

HC-2 User manual

catalogue

1	Product overview.....	2
	1.1 Product appearance.....	2
	1.2 Technical specifications.....	4
	1.2.1 Hardware specifications	4
	1.2.2 business specifications.....	4
	1.2.3 Environmental specifications.....	5
2	Configuration.....	5
	2.1 HC-2 Hardware setup	5
	2.2 Ip address configuration.....	6
3	Provisioning of execution and configuration	7
	3.1.0 Provisioning of execution and configuration for RF1.....	7
	3.1.1 Execution of L1&L2 for RF1	7
	3.1.2 Configuration for RF1	8
	3.1.3 MIMO (multiple input, multiple output) configuration.....	9
	3.1.4 Provisioning of execution and configuration for RF2.....	10
	3.1.5 Execution of L1&L2 for RF2.....	10
	3.1.6 Configuration for RF2	11
	3.1.7 MIMO (multiple input, multiple output) configuration.....	12
	3.1.8 Troubleshooting.....	13
4	UHD UPGRADE.....	15
	4.1.1 Prerequisite.....	15
	4.1.2 REBOOT LC-2Gnb	16
	4.1.3 FCC Regulations and RF Exposure	17

1 Product overview

1.1 Product appearance.



Figure 1-1 Equipment appearance

Table 1-1 shows the interface description of HC-2.

Interface name	Number of Ports	Interface type	Interface Capability	remarks
LS	4	RJ45	100/1000Base-T, RJ45	
AC SOCKET	1	AC socket	100V TO 240V AC , 8-4 amp	
HDMI	1	HDMI	User interface display	Disabled
USB	2	USB	USB 2.0, 480 Mbps	
HS	1	RJ45	100 / 1000/ 10000 Mbps Base-T, RJ45	

Table 1-2 HC-2 LED/ indicator

LED	Power switch with LED	Blue: On, the system starts normally Blue: Off, system not started
	Alarm LED	Red: on, any failure on gNB side
	LAN port	100 / 1000 adaptive, green and yellow LEDs Green (link): on, light port works normally Green (link): off, faulty or not working Red (ACT): flashing, with data transmission Red (ACT): off, no data transmission NOT support 10Mbps
	RF1	When RF cell -1 is up
	RF2	When RF cell -2 is up
	Sync	When UE is attached with RAN

1.2 Technical specifications

1.2.1 Hardware specifications

Project	Describe
Installation mode	Indoor lab equipment
Power consumption (Max)	400W
Power module	240V AC
CPU Spec	NUC i9 12 th GEN.
RF card	B210+N310
SSD	500GB
RAM	64GB
LAN management port	4X1G RJ45, 1X10G RJ45

1.2.2 Technical specifications

Project	Description
Performance	1. Support 1 radiation surface
	2. Carrier bandwidth: single carrier 100MHz
	3. Backhaul: 1G Optical interface SFP+
Compatible design	Supports distributed base stations
Synchronization mode	1. IEEE1588V2 synchronization
	2. SyncE synchronization
Heat management	4X 120 mm Fan
	Aluminum passive heat blocks on each side
Band and bandwidth	Support standard 5G-NR rel-15
	Support FDD and TDD band. 10,20MHz for n2, n5, n66, n77 band & 40MHz for n2, n66, n77 band & 100MHz for n77 band
Frequency Range (MHz)	n2
	n5
	n66
	n77
Tune up Tolerance	+/- 2dB
	+/- 2dB
Tx Spec	For N310 USRP device has four TX/RX port. For TX/RX port TX power 19.76dBm max (RF1) RX power -15dBm
	For B210 USRP device has two TX/RX port. For TX/RX port TX power 7.4dBm max (RF2) RX power -15dBm
Rx Spec	For N310 USRP device has four RX port. For RX port RX power -15dBm
	For B210 USRP device has two RX port. For RX port RX power -15dBm

1.2.3 Environmental specifications

Project	Description
Storage temperature / humidity	The equipment shall be able to work or store normally within the following temperature and humidity range: Operating temperature: - 5 ° C to + 30 ° C Storage temperature: - 40 ° C to + 70 ° C Relative humidity: 5% ~ 95% (no condensation)
Heat dissipation mode	Natural convection heat dissipation
Atmospheric pressure	86 Kpa~106 Kpa
Protection level	IP30
Surge	Indoor products, no surge requirements

2. Configuration

2.1 HC-2 Hardware Setup

Cables should be connected as shown in the image.



