

SPIRIT1 Development Kit Software Package



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SPIRIT1 Development Kit content [1/3]

- SPIRIT1 Library (STM32L, STM8L)
 - Spirit1 low level drivers: APIs to manage the features the device offers (platform independent)
 - Radio, GPIO, IRQ, Calibration, CSMA etc.
 - SDK_EVAL Libraries: APIs to manage the main features of the motherboard
 - Examples: BasicGeneric, LDCGeneric, StackGeneric, ...
- WMBUS Library (Binary for STM32L)
 - library files with the PHYSICAL and LINK layer of the WMBUS STACK
 - Examples: The example has four configurations to differentiate between these combination :
169 or 868 bands and meter or concentrator
- SPIRIT1 SDK Virtual Com port
 - VirtualCom Libraries for the STM32L motherboard.
- MCU Standard Peripheral Library
 - standard peripheral library for the STM32L + STM8L microcontroller
- STM32 USB-FS-Device Library:
 - USB library for STM32L microcontroller



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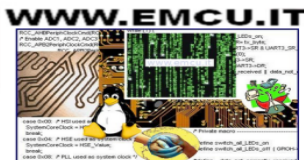
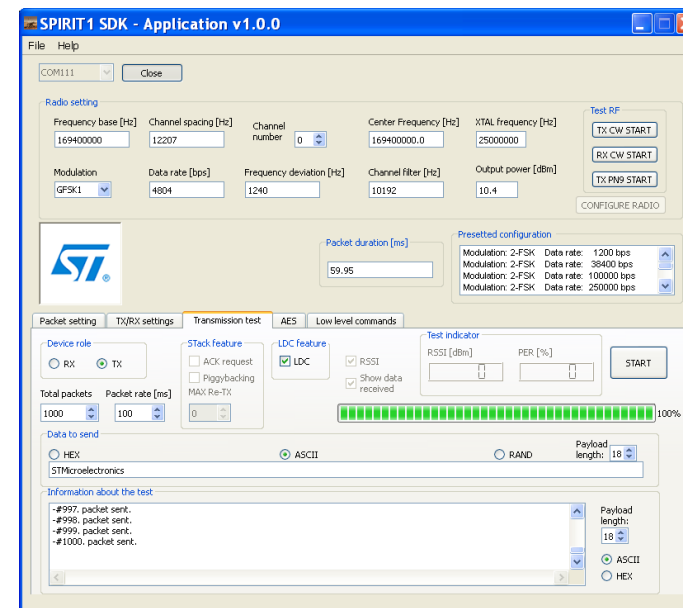


SPIRIT1 Development Kit content [3/3]

SPIRIT1 SDK Suite GUI

- SPIRIT1 SDK contains PC application (GUI) allowing:
 - Radio configuration
 - RF tests (TX of unmodulated carrier, TX PN9 sequence, RX activation)
 - Packet transmission/reception test with PER evaluation
 - AES engine encryption/decryption tests
 - Register read/write and dump
 - Store/load radio and packet configuration
 - Automatic Firmware Upgrade
 - Windows XP, 7

