



Regulatory Engineering

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# 7545MBWN SAR Test Proposal

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## EUT information

Product	OMNII - HANDHELD COMPUTER
FCC ID	H9PRA1202
This product contains 3 RF transmitters	
Transmitter 1 (UHF Narrow Band)	<ul style="list-style-type: none"><li>i. 403-435 MHz / max. output power: 30.4 dBm</li><li>ii. 435-470 MHz / max. output power: 30.4 dBm</li></ul> <p>Antenna: UHF 1 for TX and RX 403-435 MHz Antenna UHF 2 for TX and RX 435-470 MHz</p>
Transmitter 2 (WLAN)	<p>That was provided two transmission modes for selection that as the following:</p> <ul style="list-style-type: none"><li>IEEE 802.11b / max. average output power: 15.46 dBm</li><li>IEEE 802.11g / max. average output power: 14.24 dBm</li><li>IEEE 802.11a / max. average output power: 18.30 dBm</li><li>IEEE 802.11n/ max. average output power: 13.33 dBm</li></ul> <p>Antenna: WLAN1 for TX WLAN 2 used for RX diversity only</p>
Transmitter 3 (Bluetooth)	Bluetooth 2.1 EDR / max. output power: 4.64 dBm (GFSK)

# Operating condition

OMNII supporting:

- UHF FSK data
- WiFi 802.11abgn
- Bluetooth V.2.0 + EDR

UHF (403-435/435-470) can simultaneously transmit both WiFi (802,11abgn) & Bluetooth. Co-located modes as the table below:

Simultaneous Transmission Condition	UHF FSK 403-435 (data only) + WiFi abgn (data & voice) + Bluetooth V2.0 + EDR (data & voice)
	UHF FSK 435-470 (data only) + WiFi abgn (data & voice) + Bluetooth V2.0 + EDR (data & voice)

Supported positions:

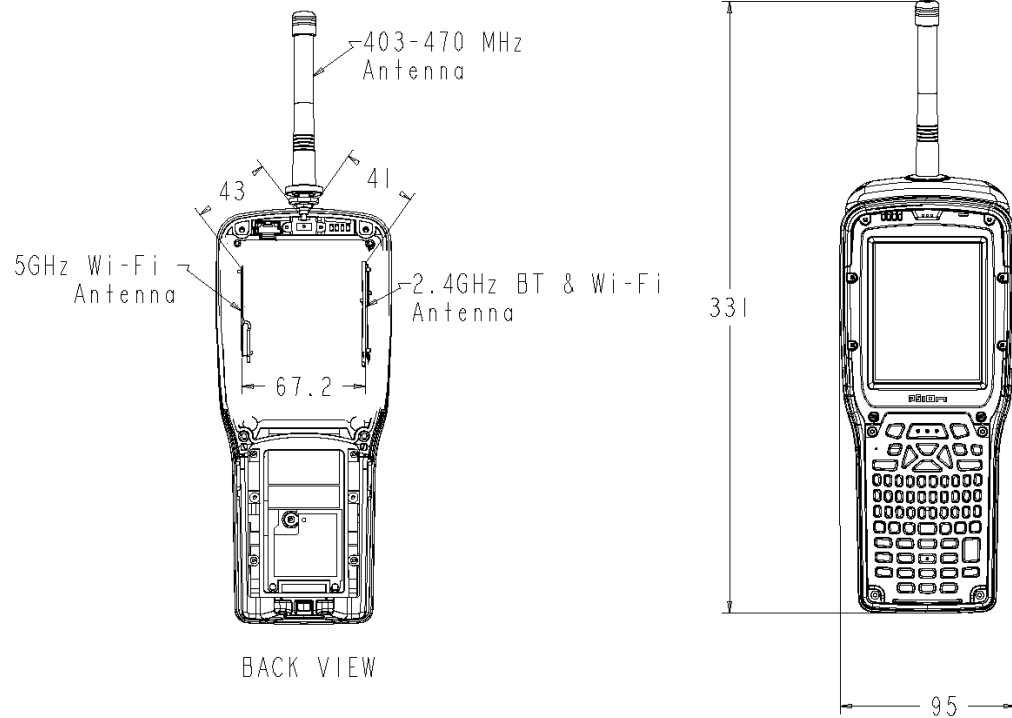
- 1) On belt with supported holsters (see below): UHF (data only) + WiFi (data & voice) + Bluetooth (data & voice)
- 2) Held in hand: UHF (data only) + WiFi (data & voice) + Bluetooth (data & voice)
- 3) Held to head: WiFi (data & voice) + Bluetooth (data & voice). Microphone/speaker disabled when UHF is transmitting. This prevents the user from transmitting with all 3 radios simultaneously in held to

head mode.

