Antenna Sharing Hub
User's Guide

DOCUMENT CHANGE RECORD

Revision	Date	Description	Affected sections
A	12/11/2018	Changes for tool to support 10 RETs and related firmware changes	All
C	07/11/2019	Added 2.1.1 Current Alarm thresholds for operators	2.1.1(new)
D	02/17/2020	Changes in tool UI for release 1.2 with support for site reports	All
F	06/02/2020	Updated site report changes for release 1.4	Site Reports
G	06/17/2020	Correct title for section 3.2.8	3.2.8
H	11/04/2020	Added section 2.1.1	2.1
I	03/19/2025	Changed CommScope Log pictures to ANDREW Log	All

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1. INTRODUCTION TO ANTENNA SHARING HUB

1.1 Antenna Sharing

Deployed multiport antennas consisting of two or more internal RET elements typically has a single AISG Port interface allowing the control by one BTS/RRH controller. Antenna Sharing is the ability of a multiport antenna to allow independent control of its internal RET elements to two or more operators.

In some regions, operators are forced to share elements within the networks including antennas due to aesthetic and/or site space limitations. The ANDREW Antenna Sharing Hub or ASH solves the problem where deployed multiport antennas are not capable of providing antenna sharing.

The ANDREW ASH allows internal RET elements of multiport antennas to be shared across multiple BTS/RRH controllers.

1.2 ANDREW Antenna Sharing Hub

The main features of ANDREW ASH are:

1. Antenna RET elements can be shared across six independent BTS/RRH controllers.
2. All BTS/RRH control ports are female AISG four pin RS-485 ports with surge protection level 20kV/8kA. Control ports are labeled 'A', 'B','C', 'D', 'E' and 'F'.
3. All BTS/RRH control ports can be independently configured to support either AISG 2.0/3GPP SRET (Device Type 0x01) or MRET (Device Type 0x11) modes using ANDREW Antenna Sharing Configuration Tool Software.
4. All BTS/RRH control ports supports AISG 2.0/3GPP protocol release versions 6 – 14 when allowed by connected Antenna RET.
5. Supports up to 24 RET elements from any number of Antenna devices in SRET and MRET modes daisy chained at ASH output port when two or more BTS/RRH control ports are in use. Supports up to 12 Ret elements when a single BTS/RRH control port in use.
6. Supports ANDREW COMMRET1, COMMRET2, CP RET and Legacy Argus Antennas in their default protocol mode MRET or SRET. No additional configuration steps to ANDREW Antennas are required for use with ANDREW Antenna Share Hub Hardware. ANDREW ASH will not modify attached Antenna's default protocol mode, configuration and other internal settings.
7. Configurable access levels of "Full Control" or "Restricted Access" on a per BTS/RRH control port basis.
8. Antenna Sharing is applied on a per Antenna Model basis. Up to 16 different configurable Antenna Sharing settings can be programmed and stored in the ASH. See use scenarios section.
9. Antenna Sharing will default all RET elements Full Control access be visible to all BTS/RRH control ports for ANDREW's Antenna Models without an Antenna Sharing configuration.
10. Packet forwarding and AISG 2.0/3GPP protocol translation between BTS/RRH controllers and daisy chained Antenna RETs.

2. INSTALLATION OF ANTENNA SHARING HUB

2.1 Installation

The ANDREW Antenna Sharing Hub hardware is designed to be installed in an unprotected outdoor environment. All hardware required for the installation is included with the product.

The Antenna Sharing Hub hardware can be installed in any orientation, however, orienting the ASH with its AISG connectors facing down is preferred whenever practical. This ensures an extra measure of protection against weather exposure that is independent of installation workmanship.

The ASH is intended to be installed between RRH/BTS controllers and the Antenna RETs. Although a DTMA is considered an Antenna device it should not be connected at ASH output port, but instead DTMA's RET output should be connected to ASH RRH/BTS control ports.

2.1.1 High/Low Current Alarm Thresholds for Operators

For operators with High Current Alarm Thresholds, the optimum setting is dependent on the number of radios, the number of RETs, and the types of RETs being used. However, to ensure no alarms are reported, even in worst case conditions, ANDREW recommends high current thresholds of **500mA for 24V** radios, and **850mA for 12V** radios.

Low Current Alarm Thresholds should be **0mA**.

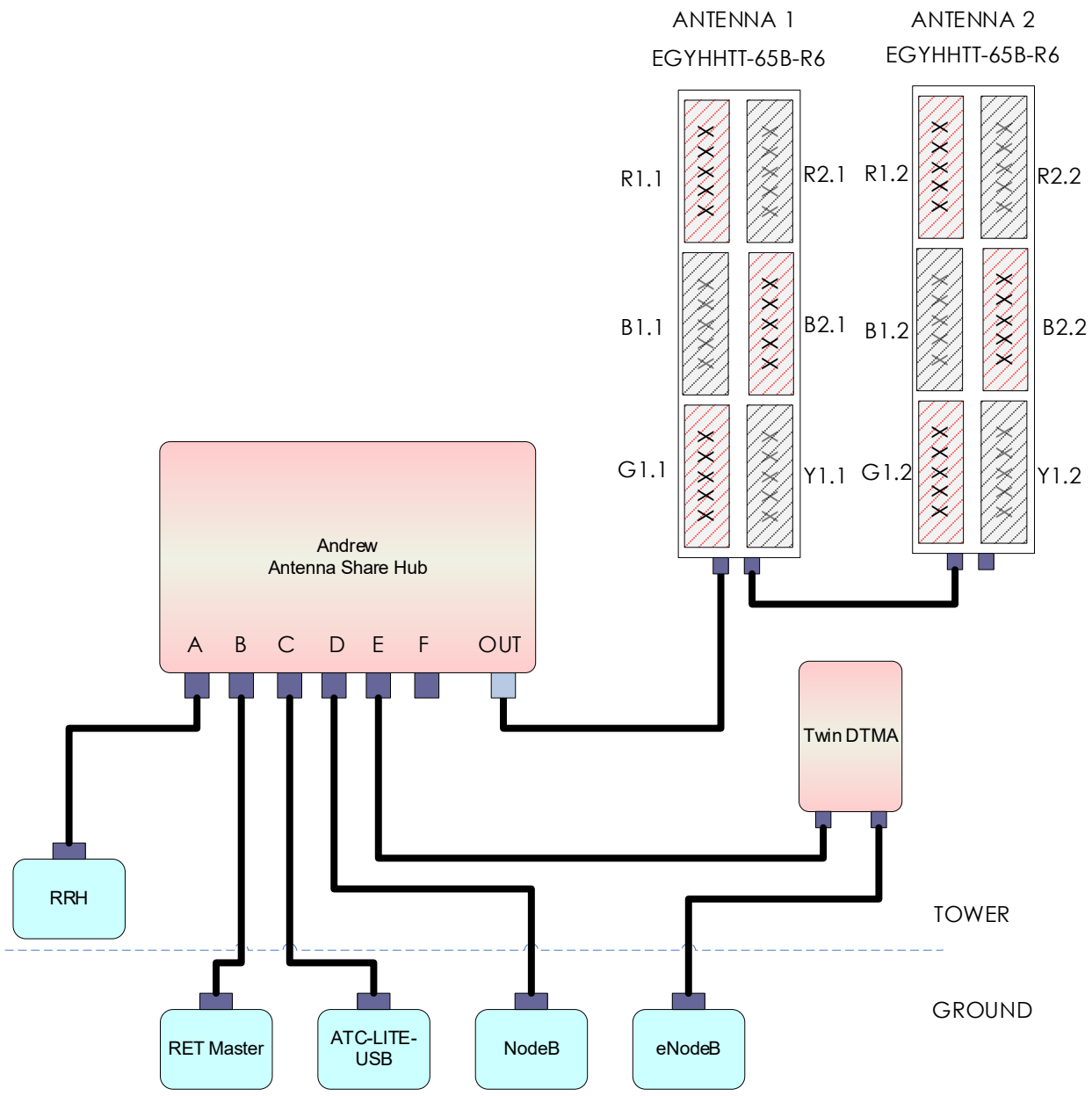

Figure 1 Andrew Antenna Sharing Hub Installation

2.2 Use Scenarios

Antenna Sharing use case examples are illustrated here using two ANDREW EGYHHTT-65B-R6 and a six port ANDREW ASH. Note one antenna sharing configuration for model EGYHHTT-65B-R6 has been previously programmed and stored in the ASH.

2.2.1 Scenario 1. All control ports in MRET mode.

An antenna sharing configuration for the Antenna Model EGYHHTT-65B-R6 is programmed into the ANDREW ASH where all control ports are configured to AISG2.0/3GPP MRET protocol mode. Antenna Sharing Mapping is as follows:

Band R1 to Control Port A
Band R2 to Control Port B
Band B1 to Control Port C
Band B2 to Control Port D
Band G1 to Control Port E
Band Y1 to Control Port F.

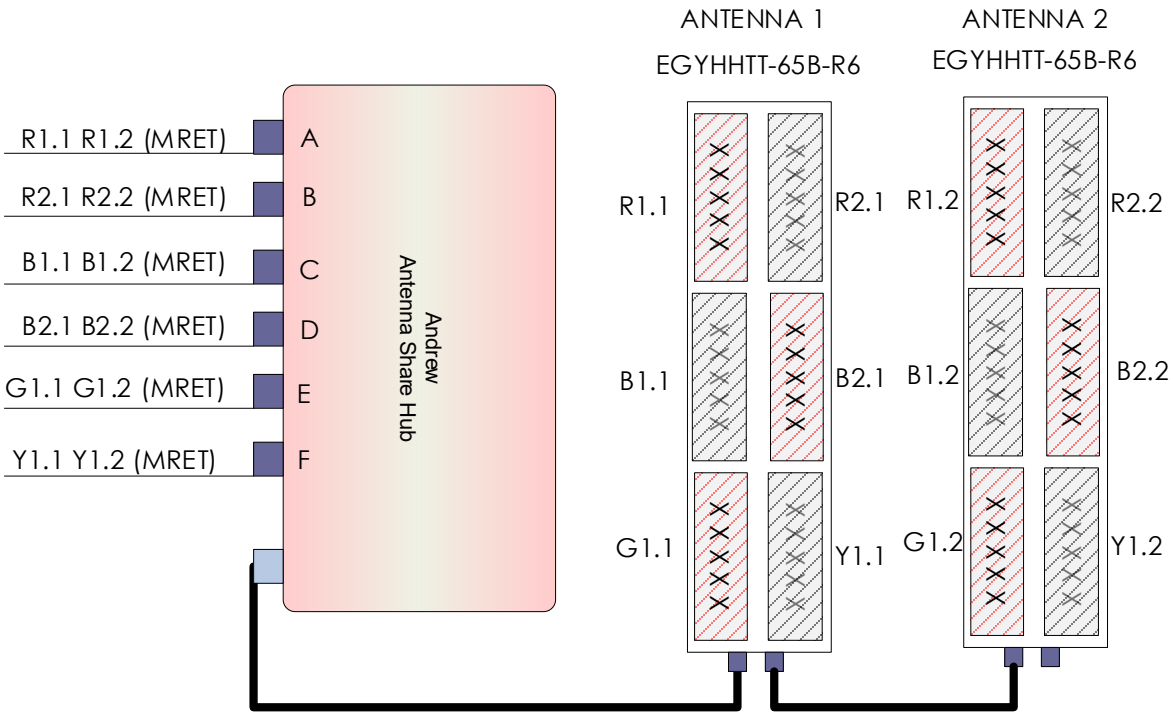

Figure 2 EGYHHTT-65B-R6 Antenna Sharing Scenario 1

2.2.2 Scenario 2. All control ports in SRET mode.

An antenna sharing configuration for the Antenna Model EGYHHTT-65B-R6 is programmed into the ANDREW ASH where all control ports are configured to AISG2.0/3GPP SRET protocol mode. Antenna Sharing Mapping is as follows:

Band R1 to Control Port A
Band R2 to Control Port B
Band B1 to Control Port C
Band B2 to Control Port D
Band G1 to Control Port E
Band Y1 to Control Port F.

