



STEVAL-ISB047V1 Test Procedure

STEVAL-ISB047V1 Test Procedure

Introduction

This document presents the different steps needed to

- Load the firmware into the STWBC
- Test the STEVAL-ISV047V1T board
- Test the STEVAL-WBCDNGV1 (dongle USB)

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1 Definition and Acronyms

Abbreviation	Comment
Tx	Transmitter: The device which is sending power in a wireless way.
Rx	Receiver : The device which is receiving power in a wireless way
STWBC-MC	STMicroelectronics Wireless Battery Charger transmitter Multi Coil solution
Qi	one of the wireless battery charger standard defined by the Wireless Power Consortium

2 Tools and equipment

In order to apply the test procedure, it requires:

Item	Manufacturer Ref	Manufacturer
Power supply 12V / 3A	Ex : E3644A	Agilent
PC, Core2Duo, 4GB	ELITE DESK	HP
Load Board	BOARD ref XX	STMicroelectronics
Jack power supply board		
USB cable n°1	USB A male to micro USB B male	
USB cable n°2	USB A male to USB A female	
USB cable n°3	USB C male to USB C male	
USB cable n°3	USB C male to USB A male	
USB PD power charger	UGREEN	UGREEN
USB quick charger	KOVOL TK QC3.0	KOVOL
STEVAL-WBCDNGV1	Dongle USB to UART board (to tested)	STMicroelectronics
STEVAL-ISB047V1T	Board TX 3 coils (to tested)	STMicroelectronics
STEVAL-ISB042V1	Board RX EP	STMicroelectronics

2.1 Power supply by DC jack

Use a power supply (ex E3644A AGILENT) delivered 12 volts and 3 Amps

Use current limitation for first connection

- Connect Power supply with a cable DC jack to STEVAL-ISB047V1T connector J101 (see figure 2)
- Check jumper connected between J100 pin 1 & 2 of STEVAL-ISB047V1T (see figure 1)
- Current limitation at 100mA – power ON power supply at 12V
- Check current of power supply is less than 50mA
- If yes – current limitation is OFF – if no : problem of current consumption

Figure 1 : Jumper power supply

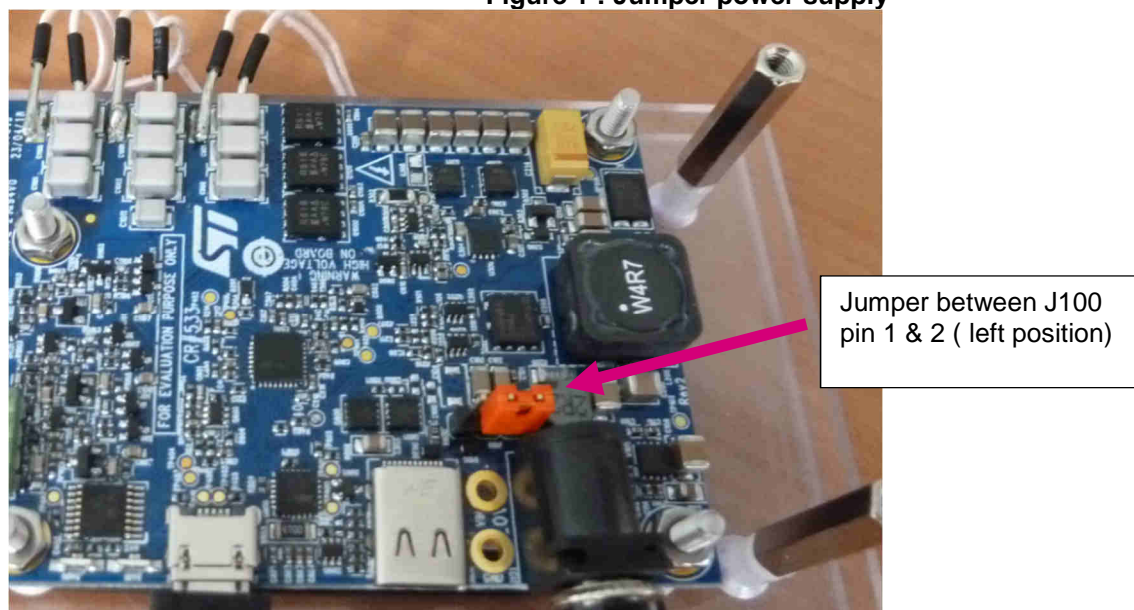
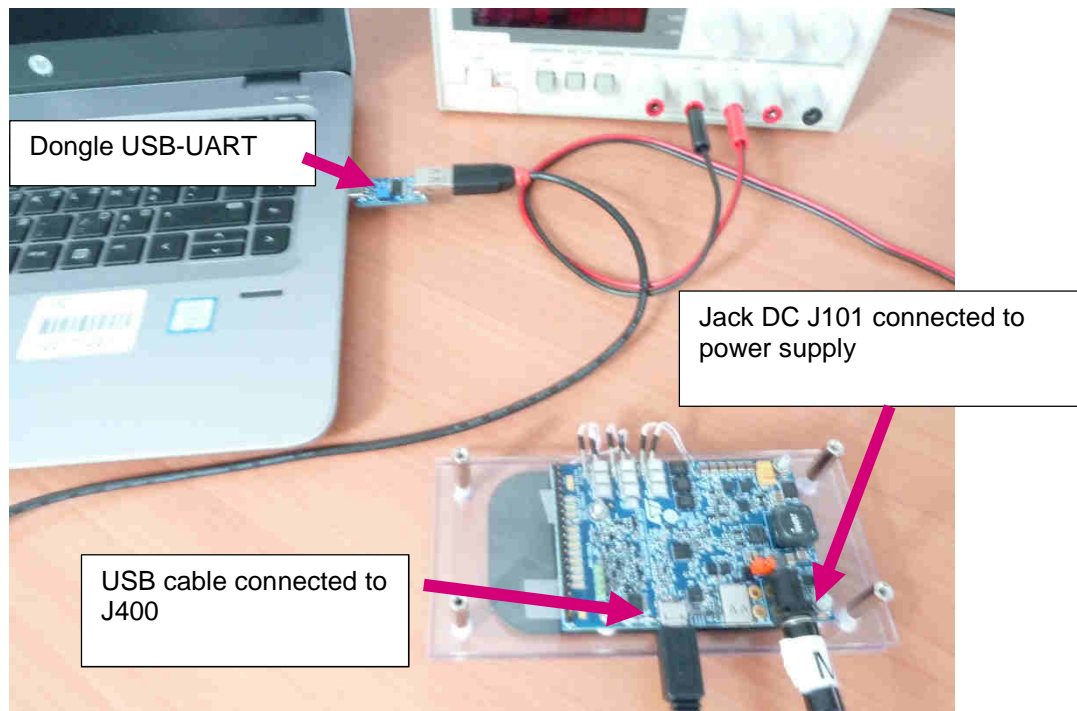


