Quick Start Guide (QSG)
Arttha 5G-NR-FR1 (N77 band)
NLM Board

PureSoftware

Contents

1. Introduction

1.1 Purpose

The purpose of this Quick Start Guide is to provide the steps to create the setup for NLM (Network Listening Module) on LS1043 host and LA9310 baseband processor. This guide will further provide steps to run the 5G-NR NLM sub-6GHz application on the platform.

1.2 Abbreviations

NLM	Network listening module
SSB	Synchronization signal block
RSSI	Received signal strength indicator
VSG	Vector signal generator
GSCN	Global synchronization channel number
MIB	Master information block

2. Hardware & Software components

2.1 Hardware Components:

a) **LS1043ARDB** (motherboard) is the host and it is 64-bit Arm®-based processor for embedded networking.

b) **LA9310** (daughter-card) is a programmable baseband processor targeted at a sub-6GHz 5G such as network listening modules, repeaters, repeater controllers, etc.

2.2 Software Components:

a) **Linux:** Host device runs on Linux OS.

b) **Free RTOS:** Baseband device runs on Free RTOS.

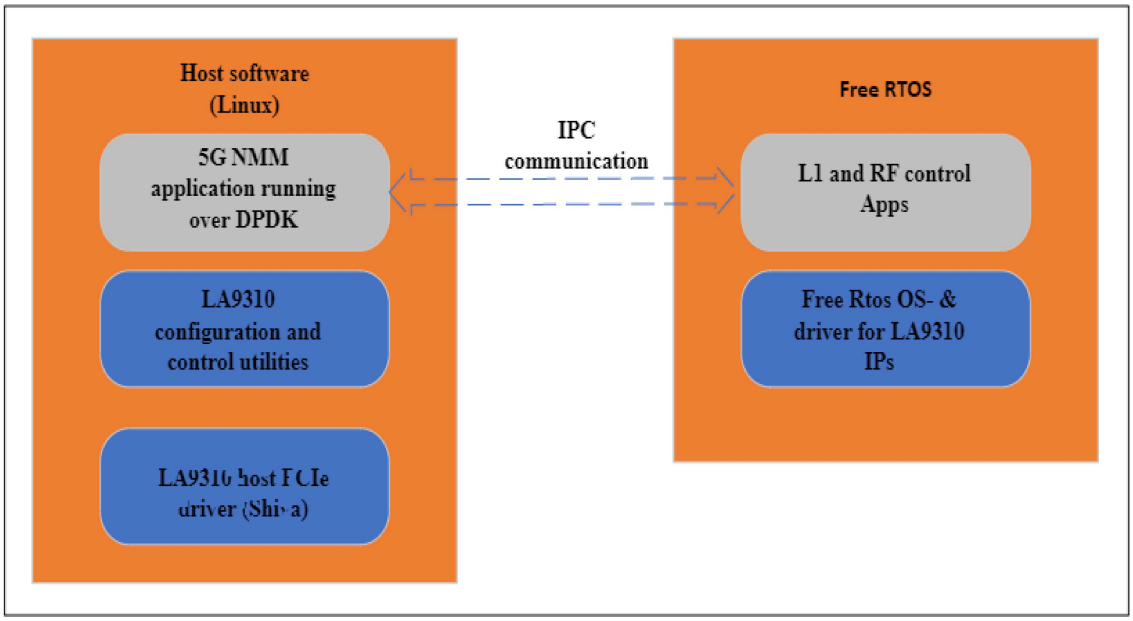


Fig.1 Host and controller side communication

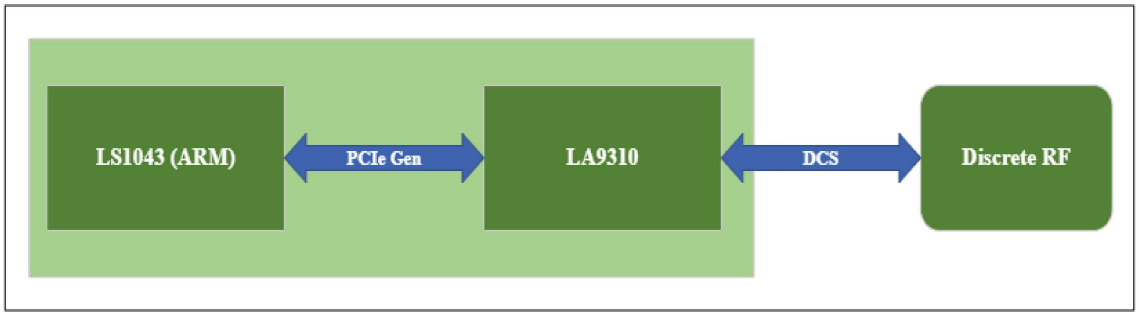
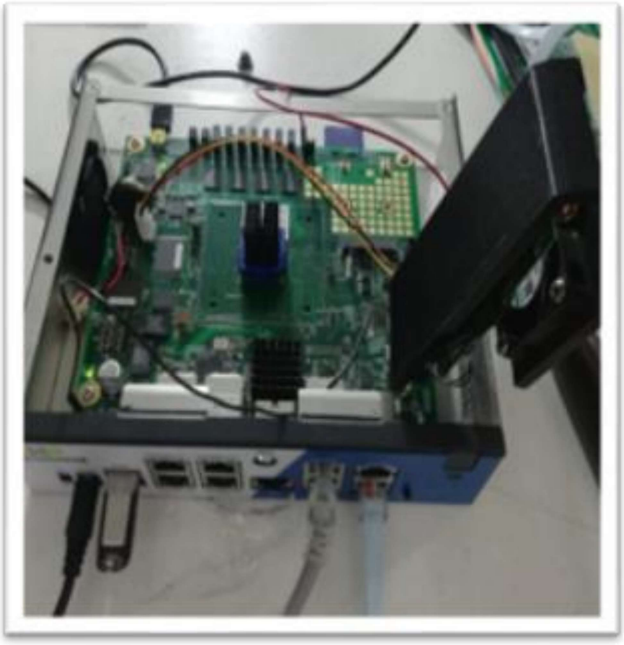


Fig. 2 Hardware connection of board



(a)

(b)

Fig. 3 Board setup and connections

3. Application bring up

3.1 Required application and data files

