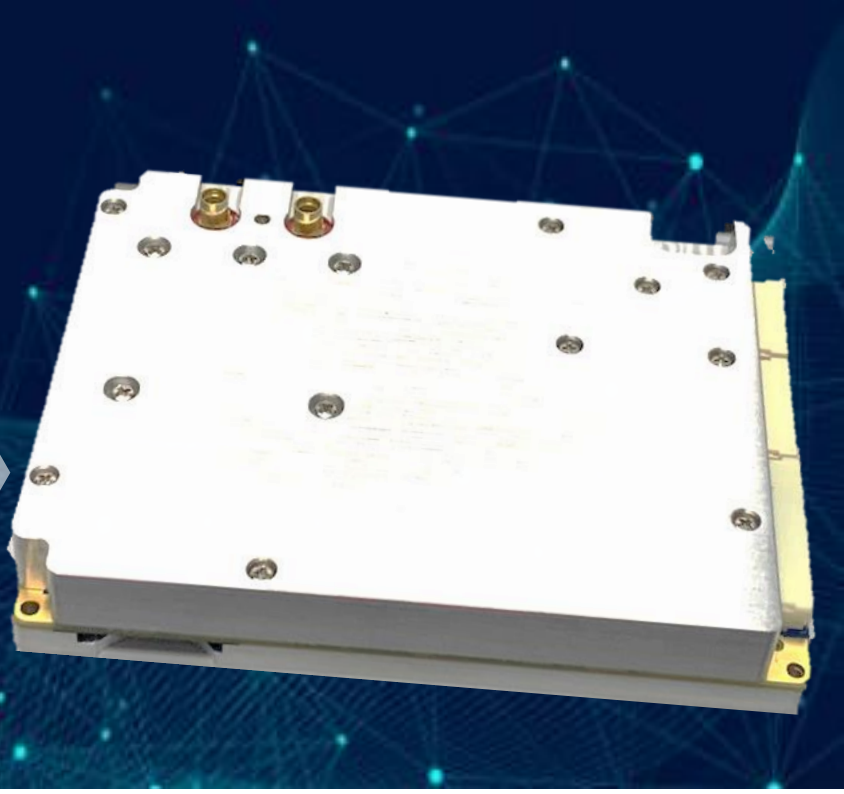
vizmo

FREEDOM FROM WIRES



DATASHEET

ES-N2N2-2409

IEEE 820.11 b/g/n

High-Performance, Dual independent Radio operating in ISM 2.4 GHz license-free Band and 900 MHz ISM Band

SWaP-C

Size, Weight, Power, Cost
Optimized Radio Module

Industrial grade

-40 deg C to +85 deg C operation temperature

dun & bradstreet

Business Eminence Awards 2020 Singapore

VIZMONET PTE LTD

21 Woodlands Close, #03-01, Primz Biz Hub, Singapore 737 854
+65 6255 0581 | enquiry@vizmonet.com| www.vizmonet.com

TECHNICAL SPECIFICATION

RADIO MODULE – GENERAL INFO	
11 b/g/n Radio chipset 11 a/n Radio chipset	QCA 9550-AT4B (CPU) & AR 8033-AL1B (Ethernet PHY) AR 9592-AR1B
NOR Flash NAND Flash RAM	SPI Flash, 16MB NAND Flash, 256 MB DDR2, 200 MHz, 256 MB (64Mx16x2)
Operating frequency – 11 b/g/n Operating frequency – 11 b/g/n	2300 MHz to 2700 MHz (Operating frequency range) 902 MHz to 928 MHz (Operating frequency range)
Data rate-11n HT20/HT40-1S (SISO) Data rate-11n HT20/HT40-2S (MIMO)	6Mbps, 9Mbps, 12Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps (11a) MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7 (11n) MCS8, MCS9, MCS10, MCS11, MCS12, MCS13, MCS14, MCS15 (11n)
Channel BW – 2.4 GHz Channel BW – 900 MHz	5 MHz/10 MHz/20 MHz /40 MHz 5 MHz/10 MHz/20 MHz
RoHS Compliance	Compliant
INTERFACE SPECIFICATIONS	
Power in	Power Over Ethernet
Operating Voltage	9V to 30V
RF Antenna connector	x4 MMCX Female (Jack) connectors
ENVIRONMENTAL SPECIFICATIONS	
Operating Temperature Range	-40 deg C to +85 deg C
PHYSICAL SPECIFICATIONS	
Mechanical Dimension	(L) 86 mm x (W) 65 mm x (D) 16.3 mm
Weight	115 g
REGULATORY INFORMATION	
Compliance	TBD
PACKAGING INFORMATION	
No of units	TBD

ORDERING INFORMATION	
ES-N2N2-2409	Embedded System-in-Module, Dual Independent, MIMO, IEEE 802.11 b/g/n, 2.4 GHz, 900 MHz Bands, 29 dBm
EVK-ES-N2N2-2409	EVK, Embedded System-in-Module, Dual Independent, MIMO, IEEE 802.11 a/b/g/n, 2.4 GHz, 5 GHz Bands, 29 dBm

