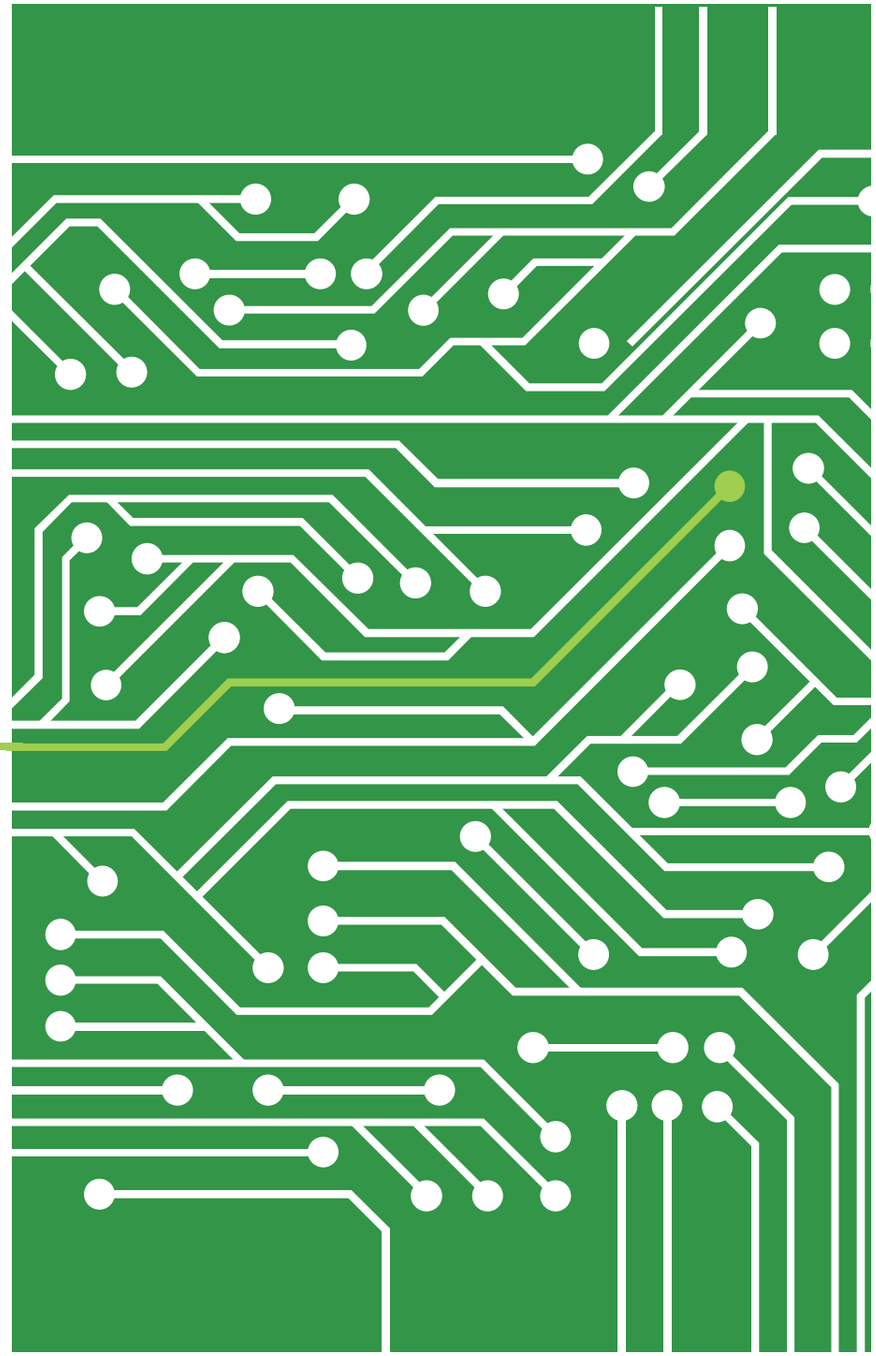
Lime microsystems

Vodafone CrowdCell Course:

SDR Demos

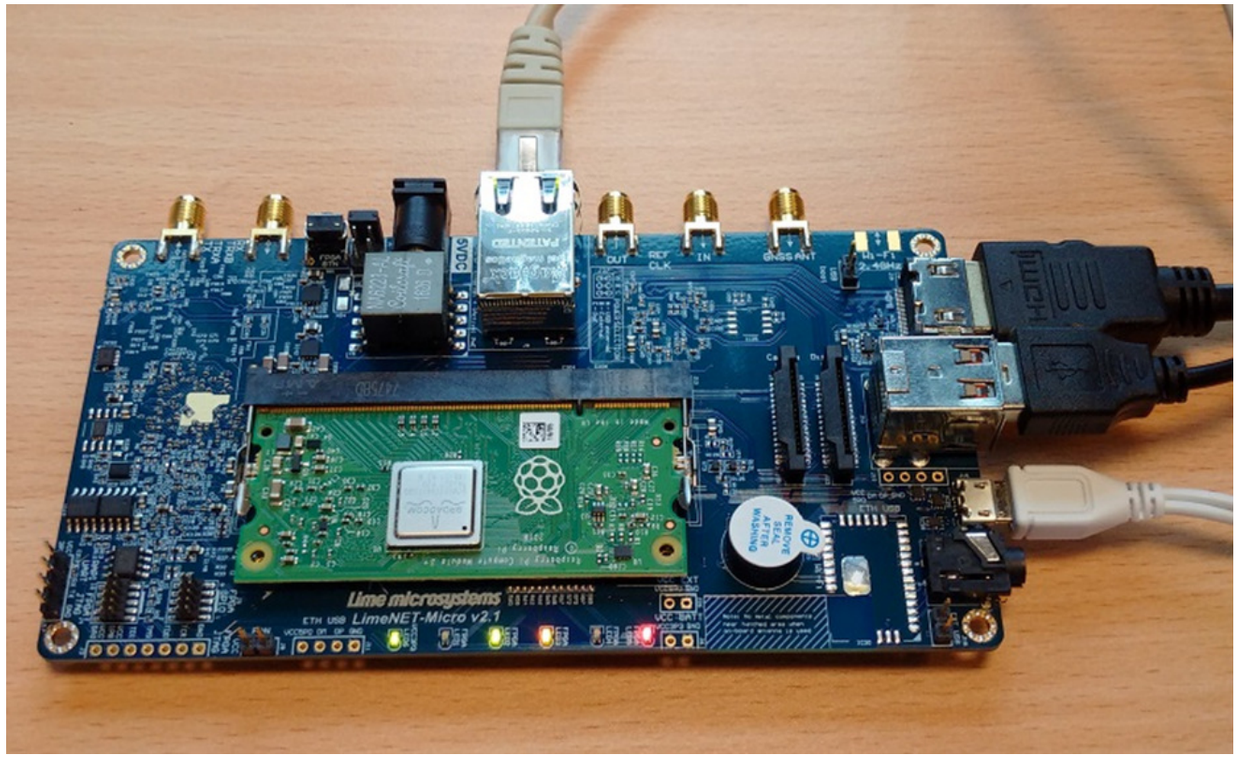
Lime Microsystems| FPRF company
Guildford, Surrey, United Kingdom



