UM2177
User manual

PC software for the ST25R3911B-DISCO kit

Introduction

The ST25R3911B-DISCO GUI (STSW-ST25R001) is a PC software application, which allows the user to configure, evaluate, and communicate with the ST25R3911B high performance HF reader / NFC initiator.

The software must be used in conjunction with the ST25R3911B-DISCO kit, which includes a ready-to-use board to interface with the host PC through a USB interface. This software allows the evaluation of every feature of the ST25R3911B. The ST25R3911B communicates with the STM32L476 32-bit core MCU via the SPI bus.

The ST25R3911B-DISCO board is powered through the USB port, and no external power supply is required. It includes an ST25R3911B high performance HF reader / NFC initiator, an etched antenna, and the associated tuning components.

Starting with version 1.1.0 the ST25 Tag Editor is included, which allows access to all features of ST25 Tag and Dynamic Tags series.

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1 List of acronyms

Table 1. List of acronyms

Acronyms	Description
CW	Continuous wave
DFU	Device Firmware Upgrade
FeliCa	Contactless RFID smart card system from Sony
GUI	Graphical User Interface
HID	Human Interface Device class
ISO14443-A	Technology A of international standard that defines proximity cards used for identification.
ISO14443-B	Technology B of international standard that defines proximity cards used for identification.
ISO15693	ISO standard for vicinity cards. These cards can be read from a greater distance compared to proximity cards
PUPI	Pseudo Unique Identifier
UID	Unique Identifier
USB	Universal Serial Bus
VICC	Vicinity Integrated Circuit Card according to ISO 15693.

2 ST25R3911B-DISCO demo kit

This section describes the USB driver installation, and the GUI (Graphical User Interface) software for communication between the PC and the ST25R3911B-DISCO board.

2.1 ST25R3911B-DISCO board installation

To install the ST25R3911B-DISCO board, connect it to a PC with a USB cable to a USB port that is capable to deliver more than 250 mA of current. Usually, this kind of port is on a powered USB Hub or directly on a PC.

2.2 Installing the ST25R3911B-DISCO PC software (STSW-ST25R001)

To install the ST25R3911B-DISCO development software (STSW-ST25R001):

- Download the latest version of the ST25R3911B-DISCO development software from *www.st.com*.
- Execute the installer and follow the GUI install procedure.

When the installation process is complete, the ST25R3911B-DISCO development software can be used.

Note: The ST25R3911B-DISCO board works using USB HID (Human Interface device class). There are no special ST25R3911B-DISCO drivers. Windows® uses stack mouse and keyboard drivers.

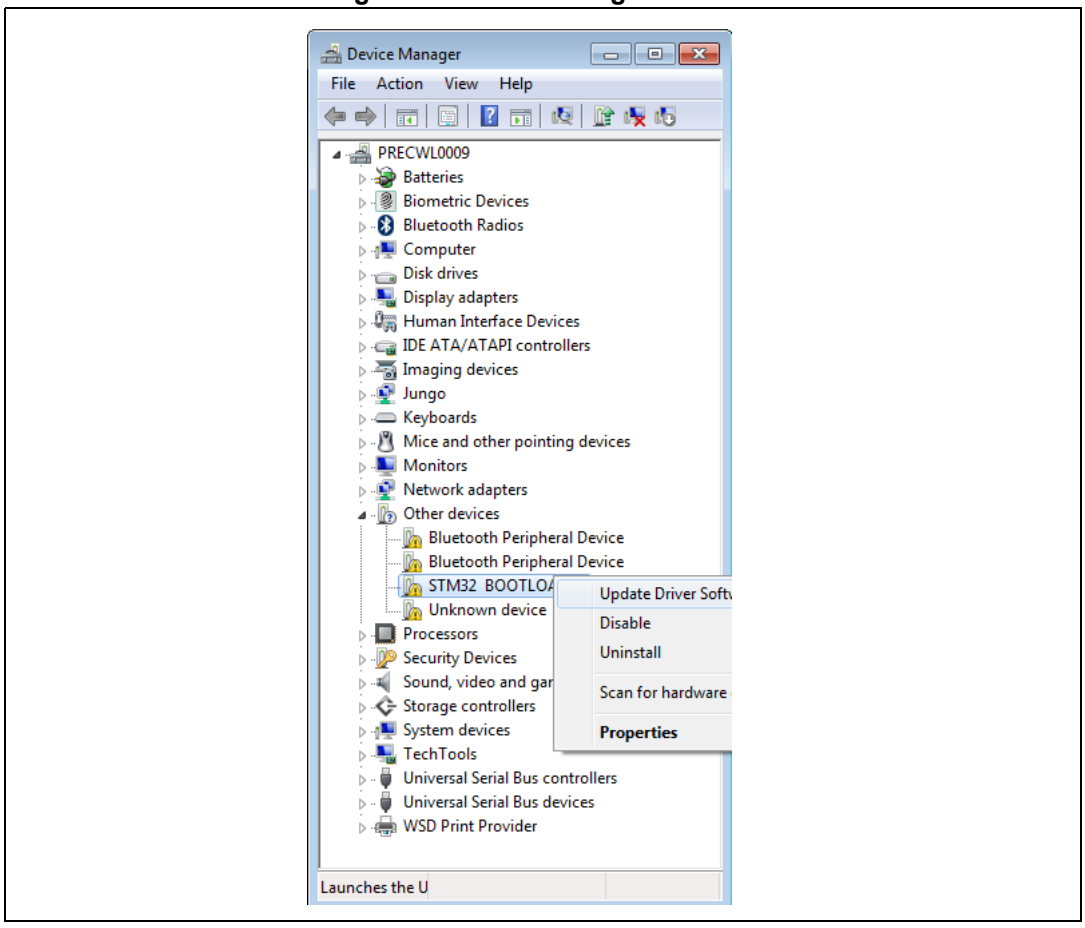
2.3 Firmware update

The ST25R3911B-DISCO demo kit contains a DFU driver, and it is required to update the firmware before using the STSW-ST25R001.

Open the GUI and select “Firmware update:

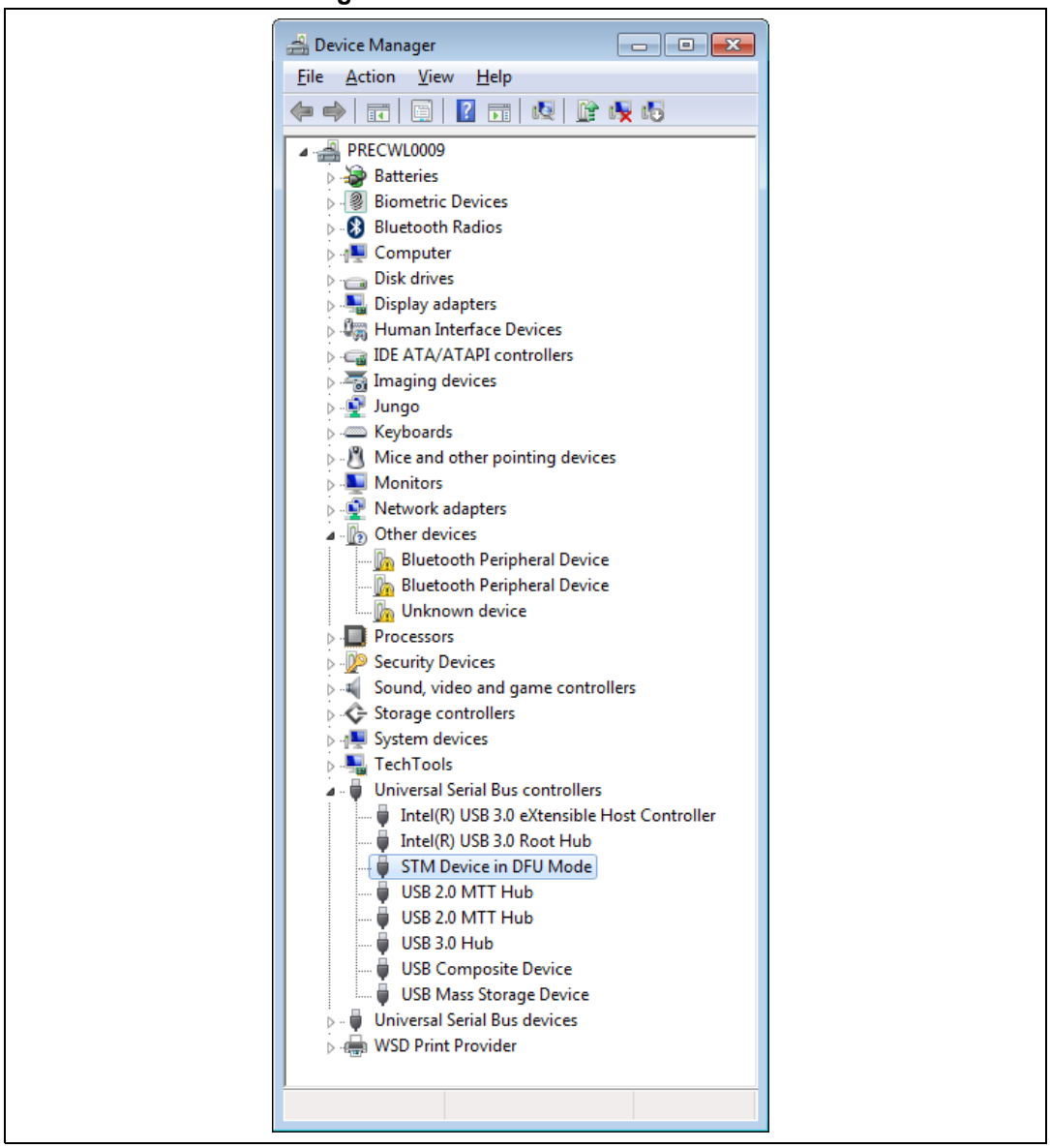
1. Select in the menu “Help” the entry “Firmware Update”. A file chooser opens, there choose the “DISCO_STM32L4x6.hex”. If the DFU driver is already installed the firmware update should finish in few seconds, otherwise go to point 2.
2. If the DFU driver is not installed, open the “Device Manager” window (no need to wait for the GUI’s feedback):
   a) Select under “Other devices” the “STM32 BOOTLOADER”
   b) Click on right button of the mouse and select “Update driver software (See *Figure 1*)

Figure 1. Device Manager window



   c) Select “Browse my Computer for driver software”
   d) Enter “C:\Program Files (x86)\STMicroelectronics\ST25R3911B_Discovery_GUI\Driver” and install it.
   e) Under “Universal Serial Bus controllers” appears an STM Device in DFU Mode. (See *Figure 2*)

Figure 2. STM Device in DFU Mode



f) In the meantime the ST25R3911B-DISCO GUI is in timeout, and the USB field in the status bar is red.

g) To do the update, restart from point 1

Caution: The loading of a wrong firmware makes the board unusable, but the board can be automatically enumerated as an STM Device in DFU Mode forcing the bootloader by pressing the Boot button on the board, holding it and then connecting the USB.

2.4 ST25R3911B Discovery GUI tab

If the software package is installed correctly, and the ST25R3911B-DISCO board is connected to PC USB port, the main menu is displayed (see *Figure 3*). The toolbar also contains the ST25 Tag Editor icon, which allows the ST25 Tags editing. To open it, click on the ST25 Tag Editor icon, while a board is connected. The Disco GUI will automatically disconnect from the board, and open the ST25 Tag Editor to take control over the board. To go back to the Disco Reader functionality, just close the ST25 Tag Editor or click on the icon again. The ST25 Tag Editor will be closed automatically in this latter case.

Please see *Section 3: Using the ST25 Tag Editor software* for details.

Note: The firmware version number is shown in the status bar of the main window.

This tab allows the user to access several sub-menu:

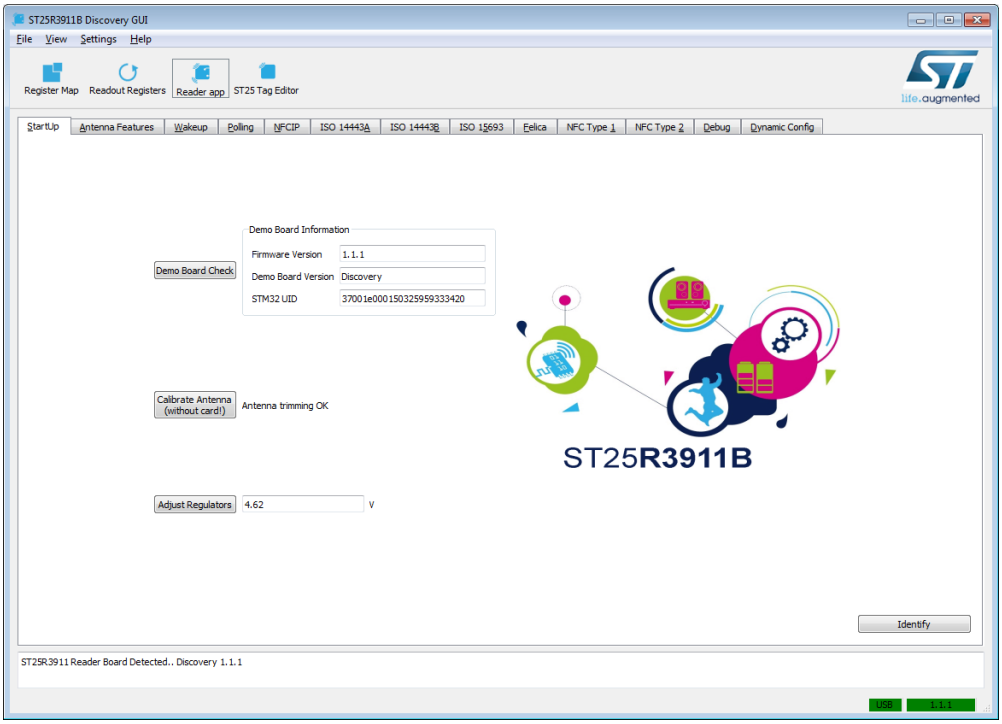
- **StartUp tab** (see *Section 2.4.1*)
- **Antenna features tab** (see *Section 2.4.2*)
- **Wakeup tab** (see *Section 2.4.3*)
- **Polling tab** (see *Section 2.4.4*)
- **NFCIP tab** (see *Section 2.4.5*)
- **ISO 14443A tab** (see *Section 2.4.6*)
- **ISO 14443B tab** (see *Section 2.4.7*)
- **ISO 15693 tab** (see *Section 2.4.8*)
- **FeliCa tab** (see *Section 2.4.9*)
- **NFC Type 1 tab** (see *Section 2.4.10*)
- **NFC Type 2 tab** (see *Section 2.4.11*)
- **Debug tab** (see *Section 2.4.12*)
- **Dynamic Config tab** (see *Section 2.4.13*)

2.4.1 StartUp tab

Figure 3 shows the startup tab.

The status tab on the bottom right corner shows the connection status. If the HW is successfully connected via USB then the status turns to green, and displays the version of the Firmware.

Figure 3. GUI startup



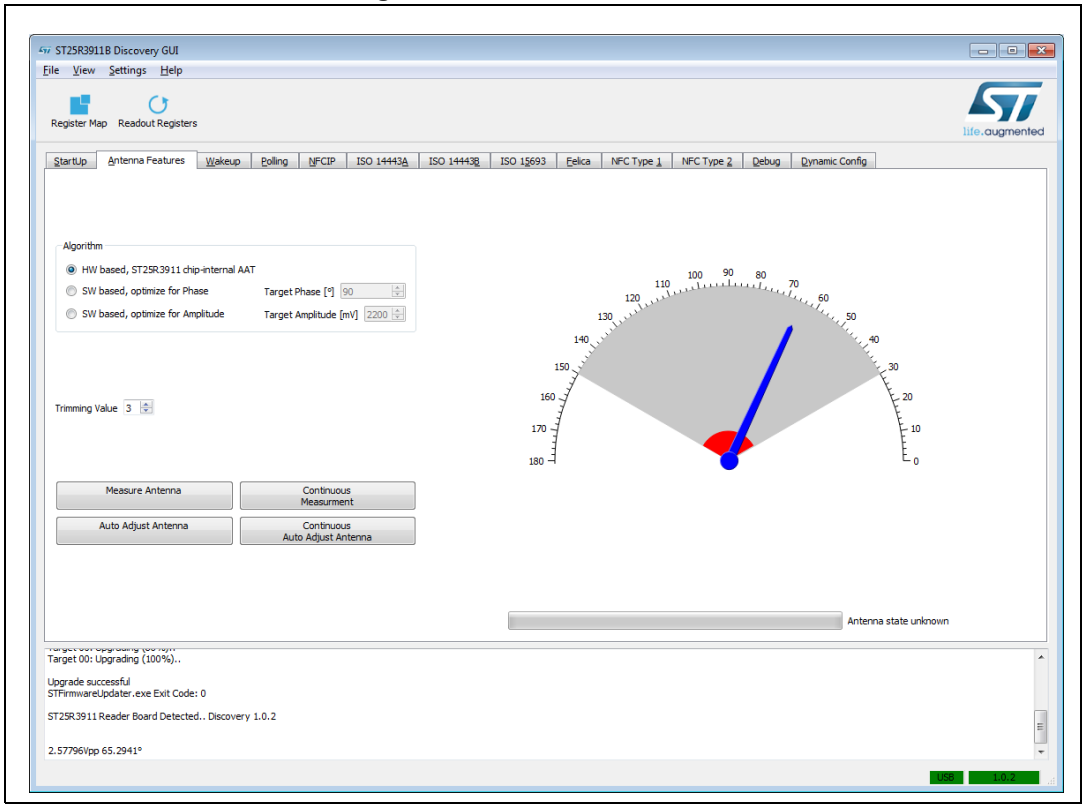
- Click on “Demo Board Check” button. This action checks the USB connection to the demo board, and reads some demo board information, which is required for the GUI operation. The configuration of the ST25R3911B is based on this information.
- Click on “Adjust Regulators” button to automatically set the regulators. This command improves the system Power Supply Rejection Ratio, and the value of regulated voltage is displayed.
- Click on “Calibrate Antenna” button. This command automatically adjusts the resonance frequency of the antenna LC tank. It has to be run again in case the environment of antenna coil is changed (for example in case that some metal object is placed near to the antenna).
- Antenna trimming OK is displayed next to the button.

When the Start-up procedure is done, the user can proceed with using the other tabs.

2.4.2 Antenna features tab

Figure 4 shows the Antenna features tab.

Figure 4. Antenna features tab



- The antenna resonates at 13,56MHz, when the pointer shows maximum input signal amplitude.
- Choose a target phase to use it as a reference for the software algorithm.
- Click on “Measure Antenna” button to measure the amplitude of the input signals and the phase differences between output and input signal. Both are displayed on the graph and the command line on the bottom.

The input amplitude and phase difference can be continuously monitored by using the “Continuous Measurement” button. Moreover, when this option is activated and a piece of metal is approached to the antenna, a detuning effect can be seen.

The “Auto Adjust Antenna” button allows the antenna tuning. This action can be done continuously by pressing the “Continuous Adjust Antenna” button.

Moreover, it is possible to manually adjust the trim value with the List Box “Trimming values”. It is recommended to use the “Continuous Measurement” for this investigation.

Note: The antenna feature menu can be easily used for matching network evaluation of others ST25R3911B based readers.

2.4.3 Wakeup tab

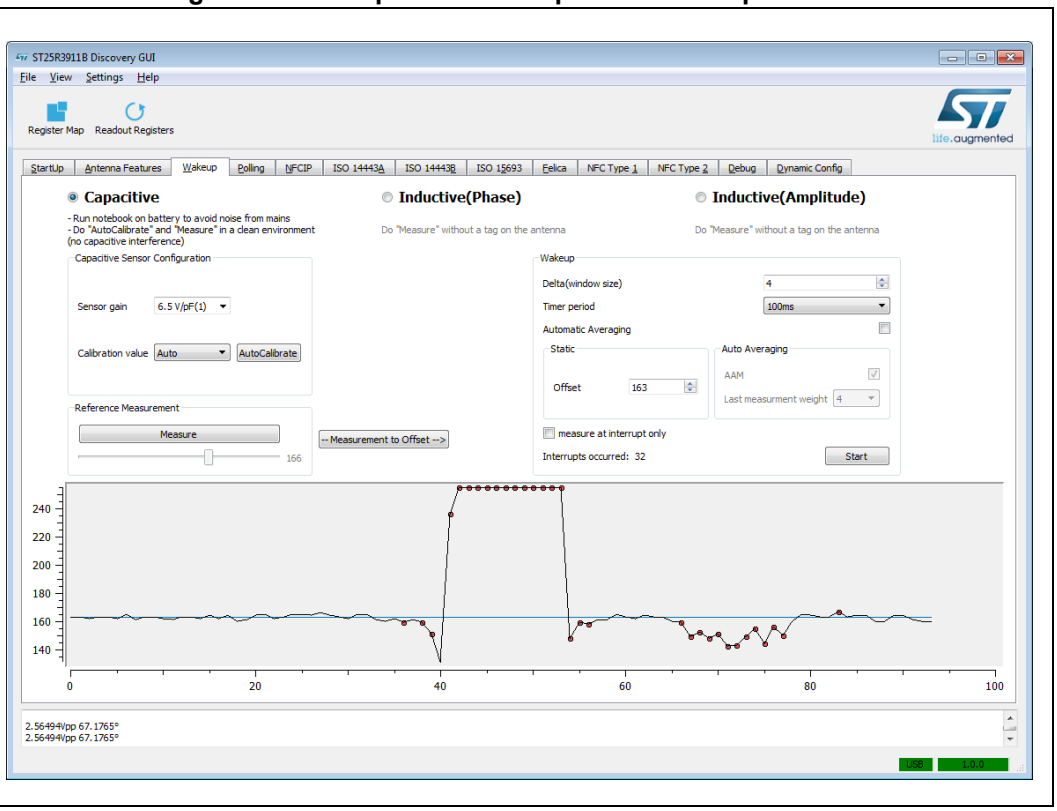
The ST25R3911B offers three wakeup modes (capacitive, inductive (phase) and inductive (amplitude) that generate an interrupt to a microcontroller in some sleep mode.

Note: This demonstrator is for evaluation purposes, there are continuous measurements updates happening, which result in extra current consumption.
The "read at interrupt only" switch avoids interaction and minimizes the current.

Capacitive wakeup

Figure 5 shows the wakeup window with the capacitive wakeup enabled.

Figure 5. Wakeup window - Capacitive wakeup enabled



This method allows to measure the capacitance across two electrodes.

- Click on "AutoCalibrate" button to do the calibration and to remove the parasitic capacitances influence. Alternatively, it is possible to manually set the calibration value.

Note: The "AutoCalibrate" button only works if the calibration value is set to "Auto".

- Click on "Measure" and "Measurement to Offset" button to set the initial status (Offset).
- Click on "Start" button to initiate the autonomous wake up mode of ST25R3911B.

The obtained measurement values are shown in *Figure 5*.

Note: Each interrupt is indicated by a red dot.

Other additional parameters are:

- **Delta (window size)** defines the window in which no interrupt is generated. If the actual measured value is within the window range, no interrupt will be generated.
- **Timer period** defines how often the measurement procedure is executed.
- **Automatic averaging** box selects an automatic or static offset value. In case of an auto averaging, the offset is dynamically adjusted to the environment condition. If this option is active, the offset changes dynamically with a weighted factor which can be selected. The weight option defines how fast the offset value is being adapted to the new environment condition.

Inductive wakeup

The inductive wakeup scans periodically the input signal amplitude and the phase difference of the output and input signal. If there is a change of one of these two antenna tuning parameters an interrupt is generated.

The antenna needs to be tuned before starting the inductive wakeup procedure.

Figure 6. Wakeup window - Inductive (phase) wakeup enabled

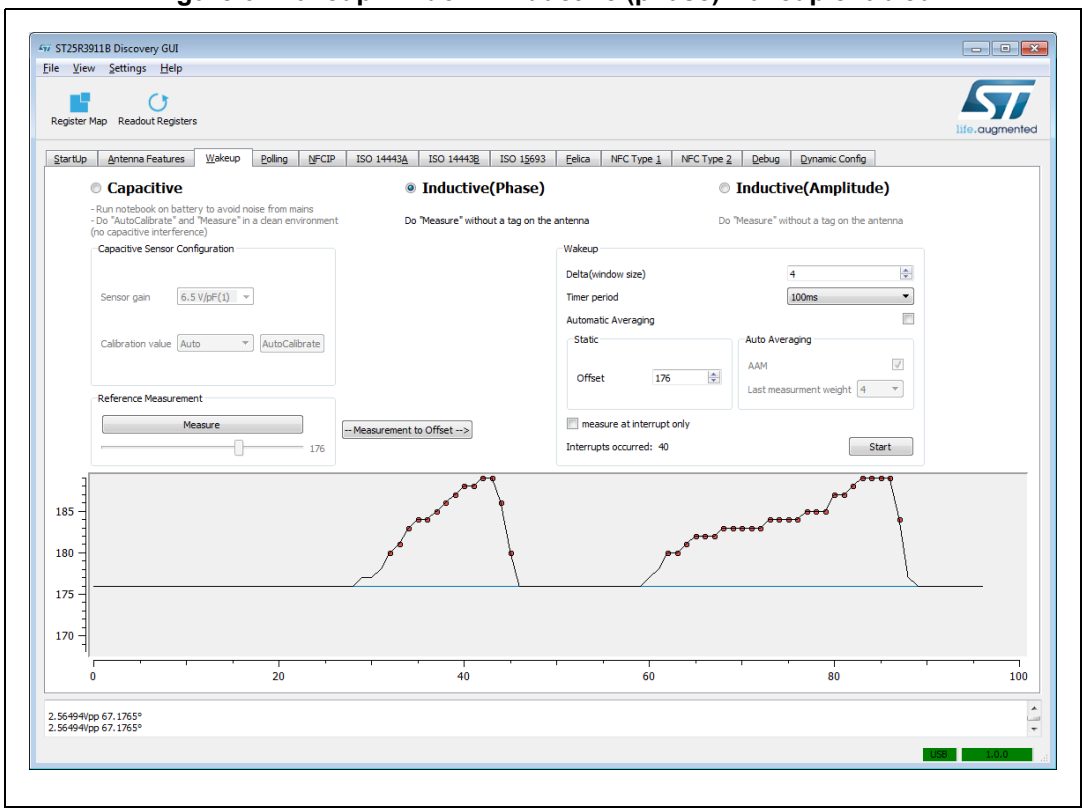
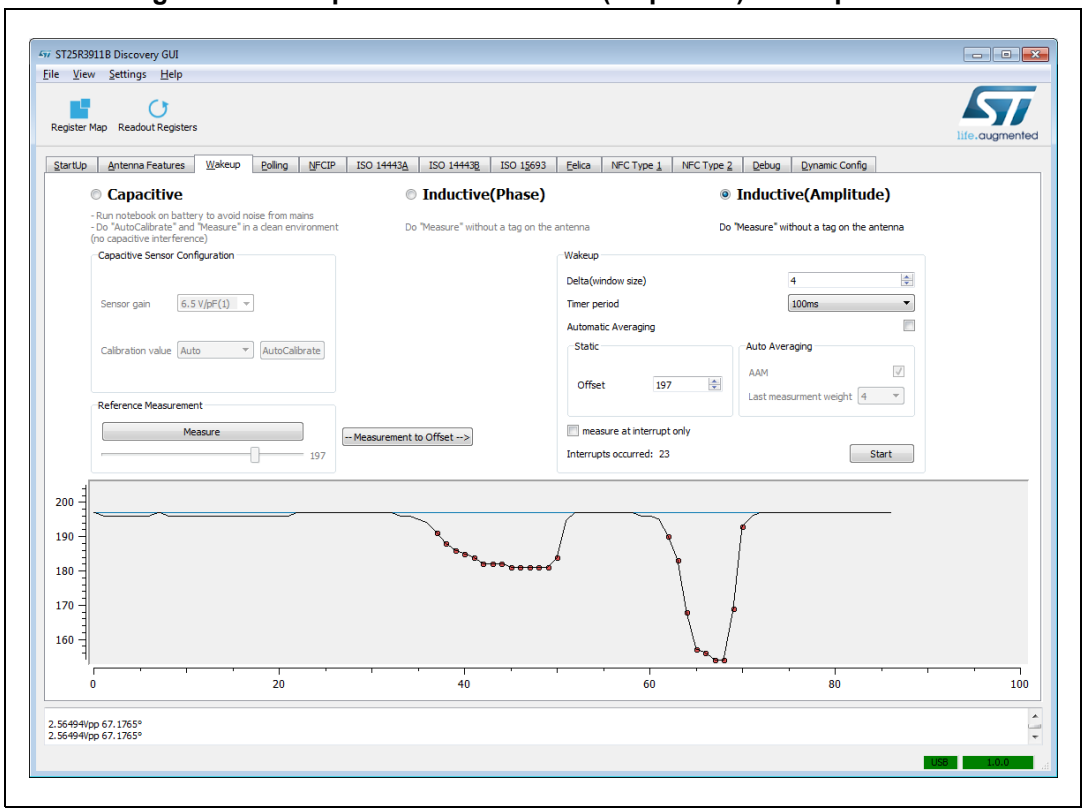


Figure 6 shows the wakeup window with the phase differences measurement enabled.