RADIO SPECIFICATION

TX/RX Specification – 2412 MHz to 2462 MHz

TX Power and Sensitivity Tolerance = +/- 2 dBm

Data Rate	TX Power per chain (dBm)	Current 24V (A)	RX Sensitivity (dBm)
54 Mbps	21	0.290	-80
48 Mbps	22	0.300	-81
36 Mbps	24	0.320	-88
24 Mbps	26	0.360	-89
18 Mbps	26	0.360	-92
12Mbps	26	0.360	-94
9 Mbps	26	0.360	-95
6 Mbps	26	0.360	-96
11 Mbps	26	0.360	-91
5.5 Mbps	26	0.360	-96
2 Mbps	26	0.360	-98
1 Mbps	26	0.360	-99
HT20-MCS7	19	0.270	-74
HT20-MCS6	20	0.280	-75
HT20-MCS5	24	0.320	-76
HT20-MCS4	25	0.350	-81
HT20-MCS3	25	0.350	-85
HT20-MCS2	25	0.350	-89
HT20-MCS1	25	0.350	-91
HT20-MCS0	25	0.350	-93
HT40-MCS7	19	0.270	-71
HT40-MCS6	20	0.280	-72
HT40-MCS5	24	0.320	-73
HT40-MCS4	25	0.350	-78
HT40-MCS3	25	0.350	-82
HT40-MCS2	25	0.350	-86
HT40-MCS1	25	0.350	-88
HT40-MCS0	25	0.350	-90

TX/RX Specification – 902 MHz to 928 MHz

Sensitivity tested in ART Mode, PSR >=95%, Chain0+Chain1
TX Power Setting = Calibrated Power level in dBm

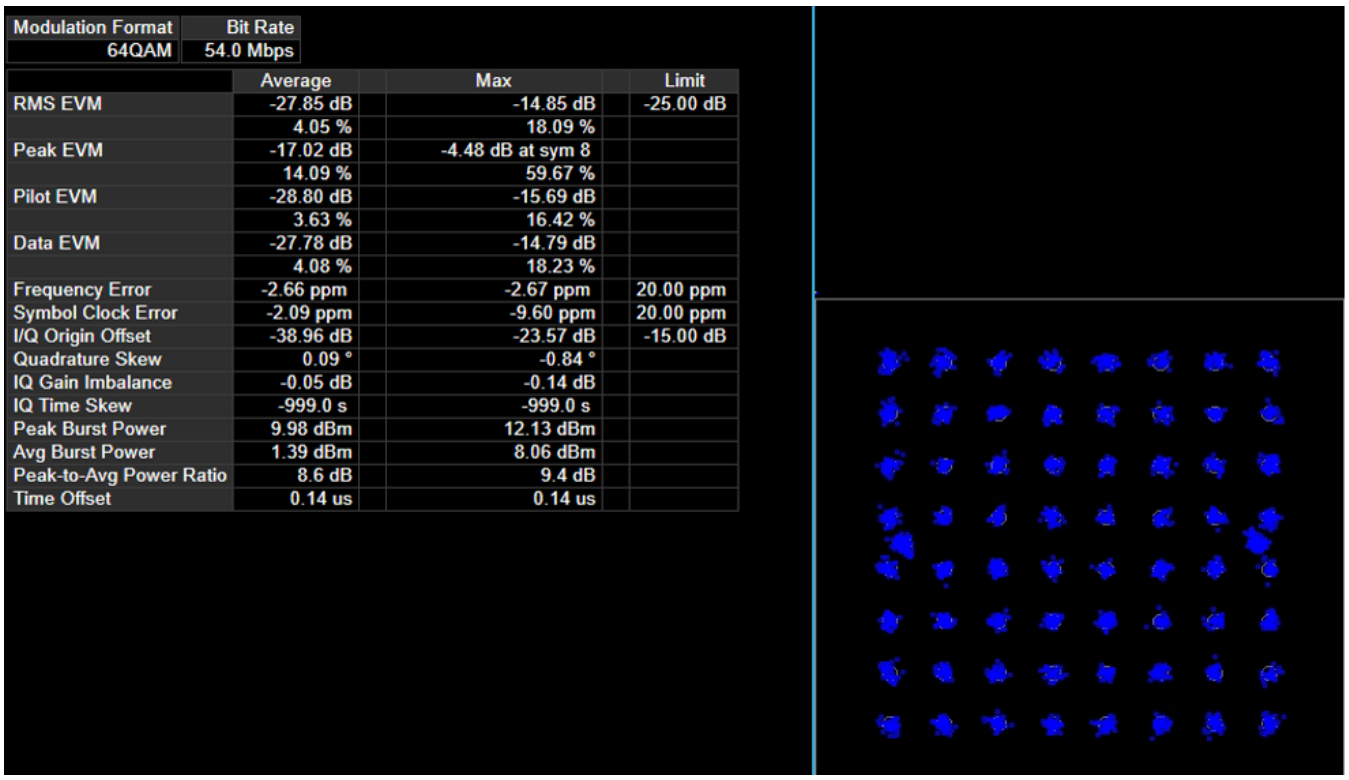
Data Rate	TX Power per chain (dBm)	Current 24V (A)	RX Sensitivity (dBm)
54 Mbps	19	0.19	-77
48 Mbps	20	0.20	-80
36 Mbps	22	0.22	-82
24 Mbps	23	0.23	-85
18 Mbps	23	0.23	-87
12Mbps	23	0.23	-89
9 Mbps	23	0.23	-92
6 Mbps	23	0.23	-94
HT20-MCS7	18	0.19	-71
HT20-MCS6	19	0.19	-74
HT20-MCS5	20	0.20	-75
HT20-MCS4	22	0.22	-79
HT20-MCS3	23	0.23	-82
HT20-MCS2	23	0.23	-86
HT20-MCS1	23	0.23	-88
HT20-MCS0	26	0.27	-92
HT40-MCS7	18	0.19	-68
HT40-MCS6	19	0.19	-71
HT40-MCS5	20	0.20	-72
HT40-MCS4	22	0.22	-76
HT40-MCS3	23	0.23	-79
HT40-MCS2	23	0.23	-83
HT40-MCS1	23	0.23	-85
HT40-MCS0	26	0.27	-89

Channel Mapping – 902 MHz to 928 MHz

BASE BAND (MHz)	OP FREQ (MHz)	CH BW (MHz)	STANDARD (11b/g/n)
2427	907	5/10	11g/n
2432	912	5/10/20	11b/g/n
2437	917	5/10/20	11b/g/n
2442	922	5/10	11g/n

