

User's Guide for the SFCG Satellite Database (SSDB)

Introduction

The SFCG database was designed as a web application. It was intended for multiple agencies to be able to enter data into the same database concurrently. This approach ensures that all users have access to the most up-to-date version of the mission data. The database is hosted on a NASA server. Accounts are password protected and coordinated through a single account administrator. The application is accessible via the SFCG web page.

Account Levels

There are two user levels for the database application: *entry* and *approval*. Each agency may have multiple entry accounts, but will be assigned only one approval account. An entry-level user will be able to access the entry forms and provide data for any mission that belongs to their agency. During this data entry process, the mission data is only accessible to that agency via the entry forms. The data will not appear during searches and will not be accessible to any other agencies. Each agency will appoint a single point of contact to have approval authority. This person has the responsibility of verifying the data entered for their agency's missions and officially submitting the mission to the database so that the data is accessible to other agencies via the on-line search engine.

Database Structure

The database is designed around the notion that all of the equipment is defined first, and then linked together. An example diagram of the database structure is shown in Figure 1. This figure shows only the satellite branches associated with the mission; there would be corresponding branches for each ground station or relay satellite used (not shown in the interest of space).

Level 1 of the figure contains all of the high-level mission data. This information would include parameters such as mission name, launch date, point-of-contact, etc. Level 2 identifies the stations, both earth and space, associated with the mission. Although most space research and Earth exploration missions have a single satellite, it is possible that a mission may have a target and chaser configuration, or be composed of a constellation of satellites. For this reason, the user could add any number of satellites associated with the mission.

Level 3 associates the RF equipment with the station(s). Figure 1 identifies the transmitters and receivers as being invisible to the user. These are only needed to identify an antenna as transmitting or receiving when connected to create the links; there is no data collected for this equipment. For each station (e.g. a satellite in Figure 1), antennas and/or sensors are defined in the third level. It should be noted that antennas should be thought of in logical terms, and not as physical entities. That is, if a single physical antenna were used to transmit and receive at S-band, and transmit at X-band, it would be defined as three logical antennas in the database. Sensors are only defined for satellites.