LimeNet Micro Demos:

Contains:

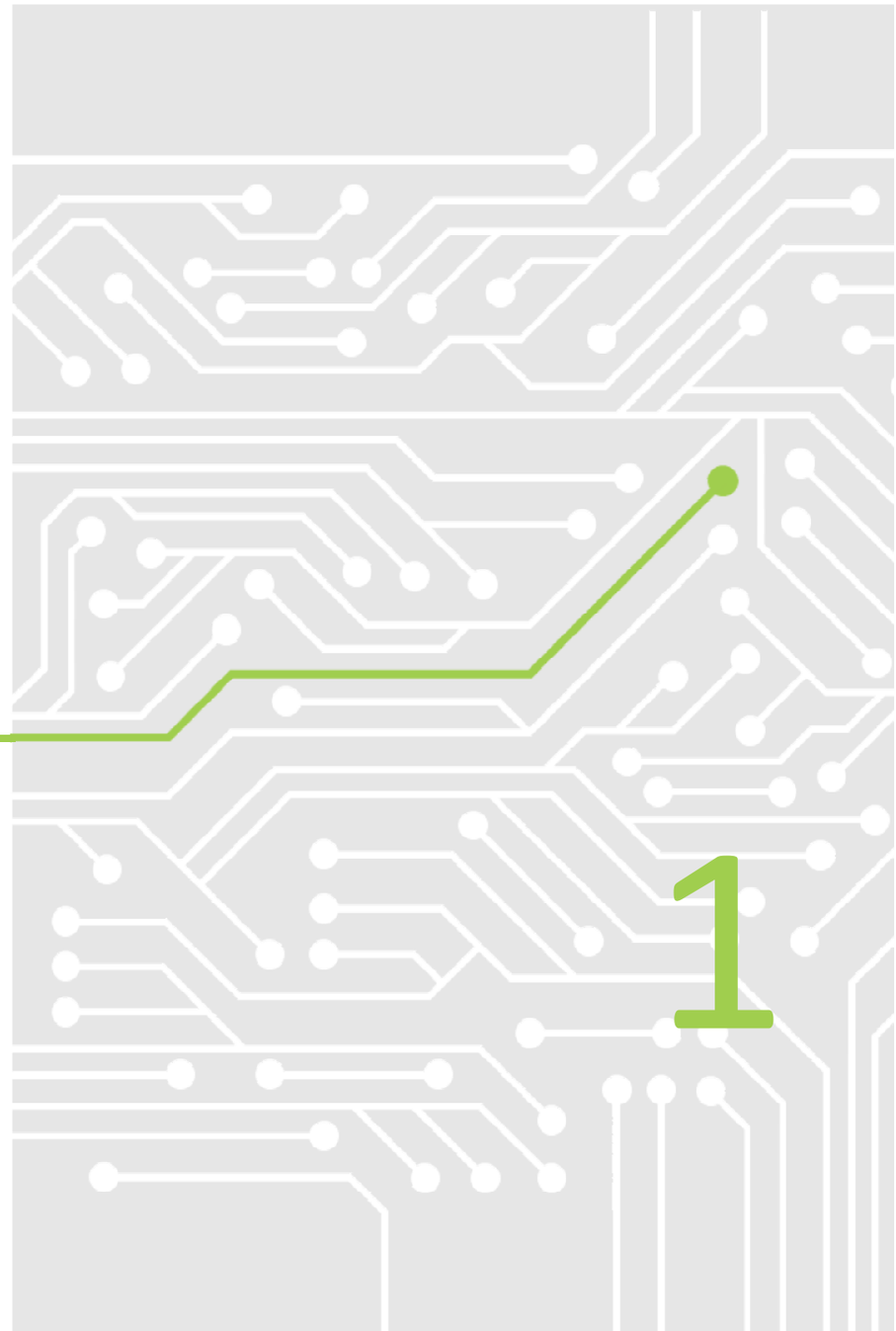
- **Software Defined Radio**
- **Raspberry Pi Compute Module**
- **GPS Module**



So lets see some of the things we can do with LimeNet Micro…

- **Osmocom GSM Base Station**
- **LimeScan Spectrum Scanner**
- **LTEscan 4G Scanner**