Figure 2 : Power Labs setup



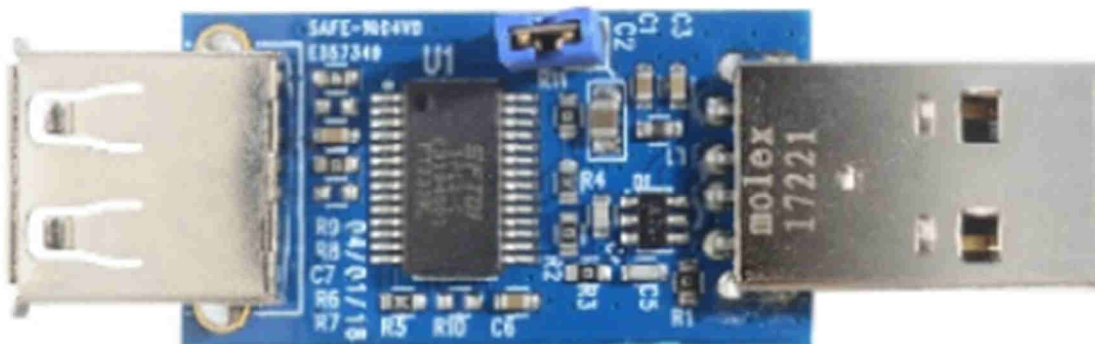
2.2 USB-UART communication

UART communication between PC and the transmitter is mandatory for firmware download and test software. USB to UART dongle is used for that purpose

A USB Cable (USB A male to USB A female) enables to connect the Dongle to the PC. Then, a uUSB cable is used to connect the dongle to the transmitter STEVAL-USB047V1T

- Power ON power supply 12V
- Connect USB A cable to PC
- Connect USB uUSB to J400 connector of STEV STEVAL-USB047V1T
- Check port Com n° on your computer
- Connection from PC to transmitter for UART communication is now ready

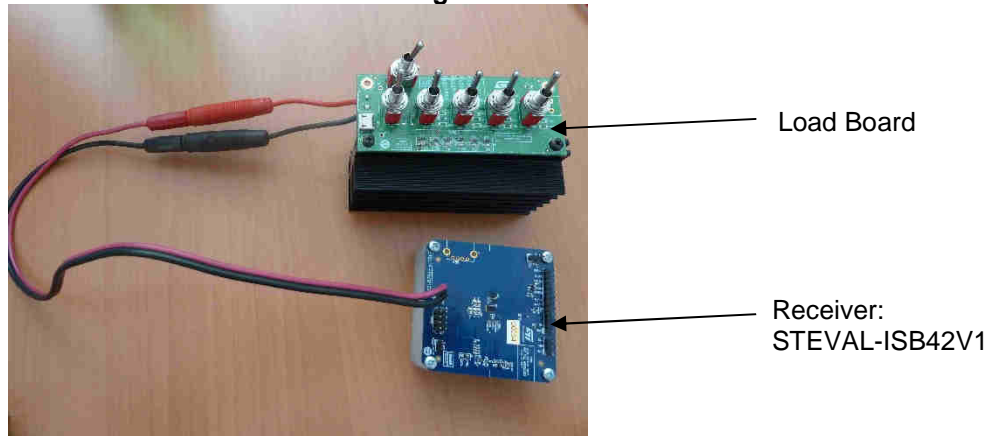
Figure 3 : STEVAL-WBCDNGV1 : USB to UART dongle



