



UHF RFID Desktop Reader Specification

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Revision History

Version	Date	Page	Description
0.1.0	2021.10.12		Preliminary
1.0.0	2021.10.15		1 st edition

1 Overview

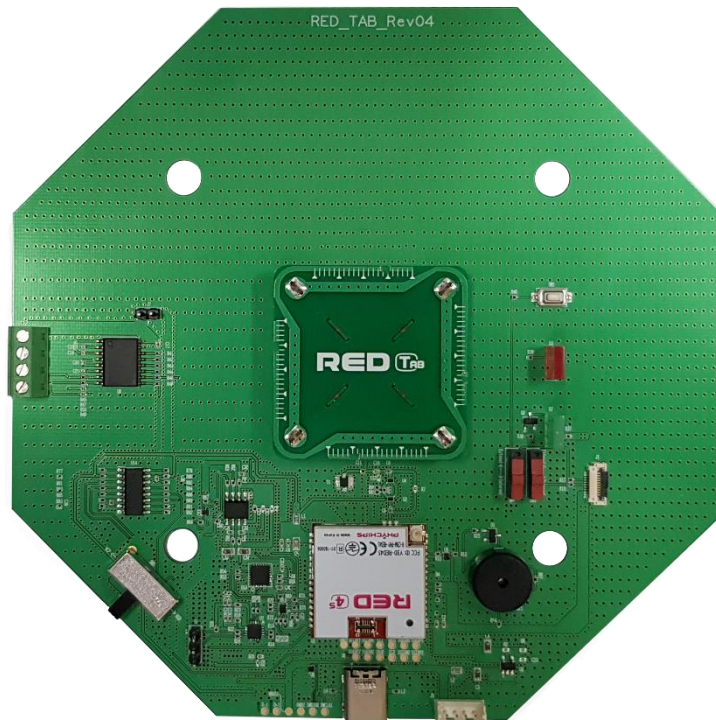


Figure 1 RED TAB

The RED TAB is a UHF RFID Desktop Reader which consists of RED4S and QUBE antenna. RED4S as a part of RED TAB, is the RFID reader module based on PR9200, PHYCHIPS' UHF RFID READER SoC which integrates 900MHz RF, baseband processor, industry standard enhanced Cortex-M0 MCU, memory (64K Flash & 16K SRAM) and many other features. It includes PR9200, TCXO, Balun, SAW filter, Power amp and coupler with low pass filter. This module fully compliant with ISO18000-6C/EPC Global Gen II reader protocol and provide all functions of PR9200.

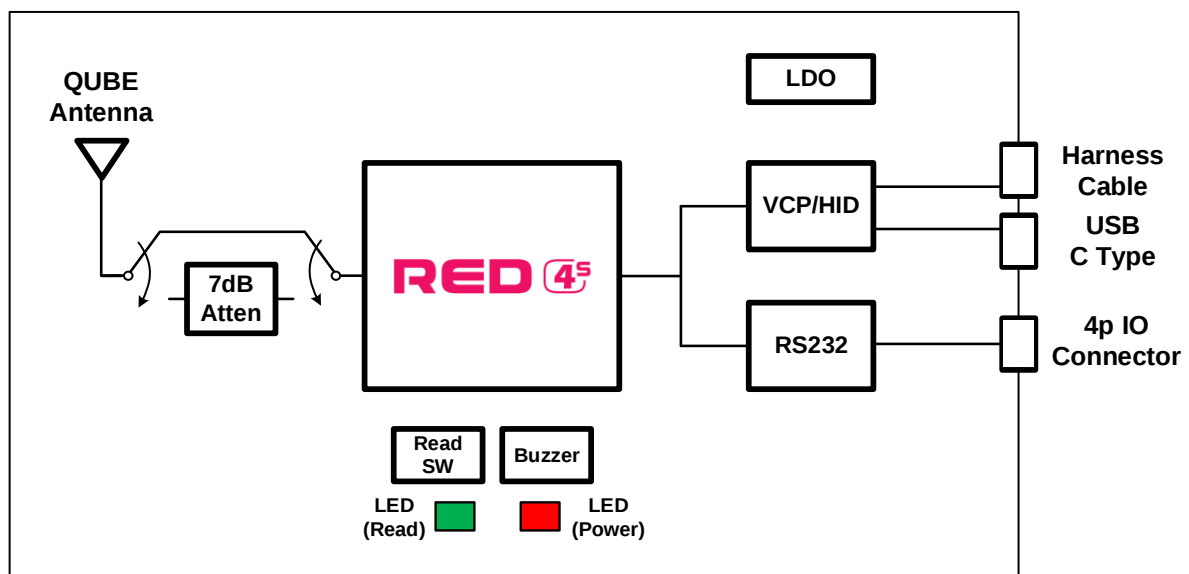


Figure 2 Block Diagram

2 Electrical Specification

2.1 Absolute Maximum Ratings

No.	Item	Unit	Test Condition	Specification			Remark
				min	Typ.	max	
1	Supply voltage: VBUS	V	-	-	-	5.5	
3	Storage temperature	°C	-	-40		85	

2.2 Functional Specification

No.	Item		Unit	Test Condition	Specification			Remark
					min	Typ.	max	
1	Frequency Range		MHz		860		960	
2	Tx Max. Power ^{NOTE1}		dBm				25	
3	Tx Dynamic Range		dB			21		
3	Spurious		dBm		Meet to local regulation: US (FCC 15C) Japan (ARIB STD-T107)			
4	Antenna Gain		dBi			-4.0		
5	Impedance		Ω			50		
6	DC Power		V			5.0		
7	Operating Temperature		°C		-20		70	
8	Operating Humidity		%		0		90	
9	Current	Power Down	uA	Active current is measured at 25dBm with 50ohm load			20	
		Idle	mA				20	
		Active					550	

NOTE1. Available Tx power is 23dBm under Japan regulation. Current consumption is 380mA at 23dBm CW.