To achieve the offset level, it needs to execute the same procedure of *Capacitive wakeup*.

Figure 7 shows the wakeup window with the input signal amplitude measurement.

Figure 7. Wakeup window - Inductive (amplitude) wakeup enabled



Note: Different wakeup ranges can be achieved with the phase or amplitude method. This depends on the antenna matching network.

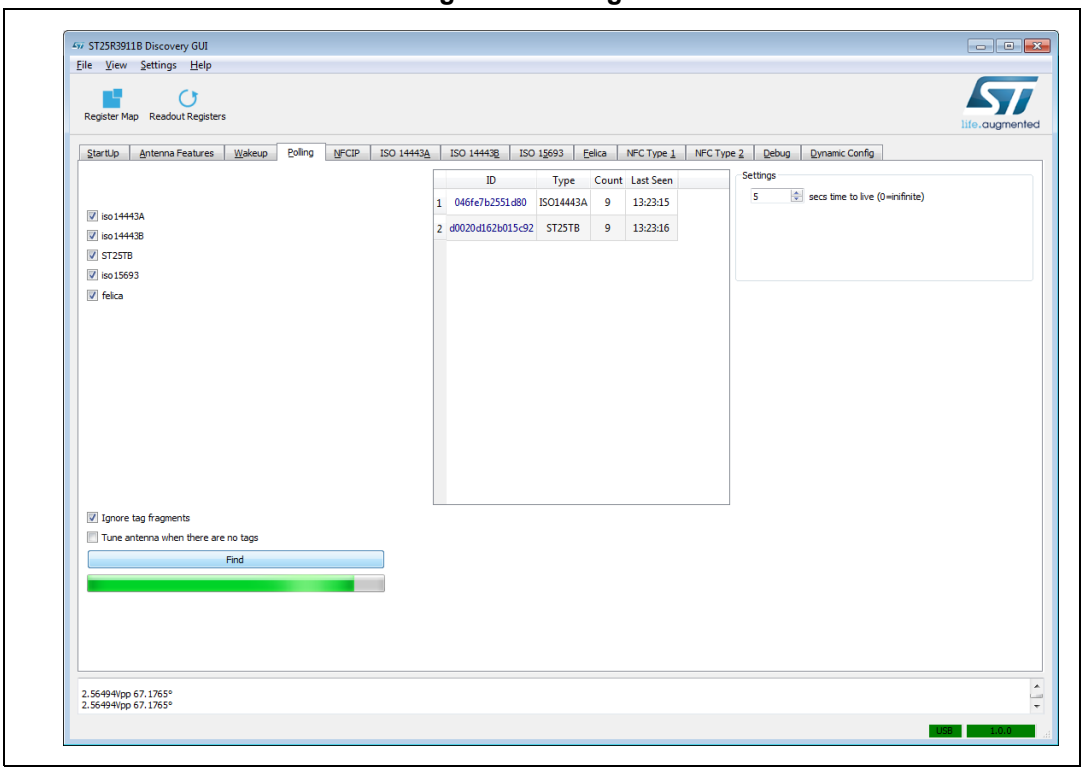
2.4.4 Polling tab

Figure 8 shows the anti-collision and multi-protocol features of ST25R3911B-DISCO board.

In addition to the protocols shown, the following protocols are supported:

- Kovio Barcode 128/256 bit (ISO 14443A checkbox)
- iCLASS (ISO 15693 checkbox)

Figure 8. Polling tab



By default all standards are active.

- Click on the “Find” button. The reader starts to scan for tags that are in the proximity of the reader.
- The polling process stops if clicked on “Stop” button during the polling process.
- The screen log shows the UIDs or PUPIs, the type and how often the tag is detected.
- The time stamp shows the time of the last detection.

2.4.5 NFCIP tab

Figure 9 shows the NFCIP tab, which displays the peer-to-peer functionality of the ST25R3911B.

Figure 9. NFCIP window

Note: This feature requires an NFC enabled device supporting peer to peer protocol.

The ST25R3911B is initially configured to cycle through the initiator and target mode. The default setting for the bit-rate is 424kbps.

The communication starts automatically when the tab is selected.

Once the link is established, the initial gray phone picture on the GUI is replaced by a colored one.

When the connection is established it is possible to transfer an URL to the phone:

- Write the URL and click on “=URL =>” button to start the transfer.
- The browser of the phone opens the requested URL.

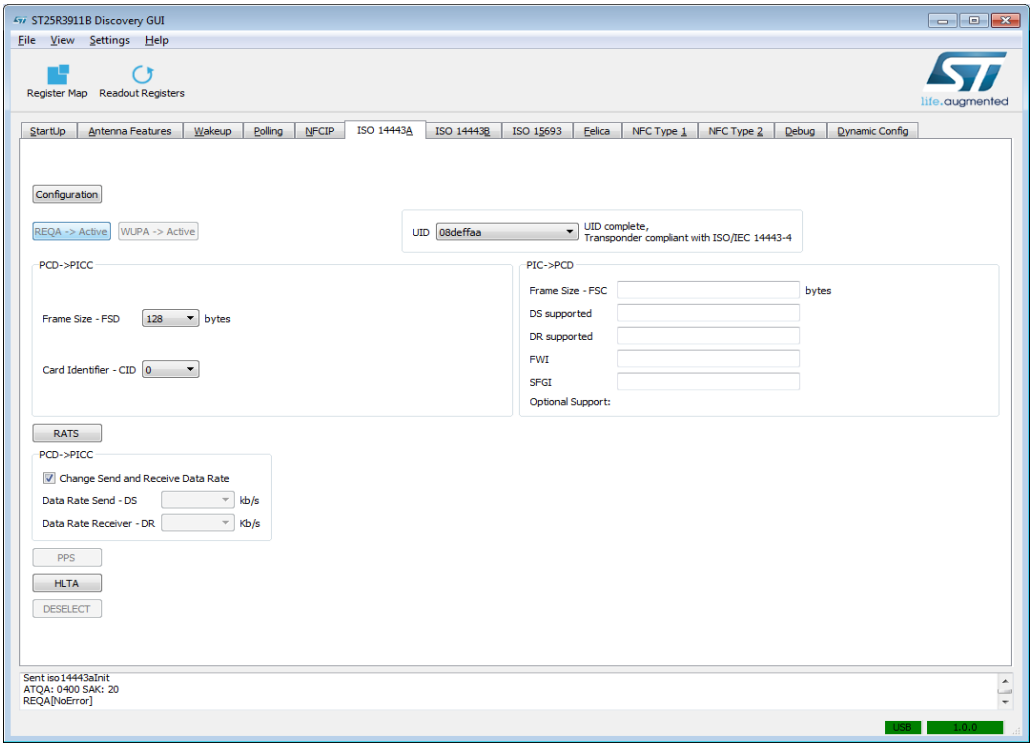
It is possible to transfer pictures to the phone (The GUI provides three samples as example):

- The “Image from Disk” button provides an individual option to select a file.
  - Click on one picture to start the transfer. The picture’s transfer takes several seconds, because the picture contains a large amount of data. For this reason, please wait until the picture is transferred.
  - The phone will display the received picture with the comment “new Tag received”.

2.4.6 ISO 14443A tab

Figure 10 shows the ISO 14443A tab.

Figure 10. ISO 14443A tab



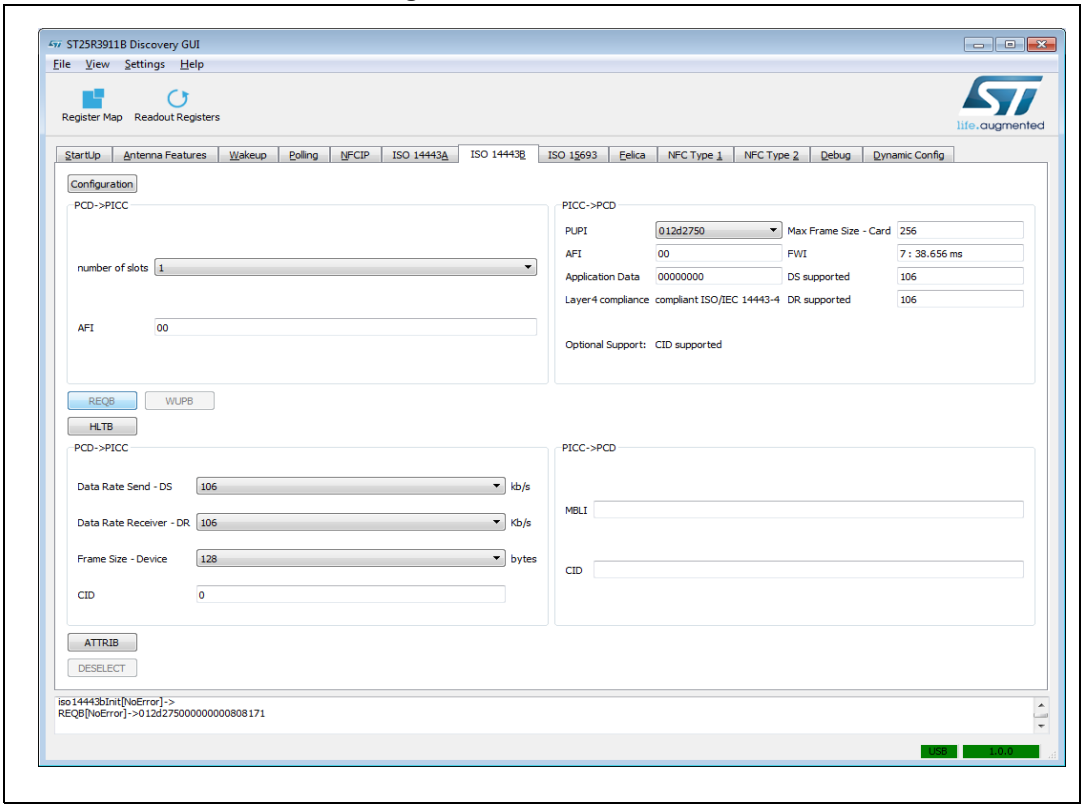
The “Configuration” button prepares the board for ISO 14443-A communication, and the following sequence activates the cards:

- “REQA ->Active” or “WUPA ->Active” starts the anti-collision procedure
- Tag UID is displayed.
- If the card/tag supports ISO 14443-4 then additional commands like RATS or PPS can be carried out.
- Click on RATS or PPS.
- Send arbitrary frames using “Debug” tab (See *Section 2.4.12: Debug tab*)

2.4.7 ISO 14443B tab

Figure 11 shows the ISO 14443B tab.

Figure 11. ISO 14443B tab



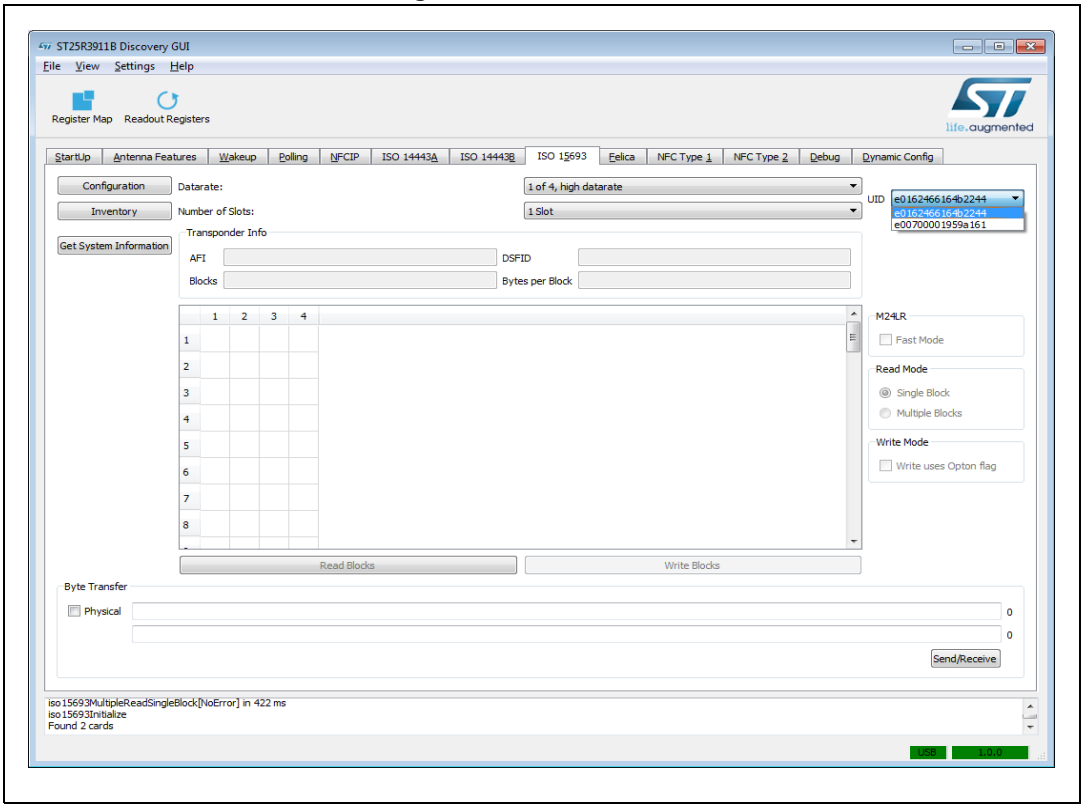
The “Configuration” button prepares the board for ISO 14443-B communication, and the following sequence activates the card:

- Click on “REQB” or “WUPB” button to poll once. The PUPI of a found tag will be displayed.
- If the card/tag supports ISO 14443-4 then additional commands like “ATTRIB” can be carried out.
- Send an arbitrary frames using “Debug” tab (See *Section 2.4.12: Debug tab*)

2.4.8 ISO 15693 tab

Figure 12 shows the ISO 15963 tab.

Figure 12. ISO 15693 tab



The “Configuration” button prepares the board for ISO 15693 communication, and the following sequence activates multiple cards:

- Click on “Configuration” button
- Set the ISO 15693 parameter to receive data rate, and the number of slots, which are used in the anti-collision loop in the firmware.
- Click on “Inventory” button to scan for Vicinity Integrated Circuit Cards.
- Select one of found UIDs using the drop-down box. Now the “Get System Information button” can be pressed to retrieve more information about the selected card.

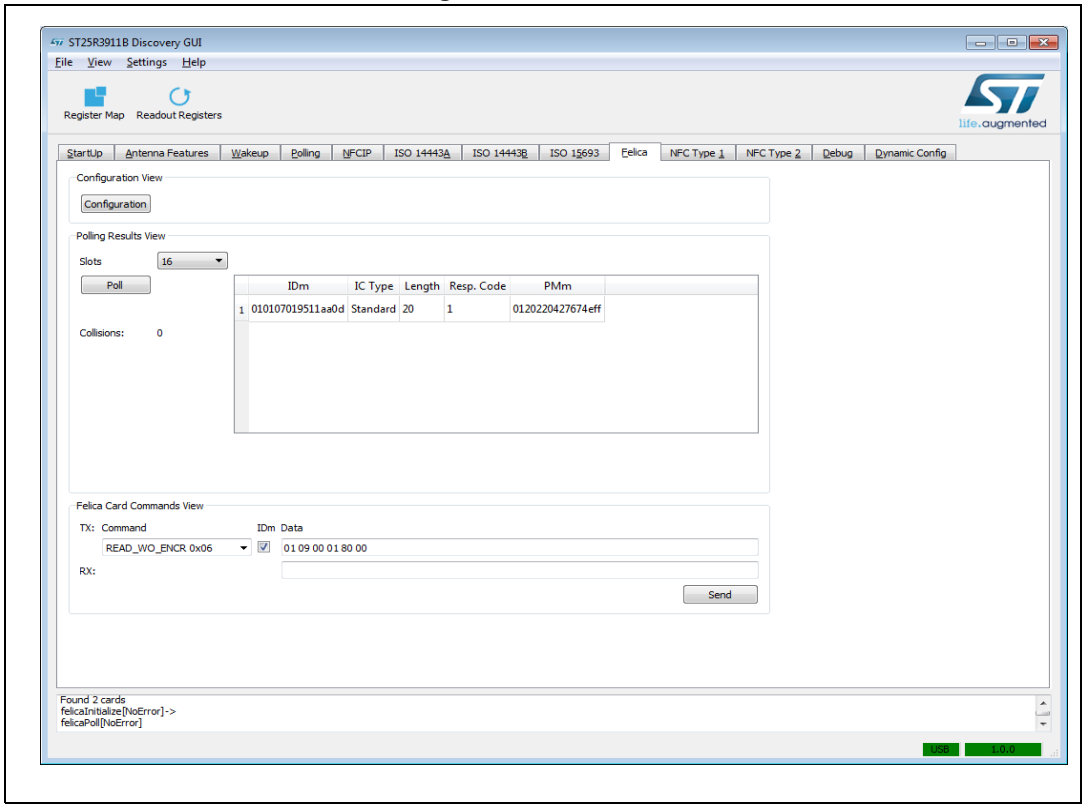
The “Get System Information” will request the card for supported features. The command “Read blocks” will read out and display the memory blocks of the card.

Note: Not all vicinity cards support “Get System Information” command.

2.4.9 FeliCa tab

Figure 13 shows the FeliCa tab.

Figure 13. FeliCa tab



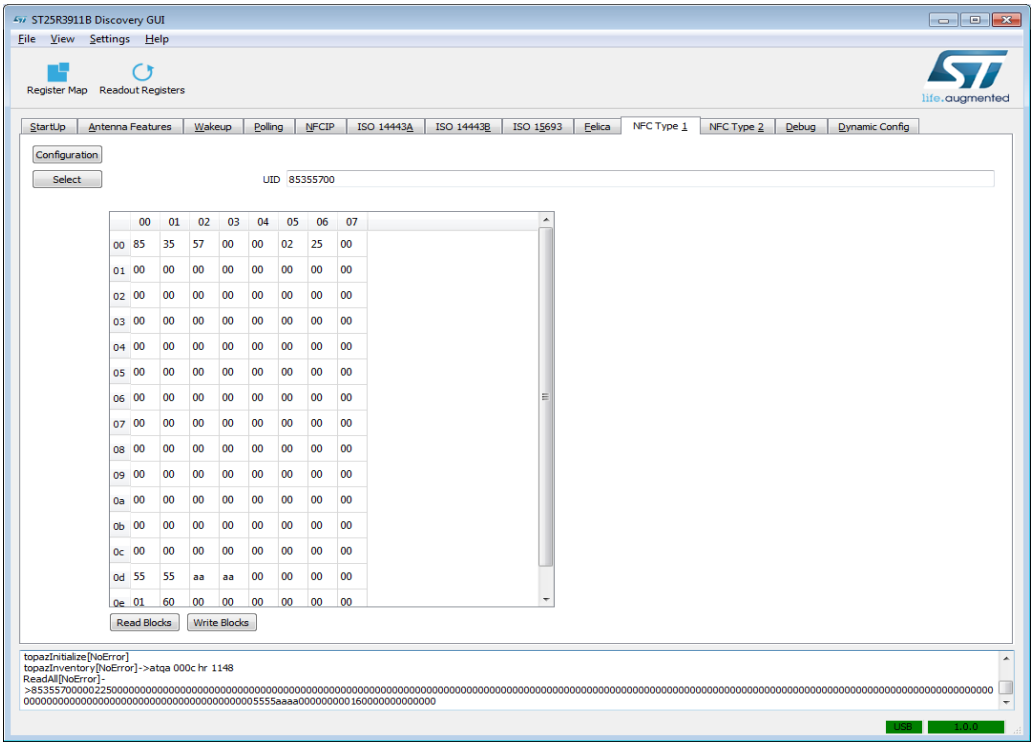
The “Configuration” button prepares the board for FeliCa communication, and the following sequence activates a card:

- Set the number of slots used in the anti-collision
- Click on “Poll” button to poll once for FeliCa cards.
- Arbitrary FeliCa commands can be executed using the “FeliCa Card Commands”. The IDm will be inserted on request.

2.4.10 NFC Type 1 tab

Figure 14 shows the NFC Type 1 tab.

Figure 14. NFC Type 1 tab



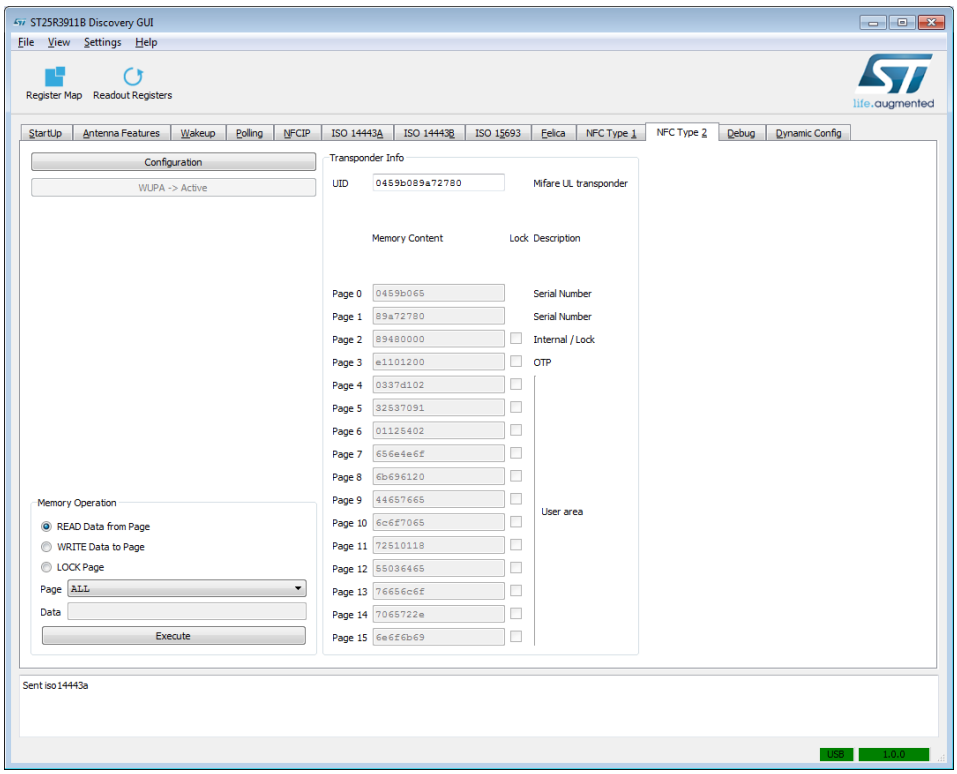
The “Configuration” button prepares the board for NFC Type 1 communication, and the following sequence activates a card:

- Click on “Select” button to send a WUPA. The UID of the Type 1 Tag is shown.
- The commands read and write are available, and it is possible to read and write its memory blocks.

2.4.11 NFC type 2 tab

Figure 15 shows the NFC type 2 tab.

Figure 15. NFC type 2 tab



The “configuration” button prepares the board for ISO 14443A communication and enables the field.

Read data from page sequence:

- Click on “Configuration” button.
- Click on “WUPA->Active” to find a cards.
- Activate the “READ Data from Page” flag
- Click on “Execute” to read the memory card content

Write data from page sequence:

- Click on “Configuration” button.
- Click on “WUPA->Active” to find a card.
- Activate the “WRITE Data from Page” flag
- Click on “Execute” to write the memory card content

The Lock page:

- Click on “Configuration” button.
- Click on “WUPA->Active” to find a card.
- Activate the “LOCK Page” flag
- Click on “Execute” to lock the memory card page content

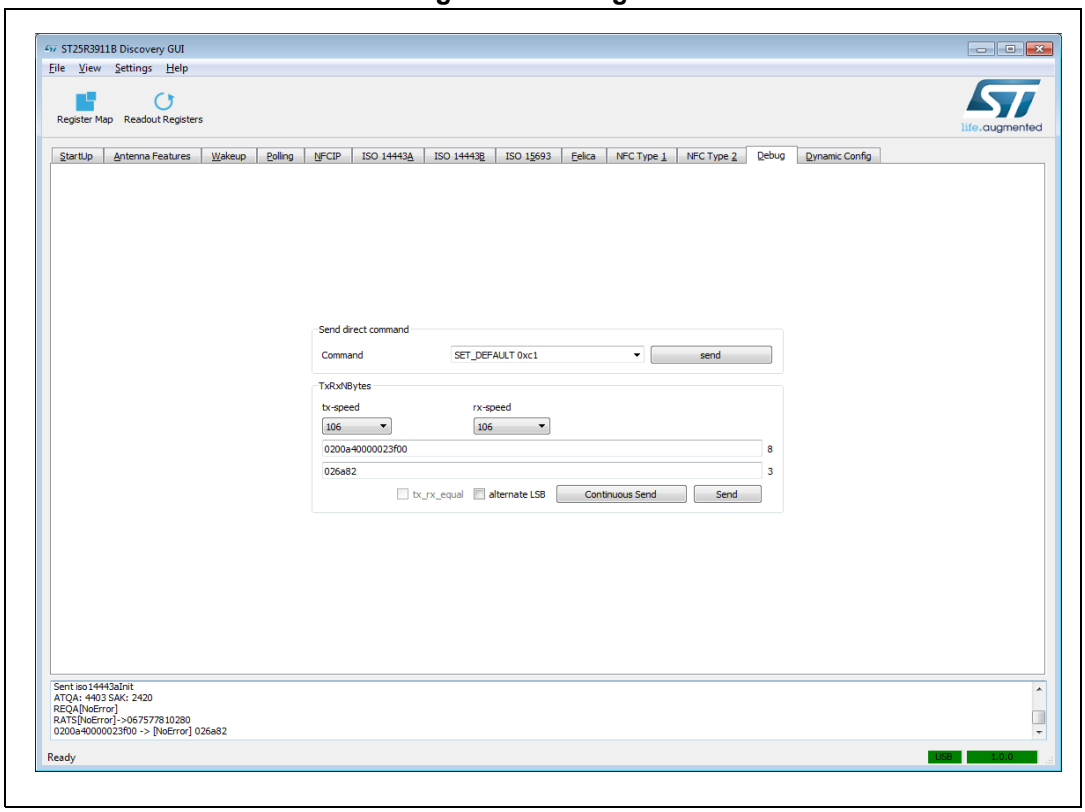
2.4.12 Debug tab

The debug tab is split into two group boxes (see *Figure 16*):

- “Send Direct Command” allows sending ST25R3911B direct commands.
- “TxRxNBytes” allows to send the arbitrary hex-encoded byte strings, with the previously selected protocol, directly through the FIFO.