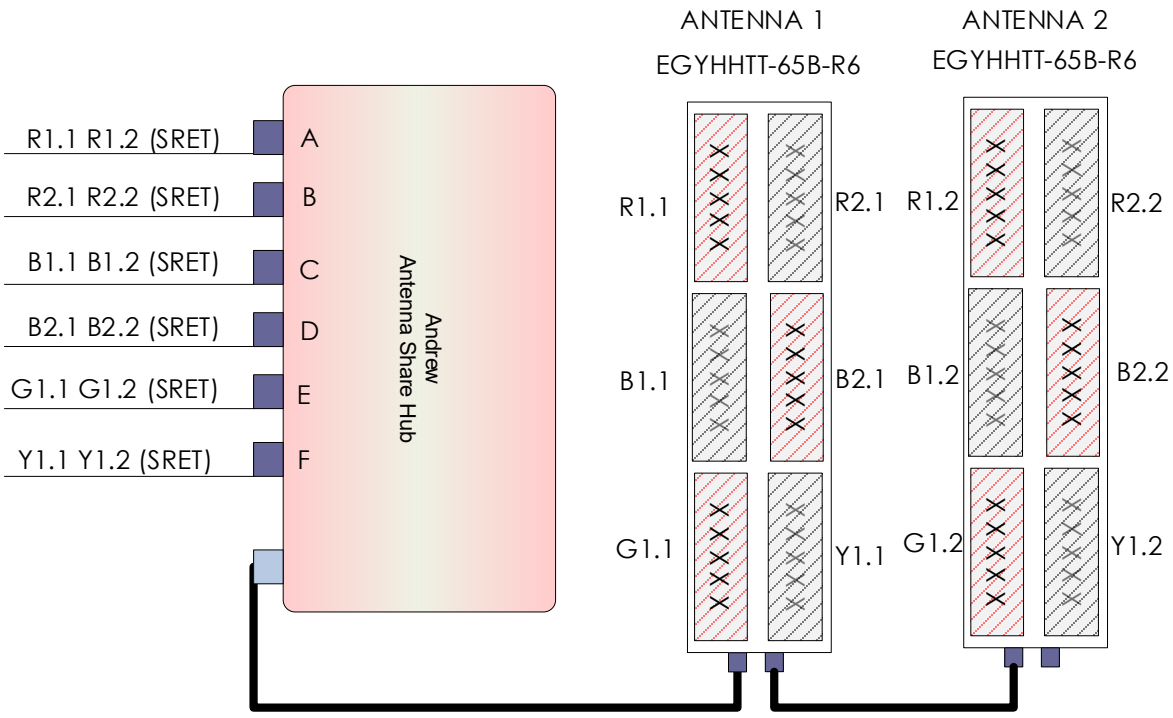

Figure 3 EGYHHTT-65B-R6 Antenna Sharing Scenario 2

2.2.3 Scenario 3. Mixed MRET/SRET mode control ports.

An antenna sharing configuration for the Antenna Model EGYHHTT-65B-R6 is programmed into the ANDREW ASH where all control ports are configured to both AISG2.0/3GPP SRET/MRET protocol modes. Antenna Sharing Mapping is as follows:

Band R1 to Control Port A
Band R2 to Control Port B
Band B1 to Control Port C
Band B2 to Control Port D
Band G1 to Control Port E
Band Y1 to Control Port F

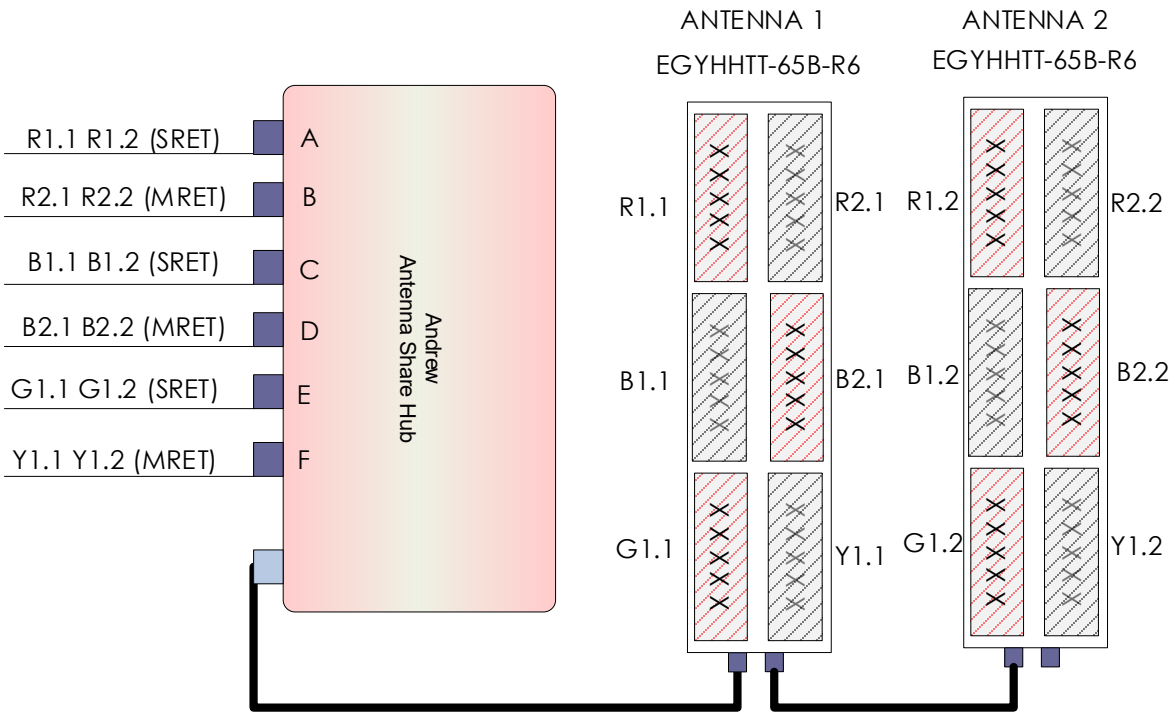

Figure 4 EGYHHTT-65B-R6 Antenna Sharing Scenario 3

2.2.4 Scenario 4. Mixed RETs mapping.

ANDREW ASH supports multiple antenna sharing configuration variants not only the before mentioned scenarios. In this last example, a mixed RET antenna sharing configuration for the Antenna Model EGYHHTT-65B-R6 is programmed into the ANDREW ASH. When ANDREW ASH detects an EGYHHTT-65B-R6 antenna it will replicate the RETs to its control ports as illustrated below.

This configuration for this scenario in the Antenna Sharing configuration tool is shown in the Figure 11.

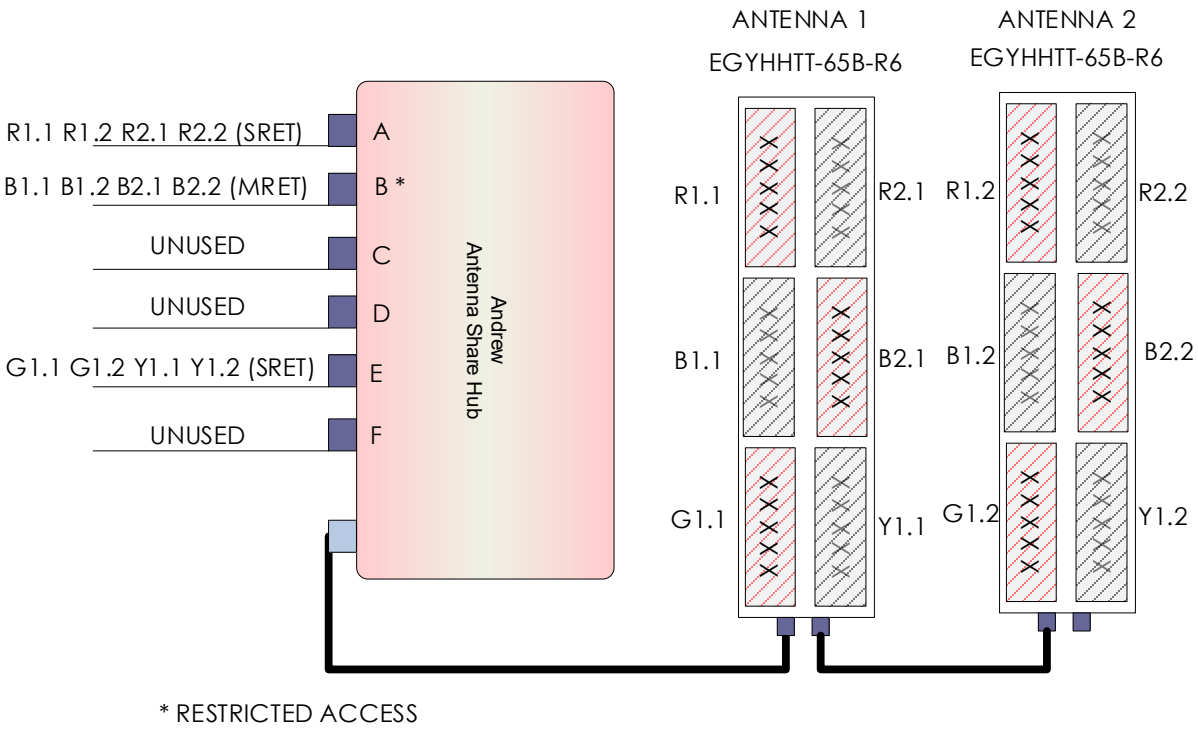

Figure 5 EGYHHTT-65B-R6 Antenna Sharing Scenario 4

3. CONFIGURATION OF THE ANTENNA SHARING HUB

3.1 Antenna Sharing Hub Configuration Tool

The Antenna Sharing Hub Configuration Tool is the PC software used to communicate with the ANDREW ASH hardware. The PC software uses the ANDREW ATC200-LITE-USB portable controller hardware and runs on Windows operating systems (Windows 7 or higher). Visit ANDREW website at www.andrew.com to download the latest Antenna Sharing Hub Configuration software.

ATC200-LITE-USB is used as the interface between a local PC/laptop running Antenna Sharing Hub Configuration Tool and the ANDREW ASH hardware. The ATC200-LITE-USB provides signal level conversion from the PC/laptop to RS-485 as well as power to the ASH hardware.

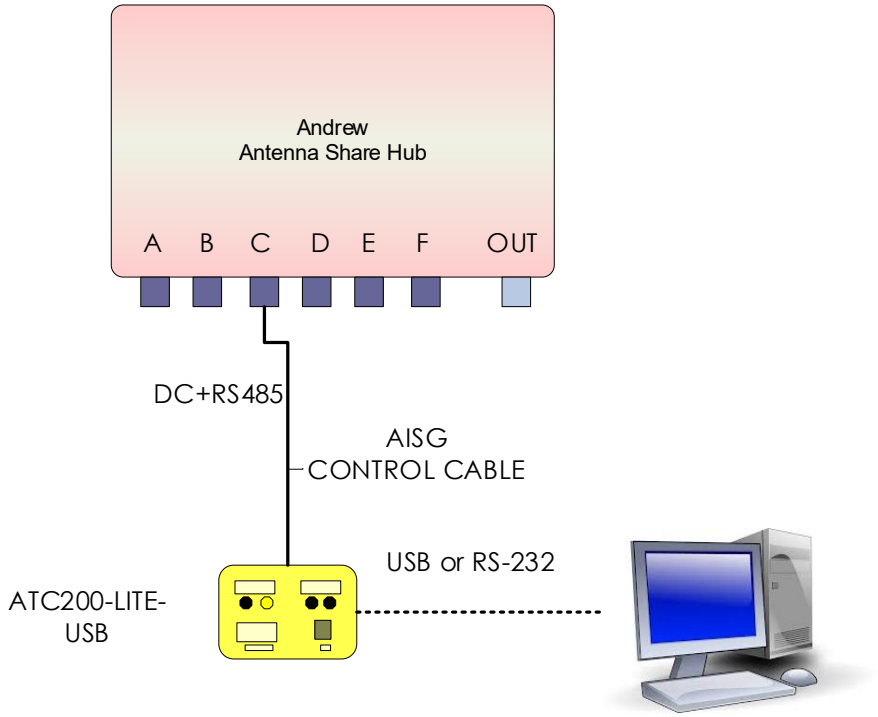

Figure 6 ATC200-LITE-USB connected to ANDREW Antenna Sharing Hub on control port C.