EVM PERFORMANCE

Frequency = 912 MHz, 802.11g, 54 Mbps

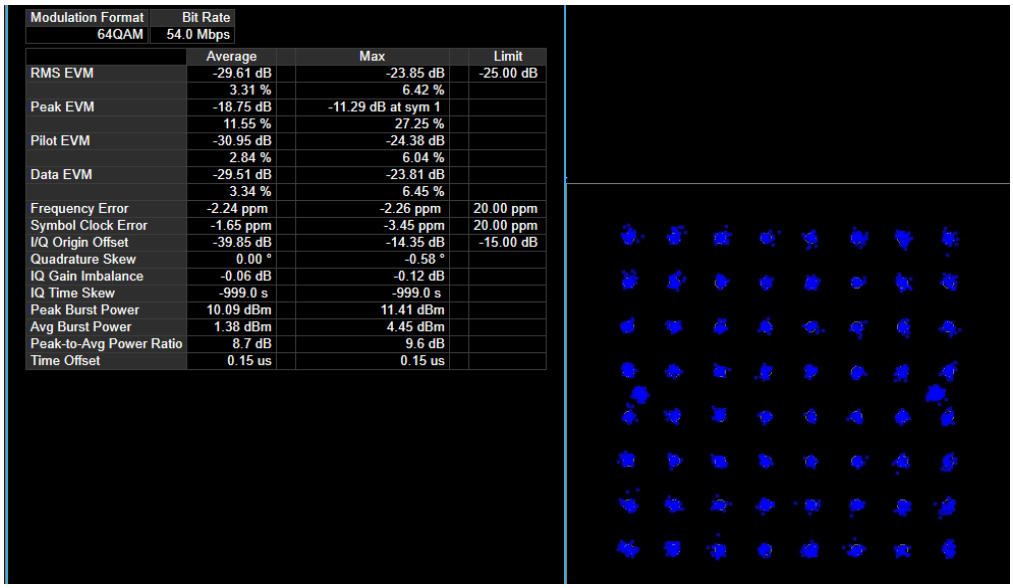


Channel Mapping – 902 MHz to 928 MHz

BASE BAND (MHz)	OP FREQ (MHz)	CH BW (MHz)	STANDARD (11b/g/n)
2427	907	5/10	11g/n
2432	912	5/10/20	11b/g/n
2437	917	5/10/20	11b/g/n
2442	922	5/10	11g/n

EVM PERFORMANCE

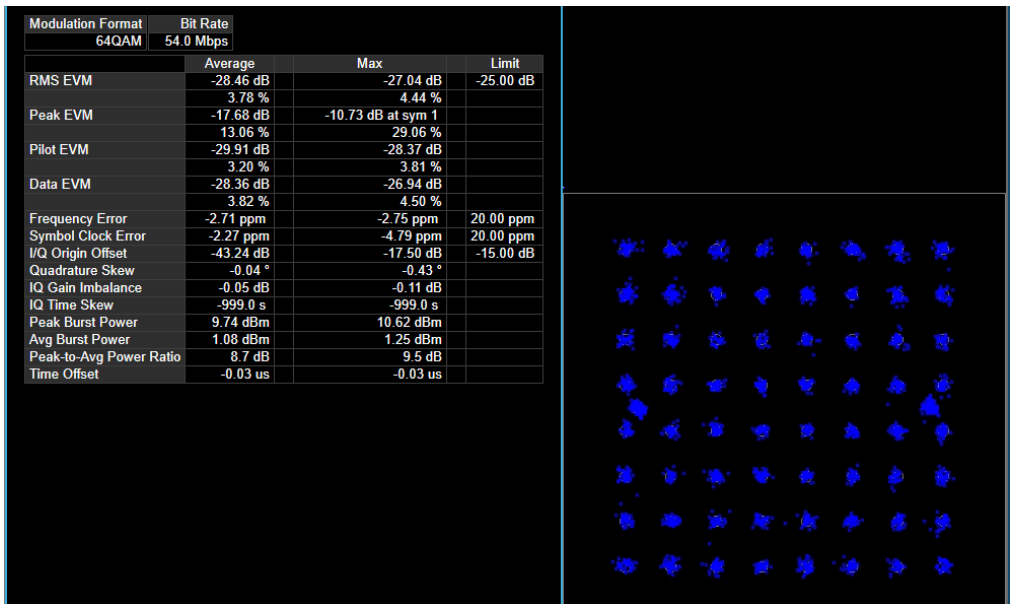
Frequency = 912 MHz, 802.11g, 54 Mbps, CH0



Modulation Format	Bit Rate
64QAM	54.0 Mbps

	Average	Max	Limit
RMS EVM	-29.61 dB	-23.85 dB	-25.00 dB
	3.31 %	6.42 %	
Peak EVM	-18.75 dB	-11.29 dB at sym 1	
	11.55 %	27.25 %	
Pilot EVM	-30.95 dB	-24.38 dB	
	2.84 %	6.04 %	
Data EVM	-29.51 dB	-23.81 dB	
	3.34 %	6.45 %	
Frequency Error	-2.24 ppm	-2.26 ppm	20.00 ppm
Symbol Clock Error	-1.65 ppm	-3.45 ppm	20.00 ppm
I/Q Origin Offset	-39.85 dB	-14.35 dB	-15.00 dB
Quadrature Skew	0.00 °	-0.58 °	
IQ Gain Imbalance	-0.06 dB	-0.12 dB	
IQ Time Skew	-999.0 s	-999.0 s	
Peak Burst Power	10.09 dBm	11.41 dBm	
Avg Burst Power	1.38 dBm	4.45 dBm	
Peak-to-Avg Power Ratio	8.7 dB	9.6 dB	
Time Offset	0.15 us	0.15 us	