2.3 Receiver Qi & Load board

The receiver STEVAL-ISB042V1 is connected to the load board as shown below:

Figure 4 : Receiver connected to load board



A load board is used to load the receiver. Depending on the switch configuration, different load can be applied:

Figure 5 : Load board

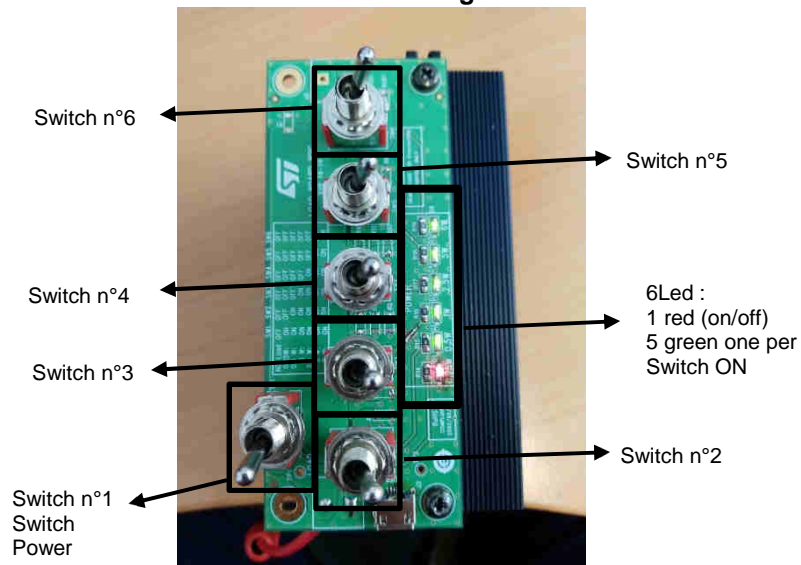


Figure 6 : Matrix of Load board

	Switch Power, SW1	SW2	SW3	SW4	SW5	SW6
0	0	x	x	x	x	x
10W	1	0	0	0	0	1
14.5W	0	0	0	0	1	1

2.4 Power transfer between Rx & Tx board

To enter in power transfer with the receiver, transmitter board STEVAL-ISB047V1T should first be supply by 12V/3A. Then receiver board should be centered on the transmitter – on top of center coil. Starting with low load at this step is recommended.

Figure 7 : Power transmission between Rx and Tx



3 Download / Test

Download and Test are done under DOS application. No GUI is used, manual interventions are reduced to minimum for the test. It should lead to quick download and test procedure.

A directory named stwbc_production_mc contains several files:

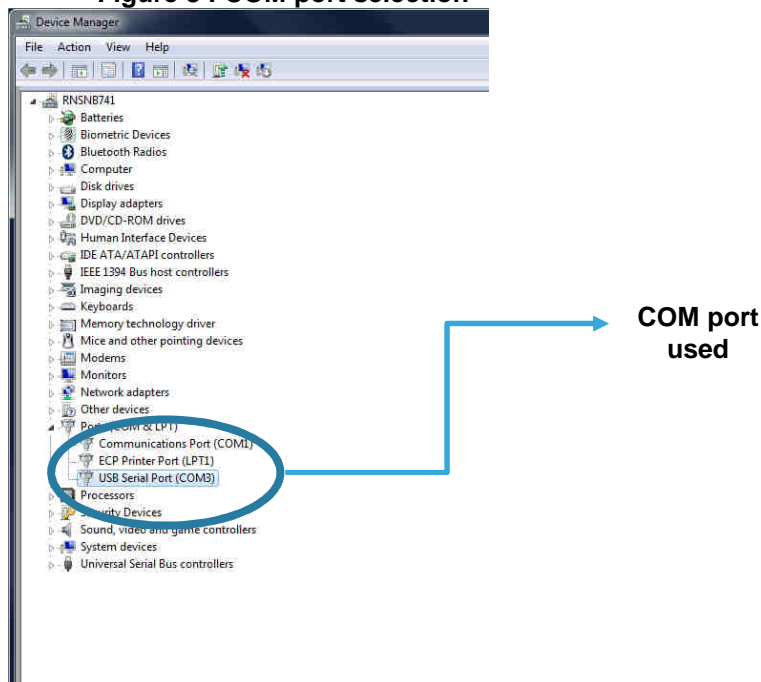
- STWBC_Loader.exe: enables to download Firmware into STWBC
- enable_boot.bin: Used for synchronization with STWBC in case it is not empty and has already been loaded
- WBC...cab: Firmware to be downloaded into the STWBC
- production_test.exe: enables to test the transmitter
- stwbc_...bat: batch file calling directly stwbc_loader.exe, production_test.exe..