GSM BTS



LimeNetMicro – GSM Cell 1

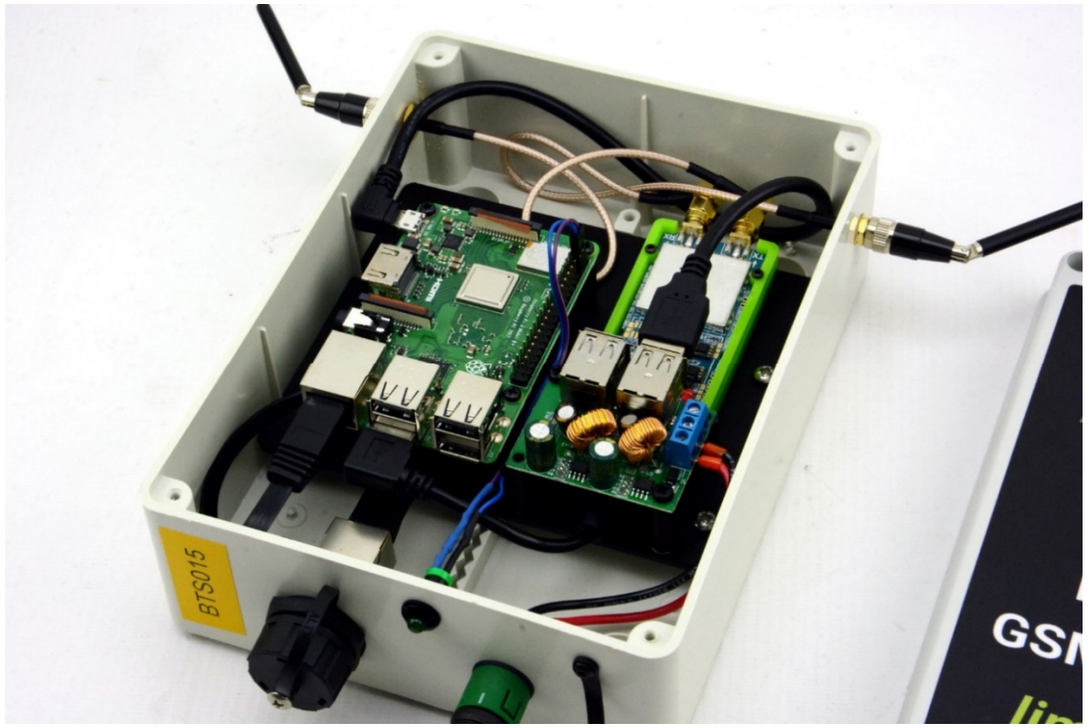
Originally developed for LimeSDR mini and Raspberry Pi and deployed at the EMC 2018 in Herefordshire in the UK

- **Temporary GSM service at a rural campsite event.**
- **GSM software ran on Rpi**
- **Up to 5 simultaneous voice calls per unit.**
- **Several interlinked units around the campsite**
- **Required OFCOM licensing in UK**
- **We recommend applying for License with <=0dBm output power**
  - Avoid concerns about interference issues with existing operators

OSMOCOM Open Source Software

- **https://osmocom.org/projects/cellular-infrastructure/wiki/GSM**

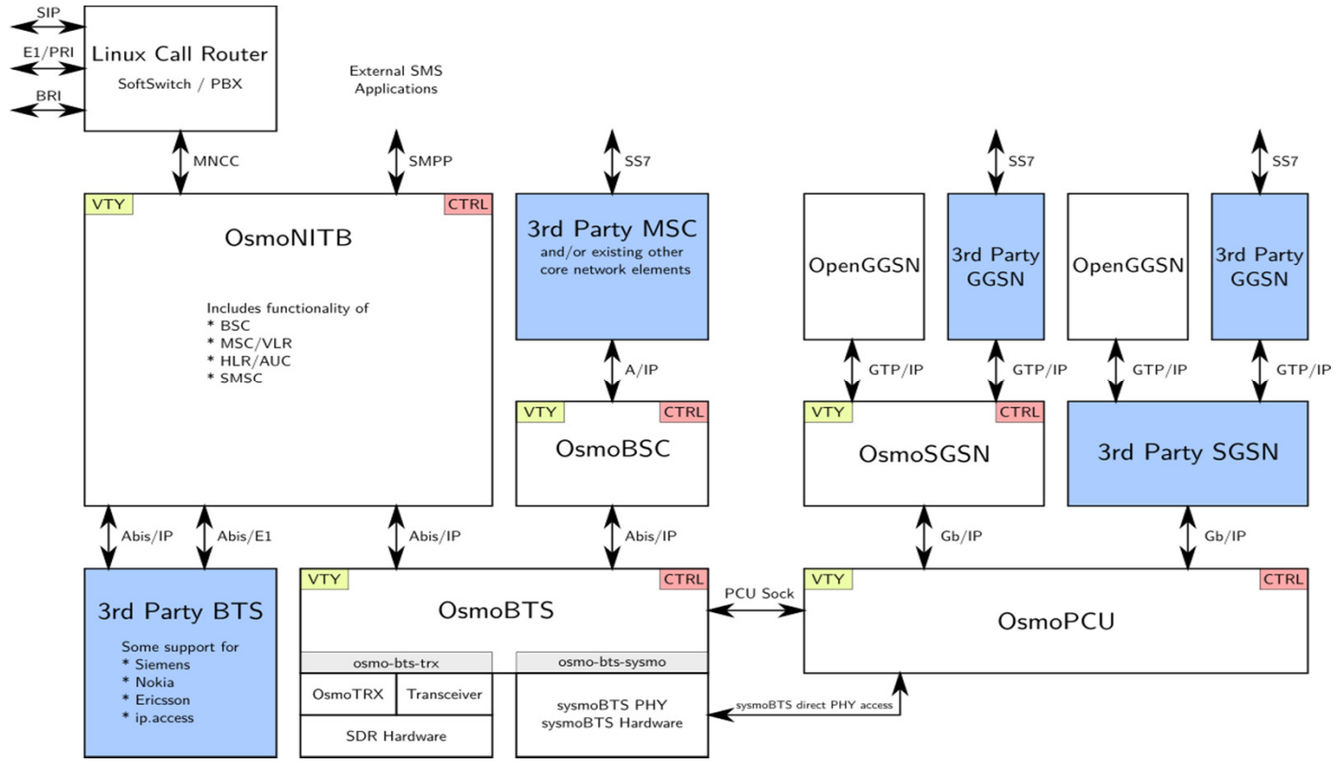
Now available for LimeNet micro with Pantahub for easy installation and rapid deployment