2.3 Firmware Default Function

No.	Item	Status	Remark
1	Firmware Version ^{NOTE1}	RED4S_TAB_v1.0.0 or later	
2	Region	-	
3	Frequency Hopping	ON	
4	Q	Dynamic Q	
5	Modulation Type	DSB-ASK	
6	Back Link Frequency (BLF)	250 kHz	

NOTE1. It can be changed according to the customer's request.

3 Description

3.1 Board Configuration

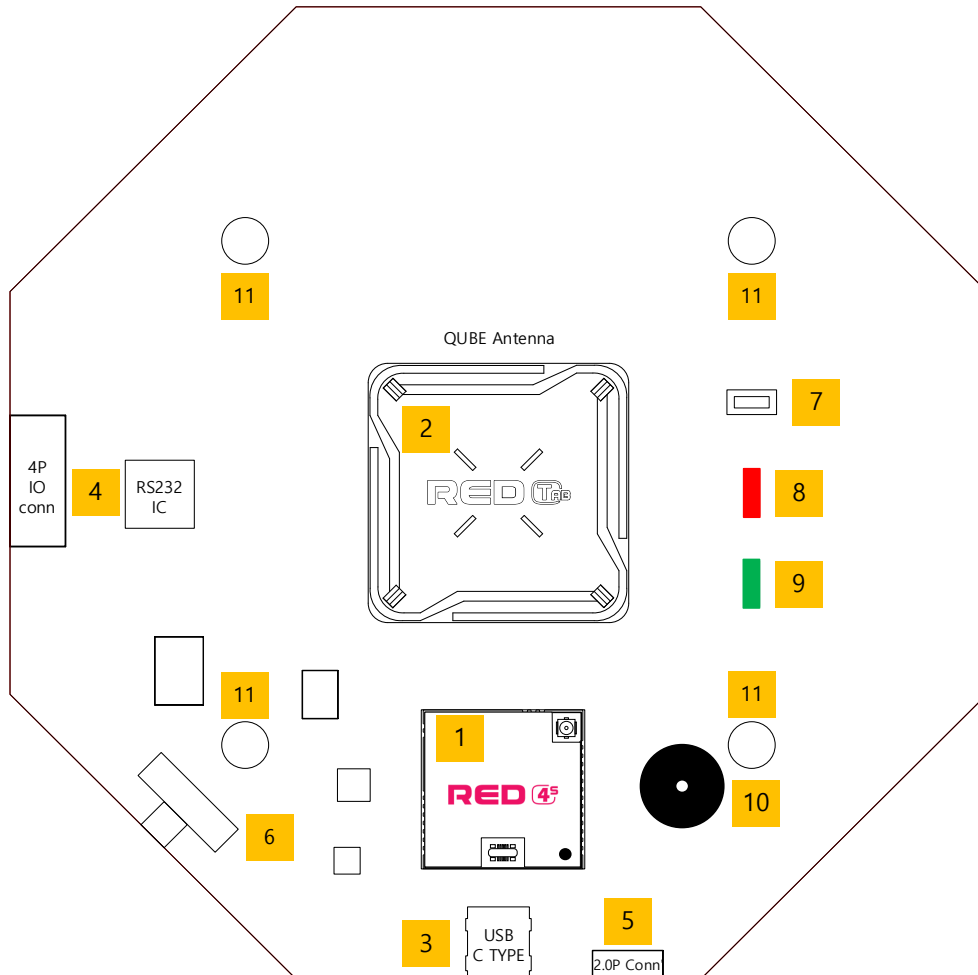


Figure 3 Board description

The control board of RED TAB integrates USB C type connector, harness connector, 4P RS232 IO connector, USB-to-UART bridge IC, RS232 bridge IC, LDO, LED, read switch, and buzzer.

3.1.1 RED4S

RED4S is PHYCHIPS RFID module. For detailed description of RED4S module, refer to the datasheet at the link below.

[RED4S Specification \(phychips.com\)](https://www.phychips.com/RED4S%20Specification)

3.1.2 QUBE Antenna

QUBE antenna has quadrifilar helix structure. See 3.5 for detailed performance.

3.1.3 USB C type Connector

RED TAB supports USB C type connector.

3.1.4 4P RS232 IO Connector

4P RS232 IO connector has the part number of 1751264 from Phoenix Contact and is a wire to board connector. Pinmap is shown in the table below.

3.1.5 2.0 Pitch USB Harness Connector

2.0 pitch USB harness connector has the part number of 0532530470 from Molex. Pinmap is shown in the table below.

Pin No.	RS232 IO	2.0 pitch USB harness
1	VBUS	VBUS
2	RX	D +
3	TX	D -
4	Ground	Ground

3.1.6 USB VCP / HID Mode Selection Slide Switch

RED TAB supports USB VCP / HID mode with slide switch. If slide switch is moved to the left, RED TAB operates in VCP mode, and if slide switch is moved to the right, it operates in HID mode.

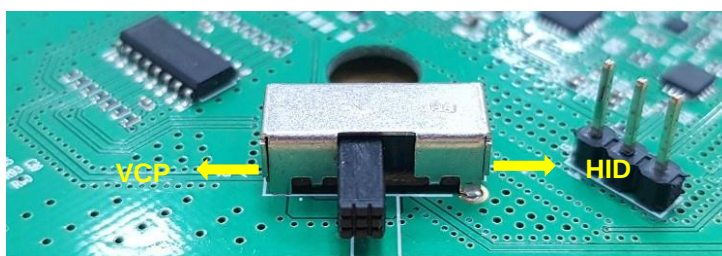


Figure 4 Slide switch

3.1.7 Read Push Button

RED TAB's read push button reads the tag while pushed.