ATC200-LITE-USB controller can be connected to any ASH's RRH/BTS control ports: A, B, C, D, E or F as shown in the Figure above. The LEDs on ATC200-LITE-USB indicates power and data communication. It is equipped with a USB port, as well as a RS-232 serial port for flexibility in connecting to a PC.

Figure 7 ATC200-LITE-USB Controller End Panels

The Antenna Sharing Hub Configuration Tool can be used in two modes:

1. In **Online mode**, the ASH Configuration Tool provides direct management of the hub. The operator can:
    a. view, edit, or delete antenna model configurations stored on the hub
    b. view or edit the current BTS/RRH control port protocol modes (MRET, SRET)
    c. download a new antenna model configuration
    d. update the ASH software
    e. perform all functions available in Offline mode
2. In **Offline mode**, the ASH Config Tool allows an operator to
    a. create and save new antenna model configurations
    b. edit and save previously created antenna model configurations

Online mode is described in more detail in Section 3.2, while Offline mode is described in Section 3.3.

3.2 Antenna Sharing Hub Configuration Tool (Online mode)

In Online mode of operation, a physical connection to any ANDREW ASH RRH/BTS control port is required using ATC-LITE-USB hardware. Communication activities between Antenna Sharing Hub Configuration Tool and the ANDREW ASH will not interfere with on-going activities from RRH/BTS controllers. However, ASH hardware will perform a board-level reset whenever new or existing Antenna Sharing Configurations are modified and applied.

The following sections provide step-by-step instruction on how to navigate through ASH Configuration Tool in Online mode.

3.2.1 Launching Antenna Sharing Hub configuration tool

An Antenna Sharing Hub Configuration Tool icon will be available on the PC's desktop after completing the software installation. Click on the Antenna Sharing Hub configuration tool icon (as shown in the picture below) from the desktop.

The startup screen for the tool is as follows.

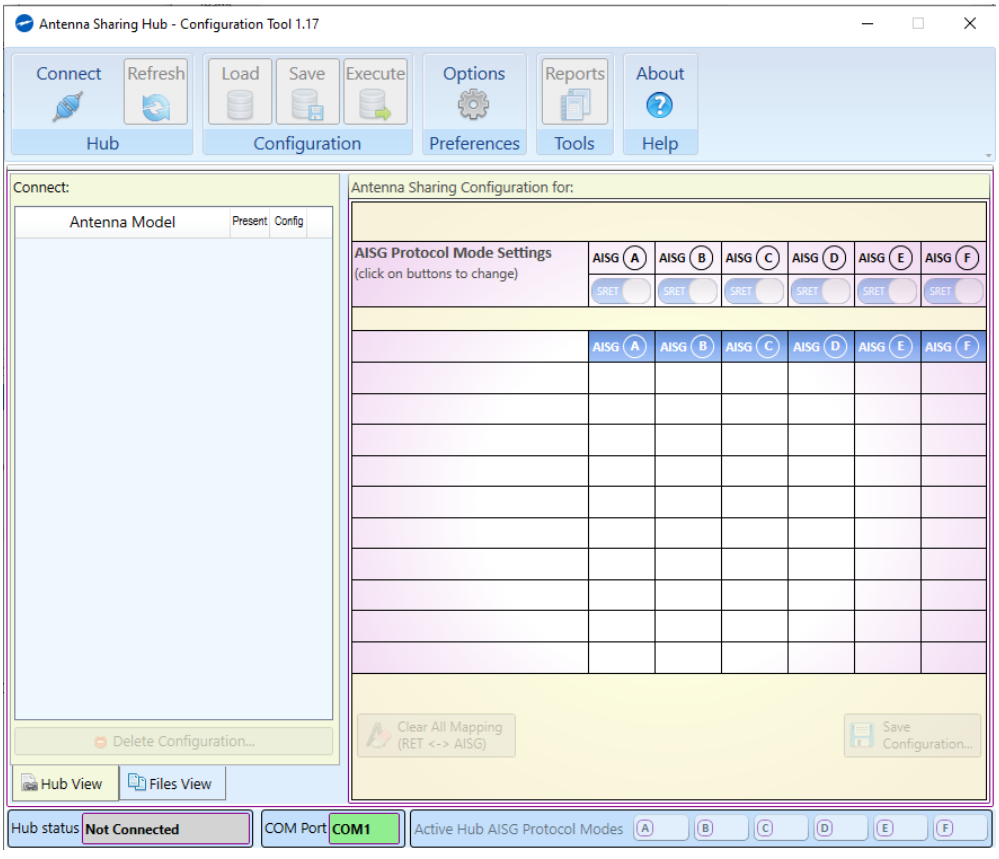

Figure 8 Antenna Sharing Configuration Tool User's Interface

3.2.2 Setting up Antenna Sharing Hub configuration tool

Under User Preference Settings, select the Serial COM port to be used to communicate with ANDREW ASH hardware.

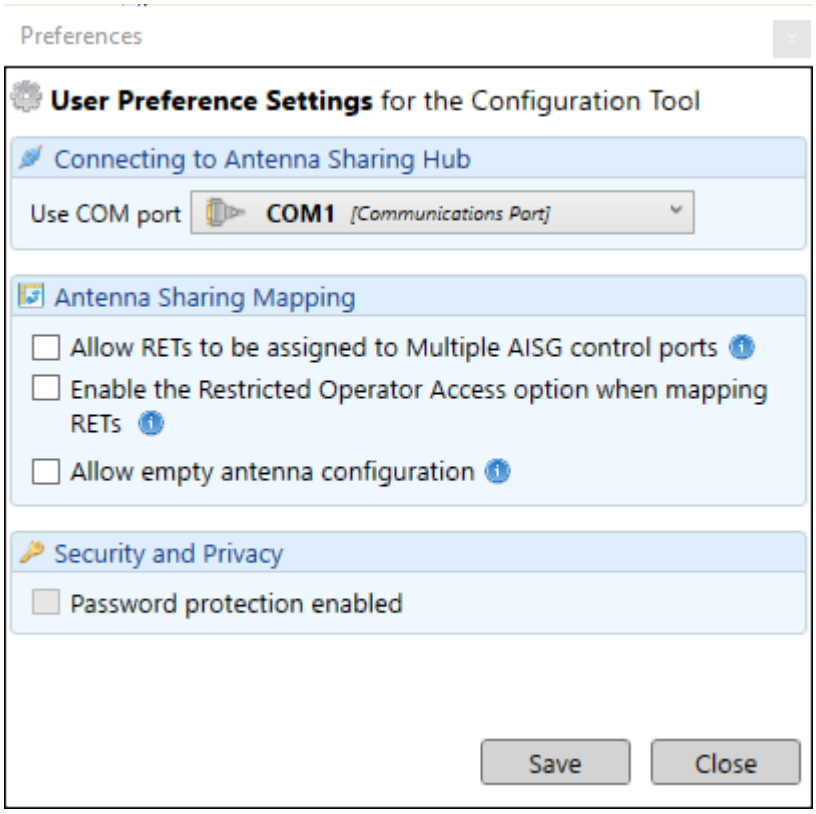

Figure 9 Antenna Sharing Hub Configuration Tool Preferences

3.2.3 Connecting with Antenna Sharing Hub

Click on the 'Connect' tool bar button to establish connection to the Antenna Sharing Hub. Once connected the tool retrieves all relevant data and displays the Antenna Sharing Hub details and the antenna models currently configured and discovered on ANDREW ASH.

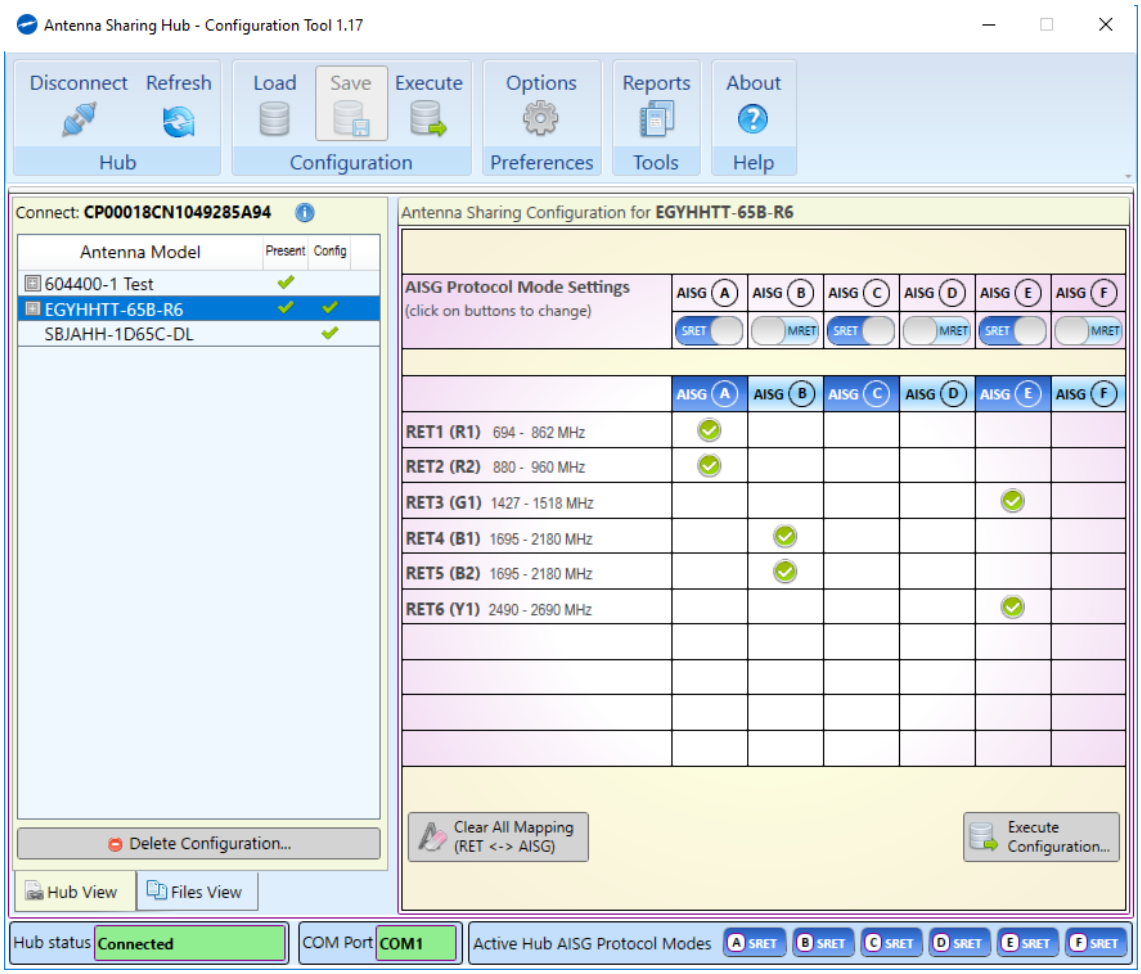

Figure 10 Antenna Sharing Hub Configuration Tool online and connected to COM1

Each of the antenna model shown in the "Hub View" list in the figure above has the following details (description of columns 'Present' and 'Config').

- 'EGYHHTT-65B-R6' is shown as that it has configuration and there is a device with this model connected to the ASH.
- 'SBJAH4-1D65C-DL' is shown as that it has configuration and there are no devices of this model connected to ASH.
- '604400-1 Test' is shown as that it has no configuration and there is a device with this model connected to the ASH.

Select an antenna model from the 'Hub view' list to display the configured antenna sharing mapping between the BTS/RRH control ports to the Antenna RET elements as shown in Figure 10.