3.1 Start up

Copy stwbc_production_mc directory under C: and then follow the below procedure:

- Open a DOS window and go into C:\stwbc_production_ep directory.
- Connect the USB to UART dongle and USB cable between PC and transmitter board (see figure 2).
- Check the USB serial COM port. You can check Windows Device Manager to identify the correct port number.
- Connect the Jack cable between Transmitter and Power supply (see figure 3). At this step, Power supply is OFF

Figure 8 : COM port selection

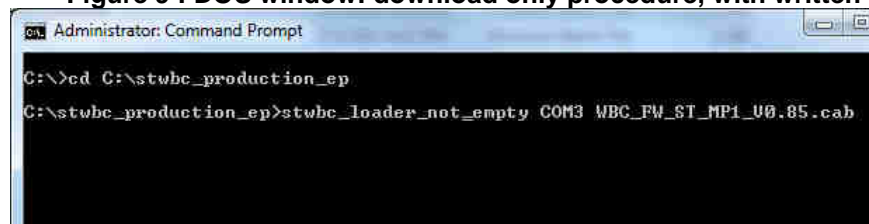


3.2 Download only procedure

3.2.1 With written chip

In order to download the firmware into the board, run the stwbc_loader_not_empty.bat from the command line, specifying the COM number (e.g. COM3) and firmware filename parameters. ("firmware name.cab")

Figure 9 : DOS window: download only procedure, with written chip



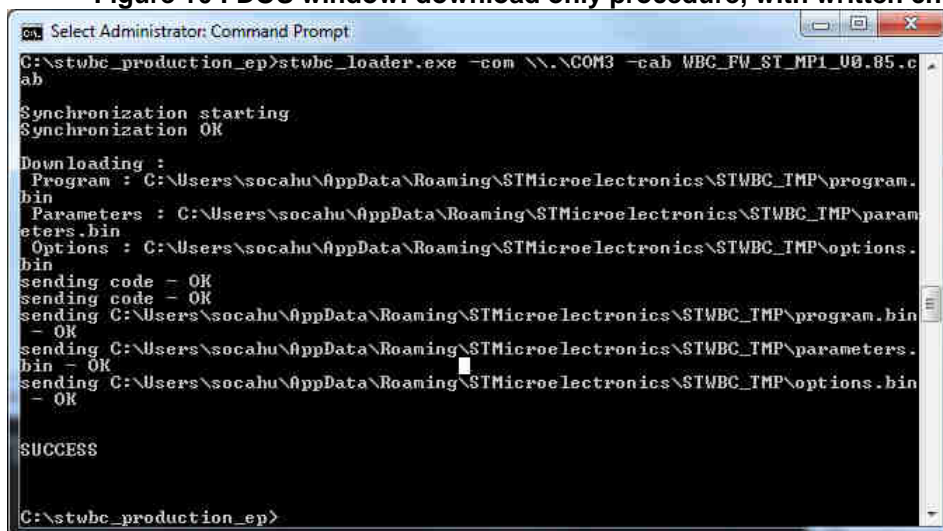
```

Administrator: Command Prompt
C:\>cd C:\stwbc_production_ep
C:\stwbc_production_ep>stwbc_loader_not_empty COM3 WBC_FW_ST_MP1_U0.85.cab
  
```

To guarantee a good synchronization for UART download, power ON the transmitter to 12V and then enter this command line.

If download is well done, you should see SUCCESS on DOS window:

Figure 10 : DOS window: download only procedure, with written chip



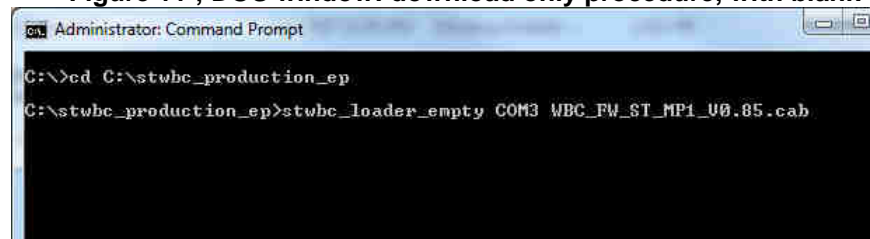
```

Select Administrator: Command Prompt
C:\stwbc_production_ep>stwbc_loader.exe -com \\.\COM3 -cab WBC_FW_ST_MP1_U0.85.cab
Synchronization starting
Synchronization OK
Downloading :
Program : C:\Users\socahu\AppData\Roaming\STMicroelectronics\STWBC_TMP\program.
bin
Parameters : C:\Users\socahu\AppData\Roaming\STMicroelectronics\STWBC_TMP\param
eters.bin
Options : C:\Users\socahu\AppData\Roaming\STMicroelectronics\STWBC_TMP\options.
bin
sending code - OK
sending code - OK
sending C:\Users\socahu\AppData\Roaming\STMicroelectronics\STWBC_TMP\program.bin
- OK
sending C:\Users\socahu\AppData\Roaming\STMicroelectronics\STWBC_TMP\parameters.
bin - OK
sending C:\Users\socahu\AppData\Roaming\STMicroelectronics\STWBC_TMP\options.bin
- OK
SUCCESS
C:\stwbc_production_ep>
  
```

3.2.2 With blank chip

In order to download the firmware into the board, run the stwbc_loader_empty.bat from the command line, specifying the COM number (e.g. COM3) and firmware filename parameters. ("firmware name.cab")

Figure 11 ; DOS window: download only procedure, with blank chip



To guarantee a good synchronization for UART download, enter this command line and then power ON the transmitter to 12V.