Note: This is not possible for ISO15693 since for this protocol the firmware has to do the bit coding.

Figure 16. Debug tab

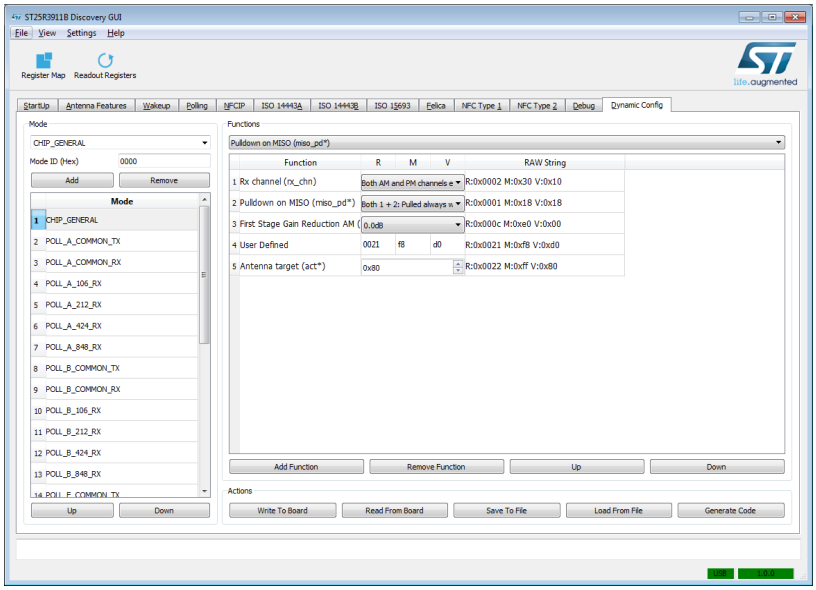


Note: The usage of this tab is for experienced users only.

2.4.13 Dynamic configuration tab

The dynamic configuration tab is a powerful instrument to fine-tune the settings of every technology and bit rate.

Figure 17. Dynamic configuration tab



Elements:

- Read from board: Replace the current configuration with the one from the board.
- Write to board: Apply the current configuration on the board. It will be stored in RAM only, and a reset erases it.
- Save to File: Write the settings as an XML to your computer.
- Load From File: Read an existing XML from your computer.
- Generate Code: Generate the table as C-Code to be included in user source code.
- Mode group:
  - Every operation mode of ST25R3911B has a corresponding mode ID.
    The drop down box allows you to select the pre-defined modes, and add them to the listed modes.
  - It is also possible to define your own modes with own mode IDs but these may not be used by the firmware. Be careful to do that only if you know what you are doing.
- Functions group:
  Every mode has associated one or more functions. A function can be:
  - Selected from drop down box
  - Defined by user. In this case it can be defined as triples of register address + register mask + register value. All named functions will just be translated into these register mark value.

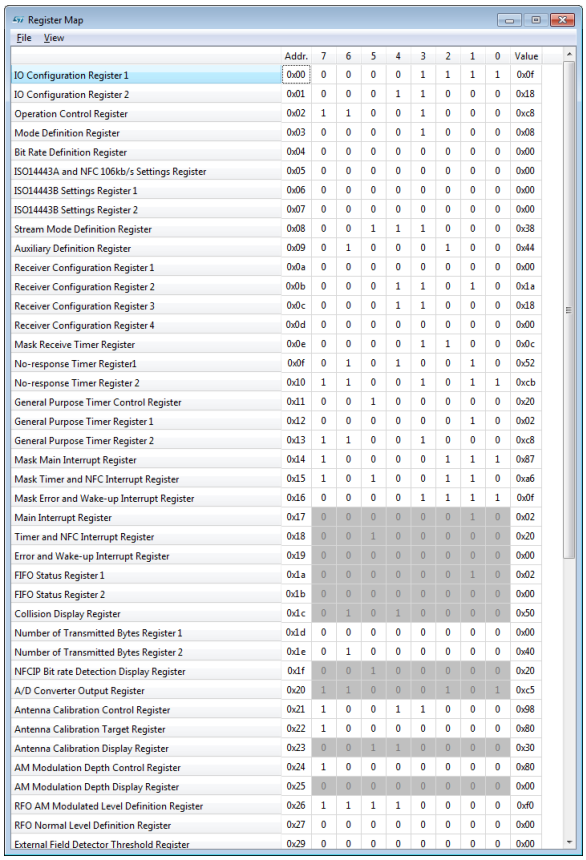
  If the new function is added to only one of the modes, it will be applied when this mode is selected, but it will not be reset to its initial state after leaving this mode. To be available to all modes, it must be added to all modes on the same level.

Note: The default configuration works in most cases.

2.5 Register Map

The GUI includes a register map window showing the registers of ST25R3911B.

Figure 18. Register map



	Addr.	7	6	5	4	3	2	1	0	Value
IO Configuration Register 1	0x00	0	0	0	0	1	1	1	1	0x0f
IO Configuration Register 2	0x01	0	0	0	1	1	0	0	0	0x18
Operation Control Register	0x02	1	1	0	0	1	0	0	0	0xc8
Mode Definition Register	0x03	0	0	0	0	1	0	0	0	0x08
Bit Rate Definition Register	0x04	0	0	0	0	0	0	0	0	0x00
ISO14443A and NFC 106kb/s Settings Register	0x05	0	0	0	0	0	0	0	0	0x00
ISO14443B Settings Register 1	0x06	0	0	0	0	0	0	0	0	0x00
ISO14443B Settings Register 2	0x07	0	0	0	0	0	0	0	0	0x00
Stream Mode Definition Register	0x08	0	0	1	1	1	0	0	0	0x38
Auxiliary Definition Register	0x09	0	1	0	0	0	1	0	0	0x44
Receiver Configuration Register 1	0x0a	0	0	0	0	0	0	0	0	0x00
Receiver Configuration Register 2	0x0b	0	0	0	1	1	0	1	0	0x1a
Receiver Configuration Register 3	0x0c	0	0	0	1	1	0	0	0	0x18
Receiver Configuration Register 4	0x0d	0	0	0	0	0	0	0	0	0x00
Mask Receive Timer Register	0x0e	0	0	0	0	1	1	0	0	0x0c
No-response Timer Register1	0x0f	0	1	0	1	0	0	1	0	0x52
No-response Timer Register 2	0x10	1	1	0	0	1	0	1	1	0xcb
General Purpose Timer Control Register	0x11	0	0	1	0	0	0	0	0	0x20
General Purpose Timer Register 1	0x12	0	0	0	0	0	0	1	0	0x02
General Purpose Timer Register 2	0x13	1	1	0	0	1	0	0	0	0xc8
Mask Main Interrupt Register	0x14	1	0	0	0	0	1	1	1	0x87
Mask Timer and NFC Interrupt Register	0x15	1	0	1	0	0	1	1	0	0xa6
Mask Error and Wake-up Interrupt Register	0x16	0	0	0	0	1	1	1	1	0x0f
Main Interrupt Register	0x17	0	0	0	0	0	0	1	0	0x02
Timer and NFC Interrupt Register	0x18	0	0	1	0	0	0	0	0	0x20
Error and Wake-up Interrupt Register	0x19	0	0	0	0	0	0	0	0	0x00
FIFO Status Register 1	0x1a	0	0	0	0	0	0	1	0	0x02
FIFO Status Register 2	0x1b	0	0	0	0	0	0	0	0	0x00
Collision Display Register	0x1c	0	1	0	1	0	0	0	0	0x50
Number of Transmitted Bytes Register 1	0x1d	0	0	0	0	0	0	0	0	0x00
Number of Transmitted Bytes Register 2	0x1e	0	1	0	0	0	0	0	0	0x40
NFCIP Bit rate Detection Display Register	0x1f	0	0	1	0	0	0	0	0	0x20
A/D Converter Output Register	0x20	1	1	0	0	0	1	0	1	0xc5
Antenna Calibration Control Register	0x21	1	0	0	1	1	0	0	0	0x98
Antenna Calibration Target Register	0x22	1	0	0	0	0	0	0	0	0x80
Antenna Calibration Display Register	0x23	0	0	1	1	0	0	0	0	0x30
AM Modulation Depth Control Register	0x24	1	0	0	0	0	0	0	0	0x80
AM Modulation Depth Display Register	0x25	0	0	0	0	0	0	0	0	0x00
RFO AM Modulated Level Definition Register	0x26	1	1	1	1	0	0	0	0	0xf0
RFO Normal Level Definition Register	0x27	0	0	0	0	0	0	0	0	0x00
External Field Detector Threshold Register	0x29	0	0	0	0	0	0	0	0	0x00

This window can be opened by clicking the “Register Map” button in the toolbar, selecting the “View->Register Map” menu entry or pressing “Ctrl-M”.

Typically, the display of the registers is in hex but can also be changed to decimal. Hovering over the icon “bits” opens up a tool tip showing details of the bit/bit fields.

Clicking bits will toggle the bits and entering a value without “0x” into the Value column will allow changing complete registers.

The update of the register map can be manually triggered (“File->Readout Registers”), or be done automatically (“Settings->Automatic Update”).

3 Using the ST25 Tag Editor software

When the ST25 Tag Editor software is launched, a detection process begins (see *Figure 19* and *Figure 20*) to check:

- the revision of the DLL installed on your computer
- the revision of the ST25R3911B-DISCO's firmware
- the ST25R3911B-DISCO's hardware name

The objective of these checks is to verify that the DLLs installed on your PC is up-to-date, and aligned with the firmware revision of the ST25R3911B-DISCO.

If a problem occurs during the detection, the message shown in *Figure 21* is displayed.

Figure 19. Detection message 1/3

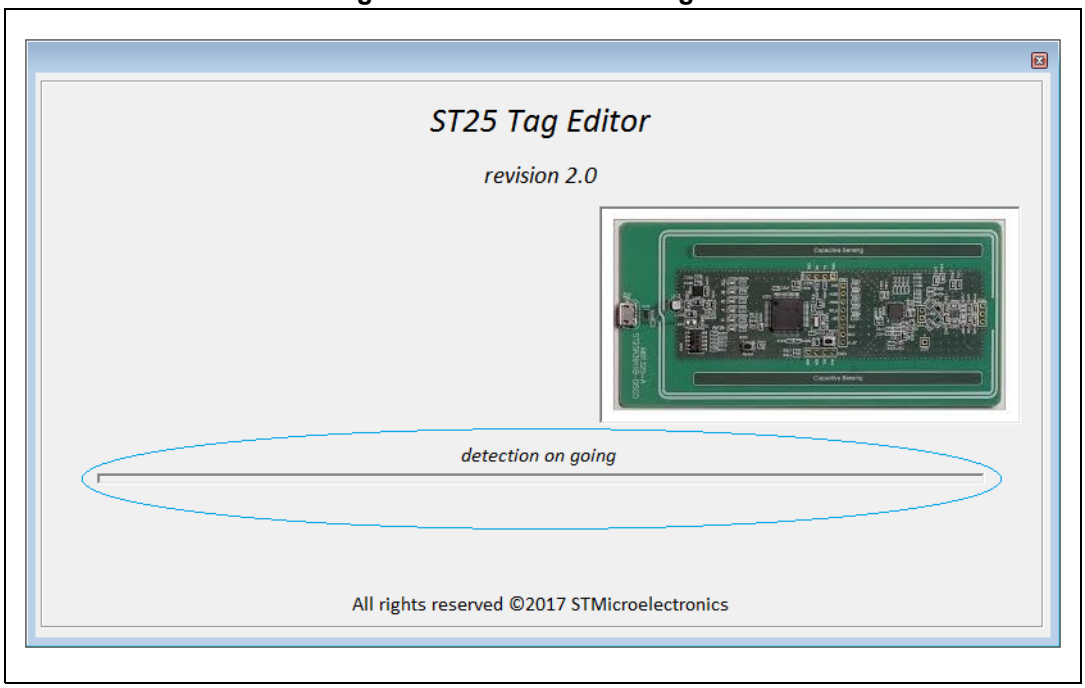


Figure 20. Detection message 2/3

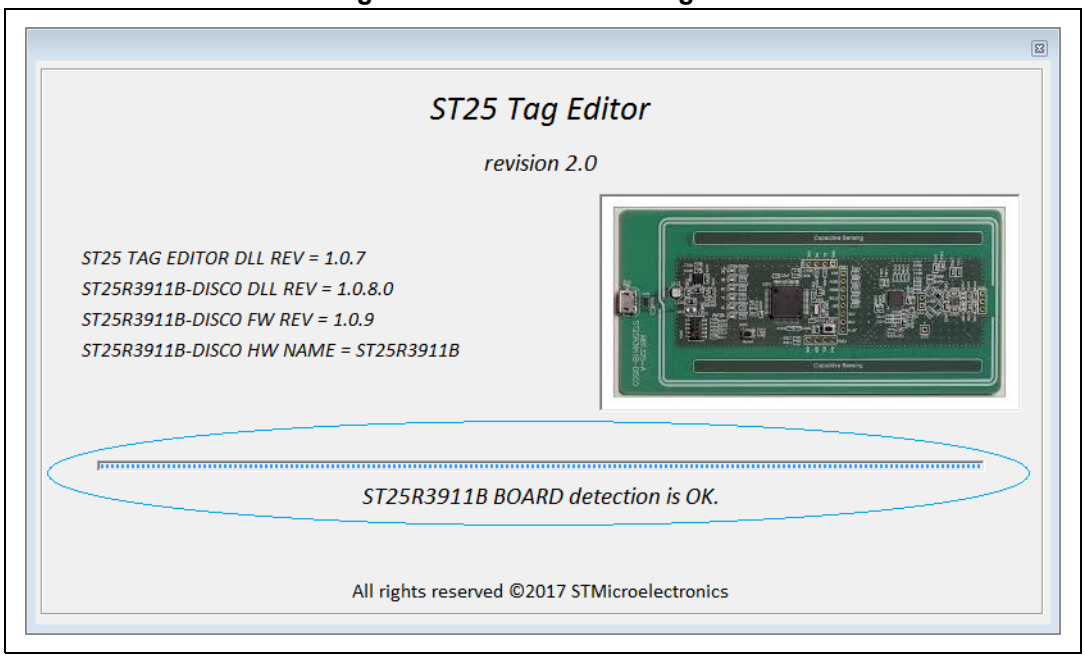
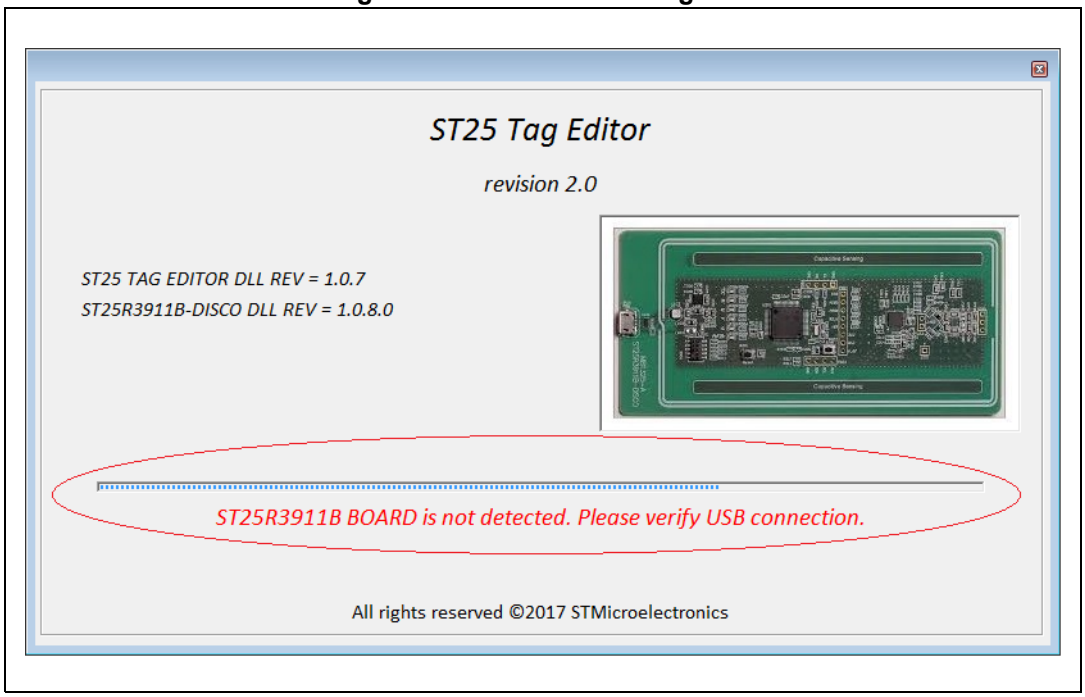


Figure 21. Detection message 3/3



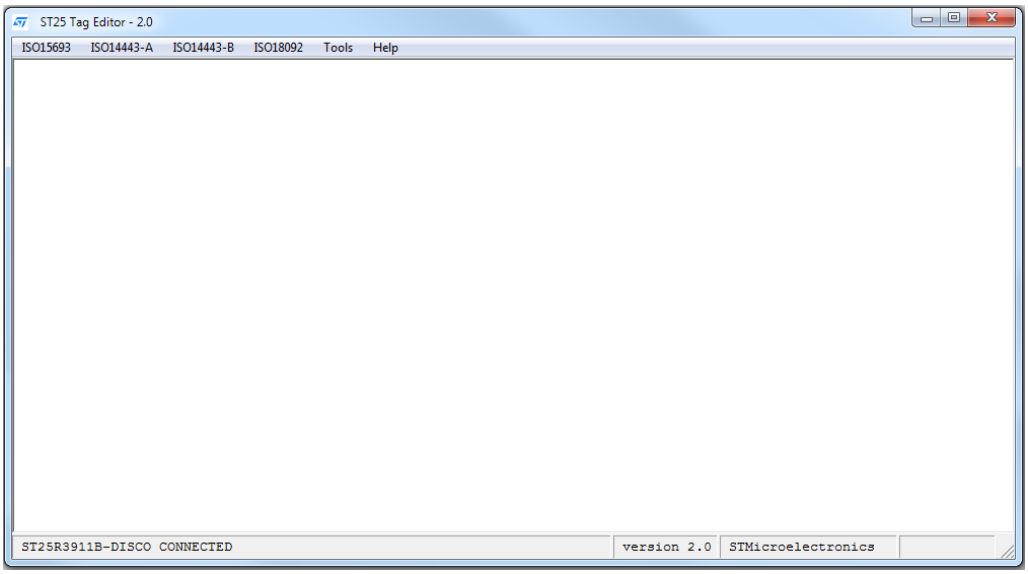
3.1 Main menu

If the software package has been installed correctly and the ST25R3911B-DISCO board is connected to PC USB port, the main menu appears.

This menu allows the user to access several sub-menus:

- **ISO15693** mode (see *Section 3.2*)
- **ISO14443-A** mode (see *Section 3.3*)
- **ISO14443-B** mode (see *Section 3.4*)
- **ISO18092** mode (see *Section 3.5*)
- **Tools** menu (see *Section 3.6*)
- **Help** menu (see *Section 3.7*)

Figure 22. Main menu

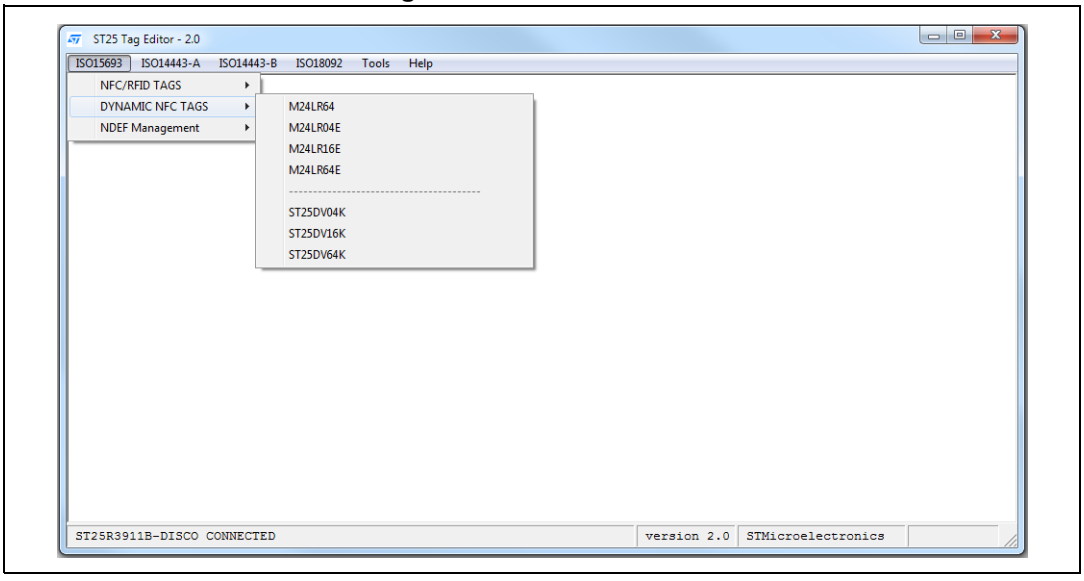


3.2 ISO15693 menu

1. Select **ISO15693** from the main menu to use the ST25R3911B-DISCO as an ISO15693 reader (see *Figure 23*).
The menu allows to select:

- NFC/RFID TAGS
  - LRI1K
  - LRI2K
  - LRIS2K
  - LRIS64K
- DYNAMIC NFC TAGS
  - M24LR64
  - M24LR04E
  - M24LR16E
  - M24LR64E
  - ST25DV04K
  - ST25DV16K
  - ST25DV64K
- OTHERS
  - PICOPASS
- NDEF Management
  - Vicinity Tags - NDEF message user interface
  - NFC Type 5 - NDEF message user interface

Figure 23. ISO15693 menu



2. EXAMPLE 1: M24LR64E USER INTERFACE
Select a device from the list (see *Figure 24* for an example). The board is then

automatically configured as an ISO15693 reader, and the ST25R3911B-DISCO can send/receive ISO15693 frames to/from the tags using the SendRecv command.

ISO15693 communications are configured as follows:

– 100% high data rate
– One subcarrier

The ISO15693 configuration is displayed in the log window.

The upper part of the menu shows buttons which allow to send ISO15693 requests to a tag through the ST25R3911B-DISCO antenna. The main available requests are:

– Inventory
– Select
– Stay Quiet
– Reset to ready
– Get system info
– Initiate
– Inventory initiated
– Fast initiate
– Fast Inventory initiated

By default, the ISO15693 requests are sent in Non-selected/Non-addressed mode, and the requests are decoded by all the tags present in the RF field.

To switch to Addressed mode, follow the steps below:

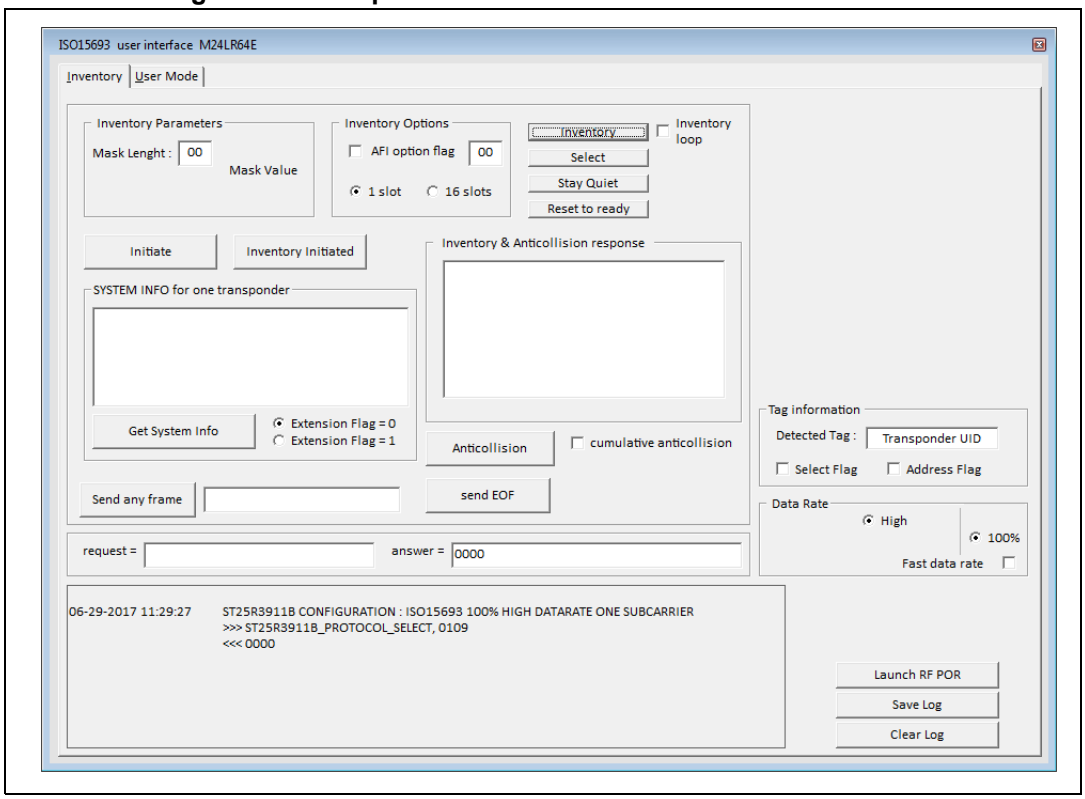
a) Send an Inventory request to retrieve the tag UID.
b) Click on the UID displayed in the **INVENTORY response** window to automatically copy the UID into the **Tag information** text box.
c) Check **Address Flag** to activate the Addressed mode for the coming requests.

The following sequence is required to switch to Selected mode:

a) Send a Select request in Addressed mode (steps *a* to *c* above).
b) Uncheck **Address Flag.**
c) Check **Select Flag**.

All the coming requests will be sent to the previously selected tag.