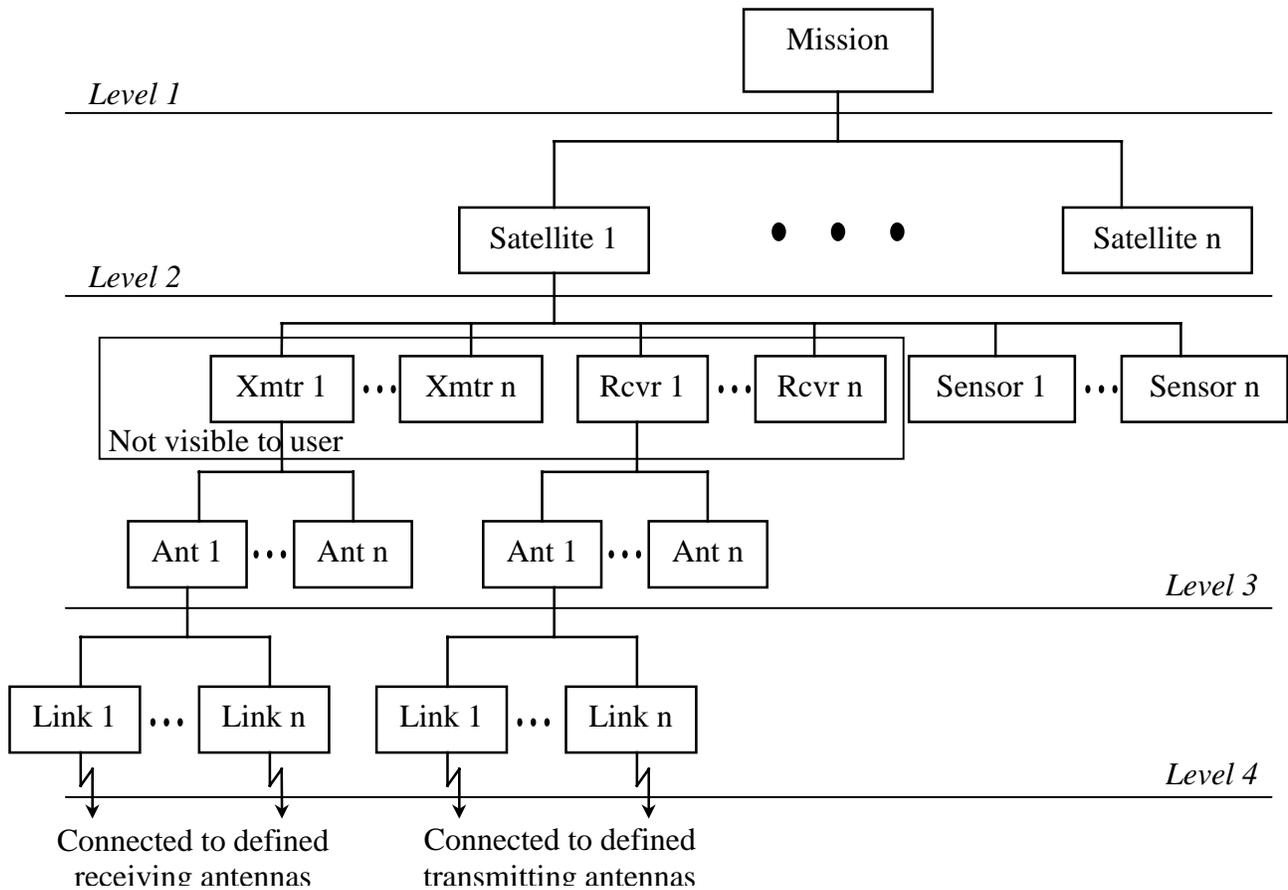


Figure 1: Database Structure Example

In Figure 1, the section labeled as Level 4 designates the portion of the data that defines the link parameters. First a connection is defined from a transmitting to a receiving antenna. Additionally, link and channel communications parameters are included in this section.

Workflow

The entry portion of the database follows a logical workflow stemming from the database design. The workflow diagram is shown in Figure 2. The graphic was designed to aide the user in supplying data to the database. The user provides the data, going from left to right, stepping through each color. The graphic is an image map, so clicking on the “Mission” box in the red section would take the user to the data entry form to supply the high-level mission information. Next, the user would proceed to the orange box, which is used to provide mission specific station information. Any number of satellites or ground stations can be added for a given mission. Within this level, the user will be prompted to add antennas and sensors (satellites only). The yellow box has two hot spots image-mapped: one to relay satellites and one to earth stations. This is the section where a user can identify resources that the mission is using, but are not owned by the mission. These are referred to as “Shared Resources”. This saves the user from supplying data that is

already in the database by allowing them to select from a drop-down option list of available shared resources.

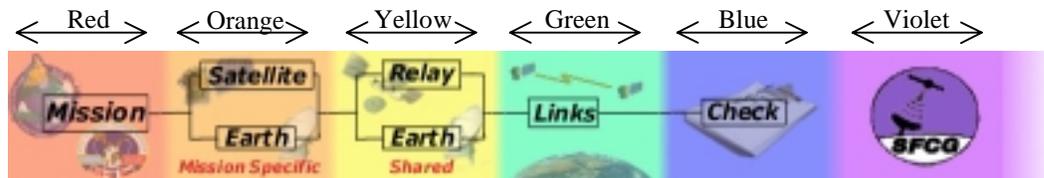


Figure 2: Data Entry Workflow Graphic

Once all stations are defined, the user proceeds to the green box to define the links. This involves first selecting transmitting and receiving antennas and then defining communications parameters. All required stations and antennas must have been defined before proceeding to the links. The reason for this is that the available antennas for defining the link are in a selection list that is built dynamically, based on the transmitting and receiving stations and antennas that have been defined for the mission. The last step the user performs on the workflow is in the blue box: check and submit for approval. The system has built in checks to ensure that defined elements are used, as well as system compatibility and boundary checking.

Data Entry

Entry Page Anatomy

There are up to five basic areas on the entry pages. Figure 3 depicts each of these partitions. The workflow is at the top of every page in the entry section (discussed in detail in the previous section). The next area down is the selection partition. This portion changes with the area clicked on in the workflow. The background color matches the color on the workflow to give users a quick visual indicator as to where they are in the process (Figure 3 shows the form for a satellite; therefore, the selection portion is orange). The drop-down selection box in this section shows all elements available, as well as the option of adding a new element. For the satellite, the selection box would contain the option of adding a new satellite to the mission or selecting from any of the satellites previously added.