If download is well done, you should see SUCCESS on DOS window.

3.3 Test only procedure

After the download of the STWBC, production_test program enables to:

- Calibrate the STWBC
- Check during power transfer (with Rx), that several metrics at 0 load/10W and 14.5W are good.

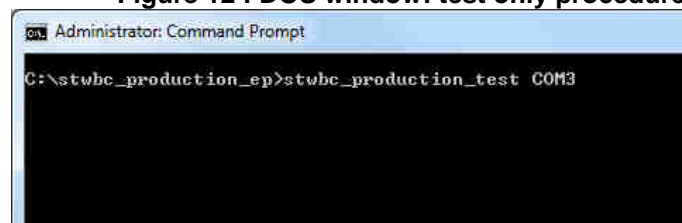
Thanks to UART communication between PC and STWBC, register value, ADC values can be checked.

Metrics like press_det value, operating frequency, Rx Reported Power, boost voltage are checked and should be in the range expected. It is also checked that all the demodulation are being used.

Good metrics enables to validate indirectly that the board is well functional and that all these function are well working. The user will only have to follow the request: Position the Rx on Tx, activate the load when requested ...

In order to test the transmitter, run the stwbc_production_test.bat from the command line, specifying the COM number (e.g. COM3).

Figure 12 : DOS window: test only procedure

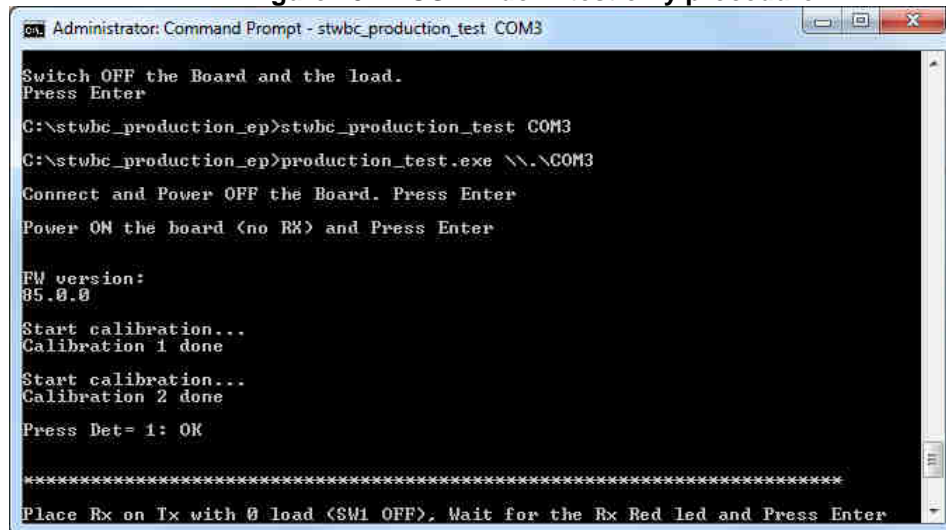


Then, you should follow the instructions:

- Power OFF the Board
- Power ON the Board (to 12V/3A) with No Receiver

The power consumption should be about 10mA. Calibration 1, 2 are done and check of Press Det value is done.

Figure 13 : DOS window: test only procedure



```
Administrator: Command Prompt - stwbc_production_test COM3
Switch OFF the Board and the load.
Press Enter
C:\stwbc_production_ep>stwbc_production_test COM3
C:\stwbc_production_ep>production_test.exe \\.\COM3
Connect and Power OFF the Board. Press Enter
Power ON the board (no RX) and Press Enter

FW version:
05.0.0

Start calibration...
Calibration 1 done

Start calibration...
Calibration 2 done

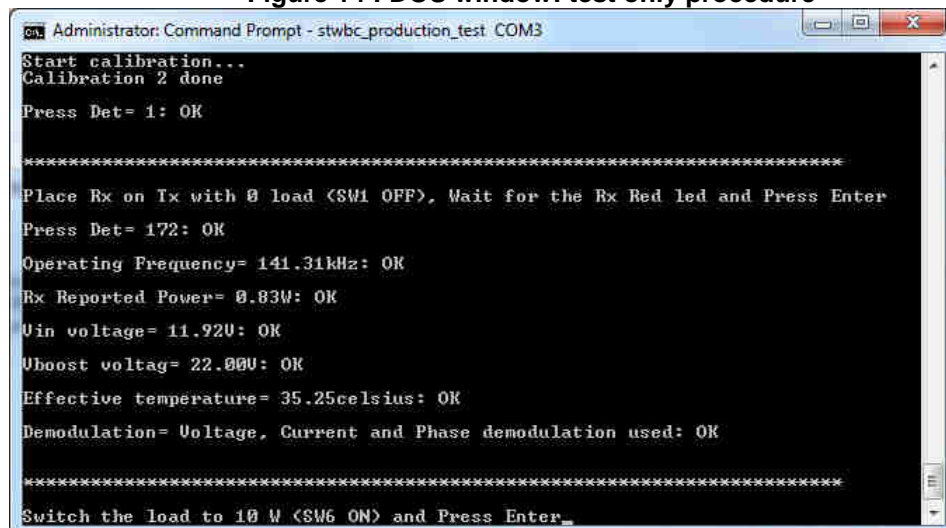
Press Det= 1: OK

*****
Place Rx on Tx with 0 load (SW1 OFF), Wait for the Rx Red led and Press Enter
```

