ALPW-BLEM103
Technical Data

V1.0

Revision history

Version	Date	Contributions	Changes
1.0	02/24/2013	Benjamin Deforge	First Draft

Approval

	Function	Name	Date	Visa
written by	Electronics Development Engineer	Benjamin Deforge	21/02/2013	
Reviewed by	Product Development Leader	Alexandre Gimard	xx/xx/2013	
Approved	CEO	Serge Veyres	xx/xx/2013	

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1 Regulatory Information

Officiel Product Name	ALPW-BLEM103
Hardware Revision	B
Maximum Conducted Power	+3dBm
Antenna Gain	0.9dBi
USA FCC Coordinates	Serge Veyres ALPWISE 4 Avenue Doyen Louis Weil 38000 GRENOBLE France Tel : 04.76.22.02.24 Fax : 04.76.22.15.64 Mail : Serge.veyres@alpwise.com
Canada IC Coordinates	Serge Veyres ALPWISE 4 Avenue Doyen Louis Weil 38000 GRENOBLE France Tel : 04.76.22.02.24 Fax : 04.76.22.15.64 Mail : Serge.veyres@alpwise.com
Product Identification	The labeling format is attached [6]

2 Product Description

The ALPW-BLEM103 is a *Bluetooth*® Low Energy module, fully compliant with the *Bluetooth*® 4.0 Single mode (*Bluetooth*® Smart) specification.

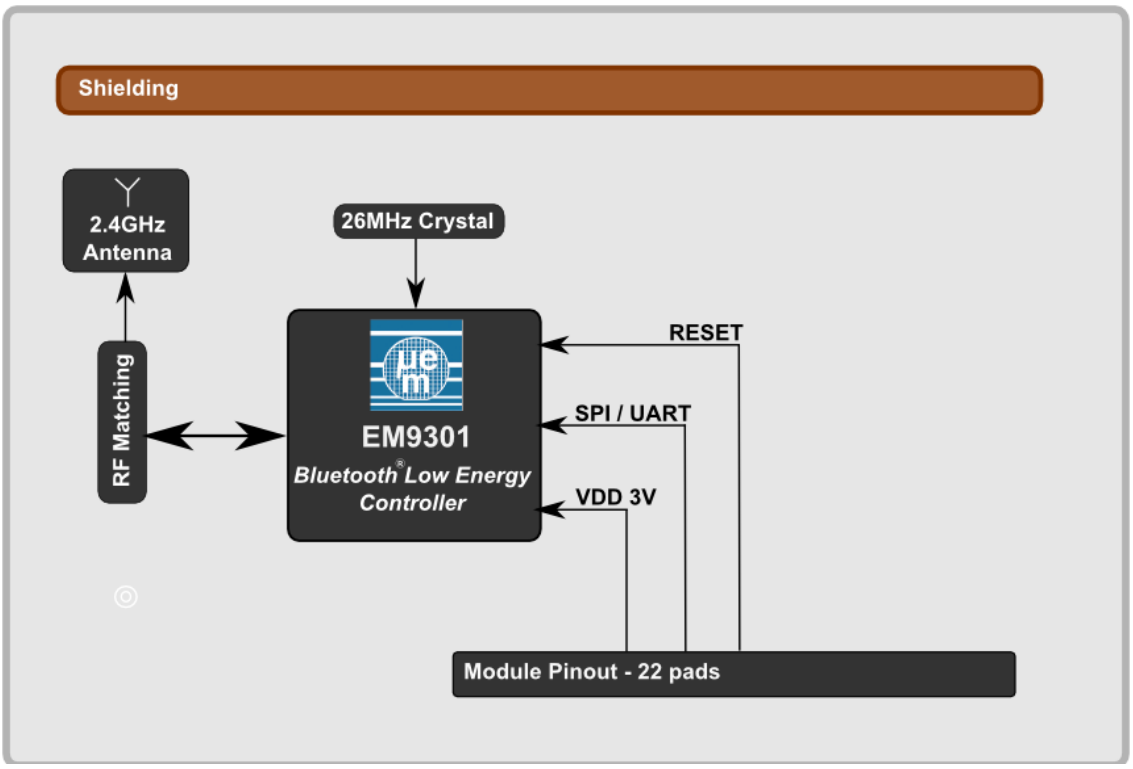
The radio is controlled by a dedicated chip EM9301. A ceramic antenna is soldered on the module.

