

# Connected tags demonstrator – User Manual

Passthrough demonstrator at high bit rates for ISO 15693 between PN5190 and NTAG5 Boost



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## Version tracker

Version	Date	Owner	Comments
0.1	03/10/2022	CP	ToC defined
0.2	04/10/2022	AI	Document completion with all data
1.0	06/10/2022	CP	Reviewed and release
1.1	11/10/2022	CP	Updated to fix bug detected on repository linked to fixed paths

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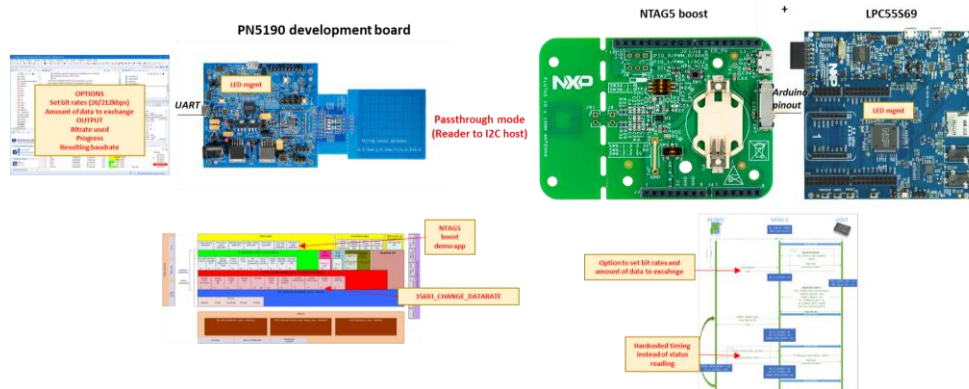
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## Scope of demonstrator

- Demonstrating a unique feature of NXP Semiconductors. High bit rates for ISO15693 communication (212 kbps) between a PN5190 reader IC and an NTAG5 boost plus LPC55S69 host MCU, when implementing passthrough mode using the SRAM of the NTAG5 boost.
- Through MCUXpresso console, the user can configure the contactless bit rate (26.4kbps or 212kbps options) as well as the amount of data to exchange using passthrough mode.
- Passthrough mode is implemented from NFC reader to LPC side only.
- The PN5190 prints on the MCUXpresso console the outcome of the transaction and baud rate achieved.
- To handle passthrough communication we are using interruptions on the LPC side and hard coded timeout on the PN5190 side.



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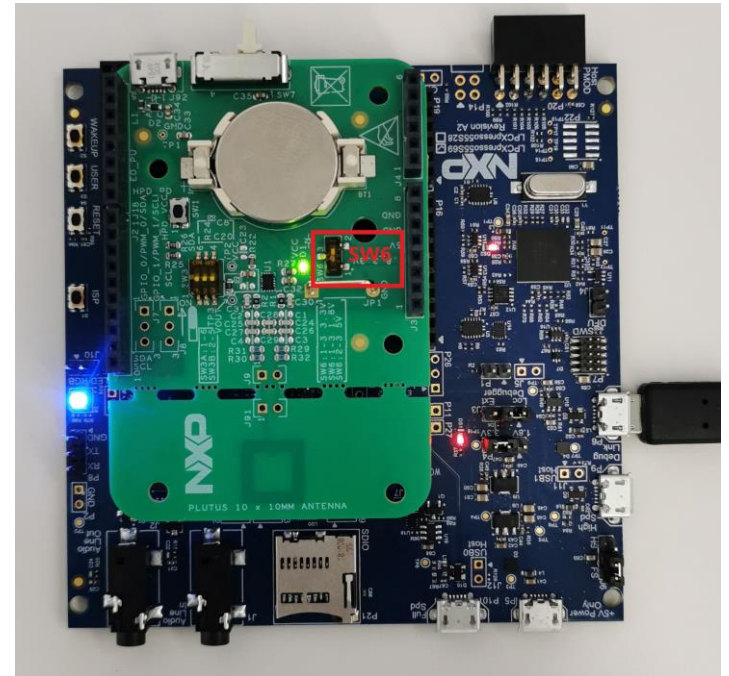
## Hardware and software material required