Boot source file: ls1043ardb_boot.scr

For controller: la9310.bin,

For VSPA: apm.eld

For NMM-test-app: nmm_test, libnmm.a, libnmmdlproc.a PSSDET_REF_TD.bin, PSS_REF_XCORR.bin

3.2 Access details of NLM board :

(a) Boardfarm IP - 192.168.2.183

(b) Host Console port – USB5

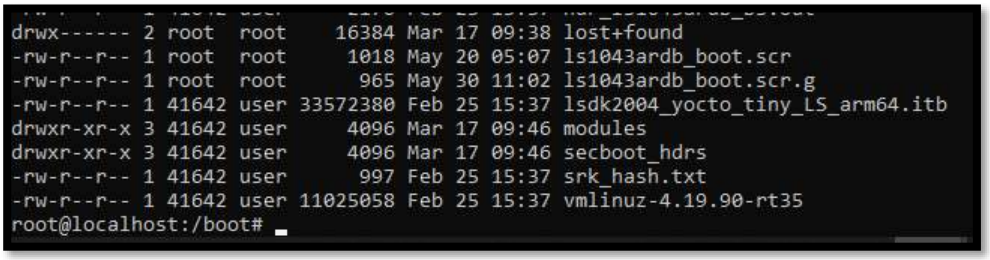
(c) Free RTOS port– USB3

3.3 Steps to run the application:

1) SSH into the boardfarm using boardfarm IP credentials.

2) Use the USB port number to minicom into the LS1043 on the boardfarm and login into the ARDB.

3) NMM Boot source file **ls1043ardb_boot.scr** is needed to run the application. There is one boot source file which comes with the BSP. This has to be replaced with the NMM version of boot.scr file. Copy the NMM provided .scr file to boot directory of the board with different name than what is already present in the boot directory.



4) Use NMM provided ls1043ardb_boot.scr when running NLM application and original (BSP default) ls1043ardb_boot.scr to run LAN on the board to transfer compiled binaries for VSPA and M4 controller. LAN does not work with the NMM app ls1043ardb_boot.scr file, so boot scr files should be renamed if working in LAN mode or in NMM mode.

Important: Make sure after renaming of files that one version of **ls1043ardb_boot.scr file(name as it is)** is always in the boot directory or else the board will never boot.

