

MWC-2143 Datasheet

Revision 1.0.2303

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1. Introduction

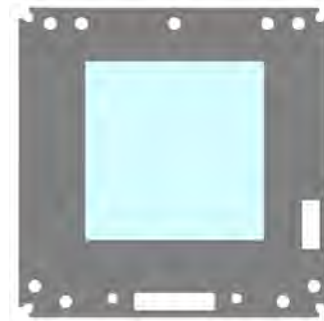
1.1 Summary

The MWC-2143 is a complete USB 3.0 to 802.11ad module with advanced features for long range , outdoor applications. It utilizes the 802.11ad 60 GHz phased array chipset which includes a baseband processor and a high-power mmWave beamforming transceiver RFIC.

The MWC-2143 incorporates a 64-element phased array antenna. This antenna is integrated into the PCB and provides uniform performance over the entire 802.11ad band from 57 to 71 GHz.

The Baseband processor is the PRS4601-B2E. This provides all MAC and PHY layer functionality necessary for 802.11ad operation and supports point - to-point or point-to-multipoint capability.

The PRS1165 RFIC provides 16 RF chains with high transmit power levels. It supports all 6 of the 802.11ad/ay defined channels.



1.2 Features

- 57 to 71 GHz operation
- 64-element PCB integrated antenna
- 40 dBm EIRP
- Total system DC power
 - Tx 11.75 W (QPSK)
 - Rx 4.5 W (QPSK)
- Automatic rate adaptation
- Dynamic beamforming
- Automatic calibrations
- Integrated power management
- 802.11ad MAC and PHY compliance
- -91 dBm receive sensitivity @MCS1
- 3 Gbps maximum data rate*
- pi/2-BPSK, p/2-QPSK modulation support
- AES 128 bit data encryption
- Directional Beam Scan and Connect (DBSC)
- STA focus
- 1PPS synchronization support*

1.3 Applications

- mmWave point-to-point small cell backhaul links
- PtMP fixed wireless access
- High performance 60 GHz access points and clients

1.4 Abbreviations and Acronym Definitions

BB	Baseband
MIB	Management Information Base
EIRP	Equivalent Isotropic Radiated Power
EMI	Electromagnetic Interference
PtP	Point to point
PtMP	Point to multipoint
BPSK	Binary phase shift key modulation
QPSK	Quadrature phase shift key modulation
QAM	Quadrature Amplitude Modulation
HPBW	Half power beamwidth
BW	Bandwidth
RSSI	Received Signal Strength Indicator
SNR	Signal to Noise Ratio
DMG-TM / DMG	Directional Multi-Gigabit Test Mode
HBM	Human Body Model

1.5 Common RF Parameters

The MWC-2143 can be tuned 802.11ad/ay Channels 1-6. Refer to Table 1-1 for the channels and center frequencies.

Table 1-1: IEEE 802.11ad/ay Channels and Center Frequencies

Channel	Center Frequency (GHz)	Frequency Range (GHz)
Channel 1	58.32	57.24 – 59.40
Channel 2	60.48	59.40 – 61.56
Channel 3	62.64	61.56 – 63.72
Channel 4	64.80	63.72 – 65.88
Channel 5	66.96	65.88 – 68.04
Channel 6	69.12	68.04 – 70.2

Table 1-2: Modulation Code and Raw PHY Data Rates

MCS Index	Modulation	Code Rate	PHY Data Rate (Mbps)
MCS0	DBPSK	1/2	27.5
MCS1	$\Pi/2$ BPSK	1/2	385
MCS2	$\Pi/2$ BPSK	1/2	770
MCS3	$\Pi/2$ BPSK	5/8	962.5
MCS4	$\Pi/2$ BPSK	3/4	1155
MCS5	$\Pi/2$ BPSK	13/16	1251.25
MCS6	$\Pi/2$ QPSK	1/2	1540
MCS7	$\Pi/2$ QPSK	5/8	1925
MCS8	$\Pi/2$ QPSK	3/4	2310
MCS9	$\Pi/2$ QPSK	13/16	2502.5

2. Product Overview

2.1 General Description

The MWC-2143 operates from a single 5V supplied through the connector. The MWC-2143 provides all of the functionality of a multi-gigabit wireless transceiver compliant with the 802.11ad standard, supporting the complete solution from SuperSpeed USB connectivity to 60GHz wireless functionality.