Figure 24. Example of ISO15693 user interface for M24LR64



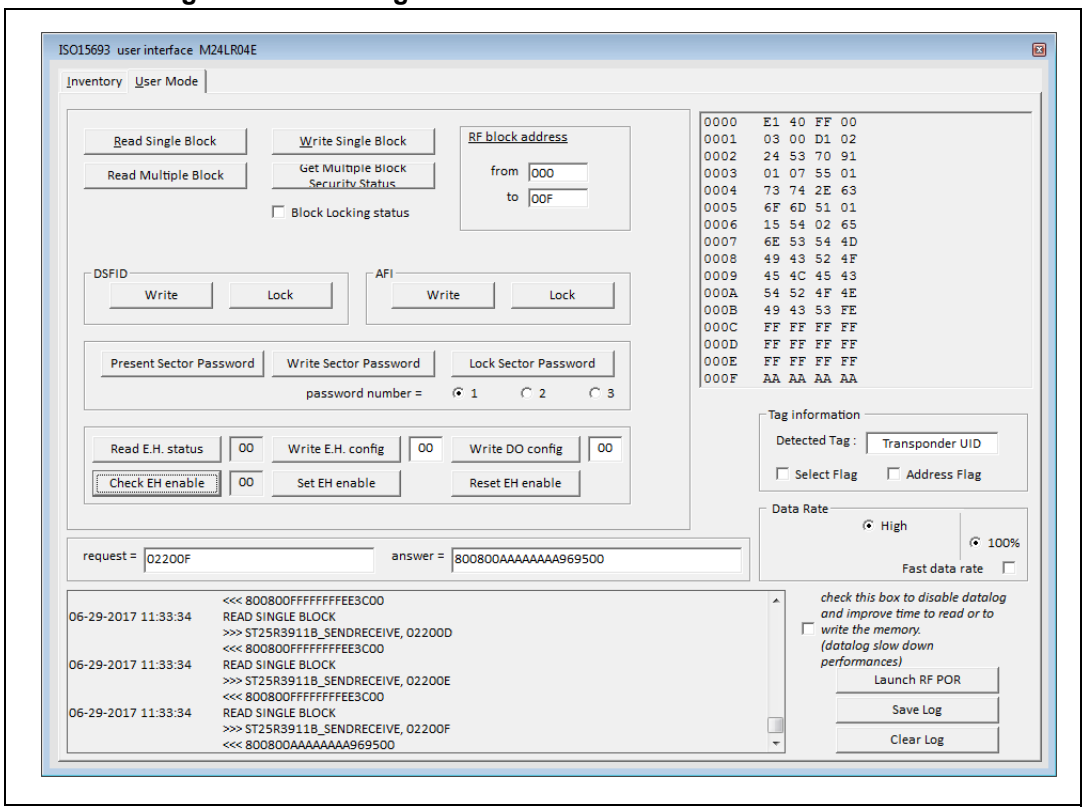
3. Click **User Mode** from the toolbar of the device ISO15693 user interface to display the ISO15693 requests that can be sent in User mode (see *Figure 25*). The main requests are:
   - Read single and multiple block(s)
   - Fast read single and multiple block(s)

     The ST25R3911B-DISCO is automatically configured in Fast mode, and put back in normal mode when the request is complete.

   Other requests are available (DSFID, AFI, ..). Refer to the device datasheet for the full list of ISO15693 requests available for a given product.

Note: The tag answer to a read request is displayed in the right part of the window.

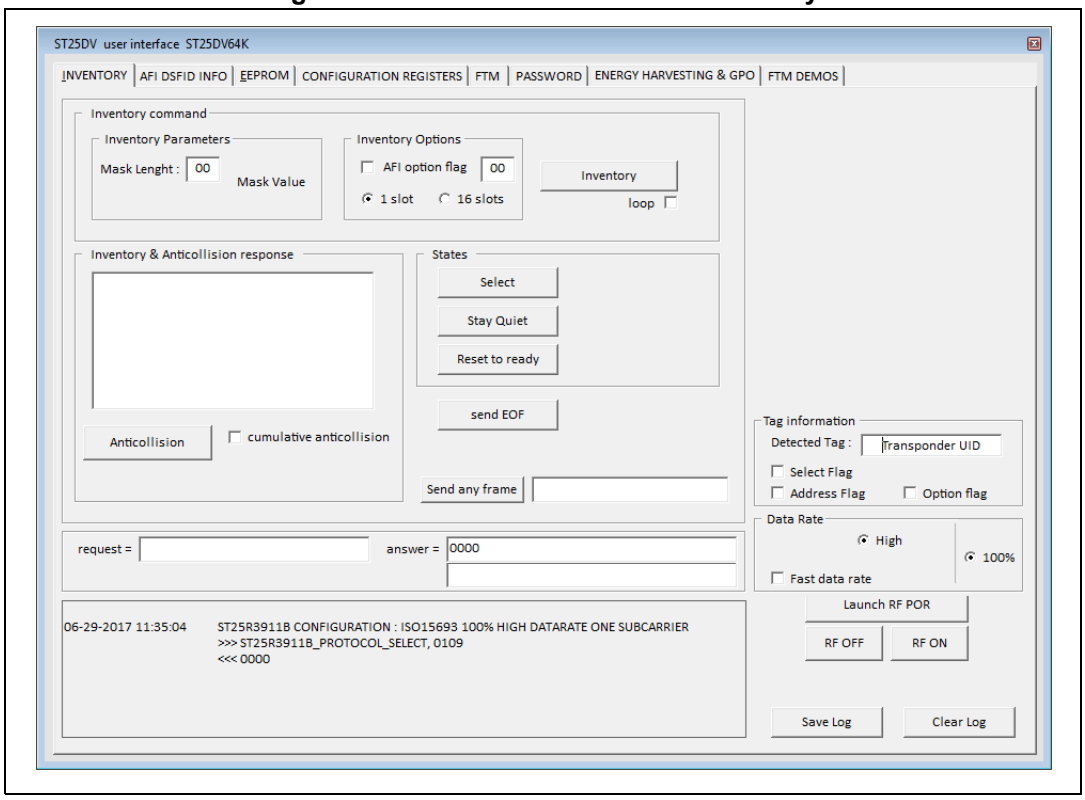
Figure 25. Selecting User Mode from ISO15693 user interface



4. EXAMPLE 2 : ST25DV64K USER INTERFACE.
   A specific user interface has been build in order to be able to use ST25DV products. This user interface allows to manage all the features of the ST25DV :
   - INVENTORY
   - EEPROM
   - FTM (FAST TRANSFER MODE)
   - CONFIGURATION
   - PASSWORD
   - ENERGY HARVESTING
   - DEMOS

   a) INVENTORY & ANTICOLLISION COMMANDS
   This part of the user interface allows the user to send Inventory commands and manage ISO15693 states:
   - Inventory
   - Select
   - Stay Quiet
   - Reset to Ready
   - Anticollision button will allow to launch global antcollision process manage by the STM32 and display up to 5 UID's tags.

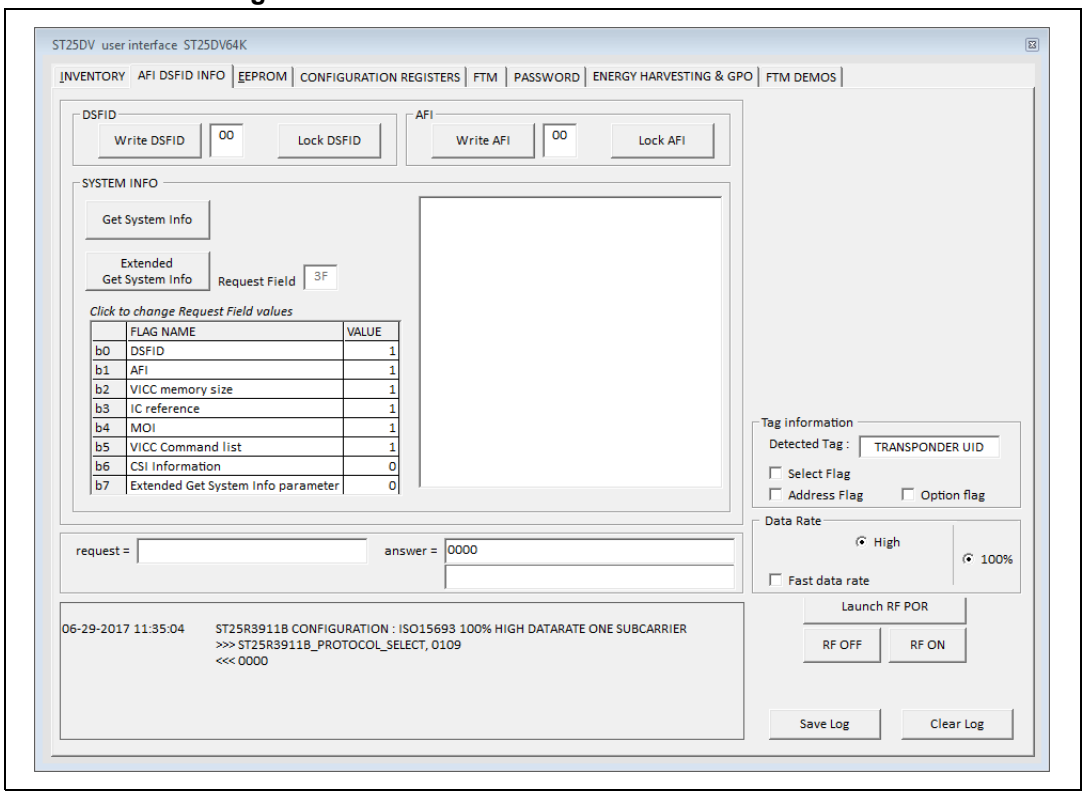
Figure 26. ST25DV user interface: Inventory



b) AFI, DSFID & SYSTEM INFO COMMANDS (see *Figure 27*):

– Write DSFID
– LOCK DSFID
– Write AFI
– LOCK AFI
– Get System Info
– Extended Get System Info

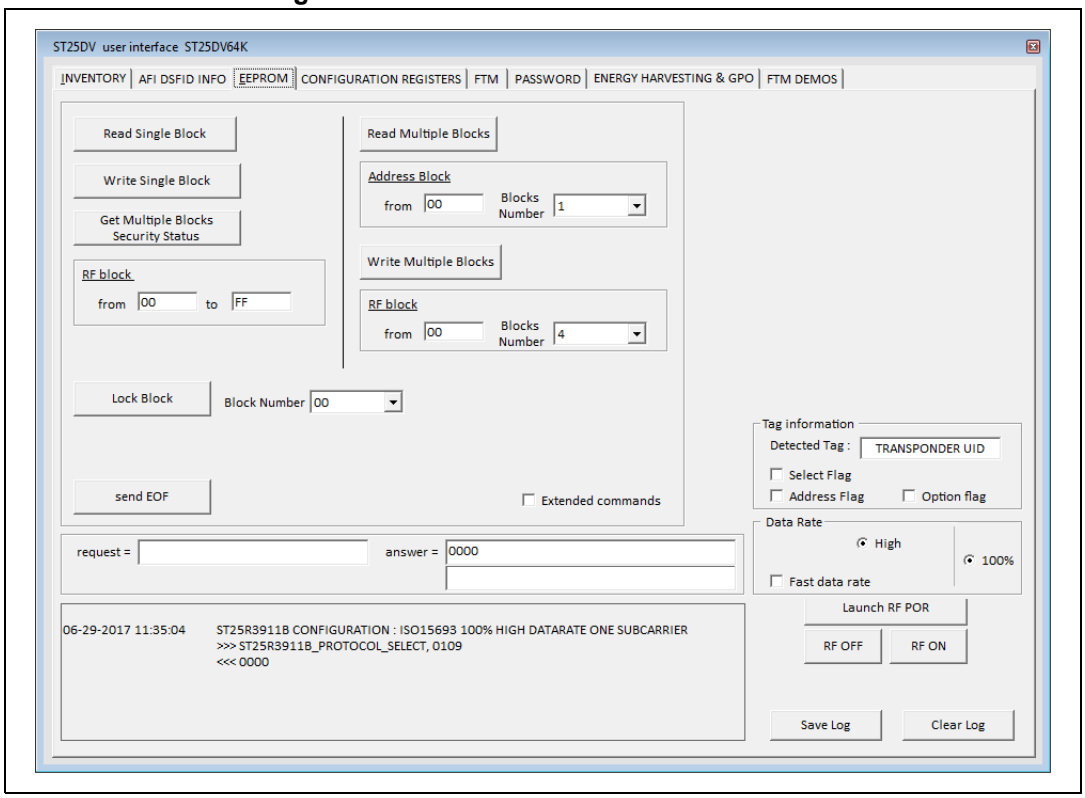
Figure 27. ST25DV user interface: AFI DSFID INFO



c) EEPROM commands (see *Figure 28*):

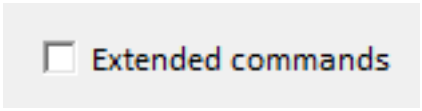
– Read Single Block
– Write Single Block
– Read Multiple Blocks
– Write Multiple Block
– Get N BSS
– Lock Block (block 0 or Block 1)

Figure 28. ST25DV user interface: EEPROM



To be able to access to Extended commands, the user will need to click on "Extended commands" check box (see *Figure 29*).

Figure 29. ST25DV user interface: display Extended commands



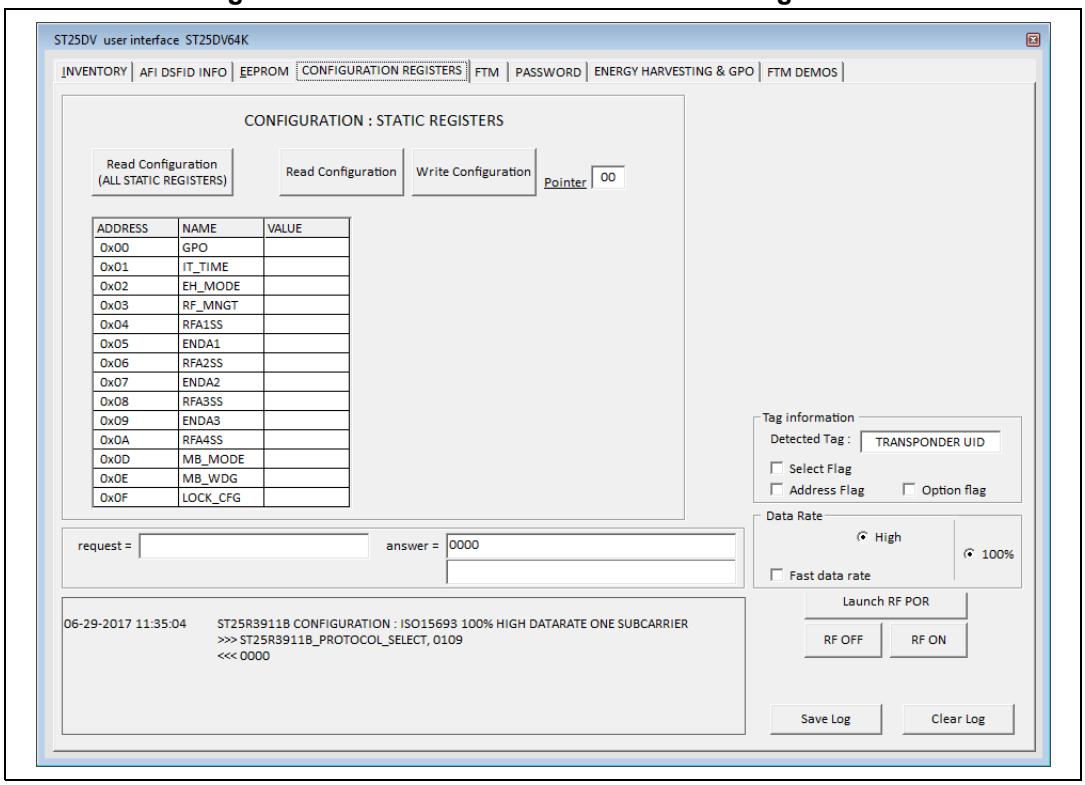
To be able to access to Fast commands, the user will need to click on "Fast data rate" check box.

d) CONFIGURATION commands:

– Read CONFIG bytes

– Write CONFIG bytes

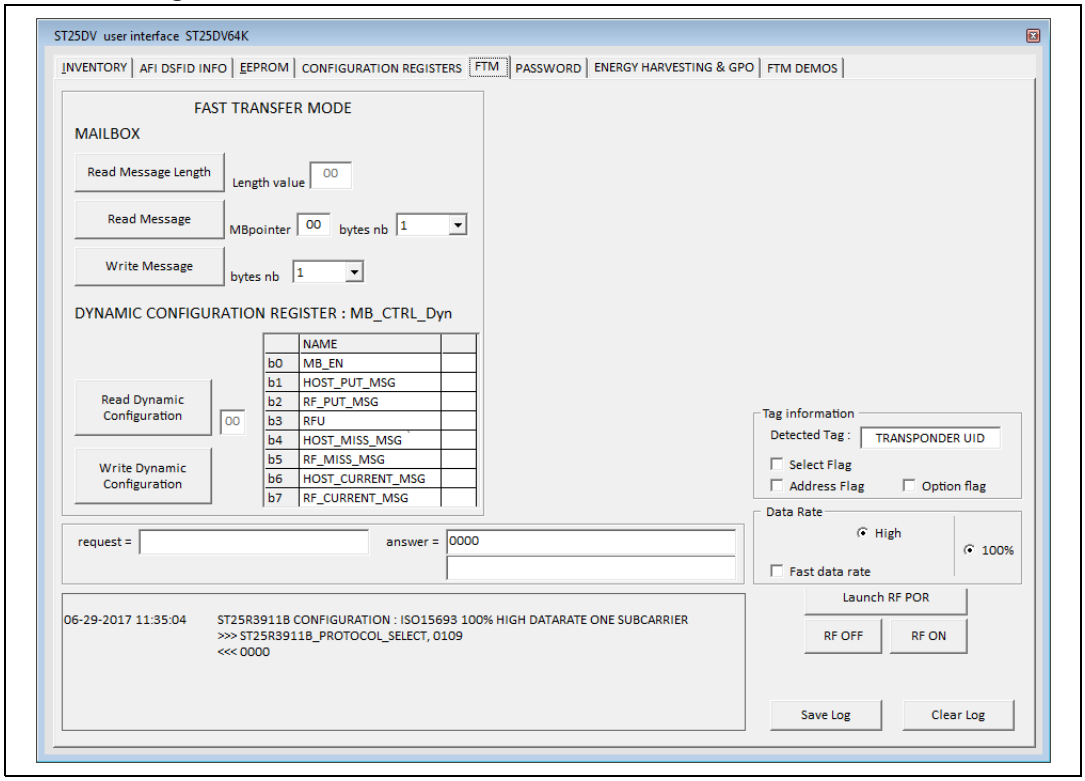
Figure 30. ST25DV user interface: static configuration



e) FTM commands (see *Figure 31*):

– Read Len
– Read Message
– Write Message
– Read DYNAMIC register
– Write DYNAMIC register

Figure 31. ST25DV user interface: Fast Transfer Mode interface

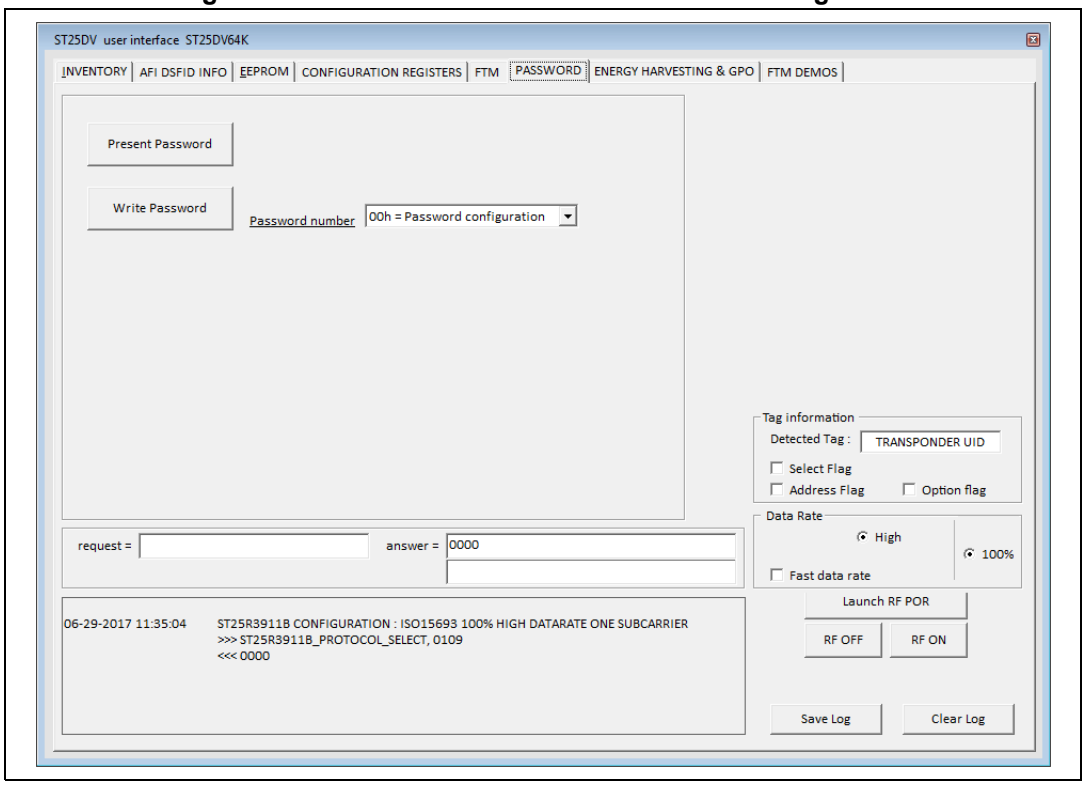


f) PASSWORD commands (see *Figure 32*):

– Present Password

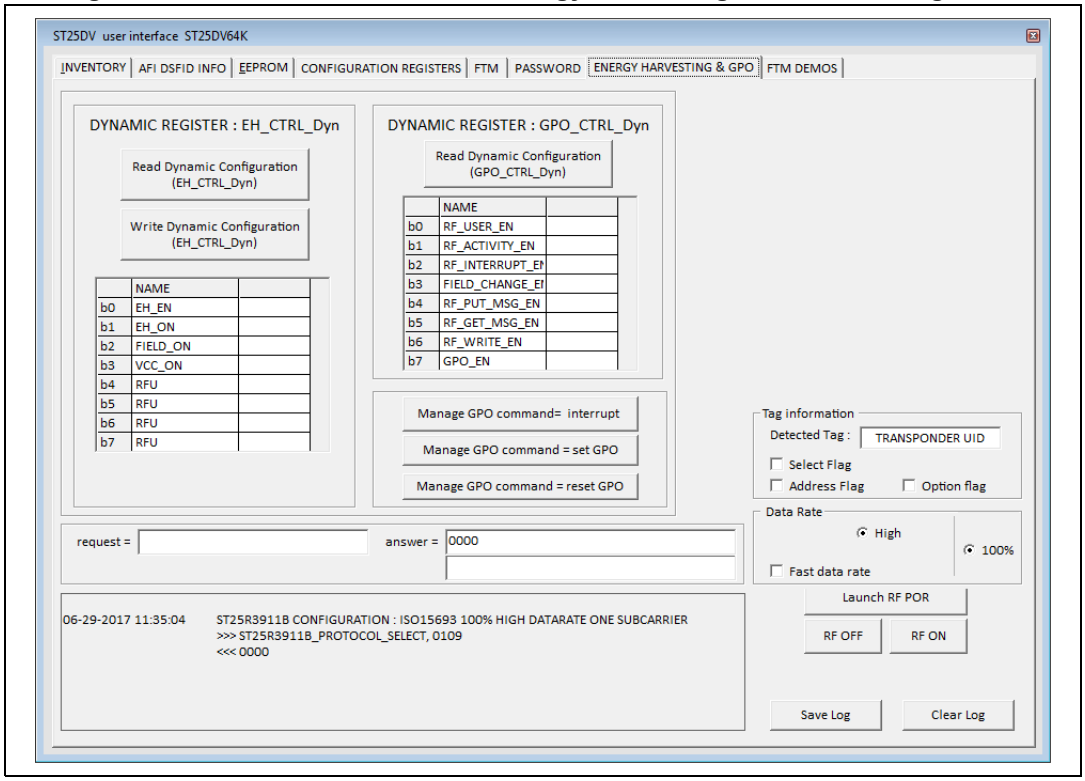
– Write Password

Figure 32. ST25DV user interface: Password management



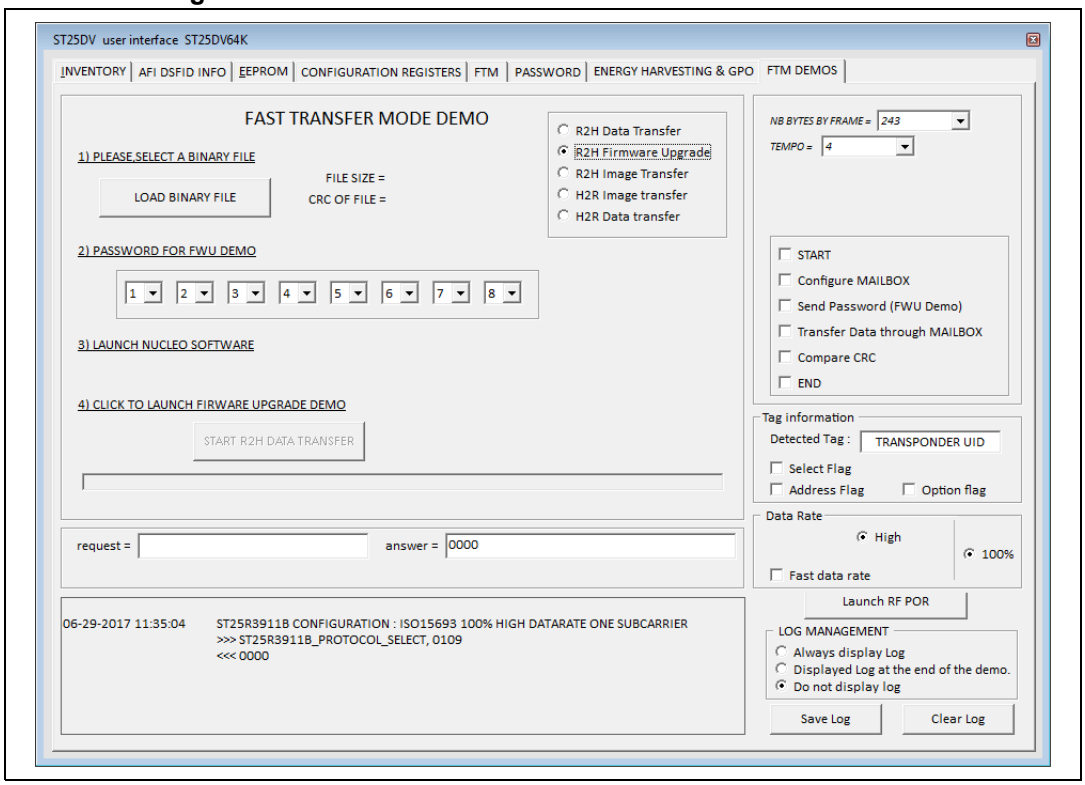
g) ENERGY HARVESTING & GPO commands
– Read DYNAMIC register
– WRITE DYNAMIC register
– Send Interrupt
– Set GPO
– Reset GPO

Figure 33. ST25DV user interface: Energy Harvesting and GPO management



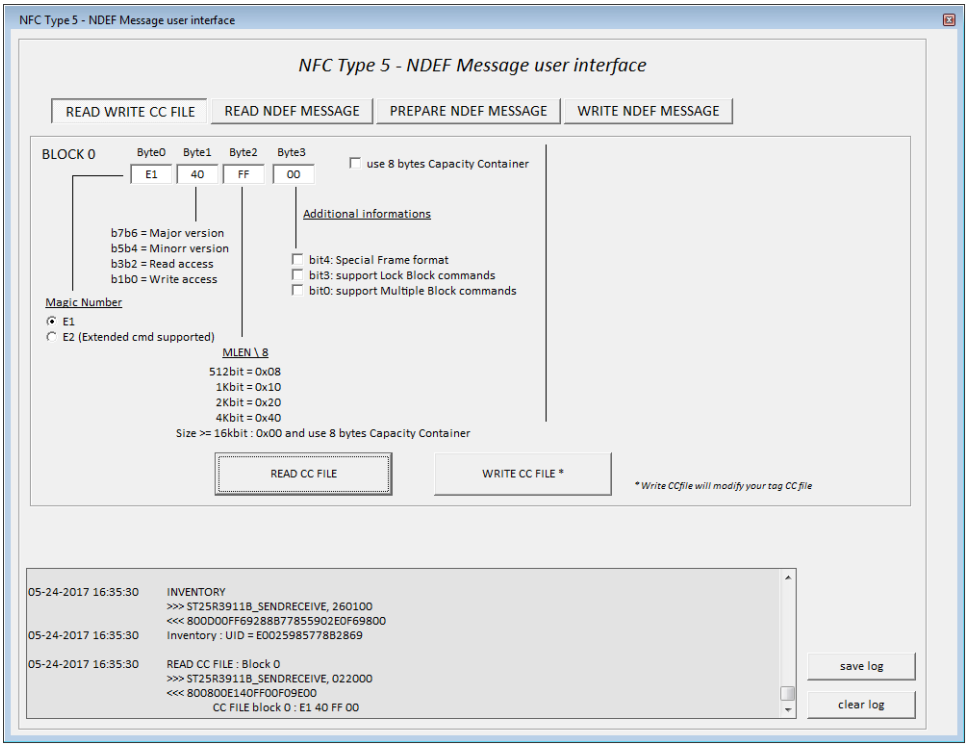
h) DEMOS (see *Figure 34*).
This demos can be played with ST25DV-DISCOVERY boards.
Refers to user manual UM2062 for more informations about this demos.