4) Too large to fit inside pocket: Device is too large to fit into pocket and this mode is not supported.

# Antenna Location

## Antenna Location



BACK VIEW

ALL DIMENSIONS ARE IN MM

## Distance between each pair of transmitting antennas

Antenna A	Antenna B	Distance mm
UHF	2.4 GHz/BT	41
UHF	5 GHz	43
2.4 GHz/BT	5 GHz	67.2

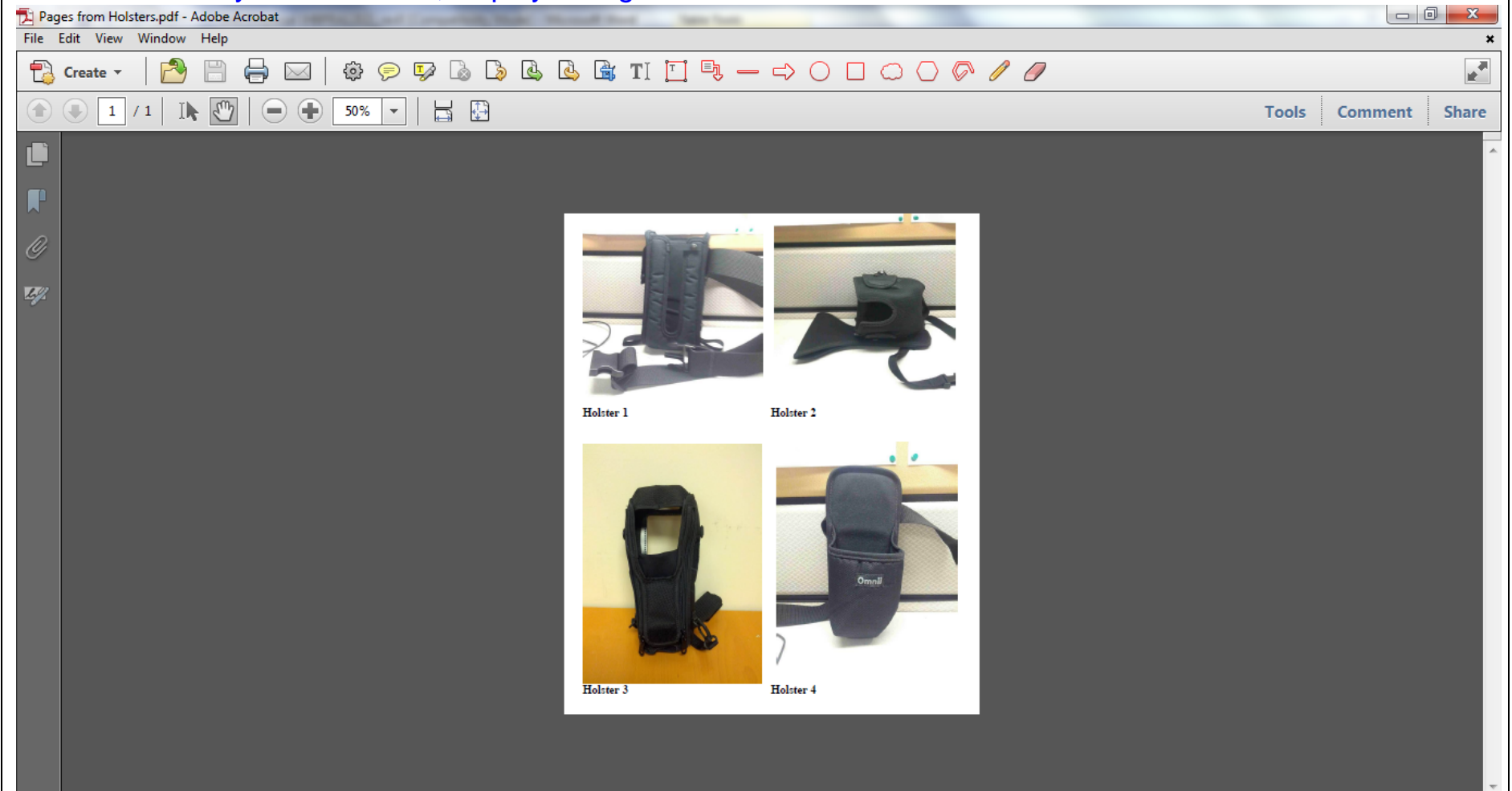
## Accessories –I for Head SAR

Head SAR Not Required because 7545MBWN disables microphone and audio receiver, hence handset is disabled

# Accessories - II (Holster) for Body SAR

## **Hard Holster: SG-MC7011110-02R**

Terminal can only fit into holster, display facing holster