3.1.8 Power LED

When power is supplied to RED TAB, red color power LED turns on.

3.1.9 Read LED

When RED TAB reads the tag, green LED blinks.

3.1.10 Buzzer

When RED TAB reads the tag, buzzer sounds.

3.1.11 Hole to Assembly

It is 4 holes for fixture RED TAB.

3.2 Power Supply

DC power to operate RED TAB is to supply for 3.6V LDO

3.3 Interface

RED TAB has built-in USB to UART bridge IC and RS232C transceiver. For USB connection, connect to the C type connector or the 2 pitch Molex connector (Model P/N :0532530470), and for RS232C connection, connect to the 4-pin block to wire IO connector. Connection is shown as below figure.

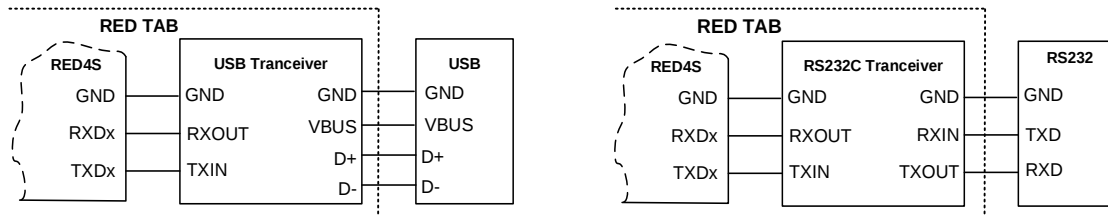


Figure 5 USB, RS 232C connection

RED TAB USB interface class provides two modes, VCP and HID, for compatibility with various system. VCP mode provides all functions such as configuration and control through Windows GUI, and HID mode provides tag ID in the form of keyboard data as a basic input device.

3.3.1 USB Mode Control

3.3.1.1 USB VCP, HID Conversion

Host provides reader configuration and control the same as RED4S DK.

3.3.1.2 USB (VCP), RS232 Mode Support

Detailed setting such as RF (Frequency, Output Power, FH&LBT) & Inventory setting are possible, and various additional functions including memory access (Manual, Auto) are available. Refer to 3.2 Product setting for details.