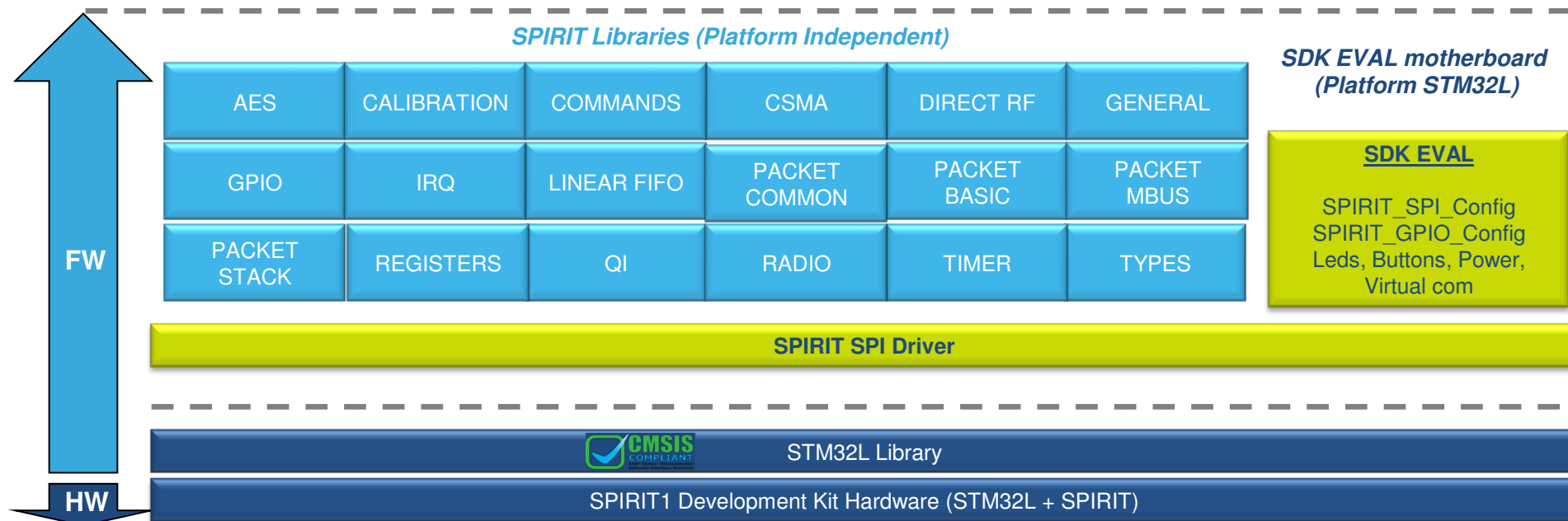
SPIRIT1 RF performance evaluation



STM32L SPIRIT1 SDK Firmware Package Architecture

The firmware package of the Spirit Development Kit provides in addition to the SPIRIT1 Library:

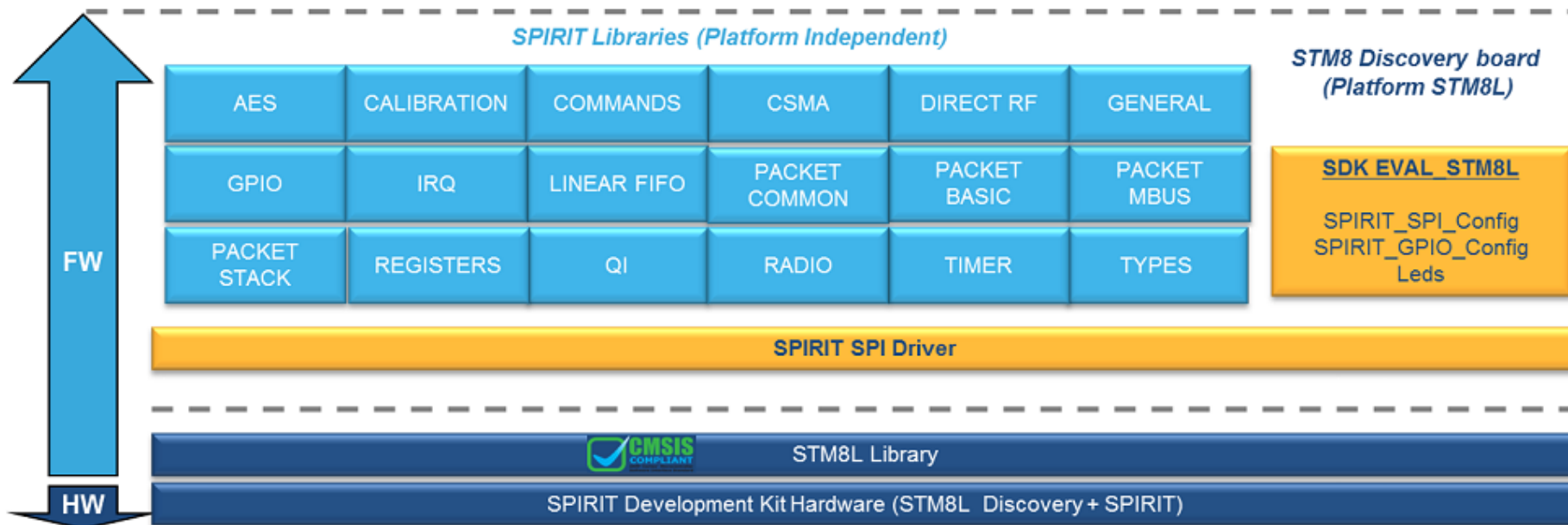
- SDK Eval: a set of API functions to manage the motherboard of the SDK (STM32L microcontroller) including USB library and DFU project files for firmware upgrade
- STM32L library: the standard peripheral library for the STM32L microcontroller.
- SPIRIT1 Examples: BasicGeneric, LDCGeneric, StackGeneric etc.
- Developed under EWARM IAR v.6.40 IDE (ST-Link, J-Link required for debugging)



STM8L SPIRIT1 SDK Firmware Package Architecture

The firmware package of the Spirit Development Kit provides in addition to the SPIRIT1 Library:

- SDK Eval: a set of API functions to manage the STM8L discovery board (STM8L microcontroller) STM8L library: the standard peripheral library for the STM8L microcontroller.
- SPIRIT1 Examples: BasicGeneric, LDCGeneric, StackGeneric etc.
- Developed under EWARM IAR v.6.40 IDE (ST-Link, J-Link required for debugging)