2.2 Ip address configuration (Optional)

The default configuration is static with IP address 192.168.2.15, and you can change this IP following below operations.

- ➔ Login via SSH user: user password: root123
- ➔ Edit IP configuration file with below command
sudo vi /etc/netplan/01-netcfg.yaml
Save file and exit

```
enp108s0:
  optional: true
  dhcp4: no
  addresses:
    - 192.168.6.252/24
    - 192.168.2.132/24
  nameservers:
    addresses: [8.8.8.8, 8.8.8.4]
  gateway4: 192.168.6.1
  mtu: 1500
```

- ➔ To apply new configuration, use below command
sudo netplan app

3 Provisioning of execution and configuration

3.1.0 Provisioning of execution and configuration for RF1

Provision

1. Open terminals as required (min 3)
 - i. Run the command in all the terminals
`ssh root@192.168.2.15`
`pass- root123`

3.1.1 Execution of L1&L2 for RF1

For 4x4 Transmission

For L1

2. Perform following steps for run processes: -
 - i. To run L1 binary enter following command: -
-> Go to first tab of terminal and enter path for L1
`cd /opt/FCC_DEV0/L1/script`

Some Details required for running L1

Now first open the L1_NR.cfg by using the command

`vi ./cfg/L1_NR.cfg`

Go to the insert mode by pressing i key and edit the parameter.

To change the Sampling Rate parameter

Uncomment (Remove #) the `samplingRate_kHz` value according to the channel bandwidth as shown in below picture.

```
#samplingRate_kHz = 15360; //10MHz
#samplingRate_kHz = 30720; //20MHz
#samplingRate_kHz = 61440; //40MHz
samplingRate_kHz = 122880; //100MHz

#sdrCallTargetChunk_us = 40; //Added to fix 61440
#sdrCallPreventFragmentation = false; //Debug conf
```

To assign antenna port value

Set the `sdrTxSubdevSpec` and `sdrRxSubdevSpec` should be given in the picture.
If it is not similar to configuration in the L1 config file, then make it like this:

```
#####
//4*4 For band
sdrTxSubdevSpec = "A:0 A:1 B:0 B:1";
sdrRxSubdevSpec = "A:0 A:1 B:0 B:1";
#sdrTxSubdevSpec = "B:0 B:1 A:0 A:1";
#sdrRxSubdevSpec = "B:0 B:1 A:0 A:1";
#####
```

Once done, save the file press ESC and type command `:wq` then press ENTER.

Now Run L1 by using this command
./runL1.sh

For L2

To run MAC_NR binary enter the following commands in second terminal

-> Go to second tab and change path for MAC_NR

cd /opt/FCC_DEV0/L2/src

-> To edit config file of L2 refer point (c) Configuration from page number 5 (Use another terminal)

-> Run L2 by using this command

taskset -ac 4-7 ./MAC_NR 0

Once done, both L1 and L2 are live. Now just press **ctrl+c** after at least 10 seconds on the L2 terminal. Go to the L1 terminal, comment (Add # at the starting of command) on the previous sdrTxSubdevSpec and sdrRxSubdevSpec parameter, and uncomment (Remove #) the sdrTxSubdevSpec and sdrRxSubdevSpec, which are shown in the below picture. After that, just save the file, press **ESC**, type command **:wq** then press **ENTER**.

```
#####
//4*4 For band
#sdrTxSubdevSpec = "A:0 A:1 B:0 B:1";
#sdrRxSubdevSpec = "A:0 A:1 B:0 B:1";
sdrTxSubdevSpec = "B:0 B:1 A:0 A:1";
sdrRxSubdevSpec = "B:0 B:1 A:0 A:1";
#####
```

Once done, run L1 and L2. Wait for some time until "**L1 is now live**" is visible on the terminal, then both processes are up. Once all LEDs are glowing on RF1, you are able to take observations on the 4 TX ports.