Figure 34. ST25DV user interface: Fast Transfer Mode demo



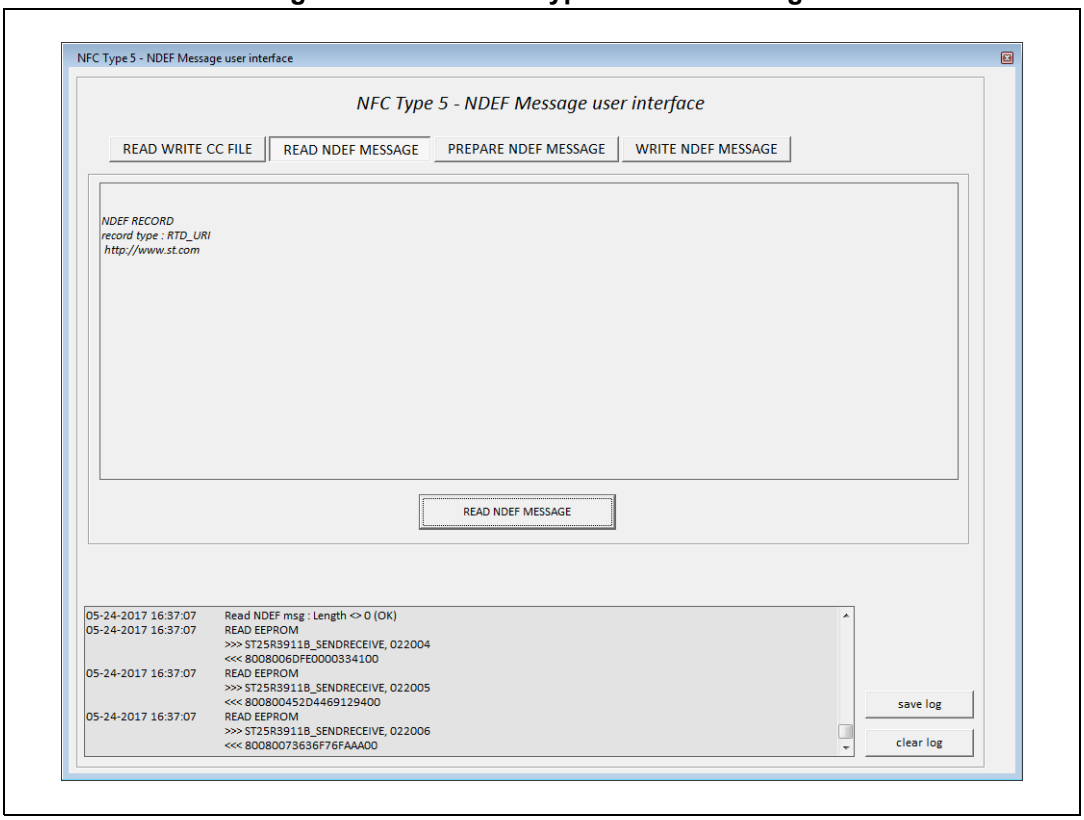
5. NFC type 5: NDEF Message User Interface.
   a) READ & WRITE CC file (see *Figure 35*)
   – Read CC File
   – Write CC File

Figure 35. Read and write NFC Type 5 CC file



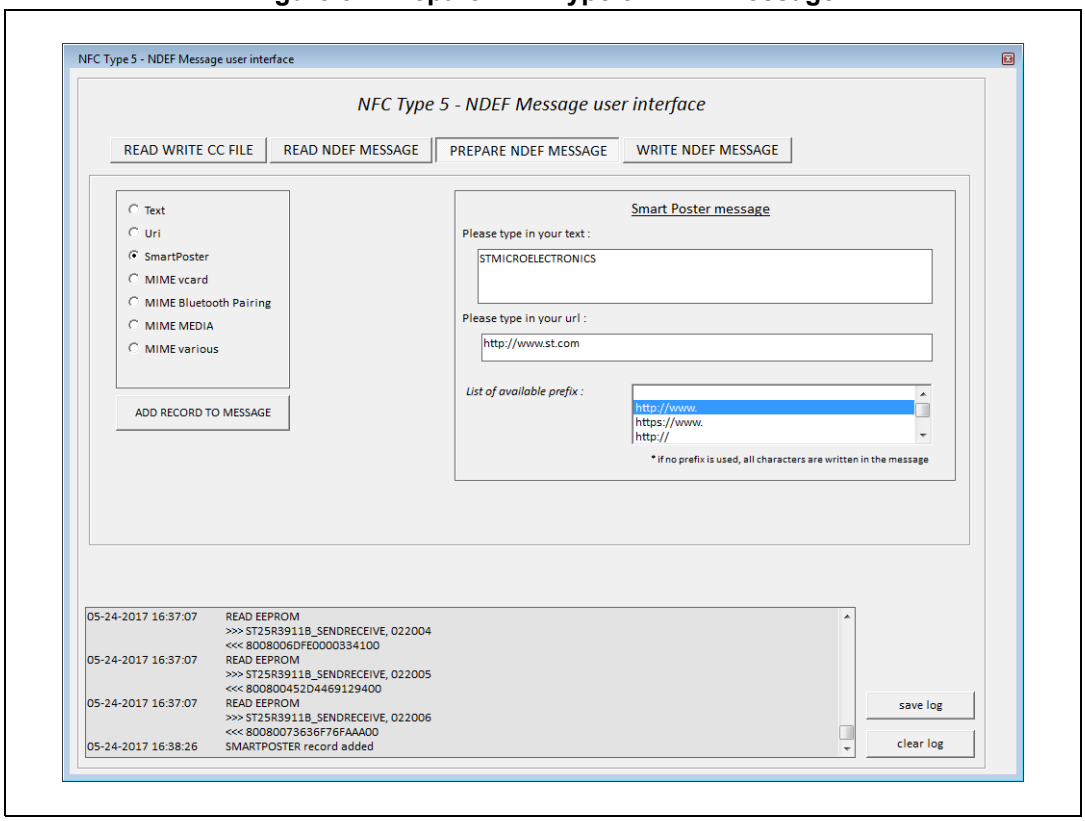
   b) READ NDEF MESSAGE

Figure 36. Read NFC Type 5 NDEF message



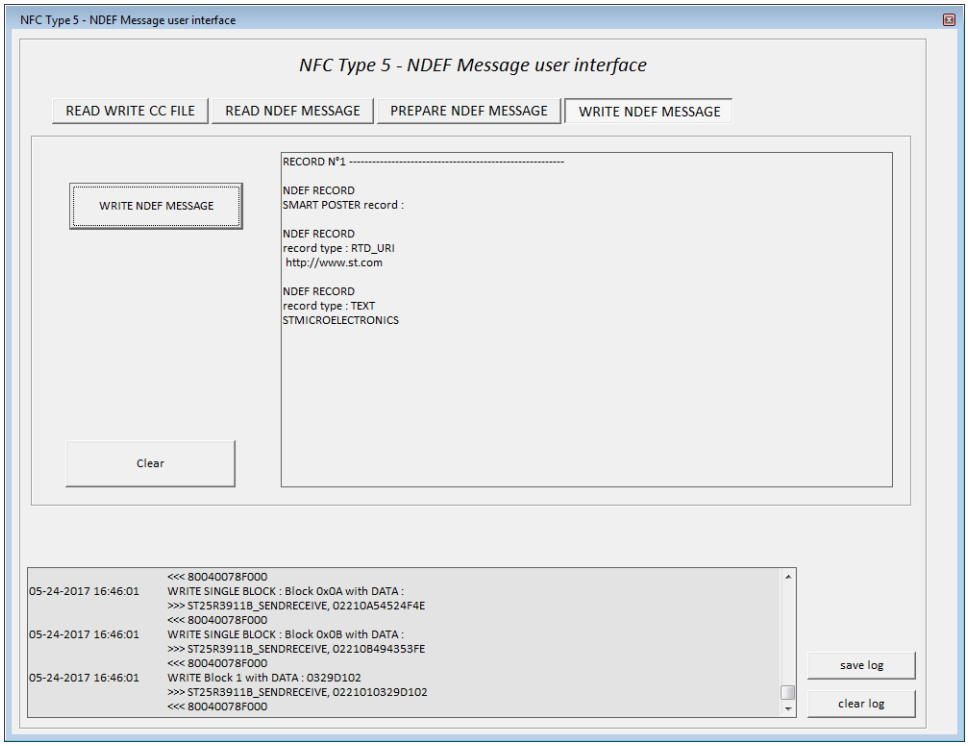
c) PREPARE NDEF MESSAGE
Use User interface to prepare your NDEF message by selecting one of the NDEF recrd format (Text, Uri, Smartposter, vcard, Bluetooth pairing).
Click on ADD RECORD TO MESSAGE button, will add the record in the NDEF message.

Figure 37. Prepare NFC Type 5 NDEF message



d) WRITE NDEF MESSAGE
The prepared NDEF MESSAGE with embedded NDEF records is displayed.
If you need to change anything on the NDEF MESSAGE, click on Clear and go back to PREPARE NDEF MESSAGE to create a new one.
Click on WRITE NDEF MESSAGE to write the NDEF message to the NFC Tag.

Figure 38. Write NFC Type 5 NDEF message

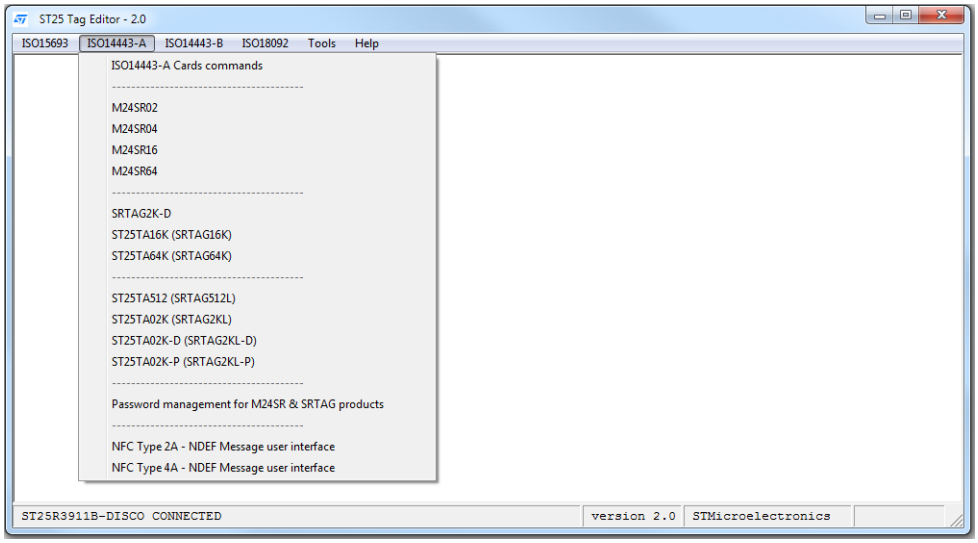


3.3 ISO14443-A menu

Select the ISO14443-A from the main menu to use the ST25R3911B-DISCO as an ISO14443-A reader. The menu allows to select:

- ISO14443-A cards commands
- M24SR products
- ST25TA Tags
- Password management for M24SR & ST25TA
- NFC Type 2A & 4A NDEF Messages management
- ISO14443-A Cards commands: (see *Section 3.3.1*).
  This menu allows the user to send any ISO14443-A requests
- M24SR02, M24SR04, M24SR16, M24SR64 (see *Section 3.3.2*).
  This menu allows the user to send any ISO14443-A requests or APDU request to M24SR product
- NFC Type_4A NDEF Message user interface (see *Section 3.3.4*).
  This menu allows the user to read and write NDEF message to Tag Type 4A
- SRTAG2K-D, ST25TA16K, ST25TA64K (see *Section 3.3.2*).
  This menu allows the user to send any ISO14443-A requests or APDU request to SRTAG product.
- ST25TA512, ST25TA02K, ST25AT02K-D, ST25TA02K-P (see *Section 3.3.2*).
  This menu allows the user to send any ISO14443-A requests or APDU request to ST25TA product.
- Password management for M24SR & SRTAG products (see *Section 3.3.3*).
  This menu allows the user to manage password and access rights on M24SR and SRTAG products

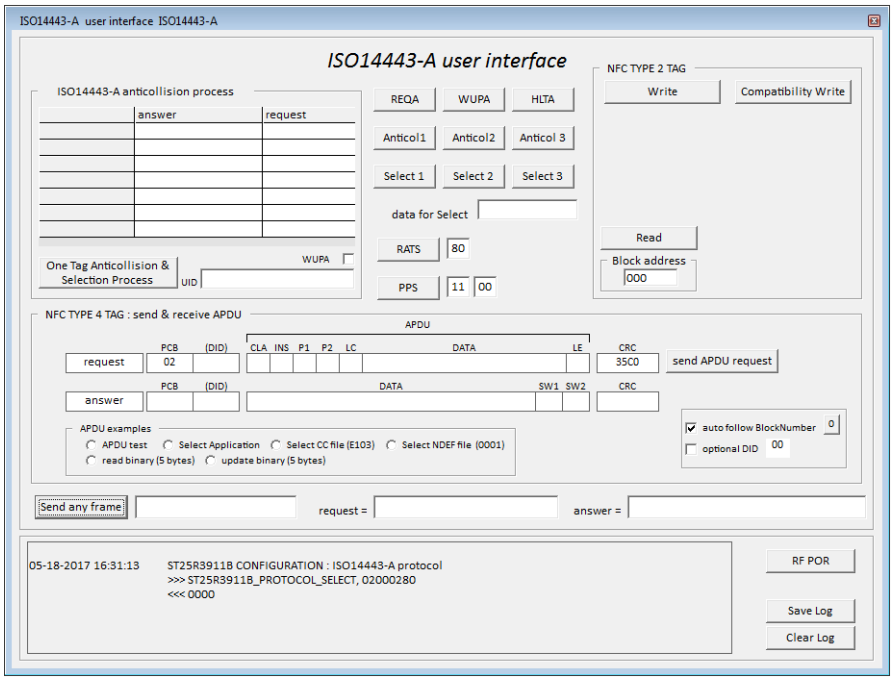
Figure 39. ISO14443-A menu



3.3.1 ISO14443-A Cards commands

Select ISO14443-A from the list (see *Figure 40* for an example). This automatically configures the ST25R3911B-DISCO as an ISO14443-A reader and displays all the ISO14443-A requests.

Figure 40. ISO14443-A selected from the list



The ISO14443-A configuration is displayed in the log window as shown in *Figure 40*.

The upper part of the window contains buttons allowing to send ISO14443-A requests to tags through the ST25R3911B-DISCO.

Refer to the device datasheet for the full list of ISO14443-A requests available for a given product.

Anticollision process will try to communicate with your Tag and try to select it. This automatic process is only for 1 tag.

It sends successively:

- ReqA
- Anticol1
- Select1
- Anticol2
- Select2
- Anticol3
- Select3

The process will be stopped as soon as an error occurs or if the anticollision process is finished (4 bytes or 7 bytes or 10 bytes UID).

Other commands can be sent such as:

- RATS
- PPS
- READ
- WRITE

Send Receive APDU can be used to send APDU requests.

3.3.2 M24SR, SRTAG and ST25TA user interface

The selected product user interface has been separated into two different windows to improve the visibility of the tool.

We have separated this two windows following the “life” of the selected product (see *Figure 41*):

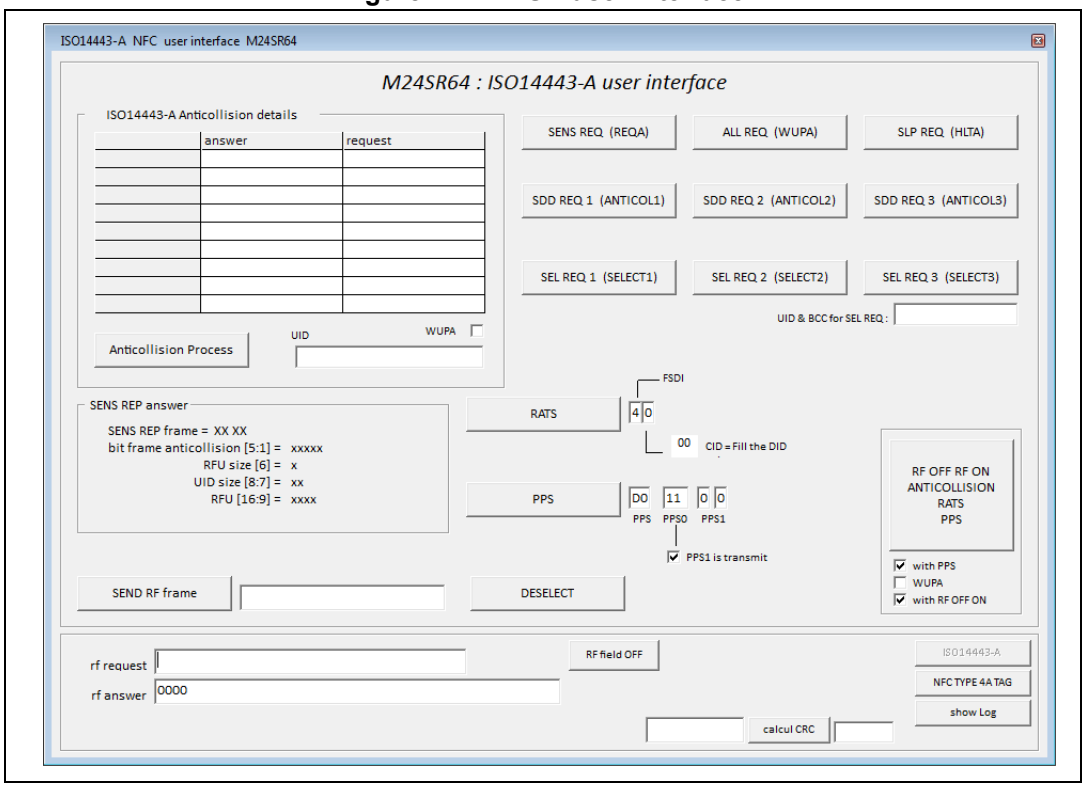
– after a RF POR or a deselect command, the selected product is in the ISO14443-A world

– after RATS or PPS command, the selected product enter in the NFC world.

First, selected product among the liost of products (M24SR, SRTAG, ST25TA).

When selecting the device, the ISO14443-A window appears.

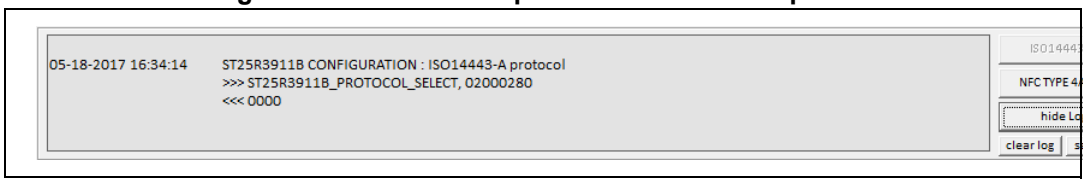
Figure 41. M24SR user interface



As soon as the windows appears, the ISO14443-A protocol selection is done in background.

Click on show log to display the log window and see the ST25R3911B-DISCO protocol selection sequence (see *Figure 42*)

Figure 42. ST25R3911B protocol selection sequence



ISO1443-A screen

The first screen (see *Figure 41*) is displayed when the M24SR is selected in the option menu. Several buttons are displayed in this window. The buttons represent all the available commands in the ISO14443-A world:

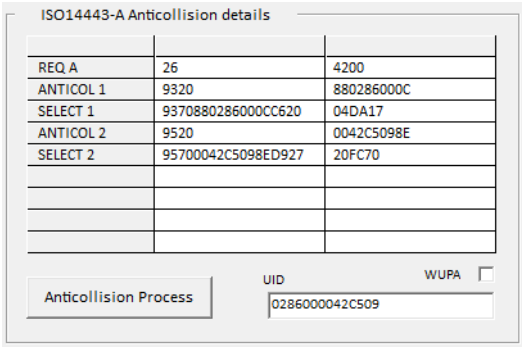
Some buttons are used to send single commands:

- **SENS REQ (REQA)**: send a REQA to the M24SR
- **ALL REQ (WUPA)**: send WPUA command to the M24SR
- **SLP REQ (HLTA)**: send HLTA command to the M24SR
- **SDD REQ 1 2 3 (ANTICOL 1 2 3)**: send Anticol command to the M24SR
- **SEL REQ 1 2 3 (SELECT 1 2 3):** send Select command to the M24SR
- **RATS**: send RATS command to the M24SR
- **PPS**: send PPS command to the M24SR
- **DESELECT**: send Deselect command to the M24SR

Two additional buttons allow to accelerate the communication with the M24SR:

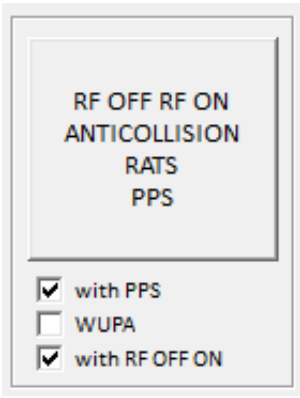
- **Anticollision Process** button
  can be used to detect a Tag and read the UID of this tag
  when clicking on this button, the anticollision sequence is sent (beginning by a REQA or WUPA) depending of the Option button.
  The REQA/WUPA answer is detailled in SENS REQ answer screen.
  The anticollision sequence is summarized in the array.
  The sequence is launched and stopped when an error occurred.
  At the end of the sequence, if no error is found, the UID of the selected M24SR is displayed in UID field as show on *Figure 43*

Figure 43. Anticollision process results



- **RF OFF RF ON ANTICOLLISION RATS PPS** button
  can be used the whole anticollision process with RATS with PPS to reach NFC type 4A world.
  This button can be configured by enabling or disabling
- RF OFF/ON
- Replace REQA command by WUPA command
- PPS request added to the sequence

Figure 44. RF OFF on anticollision RATS PPS button



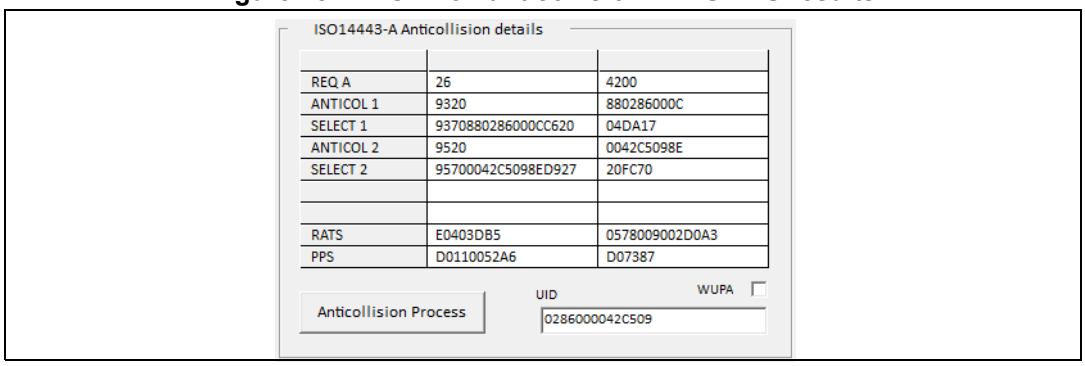
The sequence is launched and stopped when an error occurred.

At the end of the sequence, if no error is found,

- The UID of the selected M24SR is displayed in UID field.
- RATS answer
- PPS Answer (if option selected)
- The log windows is filled with RF request & RF answer

As shown on *Figure 45*

Figure 45. RF OFF on anticollision RATS PPS results



At the end of this action, if no error is occurred and M2SR answers are Ok, the window will automatically switch to the windows called **NFC Type 4A**.

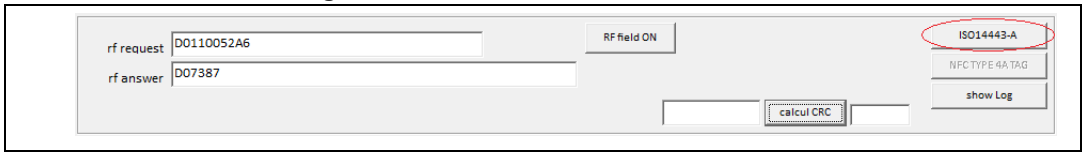
How to access to ISO14443-A command and NFC Type 4A commands:

– When the ISO14443-A windows is displayed, the “NFC Type 4A” button is available to switch to NFC Type 4A window.
See *Figure 46*

Figure 46. NFC Type 4A button available

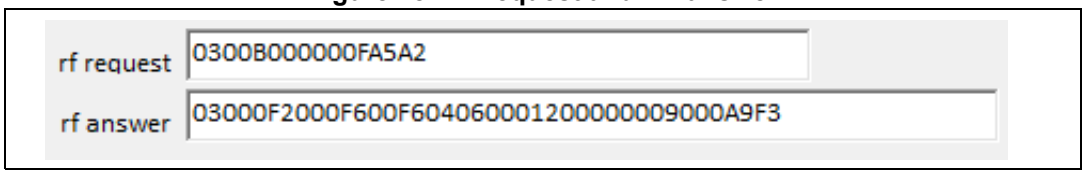
– When the NFC Type 4A windows is displayed, the **ISO14443-A** button is available to switch to iso14443-A window.
See *Figure 47*

Figure 47. ISO14443-A button available



As already explained in the user manual, the “RF request” and “RF answer” fields contains the send command and the answer from M24SR.

Figure 48. RF request and RF answer



The **show log** button is available to be able to see the history of RF request and RF answer. See *Figure 49* and *Figure 50*.