STM8L Firmware architecture

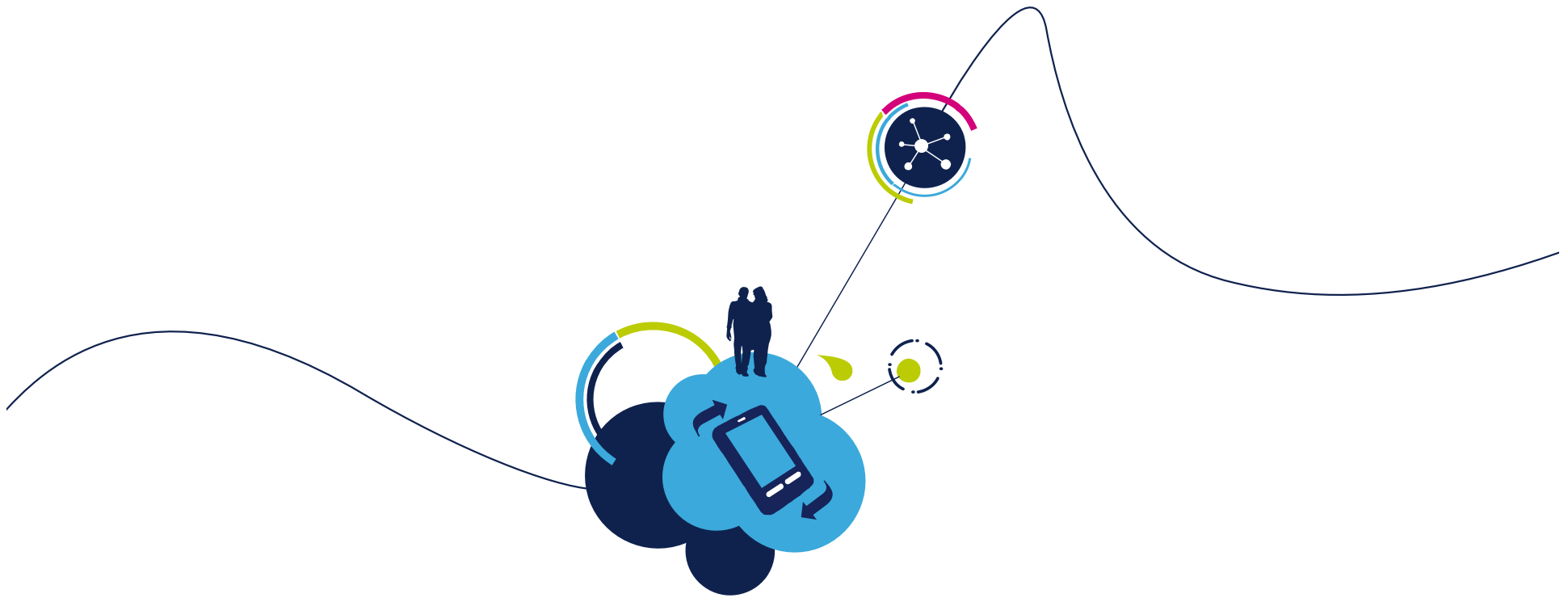
SPIRIT1 library Memory Foot print STM32L

	Flash (KBytes)	Ram (Bytes)
SPIRIT1 Library (on STM32L)	20	28

- Maximum usage using all the driver features (Typical application will use much lower flash, e.g 4K)
- Preliminary data

	Flash (KBytes)	Ram (Bytes)
WM-BUS protocol stack	9.1	2148

- Maximum usage of the Wireless M-Bus library
- Both data are referred from libraries in SPIRIT1 Dev Kit version 1.0.6 compiled with IAR with high optimization on the code size