Frequency = 912 MHz, 802.11g, 54 Mbps, CH1



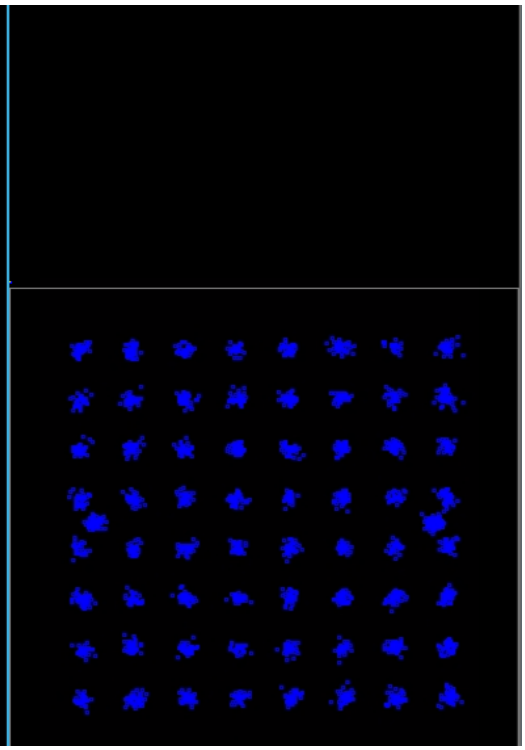
Modulation Format	Bit Rate
64QAM	54.0 Mbps

	Average	Max	Limit
RMS EVM	-28.46 dB	-27.04 dB	-25.00 dB
	3.78 %	4.44 %	
Peak EVM	-17.68 dB	-10.73 dB at sym 1	
	13.06 %	29.06 %	
Pilot EVM	-29.91 dB	-28.37 dB	
	3.20 %	3.81 %	
Data EVM	-28.36 dB	-26.94 dB	
	3.82 %	4.50 %	
Frequency Error	-2.71 ppm	-2.75 ppm	20.00 ppm
Symbol Clock Error	-2.27 ppm	-4.79 ppm	20.00 ppm
I/Q Origin Offset	-43.24 dB	-17.50 dB	-15.00 dB
Quadrature Skew	-0.04 °	-0.43 °	
IQ Gain Imbalance	-0.05 dB	-0.11 dB	
IQ Time Skew	-999.0 s	-999.0 s	
Peak Burst Power	9.74 dBm	10.62 dBm	
Avg Burst Power	1.08 dBm	1.25 dBm	
Peak-to-Avg Power Ratio	8.7 dB	9.5 dB	
Time Offset	-0.03 us	-0.03 us	

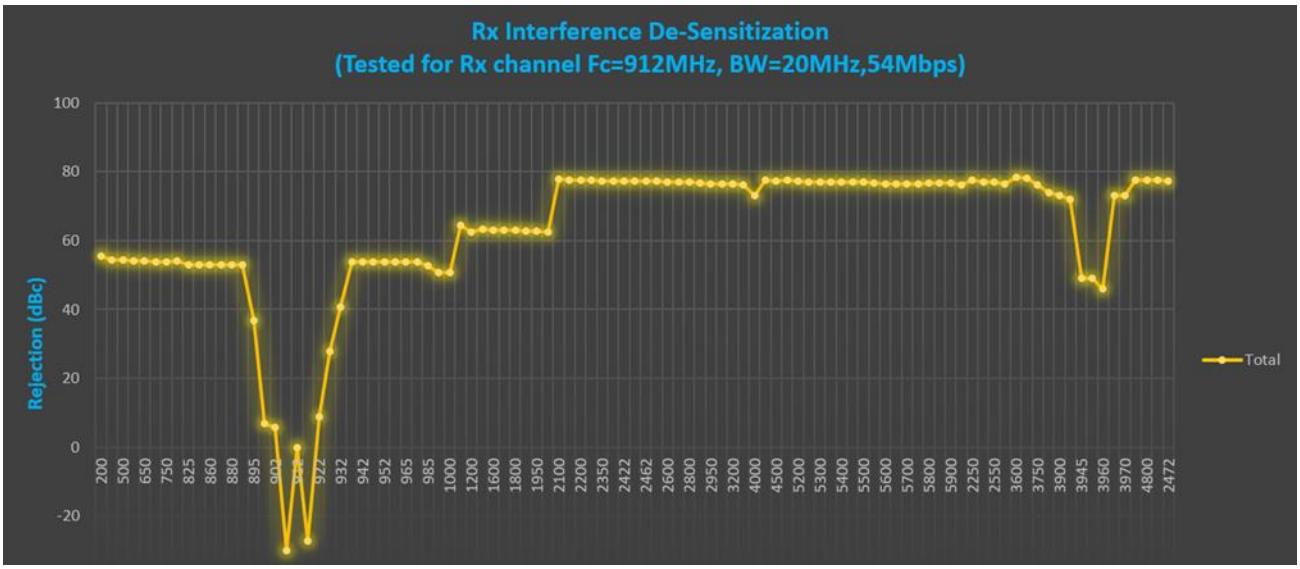
Frequency = 912 MHz, 802.11n, MCS0 (65Mbps)

Modulation Format	Bit Rate
64QAM	65.0 Mbps

	Average	Max	Limit
RMS EVM	-28.50 dB	-27.53 dB	-27.00 dB
	3.76 %	4.20 %	
Peak EVM	-17.67 dB	-15.36 dB at sym 36	
	13.08 %	17.06 %	
Pilot EVM	-29.55 dB	-28.16 dB	
	3.33 %	3.91 %	
Data EVM	-28.43 dB	-27.47 dB	
	3.79 %	4.23 %	
Frequency Error	-2.83 ppm	-2.85 ppm	25.00 ppm
Symbol Clock Error	-3.11 ppm	-5.86 ppm	25.00 ppm
I/Q Origin Offset	-48.50 dB	-44.45 dB	-15.00 dB
Quadrature Skew	0.47 °	0.63 °	
IQ Gain Imbalance	0.00 dB	-0.03 dB	
IQ Time Skew	43.67 ps	87.44 ps	
Peak Burst Power	9.90 dBm	10.85 dBm	
Avg Burst Power	1.10 dBm	1.19 dBm	
Peak-to-Avg Power Ratio	8.8 dB	9.8 dB	
Time Offset	0.15 us	0.15 us	