LimeNet Micro – GSM Base Station 2

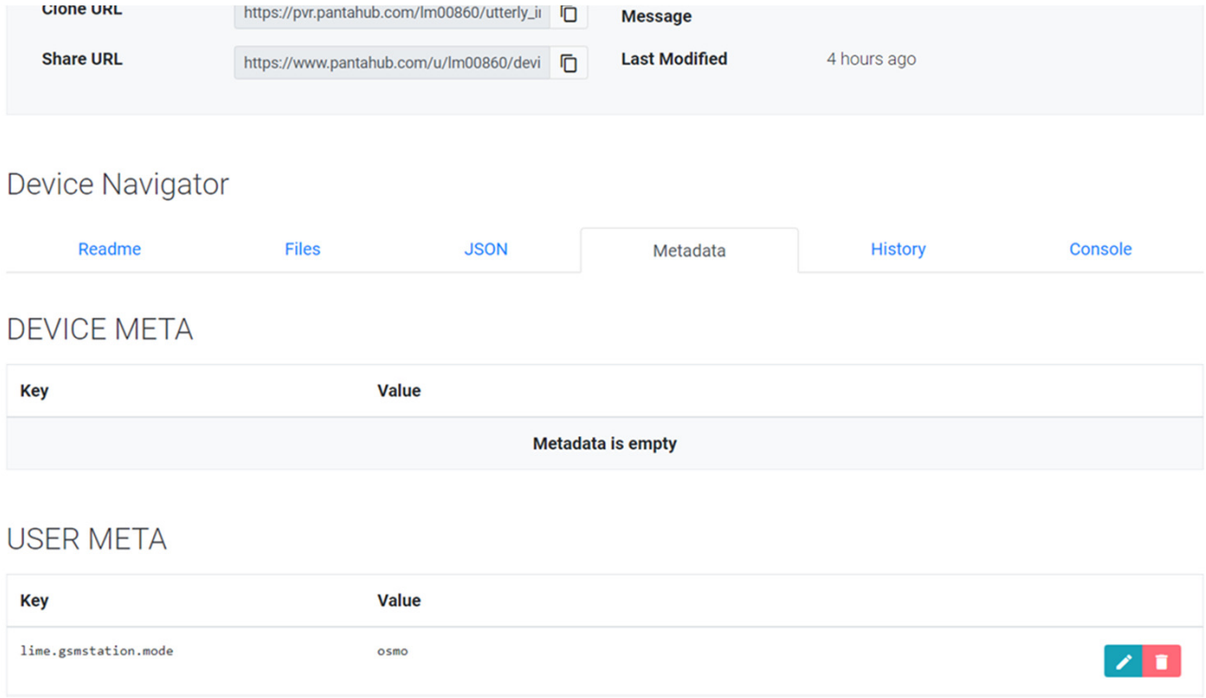
Features

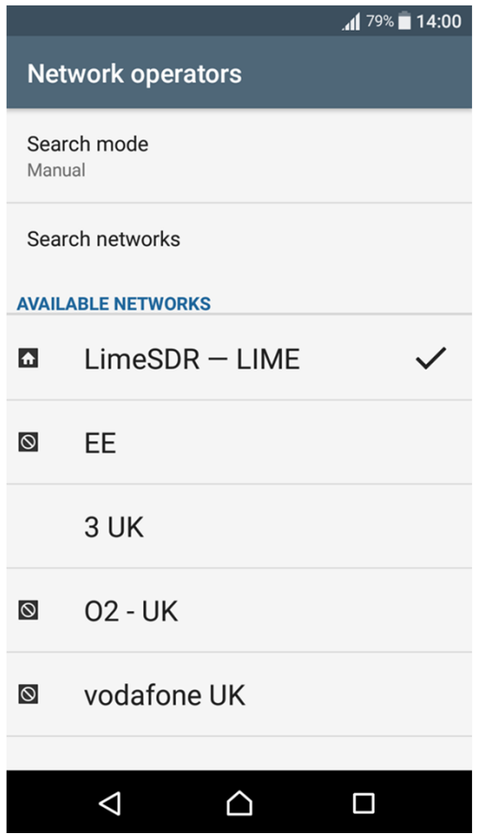
- 6 Simultaneous Voice Users
- SMS message capability
- Contains OsmoTRX and OsmoBTS
- Can be integrated with 3rd party networks via Abis interface and OsmoBSC
- Self contained OsmoNITB for complete local network.