Figure 49. "Show Log" button

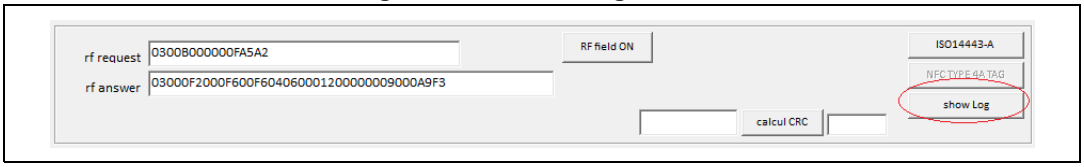
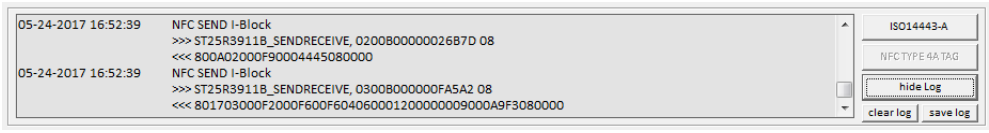


Figure 50. Log windows of RF request/answer

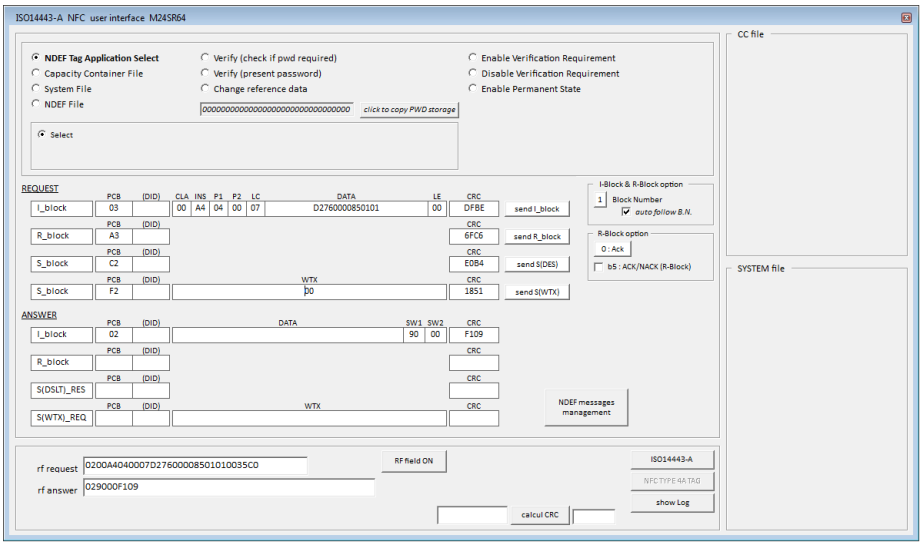


The formatted request (ex: ST25R3911B_SENDRECEIVE, 0300B000000FA5A2 08) can be used in script tool.

NFC Type 4A screen

This window will allows to send NFC APDU requests to be able to play with the M24SR tag in NFC world (see *Figure 51*). This window is automatically reached when the "RF OFF RF ON ANTICOLLISION RATS PPS" button is used and all the processes are done successfully or when the user click on "NFC Type 4A" button.

Figure 51. NFC Type 4A user interface

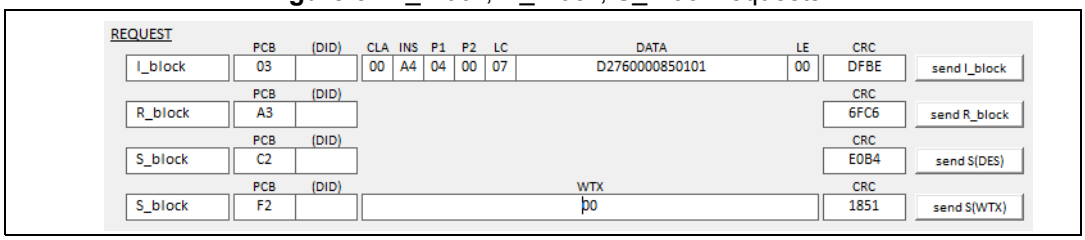


The middle part of the window is used to generate the RF frame to be sent to the M24SR: I_Block, R_Block, S(DES)_Block and S(WTX)_Block request.

All this field can be changed by clicking and modifying data

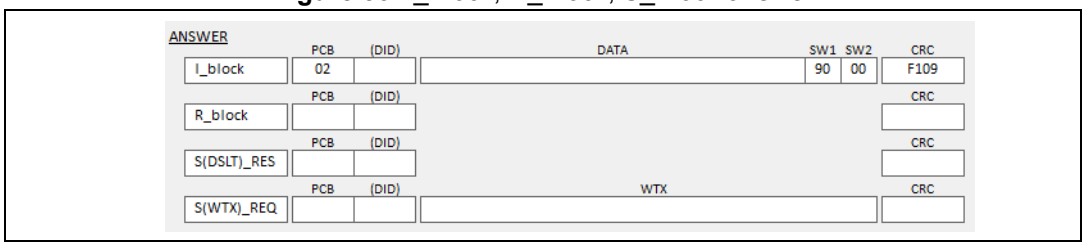
Four buttons are available to send I_Block, R_Block, S_Block requests.

Figure 52. I_Block, R_Block, S_Block requests



The answer of the M24SR is filled in I_Block, R_Block, S_Block answer fields depending on the request sent to the M24SR.

Figure 53. I_Block, R_Block, S_Block answer



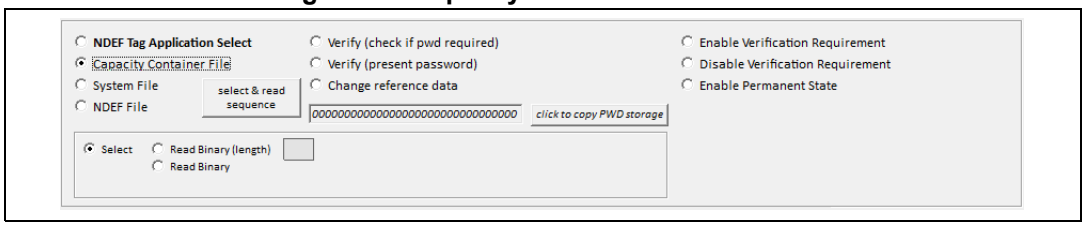
The higher part of the window can be used to automatically fill the I_Block request.

The goal is to facilitate the communication with the M24SR (following NFC forum and M24SR datasheet).

Several option buttons are available:

- **NDEF Tag Application select**
  When this option is selected, the I_Block frame is filled with adequate data.
  Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.
- **Capacity Container file**
  Selecting Capacity Container File option will allow other option to appear
  clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 54. Capacity container file selected



– **Select command**:
fill data with CC file Select command

– **Read binary (length) command**
fill data with read binary command on CC file in order to read the length of the cc file

– **Read binary command**
fill data with read binary command on CC file

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

– **Select & read sequence** button will launch automatically all the procedure and will display it in a CC file result window

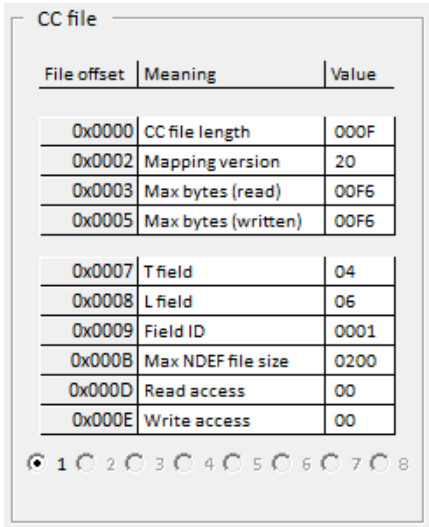
Select cc file

Read cc file length

Read cc file data

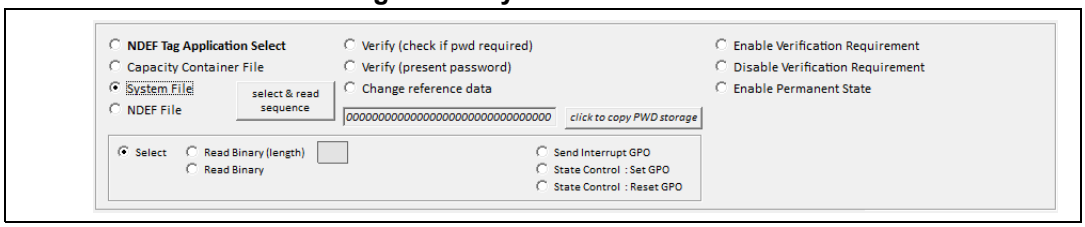
Display data in a specific CC file array (available only of no error detected)

Figure 55. Specific CC file array



- **System file**
Selecting System File option will allow other option to appear.
Clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 56. System file selected



- **Select command**:
  fill data with System file Select command
- **Read binary (length) command**:
  fill data with read binary command on System file in order to read the length of the system file
- **Read binary command**:
  fill data with read binary command on System file
- **Send Interupt GPO**
- State control: Set GPO
- State control: Reset GPO

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button send I_Block to send RF frame.

- **Select & read sequence** button will launch automatically all the procedure and will display it in System file result window

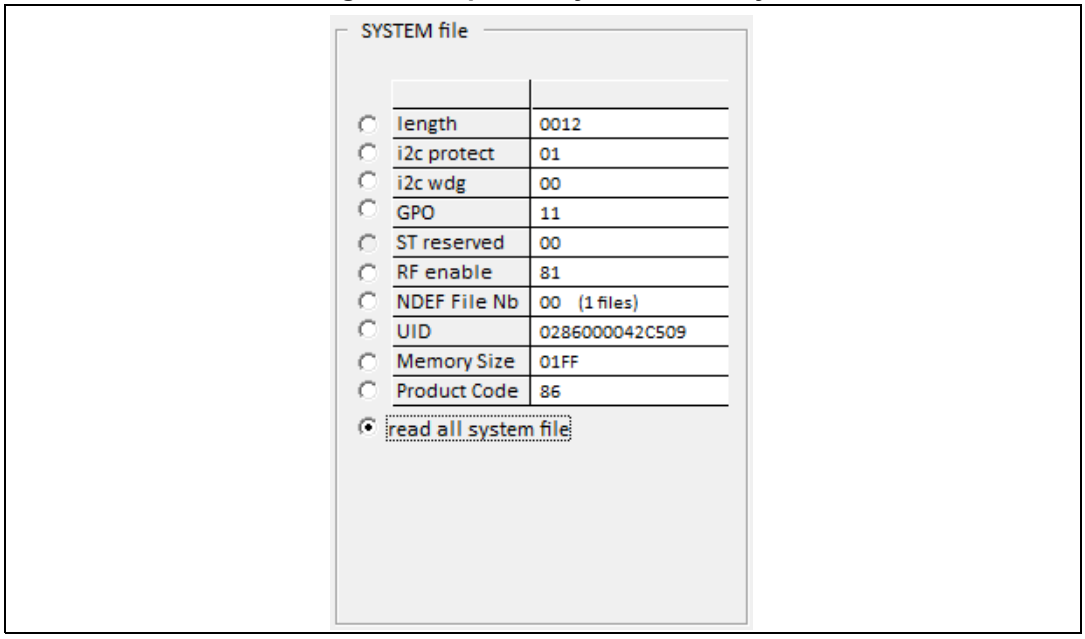
Select system file

Read sytem file length

Read system file data

Display data in a specific System file array (available only of no error detected)

Figure 57. Specific system file array

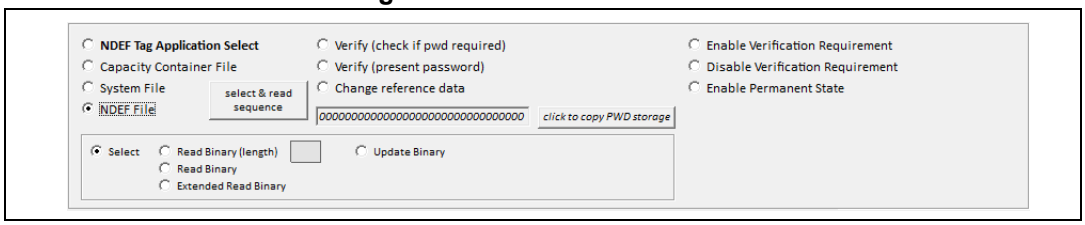


- **NDEF file**

Selecting NDEF File option will allow other option to appear.

Clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 58. NDF file is selected



– **Select command**:
fill data with NDEF file Select command

– **Read binary (length) command**:
fill data with read binary command on NDEF file in order to read the length of the cc file

– **Read binary command**
fill data with read binary command on NDEF file

– **Extended Read binary command**
fill data with extended read binary command on NDEF file

– **Update Binary command**
Fill data with update binary command on NDEF file

In case of M24SR request a WTX , this button will automatically manage it. The M24SR will reply with a Window Extension request (that will be displayed in S(WTX) answer array), then the tool will automatically send a S(WTX) request to the M24SR
All this request / answer communication will be displayed in Log window.

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

– **Select & read sequence** button will launch automatically all the procdure and will display it in NDEF file result window (NDEF file can be decoded)

Select NDEF file

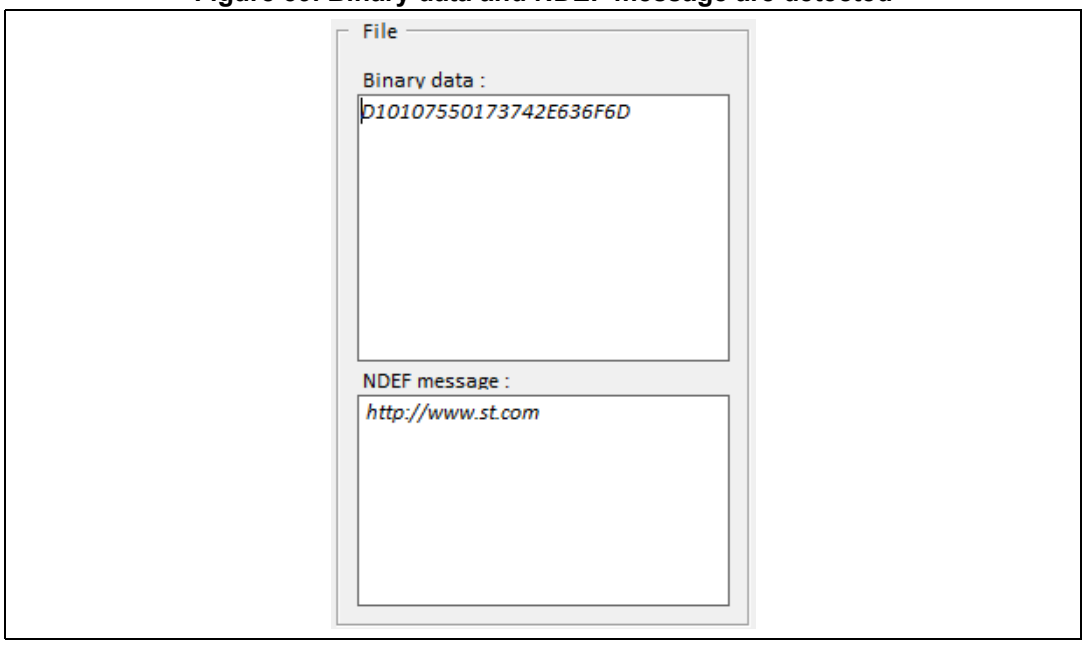
Read NDEFfile length

Read NDEF file data

Display binary data in a field (available only if no error detected)

Display decoded NDEF message if any is in a field (available only if no error detected)

Figure 59. Binary data and NDEF message are detected



- Commands to manage Password and Access Rights

Three command can be used to manage Passwords (Read password or Write password).

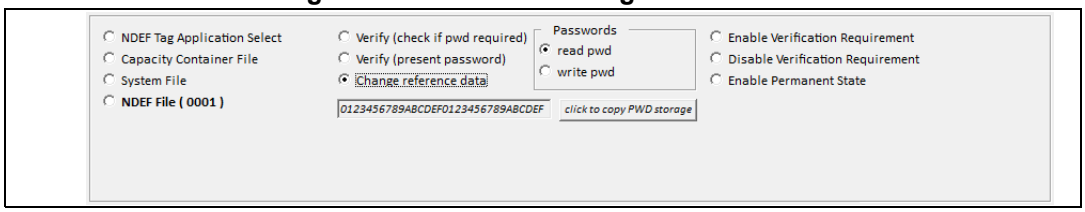
– **Verify (check if password is required)**
fill data with Verify command

– Verify (present password)
fill data with Verify command

– **Change reference data (change password value)**
fill data with Verify command

Note: Notes that a NDEF file has to be selected previously (see Datasheet)
The command sent will be applied to selected NDEF file

Figure 60. Password management button

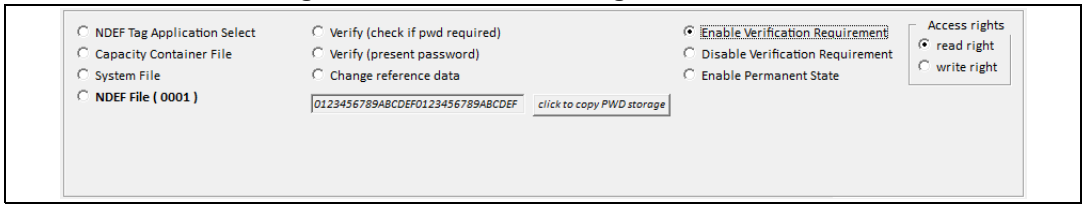


Three commands can be used to manage Access right and M24SR state (see *Figure 60*).

- **Enable Verification requirement**
  fill data with Verify command
- **Disable Verification requirement**
  fill data with Verify command
- **Enable Permanent State**
  fill data with Verify command

Note: Notes that a NDEF file has to be selected previously (see Datasheet)
The command sent will be applied to selected NDEF file

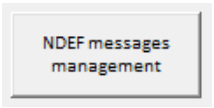
Figure 61. Password management buttons



NDEF Messages management button

It allows directly access to NFC Type_4A NDEF Message user interface (see *Section 3.3.4*)

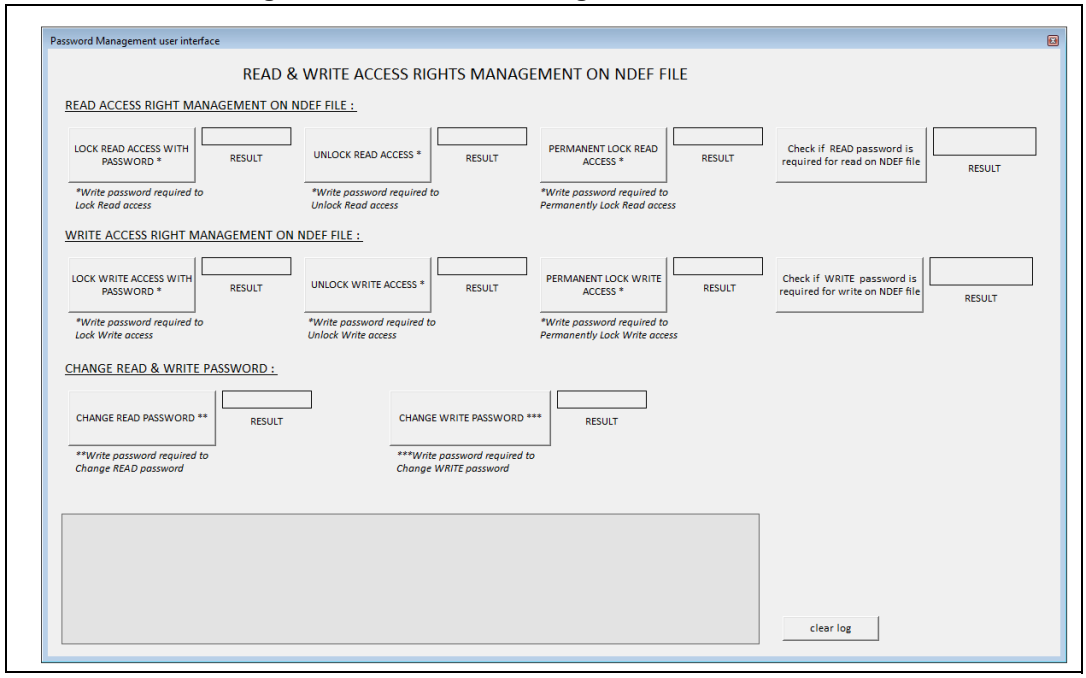
Figure 62. NDEF message management button



3.3.3 Password management for M24SR and SRTAG products

This tool allows to manage Password and access rights.

Figure 63. Password management user interface



- READ access right commands are available:
  - LOCK UNLOCK
  - PERMANENT LOCK
  - CHECK
- WRITE ACCESS RIGHT commands are available:
  - LOCK
  - UNLOCK
  - PERMANENT LOCK
  - CHECK on WRITE
- CHANGE PASSWORD commands are available to change password:
  - READ password
  - WRITE password

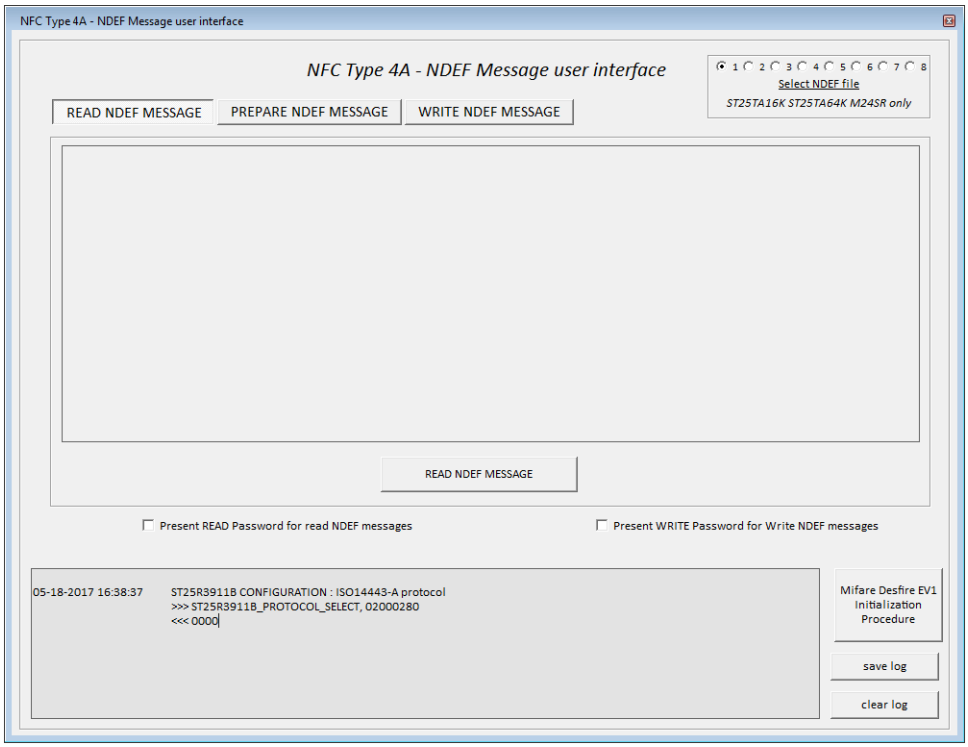
3.3.4 NFC Type 4A - NDEF Message user interface

This tool allows to read or write a NDEF file.

This user interface can manage type 2A and type 4A, type 4B, type 3, type 5 and Vicinity cards. It can be accessed by selecting the item in the menu.

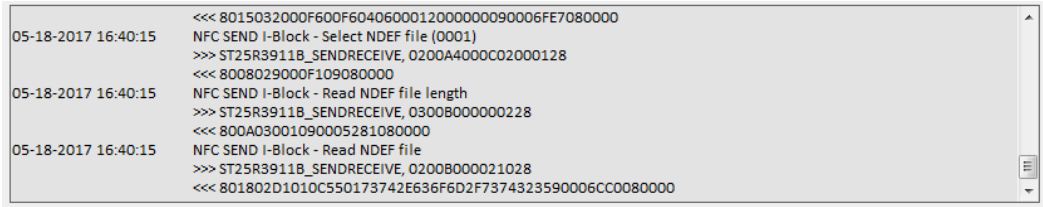
Once the NDEF message management menu is selected, the ST25R3911B is set following the selected RF protocol (Configuration) and the User interface appears.

Figure 64. NFC Type 4A - NDEF message user interface



When this tool is selected, the ST25R3911B-DISCO is configured as a ISO14443-A reader. See the log window to know the configuration set up.

Figure 65. Log window of configuration setup



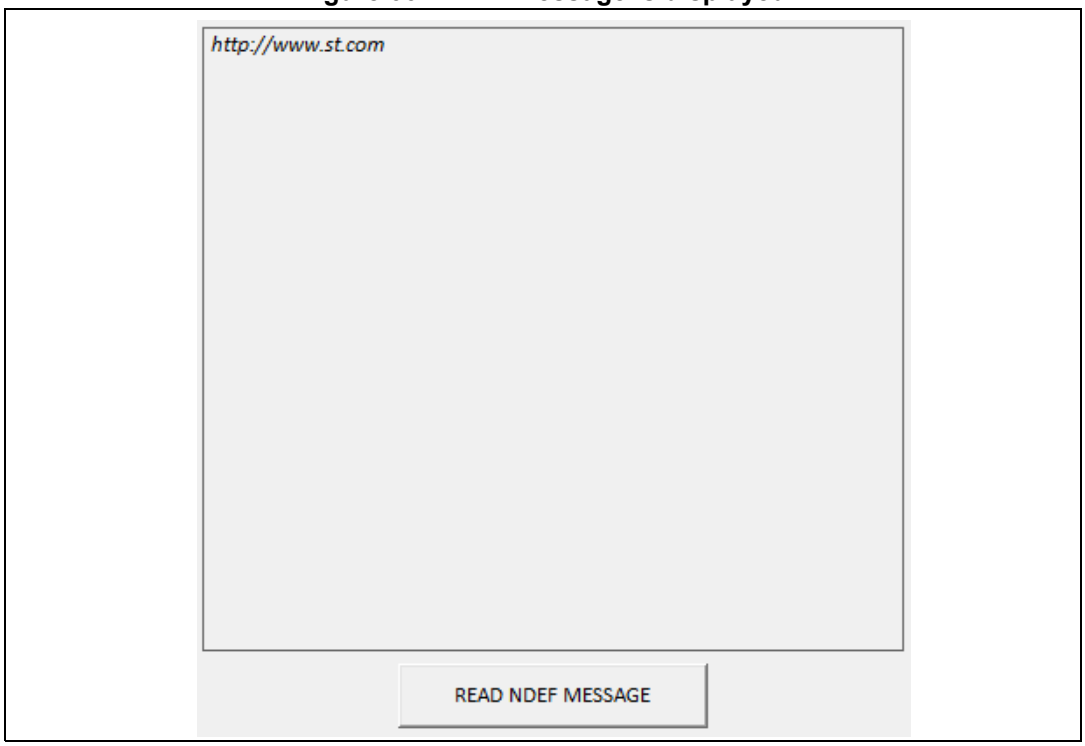
READ NDEF MESSAGE button

The READ NDEF message button is used to launch all the procedure to select the device and read the NDEF message. This whole process is described bellow.

READ NDEF MESSAGE process:

- The RF field is disabled in order to deselect the tag (RF Por).
- The RF fied is enabled.
- The Anticollision sequence is launched (ReqA, Anticol, select, RATS, PPS). The result is that the device is put in the NFC world.
- Select Application launched
- Read CC file process is launched (select, read length, read CC file)
  The goal is to identify NDEF file ID
- Read NDEF file process is launched (select, read length, read NDEF message)
- Decoding of NDEF message
- The available message is displayed on the screen (see *Figure 66*)

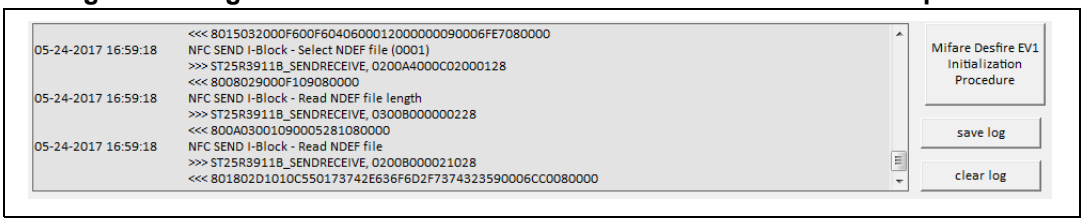
Figure 66. NDEF message is displayed



This process is automatically stopped if any error or “no answer” is detected.