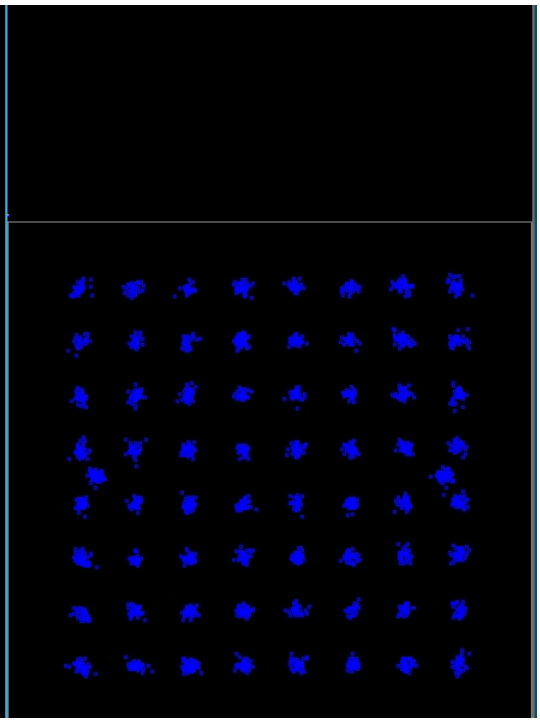
Interference Desensitization



Frequency = 912 MHz, 802.11n, MCS0 (65Mbps), CH0

Modulation Format	Bit Rate
64QAM	65.0 Mbps

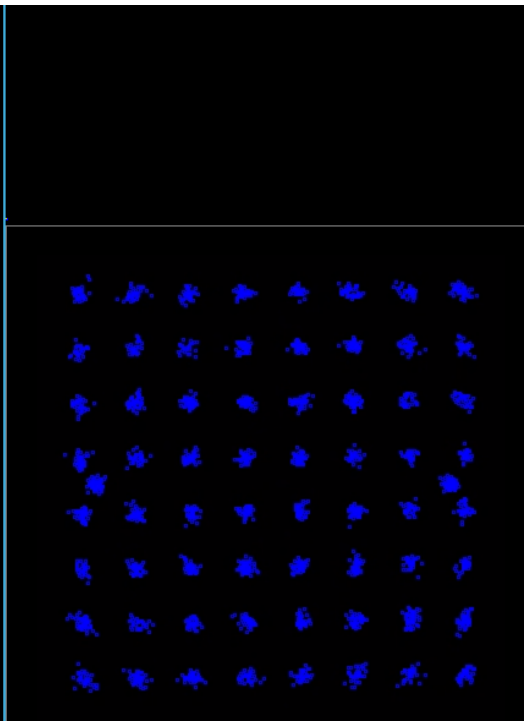
	Average	Max	Limit
RMS EVM	-29.52 dB	-28.29 dB	-27.00 dB
	3.34 %	3.85 %	
Peak EVM	-19.15 dB	-16.00 dB at sym 12	
	11.03 %	15.85 %	
Pilot EVM	-30.81 dB	-29.22 dB	
	2.88 %	3.46 %	
Data EVM	-29.44 dB	-28.17 dB	
	3.37 %	3.90 %	
Frequency Error	-2.85 ppm	-2.88 ppm	25.00 ppm
Symbol Clock Error	-2.63 ppm	-5.15 ppm	25.00 ppm
I/Q Origin Offset	-31.99 dB	-30.70 dB	-15.00 dB
Quadrature Skew	0.23 °	0.39 °	
IQ Gain Imbalance	-0.10 dB	-0.12 dB	
IQ Time Skew	1.947 ps	72.25 ps	
Peak Burst Power	10.23 dBm	11.15 dBm	
Avg Burst Power	1.46 dBm	1.58 dBm	
Peak-to-Avg Power Ratio	8.8 dB	9.7 dB	
Time Offset	0.18 us	0.18 us	