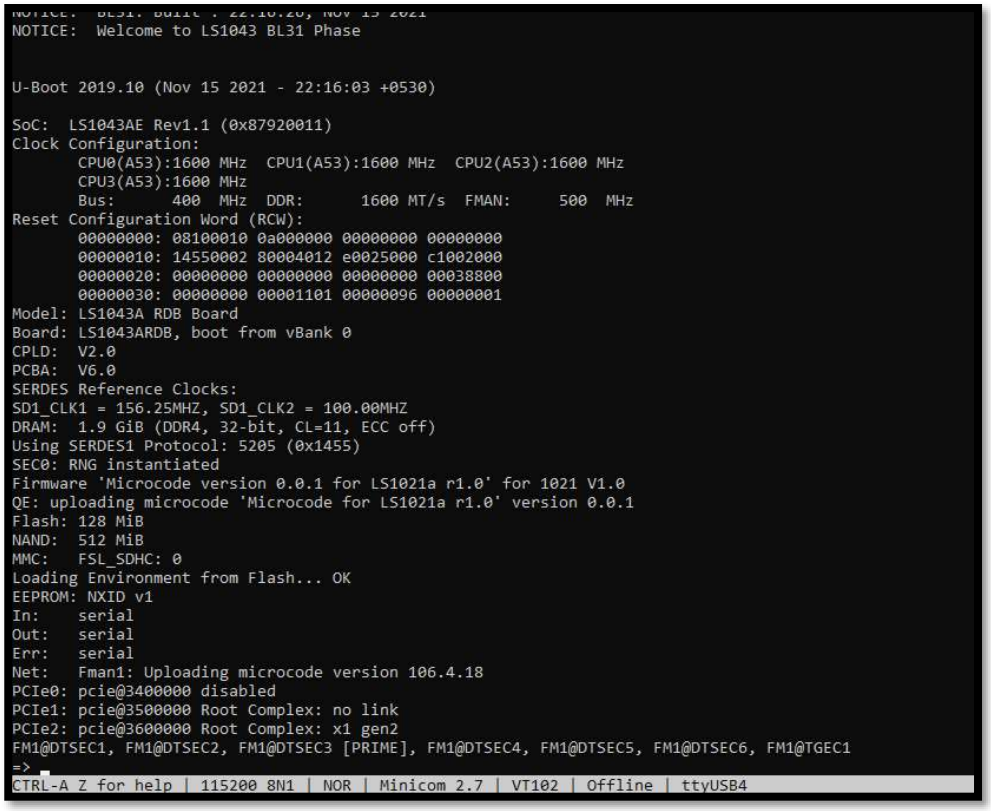
As can be seen from above steps NMM ls1043ardb_boot.scr is of 1018 bytes and BSP ls1043ardb_boot.scr is of 965 bytes.

NOTE: To Configure LAN (to transfer file into the board) follow following steps:

cd /boot
mv ls1043ardb_boot.scr ls1043ardb_boot.scr.n
mv ls1043ardb_boot.scr.g ls1043ardb_boot.scr
ls –l
reboot
cpld reset altbank
boot
dhclient
ifconfig fm1-mac4 192.168.2.203

To run nmm application (change from LAN mode to NMM app mode):

cd /boot
mv ls1043ardb_boot.scr ls1043ardb_boot.scr.g
mv ls1043ardb_boot.scr.n ls1043ardb_boot.scr
ls -l
reboot
cpld reset altbank
boot
5) Now do reboot

