

BROADCAST RADIO HEAD



User Manual & Installation Guide

Ver 1.4



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FCC Regulatory Information

FCC ID : 2AUUC-KAILASH5W00

§15.19

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
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with Part 27 of FCC Rules. This provides 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

§15.21 Information to user

The users' manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.



§15.105 Information to the user

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.

FCC Caution!!!

Exposure to Radio Frequency Radiation

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.
- This equipment should be installed and operated with a minimum distance of 150 cm between the antenna of this device and all persons.

**Supplier’s Declaration of Conformity
47 CFR § 2.1077 Compliance Information**

Unique Identifier: Broadcast Radio Head (FCC ID – 2AUUC-KAILASH5W00)

Responsible Party – U.S. Contact Information
Saankhya Labs Inc
No. 501, Seaport Court Suite 103A,
Redwood City,
CA 94063
Phone – +1-(408)-464-8601
Email – Arvind@saankhyalabs.com

FCC Compliance Statement
This device complies with Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. 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.



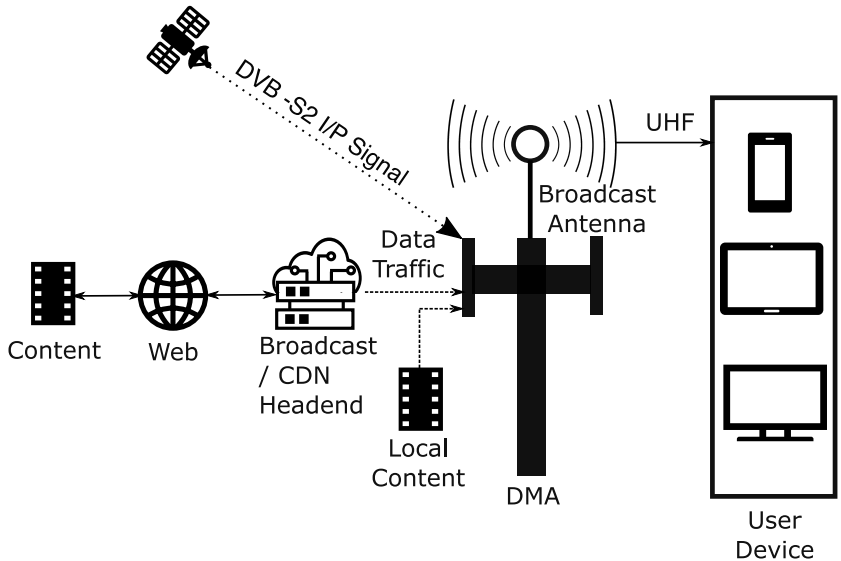
Product Description

Broadcast Radio Head (BRH) solution is a new paradigm for the Next Gen Digital Terrestrial Transmission (DTT). Deployed in a Low-Power Low Tower (LPLT) topology, it can create uniformly high signal strength to support Direct to Mobile (DTM) indoor reception.

LPLT enables efficient spectrum reuse and can also supplement conventional High-Power High Tower (HPHT) deployments.

The Low-Power Low Tower (LPLT) networks for which this BRH Sub-system has been developed and expected to operate to provide Broadcast services in High Population Density/Low Population Density Areas.

The BRH Sub-systems operates in 722 - 728MHz (Channel 56) band while avoiding interference to the other licensed operations.



BRH Deployment Diagram

In The Box

| Equipment | Quantity |
|----------------------------------------------|----------|
| BRH Unit | 1 Nos |
| User Manual & Installation Guide | 1 Nos |
| M4 Screws (already mounted on the enclosure) | 1 Nos |



Tech Specs

| Parameter | Specification |
|--------------------------------|------------------------------------------------------|
| Operating Frequency Band (MHz) | 722-728 MHz (Channel 56) |
| Channel Spacing (MHz) | 6 MHz |
| Transmitter Average Output | 5 W (37 dBm with tolerance ± 0.5 dB) |
| Input Voltage | - 48 V |
| Maximum Power Consumption | 150 W |
| Enclosure Grade | IP65 Certified |
| Size (L*W*D) | 622 *172.2 *137 mm |
| Weight (kg) | 8 kg |
| FCC Compliance | FCC part 27 rules for operation in 700 MHz spectrum |
| Operating Temp Range | -40°C to +50°C |
| Supported Output Modulation | ATSC 3.0 |
| Input Signal Type | DVB-S and DVB-S2 (L band frequency, 950-2150 MHz) |

IEC-61000-4-5

Qualifies Level - 2 (1 KV)

For more than 1 KV surge protection, it is recommended to use additional external protection on power line