- Hardware
  - PNEV5190BP development board
  - LPCXpresso55S69 Development Board
  - OM2NTA5332 - NTAG5 boost development kit
  - 3 x USB micro cables
- Software
  - Firmware Source Code for PN5190
    - <https://avant-studio.box.com/s/zsuw6d34g1swd3nx79oomykviglivq37>
    - SDK\_2.x\_FRDM-K82F included
  - Firmware Source Code for LPCXpresso55S69
    - <https://avant-studio.box.com/s/bmste190od80xprpaa6uqv628ynmvh0k>
    - SDK details in slide 8
  - MCUXpresso IDE recent version (v11.6.0 or newer)

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## Demonstrator bring up

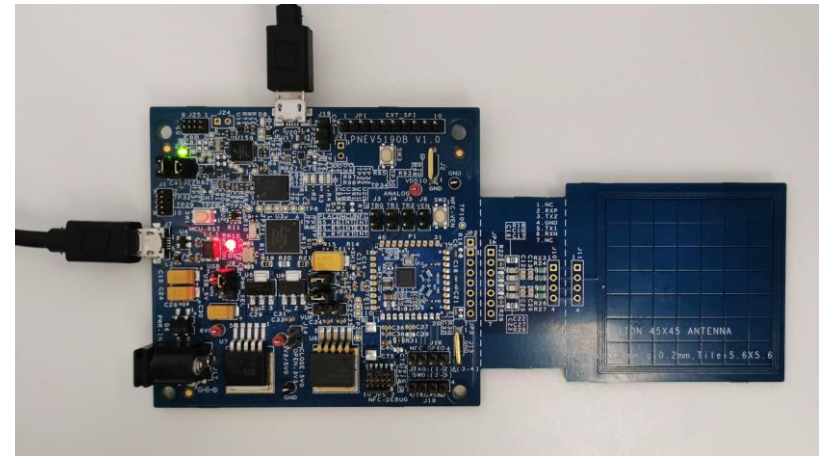
- Hardware assembly for LPCXpresso55S69
  - Connect NTAG5 Boost board to LPCXpresso55S69
  - Make sure SW6 is on position 2-3 to enable 5V power on tag side.
  - Connect LPCXpresso board to your computer (Debug Link Input).
  - No additional power source is needed.



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## Demonstrator bring up

- Hardware assembly for PNEV5190B
  - Connect two USB micro cables to PNEV5190B board for power, flashing firmware and UART connection
  - Red LED indicates power is enabled
  - Green LED debugging/UART status