The ALPW-BLEM103 module provides a 22-pads LGA pinout, to allow reflow soldering on an application board.

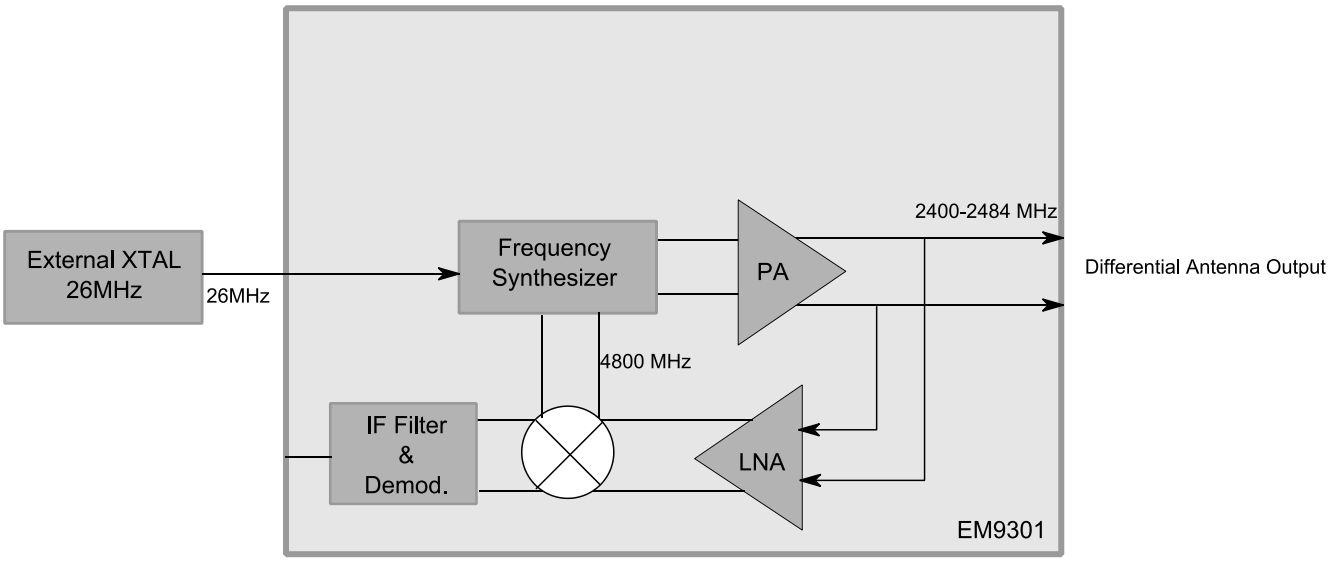
2.1 Commercial Description

The commercial product description is attached [6].

2.2 Block Diagram



2.3 Clock tree



2.4 Schematics

The schematics are attached [6].