Pole mounting provision

1. Connector side of BRH Unit must be facing down
2. All below connectors should be plugged in first
 - a. GPS Plug
 - b. Satellite Input
 - c. ATSC 3.0 Output
 - d. Ethernet plug
 - e. Lightning Earthing
3. Active Power plug with - 48V input voltage should be connected to the BRH Unit
4. Securely fasten all screws on the Mounting brackets of the BRH Unit and the pole



EMS Provisioning

1. Please refer to 'BRH EMS User Manual' available after EMS login for users with Operators and Admin privileges
2. Refer to section, 'EMS Workflows' → 'Provisioning' → 'Provision a Device'
3. The MAC Address of the Unit will be displayed on the unit for your reference
4. Once the Device is provisioned and shows up in the BRH DEVICES list EMS provisioning procedure is completed



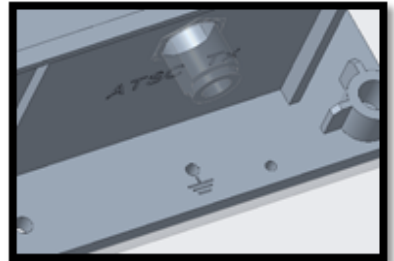
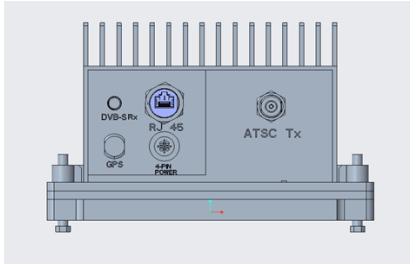
Power Up Procedure

1. Once the Unit is installed and provisioned in EMS, follow steps (2-9) to power ON the Unit
2. Check if the Ethernet plug being connected to Unit has Internet access. Once done, connect the Ethernet plug
3. Check if the F-type DVB-S2 plug is receiving signal on EMS configured backhaul frequency. Once done, connect the F-type connector as DVB-S2 input
4. Connect the N-type plug to GPS Receiver Antenna
5. Connect the Output N-type plug to Transmission Antenna
6. Verify that the Power Connector output gives - 48V
7. Once below four plugs are plugged into the Unit securely, connect the Power plug to the Unit at the very end,
 - a.) RJ-45, Internet Connectivity
 - b.) F-type, DVB-S2 Input
 - c.) N-type, GPS Receiver
 - d.) N-type, ATSC 3.0 output
8. Unit boots up in ~5mins after which the Unit should show up as active on the EMS login for the assigned Operator and statistics sent by the Unit should be visible on the EMS
9. An active unit would start transmitting once GPS lock is achieved and according to configured settings on the EMS



Description of Connectors

| S.No. | Connector Name | Label on Box | Connector Type |
|-------|-----------------------------------------------|---------------|--------------------|
| 1 | DVB-S2 L-Band Input | DVB-S2 Rx | F-Type Female |
| 2 | Ethernet Plug | RJ-45 | RJ-45 |
| 3 | 4 Pin Mini-Con-X - 48V Power Supply Connector | 4 Pin Power | Mini Con-X Female |
| 4 | GPS Input | GPS | N-Type Female |
| 5 | Antenna Output | ATSC-Tx | N-Type Female |
| 6 | Lightning Ground | Ground Symbol | Hole for M4 Screws |



Below diagram describes the pin configuration for input power supply of +48V towards the Enclosure side.



1&2 : Black (0V)
3&4 : Red (-48V)

Note: Above configuration has been provided for connector on the Enclosure side and not on the input plug

Caution: Please verify the voltage supply on the input connector plug to match above configuration before connecting to the BRH Unit



Do's

1. All connectors should be plugged in only after the BRH Unit is securely mounted on the pole
2. After complete installation of all components, LNB Antenna, BRH Unit, etc, all should have a common ground
3. Make sure - 48V is provided to Mini-Con-X power supply connector according to provided pin diagram
4. Make sure transmitter antenna is properly connected to the BRH Unit before connecting the power supply
5. Power ON the BRH Unit only after checking common ground of complete BRH System
6. Please use a low-loss/high-power handling cable with minimal length between BRH Unit and Antenna systems
7. Power plug should be connected at the very last
8. BRH Unit should have access to EMS over connected Ethernet
9. MAC ID of the BRH Unit should be registered on the Network and IP address should be assigned using an active DNS server
10. On an active running BRH Unit, if the power plug is removed, a wait time of 4 minutes is expected before connecting back the power plug
11. For any maintenance of the BRH Unit, EMS 'Shutdown' command should be used and wait time of 1 min is needed before removing the power plug
12. BRH Unit should be added and defined on EMS before getting powered on. *Please refer to the User guide available at <https://brh.saankhyalabs.com> on instructions to define the current BRH Unit on EMS*