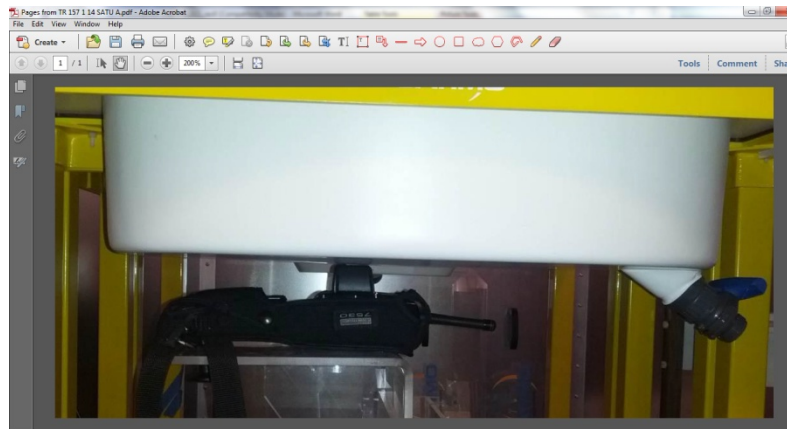




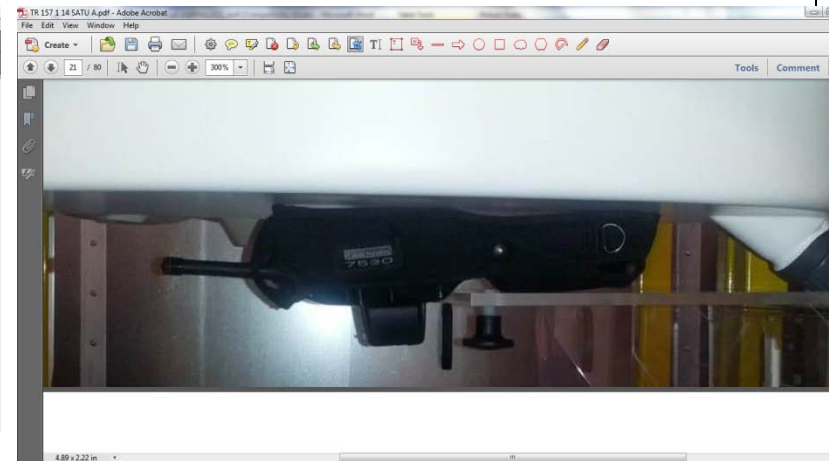
# WORST CASE Positions

## BODY

### Holster position



EUT **Back side** - Flat phantom separation is **0mm**.



EUT **Front side** - Flat phantom separation is **0mm**.

Band	Frequency (MHz)	Device	Holster	Step	SAR 1g (W/Kg)	SAR 10g (W/Kg)
435-470	435	1	3 (Back)	C	0.494	0.337
435-470	435	1	3 (Front)	C	1.090	0.764

4 different devices with 4 different holsters were under test. In order to optimize the number of test the following procedure was defined:

Step a: in the band 435-470 MHz, test of the 3 channels with the device 1 and holster 1.