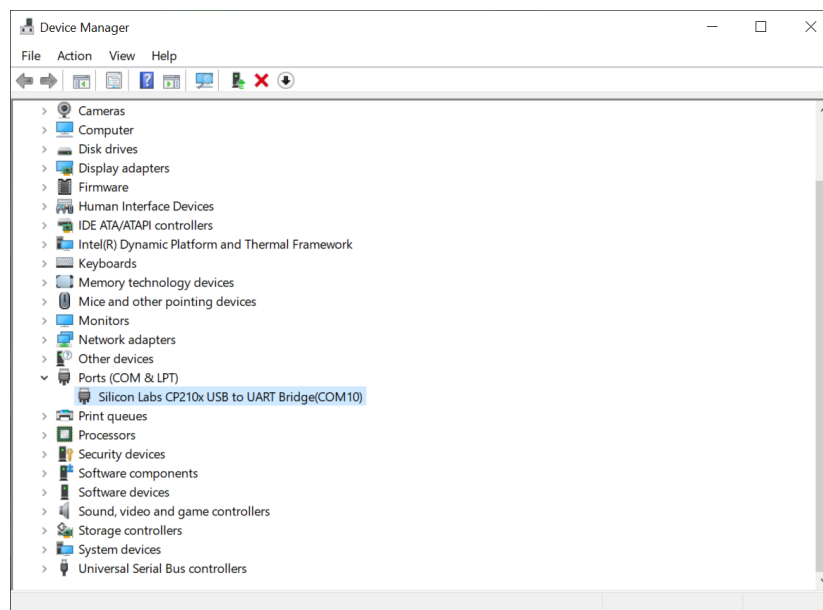


Figure 6 Device manager of Window OS VCP mode

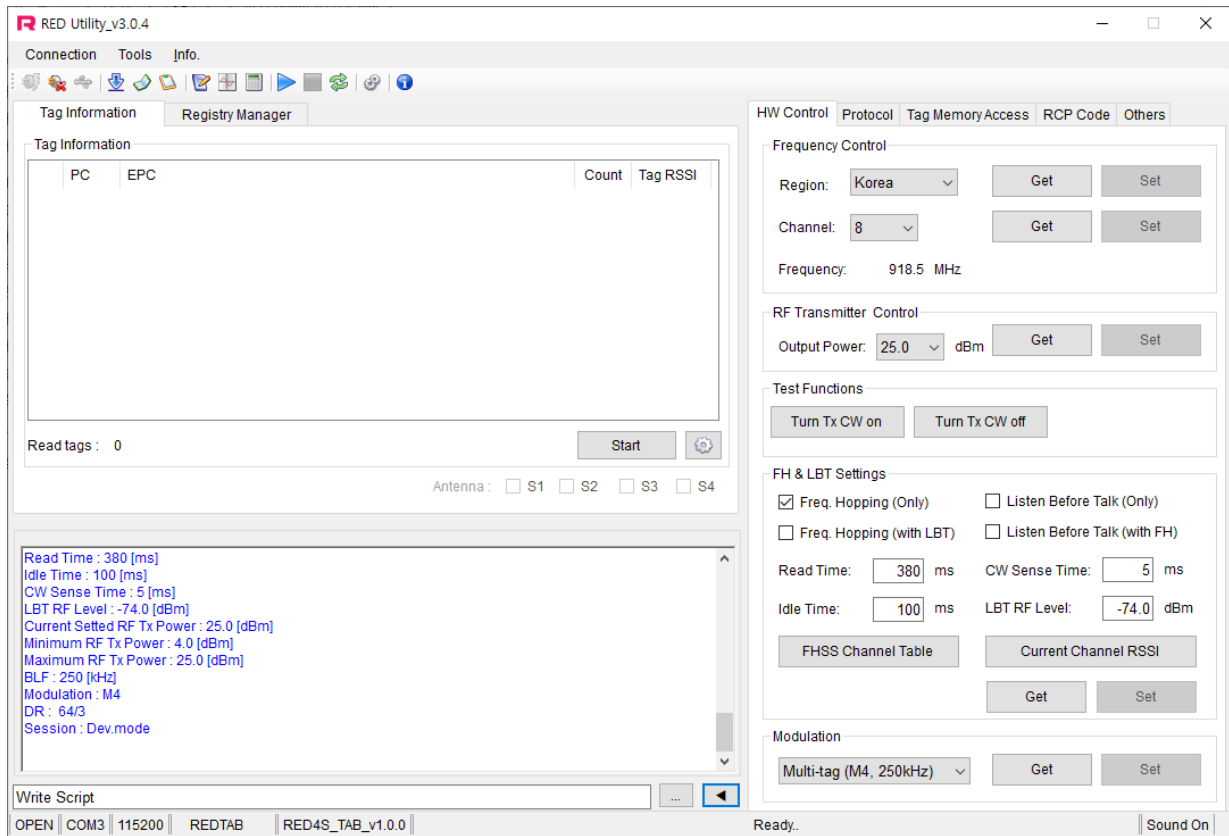


Figure 7 RED Utility of Window OS VCP mode

3.3.1.3 USB (HID) Mode Support

It works as a keyboard wedge scenario where Tag ID is passed to any application by emulating keyboard input. RFID identification data(Tag ID) can be directly entered in a simple text editor such as Notepad without a separate interface program.

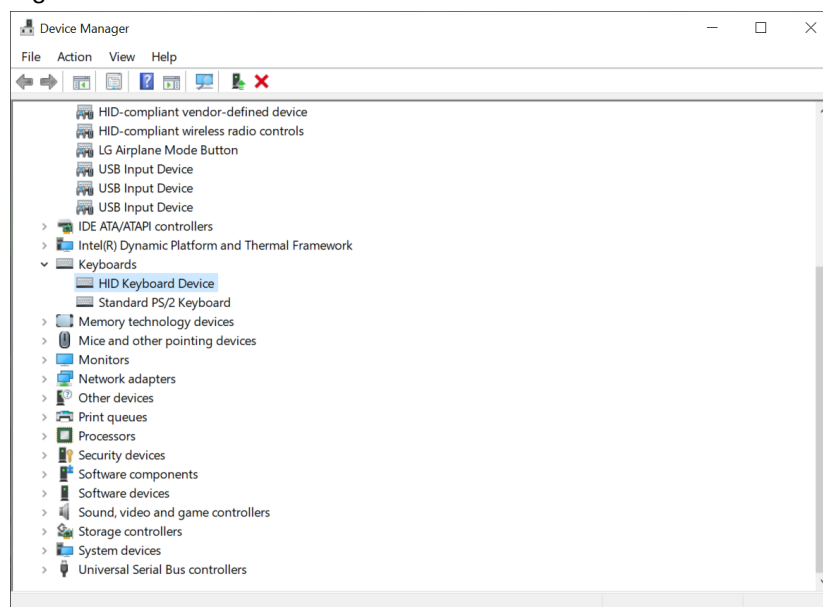


Figure 8 Device manager of Window OS HID mode

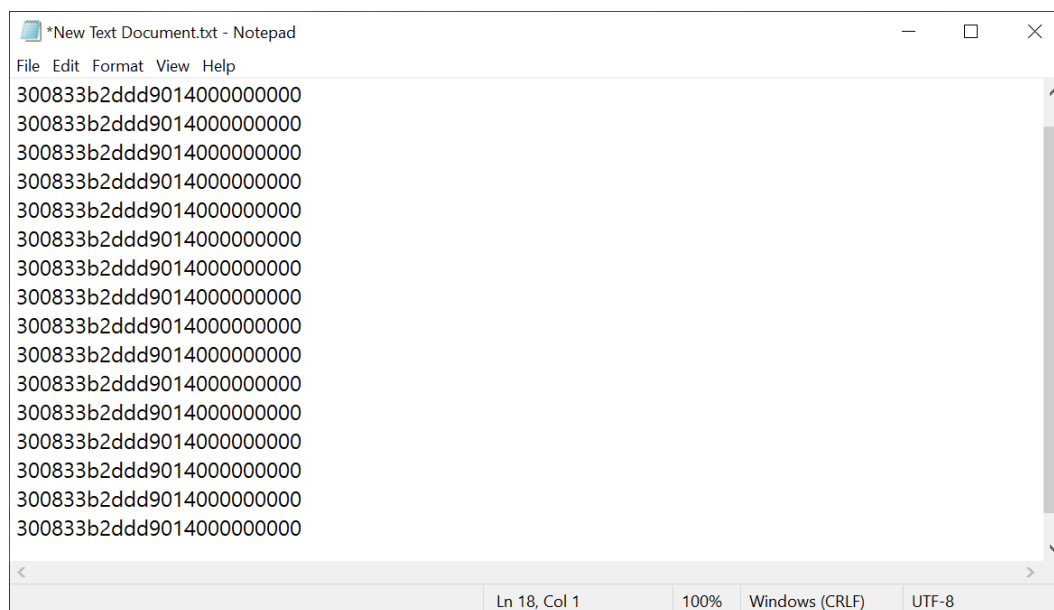


Figure 9 Notepad of Window OS HID mode

3.4 Product Settings

3.4.1 GUI Control

The RED Utility helps the user to start working with RED TAB UHF RFID desktop reader. Follow below step to run GUI.