The location partition of the page simply tells the user where they are in the process. This also allows the users to jump to any parent level in the tree. Clicking on the “Mission TEST” in “Current Location: Mission: TEST > Spacecraft: TEST” from Figure 3 would return the user to the mission entry form for the TEST mission. The next partition on the page is the form itself. This area may update dynamically as selections are made. The last partition, which may or may not appear, is for connected elements. This is used when the high level elements that are on the workflow have elements associated with them that need to be defined. For a user-defined satellite or ground station, this section includes options to add or modify existing sensors and/or antennas. The link form allows users to define the channel parameters.

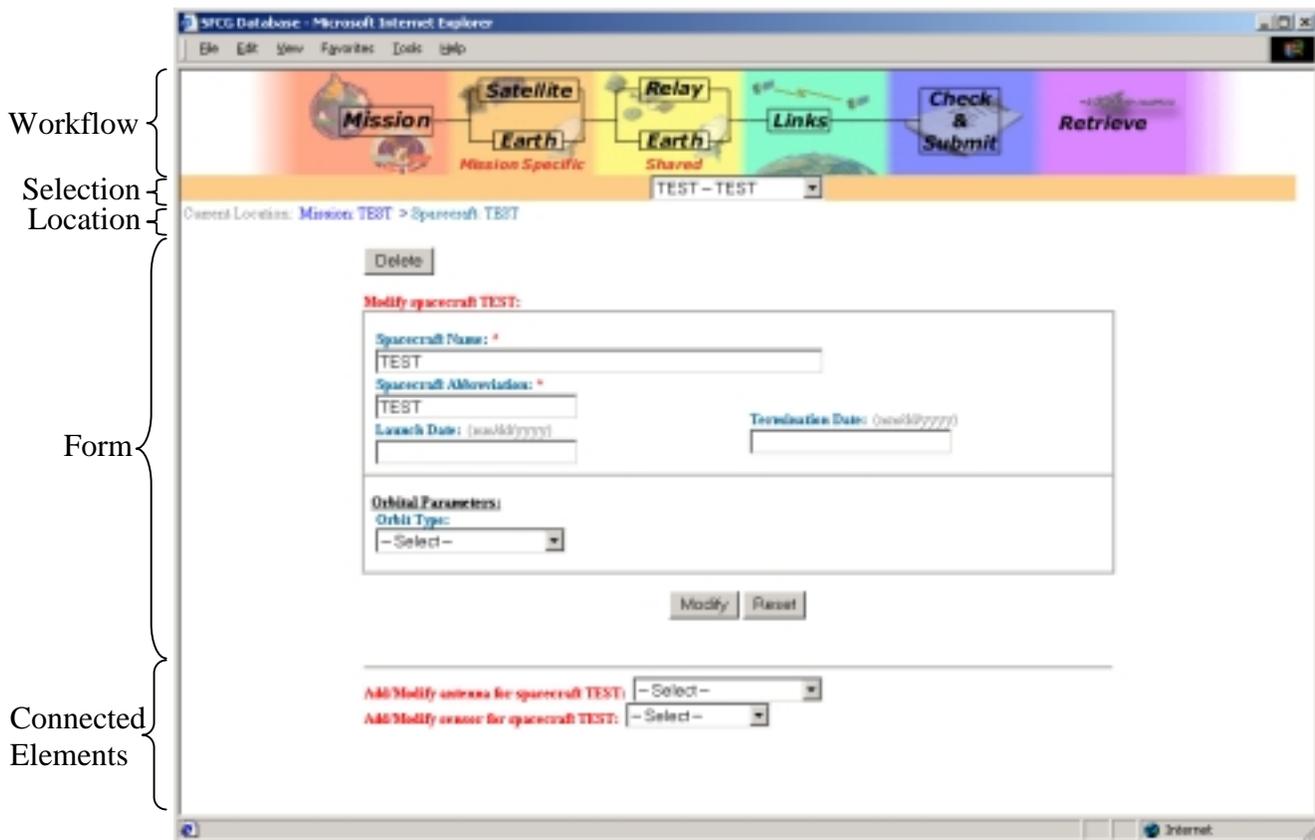


Figure 3: Entry page partitions

Step-by-Step

This section contains a summary of the process for adding or modifying a mission.