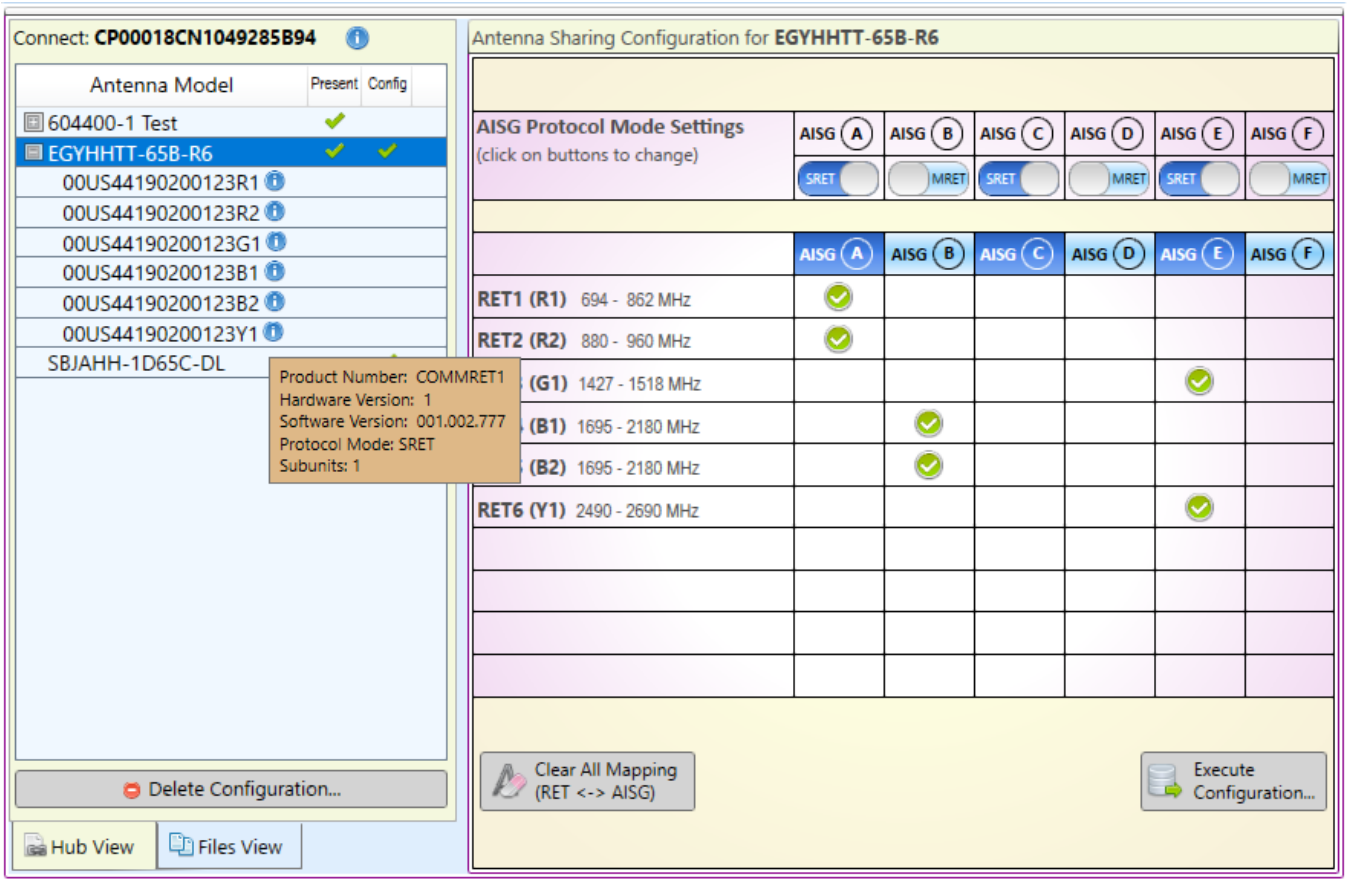

Figure 11 Configuration for Antenna Model 'EGYHHTT-65B-R6' depicting Scenario 4. Mixed RETs mapping.

The configuration shown for the antenna model 'EGYHHTT-65B-R6' in the figure 11 (above) uses the scenario 4 Mixed Rets mapping described in the section 2.2.4.

Also the clicking on the plus icon before the 'EGYHHTT-65B-R6' model name will display an expanded list of antenna device serial numbers based on the protocol mode (SRET/MRET) that are connected to the ASH. A window with device details is displayed when mouse is moved over the information icon at the end of the serial number as shown in the figure above.

3.2.4 Changing configuration for Antenna Sharing Hub

The Antenna Sharing for the chosen Antenna Model can be configured by selecting one of three possible access policies on each cell. These are:

1. Full Access
2. Restricted Access, or
3. No Access

Table below shows the Access Policy enforced by ANDREW ASH hardware for Full and Restricted Accesses.

AISG 2.0/3GPP Procedure	Full Access	Restricted Access
RET Discoverable	YES	YES
Reset Software	YES	YES
Get Alarm Status	YES	YES
Get Information	YES	YES
Clear Active Alarms	YES	YES
Read User Data	YES	YES
Write User Data	YES	YES
Alarm Subscribe	YES	YES
Self Test	YES	NO
Software Download	YES	NO
Vendor Specific Procedures	YES	YES
Set Device Data	YES	YES
Get Device Data	YES	YES
Calibrate	YES	NO
Send Configuration Data	YES	YES
Set Tilt	YES	NO
Get Tilt	YES	YES
Antenna Get Number of Antennas	YES	YES

Note: RET device is not discoverable through AISG2.0/3GPP device scan procedures under No Access Policy.

Table 1 AISG 2.0/3GPP Procedure Support versus Access Policy

With continuous mouse click on the same cell, user can navigate and select the desired access policy. Navigation of the changes in the access policies on a clicked cell are as follows.

(**Full Access**) → (**Restricted Access**)→ (**No Access**)→ (**Full Access**)

If the user had unselected the setting 'Enable the Restricted Operator Access option when mapping RETs' from the 'Preferences' window as described in section 3.2.2, the navigation of the changes in the access policies on a clicked cell are as follows.

(**Full Access**) → (**No Access**)→ (**Full Access**)

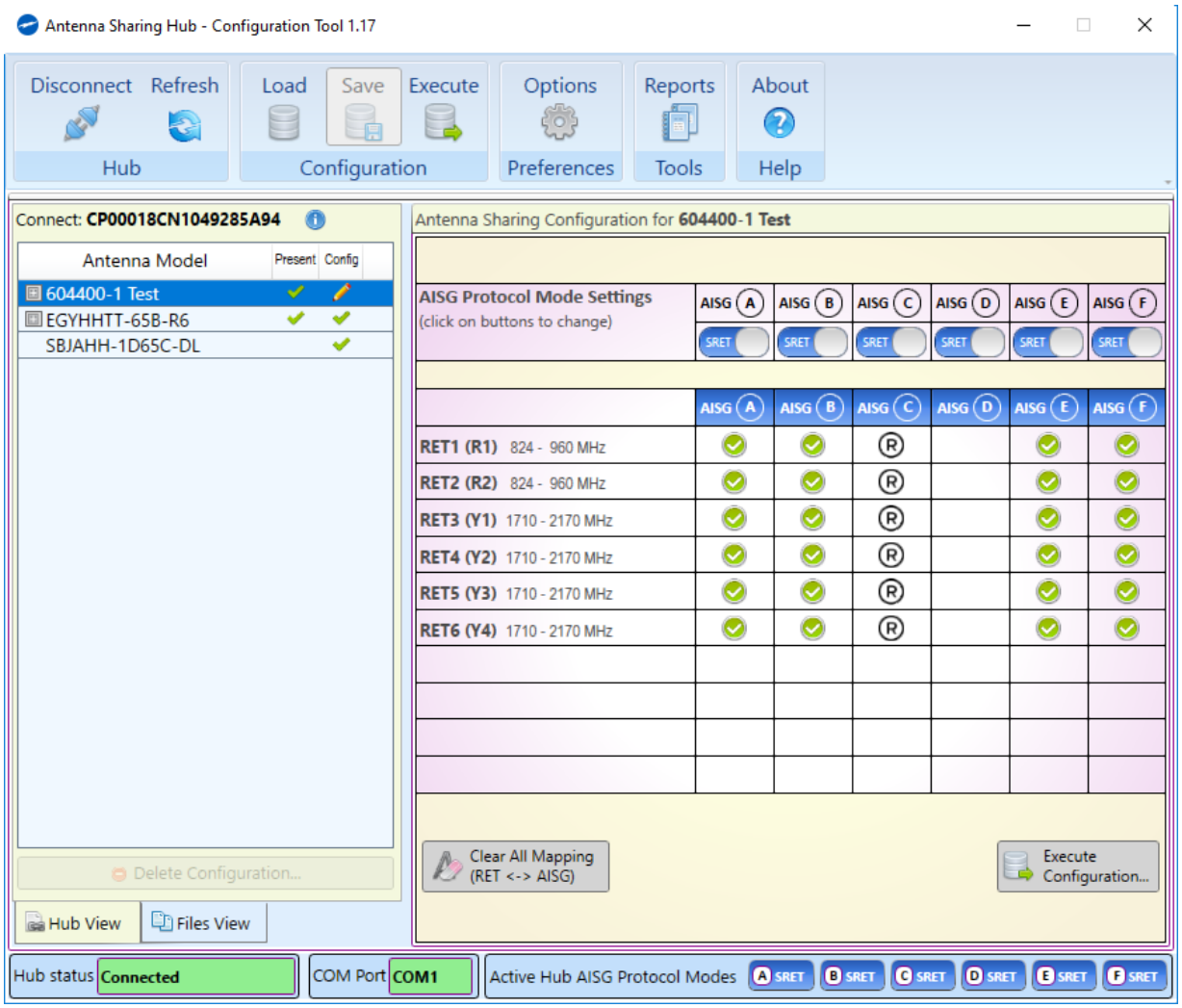

Figure 12 Antenna Sharing Access Level available for the chosen Antenna Model Online Mode

There is a popup menu available on a right click on the cell to select the access policy (Full Access, Restricted Access and No Access).

To store the changes to the Antenna Sharing Configuration for the chosen Antenna Model to a file, click the 'Execute configuration' button. In Online mode, the User has the option to send these changes to the connected ASH hardware

and/or also save to file as shown in Figure 13. The configuration data saved to a given file will have the extension name .dat.

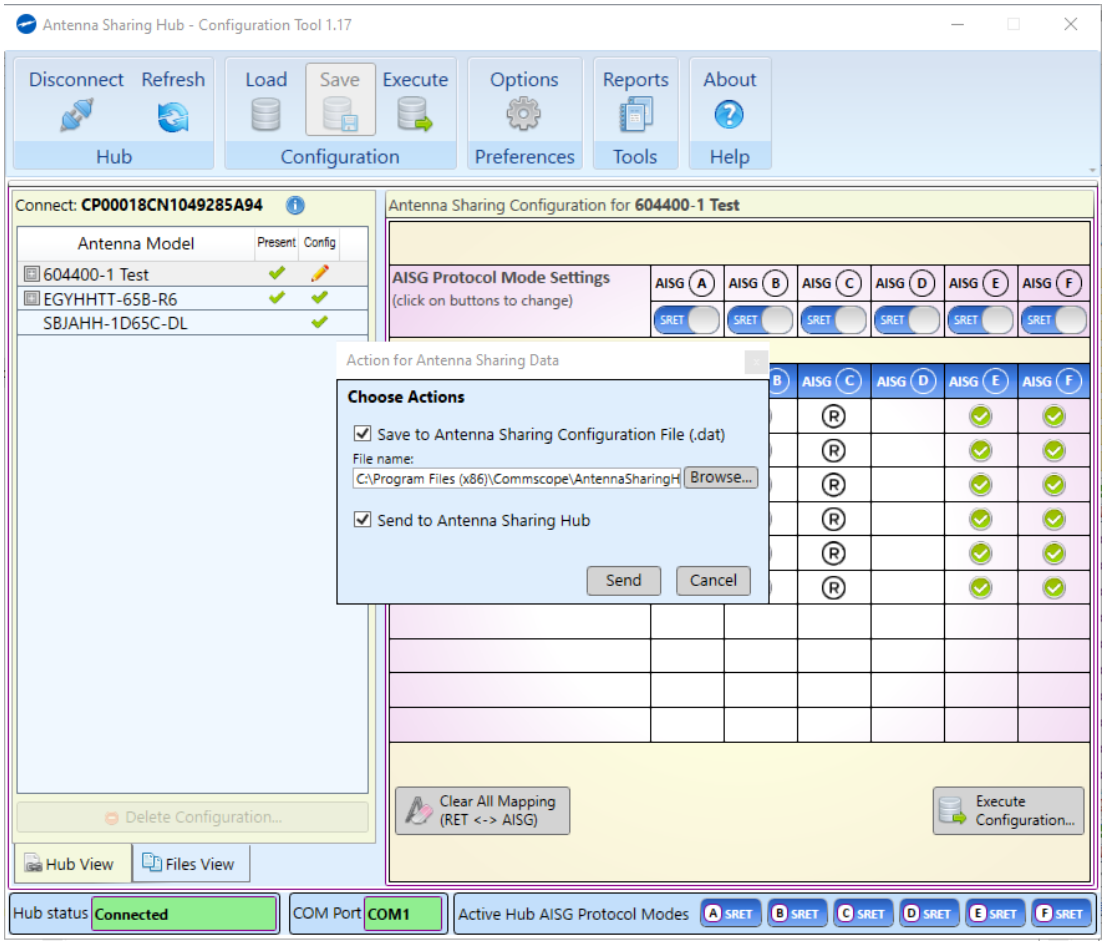

Figure 13 Storing changes to the Antenna Sharing Configuration Online mode.