- Receiver should then be set on Transmitter (see Figure 7) with 0 load (Switch 1 OFF)

The power consumption should be about 160 mA. Press Det value, Operating Frequency are checked. If all are in the range expected, then you should see “OK” at the end of each test.

Figure 14 : DOS window: test only procedure



```
Administrator: Command Prompt - stwbc_production_test COM3
Start calibration...
Calibration 2 done

Press Det= 1: OK

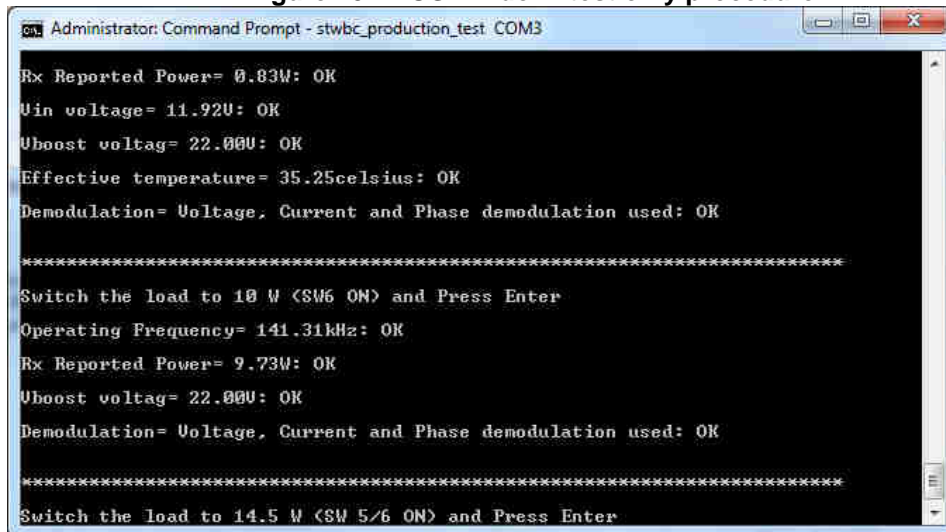
*****
Place Rx on Tx with 0 load (SW1 OFF), Wait for the Rx Red led and Press Enter
Press Det= 172: OK
Operating Frequency= 141.31kHz: OK
Rx Reported Power= 0.83W: OK
Vin voltage= 11.92V: OK
Vboost voltage= 22.00V: OK
Effective temperature= 35.25celsius: OK
Demodulation= Voltage, Current and Phase demodulation used: OK

*****
Switch the load to 10 W (SW6 ON) and Press Enter_
```

- Then, load should be set to 10W (Switch 1 ON and Switch 6 ON)

Power consumption should be about 940 mA. Operating Frequency, Rx Reported Power, Vboost Voltage.. are checked again..

Figure 15 : DOS window: test only procedure



```

Administrator: Command Prompt - stwbc_production_test COM3

Rx Reported Power= 0.83W: OK
Uin voltage= 11.92V: OK
Uboost voltage= 22.00V: OK
Effective temperature= 35.25celsius: OK
Demodulation= Voltage, Current and Phase demodulation used: OK

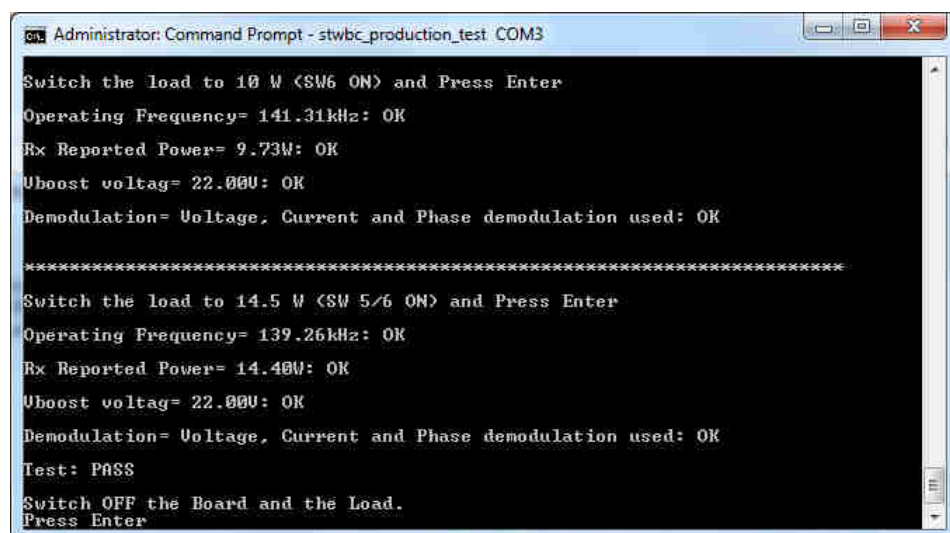
*****
Switch the load to 10 W <SW6 ON> and Press Enter
Operating Frequency= 141.31kHz: OK
Rx Reported Power= 9.73W: OK
Uboost voltage= 22.00V: OK
Demodulation= Voltage, Current and Phase demodulation used: OK

*****
Switch the load to 14.5 W <SW 5/6 ON> and Press Enter
  