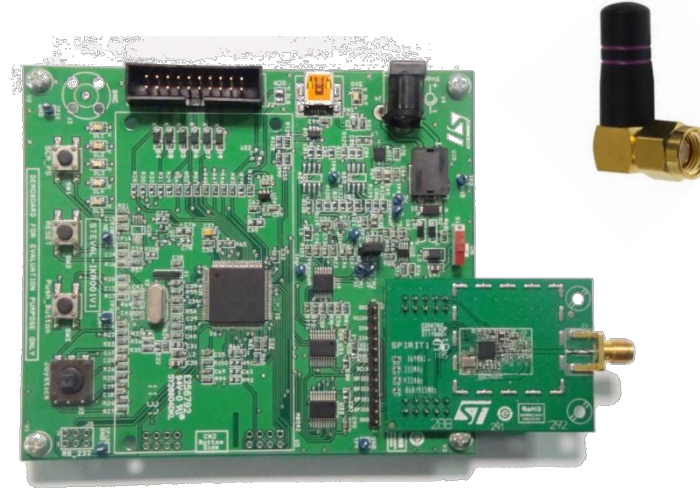
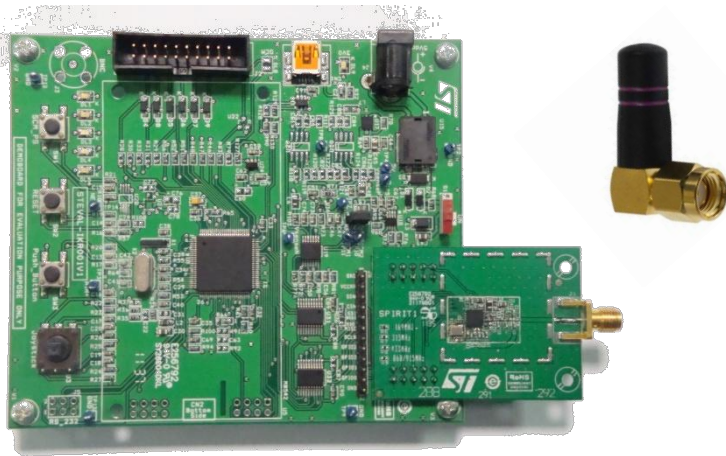
Getting Started with the SPIRIT1 Development Kit (DK)