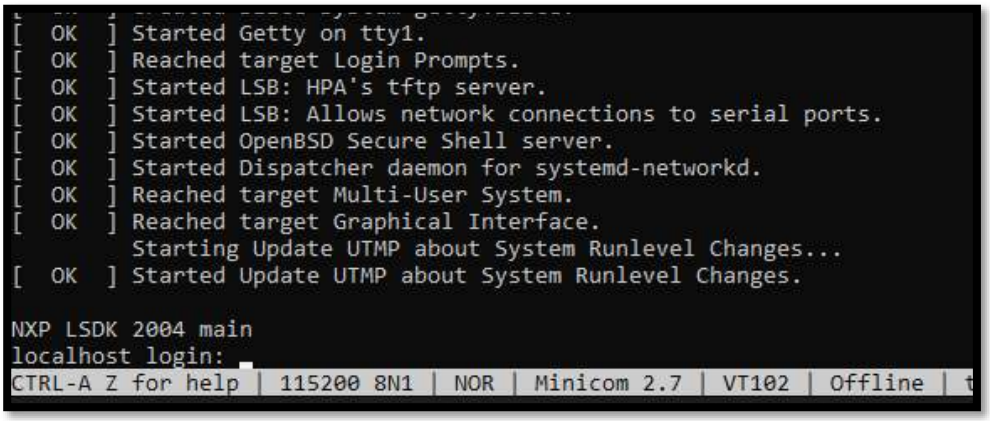


Board will stop at above prompt

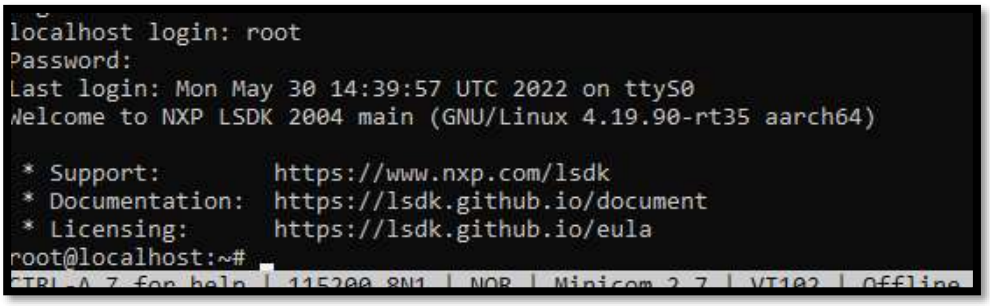
6) Type cpld reset altbank here at the prompt, it will start booting and a timer count down to 0 will appear.

7) Now press command ‘boot’

8) Board will start booting up and stop at login prompt



9) Login is root and password is root



10) Now we are inside host environment

11) Check for LA9310 binaries in /lib/firmware directory

12) NLM application is dependent on NMM host environment as we have not yet gone into host side yet

NLM need NMM boot.scr also needs NMM application(Host) from NXP.

13) Now all commands will be run from this folder as nmm is present here

14) Before running any other command, open FreeRTOS port in another terminal, and minicom into RTOS USB port.

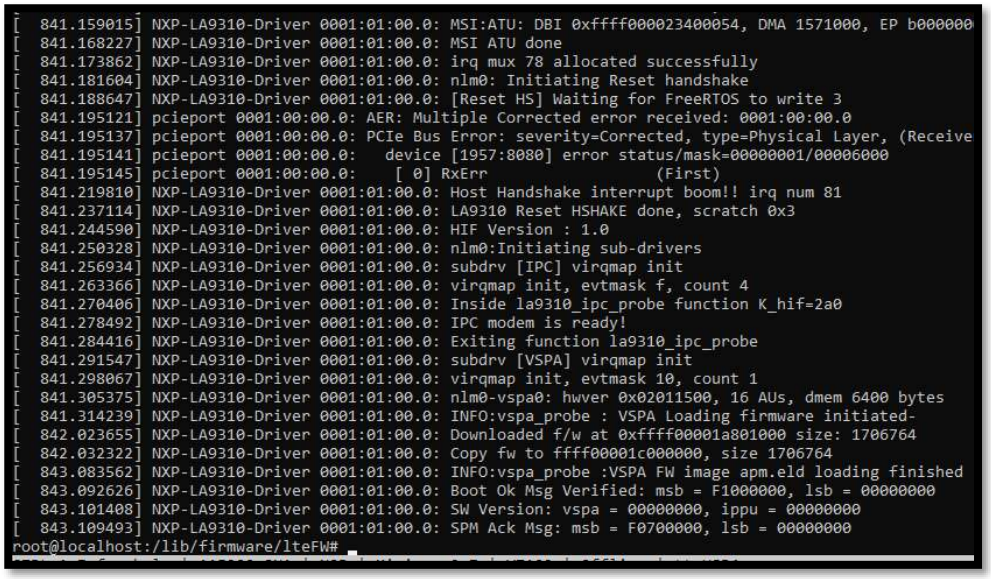
15) Type following command on the host console from /lib/firmware/lteFW directory to load VSPA

```
echo 1 > /sys/bus/pci/rescan

echo 7 > /proc/sys/kernel/printk
```