```

- Load should then be set to 14.5W (Switch 1 ON and Switch 5/6 ON)

Power consumption should be about 1350 mA. Operating Frequency, Rx Reported Power, Vboost Voltage are checked again.

Figure 16 : DOS window: test only procedure



```

Administrator: Command Prompt - stwbc_production_test COM3

Switch the load to 10 W <SW6 ON> and Press Enter
Operating Frequency= 141.31kHz: OK
Rx Reported Power= 9.73W: OK
Uboost voltage= 22.00V: OK
Demodulation= Voltage, Current and Phase demodulation used: OK

*****
Switch the load to 14.5 W <SW 5/6 ON> and Press Enter
Operating Frequency= 139.26kHz: OK
Rx Reported Power= 14.40V: OK
Uboost voltage= 22.00V: OK
Demodulation= Voltage, Current and Phase demodulation used: OK
Test: PASS
Switch OFF the Board and the Load.
Press Enter
  
```

Final result is PASS if all the tests are PASS. If test is FAIL, then you should run again one or two times the test procedure only. If FAIL again, you should report to ST the test FAIL in order to debug.

Load and Power supply should be switch OFF at the end of the test. Load should not be keep ON too long since the power is quite high.

3.4 Download and test procedure

3.4.1 With written chip

In order to download the firmware and test the board, run the `stwbc_loader_not_empty_production_test.bat` from the command line, specifying the COM number (e.g. COM3) and firmware filename parameters. ("firmware name.cab")

Figure 17 : DOS window: download and test procedure, with written chip



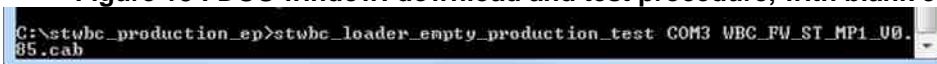
To guarantee a good synchronization for UART download, power ON the transmitter to 12V and then enter this command line.

If download is well done, you should see SUCCESS on DOS window. Then the production_test as describe in 3.3 should follow.

3.4.2 With blank chip

In order to download the firmware into the board, run the `stwbc_loader_empty_production_test.bat` from the command line, specifying the COM number (e.g. COM3) and firmware filename parameters. ("firmware name.cab")

Figure 18 : DOS window: download and test procedure, with blank chip



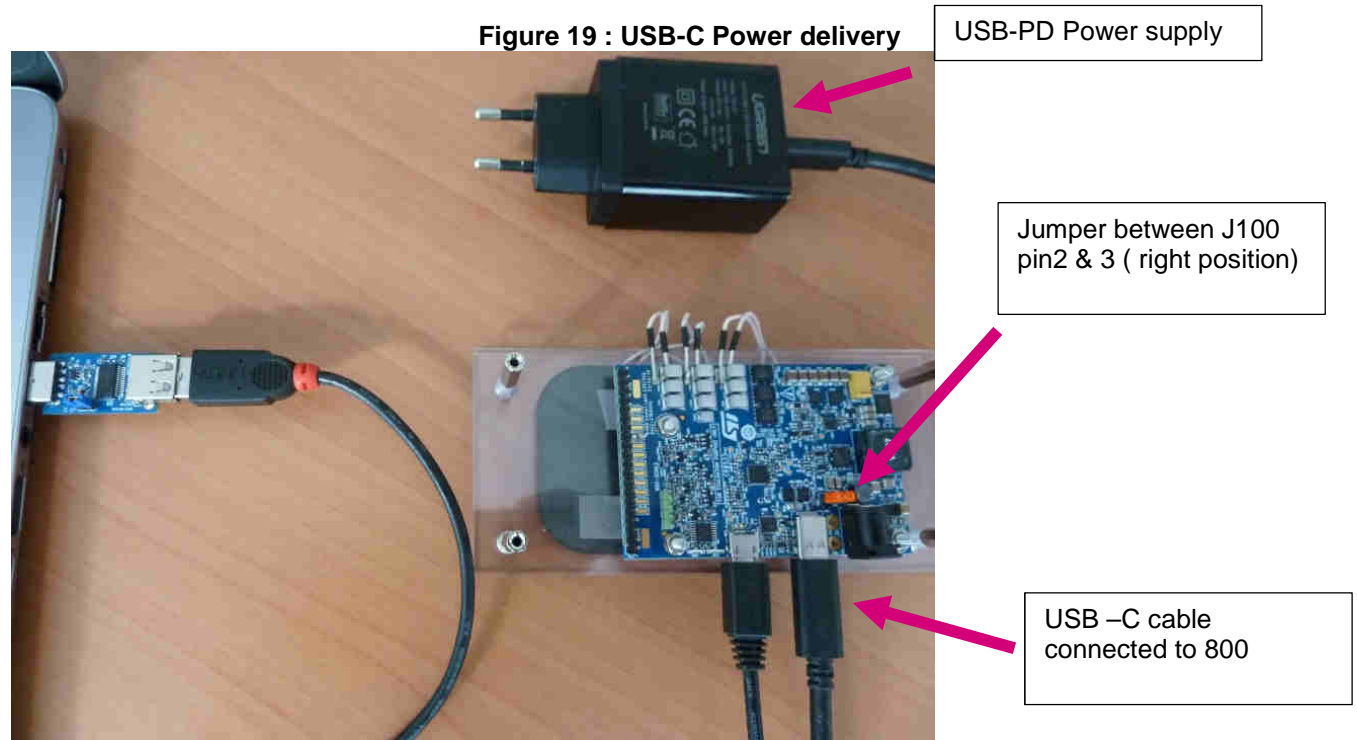
To guarantee a good synchronization for UART download, enter this command line and then power ON the transmitter to 12V.