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SPIRIT1 DK content



SPIRIT1 Development Kits

STEVAL-IKR001V1 – 169 MHz

STEVAL-IKR001V2 – 315 MHz

STEVAL-IKR001V3 – 433 MHz

STEVAL-IKR001V4 – 868MHz

STEVAL-IKR001V5 – 915 MHz

STEVAL-IKR001V6 – 920 MHz



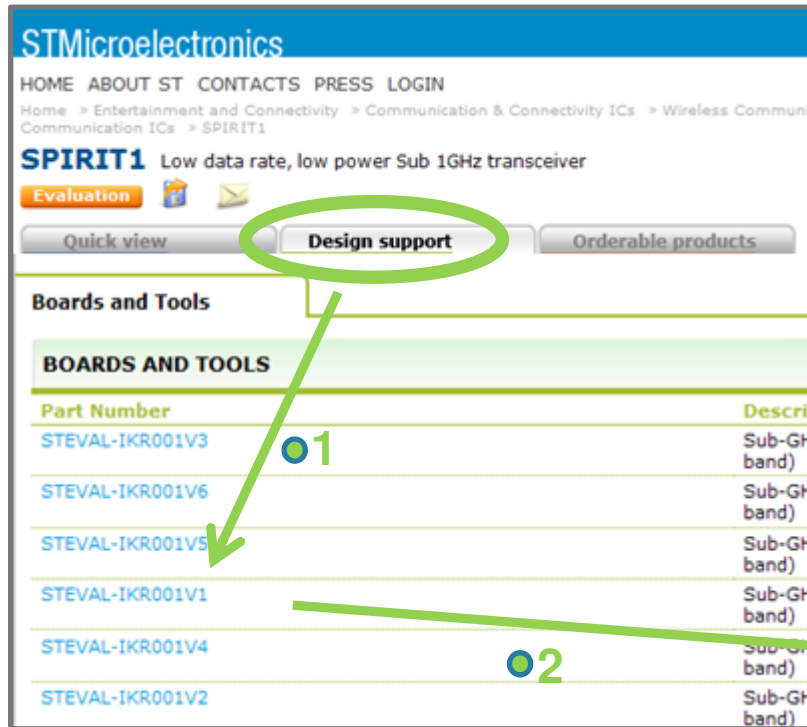
***DK – Development Kit**



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SDK Download

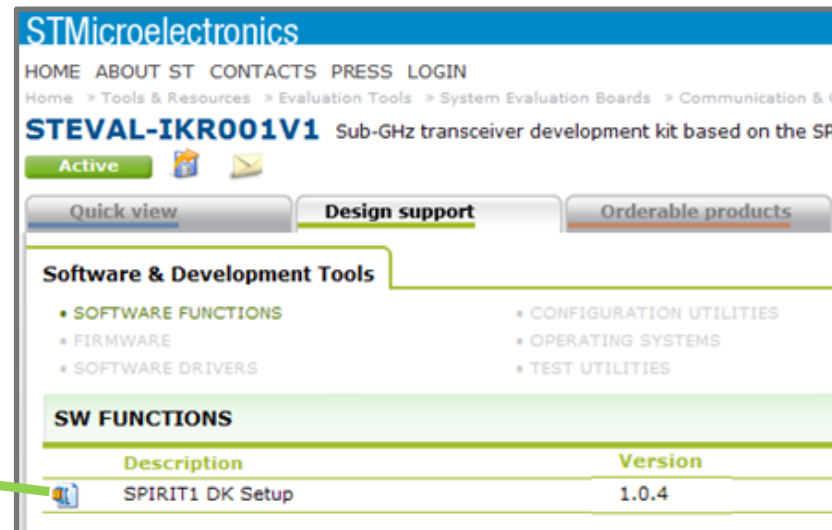


- Go to SPIRIT1 website

http://www.st.com/internet/imag_video/product/253167.jsp

- Under Design Support TAB 1 click on the link of the board you have,

- i.e. STEVAL-IKR001V1 2



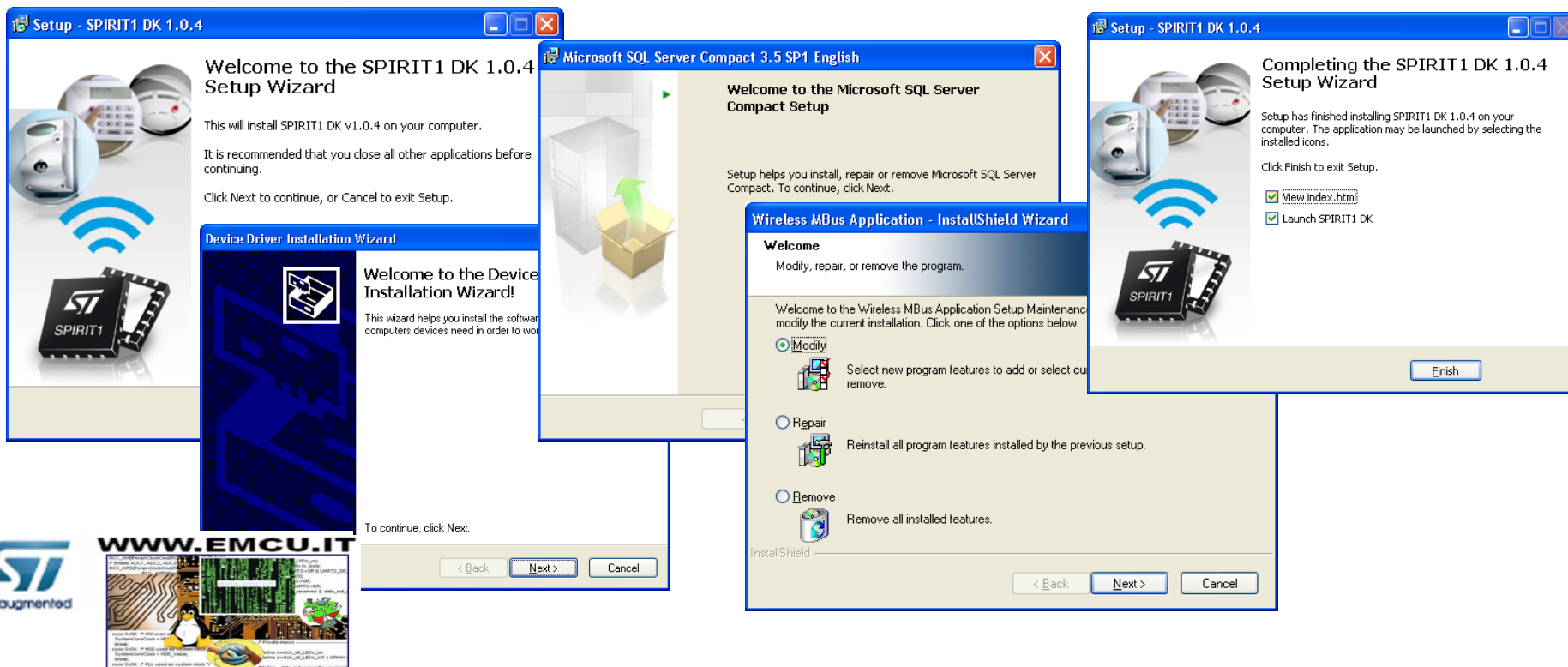
- In the Design Support TAB click download and install the latest SPIRIT1 DK Setup 3