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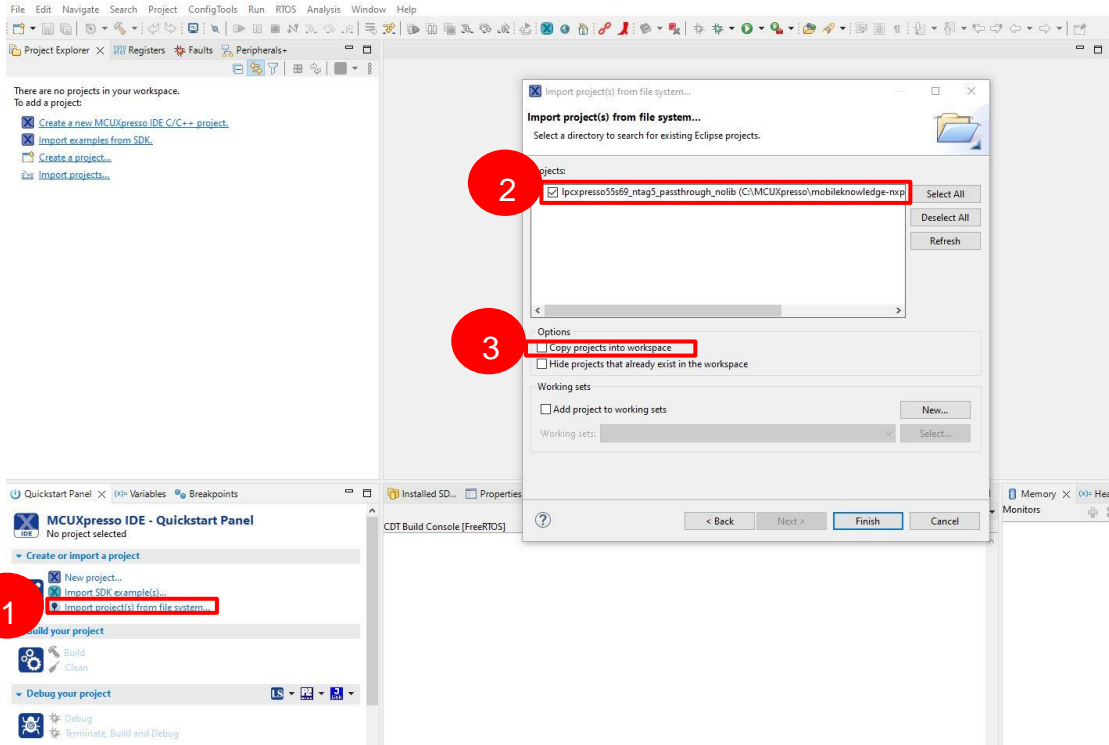
## Demonstrator bring up

- Software loading on LPC55S69
  - Import “lpcxpresso55s69\_ntag5\_passthrough\_nolib” project to MCUXpresso IDE
  - Install SDK\_2\_12\_0\_LPCXpresso55S69. SDK can be downloaded from
    - <https://www.nxp.com/security/login?service=https%3A%2F%2Fmcuxpresso.nxp.com%2Flogin%2F>
  - Build project and flash a binary file using GUI Flash Tool. After flashing, reboot your board. Blue LED must be enabled which means tag is waiting for field to be detected.



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## Demonstrator bring up



1. Import project from file system
2. Select lpcxpresso55s69 project
3. Uncheck copy projects into workspace

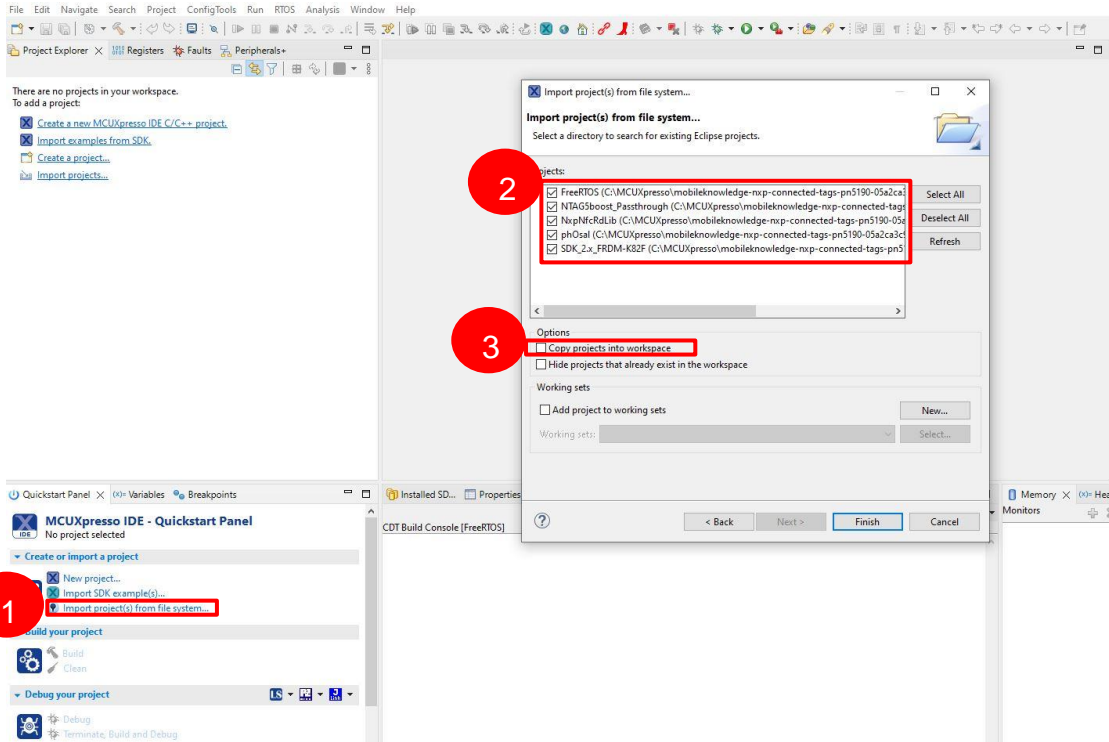
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## Demonstrator bring up