Once the configuration is sent to ASH, a confirmation message is displayed as shown in Figure 14 below. The ASH will restart and the tool will show the status of ASH connection status.

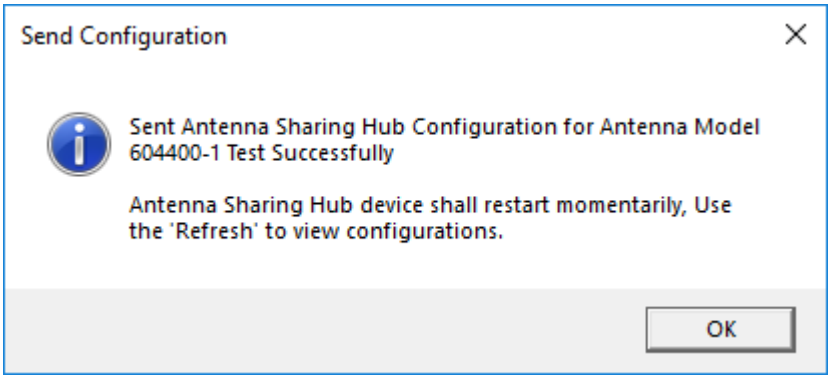

Figure 14 Confirmation message for sending configuration to ASH and/or file.

3.2.5 Using offline features in online mode

When connected to ASH, user can generate configuration using the 'File View' tab (offline mode). Select the 'Files View' tab and select the antenna model from the list to configure. Make changes to the default configuration by clicking on the cell for changing access policies and click on buttons (AISG protocol mode settings) for changing the BTS/RRH control port protocol modes as shown in the Figure 155 below.

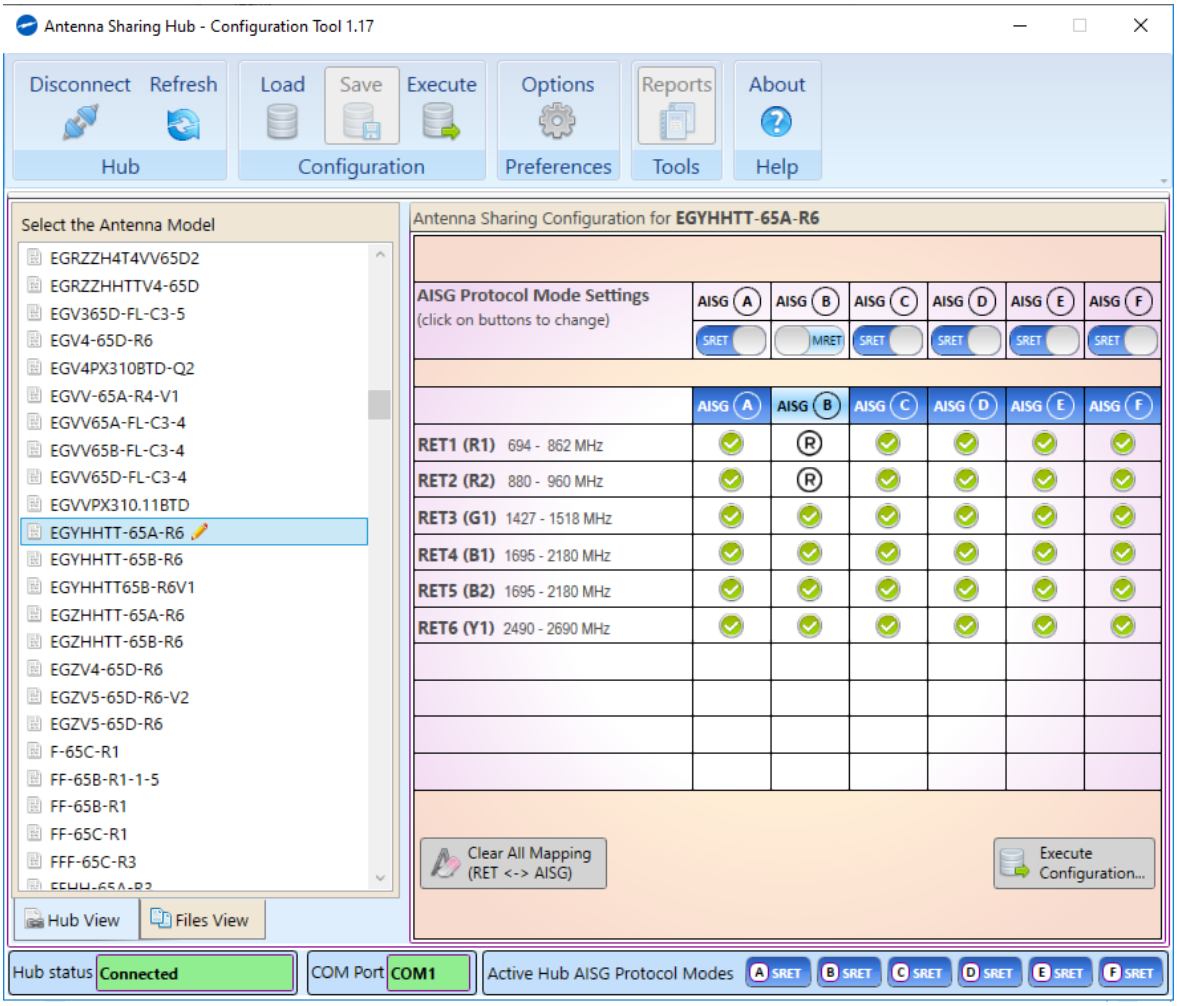

Figure 15 Generating Antenna Sharing Configuration using offline feature in online mode.

To store the changes for the selected antenna model, click on the 'Execute Configuration' button. The user will be prompted to send the changes to the connected ASH hardware and/or to save to a file as shown in Figure 13.

3.2.6 Protocol modes in configuration for Antenna Sharing Hub

The BTS/RRH control port protocol modes (SRET and MRET) for a selected antenna model can be changed for a given configuration by clicking on the buttons on the 'AISG Protocol Mode Settings' section as shown in the Figure 16 below.

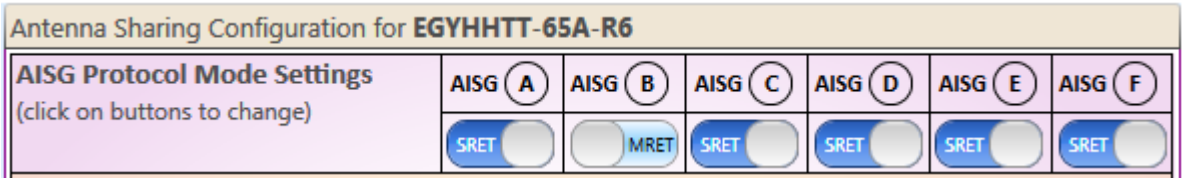

Figure 16 Changing BTS/RRH Control port protocol modes for given antenna model.

When connected to the ASH the current active protocol modes on the ASH's BTS/RRH control ports are shown in the section 'Active Hub AISG Protocol Modes' as shown in the Figure 17 below.

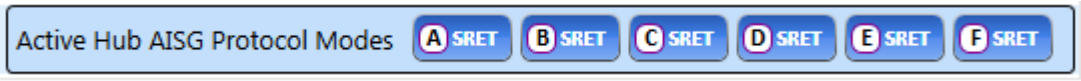

Figure 17 Current active BTS/RRH Control port protocol modes on ASH.

3.2.7 Editing saved configuration from file

To load and edit the configuration from a file, click on the 'Load' tool bar button under 'Configuration' group. Open file dialog is displayed for the user to select the configuration file (.dat extension) and click the 'Open' button. If the configuration that being loaded has an antenna model available in the selected tab (Hub View), the model is selected, and the configuration is displayed.

If the loaded configuration does not have an antenna model in the 'Hub View' list, then the following message is displayed.

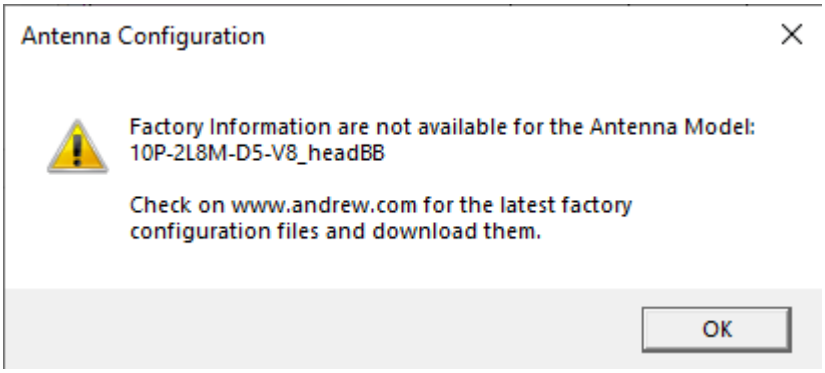

Figure 18 Message for non-availability of antenna model for loaded configuration from file.

The configuration can be changed and sent to ASH and/or saved to a file through 'Execute Configuration' button click.

3.2.8 Site Reports

Reports about the configurations and its details available in the connected ASH device are generated through the 'Reports' menu under 'Tools'. The report generate window allows the user to specify a file name or use the file name provided. The generated report file is of type pdf format and opened in the pdf viewer provided in the window as shown in Figure 21. The page size, orientation, margins, adding header footers for each of the PDF pages in the generated file be changed in PDF settings section. All report files (*.pdf) are available under the folder named 'HubReportFiles' in the ASH configuration tool installation folder.

Note: This feature requires an installed PDF viewer software, such as the Acrobat Reader with browser extension.