Note: Whenever you want to change frequency and band, you need to repeat the above process.

3.1.2 Configuration for RF1

3. Perform following steps for opening configuration file :-

- i. Go to the third tab of terminal
- ii. Enter **cd /opt/FCC_DEV0/L2/cfg** for config path
- iii. Enter **vim config.cfg** to open config file in vim text editor.
- iv. After completion of vim command a list of parameters will appear as shown below.


```

# TDD = 0, FDD = 1
DuplexingMode=0
# Supported Band n2(FDD), n5(FDD), n66(FDD), n77(TDD)
Band=77
# SubcarrierSpacing 15KHz = 0, 30KHz = 1
SCS=0
# Downlink bandwidth, 10MHz BW = 0, 20Mhz BW = 1, 40Mhz BW = 2, 100Mhz BW = 3
DL_Channel_Bandwidth=3
# Range 0 - 1000
Tx_Gain=850
# Downlink ARFCN pointA
Frequency_PointA=627056
# Downlink ARFCN SSB
Absolute_Frequency_Ssb=627296
# UL frequency needed if FDD is present
ulPointA_present=0
# Uplink ARFCN pointA if DD is Present
ul_Frequency_pointA=0
# modulation scheme QPSK = 0, 16-QAM = 1 64-QAM = 2
Modulation_Scheme=0
# Number of Tx Antenna port
NumTxPort=4
# Number of Rx Antenna port
NumRxPort=4

```

Note : When you want to change frequency according to band, first edit the config file of L2 of RF1 (above picture), then save it. After saving, first run L1 of RF1 by using `./runL1.sh` and then L2 of RF1 by using `taskset -ac 4-7 ./MAC_NR 0`

4. Perform following steps to modify configuration file :-

- i. Go to the insert mode by pressing `i` key and edit the parameter.
- ii. To save the file press `ESC` and type command `:wq` then press `ENTER`
- iii. If don't want to save file, press `ESC` and enter command `:q!` then press `ENTER`

3.1.3 MIMO (multiple input, multiple output) configuration for RF1

Note : It is already defined 4x4 MIMO in config file of L1.

- i. Open new terminal and do `ssh root@192.168.2.15` and provide password `root123` and run the command below
- ii. `sudo vim /opt/FCC_DEV0/L1/cfg/L1_NR.cfg`

```

root@127:~# sudo vim /opt/FCC_DEV0/L1/cfg/L1_NR.cfg

```

- iii. After running this command `L1_NR.cfg` file will open shown in the picture below

```

numTxAntennas = 4;
numRxAntennas = 4;
txGainScalingFactor = 0.05;
timingOffsetThreshold_nsec = 1000;
//sdrSendAdvance_ns = 9000;
//sdrSendAdvance_ns = 14000;
sdrSendAdvance_ns = 12000;

#####8.9.1_rc6 change #####

#sdrTxSubdevSpec = "B:0 B:1";
#sdrRxSubdevSpec = "B:0 B:1";
#####
#sdrTxSubdevSpec = "B:0";
#sdrRxSubdevSpec = "B:0";

#####

sdrTxSubdevSpec = "B:0 B:1 A:0 A:1";
sdrRxSubdevSpec = "B:0 B:1 A:0 A:1";

#sdrTxSubdevSpec = "A:0 A:1 B:0 B:1";
#sdrRxSubdevSpec = "A:0 A:1 B:0 B:1";

```

iv. As mention above in the picture the highlight portion, we can change MIMO configurations here.

6. Perform following steps to modify L1_NR.cfg configuration file :-

- i. Go to the insert mode by pressing i key and edit the parameter as required.
- ii. To save the file press ESC and type command :wq then press ENTER
- iii. If don't want to save file, press ESC and enter command :q! then press ENTER

3.1.4 Provisioning of execution and Configuration for RF2

Provision

1. Open terminals as required (min 3)

- i. Run the command in all the terminals

```
ssh user@192.168.2.15
```

```
pass- root123
```

3.1.5 Execution of L1&L2 for RF2

2. Perform following steps for run processes:-

- i. To run L1 binary enter following command :-

-> Go to first tab of terminal and change path for L1Path

```
cd /opt/FCC_DEV1/L1/script
```

vi ../cfg/L1_NR.cfg

```
numTxAntennas = 2;  
numRxAntennas = 2;  
txGainScalingFactor = 0.05;  
timingOffsetThreshold_nsec = 1000;  
sdrSendAdvance_ns = 8000;  
#sdrSendAdvance_ns = 10000;  
sdrTxGain_dB = 75;
```

Once you enter press escape :wq to save the file.