Window start button → Program Menu → RED Utility Connection is shown as below figure.

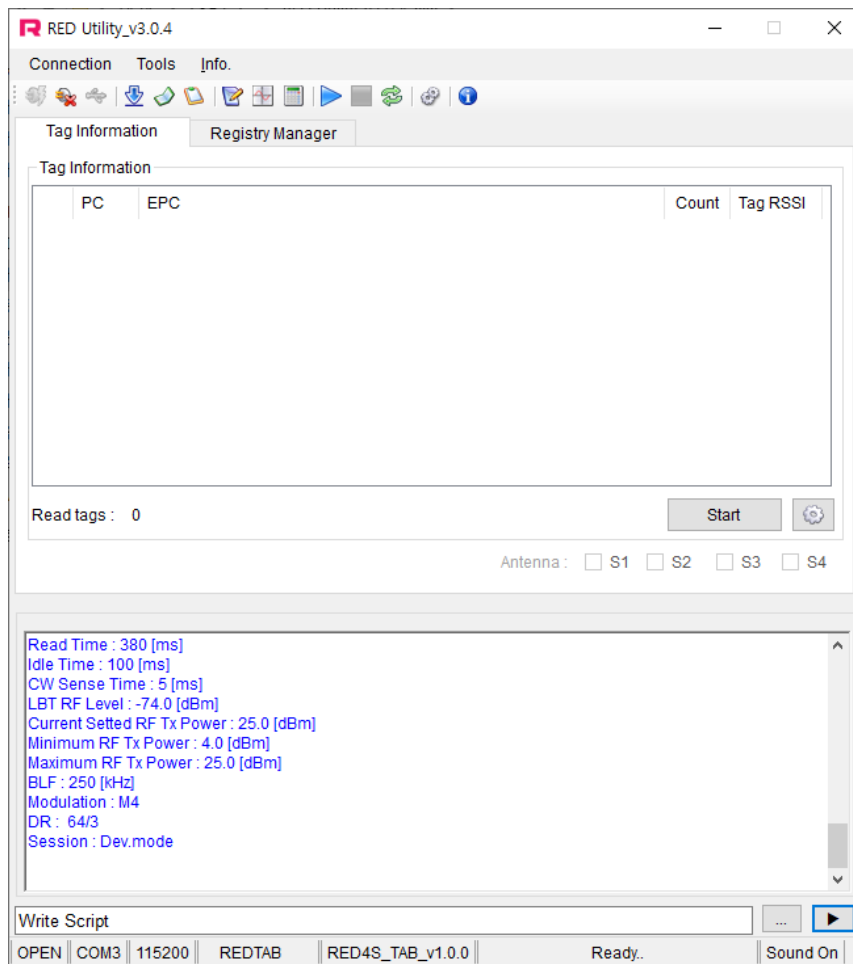


Figure 10 Window GUI RED Utility

3.4.2 View Mode Control

RED Utility provides two view modes. User can select view mode depending on purpose of use between Basic View Mode and Extended View Mode.

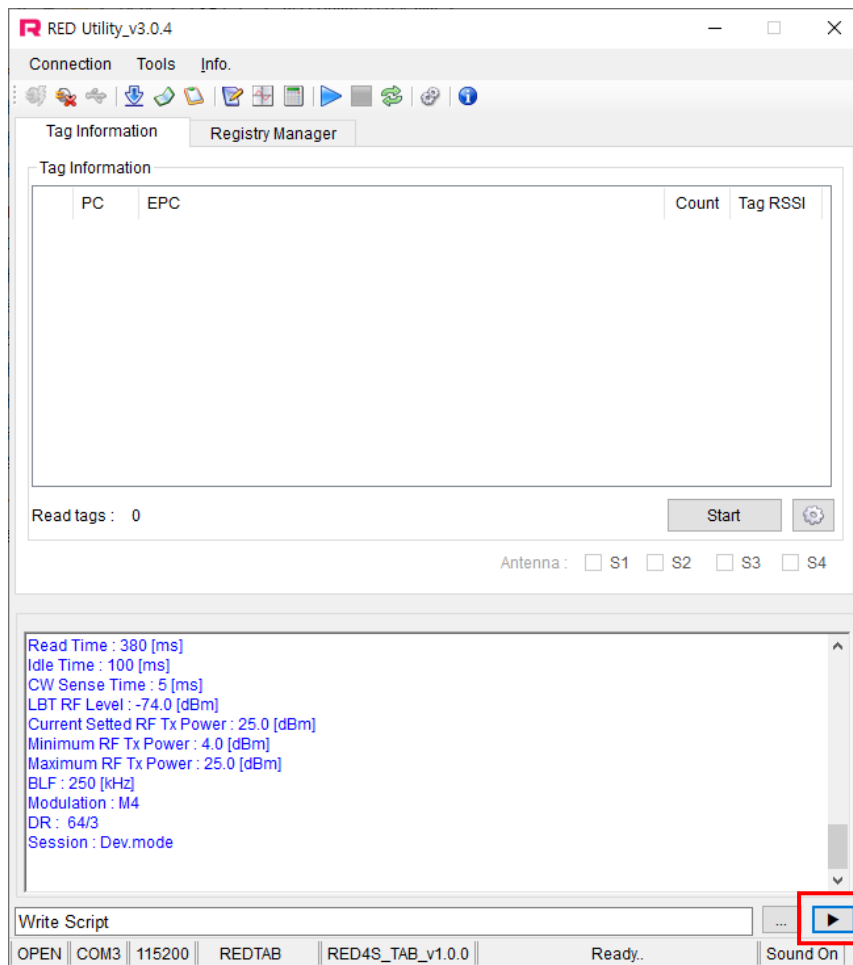


Figure 11 Basic view mode

To change View Mode, click the extension button marked red in Figure 6 above.