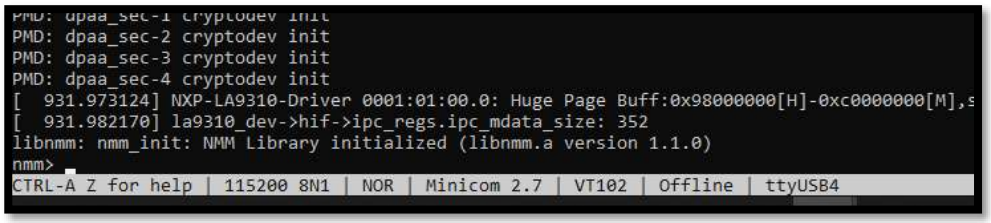
insmod la9310shiva.ko scratch_buf_size=0x2000000 scratch_buf_phys_addr=0xc0000000

This will load VSPA binary

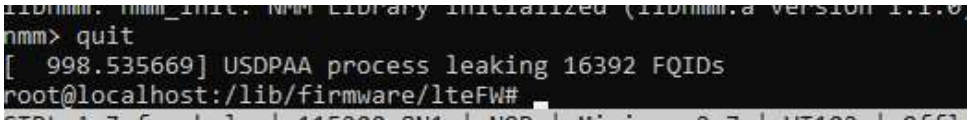


16) Now run the following command to execute NMM application

mkdir /dev/hugepages2M
mount -t hugetlbfs -o pagesize=2M none /dev/hugepages2M
chmod +x nmm-test
./nmm-test --vdev=bbdev_la93xx -n 1
NMM prompt will show up



17) Type quit here and wait for app to close



18) Run following command to configure rfic

cd /home/root/rf-ctrl/
python3 nlm.py
RFIC prompt will come, here configure rfic

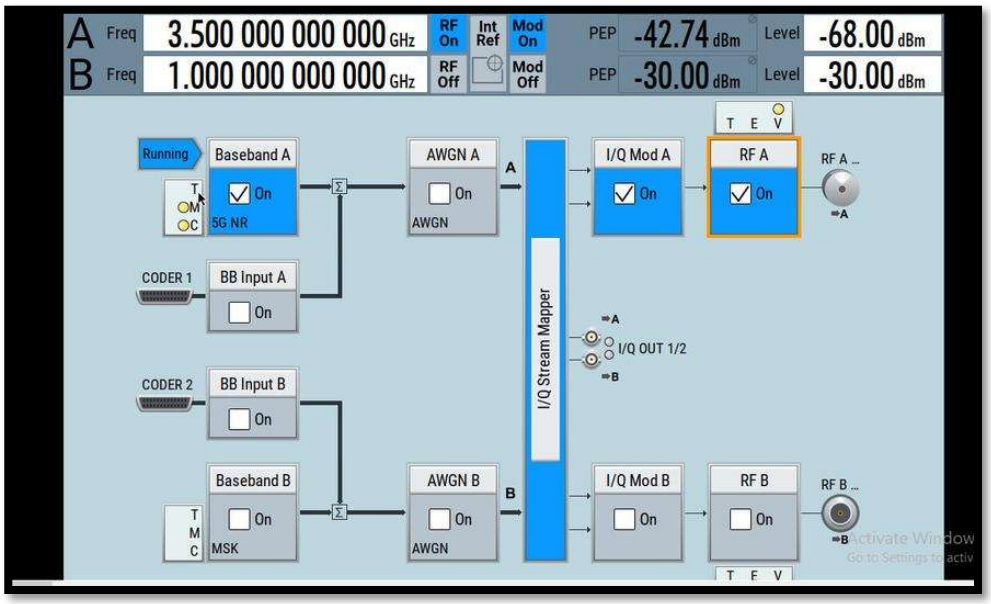
```
root@localhost:/lib/firmware/lteFW# cd /home/root/rf-ctrl/
root@localhost:/home/root/rf-ctrl# python3 nlm.py
Starting RF prompt...
rfic-nlm>
CTRL-A Z for help | 115200 8N1 | NOR | Minicom 2.7 | VT102 | Offline |
```

Configure LNA by using command

lna l

19) Check VSG connection Port A/B to the board and configuration of VSG, keep RF, BASEBAND, IQ on.