-> Run L1 Binary using the following command

./runL1.sh

ii. To run MAC_NR binary enter the following commands

-> Go to second tab and change path for MAC_NR

cd /opt/FCC_DEV1/L2/src

iii. Enter ls command for checking binary.

-> If MAC_NR binary is not available so you need to run **make** command and check again using ls command.

-> Run MAC binary using the following command

./MAC_NR 1

iv. Wait for some time, when “**L1 is now live**” is visible on console then both processes are up.

v. You are able to take observation as required.

3.1.6 Configuration for RF2

3. Perform following steps for opening configuration file :-

i. Go to the third tab of terminal

ii. Enter **cd /opt/FCC_DEV1/L2/cfg** for config path

iii. Enter **vim config.cfg** to open config file in vim text editor.

iv. After completion of vim command a list of parameters will appear as shown below

```
#####
#####
#
#   Name       :   config.cfg
#
#   Description :   This is configuration data file for Initial Configuration of L1.
#                   It contain frequency parameters required for L1.
#
#####
# CONFIGURATION FOR L1
#####
# TDD = 0, FDD = 1
DuplexingMode=1
# Supported Band n2(FDD), n5(FDD), n66(FDD), n77(TDD)
Band=2
# SubcarrierSpacing 15KHz = 0, 30KHz = 1
SCS=0
# Downlink bandwidth, 10MHz BW = 0, 20MHz BW = 1
DL_Channel_Bandwidth=0
# Range 0 - 1000
Tx_Gain=1000
# Downlink ARFCN pointA
Frequency_PointA=388000
# Downlink ARFCN SSB
Absolute_Frequency_Ssb=388360
# UL frequency needed if FDD is present
ulPointA_present=1
# Uplink ARFCN pointA if FDD is Present
ul_frequency_pointA=372000
# modulation scheme QPSK = 0, 16-QAM = 1 64-QAM = 2
Modulation_Scheme=0
~
~
32,26 All
```

Note : When you want to change frequency according to band, first edit config file of L2 of RF2 (above pic) then save it. After saving run L1 of RF2 by using `./runL1.sh` and L2 of RF2 by using `./MAC_NR 1`

Perform following steps to modify configuration file :-

- i. Go to the insert mode by pressing `i` key and edit the parameter.
- ii. To save the file press `ESC` and type command `:wq` then press `ENTER`
- iii. If don't want to save file, press `ESC` and enter command `:q!` then press `ENTER`

3.1.7 MIMO (multiple input, multiple output) configuration for RF2

Note : It is already defined 2x2 MIMO in config file of L1.

- i. open new terminal and run the command below
- ii. `sudo vim /opt/FCC_DEV1/L1/cfg/L1_NR.cfg`

```
root@127:~# sudo vim /opt/FCC_DEV0/L1/cfg/L1_NR.cfg
```

