

## Software Defined Radio (SDR) – Try it yourself exercises

### Equipment

- Please use one of the provided USB sticks (it is Kali base with added SDR tools) and boot into persistence mode. Enter the Wi-Fi password for the workshop location
- Plug in one of the provided RTL SDR dongles
- Ask questions at any time during the workshop if you get stuck or need any help!
- Important: please return back the USB sticks and the RTLSDR dongles once you are finished the workshop today

### Frequency scanning

- The USB has the “qspectrumanalyzer” tool pre-installed, located here:
  - `~/.local/bin/qspectrumanalyzer`
- Check that the RTL SDR dongle is plugged in
- Open qspectrumanalyzer
- Select File -> Settings->rtl\_power
- Set the start and stop frequency ranges on the right hand side of the main screen
- Click start
- Once the scan completes, scroll across the spectrum to view the results in the frequency range you set, you can zoom in and out as well

### Remote control demo

- The USB has the “gqrx” tool pre-installed, which also has an icon on the main desktop menu bar
- You may need to start the audio server first by typing (ignore any error messages):
  - `$ pulseaudio -D`
- Check that the RTL SDR dongle is plugged in
- Open gqrx and press the power button on the top left to start
- Enter 433Mhz as the frequency on the top left
- Make sure AM is checked on the right hand side
- Using the doorbell remote from our workshop, press its button and observe the data appear on the waterfall underneath
- Note: you may also use your car remote for this demo but be aware that pressing it too many times may make it go out of synch so it is not advised to press more than two or three times. Car remotes typically operate around 433Mhz or 313Mhz approx.

### Listening to pagers

- The USB has the “gqrx” and “multimon-ng” tools pre-installed
- You may need to start the audio server first by typing (ignore any error messages):
  - `$ pulseaudio -D`
- Check that the RTL SDR dongle is plugged in
- Open the gqrx tool
- Tune into 148Mhz approx.
- Carefully tune into a pager broadcast and listen to the audio to make sure you have as clean a signal as possible. This will be easier with headphones

- Run the following command on the command line to capture the audio from gqrx and decode it using known pager protocols in the multimon-ng tool:
  - `$ padsp multimon-ng -a POCSAG512 -a POCSAG1200 -a POCSAG2400 -f alpha`
- Once you have a clear pager message come through, it will be decoded and displayed by multimon-ng in the command line window
- I can't hear anything in gqrx?!
  - After you have started the pulseaudio server and your audio volume is correctly set and you still cannot hear the audio coming from gqrx, there is a known bug. The fix is to toggle between the WFM Mono option back to Normal (on the right hand side of gqrx)
  - If you are still having trouble, also check the settings in the "pavucontrol" tool and make sure the "Configuration" tab is set to use "Analog Stereo Output"

### **Listening to Airplanes**

- The USB has the "dump1090" and "modes\_rx" tools pre-installed
- You may need to start the audio server first by typing (ignore any error messages):
  - `$ pulseaudio -D`
- Check that the RTL SDR dongle is plugged in
- In the TOOLS directory, you will find the dump1090 tool, run it as follows
  - `$ ./dump1090 --interactive --net`
- You can also load the map by visiting <http://localhost:8080/>

### **Want to learn more?**

- Come along to one of our monthly meetings:
  - Cyberspectrum Melbourne (<https://www.meetup.com/Cyberspectrum-Melbourne>)
  - Cyberspectrum Sydney (<https://www.meetup.com/sdr-sydney>)
  - Cyberspectrum Bay Area USA (<https://www.meetup.com/Cyberspectrum>)
  - SDR SIG Hobart (<https://sdrsig.net>)
- Join us on slack to chat and ask questions or get help ([sdr-melbourne.slack.com](https://sdr-melbourne.slack.com) - email or dm for an invite at: [sdr\\_melbourne@gmail.com](mailto:sdr_melbourne@gmail.com) or request an invite during this workshop)
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