Frequency = 912 MHz, 802.11n, MCS0 (65Mbps), CH0

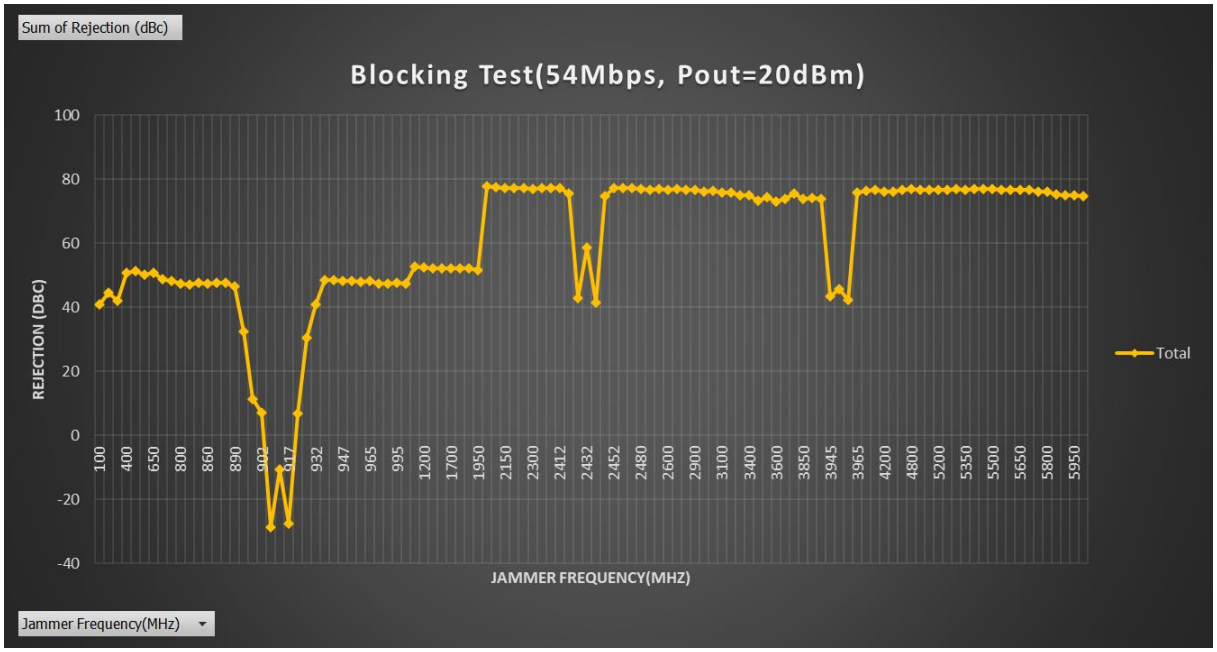
Modulation Format	Bit Rate
64QAM	65.0 Mbps

	Average	Max	Limit
RMS EVM	-28.76 dB	-27.07 dB	-27.00 dB
	3.65 %	4.43 %	
Peak EVM	-17.82 dB	-14.14 dB at sym 41	
	12.86 %	19.63 %	
Pilot EVM	-30.10 dB	-28.52 dB	
	3.13 %	3.75 %	
Data EVM	-28.68 dB	-26.97 dB	
	3.68 %	4.48 %	
Frequency Error	-2.64 ppm	-2.67 ppm	25.00 ppm
Symbol Clock Error	-2.29 ppm	-5.97 ppm	25.00 ppm
I/Q Origin Offset	-38.11 dB	-17.50 dB	-15.00 dB
Quadrature Skew	0.32 °	0.51 °	
IQ Gain Imbalance	-0.06 dB	-0.10 dB	
IQ Time Skew	107.7 ps	193.1 ps	
Peak Burst Power	9.72 dBm	10.74 dBm	
Avg Burst Power	1.04 dBm	1.19 dBm	
Peak-to-Avg Power Ratio	8.7 dB	9.6 dB	
Time Offset	-0.15 us	-0.15 us	



Interference Desensitization

Frequency = 912 MHz, 802.11n, MCS0 (65Mbps), CH0+CH1



Data rate vs Attenuation (MIMO)

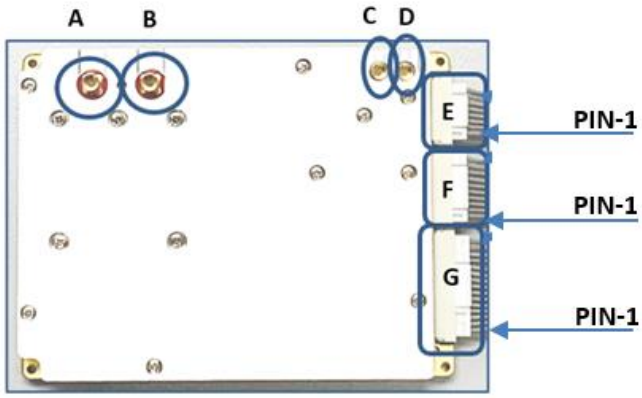
Frequency = 912 MHz, 802.11 b/g/n mode, MIMO

Att (dB)	BW (MHz)	WR (Mbps)	BW (MHz)	WR (Mbps)	BW (MHz)	WR (Mbps)
86	20	144.4	10	72.2	5	36.1
106	20	57.7	10	39	5	19.5
120	20	11	10	7.2	5	3.6