The Log window at the bottom of the screen will help to understand the issue in case of error.

Figure 67. Log window when occur error on READ NDEF MESSAGE process



PREPARE NDEF MESSAGE

This item will allow to create a NDEF Message with a single NDEF record or several NDEF record.

Notes that the NDEF message will not be written to the Tag. To be able to write the NDEF message to the Tag, you will need to click on WRITE NDEF MESSAGE

Figure 68. Prepare TEXT NDEF record

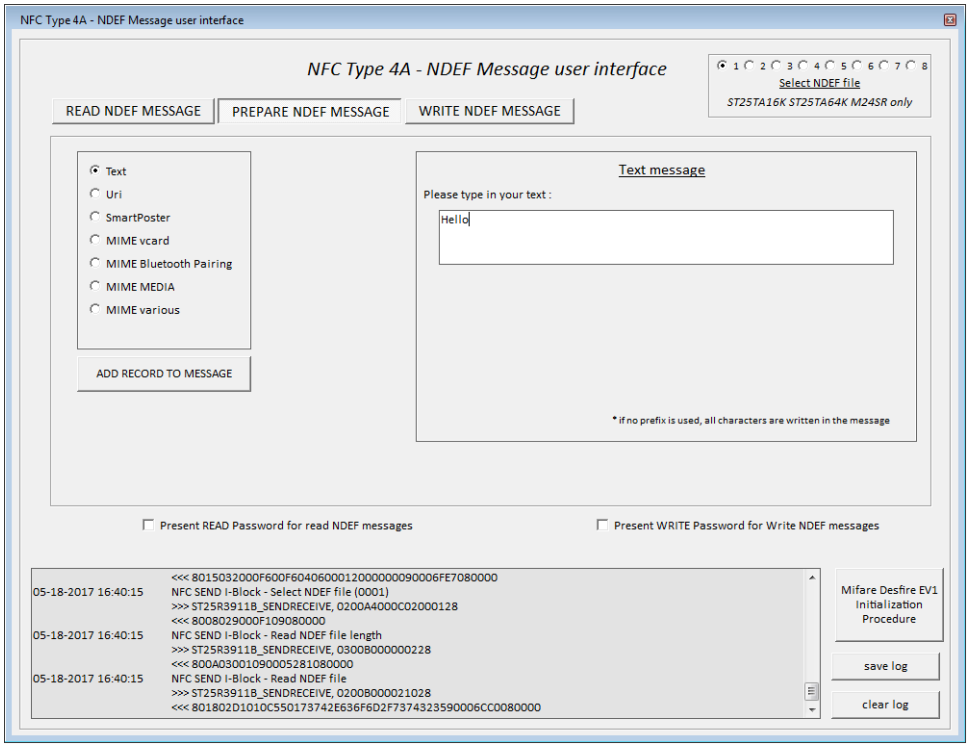


Figure 69. Prepare URI NDEF record

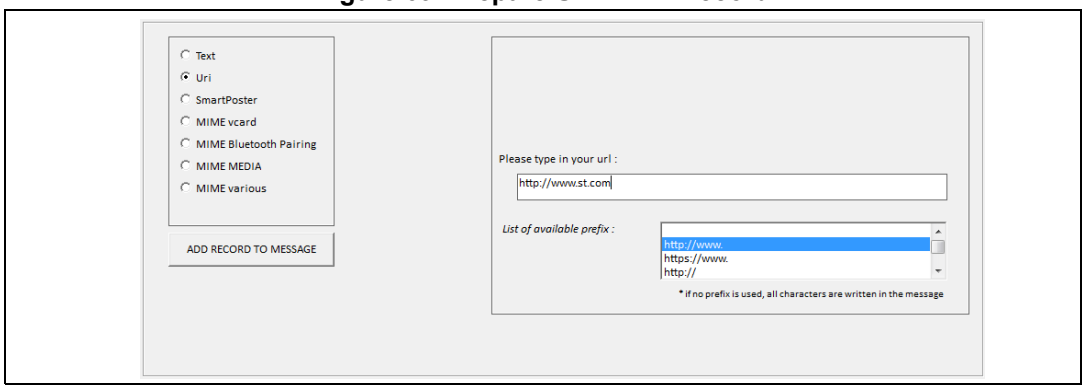


Figure 70. Prepare SMARTPOSTER NDEF record

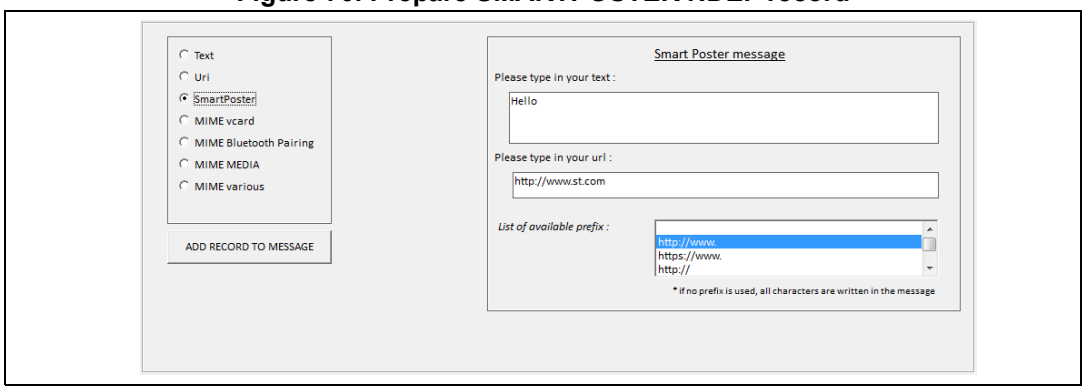


Figure 71. Prepare MIME VCARD NDEF record

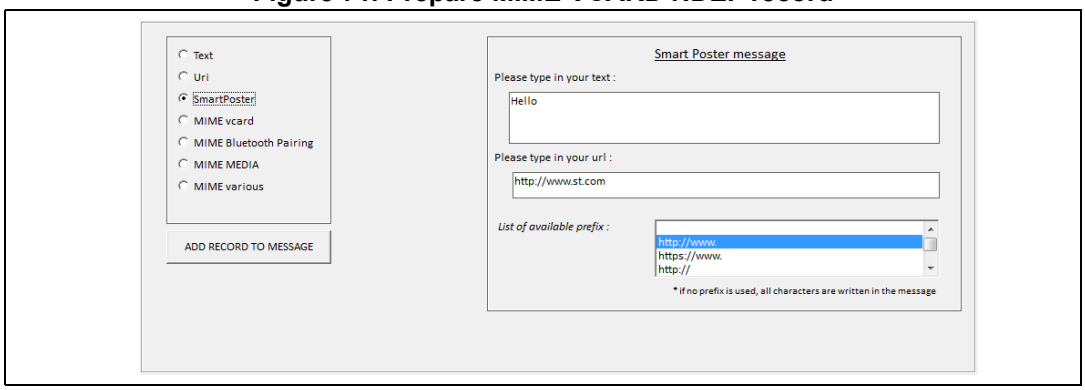


Figure 72. Prepare MIME BLUETOOTH PAIRING NDEF record

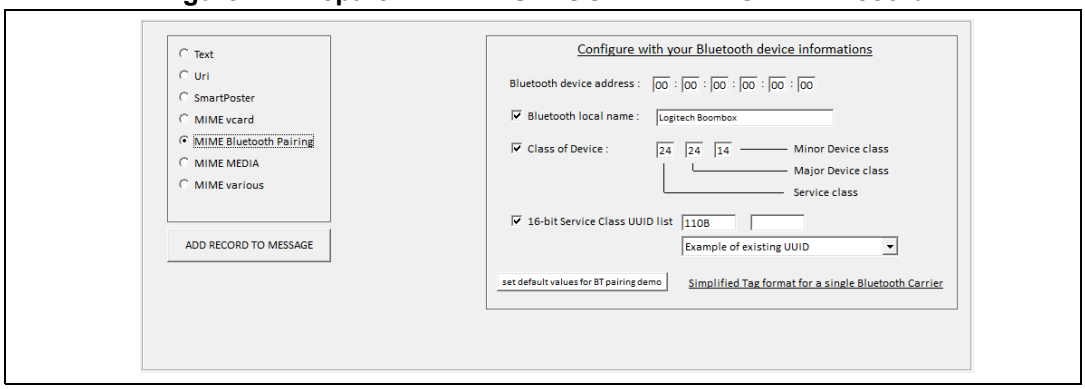


Figure 73. Prepare MIME MEDIA NDEF record

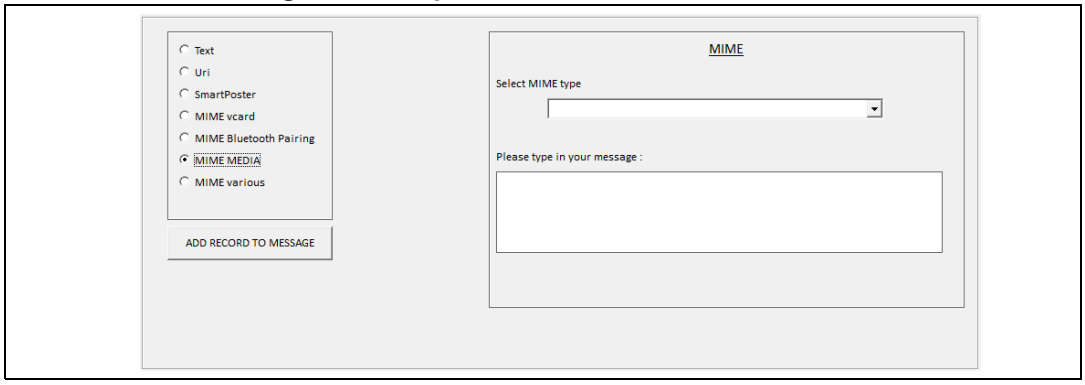


Figure 74. Prepare MIME VARIOUS NDEF record

WRITE NDEF MESSAGE

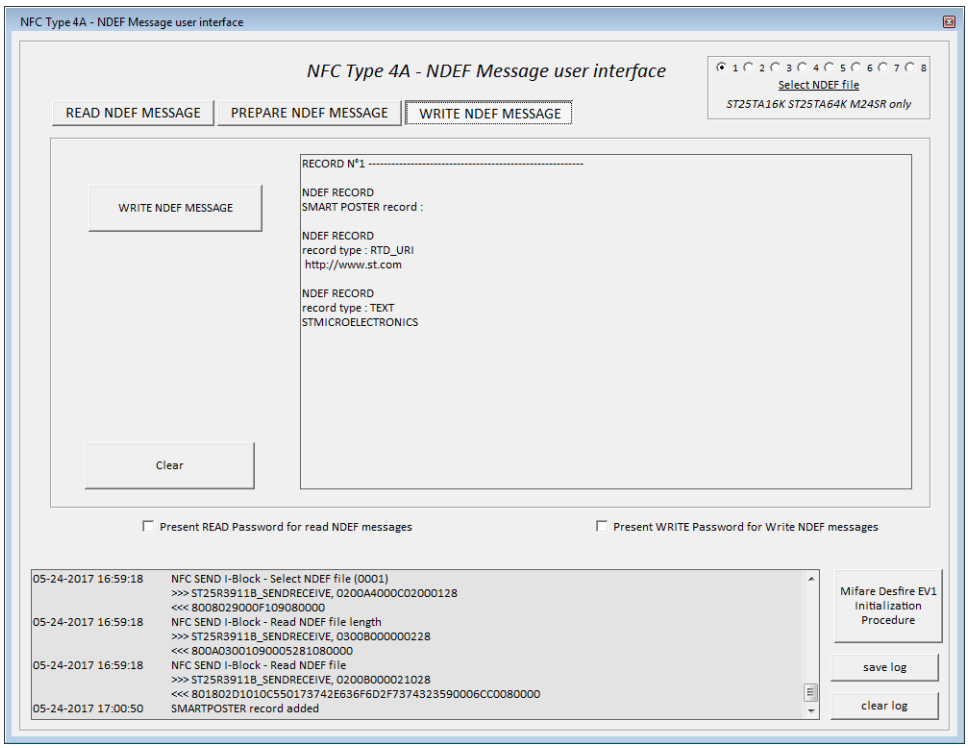
Once one or more NDEF records have been selected, The user are able to write the whole NDEF message in the tag selecting WRITE NDEF MESSAGE ITEM.

The user can now check NDEF message. Then click on WRITE NDEF MESSAGE to write it.

If the user want to change message, he can click on CLEAR then return on PREPARE NDEF MESSAGE to build a new one.

At the right of the window, the user will be able to prepare and write a NDEF message from a list of NDEF message types.

Figure 75. Write Text NDEF message



WRITE NDEF MESSAGE process:

- The RF field is disabled in order to deselect the tag (RF Por).
- The RF fied is enabled.
- The Anticollision sequence is launched (ReqA, Anticol, select, RATS, PPS). The result is that the device is put in the NFC world.
- Select Application launched
- Read CC file process is launched (select, read length, read CC file)
  The goal is to identify NDEF file ID
- Write the Encoded NDEF messageThis process is automatically stopped if any error or “no answer” is detected.

The Log window at the bottom of the screen will help to understand the issue In case of error.

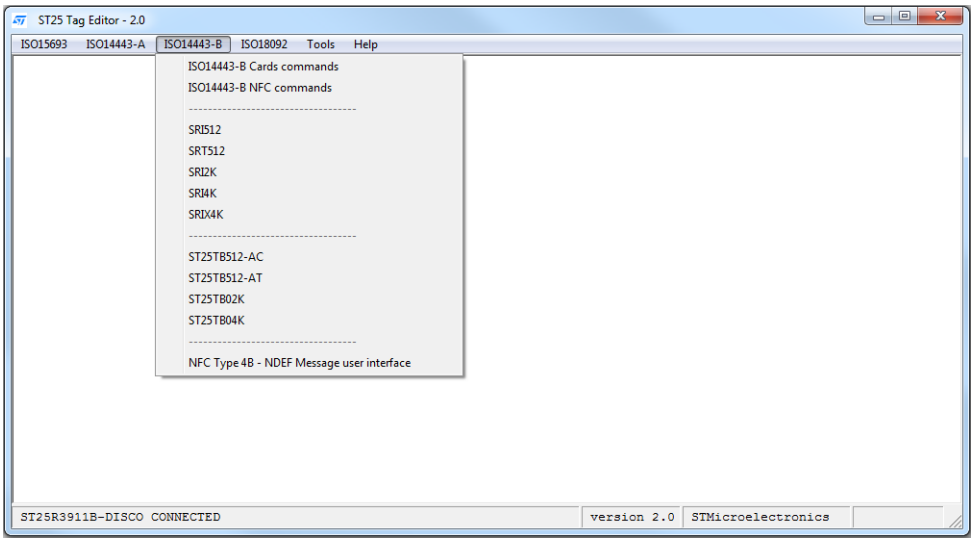
3.4 ISO14443-B menu

This section allows to communicate with ISO14443-B tags.

Select ISO14443-B from the main menu to use the ST25R3911B-DISCO as an ISO14443-B reader. You can then choose between:

- ISO14443-B cards
- SO14443-B with NFC features
- SRIxx & SRT devices

Figure 76. ISO14443-B menu



Select a device from the list (see *Figure 77* and *Figure 78* for an example). This automatically configures the board as an ISO14443-B reader and displays all the ISO14443-B requests.

ISO14443-B communications are configured as follows:

– 106 kbits/s data rate for both transmission and reception
– CRC appended

The ISO14443-B configuration is displayed in the log window.

The upper part of the window contains buttons allowing to send ISO14443-B requests to tags through the ST25R3911B-DISCO antenna (refer to the device datasheet).

Select the ISO14443-B menu to launch one of the following user interface (see *Figure 78*):

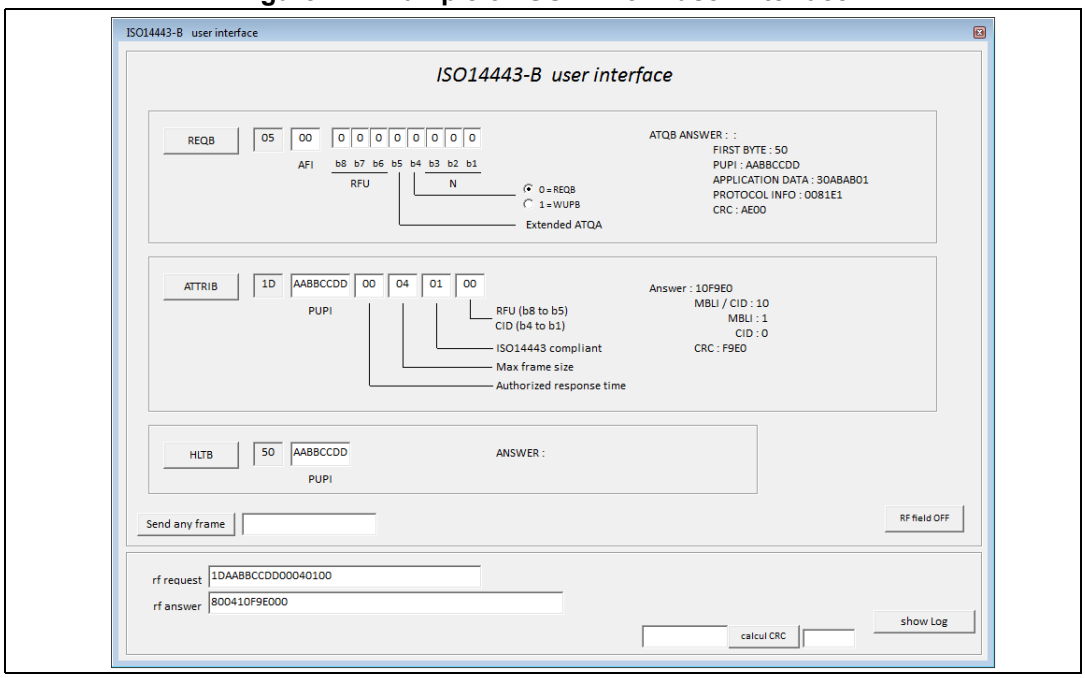
- ISO14443-B Cards commands: (see *Section 3.4.1*)
  This menu allows the user to send any ISO14443-B requests
- ISO14443-B NFC commands: (see *Section 3.4.2*)
  This menu allows the user to send any ISO14443-B requests
- SRI512 SRT512 SRI2K SRI4K SRIX4K (see *Section 3.4.3*)
  This menu allows the user to send any ISO14443-B requests to SRXxx product
- NFC Type 4B NDEF Message user interface (see *Section 3.4.4*)
  This menu allows the user to read and write NDEF message to Tag Type 4B

3.4.1 ISO14443-B Cards commands

This window allows to communicate to any ISO14443-B card.

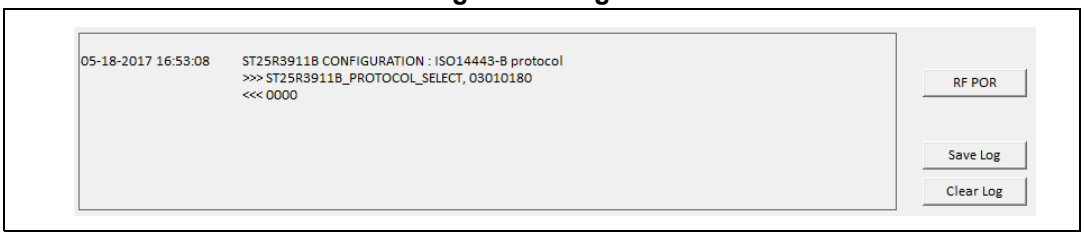
When selecting the ISO14443-B Card commands, the user interface is displayed, as shown in *Figure 78*

Figure 77. Example of ISO14443-B user interface



The protocol selection is launched immediately. The summary of the commands sent to the ST25R3911B-DISCO are included in the log window. Click on “show log” to display it (see *Figure 79*)

Figure 78. Log file



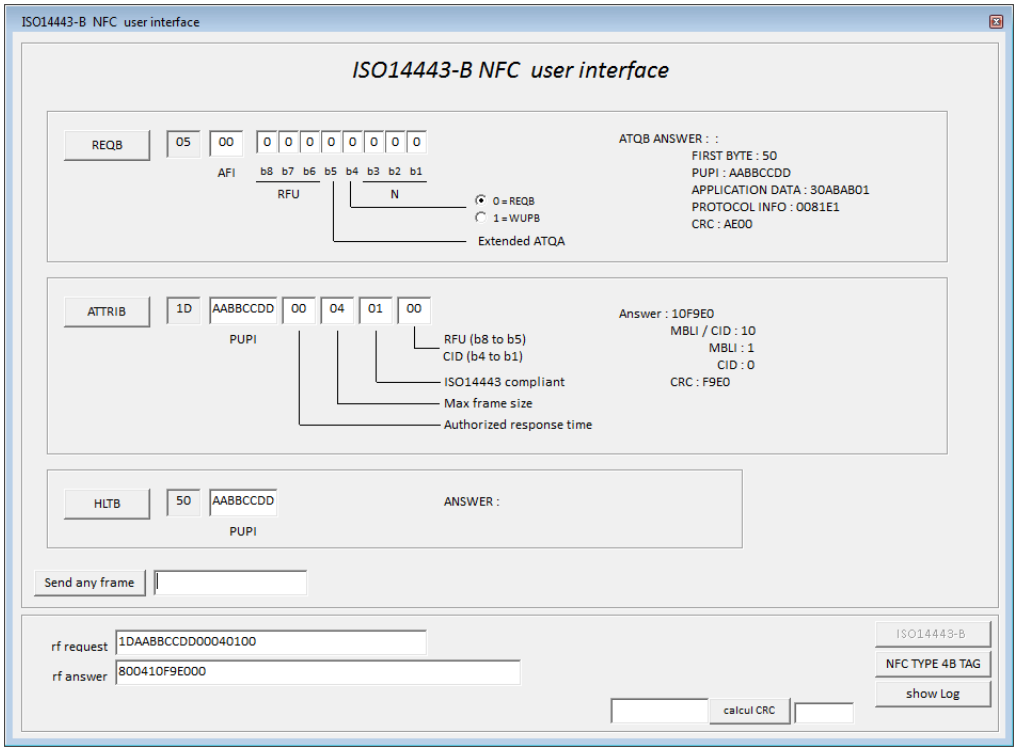
Some basic commands are available to be able to play with ISO14443-B cards such as:

- REQB
- WPUB
- ATTRIB

Log window can be displayed by clicking on “Show log” button.

3.4.2 ISO14443-B NFC commands

Figure 79. ISO1443-B user interface



The protocol selection is launched immediately. The summary of the commands sent to the ST25R3911B-DISCO are included in the log window.

This screens allow to send ISO14443-A commands:

- REQB
- WUPB
- ATTRIB

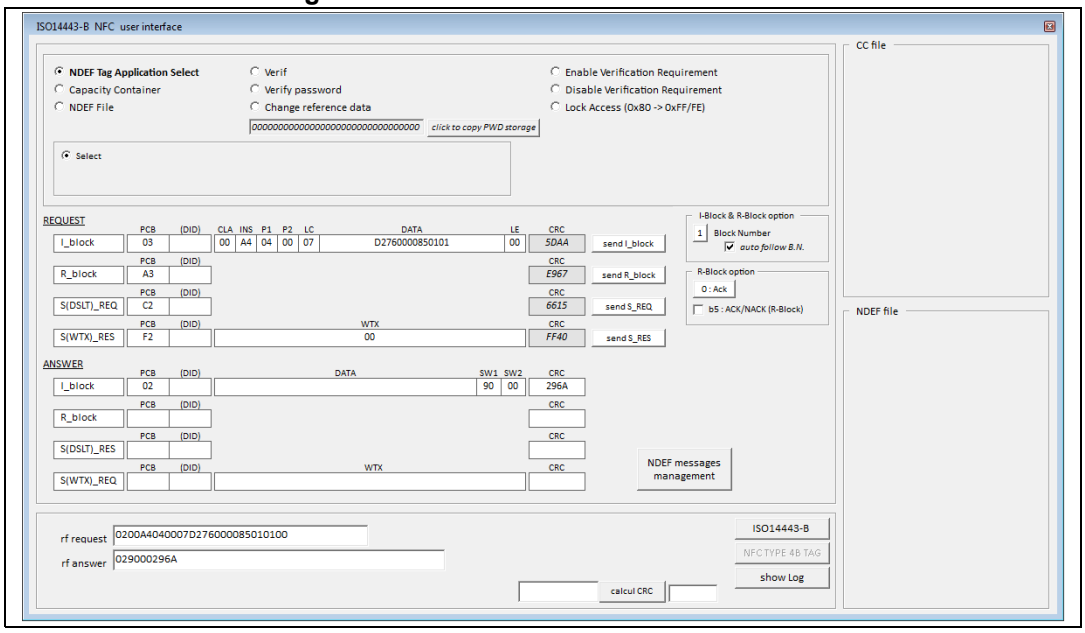
REQB & ATTRIB commands are mandatory to put the ISO14443-B NFC card into NFC world.

As soon as this commands have been sent successfully, you will be able to send NFC commands.

This commands are available on a second window. To show this window, please click on NFC TYPE 4B TAG button.

This window will allows to send NFC APDU in order to play with the NFC Type 4B tag.

Figure 80. ISO14443-B NFC user interface



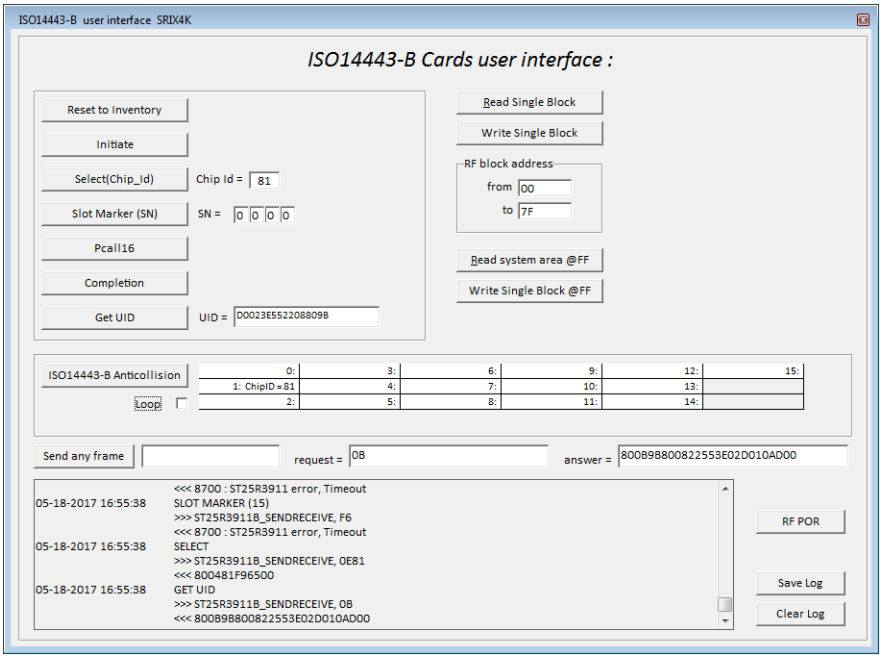
For more informations about the use of each button, please refers to *Section 3.3.2*.

3.4.3 NFC Type 4B NDEF Message user interface

The functionality of this tool is the same as the NFC TYPE 4A TAG that can be found in ISO14443-A (see to *Section 3.3.4* for more informations about how to use it).

3.4.4 SRIxx/SRTxx products

Figure 81. Example of ISO14443-B user interface for SRIxxx



The ISO14443-B configuration is displayed in the log window as shown in figure.