Don'ts

1. Removing the power plug and connecting it back immediately will not power up the unit properly
2. During active operation of BRH Unit, transmitter antenna radiates RF energy. Do not stand in front or touch the antenna during active operation
3. Under lab conditions, do not power ON the BRH Unit without connecting high power attenuators & antenna on the transmission port. Electronics on the BRH Unit will be damaged if an active transmission is done without connecting proper attenuator and antenna
4. BRH Unit should not be opened. Warranty will be void if done so



Device is unreachable on the network

| Possible Cause | Steps to Verify | Steps to Resolve |
|--------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment is Powered Off | Verify if BRH Unit is drawing at least 300mA or more | <ol style="list-style-type: none"> 1. Remove the power plug from the BRH Unit 2. Wait for 4 minutes 3. Connect the power plug to BRH Unit again 4. Unit takes around 4 minutes to boot up completely and connect to EMS |
| DHCP Server failed to assign IP address | Verify if MAC ID of the BRH Unit is recognized by the DHCP server | <ol style="list-style-type: none"> 1. IT team should add the MAC ID of BRH Unit to their list of recognized devices 2. [Good to have] DHCP Server should have MAC ID to IP binding 3. Once done, remove the Ethernet plug and connect it back to BRH Unit 4. Ping the IP address of the BRH Unit after a couple of minutes |
| Power plug on BRH Unit was removed and connected back immediately | | <ol style="list-style-type: none"> 1. Remove the power plug from the BRH Unit 2. Wait for 4 minutes 3. Connect the power plug to BRH Unit again 4. Unit takes around 4 minutes to boot up completely and connect to EMS |

BRH Unit is not transmitting after "Power On"

| Possible Cause | Steps to Verify | Steps to Resolve |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BRH Unit is not provisioned on EMS | Check if the Device is provisioned on EMS with MAC ID | <ol style="list-style-type: none"> 1. Follow EMS Guide and provision the device with MAC ID of the Device 2. Select proper configuration during provisioning of the device |
| BRH Unit is provisioned but EMS is still showing the unit is down | Check if the Unit, <ol style="list-style-type: none"> 1. Is powered ON 2. Is connected to EMS on the network | Refer to troubleshooting on 'Device is Unreachable on Network' |



Troubleshooting

| Possible Cause | Steps to Verify | Steps to Resolve |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMS shows DVB-S2 Signal has not locked on the Box | Check if BRH Unit is in <i>Green</i> state on EMS and if <i>Statistics</i> → <i>Backhaul link</i> → <i>DVBS2 link</i> → <i>lock status</i> is <i>true</i> | <ol style="list-style-type: none"> 1. Correct the value of backhaul frequency and sampling rate on the selected configuration on EMS 2. Reboot the BRH Unit from EMS for picking the correct backhaul frequency 3. Verify that the lock status is showing <i>true</i> which should solve the issue |
| Frequency on configuration is correct, but DVB-S2 Signal has not locked on the Box | Shutdown the BRH Unit from EMS, remove the power plug from the unit and check the following, <ol style="list-style-type: none"> 1. Connections of LNB Antenna 2. Common ground on the BRH Setup | |
| DVB-S2 Signal is shown as locked, my unit is still not transmitting | Verify if following fields are showing non-zero value, <i>Statistics</i> → <i>Fronthaul Link</i> → <i>Pipeline Scheduler</i> →(<i>STL Out rate</i> , <i>Emission Rate</i> and <i>Buffered Jitter Rate</i>) | <ol style="list-style-type: none"> 1. If the field values are zero, check if the PID value carried by stream is matching the value on the EMS configuration 2. Update the PID value on the configuration 3. Reboot the BRH Unit from EMS |
| Mentioned fields on Pipeline Scheduler in EMS is showing non-zero values, my Unit is still not transmitting | Unit is configured to Transmit only when GPS lock is achieved. Verify if <i>Statistics</i> → <i>GPS Status</i> → <i>Lock status</i> is <i>true</i> | <ol style="list-style-type: none"> 1. Check the GPS antenna connections on the BRH Unit 2. Check if the GPS receiver antenna is working using independent tests 3. Once GPS lock is achieved, unit will start Transmitting at the configured output power |

If you need any assistance regarding the deployment or troubleshooting the BRH Unit, please write to us at **support-brh@saankhyalabs.com**

Saankhya Labs Pvt. Ltd.

Embassy Icon, Floor 3

No.3 Infantry Road

Bengaluru, India - 560 001

www.saankhyalabs.com