Important: Always off the RF on VSG while configuring VSG frequency and power level, and RF power level should always be set below –65dBm.



20) In RFIC prompt configure frequency equal to the value of VSG or the frequency to tune using freq command (This step is only required for ssb_scan).

```
Starting RF prompt...
rfic-nlm> freq 3500000
rfic-nlm> getfreq
3500000kHz
rfic-nlm>
CTRL-A Z for help | 115200 8N1 | NOR | Mir
```

Configure using freq <value> command and verify using getfreq command to see if configured properly

4. Running commands

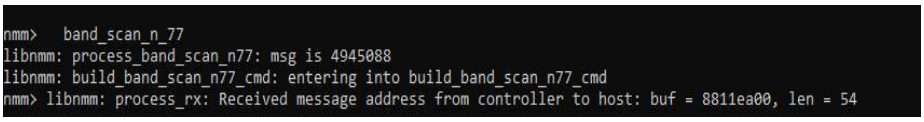
All the commands will run on nmm application (on host console) and the corresponding output will be on controller console.

To get list of commands in the host type help, it will list out all the commands.

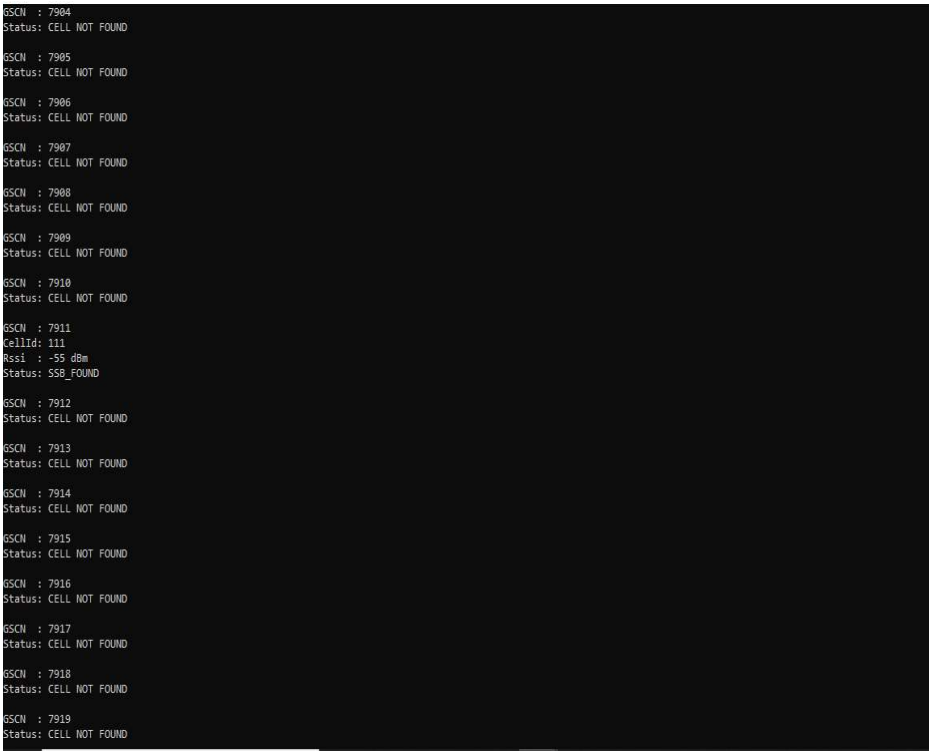
1) band_scan_n_77

This command will scan the whole n77 band for GSCN values (7711 to 8329), according to the gscn frequency set on VSG it will try to detect the respective GSCN value.

Type command band_scan_n_77 on nmm application (on host).



It will give this type of output on controller console.



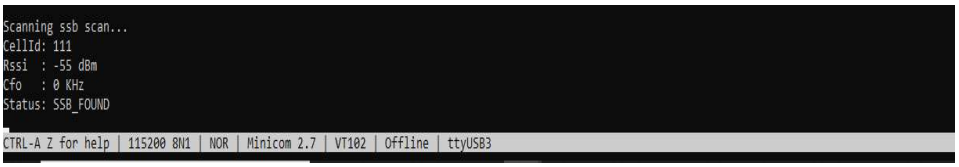
2) ssb_scan

It will give the Cell id, rssi and C_{fo} details.