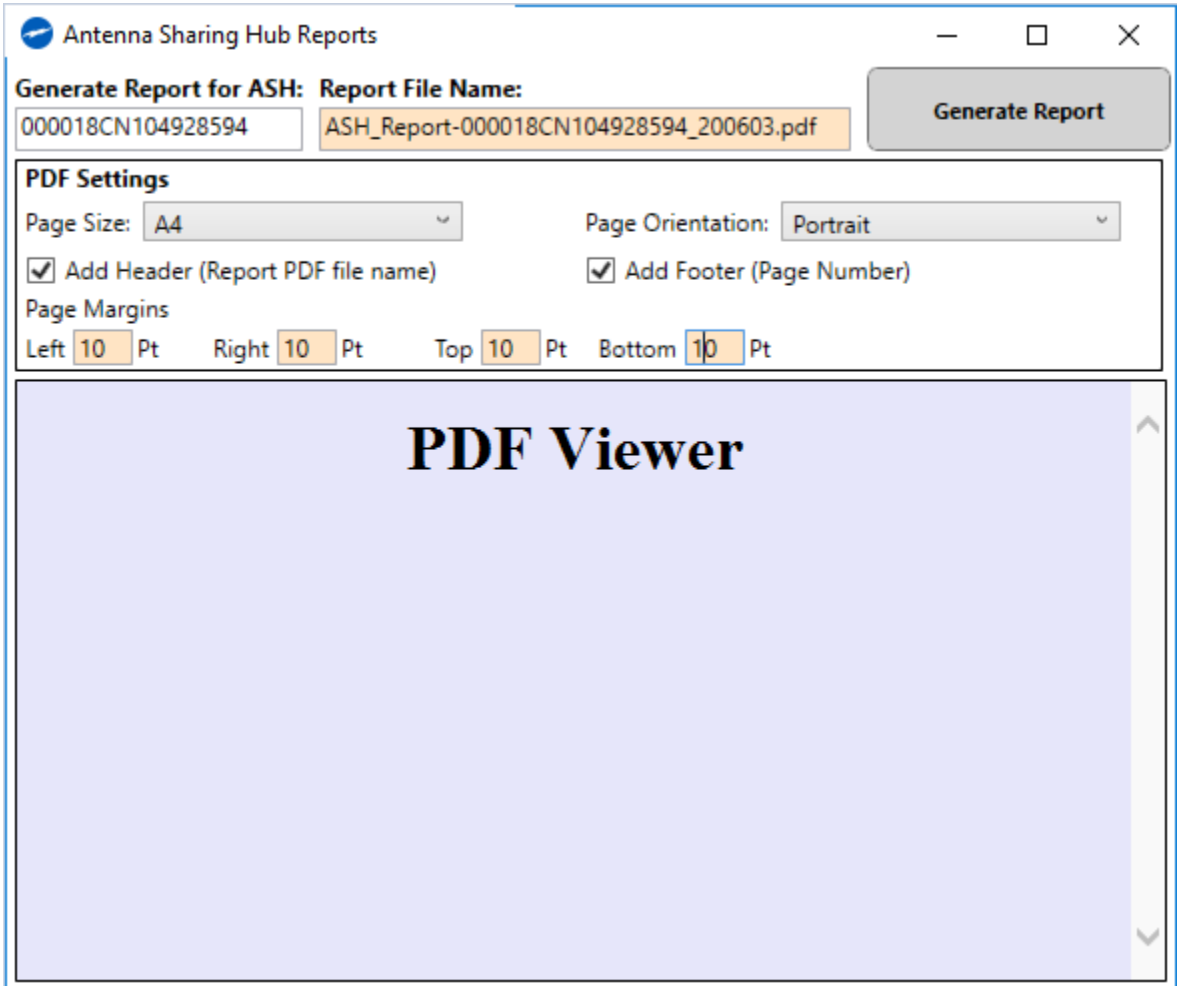

Figure 19 Site Report generate with viewer.

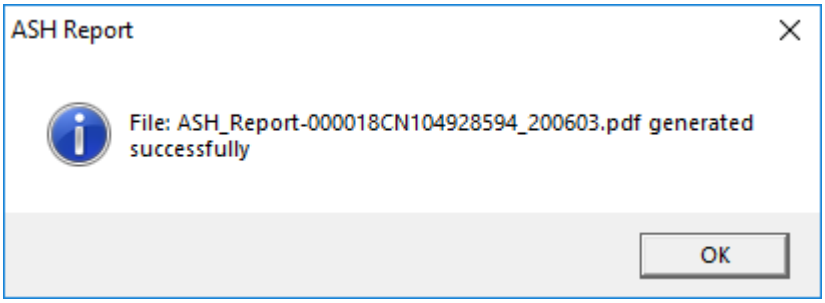

Figure 20 Confirmation message for report generation.

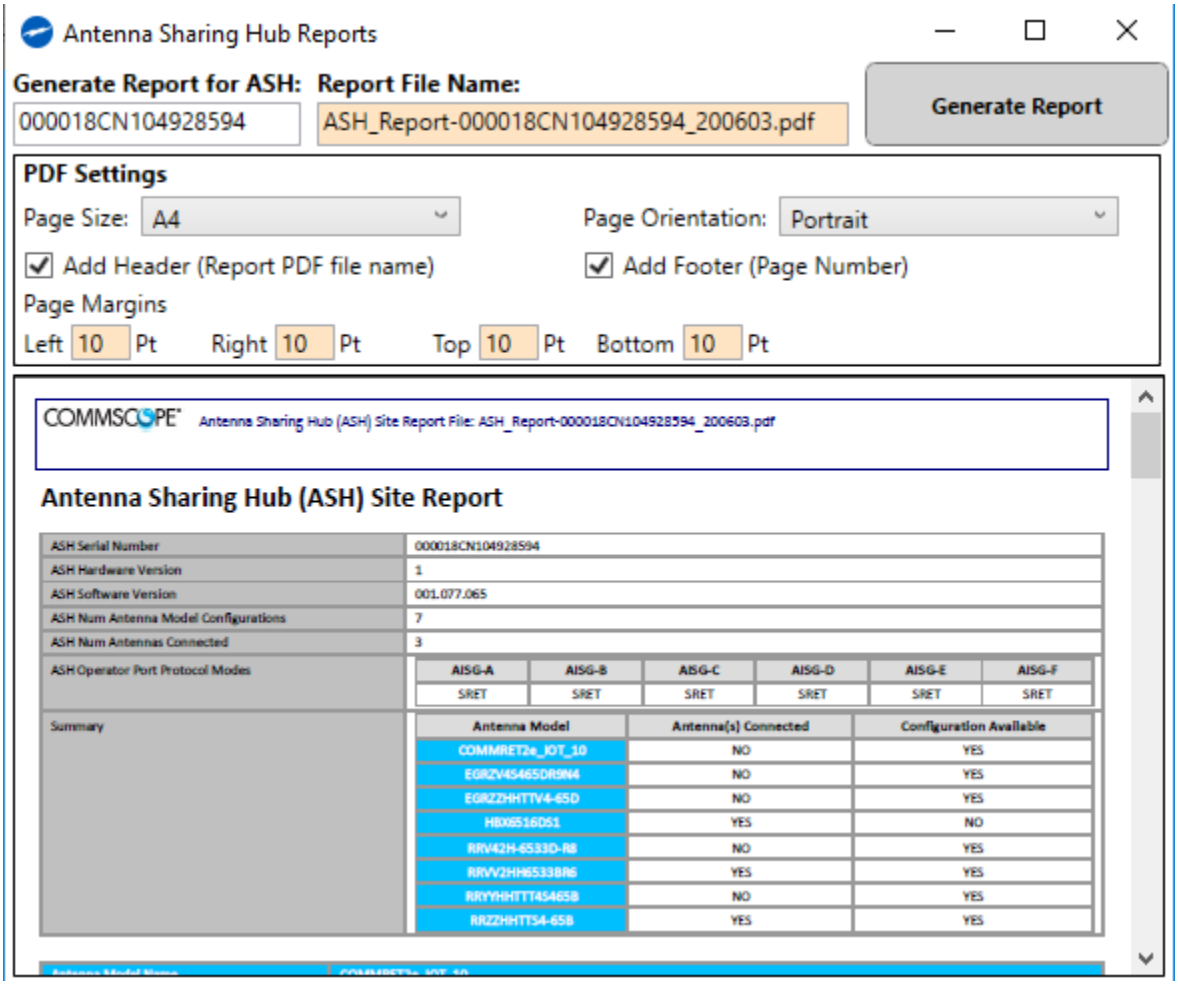

Figure 21 Generated report open in the viewer.

3.2.9 Firmware update for Antenna Sharing Hub

When the tool connects to the ASH (Connect tool bar button click), the firmware version from the ASH is compared to the bundled firmware version. If there is a need for updating the firmware on the ASH, tool displays the message with descending timer value as shown in the Figure 22 below.

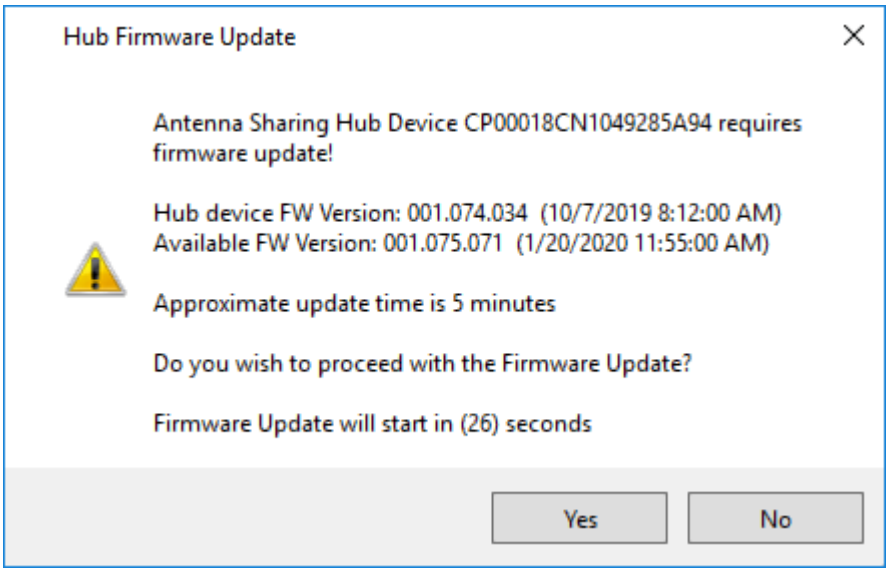

Figure 22 Firmware update notification message for ASH during connection.

On the elapse of the timer value on the message or the user click on 'Yes' button, the firmware update to the ASH will proceed as shown in the Figure 23 below.

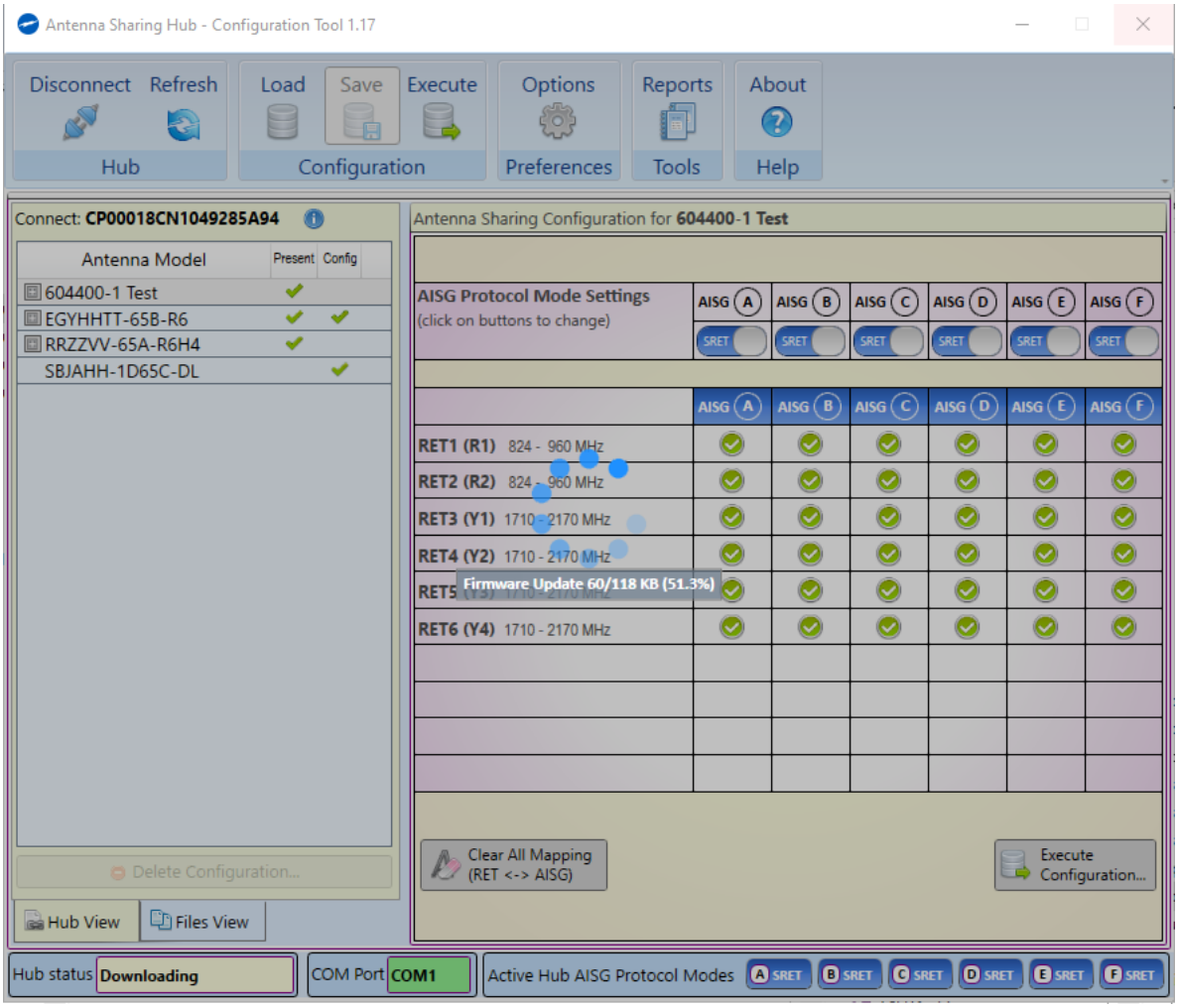

Figure 23 Firmware update progress for connected ASH.