The integrated 64-element antenna performs beamforming. This antenna can also operate with a quasi-omnidirectional antenna pattern. This module is not suitable for use with a dish reflector antenna.

No factory calibration is required, as all calibration is performed at run-time.

This module meets the compliance requirements of European Union Directive 2011/65/EU (RoHS).

3. Specifications

3.1 Antenna Specifications

This section gives the specifications for the MWC-2143 antenna. Unless otherwise noted, all DC specifications are at 25 °C ambient, with the PRS4601 B2E and PRS1165 junction temperature at 65 °C.

Table 3-1: Performance Parameters of the MWC-2143

Parameter/Pin	Conditions	Value	Units
Beam Steerability in Elevation and Azimuth	16 -elements active	+/-20°	deg
EIRP	T _{amb} =25°C, MCS9, 16-elements active	39	dBm
Antenna Gain		20	dBi

3.2 Receiver Specifications

Table 3-8 shows the boresight sensitivity, as measured at the reference plane between the antenna and the RF input of the radio IC. .

Table 3-2: Boresight Sensitivity

Channel	MCS	Conditions	Min	Typ	Max	Units
Channel 1	MCS9	Boresight beam		-60		dBm
	MCS4	Boresight beam		-69		dBm
	MCS1	Boresight beam		-70		dBm
Channel 2	MCS9	Boresight beam		-61		dBm
	MCS4	Boresight beam		-67		dBm
	MCS1	Boresight beam		-69		dBm
Channel 3	MCS9	Boresight beam		-61		dBm
	MCS4	Boresight beam		-68		dBm
	MCS1	Boresight beam		-69		dBm
Channel 4	MCS9	Boresight beam		-57		dBm
	MCS4	Boresight beam		-70		dBm
	MCS1	Boresight beam		-72		dBm
Channel 5	MCS9	Boresight beam		-61		dBm
	MCS4	Boresight beam		-68		dBm
	MCS1	Boresight beam		-68		dBm
Channel 6	MCS9	Boresight beam		-61		dBm
	MCS4	Boresight beam		-67		dBm
	MCS1	Boresight beam		-69		dBm

4. Typical Performance Characteristics

Unless otherwise noted, all specifications are at 25 °C (65 °C junction).

4.1 Typical Antenna Performance

Figure 4-1 to Figure 4-6 show integrated plots for the antenna gain and the drop from peak gain for all channels.

For the 2D surface plots showing gain drop from peak – Green: 0-3 dB drop; Yellow:3-6 dB drop; Blue:6-8 dB drop.