- Software loading on PNEV5190B
  - Unzip the “PN5190\_NTAG5boost\_Passthrough.zip” folder.
  - Import all projects inside “PN5190\_NTAG5boost\_Passthrough” to MCUXpresso IDE
  - Install SDK\_2.x\_FRDM-K82F. SDK is included in project file tree:
    - nxp-connected-tags-pn5190\Platform\SDK\_2.x\_FRDM-K82F
  - Build project and flash a binary file using GUI Flash Tool. After flashing, reboot your board. Blue LED must be enabled which means reader is waiting for NTAG5 to be detected.
  - Start Debug session to see available bitrate options on the console.

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## Demonstrator bring up



1. Import project from file system
2. Select all the projects
3. Uncheck copy projects into workspace

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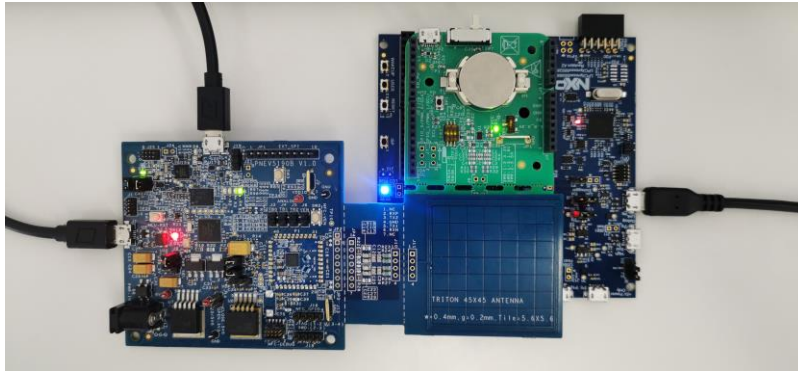
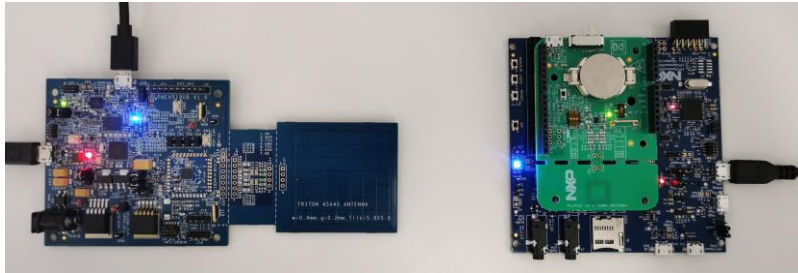
## Demonstrator bring up

- LED UI Specifications (same for LPCXpresso55S69 an PNEV5190B)
  - Steady blue - waiting for Tag - discovery loop,
  - Blinking green - passthrough transfer ongoing
  - Steady green - all data transferred successfully.
  - Steady red - error - tag lost during transfer.