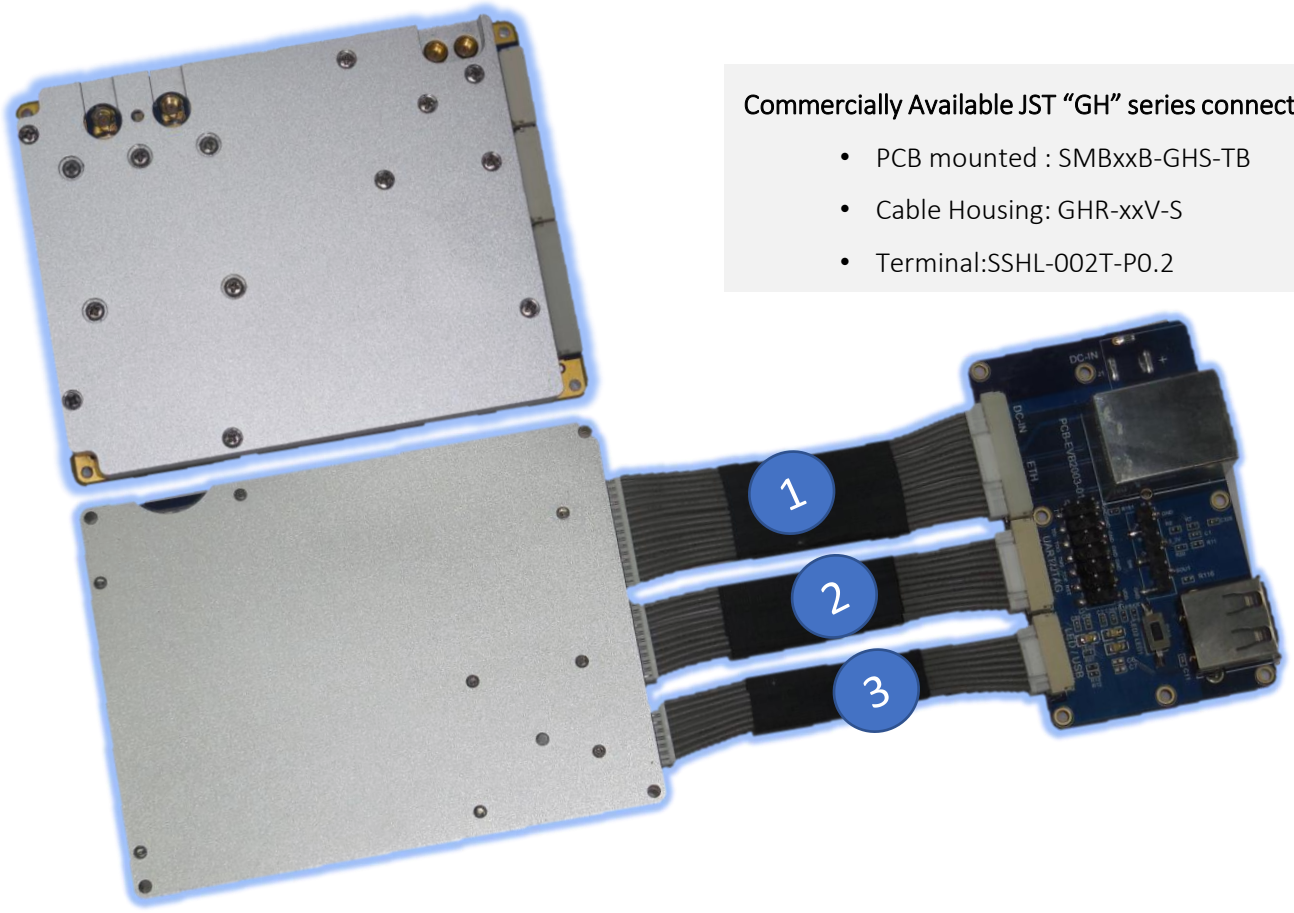
Legends
Att – RF Attenuation between Transmitter and Receiver
BW – Channel Bandwidth
WR – Working Rate

CONNECTOR PIN OUT

PIN#	PIN DESCRIPTION
A	900 MHz Ant-0
B	900 MHz Ant-1
C	2.4 GHz Ant-0
D	2.4 GHz Ant-1
E-Pin1	UART_SOUT
E-Pin2	UART_SIN
E-Pin3	3.3V
E-Pin4	2.5V
E-Pin5	RST_B
E-Pin6	EJTAG-TCK
E-Pin7	EJTAG-TDI
E-Pin8	EJTAG-TDO
E-Pin9	EJTAG-TMS
E-Pin10	EJTAG-TCK
F-Pin1	5V
F-Pin2	GND
F-Pin3	LED0
F-Pin4	LED1
F-Pin5	LED2
F-Pin6	SWRST
F-Pin7	USB_DM
F-Pin8	USB_DP
G-Pin1	POE_POWER
G-Pin2	POE_POWER
G-Pin3	POE_POWER
G-Pin4	GND
G-Pin5	GND
G-Pin6	GND
G-Pin7	SHIELD GND
G-Pin8	MDI_3-
G-Pin9	MDI_3+
G-Pin10	MDI_2-
G-Pin11	MDI_2+
G-Pin12	MDI_1-
G-Pin13	MDI_1+
G-Pin14	MDI_0-
G-Pin15	MDI_0+