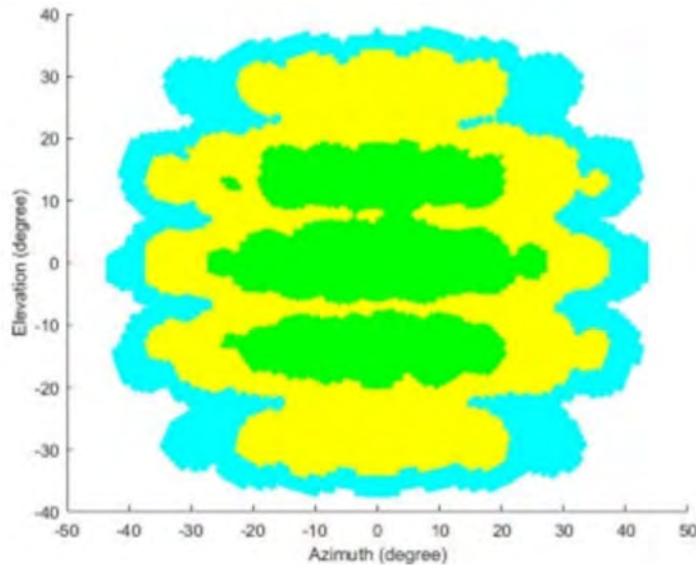


Figure 4-1: 2D surface plot showing gain drop from peak for Ch. 1

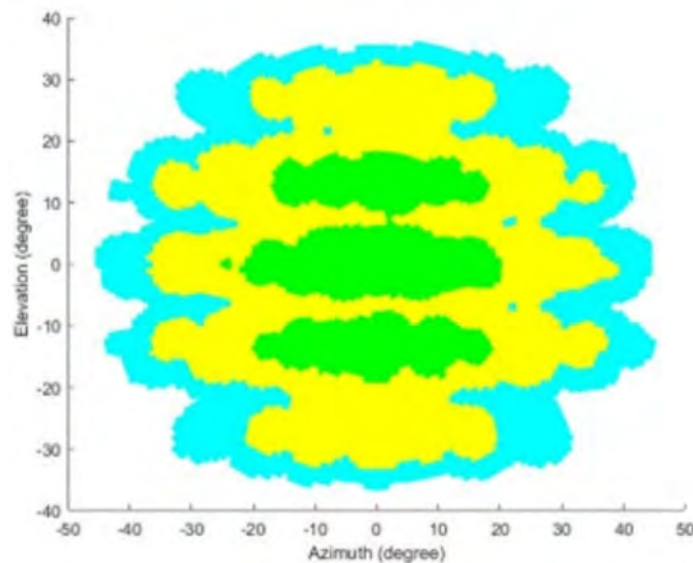


Figure 4-2 : 2D surface plot showing gain drop from peak for Ch. 2

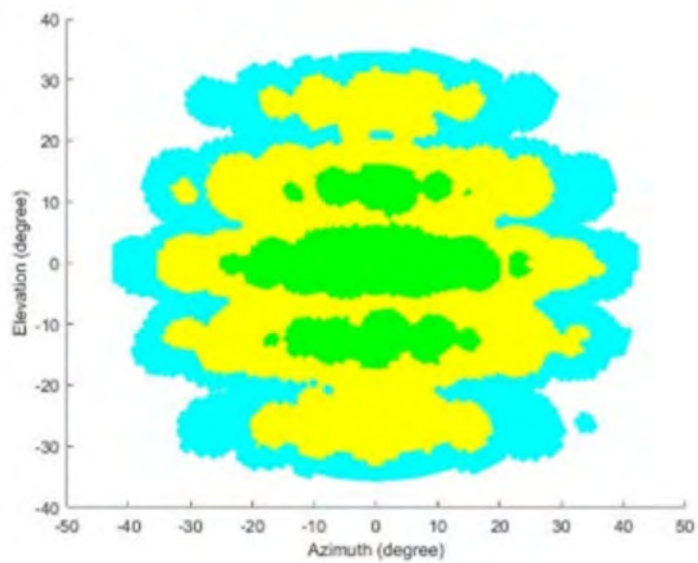


Figure 4-3: 2D surface plot showing gain drop from peak for Ch. 3

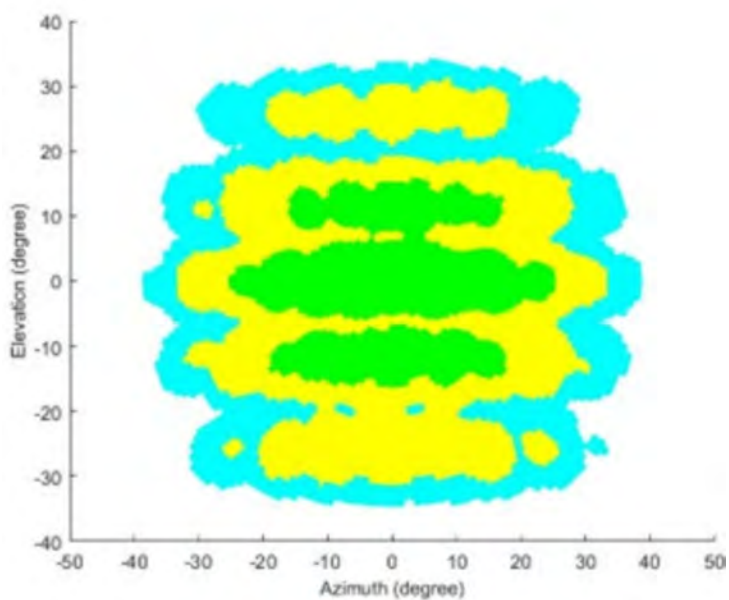


Figure 4-4: 2D surface plot showing gain drop from peak for Ch. 4