On completion of the firmware update, following confirmation message is displayed as shown in the Figure 24 below. Once the firmware update is complete the ASH will restart.

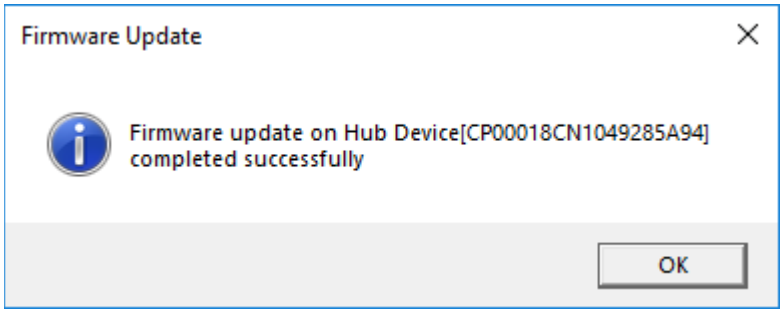

Figure 24 Confirmation message on the successful completion of firmware update.

3.3 Antenna Sharing Hub Configuration Tool (Offline mode)

In Offline mode, the Antenna Sharing Hub Configuration Tool software can be used to generate antenna sharing configuration files for supported ANDREW Antenna Models.

3.3.1 Launching Antenna Sharing Hub configuration tool

After the launch of the tool software select the 'Files View' tab to view the antenna models supported by the current software.

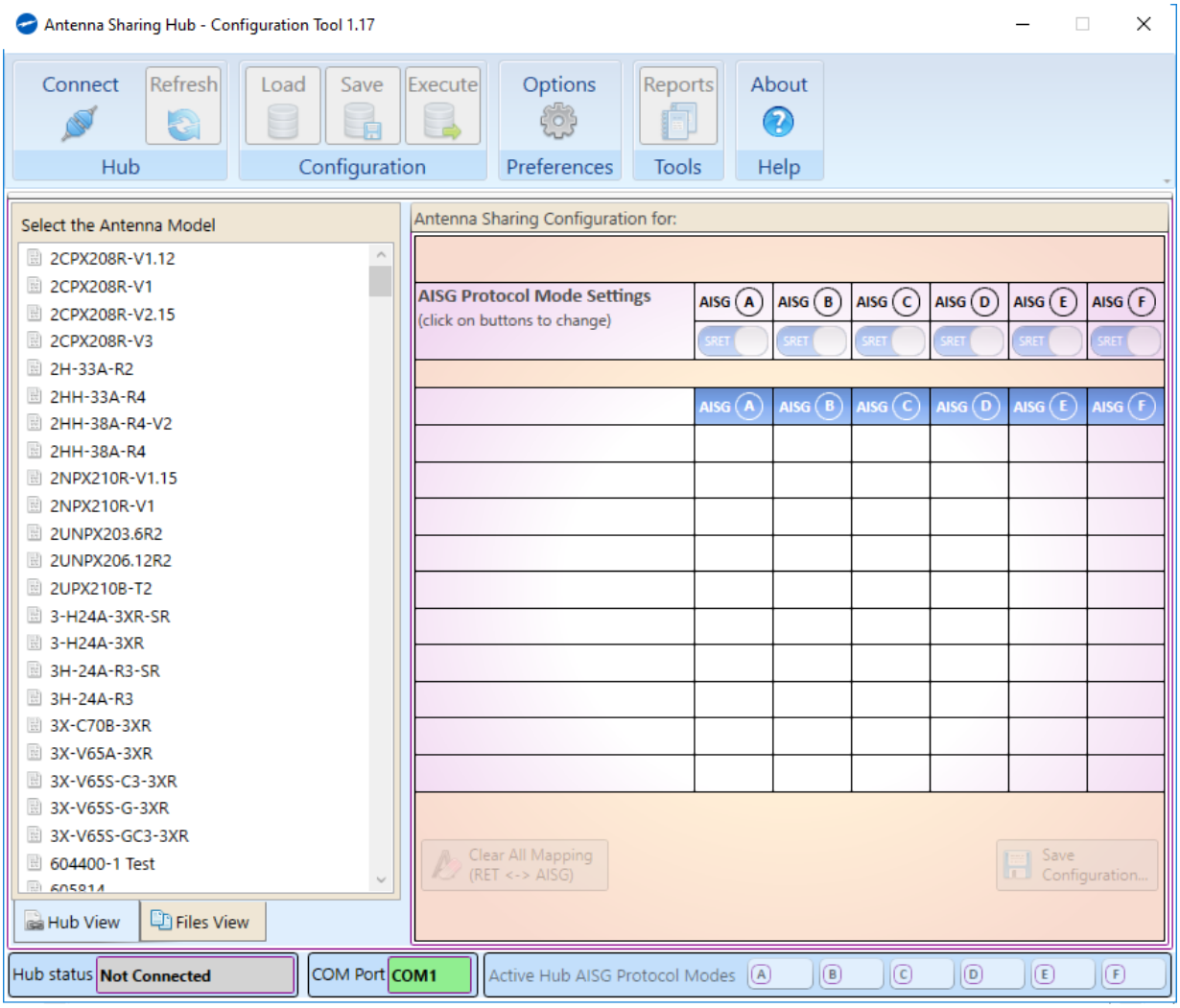

Figure 25 Antenna Sharing Configuration Tool Offline mode

Select an antenna model from the "Files View" list to begin the antenna sharing mapping procedure. On selection, the default configuration gives Full Access of all RET elements on all BTS/RRH control ports. See Figure 26.

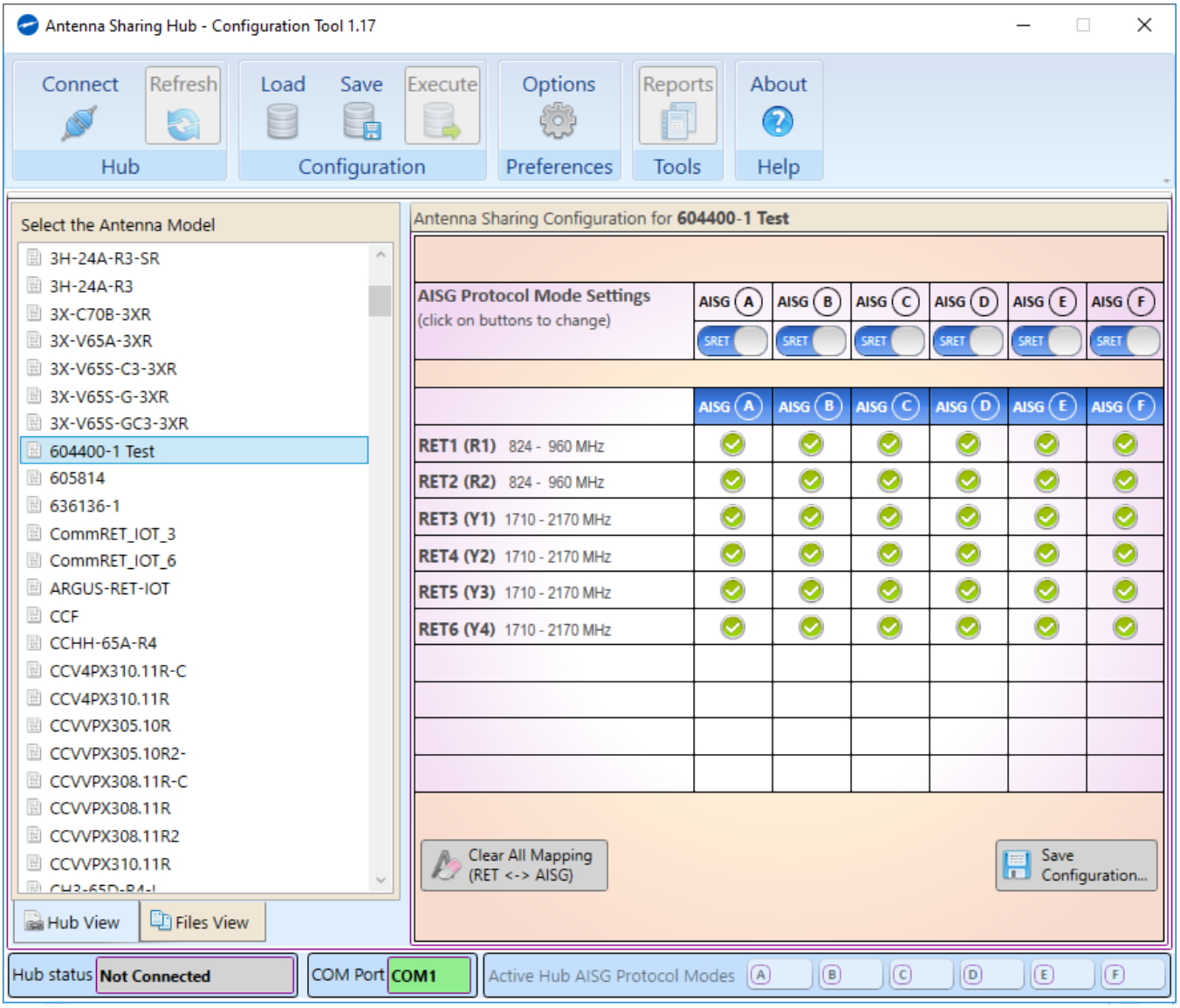

Figure 26 Default Antenna Sharing Access Policies.

3.3.2 Changing configuration for antenna model

The same procedure used in Online mode applies when changing Antenna Sharing for a particular Antenna Model in Offline mode. Click on the individual cell multiple times until desired Access policy is displayed. See Figure 27.