If download is well done, you should see SUCCESS on DOS window. Then the production_test as describe in 3.3 should follow.

3.5 USB PD test

The transmitter can be supplied either by the jack or the USB connector. The goal of this test is to check that supplying the transmitter by the SSG charger (by USB), transmitter is able to transfer power (10W) to the receiver.

Warning: Jumper allow to select the supply source



- Switch off Labs power supply
- Remove DC jack connector to J100
- Remove receiver from transmitter
- Move jumper between J100 pin 2&3
- Connect USB-C cable to J800
- Connect USB-C cable to USB-PD power charger and plug in to AC voltage
- Board is power up by USB-PD
- move receiver from transmitter on coil on left position (see figure n°11)
- Set the receiver on transmitter with load at 0W. You should see red blinking on receiver side.
- Switch SW6 on load board to load 10W. Transmitter should able to continue power transfer. Led Red on receiver should still be ON -> Test is PASS.
- If Led Red is not ON receiver, redo the test and contact ST if this test continue to be FAIL.
- move receiver from transmitter on coil on right position (see figure n°12)
- Set the receiver on transmitter with load at 0W. You should see red blinking on receiver side.
- Switch SW6 on load board to load 10W. Transmitter should able to continue power transfer. Led Red on receiver should still be ON -> Test is PASS.
- If Led Red is not ON receiver, redo the test and contact ST if this test continue to be FAIL.

Figure 20 : Rx on left position



Figure 21 : Rx on right position

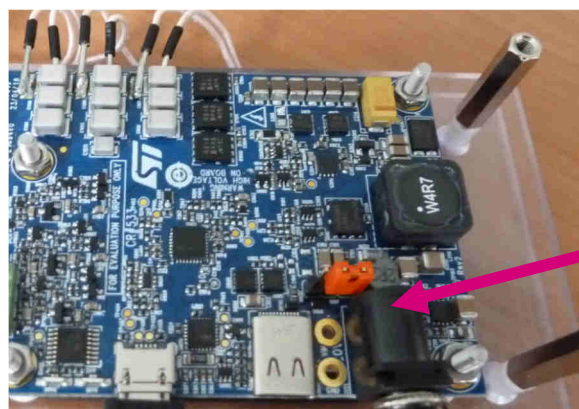


- move receiver from transmitter on coil on center position (see figure n°11)
- Set the receiver on transmitter with load at 0W. You should see red blinking on receiver side.
- Switch SW6 on load board to load 10W. Transmitter should be able to continue power transfer. Led Red on receiver should still be ON -> Test is PASS.
- If Led Red is not ON receiver, redo the test and contact ST if this test continues to be FAIL
- Then, Set the load to 0W, remove the receiver from transmitter and remove the USB charger.

3.6 USB Quick charge power test

- Switch off USB-PD power supply
- If needed change USB-C (USB-C male – USB-C male) cable by (USB-C male – USB A male)
- Plug and connect quick charger
- move receiver from transmitter on coil on center position (see figure n°11)
- Set the receiver on transmitter with load at 0W. You should see red blinking on receiver side.
- Switch SW6 on load board to load 10W. Transmitter should be able to continue power transfer. Led Red on receiver should still be ON -> Test is PASS.
- If Led Red is not ON receiver, redo the test and contact ST if this test continues to be FAIL
- Then, Set the load to 0W, remove the receiver from transmitter and remove the USB charger.
- Disconnect USB cable to J800
- Move jumper on left position – see figure n°20

Figure 22 : Jumper left Position



Jumper between J100
pin 1 & 2 (left position)

4 Revision history

Table 1. Revision history

Revision	Date	Author	Comment
0.1	18-07-2018	Christian GAUTIER	Initial release