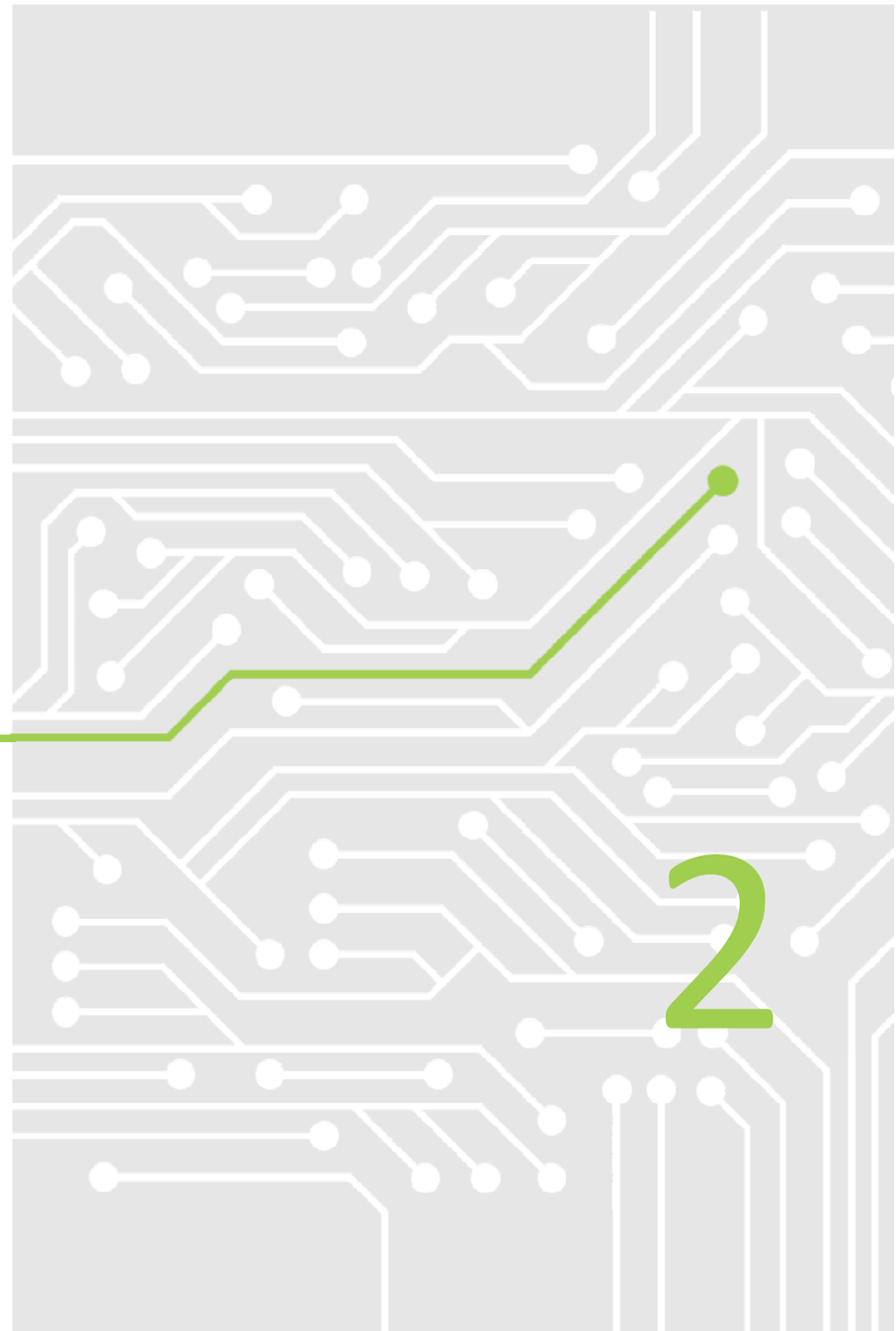
LimeNet Micro – GSM Base Station 3

Configuration edited via Pantahub web tools.





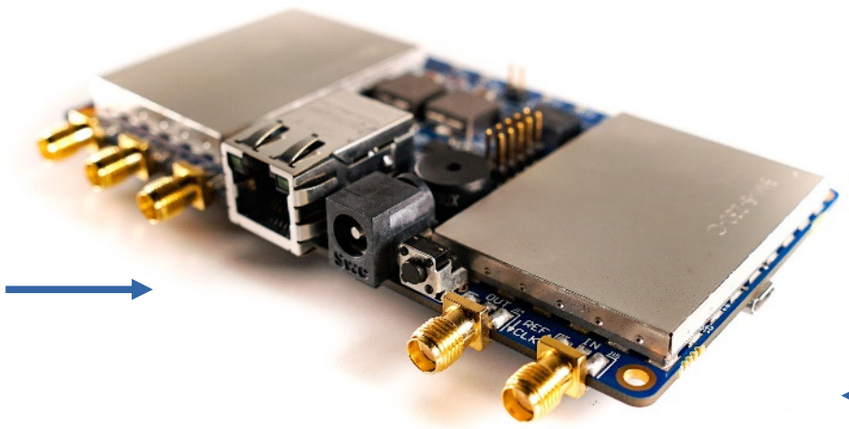
LimeScan



LimeNet Micro – LimeScan 1

Pantahub

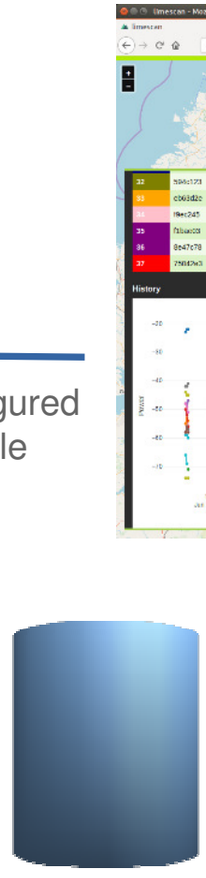
1. SDR scan and analysis stack container + base configuration