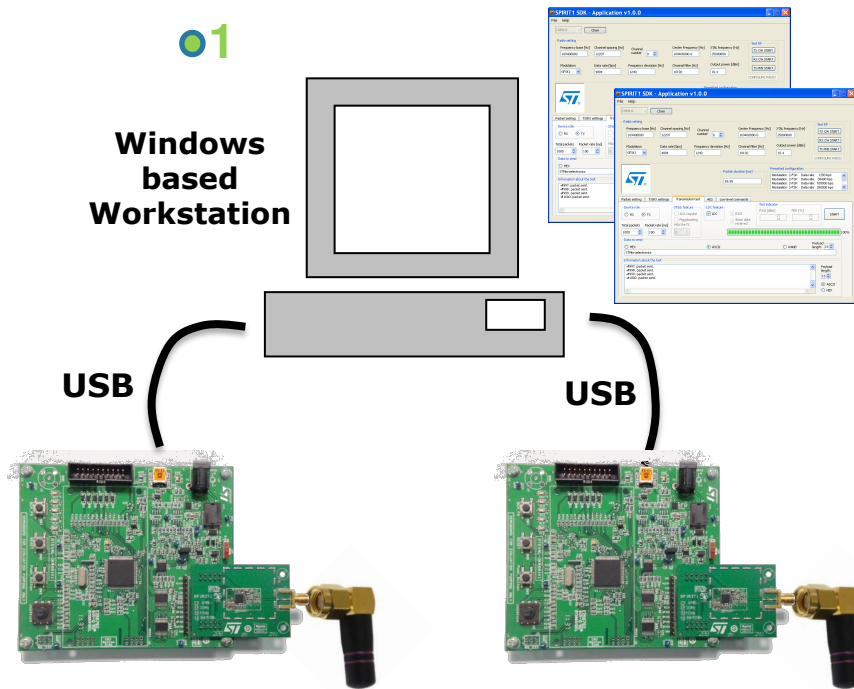
*SDK – Software Development Kit

SDK installation

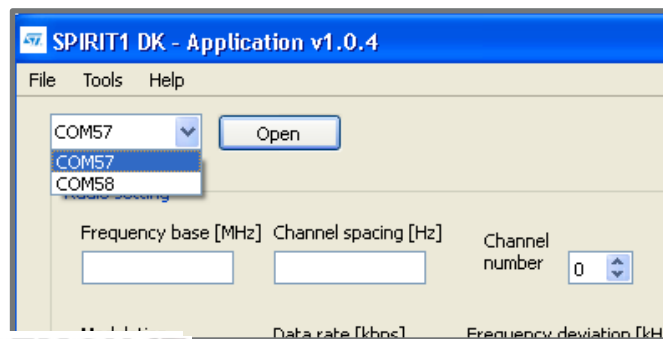
- Run the **SPIRIT1 DK-Setup-1.0.x.exe** downloaded from www.st.com
 - Follow the instruction given in the dialog box
 - You will be prompted to accept device driver installation (VCOM driver). Click next and follow the instructions to install it
 - Microsoft SQL Server Compact installation will be started automatically. Proceed with the installation in case you want to use the W-Mbus (optional)
 - Finally, accept to install the W-Mbus Application (optional)



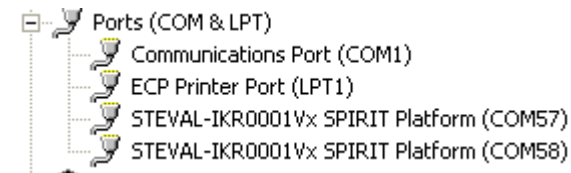
HW & SW set-up



02



- Connect both STM32L motherboards to the PC 01
- Check the device manager, two devices with different VCOM numbers should be visible



- Run two instances of the SPIRIT1 DK GUI (Start -> Programs-> STMicroelectronics -> SPIRIT DK_1.0.x -> SPIRIT1 DK)
- In each SPIRIT1 DK GUI, select one of the COM ports 02
 - Click Open port in both GUIs -> you are ready to test SPIRIT1