Step b: In the band 435-470 MHz, test on the worst channel measured in step a with the 3 other devices using holster 1

Step c: In the band 435-470 MHz, test on the worst device measured in step a and b with the 3 other holsters

Step d: in IEEE 802.11b, test on the worst device/holster found in step a through c

Step e: In IEEE 802.11 b,g,n test on middle channel with the worst device defined in the previous step in the position where antenna is the closest to the phantom

The device is tested using chipset based test mode software to ensure test results are consistent and reliable. For all the measurement, the test mode ensures the device to emit continuously.

Device 1: Bar code reader : 1D Laser scanner SE1224 Large Pod

Keypad: Alpha Numeric

Device 2: Bar code reader : 1D Laser scanner SE955 Slim Pod

Keypad: Alpha Numeric

Device 3: Bar code reader : No Scanner

Keypad: Alpha Numeric

Device 4: Bar code reader : No Scanner  
Keypad: Alpha Numeric

**The following table reports the results for the tested configuration**

<b>BODY MEASUREMENT</b>						
<b>Band</b>	<b>Frequency (MHz)</b>	<b>Device</b>	<b>Holster</b>	<b>Step</b>	<b>SAR 1g (W/kg)</b>	<b>SAR 10g (W/kg)</b>
435-470	435	1	1	a	0.490	0.348
435-470	450	1	1	a	0.378	0.267
435-470	470	1	1	a	0.280	0.201
435-470	435	2	1	b	0.332	0.234
435-470	435	3	1	b	0.310	0.217
435-470	435	4	1	b	0.430	0.305
435-470	435	1	2	c	0.309	0.217
435-470	435	1	3 (back)	c	0.494	0.337
435-470	435	1	3 (front)	c	1.090	0.764
435-470	435	1	4	c	0.276	0.199
IEEE 802.11b	2437 (channel 6,	1	3 (front)	d	0.028	0.014

	11 mbps)					
IEEE 802.11b	2437 (channel 6, 11 mbps)	1	1	e	0.162	0.087
IEEE 802.11g	2437 (channel 6, 54 mbps)	1	1	e	0.092	0.046
IEEE 802.11n	2437 (channel 6, 65 mbps)	1	1	e	0.068	0.034
IEEE 802.11n	5500(channel 100, 65 mbps)	1	1	e	0.104	0.084

Notes:

1. Holster 1 has given the highest SAR readings.
2. SE1224 Large pod has given the higher SAR value
3. Only one battery is used in this product

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Combined SAR results (worst case measured)

BODY MEASUREMENT					
Band	Frequency (Mhz)	Device	Holster	SAR 1g (W/kg)	SAR 10g (W/kg)
435-470 + IEEE802.11b	435/2437	1	3(front)	1.118	0.778
435-470 + IEEE802.11b	435/2437	1	1	0.652	0.435
435-470 + IEEE802.11g	435/2437	1	1	0.582	0.394
435-470 + IEEE802.11n	435/2437	1	1	0.558	0.382
435-470 + IEEE802.11n	435/5500	1	1	0.594	0.432

**Conclusion:**

In 435-470 MHz band the Device # 1 Holster # 3 Front facing body is the worst configuration.

## **TESTS FOR 403-435 MHz and 435-470 MHz**

See Annex 1 for device and position pictures

4 different devices (3 operating in the band 403-435 MHz and 1 operating in the 435-470 MHz in addition of WLAN) with 4 different holsters were under test. In order to optimize the number of test, the following procedure was defined:

Step a: In the band 403-435 MHz, test of the 3 channels with the device B and holster 3 back facing the body.

Step b: In the band 403-435 MHz, test on the worst channel measured in step a with the 2 other devices using holster 3 back facing.

Step c: In the band 403-435 MHz, test on the worst device measured in the step a and b with the 3 other holsters position

Step d: In the band 435-470 MHz, test the device on the worst configuration defined above.

Step e: In the band 435-470 MHz, test the device on the second worst configuration defined above.

Step f: In IEEE 802.11a,b,g,n, test on the worst configuration device/holster found on step a through c and on the side position.

Step g: In IEEE 802.11 a,b,g,n, test on the worst configuration holster found on step c through d on the side position.