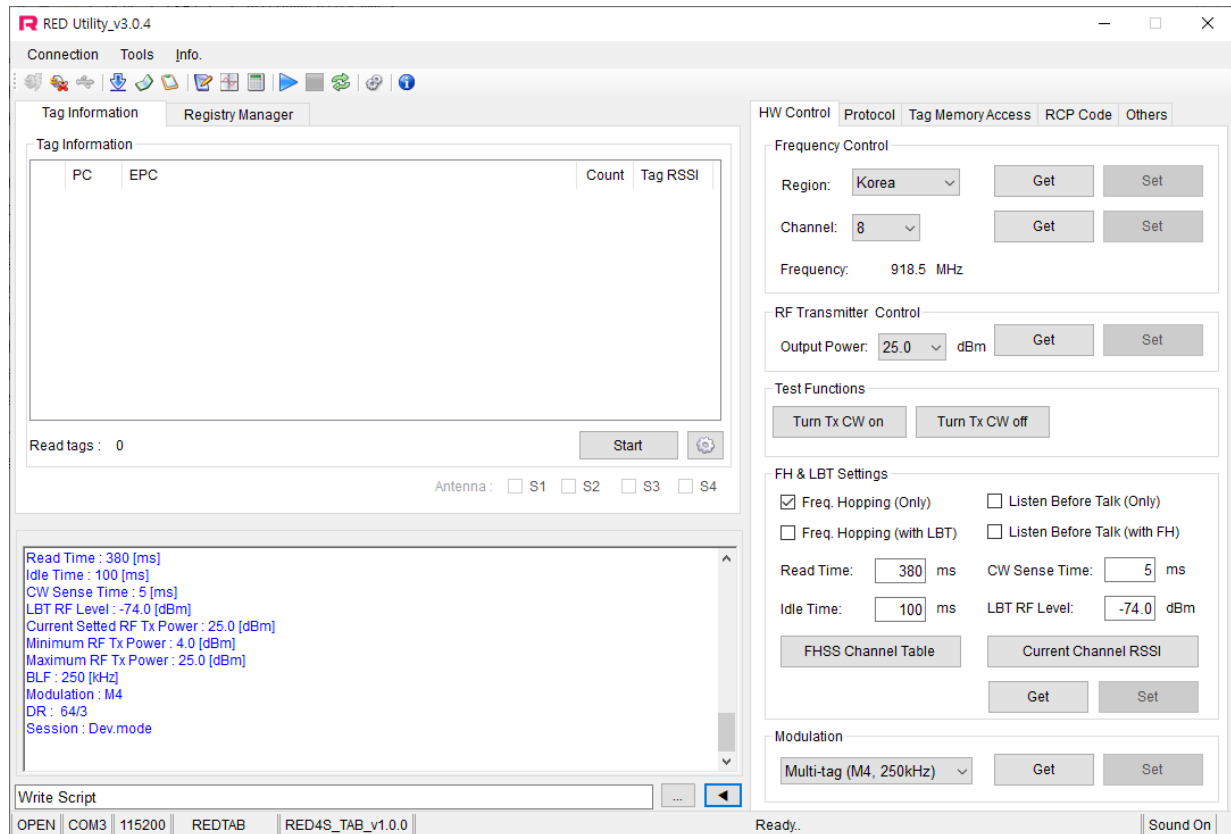


Figure 12 Extended view mode

3.4.3 Connection

If hardware connection is valid, RED utility connect RED TAB automatically.

If utility cannot connect hardware, please follow below step. Click “Connection → Connect” to connect to RED TAB through USB-to-UART at main window. GUI will find the Device and synchronize parameters with RED TAB automatically. If the GUI cannot find the device automatically, Click “Connection → Port Setting” and select other Device. Default baudrate is 115200 bit/s.

Connection	Tools	Info.
Connect	Alt+C	
Disconnect	Alt+D	
Port Settings	Alt+P	

If RED TAB connected successfully, status bar will display “OPEN” state and device number and so on.

OPEN	COM3	115200	REDTAB	RED4S_TAB_v1.0.0	Ready..	Sound On
------	------	--------	--------	------------------	---------	----------

3.4.4 Hardware Control

Click 'H/W Control' tab to control hardware.

3.4.5 Region Setting

To select operating band, band setting should be required. Select band in combo box and click Set button to set operating band in group box 'Frequency Control.'

Region:

3.4.6 Power Class Setting

Some countries classify channel number by power class. Click Get button and choose required power class. And then click Set button to set finally.

Channel:

3.4.7 Output Power setting

To set RED output power, select the Output Power combo box and click Set button.

RF Transmitter Control

Output Power: dBm

3.4.8 Tag Inventory Procedure

Click 'Start' button in tag Information tab to read UHF RFID tag with RED Utility and tag's EPC information is displayed.