SPIRIT1 DK GUI - 1/5

Tools, firmware
flasher

Connection panel
COM port

Radio settings

Non-RADIO
SPIRIT1 set-up,
register access,
Communication
test

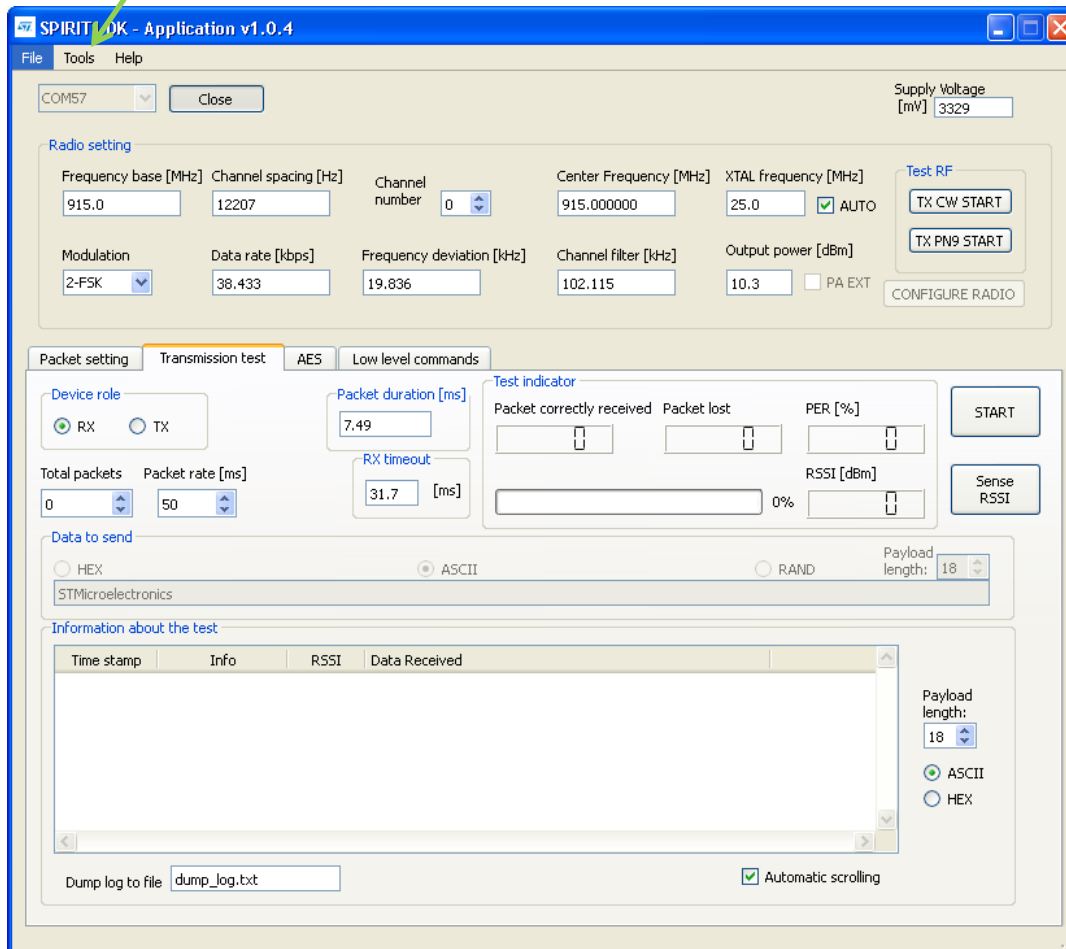
SPIRIT1 supply
voltage

Test RF – generates
Carrier Wave or
pseudorandom
binary sequence

Click CONFIGURE
RADIO button when
you change any
Radio settings

SPIRIT1 DK GUI - 2/5

Tools



Tools

• Firmware Upgrade

- Uses DFU boot loader (read details in the board user manual about how to put DK board in the DFU mode)

• Firmware Version

- Reads the board firmware version, in case it does not correspond to the DK GUI version, it is recommended to flash the corresponding one (you can find it at [...\Firmware\Binary file\SPIRIT1_DK.hex](#)) - Firmware Upgrade

• Save the Current Configuration

- Stores the SPIRIT1 DK GUI configuration you made

• Load the Saved Configuration

SPIRIT1 DK GUI - 3/5

Packet Setting

Packet Format

Preamble Length;
1 – 32 Bytes

Sync Word, Length
(1- 4 Bytes)

CRC Polynomial
selection

Forward Error
Correction

Data Whitening

Similar for
WMBUS packet
format

The screenshot shows the SPIRIT1 DK - Application v1.0.4 GUI. The top menu bar includes File, Tools, and Help. Below the menu bar, there is a COM port selection dropdown set to COM57 and a Close button. On the right, the Supply Voltage is set to 3301 mV. The main area is divided into two sections: Radio setting and Packet setting. The Radio setting section includes fields for Frequency base [MHz] (915.0), Channel spacing [Hz] (12207), Channel number (0), Center Frequency [MHz] (915.000000), XTAL frequency [MHz] (25.0), Modulation (2-FSK), Data rate [kbps] (38.433), Frequency deviation [kHz] (19.836), Channel filter [kHz] (102.115), Output power [dBm] (10.3), and checkboxes for AUTO, PA EXT, and Test RF. The Packet setting section is currently selected and shows options for Packet format (BASIC and WMBUS), Preamble length (4), Sync word length (4), Sync word (0x88888888), CRC polynomial (Poly 0x8005), and Data elaboration (FEC and Data whitening). A CONFIGURE PACKET button is located at the bottom right of the Packet setting section.