Type command ssb_scan on nmm application (on host).

If frequency configuration on host and vsg are not same or if vsg is not connected to board then it will give following output on controller console.

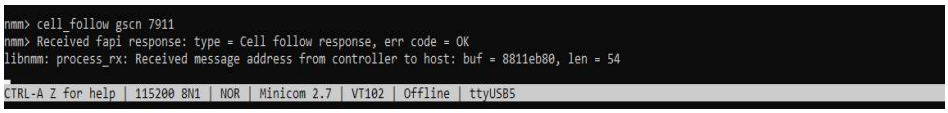
When frequency configuration are correct and vsg is connected to board it will give the following output.



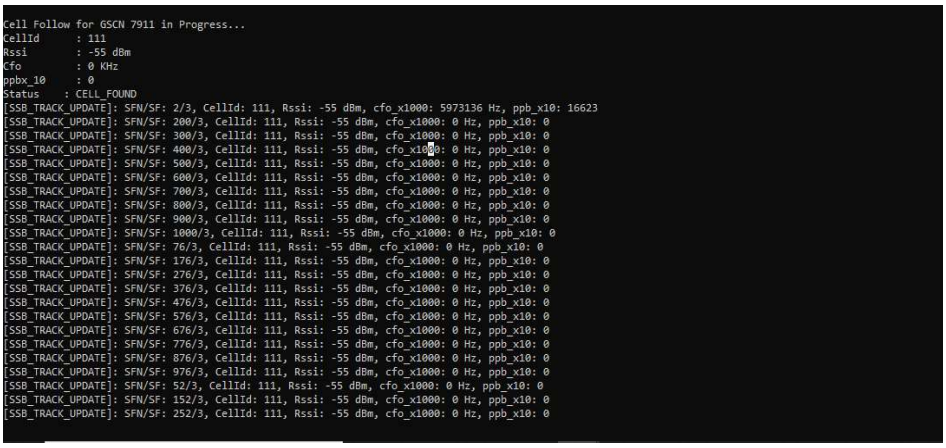
3) cell_follow gscn <enter gscn number>

It will track cell id for ever 20ms and also reduces C_{fo}.

Type command cell_follow gscn <gscn no.>on nmm application (on host).



A sample output is given below

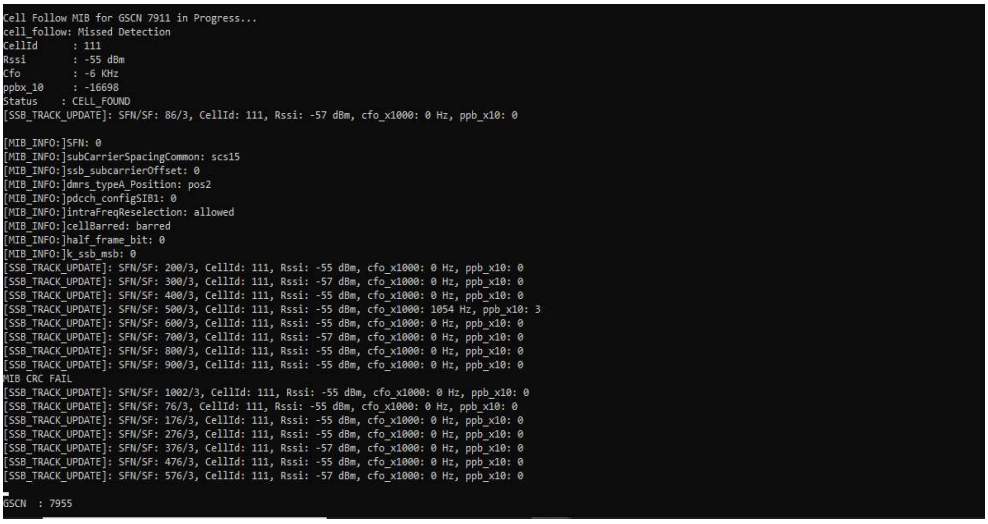


4) cell_follow_mib gscn <enter gscn number>

It will detect mib (master information block) on the received signal.

Type command cell_follow mib gscn <gscn no.> on nmm application (on host).

A sample output is given below



5) cell_follow stop

After running cell_follow gscn or cell_follow mib it has to be stopped otherwise, it will run continuously, so this command will stop the cell follow.