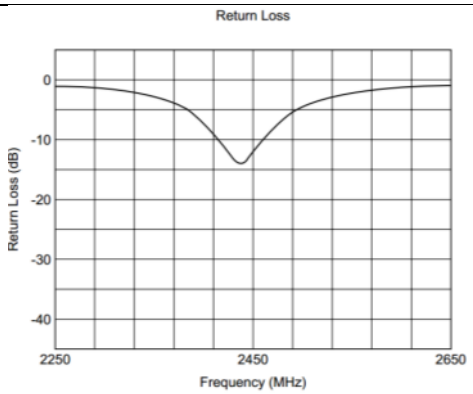
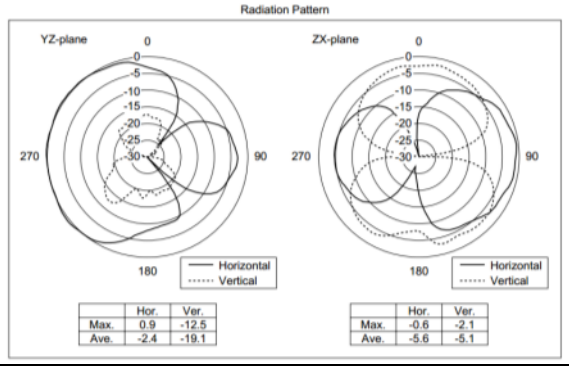
2.5 Bill of Material

The Bill of Material is attached [6].

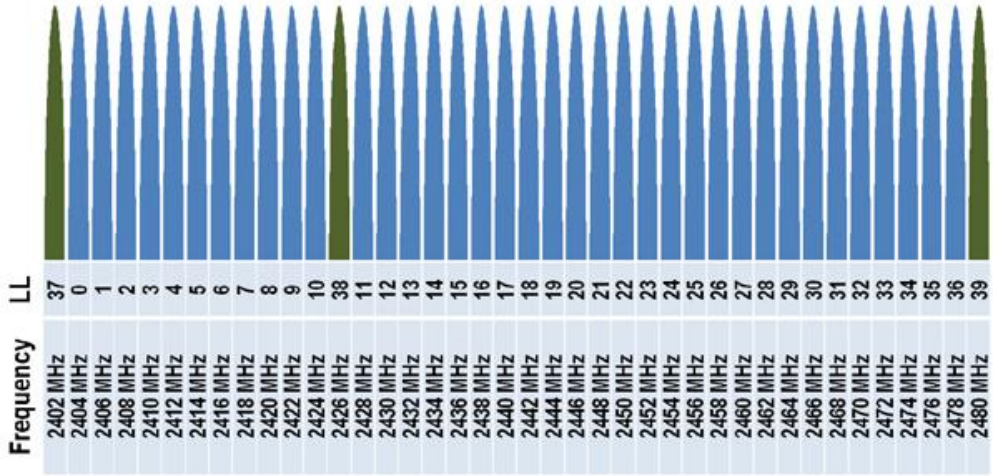
3 Technical Data

3.1 Antenna

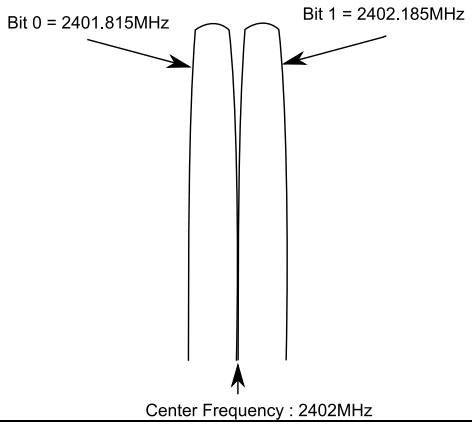
The ceramic antenna is permanently soldered on the pcb.

Antenna Reference	Murata LDA212G4410K-283
Center Frequency	2460MHz with +- 31MHz tolerance
Nominal Bandwith	84MHz @VSWR 4
Nominal Impedance	50 ohms
Typical Return Loss	
Gain	BT/WLAN2.4G Linear Polarization YZ-plane: Hor. (dBi) / Ver. (dBi) ZX-plane: Hor. (dBi) / Ver. (dBi) Efficiency (dB) 2400 MHz Max.: -0.2 / -14.8 / -1.4 / -3.3 / -3.1 2400 MHz Ave.: -3.3 / -20.4 / -6.4 / -6.4 2442 MHz Max.: 0.9 / -12.5 / -0.6 / -2.1 / -2.2 2442 MHz Ave.: -2.4 / -19.1 / -5.6 / -5.1 2484 MHz Max.: -0.4 / -13.2 / -1.9 / -3.1 / -3.2 2484 MHz Ave.: -3.4 / -19.3 / -6.8 / -5.8 **Max gain = 0.9dBi**
Radiation Pattern	
Data from Murata	