SPIRIT1 DK - Application v1.0.4

File Tools Help

COM57 Close

Supply Voltage [mV] 3301

Radio setting

Frequency base [MHz] 915.0 Channel spacing [Hz] 12207 Channel number 0 Center Frequency [MHz] 915.000000 XTAL frequency [MHz] 25.0 ☒ AUTO Test RF TX CW START TX PN9 START

Modulation 2-FSK Data rate [kbps] 38.433 Frequency deviation [kHz] 19.836 Channel filter [kHz] 102.115 Output power [dBm] 10.3 ☐ PA EXT CONFIGURE RADIO

Packet setting Transmission test AES Low level commands

Packet format BASIC WMBUS

Preamble length 4 Sync Length [bytes] 4 Sync word 0x88888888 CRC Poly 0x8005 Data elaboration ☐ FEC ☒ Data whitening CONFIGURE PACKET

SPIRIT1 DK GUI - 4/5

Transmission Test

Select the device Role (different for each board)

Number of packets to transmit (0 = infinite nbr)

Packet rate; set the same for TX and RX role

Payload data format

Payload data for transmitting

Overview of the received or transmitted packets

Packet duration – calculated from the data rate and number of bytes transmitted

Start Receiving or transmitting

Packet Error Rate Statistic

Number of Bytes to send as payload

Number of Bytes expected in the receiver

SPIRIT1 DK - Application v1.0.4

File Tools Help

COM58 Close

Supply Voltage [mV] 3301

Radio setting

Frequency base [MHz] 169.0 Channel spacing [Hz] 12207 Channel number 0 Center Frequency [MHz] 169.000000 XTAL frequency [MHz] 25.0 ☒ AUTO Test RF

Modulation 2-FSK Data rate [kbps] 38.433 Frequency deviation [kHz] 19.836 Channel filter [kHz] 102.115 Output power [dBm] 10.8 ☐ PA EXT TX CW START TX PN9 START CONFIGURE RADIO

Packet setting **Transmission test** AES Low level commands

Device role ☐ RX ☒ TX

Packet duration [ms] 7.49

RX timeout 31.7 [ms]

Total packets 0 Packet rate [ms] 50

Data to send ☐ HEX ☒ ASCII ☐ RAND Payload length: 18

STMicroelectronics

Information about the test

	Time stamp	Info	RSSI	Data Received
76	13:33:35.85	Packet sent		
77	13:33:35.89	Packet sent		
78	13:33:35.94	Packet sent		
79	13:33:36.00	Packet sent		
80	13:33:36.05	Packet sent		
81	13:33:36.10	Packet sent		
82	13:33:36.14	Packet sent		

Payload length: 18 ☒ ASCII ☐ HEX

Dump log to file dump_log.txt ☒ Automatic scrolling

Test indicator

Packet correctly received Packet lost PER [%]

RSSI [dBm]

START Sense RSSI

SPIRIT1 DK GUI - 5/5

The screenshot shows the SPIRIT1 DK GUI v1.0.4 interface. The 'Radio setting' tab is active, displaying fields for Frequency base [MHz] (915.0), Channel spacing [Hz] (12207), Channel number (0), Center Frequency [MHz] (915.000000), XTAL frequency [MHz] (25.0), Modulation (2-FSK), Data rate [kbps] (38.433), Frequency deviation [kHz] (19.836), Channel filter [kHz] (102.115), and Output power [dBm] (10.3). The 'Test RF' section includes buttons for 'TX CW START', 'TX PN9 START', and 'CONFIGURE RADIO'. The 'Low level commands' tab is selected, showing sections for 'Read registers', 'Write registers', 'Save register values', and 'SPIRIT1 information'. The 'Read registers' section has fields for 'First Register' (0x0) and 'No. registers' (5), with a 'Read' button. The 'Write registers' section has fields for 'Register to change' (0x) and 'New value' (0x), with a 'Write' button. The 'Save register values' section has a text field 'register.txt' and a 'Save' button. The 'SPIRIT1 information' section has buttons for 'SPIRIT state' and 'SPIRIT version', and a status box showing 'SPIRIT Status : READY'. The 'Vcc_RF regulator [mV]' section has a value of 1800 and a 'Set' button. The 'RX Data on GPIO' and 'Send Data from GPIO' buttons are also visible. Annotations with green arrows point to various parts of the GUI: 'Low level Commands' points to the 'Low level commands' tab; 'Read the register content' points to the 'Read registers' section; 'Save register content (e.g. to copy it to your C code)' points to the 'Save register values' section; 'Set the supply voltage (1.8 – 3.4V)' points to the 'Vcc_RF regulator' section; 'Set the Direct mode RX/TX through GPIOs' points to the 'RX Data on GPIO' and 'Send Data from GPIO' buttons; 'Write any particular register' points to the 'Write registers' section; 'Reads the current state of SPIRIT1' points to the 'SPIRIT state' button; 'Information block' points to the 'SPIRIT Status : READY' box; and 'SPIRIT1 silicon version' points to the 'SPIRIT version' button.

Low level Commands

Read the register content

Save register content (e.g. to copy it to your C code)

Set the supply voltage (1.8 – 3.4V)

Set the Direct mode RX/TX through GPIOs

Write any particular register

Reads the current state of SPIRIT1

Information block

SPIRIT1 silicon version