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## Demonstrator bring up

- Demonstrator execution



```
Console X
NfcrdlibEx1_DiscoveryLoop_mcxu JLink DebugFRDMK82F [GDB SEGGER Interface Debugging]

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

Your choice: 3

    Select data size:
        1. 1KB
        2. 2KB
        3. 10KB

Your choice: 3

        Selected amount of data: 10240 Bytes

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

Your choice: 1

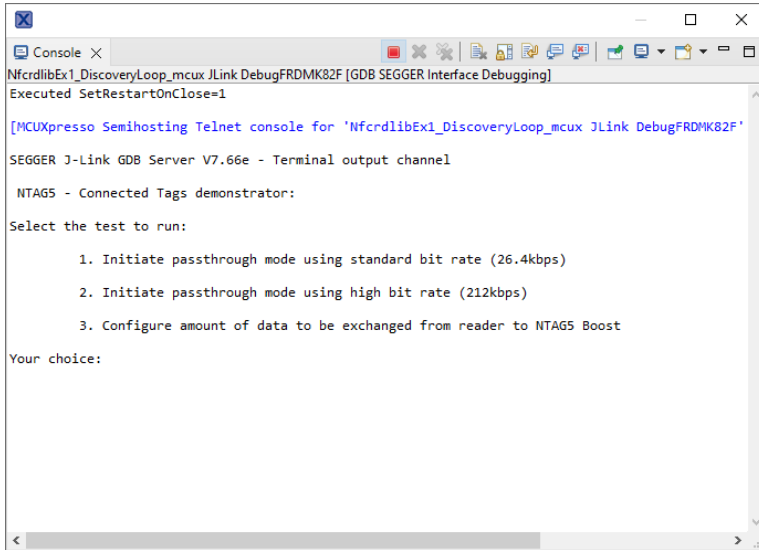
Ready to detect. Contactless bit rate selected: 26.4 kbps

Type V / ISO 15693 / T5T Detected
UID: 00 02 3E F8 58 01 04 E0
```

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## Configuration menu on MCUXpresso console