Tag Information Registry Manager

Tag Information

	PC	EPC	Count	Tag RSSI
1	34 00	30 08 33 B2 DD D9 01 40 00 00 00 00	17	

Read tags : 1



3.5 Antenna

3.5.1 Antenna Specification

No.	Item	Unit	Specification			Remark
			min	Typ.	max	
1	Size	mm	40 x 40 x 06			
2	Operation Frequency ^{NOTE1}	MHz	860		960	
3	Return Loss	dB		-15		
4	Antenna Gain ^{NOTE1}	dBi		-4.0		
5	Axial Ratio				1.3	
6	Polarization		RHCP			
7	Impedance	Ω		50		

NOTE1. The operating frequency and antenna gain may be changed by environment.

3.5.2 Radiation Pattern

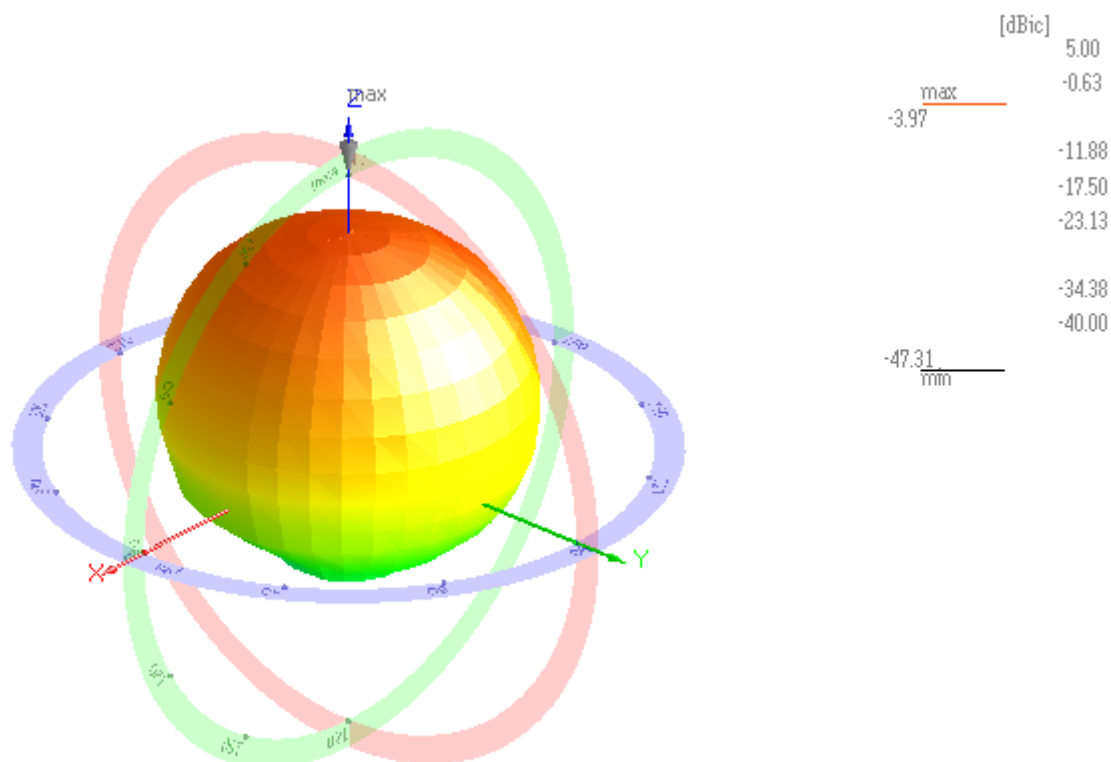
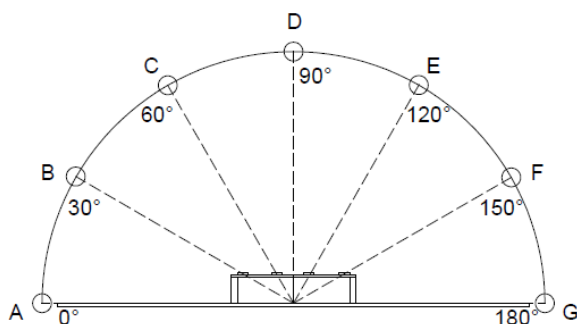


Figure 13 3D Radiation Pattern

4 Performance

4.1 Read Range

The result of measuring read range by increasing the output power of the RED TAB and changing the position of AZ-9640 Dipole tag (Higgs-3) by every 30° within 180° is shown in the figure 14.



Tx-PWR [dBm]	A	B	C	D	E	F	G
4	0	0	0	10	10	0	0
6	0	0	10	15	10	0	0
8	0	0	10	20	10	0	0
10	0	10	15	25	15	10	0
12	0	15	25	30	25	15	0
14	0	20	30	40	30	20	0
16	10	25	35	50	35	25	0
18	10	40	50	60	50	40	10
20	20	45	60	70	60	45	25
22	30	50	90	100	90	60	35
24	45	55	90	130	90	70	45
25	45	65	110	140	110	80	45

Unit: cm

Figure 14 Read range vs Output Power

4.2 Read Area

If the output power of RED TAB is 18dBm, the read area is shown in the figure 15.