LimeNET Micro

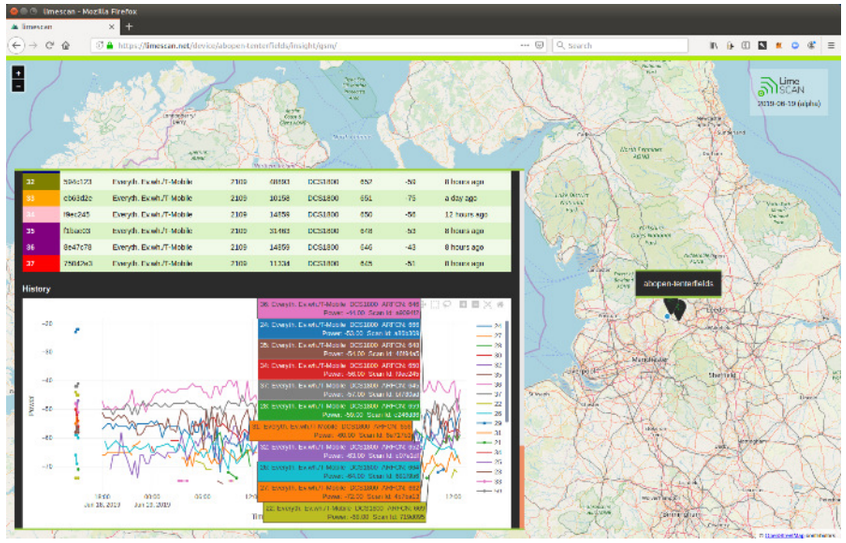
2. User configured Scan profile

3. Spectrum Scan data



InfluxDB

4. Scan data

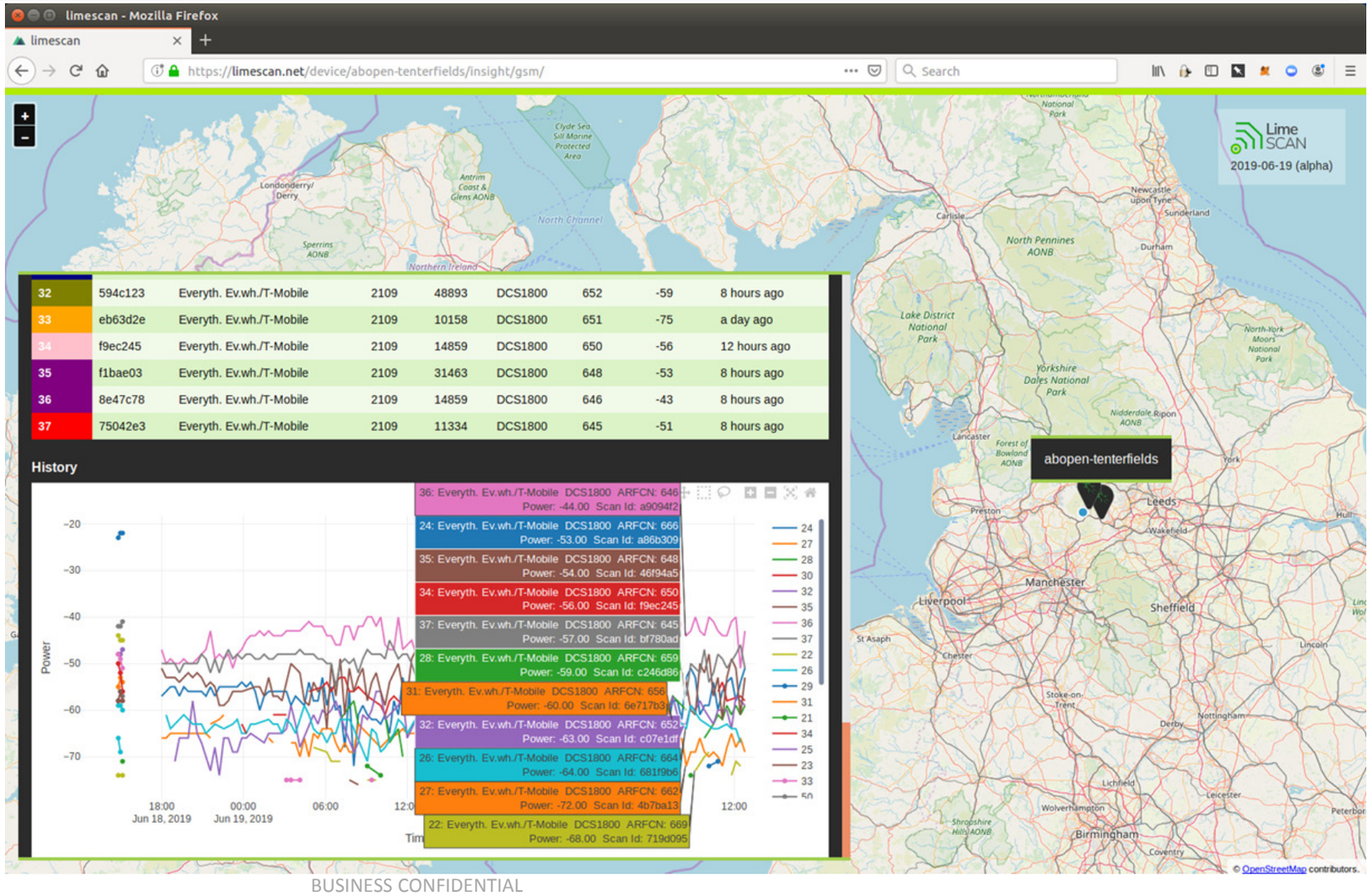


limescan.net

LimeNet Micro – LimeScan2 – GSM Example

Interactive Map

- Listing cell histories.
- Cell Frequencies
- Cell Channel Numbers
- Cell Signal Strength
- GSM Cell IDs



LimeNet Micro – LimeScan 3

Scan types:

- Power spectrum
- GSM network
- … more in the pipeline!

Closed alpha version (Invite Only)

- However, accounts will be provided for LimeNET Micro and LimeSDR Mini owners from start of July.

Plan to develop an open data resource.