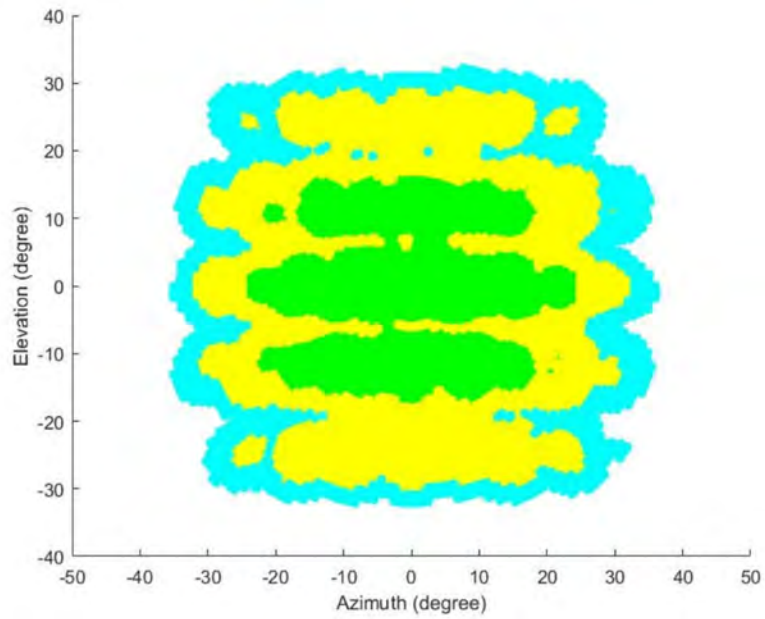


Figure 4-5: 2D surface plot showing gain drop from peak for Ch. 5

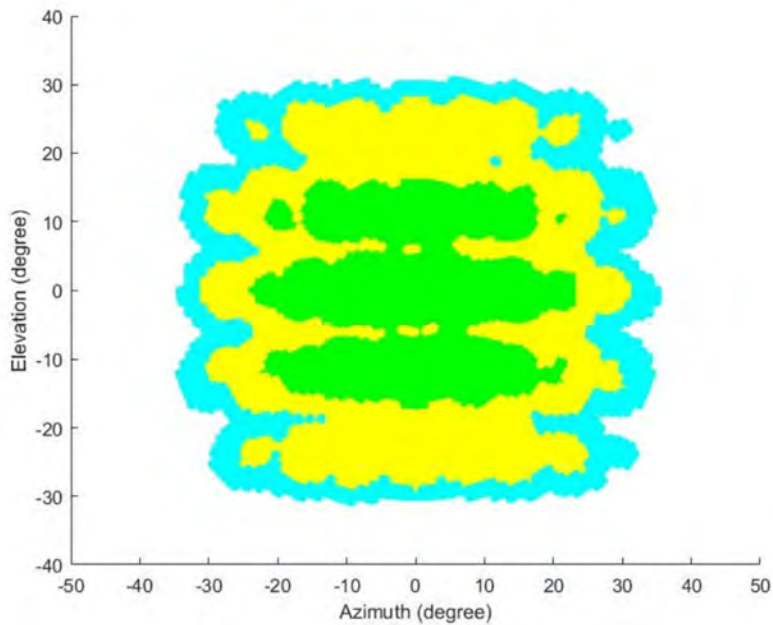


Figure 4-6: 2D surface plot showing gain drop from peak for Ch. 6

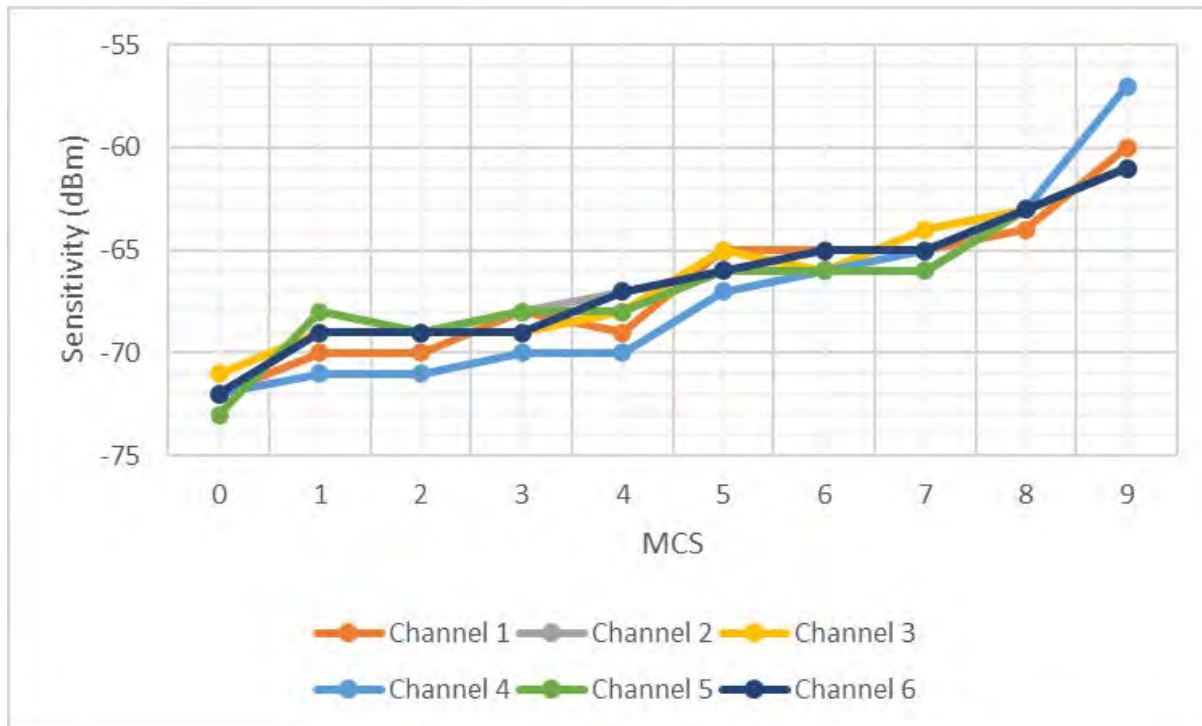


Figure 4-7: Sensitivity vs MCS for all channels

Table 4-1: Measured Sensitivity (dBm) for each