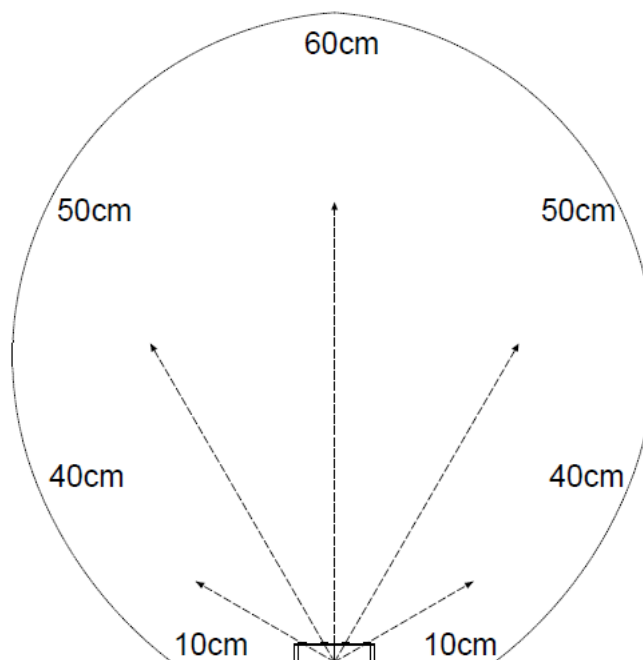


Figure 15 Read Area on 18dBm

5 Documents list

Location: /Documents/Datasheet

Name	Contents
RED_TAB_spec	RED TAB Reader specification
RED4S_spec	RED4S module specification

Location: /Documents/Manual

Name	Contents
RED_UTM	RED Utility manual
RED_FWM	RED Firmware development manual
RED_RCP	RED Reader protocol manual

Location: /Documents/Application note

Name	Contents
AN036	Anti-collision mode for multi tag
AN035	Configuration of session for multi-tag
AN111	Sensor tag application

Location: /Documents/ETC

Name	Contents
QFFA40xxG150	RED TAB antenna specification
AZ-9640	Tag datasheet Higgs-3

[NOTE] these documents are subject to be changed according to PHYCHIPS' policy

6 Dimension

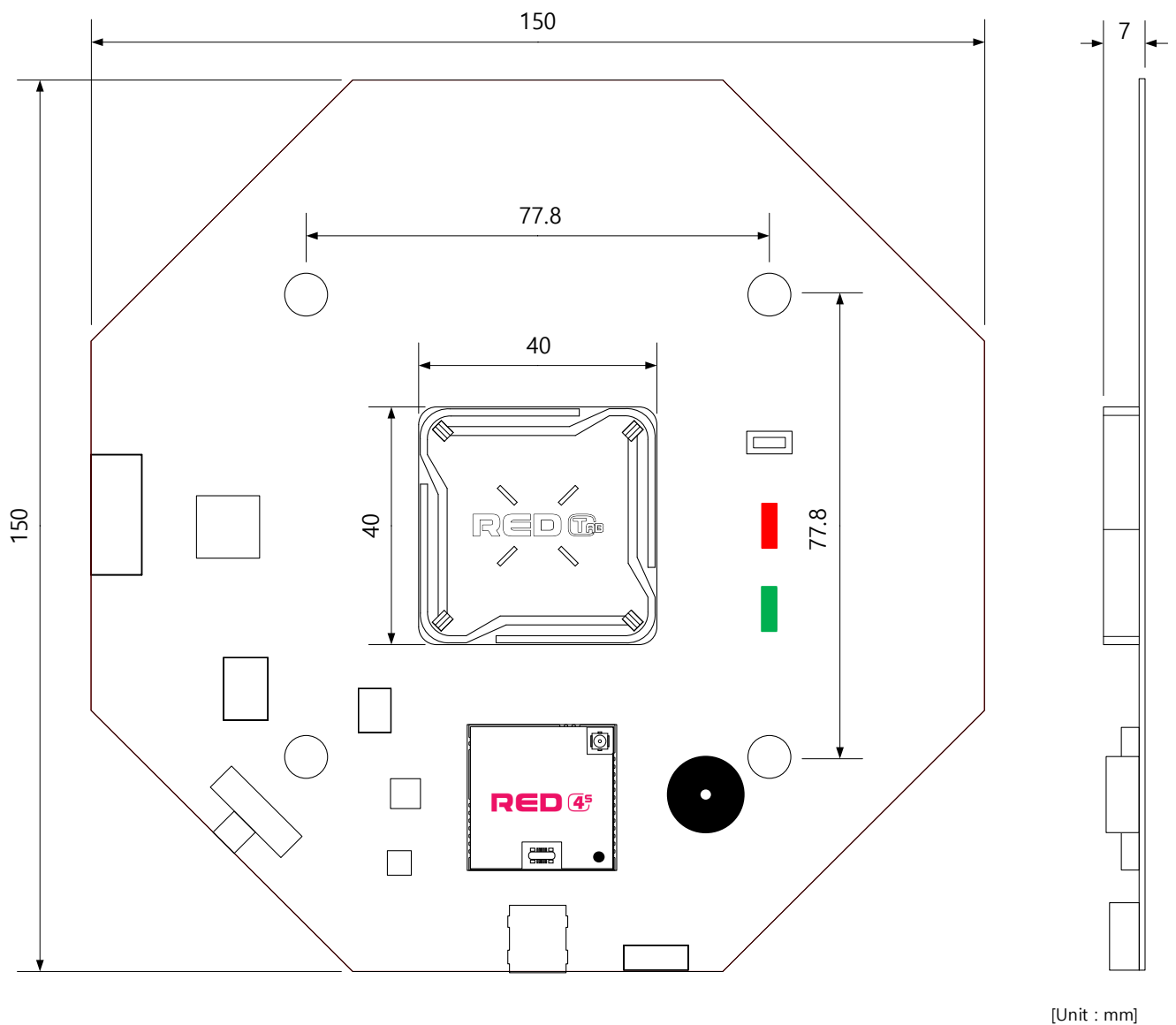


Figure 16 Dimension

7 Contact Information

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