- iii. After running this command L1_NR.cfg file will open shown in the picture below

```

/*****
 * This file is subject to the terms and conditions defined in
 * file 'LICENSE'.
 *
 *****/

//Enables verbose binary logging. WARNING: very CPU intensive and creates potentially huge output files. Use with caution.
//LogLevel_verbose = "DEBUG";
logLevels = (
    { module = "Frontend"; logLevel_normal = "CRITICAL"; logLevel_verbose = "INFORMATIVE"; },
    { module = "Backend"; logLevel_normal = "CRITICAL"; logLevel_verbose = "INFORMATIVE"; }
    // { module = "Cell"; logLevel_normal = "CRITICAL"; logLevel_verbose = "DEVEL"; }

    // { module = "PDCCH"; logLevel_normal = "CRITICAL"; logLevel_verbose = "DEVEL"; },
    // { module = "PDSCH"; logLevel_normal = "CRITICAL"; logLevel_verbose = "DEVEL"; },
    // { module = "SS-Block"; logLevel_normal = "CRITICAL"; logLevel_verbose = "DEVEL"; },
    // { module = "PUCCH"; logLevel_normal = "CRITICAL"; logLevel_verbose = "DEVEL"; }
);

maxNumPdschLayers = 2;
//Enable 64-QAM support for PUSCH (license-specific)
maxPuschModOrder = 6;

//Enable radio unit emulation mode and define corresponding number of (emulated) antennas
//backEndMode = 0;
//numEmulTxAntennas = 2;
//numEmulRxAntennas = 2;
numTxAntennas = 2;
numRxAntennas = 2;
txGainScalingFactor = 0.05;
timingOffsetThreshold_nsec = 1000;
sdrSendAdvance_ns = 8000;

```

iv. As mention above in the picture the highlight portion, we can change MIMO configurations here.

6. Perform following steps to modify L1_NR.cfg configuration file :-

- i. Go to the insert mode by pressing i key and edit the parameter as required.
- ii. To save the file press ESC and type command :wq then press ENTER
- iii. If don't want to save file, press ESC and enter command :q! then press ENTER

3.1.8 Troubleshooting

In any case if you are not able to do the ssh or getting trouble while accessing hardware then connect monitor through HDMI/VGA cable. You will get username window then enter Username as User and Password root123.

If you get blue screen then enter ctrl+alt+f3. Enter username as User and Password is root123. Once the authentication done enter command ipconfig for checking the IP address.


```

root@usermachine:/home/user# ifconfig

device memory 0x83400000-834fffff

enp11s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 9000
inet 192.168.20.1 netmask 255.255.255.0 broadcast 192.168.20.255
inet6 fe80::1e69:7aff:fed0:9959 prefixlen 64 scopeid 0x20<link>
ether 1c:69:7a:d0:99:59 txqueuelen 1000 (Ethernet)
RX packets 9 bytes 2328 (2.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 60 bytes 6806 (6.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp8s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 9000
inet 192.168.10.1 netmask 255.255.255.0 broadcast 192.168.10.255
inet6 fe80::230:93ff:fe10:2ec9 prefixlen 64 scopeid 0x20<link>
ether 00:30:93:10:2e:c9 txqueuelen 1000 (Ethernet)
RX packets 9 bytes 2232 (2.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 69 bytes 8453 (8.4 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enx00e04c6800f0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.40.1 netmask 255.255.255.0 broadcast 192.168.40.255
inet6 fe80::2e0:4cff:fe68:f0 prefixlen 64 scopeid 0x20<link>
ether 00:e0:4c:68:00:f0 txqueuelen 1000 (Ethernet)
RX packets 12 bytes 2383 (2.3 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 63 bytes 7310 (7.3 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Local Loopback)
RX packets 80 bytes 8120 (8.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 80 bytes 8120 (8.1 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

vnet140: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
inet 60.0.68.64 netmask 255.255.255.0 destination 60.0.68.64
inet6 fe80::87ff:5713:70d:cb5d prefixlen 64 scopeid 0x20<link>
unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen 500 (UNSPEC)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@usermachine:/home/user#

```

Now First do **sudo su** and password – **root123**

```

user@usermachine:~$ sudo su
sudo: unable to resolve host usermachine: Temporary failure in name resolution
[sudo] password for user:
root@usermachine:/home/user# vi /etc/netplan/00-installer-config.yaml

```

If you want to change the IP then enter **vi /etc/netplan/00-network-manager-all.yaml**. Once you enter press insert and change the IP address mention in the below picture.

```

# This is the network config written by 'subiquity'
network:
  version: 2
  renderer: networkd
  ethernets:
    enp111s0:
      optional: true
      addresses:
        - 192.168.20.1/24
      mtu: 9000
    enp8s0:
      optional: true
      dhcp4: no
      addresses:
        - 192.168.10.1/24
      mtu: 9000
    enp110s0:
      optional: true
      dhcp4: yes
      addresses:
        - 192.168.2.102/24
      nameservers:
        addresses: [8.8.8.8, 8.8.8.4]
      gateway4: 192.168.2.1
      mtu: 1500
    #addresses:
    #
    enx00e04c6800f0:
      optional: true
      dhcp4: no
      addresses:
        - 192.168.40.1/24

