



EUROPEAN UNION



ATCZ175 InterOP

SDR Interference Emulator

Getting Started with RFID Interference Rejection Measurements

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15.12.2020



1 Scope of the document

This document guides you through a measurement of Continuous Wave (CW) interference rejection ability of an RFID tag according to ISO/IEC 18000-63 [1] by the SDR Interference Emulator (SDR-IE) platform.

2 Prerequisites

The measurement scenario requires the following equipment:

- SDR-IE
- PC or Laptop (at least 12 GB RAM, Ethernet socket – 1Gbps)
- Ethernet cable
- USB cable (optional)
- Live-Linux USB stick (at least 4 GB) or preinstalled Linux OS on the PC
- RF circulator, SMA cables, antenna (for 865-MHz and 915-MHz bands)
- UHF RFID tag under test

2.1 Live-Linux USB Stick Preparation

The Live-Linux USB stick allows running the prepared SW for the interference measurement and the measurement evaluation on any PC independent of installed OS. The Live-Linux USB stick is not required if the PC runs preinstalled Linux OS (in this case continue to Preparation of SW on PC with preinstalled Linux OS).

Steps to install bootable USB stick are:

1. Format USB stick with FAT-32 file system.
2. Download `kradio-live-x86_64.zip` and extract the archive to the flash drive
3. (USB flash drive root directory has to contain the `kradio-live` directory).
4. Navigate to directory `flash_drive/kradio-live/boot/` and run a) `bootinst.cat` on Windows OS or b) `bootinst.sh` on Linux OS.
5. The Live-Linux USB stick is prepared.

2.2 Preparation of SW on PC with preinstalled Linux OS

Download archive `kradio-rfid_interference.zip`, extract it. The directory `kradio-rfid_interference` contains GNU Octave/Matlab scripts and shell scripts to run `kradio` firmware in the SDR-IE.

Download and install GNU Octave with Octave-signal package or Matlab software.

Setup the network such the PC acts as DHCP server and provides an IP address to the SDR-IE. This can be achieved through GUI-based Network manager in the most of the Linux OS as shown in Fig. 1. Without advanced changes in the configurations, the PC should set its IP address to 10.42.0.1 and provide the IP address 10.42.0.47 to the SDR-IE (default settings).

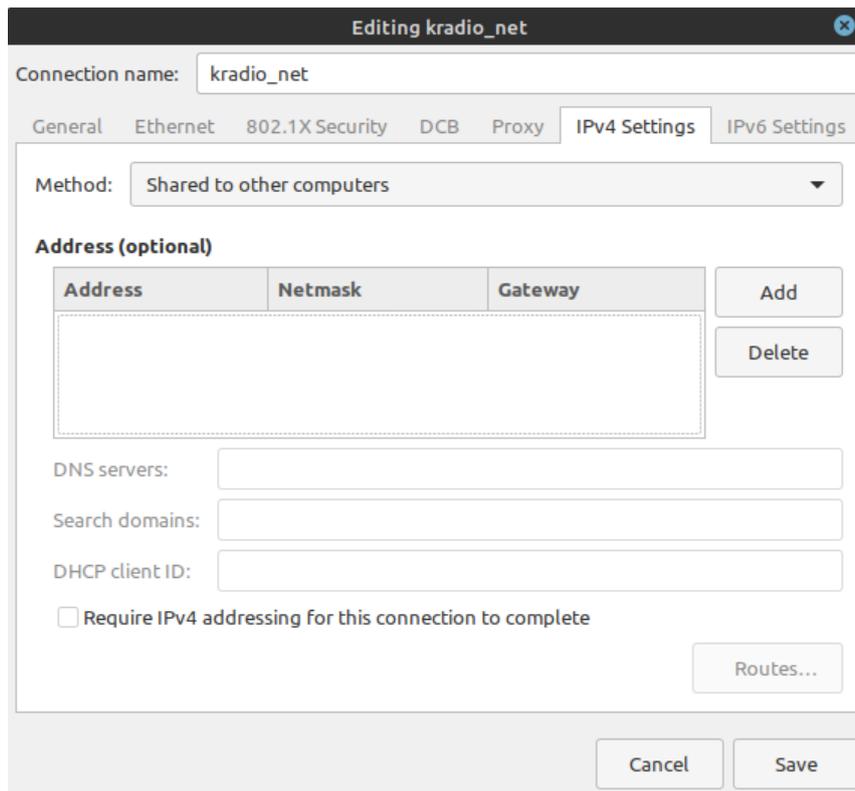


Fig. 1: Example of settings of DHCP server in the Network manager

3 Measurement Procedure

Follow these steps to perform the measurement:

1. Connect the SDR-IE to the circulator and the antenna by SMA cables and to the PC by Ethernet cable and optionally by USB cable as show in Fig. 2.
2. Boot up the PC from the Live-Linux USB stick. You should obtain the environment similar to the one in Fig. 2.
 - a. If the PC displays the message, that booting from the USB stick is not possible, because of SecureBoot restrictions (applies to newer PCs or Laptops only), disable SecureBoot in UEFI/BIOS. This is required as the Live-Linux USB stick is not signed.
3. (Optional) Open a service console by executing `screen_terminal.sh` or by the desktop icon `SCREEN_TERMINAL` to watch status of the SDR-IE
4. Power up the SDR-IE and wait approx. 60 s, or until the login is shown in the service console.
5. Based on the required carrier frequency, run the prepared kradio program by executing `run_kradio_865MHz.sh` or `run_kradio_915MHz.sh` in a terminal or by desktop icons.
6. Wait until the executed program prints "Waiting for Tx data..." and keep the terminal open.

7. Start GNU Octave by desktop icon called GNU Octave – kradio
8. Run the script called RUN_MEAS.m
9. Wait until all measurements results are evaluated and shown in the plots.

At this point, measurements are finished and results are saved in detection2_865MHz.mat or detection2_915MHz.mat. The saved measurement results can be displayed any time by the prepared script called PLOT_RESULTS.m.

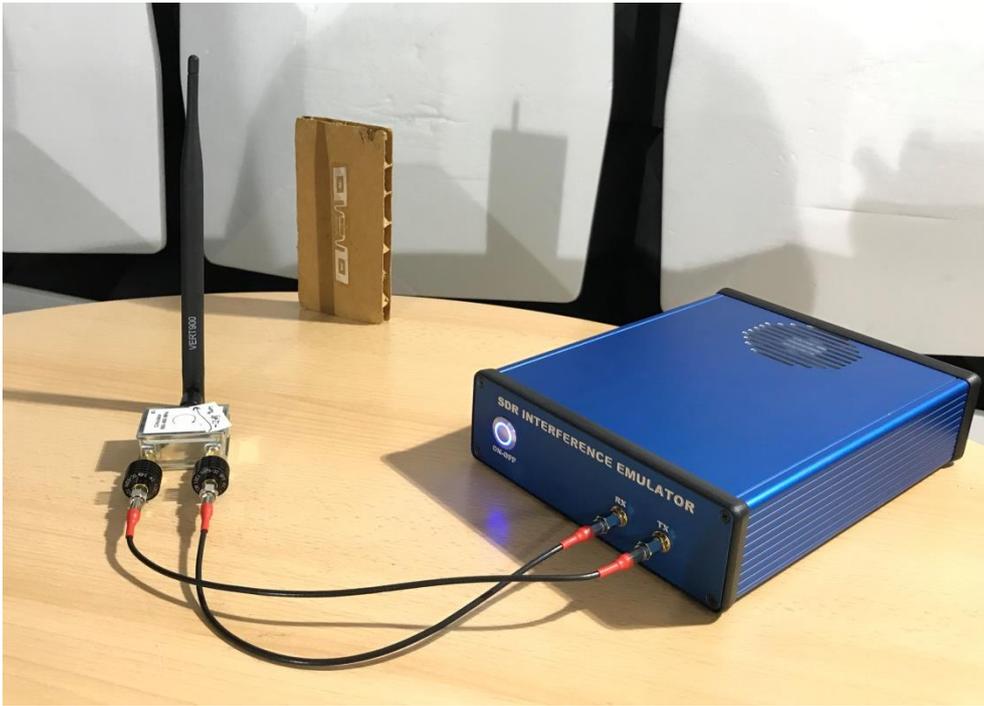


Fig. 2: Configuration of the measurement setup.



Fig. 3: Live-Linux environment.

3.1 Measurement Tips and Information

- The measurement progress can be observed in graphs if variable `IS_PLOT` is set to one. This can, however, significantly slow down the execution (depends on the PC hardware support in the live Linux).
- Modify the variable `fc` in `*.m` scripts according to the executed program (`run_kradio_865MHz.sh` or `run_kradio_915MHz.sh`) to obtain correct plot titles.
- The Live-Linux username is set to “kradio” and password to “1234”.
- The SDR-IE Linux username is set to “root” and password to “kradiopass”.

4 References

- [1] International Organization for Standardization, "ISO/IEC 18000-63:2015," 10 2015. [Online]. Available: <https://www.iso.org/standard/63675.html>. [Accessed 12 2020].