3.2 Spectrum Usage

Band	2.4GHz ISM band 2400MHz -> 2483.5MHz
Channels	40 Channels 2MHz wide 37 data channels, 3 advertisement channels 
Frequency Tolerance	Frequency tolerance for the whole packet : +- 150kHz max 26MHz crystal tolerance : 30ppm Frequency Drift during packet : 50kHz max Maximum drift rate : 400Hz / µs
Transmit Power	BLE spec : -20dBm to +10dBm EM9301 : -20dBm, -16dBm, -12dBm, -9dBm, -6dBm, -3dBm, 0dBm, +3dBm Power accuracy : +- 3dB
Declared Transmit Power	**+3dBm**

3.3 Data Type

Modulation	Gaussian Frequency Shift Keying (GFSK) Modulation index : ~ 0.5 (0.45 to 0.5)	
Data Rate	1Mbps 1 bit per symbol	
Hopping	Adaptive frequency hopping	

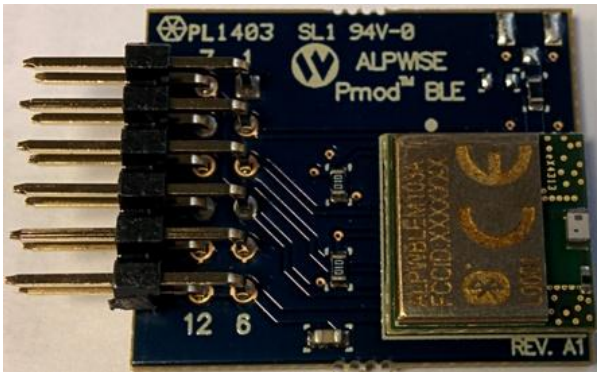
3.4 Receiver

Sensitivity	Bluetooth spec : -70dBm min @ 0.1% BER EM9301 : -80dBm typical, from EM9301 specs The EM9301 internally uses a 4.8GHz carrier frequency for the demodulation process.

4 Test Software

The ALPW-BLEM103 is soldered on the ALPW-DVKCM3 board.

The ALPW-BLEM103 is also soldered on the pMod™ compliant adaptation board :



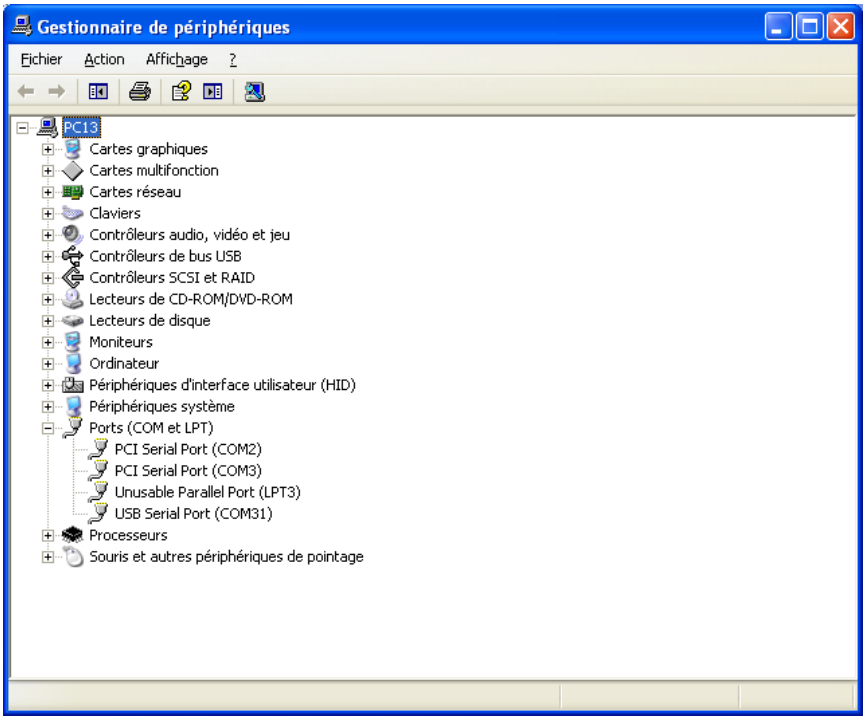
4.1 Transmitter test with the ALPW-DVKCM3