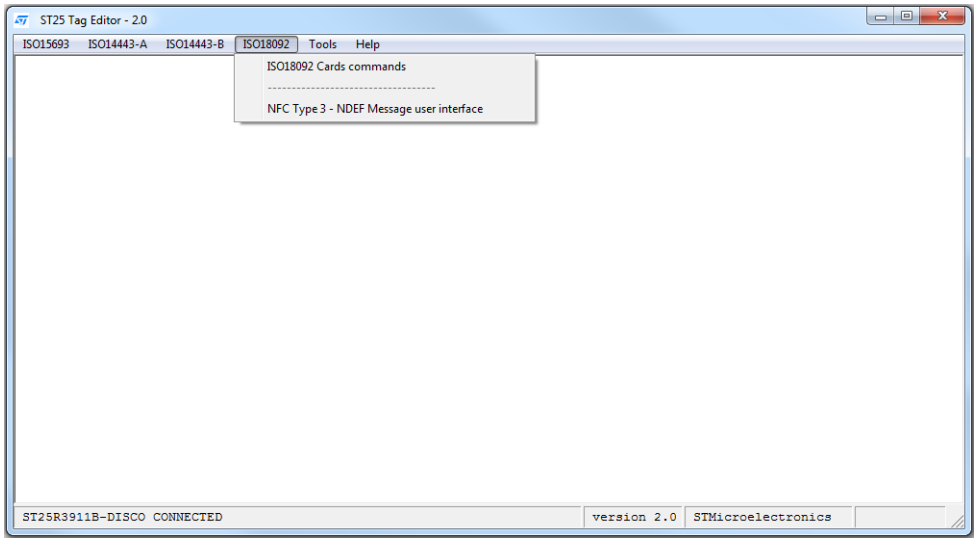
The window allows to send all the command of the datasheet for this products :

- Reset to Inventory
- Initiate
- Select
- Slot Marker
- Pcall16
- Completion
- Get UID
- Read Single Block
- Read System area (address 0xFF)
- Write Single Block
- A single button allows to launch all ths Anticollision sequence.

3.5 ISO18092 menu

1. Select ISO18092 from the main menu to use the ST25R3911B-DISCO as an ISO18092 reader (see *Figure 82*).

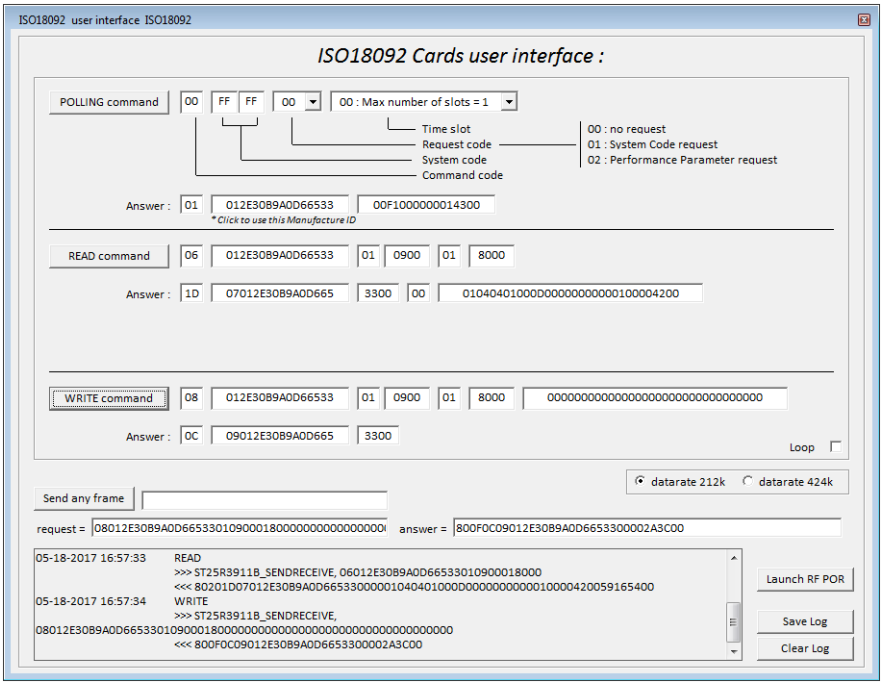
Figure 82. ISO18092 menu



2. Select ISO18092 Cards commands from the list. This automatically configures the board as an ISO8092 reader and displays all the ISO18092 requests.

The ISO18092 configuration is displayed in the log window as shown in *Figure 83*.

Figure 83. ISO18092 log window



Polling command can be done to communicate with an ISO18092 card. The response of the tag will be displayed in several fields.

ManufactureID is displayed in the second field. Click on this field to fill the Read & Write commands with this mandatory field.

Read command and Write command are also available.

3.6 Tools menu

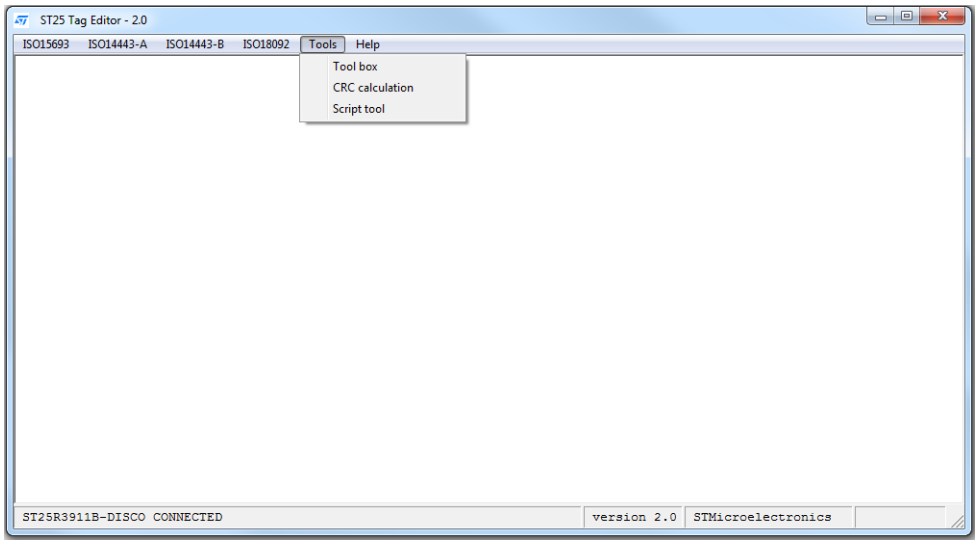
Select the **Tools** menu to launch one of the following tools (see *Figure 84*):

- **ST25R3911B-DISCO** tool box (see *Section 3.6.1: ST25R3911B-DISCO toolbox*)

  This menu allows the user to send requests to the ST25R3911B-DISCO.
- Script tool (see *Section 3.6.2: Script tool*)

  This menu allows to transmit and execute a sequence of ST25R3911B-DISCO requests.

Figure 84. Tools menu

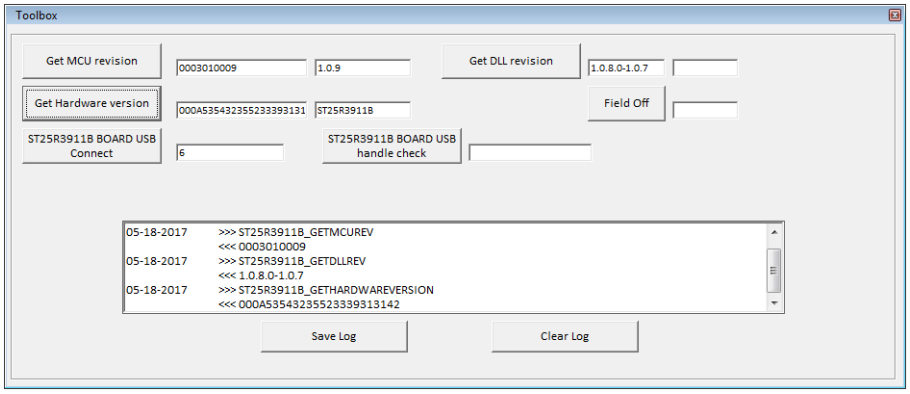


3.6.1 ST25R3911B-DISCO toolbox

The toolbox allows to send the following requests to the ST25R3911B-DISCO (see *Figure 85*):

- **Get MCU revision**: reads the revision of the STM32 microcontroller firmware.
- **Get DLL revision**: reads the revision of the DLL installed on your PC.
- **Field Off**: turns the RF field off.

Figure 85. ST25R3911B-DISCO demonstration board toolbox



3.6.2 Script tool

The **Script** tool allows playing a script containing a sequence of ST25R3911B-DISCO commands (see *Figure 89*). The following functions are available:

- **Save Script** saves the script in a text file.
- **Load Script** loads a script file
- **Launch Script** runs the script. The script is executed until an error occurs. Read the log to identify the cause of the error and correct your script. This can be due to a syntax error. Refer to the Script Help to correct it.
- **Help**: display the list of commands that can be used to program the script.

Figure 86. Script help page 1/3

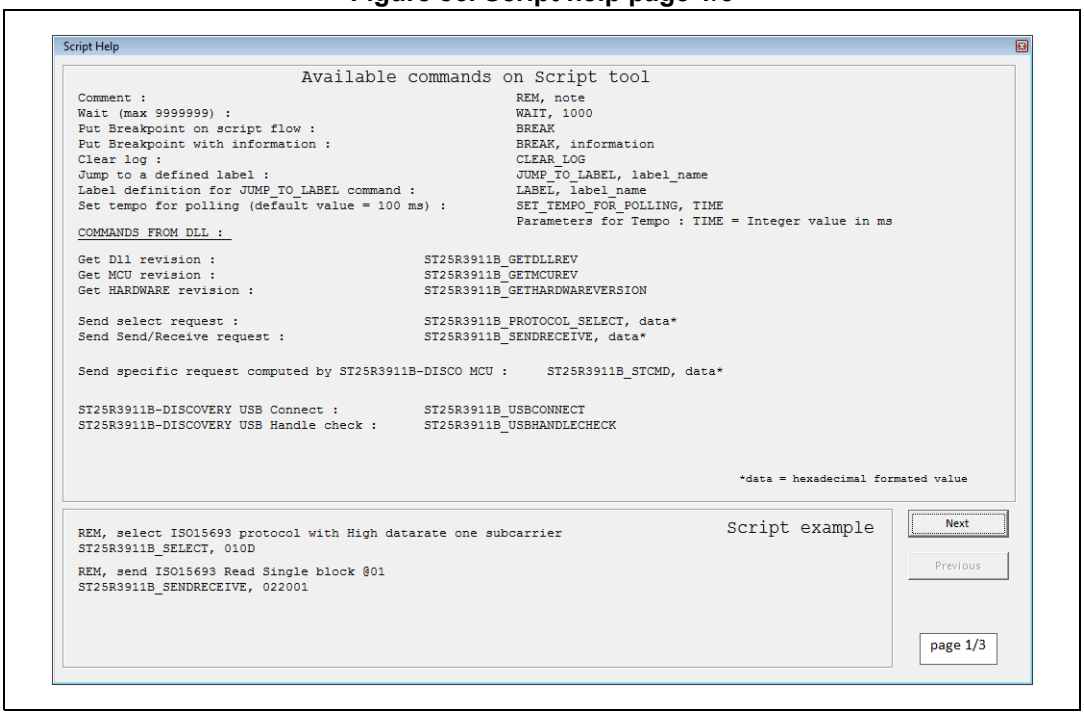


Figure 87. Script help page 2/3

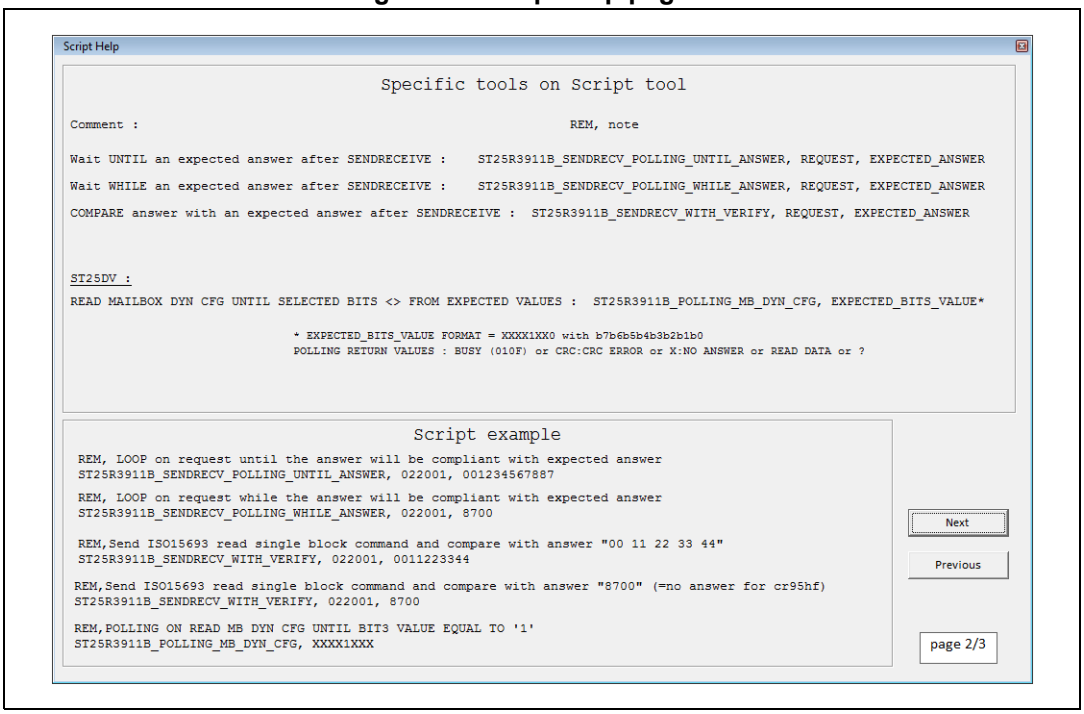
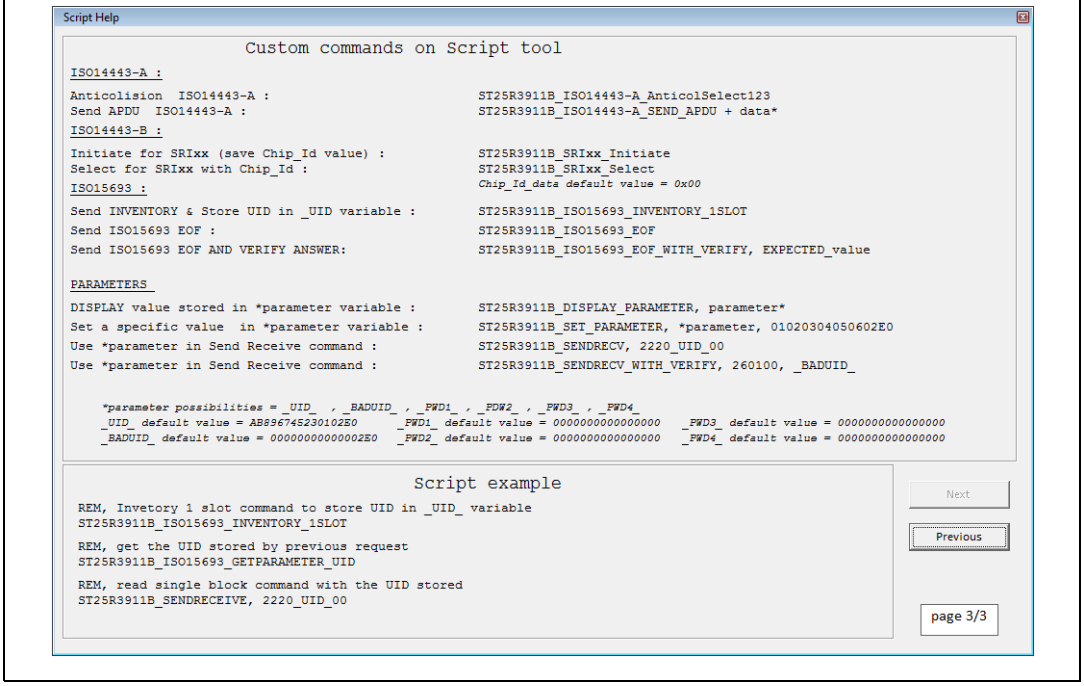
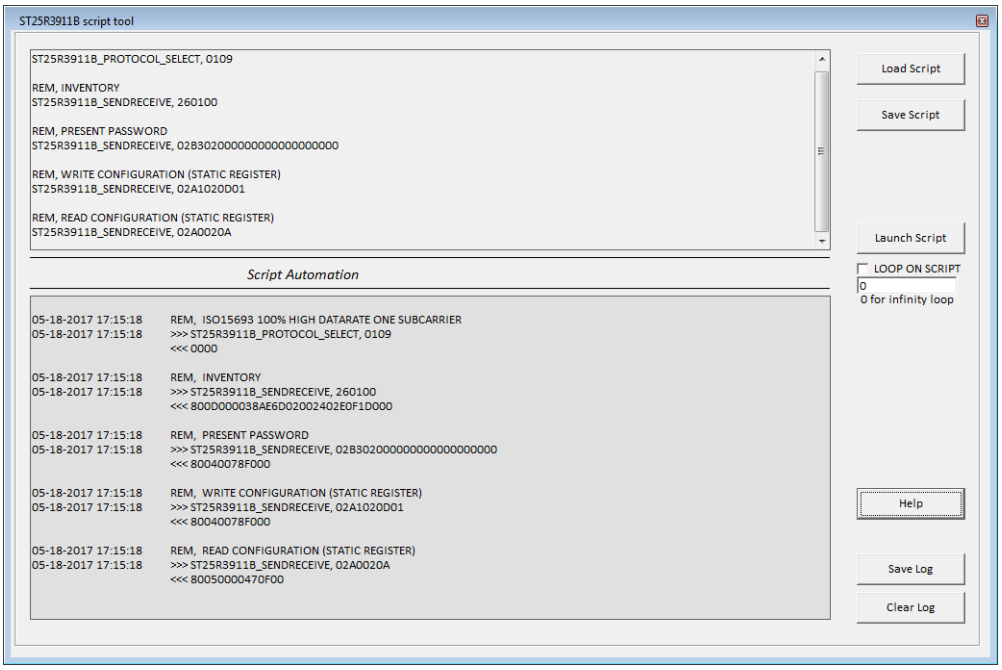


Figure 88. Script help page 3/3



The Script Help (see *Section 3.7: Help menu*) describes the syntax of all the commands that can be sent to the ST25R3911B-DISCO.

Figure 89. Script tool interface



3.7 Help menu

Select the **Help** menu to access the following functions (see *Figure 84*):

- Script Help

  This function allows to get information on ST25R3911B-DISCO function syntax (see *Figure 86*, *Figure 87* and *Figure 88*). It is particularly useful when developing a script (see *Section 3.6.2: Script tool*).

- About ...

  Click **About ...**to get information on the ST25 Tag Editor software (see *Figure 90*).

Figure 90. About window

3.8 ST25 Tag Editor RF protocol select and Send Receive functions formats

The ST25 Tag Editor software uses a specific format of parameters (log and script tool) for ST25R3911B_PROTOCOL_SELECT and ST25R3911B_SENDRECEIVE functions. (See below sections).

This function's descriptions will help to understand log window and develop scripts for script tool. Parameter and responses formats depend on selected RF protocol.

3.8.1 ISO15695 RF PROTOCOL

RF PROTOCOL SELECT

Script Prototype:

```
>>> ST25R3911B_PROTOCOL_SELECT, PARAM
<<< RESPONSE
```

Table 2. ISO15695 RF PROTOCOL SELECT

Name		Format	Description
Input parameter	PARAM	0109	ISO15693: High data rate (100%) and CRC calculated and added by ST25R3911B-DISCO
		0108	ISO15693 High data rate(100%)
Returned response	RESPONSE	0000	RF protocol selected successfully
		8300	Parameter error
		8900	USB connection error

Example: Select ISO15693 RF protocol High Data rate 100%

```
>>> ST25R3911B_PROTOCOL_SELECT, 0109
<<< 0000
```

0000: No error

SEND RECEIVE FUNCTION

Script Prototype:

```
>>> ST25R3911B_SENDRECEIVE, RF_REQUEST
<<< RESPONSE
```

Table 3. SEND RECEIVE FUNCTION

Name		Format		Description
Input parameter	RF_REQUEST	RF Frame (ex: 0220000)		– Format after PROTOCOL SELECT 0109 ISO15693 RF REQUEST The CRC of RF REQUEST is calculated and added by ST25R3911B-DISCO
		RF Frame + CRC (ex: 0220004750)		– Format after PROTOCOL SELECT 0108 ISO15693 RF REQUEST
Returned response	RESPONSE	Error	8700	No RF response detected
			8D00	RF Answer detected with collision
			8A00	RF framing error
			8900	USB connection error
		No error: RF response returned	Byte 1	80 (status byte)
			Byte 2	Length of output parameter
			Byte 3	Byte 3 to N-1 Byte N-1 = RF Answer
			Byte N	Protocol error status byte (00: OK, else CRC Error)

Example: Read Single Block @00

```
>>> ST25R3911B_SENDRECEIVE, 022000
<<< 800800E1404005FB7000
```

80	RF Answer OK
08	Length
00E1404005FB70	RF Response (00:flag, E1404005:Data, FB70:CRC)
00	No error

3.8.2 ISO14443-A RF PROTOCOL

RF PROTOCOL SELECT

Script Prototype:

```
>>> ST25R3911B_PROTOCOL_SELECT, PARAM
<<< RESPONSE
```

Table 4. RF PROTOCOL SELECT

Name		Format	Description
Input parameter	PARAM	02000280	ISO14443-A Tx=106k / Rx=106k
Returned response	RESPONSE	0000	RF protocol selected successfully
		8300	Parameter error
		8900	USB connection error

Example: Select ISO15693 RF protocol High Data rate 100%

```
>>> ST25R3911B_PROTOCOL_SELECT, 02000280
<<< 0000
```

0000: No error

SEND RECEIVE FUNCTION

Script Prototype:

```
>>> ST25R3911B_SENDRECEIVE, RF_REQUEST
<<< RESPONSE
```

Table 5. SEND RECEIVE FUNCTION

Name		Format			Description
Input parameter	RF_REQUEST	ISO14443-A RF REQUEST + CONTROL BYTE Where: CONTROL BYTE = 0xXY		X = 0	RF frame is sent as it is.
				X= 2	CRC of the RF frame is calculated and added to the RF frame sent.
				Y	Number of bits of the last byte to be sent.
Returned response	RESPONSE	Error	8700		No RF response detected
			8D00		RF Answer detected with collision
			8A00		RF framing error
			8900		USB connection error
		No error: RF response returned	Byte 1		80 (status byte)
			Byte 2		Length of output parameter
			Byte 3 to Byte N-1		RF Answer
			Byte N-2 to N = XY ZZZZ Protocol error status bytes	X = 0	CRC included in RF answer
				X = 2	NO CRC included in RF answer
				Y	Number of bits of the last received byte
				ZZZZ = 0000	No framing error detected in RF Answer

Example: REQA

```
>>> ST25R3911B_SENDRECEIVE, 26 07
<<< 80054200280000
```

80	RF Answer OK
05	Length
4200	RF Answer
280000	NO CRC included in RF answer / Last byte is 8 bits size / No error detected

Example: READ BINARY 5 BYTES @ 0000

```
>>> ST25R3911B_SENDRECEIVE, 0300B0000005FF0D 08
<<< 800D030010D1010C90006CC9080000
```

80	RF Answer OK
0D	Length
030010D1010C90006CC9	RF Answer
080000	CRC included in RF answer / Last byte is 8 bits size / No error detected

3.8.3 ISO14443-B RF PROTOCOL

RF PROTOCOL SELECT

Script Prototype:

```
>>> ST25R3911B_PROTOCOL_SELECT, PARAM
<<< RESPONSE
```

Table 6. RF PROTOCOL SELECT

	Name	Format	Description
Input parameter	PARAM	03010180	ISO14443-B: Tx=106k / Rx=106k and CRC calculated and added in the RF Frame to be sent.
Returned response	RESPONSE	0000	RF protocol selected successfully
		8300	Parameter error
		8900	USB connection error

Example: Select ISO14443-B RF protocol Tx=106k / Rx=106k

```
>>> ST25R3911B_PROTOCOL_SELECT, 03010180
<<< 0000
```

0000: No error

SEND RECEIVE FUNCTION

Script Prototype:

```
>>> ST25R3911B_SENDRECEIVE, RF_REQUEST
<<< RESPONSE
```

Table 7. SEND RECEIVE FUNCTION

Name		Format		Description
Input parameter	RF_REQUEST	-		ISO14443-B RF REQUEST
Returned value	RESPONSE	Error	8700	No RF response detected
			8D00	RF Answer detected with collision
			8A00	RF framing error
			8900	USB connection error
		No error: RF response returned	Byte 1	80
			Byte 2	Length of output parameter
			Byte 3 to Byte N-1	RF Answer
			Byte N = XX	Protocol error status byte

Example: POLLING

```
>>> ST25R3911B_SENDRECEIVE, 00FFFF0000
<<< 8012010110031014111A24100B4B428485D0FF00
```

80	RF Answer OK
12	Length
010110031014111A24100B4B428485D0FF	RF Answer
00	No error detected

Example: READ

```
>>> ST25R3911B_SENDRECEIVE, 06012E30B9A0D66533010900018001
<<< 801D07012E30B9A0D66533000001D220236170706C69636174696F6E2F7600
```

80	RF Answer OK
1D	Length
07012E30B9A0D66533000001D220236170706C69636174696F6E2F76	RF Answer
00	No error detected

3.8.4 ISO18092 RF PROTOCOL

RF PROTOCOL SELECT

Script Prototype:

```
>>> ST25R3911B_PROTOCOL_SELECT, PARAM
<<< RESPONSE
```

Table 8. RF PROTOCOL SELECT

Name		Format	Description
Input parameter	PARAM	0451100500	ISO18092-B Tx=212k Rx=212k and CRC calculated and added in RF Frame to be sent
Returned response	RESPONSE	0000	RF protocol selected successfully
		8300	Parameter error
		8900	USB connection error

Example: Select ISO8092 RF protocol Tx=212k / Rx=212k

```
>>> ST25R3911B_PROTOCOL_SELECT, 0451100500
<<< 0000
```

0000: No error

SEND RECEIVE FUNCTION

Script Prototype:

```
>>> ST25R3911B_SENDRECEIVE, RF_REQUEST
<<< RESPONSE
```

Table 9. SEND RECEIVE FUNCTION

Name		Format			Description
Input parameter	RF_REQUEST	-			ISO18092: RF REQUEST
Returned response	RESPONSE	Error	8700		No RF response detected
			8D00		RF Answer detected with collision
			8A00		RF framing error
			8900		USB connection error
		No error: RF response returned	Byte 1		80
			Byte 2		Length of output parameter
			Byte 3 to Byte N-1		RF Answer
			Byte N =	XX	Protocol error status byte

Example: INITIATE

```
>>> ST25R3911B_SENDRECEIVE, 0600
<<< 8004A6443000
```

80	RF Answer OK
04	Length
A64430	RF Answer
00	No error detected

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
24-Mar-2017	1	Initial release.
29-Jun-2017	2	Updated: – *Introduction* – *Section 2.4: ST25R3911B Discovery GUI tab* – *Table 3: SEND RECEIVE FUNCTION* Added: – *Section 3: Using the ST25 Tag Editor software* – *Section 3.8: ST25 Tag Editor RF protocol select and Send Receive functions formats*