To register for early access to LimeSCAN.net

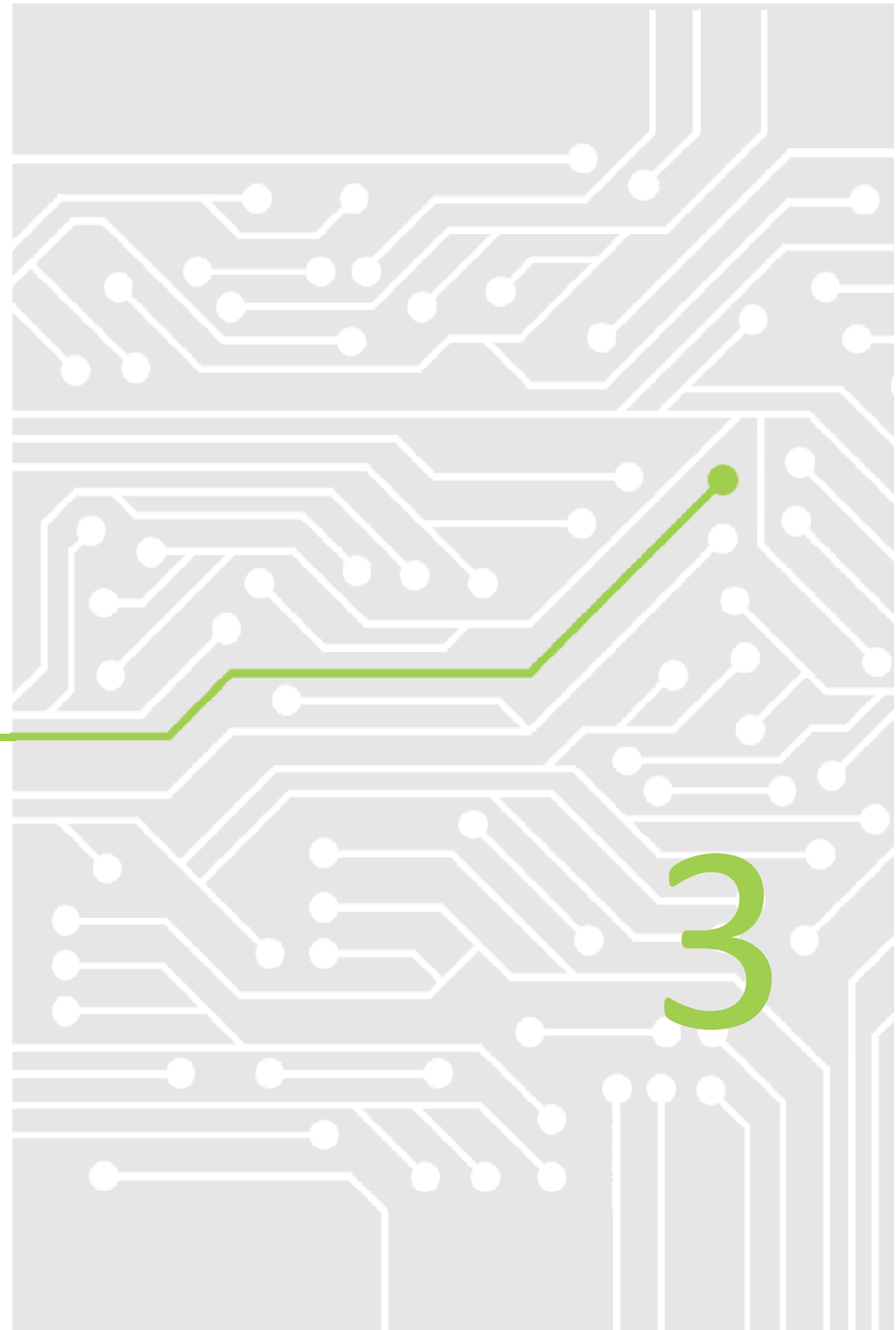
database please complete the form at:

- https://docs.google.com/forms/d/1yfzG7zkyQ608tOF2gCgtvqGFidFwSmdZdxYEV74XuXk/

https://tinyurl.com/yy7ehywy

- Software can be obtained from pantahub, or
- https://github.com/myriadrf/lime-tools/tree/master/limescan

LimeScan



Lime's LTEscan

New product in final stages of development

- Will be made open source shortly

Plan to support two modes of operation

- HTML Report Mode

- Provides detailed quality of reception of stations in selected bands
- Signal Level, SNR, EVM, Frequency Deviation
- Public ID signals, EARFCN,NID, Antennas, Bandwidth
- Band 20 Scan time approximately 40 seconds.

- LimeScan Mode

- To provide capability to survey areas for network coverage for open source database.
- To provide identification of known base stations from public signature signals.