- Two options of bitrate are available for transfer amount of data from host to NTAG5 Boost: 26.4 kbps and 212 kbps
- It is possible to configure amount of data to be exchanged: 1KB, 2KB and 10KB



```
Console x
NfcdlibEx1_DiscoveryLoop_mcx JLink DebugFRDMK82F [GDB SEGGER Interface Debugging]
Executed SetRestartOnClose=1

[MCUXpresso Semihosting Telnet console for 'NfcdlibEx1_DiscoveryLoop_mcx JLink DebugFRDMK82F']

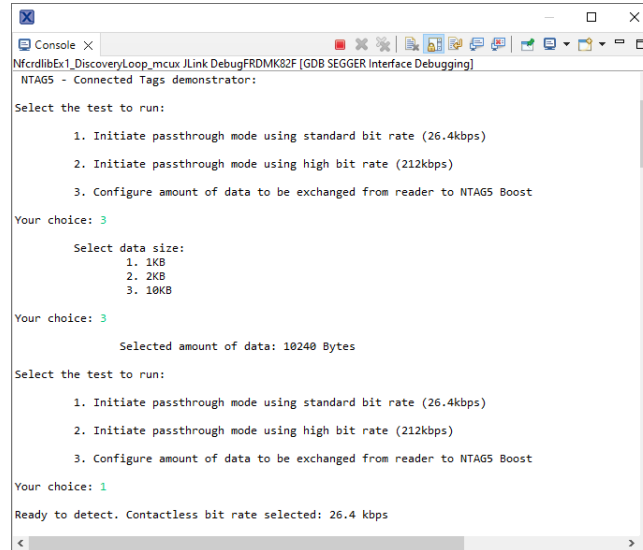
SEGGER J-Link GDB Server V7.66e - Terminal output channel

NTAG5 - Connected Tags demonstrator:

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

Your choice:
```



```
Console x
NfcdlibEx1_DiscoveryLoop_mcx JLink DebugFRDMK82F [GDB SEGGER Interface Debugging]
NTAG5 - Connected Tags demonstrator:

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

Your choice: 3

    Select data size:
        1. 1KB
        2. 2KB
        3. 10KB

Your choice: 3

    Selected amount of data: 10240 Bytes

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

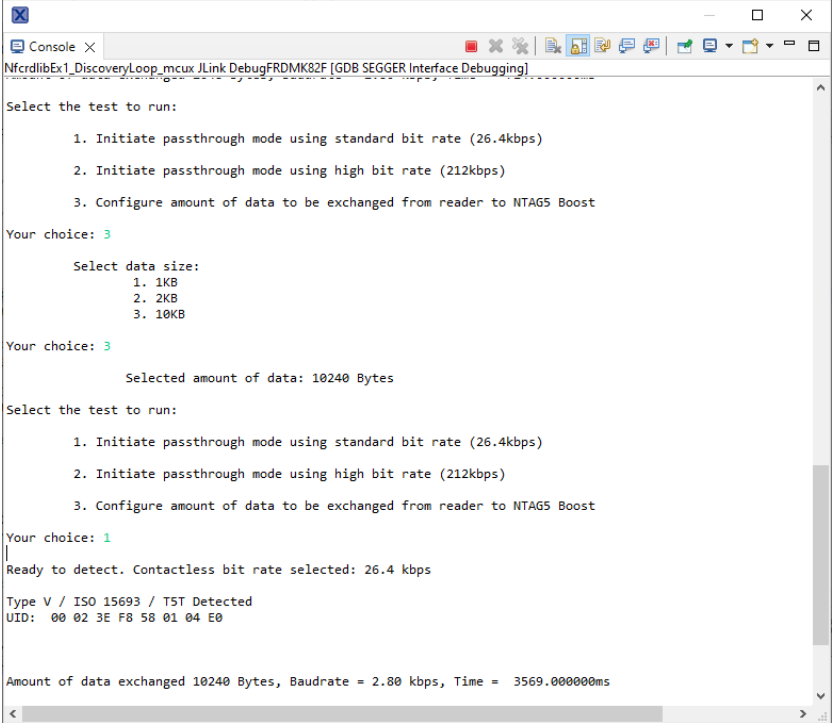
Your choice: 1

Ready to detect. Contactless bit rate selected: 26.4 kbps
```

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## Configuration menu on MCUXpresso console

- Once one of these option is selected, reader is ready to detect a tag.
- When tag is detected, reader configures selected bitrate and starts data exchange.
- Blinking green LED indicates transfer ongoing and the console shows a progress.



```
NfcrdlibEx1_DiscoveryLoop_mcuX_JLink_DebugFRDMK82F [GDB SEGGER Interface Debugging]

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

Your choice: 3

    Select data size:
        1. 1KB
        2. 2KB
        3. 10KB

Your choice: 3

        Selected amount of data: 10240 Bytes

Select the test to run:

    1. Initiate passthrough mode using standard bit rate (26.4kbps)
    2. Initiate passthrough mode using high bit rate (212kbps)
    3. Configure amount of data to be exchanged from reader to NTAG5 Boost

Your choice: 1
|
Ready to detect. Contactless bit rate selected: 26.4 kbps

Type V / ISO 15693 / T5T Detected
UID: 00 02 3E F8 58 01 04 E0

Amount of data exchanged 10240 Bytes, Baudrate = 2.80 kbps, Time = 3569.000000ms
```

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## Reference measurements

- Results of transaction at the different bit rates and data sizes offered by the demonstrator

Data Size (Bytes)	Selected bitrate (kbps)	Result Bitrate (kbps)	Total time (ms)
1024	26.4	2.8	357
	212	12.35	81
2048	26.4	2.8	714
	212	12.42	161
10240	26.4	2.7	3569
	212	12.41	806





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