The BTS/RRH control port protocol modes (SRET and MRET) for a selected antenna model can be changed for a given configuration by clicking on the buttons on the 'AISG Protocol Mode Settings' section

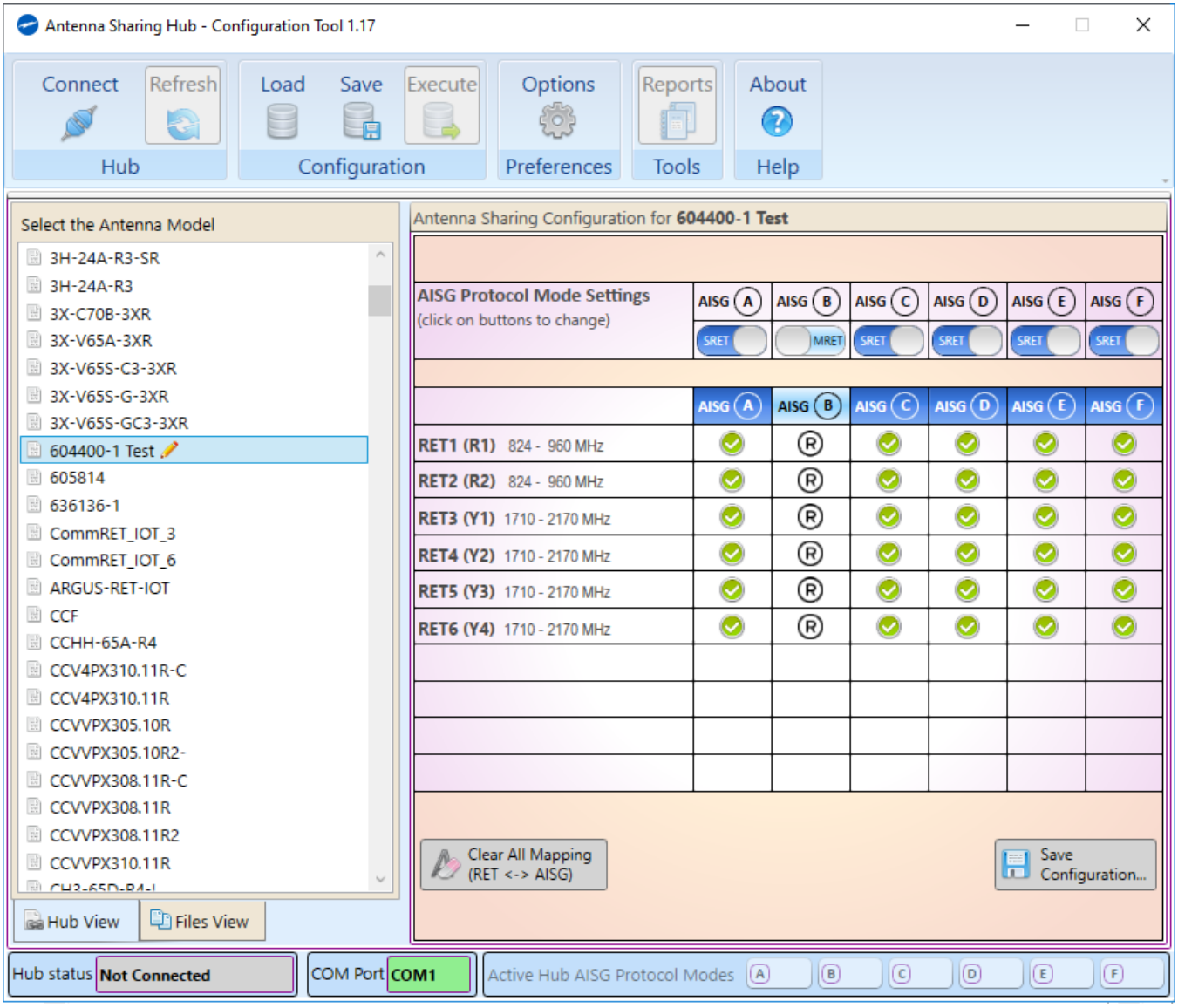

Figure 27 Antenna Sharing Access Level available for the chosen Antenna Model Offline Mode.

3.3.3 Saving configuration for antenna model

A generated Antenna Sharing Configuration for an antenna model can be saved as a .dat file and used to configure the ASH hardware by any AISG2.0/3GPP-compliant RRH/BTS controller. Refer to the section 3.4 for more details.

To save the configuration, select the 'Save Configuration' button and enter a meaningful name for the configuration file. The configuration data file with extension .dat is a binary file.

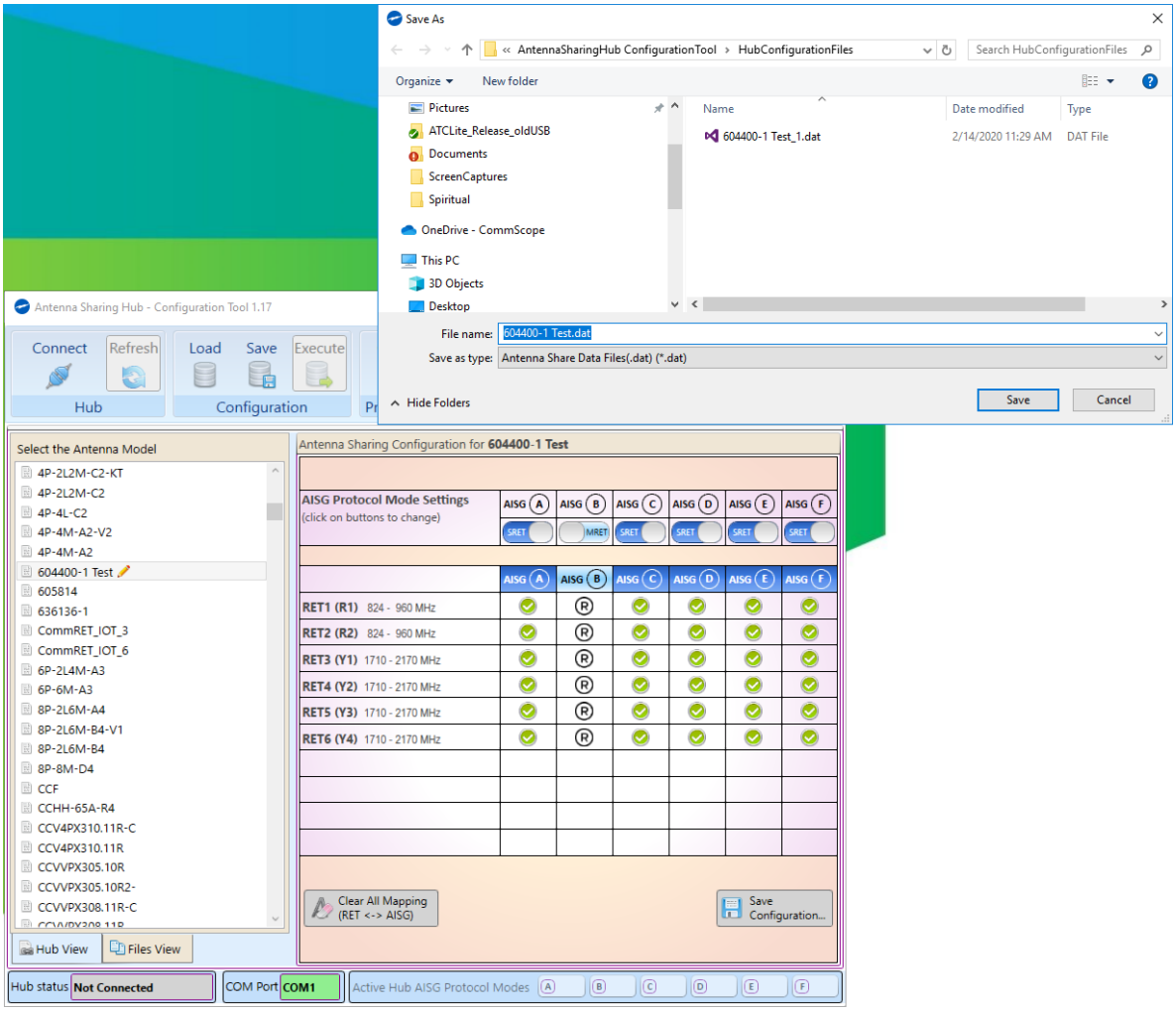

Figure 28 Saving Antenna Sharing Configuration .dat files.

3.3.4 Editing saved configuration from file

To load and edit the configuration from a file, click on the 'Load' tool bar button under 'Configuration' group. Open file dialog is displayed for the user to select the configuration file (.dat extension) and click the 'Open' button. If the configuration that being loaded has an antenna model available in the selected tab (Files View), the model is selected and the configuration is displayed.

If the loaded configuration does not have an antenna model in the 'Files View' list, then the following message is displayed.

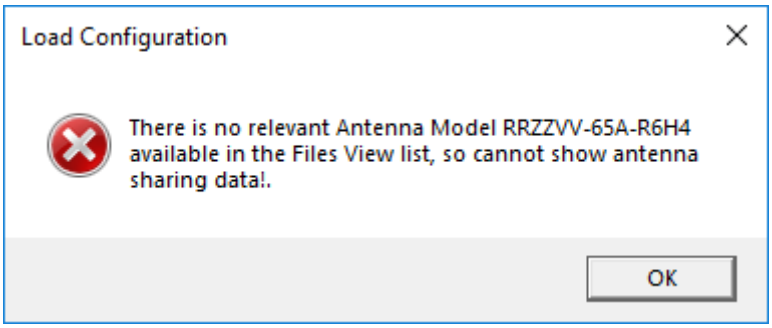

Figure 29 Message for non-availability of antenna model for loaded configuration from file.

The configuration can be changed and saved to file using the 'Save Configuration' button click.

3.4 Downloading Antenna Sharing Configurations Using Third Party Controllers

Any AISG2.0/3GPP-compliant BTS/RRH controller can be utilized to send a new antenna model configuration to the Antenna Sharing Hub. This can be accomplished in two ways:

1. Using **AISG 2.0 software download**. The controller must simply use the .dat binary file, created by the Antenna Sharing Hub Configuration Tool, as the payload for the software download to any addressed RET behind the ASH unit. (Note that the commanding operator port must have the Full Access Policy enforced.) The hub will recognize the command payload as a new configuration, intercept and store the data, and reboot with the new configuration applied.
2. Using **AISG 2.0 Send Configuration Data** (for SRET) or **AISG 2.0 Antenna Send Configuration Data** (for MRET). Again, the controller will use the .dat file as the payload for the configuration command, and the command can be addressed to any RET behind the ASH unit. (The commanding operator port can have Full Access or Restricted Access Policy enforced.) The hub will recognize the command payload as a new configuration, intercept and store the data, and reboot with the new configuration applied.

After the hub antenna sharing configuration has changed, it is best for all controllers connected to the hub to re-scan for RETs as RET access may have changed.

4. APPENDIX

4.1 Acronyms

3GPP	Third generation partnership project
ADC	Analog to Digital Converter
AISG	Antenna interface standards group
ASH	ANDREW Antenna Share Hub Hardware
ALD	Antenna line device
BTS	Base terrestrial station
CLI	Command Line Interface
CPU	Central Processor Unit
DAC	Digital to Analog Converter
DISC	Disconnect
FCS	Frame check sequence
FFS	For further study
FRMR	Frame reject
FW	Firmware
HDLC	High-level data link control
HW	Hardware
I2C	Inter−Integrated Circuit
I-FRAME	Information frame
ISO	International standards organization
ITU	International telecommunications union
LOC	Layer one converter
MRET	Multiple-antenna remote electrical tilt
MSRET	Multiple Single-RET remote electrical tilt
NRM	Normal response mode
P	Poll bit
P/F	Poll/Final bit
REJ	Reject
RET	Remote electrical tilt
RETU	Remote electrical tilt unit
RETAP	Remote electrical tilt application part

RF	Radio Frequency
RNR	Receiver not ready
RR	Receiver ready
SBT	Smart Bias Tee
SDD	Software design document
SRET	Single-antenna remote electrical tilt
SNRM	Set normal response mode
SQA	Software quality assurance
SRS	Software requirements specification
TBD	To be determined
TCP	Time consuming procedure
UA	Unnumbered acknowledgement
UART	Universal Asynchronous Receiver/Transmitter
uP	Micro Processor
XID	Exchange identification

4.2 Known Limitation and Constraints

ANDREW Antenna Share Hub Hardware acts as a Proxy between BTS/RRH Controllers and daisy chained Antenna internal RETs. Because ANDREW ASH has no control over response time of every Antenna internal RETs there are scenarios where strict compliance with AISG 2.0/3GPP response time cannot be achieved. Here, we list known issues measured during ANDREW internal stressed qualification testing.

1. It will take slightly longer to complete an AISG software download to an Antenna RET when it is connected behind the ASH. Measured time estimates for COMMRET1 and COMMRET2 Antennas are shown below.

Antenna RET System	AISG Download Without ASH	AISG Download Thru ASH
COMMRET2	10min	15min
COMMRET1 (EGYHHTT-65B-R6)	15min	20min

Table 2 Estimated AISG2.0/3GPP Software Download Times

2. If an antenna RET is in a protocol mode different from configured RRH/BTS control port protocol mode, due to the protocol translation, AISG2.0/3GPP responses could exceed 1 second.

3. The ASH Ghost RET is operational within 3 seconds after an ASH's board level reset. However, mapped RETs at ASH BTS/RRH control ports will not be operational until AISG2.0/3GPP device scan is completed at ASH output port in the event of an ASH board level reset.