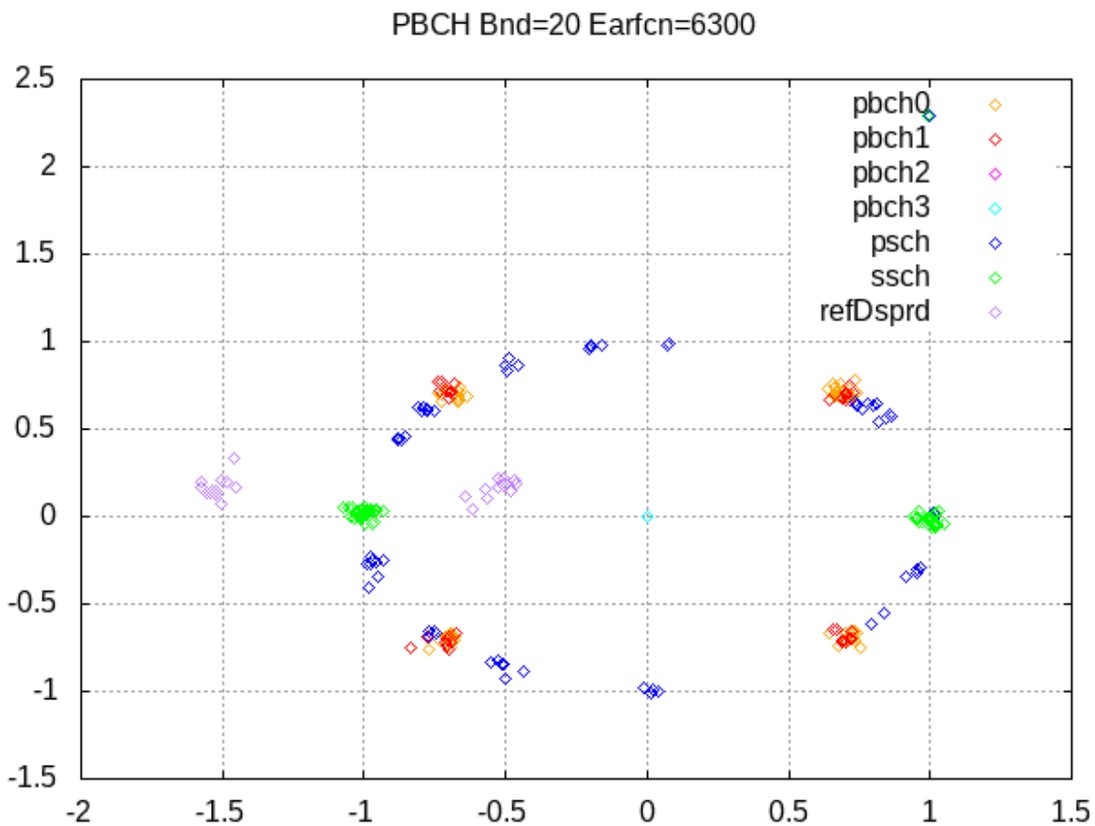
Cross Platform

- Code optimised for Intel SSE4.2 – can run on Crowd Cell, LimeNet Mini, embedded PCs etc.
- Code partially optimised for ARM – can run on LimeNet Micro

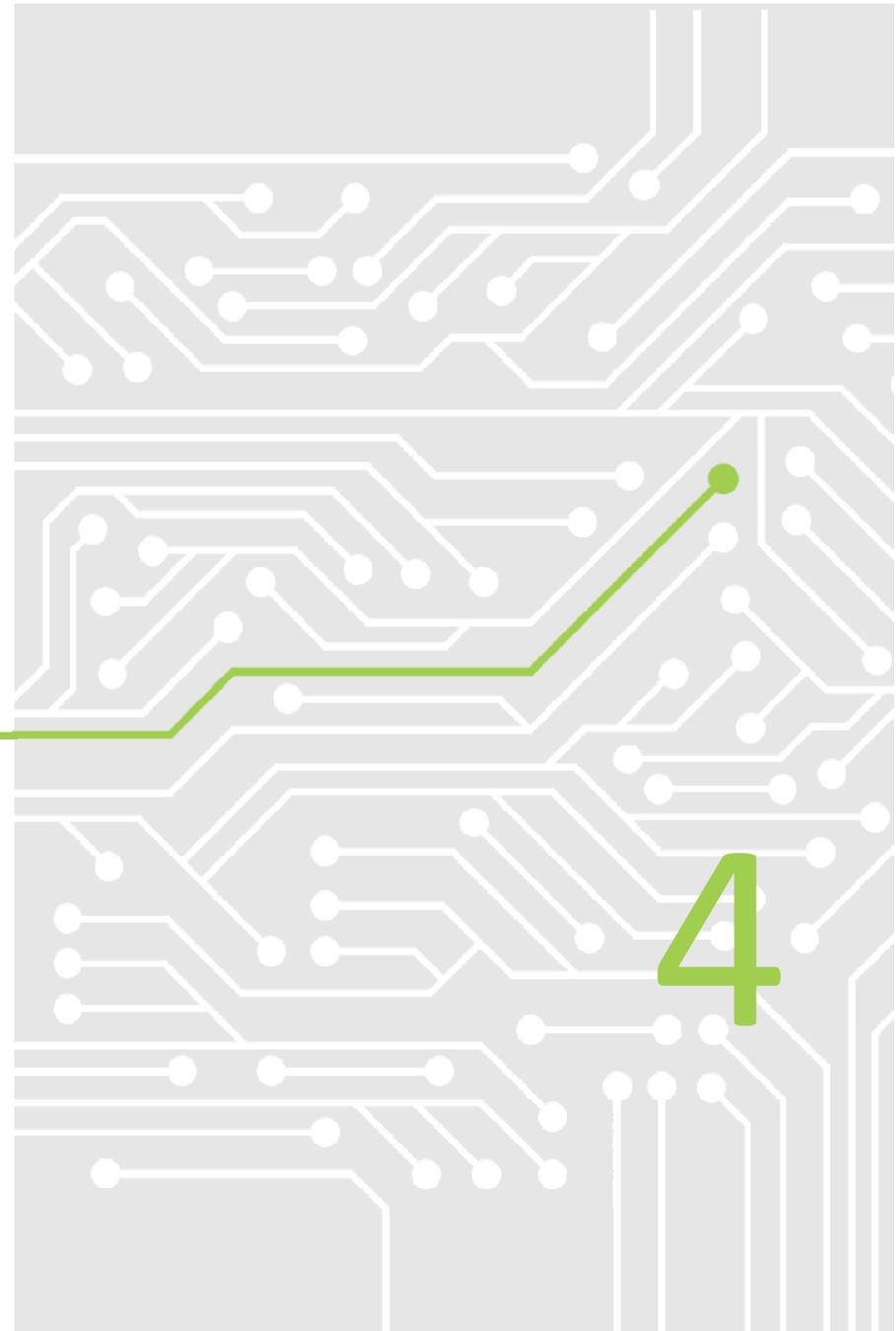
Lime's LTEscan – Html Report mode

Typical HTML Report entry

- EARFCN=6300 (806.000MHz)
  - 2019-10-21 11:10:59 ss2 r1
  - NID=1 NCP=1 P=2 BW=10.0MHz PHICHd=NORM PHICHr=1 SFN=296 CRC[2]=1 PBCHmsg={0x6928008AB5}
  - PWR=-63.5dBm/MHz SNR=32.6dB EVMp=5.6% EVMs=5.3% EVMb=14.8% FreqErr=-0.067kHz (-0.014kHz) PBCHav=0.001
  - LO=804.200MHz NFFT=512 FFTidx-DC=120 Fshift=0.0kHz
  - lms7002=45.0oC
  - PI/CMtemp=57.5'C



LimeSuite Demo



LimeSDR-USB – LimeSuite Demo

W-CDMA DL TM 2 and LTE

- 866MHz
- -50dBm
- CLKGEN/DAC 245.76Ms/s
- ADC Rate 61.44Ms/s
- USB Rate 30.72Ms/s

Direct Connection between TX and RX State