4.1.1 Starting the transmitter test Application

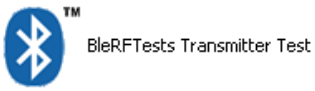
The module can be put under transmitter test mode. This allows sending commands directly to the Bluetooth Low Energy radio.

Connect the UART/USB FTDI cable the the PC. Get the port COM number allocated to "USB Serial Port" in the device manager.

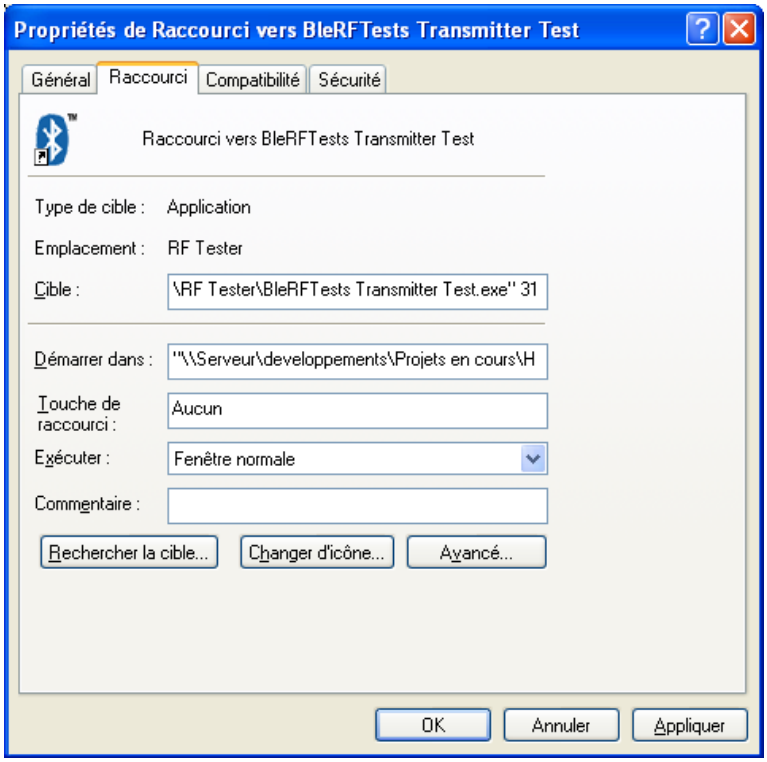
When powered, the red and green LEDs light up. The red LED will go off when the BLE radio is ready to accept commands.