Channel	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
1	-72	-70	-70	-68	-69	-65	-65	-65	-64	-60
2	-72	-69	-69	-68	-67	-66	-66	-66	-63	-61
3	-71	-69	-69	-69	-68	-65	-66	-64	-63	-61
4	-72	-71	-71	-70	-70	-67	-66	-65	-63	-57
5	-73	-68	-69	-68	-68	-66	-66	-66	-63	-61
6	-72	-69	-69	-69	-67	-66	-65	-65	-63	-61

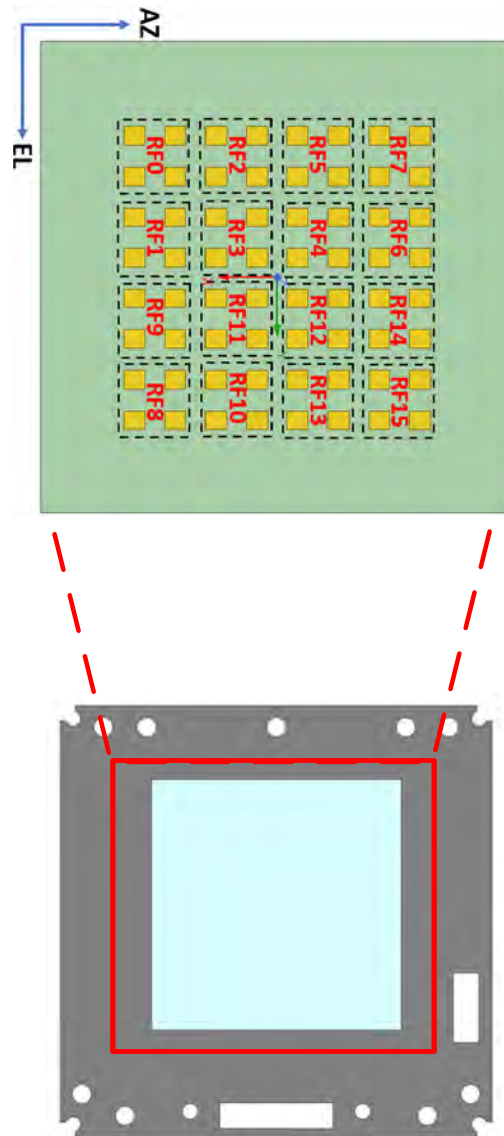


Figure 4-8: Diagram of the MWC-2143 64-element antenna and position on the module