```

4.UHD UPGRADE

4.1.1 Prerequesit:

1. Sub_6GHz Hardware should be connected with internet
2. Command: `vim /etc/resolve.conf` nameserver 127.0.0.53 change it to 8.8.8.8 save and close file.
3. Now check ping google.com it's output should be like below

64 bytes from del03s16-in-f14.1e100.net (172.217.167.46): icmp_seq=1 ttl=117 time=7.05 ms

Steps to upgrade UHD

if your are facing error something like -:

```

{
Reading package lists... Done
Building dependency tree
Reading state information... Done
E: Unable to locate package uhd-packages
root@phluido-NUC9i9QNX:~# apt-get purge libuhd-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
You might want to run 'apt --fix-broken install' to correct these.
}

```

run this command -: `apt --fix-broken install`

run below given command

1. `sudo apt-get remove uhd-host`
2. `sudo apt-get remove --auto-remove uhd-host`
3. `sudo apt-get purge uhd-host`
4. `sudo apt-get purge --auto-remove uhd-host`

while running these commands it will ask for permission Y/n then enter Y.

- `dpkg -l | grep uhd`

`apt-get purge uhd-packages`

`vim /etc/apt/sources.list`

deb https://ppa.launchpadcontent.net/ettusresearch/uhd/ubuntu bionic main
 deb-src https://ppa.launchpadcontent.net/ettusresearch/uhd/ubuntu bionic main
 append above two lines, sva e& close files.

Now run command: apt-get update

while updating it sometimes throws error for key then

apt-key adv --keyserver keyserver.ubuntu.com --recv-keys received keys

Now again run apt-get update

run **apt-get install libuhd-dev uhd-host -y**

run uhd_find_devices

it's output should look like below screen shot:

```
root@usermachine:~/Sub_6GHz/log# uhd_find_devices
[INFO] [UHD] linux; GNU C++ version 9.4.0; Boost_107100; DPDK_21.11; UHD_4.4.0.HEAD-0-g5fac246b
-----
-- UHD Device 0
-----
Device Address:
  serial: 325FFA0
  addr: 192.168.20.2
  claimed: False
  fpga: XG
  mgmt_addr: 192.168.10.2
  mgmt_addr: 192.168.20.2
  mgmt_addr: 192.168.40.2
  name: ni-n3xx-325FFA0
  product: n310
  type: n3xx

-----
-- UHD Device 1
-----
Device Address:
  serial: 326F600
  name: MyB210
  product: B210
  type: b200
```

4.1.2 REBOOT HC-2 gNB

Note: In case you face the problem like that uhd is not found or you just want to restart the hardware

Run the below command for rebooting the hardware

reboot -f

4.1.3 FCC Regulations and RF Exposure

FCC Regulations

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RF Exposure Information

This device meets the government's requirements for exposure to radio waves.

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 87cm (34 inches) during normal operation.

Amantya Technologies, inc

2803, Philadelphia Pike, Suite B 304, Claymont, DE 19703, United States

Anuradha Gupta

anuradha@amantyatech.com

This HC-2, model no: 5GTP202SSn256677 requires training professionals qualified by Service Provider to configure and install the product. This device complies with FCC rules and regulations for fixed-mounted on indoor permanent structure in commercial/business premises excluding private resident/property. This device is distributed through controlled distribution channel and requires that trained professionals to install this product, and this device will not be sold directly to the general public through retail stores.

This HC-2, model no: 5GTP202SSn256677 must be installed to provide at least 87cm separation distance from bystanders to comply with the General Population /Uncontrolled MPE limit and requirements. RF exposure compliance may need to be addressed at the time of licensing, as required by the responsible FCC bureau(s) including mitigation actions for fixed RF sources to the extent necessary to ensure compliance with FCC exposure limits per section.