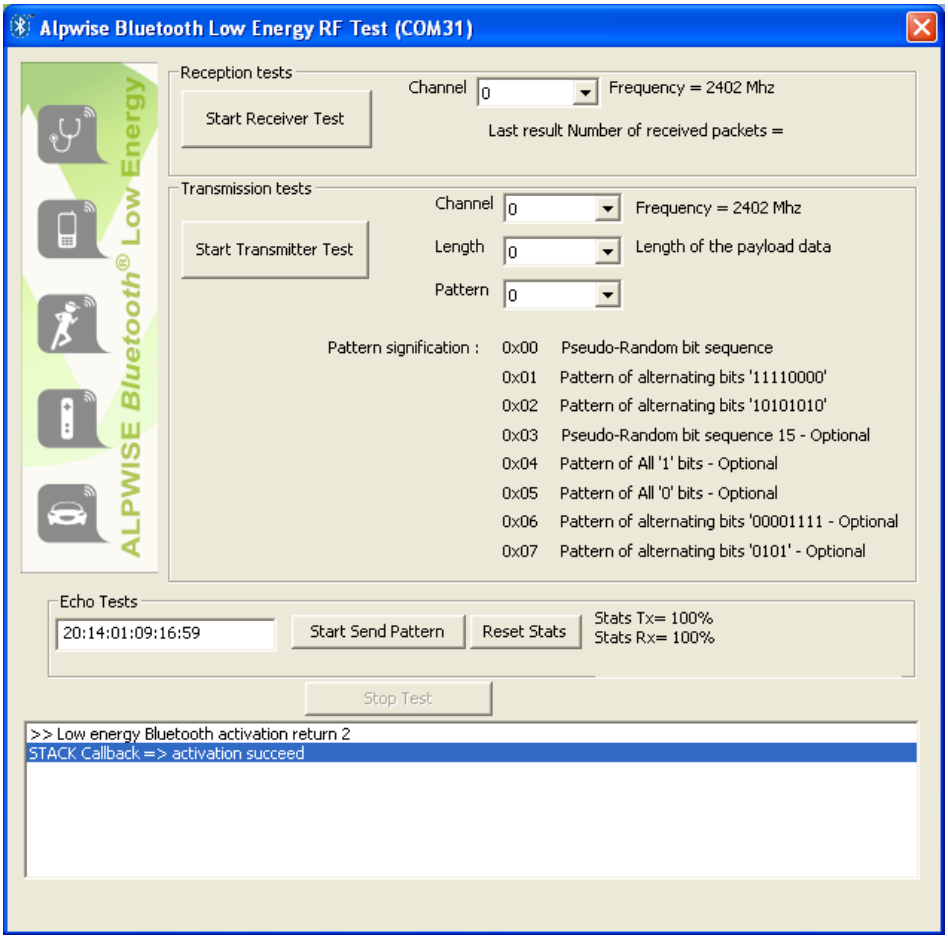
The port Com number must be passed in argument when launching "BLERFTests Transmitter Test".