EVALUATION KIT

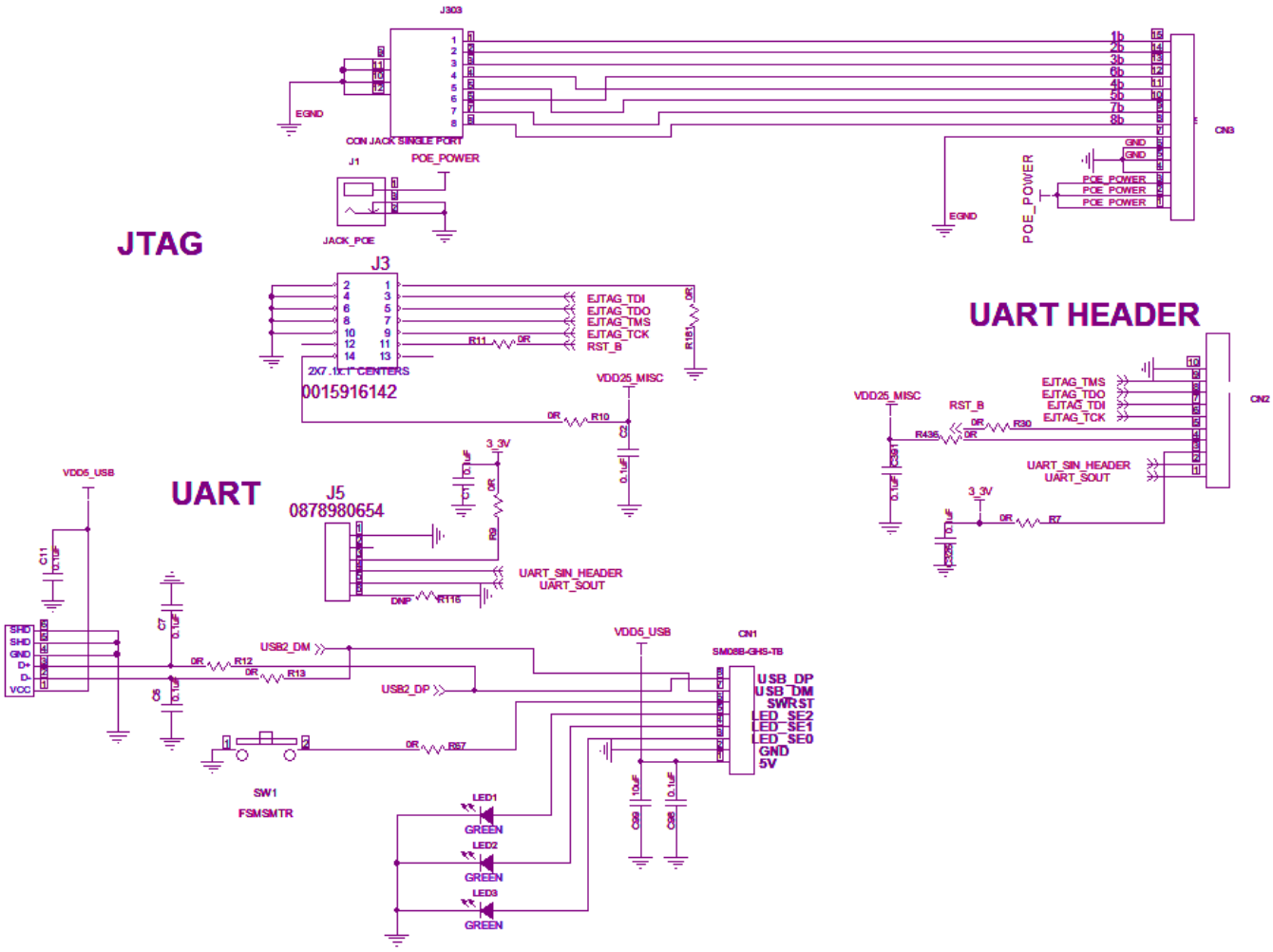


Commercially Available JST "GH" series connectors

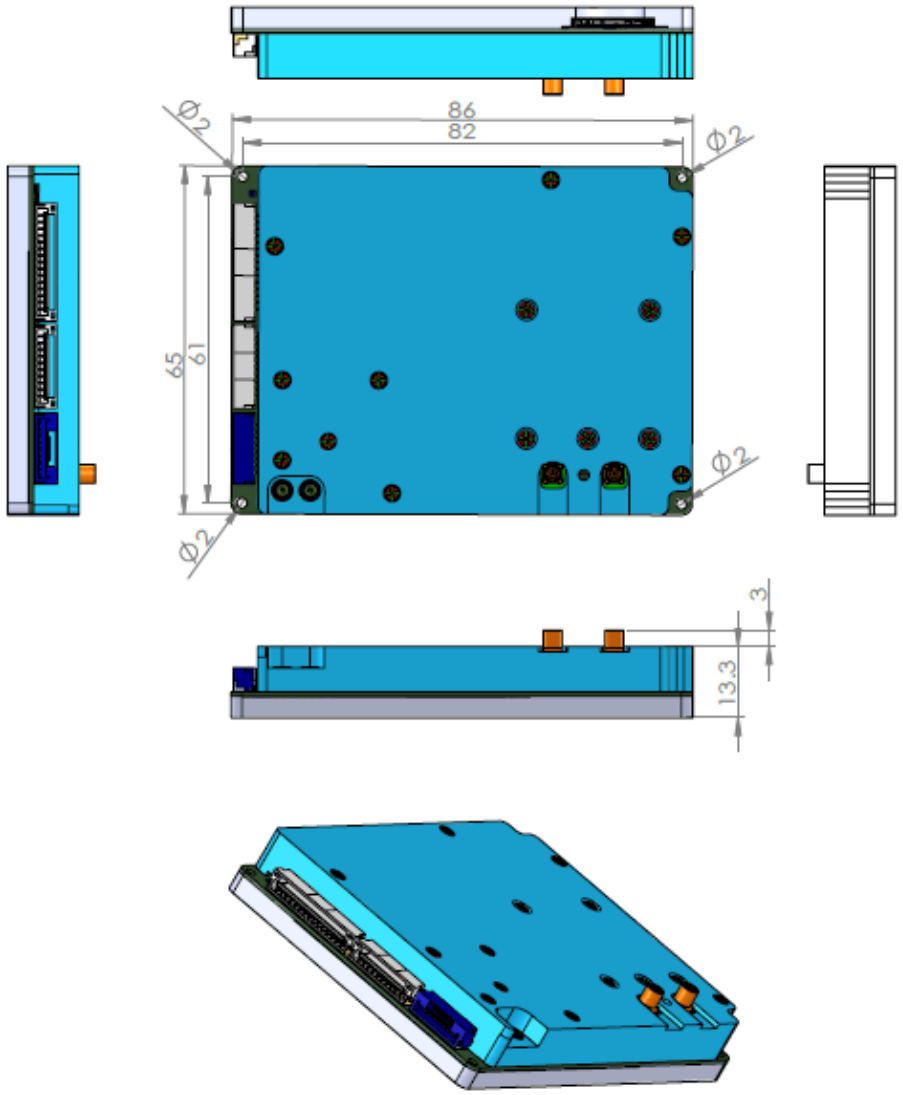
- PCB mounted : SMBxxB-GHS-TB
- Cable Housing: GHR-xxV-S
- Terminal:SSHL-002T-P0.2

PCB Mounted : JST SM15B-GHS-TB Cable Housing: JST GHR-15V-S Terminal: SSHL-002T-P0.2	1	Ethernet Data/POE in (Power)
PCB Mounted : JST SM10B-GHS-TB Cable Housing: JST GHR-10V-S Terminal: SSHL-002T-P0.2	2	LED, RESET SW, USB Data
PCB Mounted : JST SM08B-GHS-TB Cable Housing: JST GHR-08V-S Terminal: SSHL-002T-P0.2	3	UART, EJTAG

EVAL BOARD SCHEMATIC



MECHANICAL DIMENSIONS



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FREEDOM FROM WIRES

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