The device is tested using chipset based test mode software to ensure test results are consistent and reliable. For all the measurement, the test mode ensures the device to emit continuously.

The following table reports the results for the tested configuration

BODY MEASUREMENT						
Band	Frequency (Mhz)	Device	Holster	Step	SAR 1g (W/kg)	SAR 10g (W/kg)
403-435	403	B	3 back	a	0.802	0.454
403-435	421	B	3 back	a	0.930	0.507
403-435	435	B	3 back	a	0.539	0.343
403-435	421	A	3 back	b	0.563	0.378
403-435	421	C	3 back	b	1.160	0.805
403-435	421	C	3 front	c	1.586	1.106
403-435	421	C	1 left	c	0.444	0.321
403-435	421	C	1 right	c	0.389	0.284
403-435	421	C	2 left	c	0.320	0.234
403-435	421	C	2 right	c	0.169	0.122
403-435	421	C	4 front	c	0.580	0.423
403-435	421	C	4 back	c	0.333	0.243
435-470	435	D	3 front	d	1.473	1.023
435-470	450	D	3 front	d	1.228	0.850
435-470	470	D	3 front	d	0.944	0.653
435-470	435	D	4 front	e	0.436	0.320

435-470	450	D	4 front	e	0.332	0.244
435-470	470	D	4 front	e	0.377	0.228
IEEE 802.11b	2437 (channel 6, 11 mbps)	C	3 front	f	0.030	0.016
IEEE 802.11b	2437 (channel 6, 11 mbps)	C	3 left	f	0.785	0.365
IEEE 802.11b	2412 (channel 1, 11 mbps)	C	3 left	f	0.512	0.241
IEEE 802.11b	2472 (channel 13, 11 mbps)	C	3 left	f	0.756	0.355
IEEE 802.11g	2437 (channel 6, 54 mbps)	C	3 left	f	0.409	0.192
IEEE 802.11n	2437 (channel 6, 65 mbps)	C	3 left	f	0.551	0.260
IEEE 802.11a	5500 (channel 100, 54 mbps)	C	3 front	f	0.013	0.011
IEEE 802.11a	5500 (channel 100, 54 mbps)	C	3 left	f	0.466	0.189
IEEE 802.11a	5180 (channel 36, 54 mbps)	C	3 left	f	0.306	0.124
IEEE 802.11a	5825 (channel 165, 54 mbps)	C	3 left	f	0.282	0.119
IEEE 802.11n	5500 (channel 100, 65 mbps)	C	3 left	f	0.180	0.079
IEEE 802.11b	2412 (channel 1, 11 mbps)	D	3 left	g	0.493	0.231
IEEE 802.11b	2437 (channel 6, 11 mbps)	D	3 left	g	0.529	0.247
IEEE 802.11b	2472 (channel 13, 11 mbps)	D	3 left	g	0.715	0.332
IEEE 802.11g	2472 (channel 13, 54 mbps)	D	3 left	g	0.385	0.182
IEEE 802.11n	2472 (channel 13, 65 mbps)	D	3 left	g	0.297	0.140
IEEE 802.11a	5500 (channel 100, 54 mbps)	D	3 front	g	0.009	0.008



IEEE 802.11a	5500 (channel 100, 54 mbps)	D	3 left	g	0.479	0.178
IEEE 802.11a	5180 (channel 36, 54 mbps)	D	3 left	g	0.323	0.135
IEEE 802.11a	5825 (channel 165, 54 mbps)	D	3 left	g	0.345	0.141
IEEE 802.11n	5500 (channel 100, 65 mbps)	D	3 left	g	0.295	0.113

## Combined SAR results (worst case measured)

BODY MEASUREMENT					
Band	Frequency (Mhz)	Device	Holster	SAR 1g (W/kg)	SAR 10g (W/kg)
403-435 + IEEE802.11b	421/2437	C	3 front	1.616	1.122
403-435 + IEEE802.11a	421/5500	C	3 front	1.599	1.117
435-470 + IEEE802.11a	435/5500	D	3 front	1.482	1.031

ANNEX 1: SETUP PHOTO



**Terminal 1 (back and front)**



**Terminal 2 (back and front)**



**Terminal 3 (back and front)**



**Terminal 4 (back and front)**