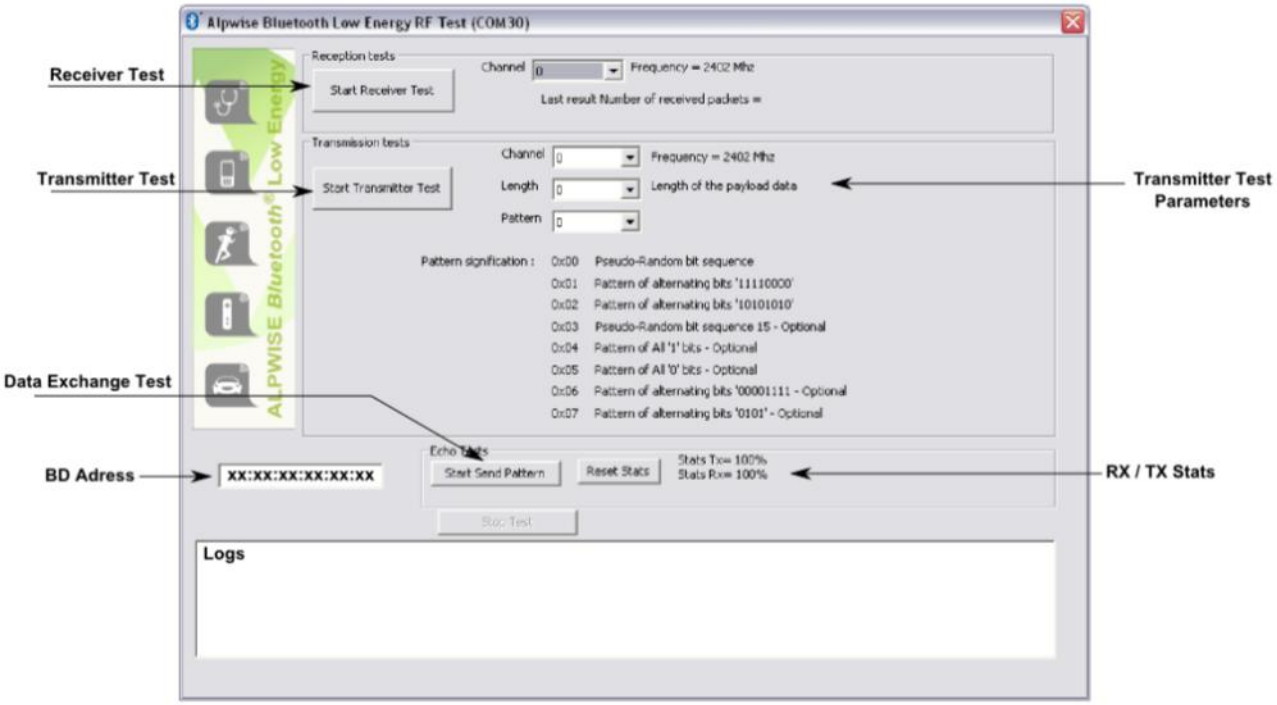
Create a shortcut, go to Properties -> Raccourci and add the port COM number.



Double click the shortcut.



4.1.2 Window description



The "RFTester – Transmitter test" allows accessing to the transmitter and receiver test functions. The parameters are the following:

- Channel Identifier : from 0 to 39

Frequency (MHz)	Channel Number	Type	Frequency (MHz)	Channel Number	Type
2402	0	Data	**2442**	20	Data
2404	1	Data	**2444**	21	Data
2406	2	Data	**2446**	22	Data
2408	3	Data	**2448**	23	Data
2410	4	Data	**2450**	24	Data
2412	5	Data	**2452**	25	Data
2414	6	Data	**2454**	26	Data
2416	7	Data	**2456**	27	Data
2418	8	Data	**2458**	28	Data
2420	9	Data	**2460**	29	Data
2422	10	Data	**2462**	30	Data
2424	11	Data	**2464**	31	Data
2426	12	Data	**2466**	32	Data
2428	13	Data	**2468**	33	Data
2430	14	Data	**2470**	34	Data
2432	15	Data	**2472**	35	Data
2434	16	Data	**2474**	36	Data
2436	17	Data	**2476**	37	Adv
2438	18	Data	**2478**	38	Adv
2440	19	Data	**2480**	39	Adv

Channel Type

Three channels are reserved to the advertisement process, used by the BLE device to signal its presence, emitting burst at a programmable interval (from 20ms to 10.28sec).

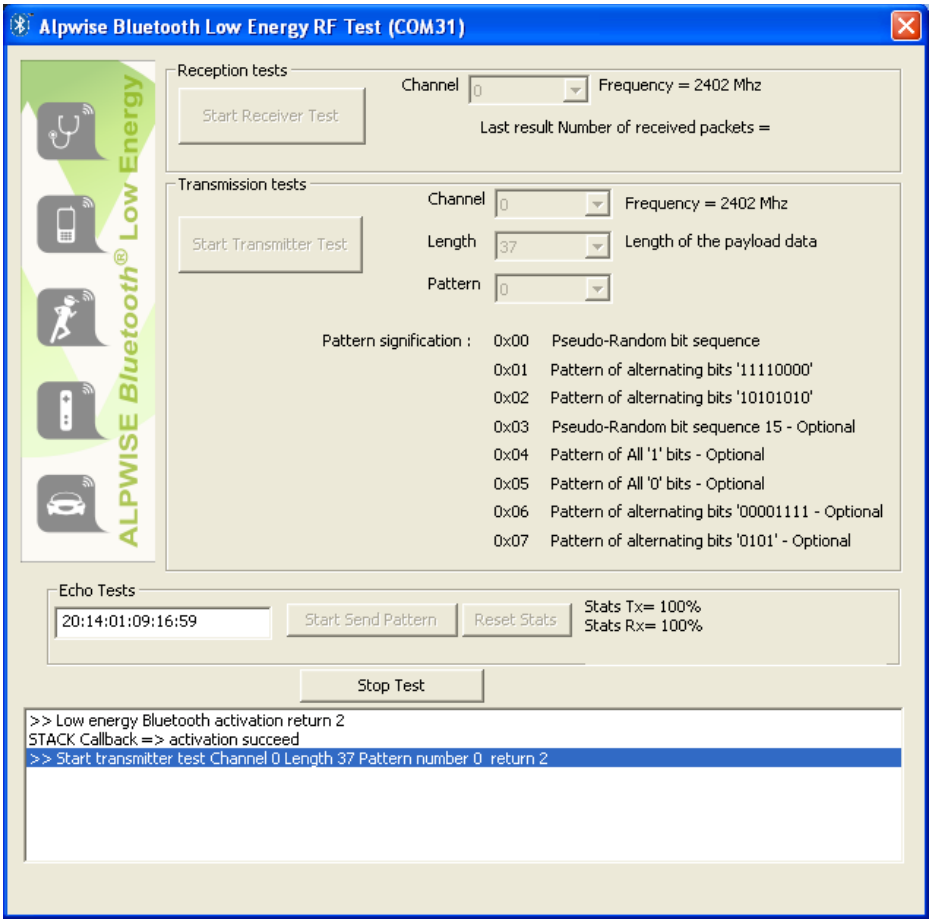
- Length

Data packet length,from 0 to 37 bytes.

- Data Type

Several options :

Argument	Description	Commentaire
0	Pseudo-random bit sequence (PRBS9)	Transmitter power test
1	Pattern of alternating bits : « 11110000… »	Frequency drift test
2	Patter of alternating bits : « 10101010…. »	Initial transmission frequency test
3	PRBS15	optionnel
4	Pattern of all '1' bits	optionnel
5	Pattern of all '0' bits	optionnel
6	Pattern of alternating bits « 00001111… »	optionnel
7	Pattern of alternating bits "0101…"	optionnel



The device acknowledges the start of the test.

4.2 Application test with the ALPW-DVKCM3

Connect an ALPW-BLEKEY002 to the host computer, launch the application "BLERFTests4 BLEKEY002"

The application automatically recognize the COM port.

Power up the ALPW-DVKCM3 through the USB on-board connector.
Note the Bluetooth Adress to use, it has the following form :
XX:XX:XX:XX:XX:XX
Copy that with the ":" in "BD Adress" filed. Click "Start Send Pattern".

4.3 Transmitter test with the BLEPMOD103

The BLEPMOD103 must be inserted in a USB/serial converter board provided by Alpwise. The firmware is the same.

4.4 Application test with the BLEPMOD103

The application firmware must be loaded into the Renesas RPBRX111 mother board. The orange LED will light up when the module is ready, and blink during transmission.

5 Embedded Firmware

The DUT has no embedded firmware.

6 External Documents

-	**[1]**	ALPW-BLEM103-Product Identification	Labeling and serial numbering of the product
-	**[2]**	ALPW-BLEM103-REVB_Schematics	Schematics
-	**[4]**	ALPW-BLEM103_Commercial-brief	Commercial Briefs product description
-	**[5]**	ALPW-BLEM103_REV_B_BOM_FCC	Bill of Material

7 Contact information

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