1. From the SFCGDB home page, click on “Mission Entry” in the left navigation frame or click on “Entry” in the bottom right-hand corner of the image map.
2. Enter the account user login and password. This will open a separate browser window. Initially the page only consists of the workflow graphic and the drop-down selection for the missions. The selection list is populated with all missions in the entry phase for the user’s agency.
3. Select an existing mission or opt to add a new mission. The page is refreshed, now displaying the mission form.
4. Fill in all known information. Note that items with a red asterisk are required fields. In Figure 3, Spacecraft Name and Spacecraft Abbreviation are such fields. These must be filled in to properly structure the database. A user cannot proceed until all asterisked parameters have been supplied. Other parameters should be supplied as information is available, but a user can come back and add this information at a later time.
5. Proceed, repeating steps 3 and 4 for all elements. Below is the order a user is prompted to enter data.

- a. Mission
- b. Mission Specific Spacecraft
 - i. Antennas
 - ii. Sensors
- c. Mission Specific Ground Stations
 - i. Antennas
- d. Shared Relay Satellite
- e. Shared Ground Station
- f. Link
 - i. Channel

Information is not provided through the forms for shared resources. Instead, a user simply selects from the available resources by highlighting and clicking the right arrow to move the option to the selected box. An example of this window is shown in Figure 4. When all of the desired resources are selected the user proceeds using the workflow image-map.

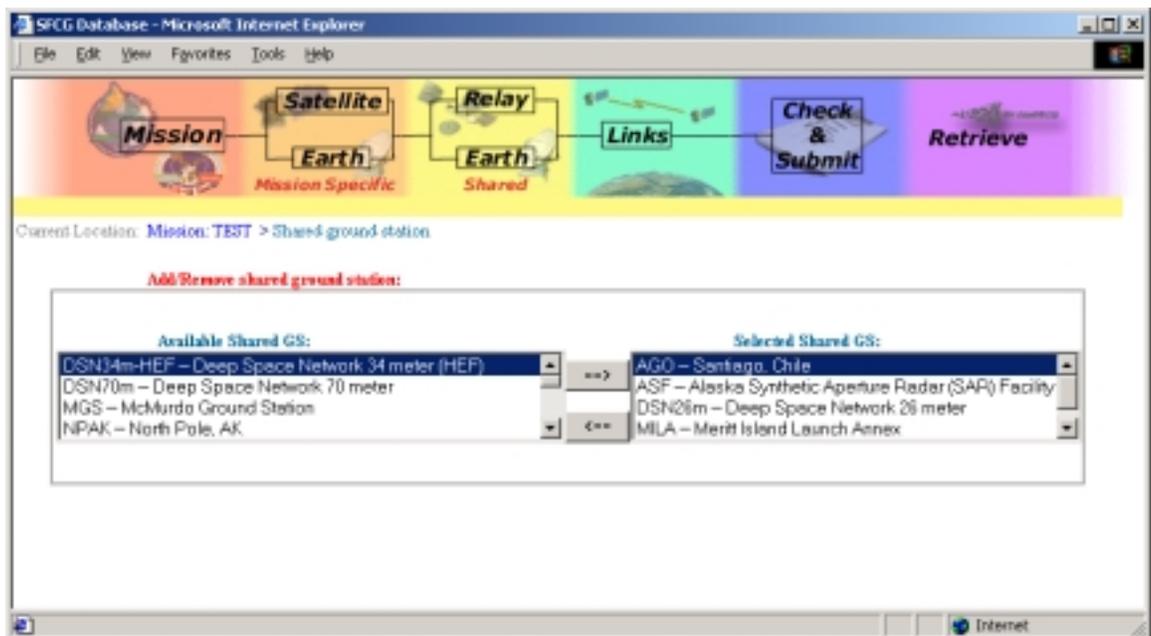


Figure 4: Shared resource selection

6. The last step is for the user to define the links. When a user clicks on the Links box in the workflow, the selection section contains a drop-down selection box. This box will allow users to edit any existing link or add a new link. If the user opts to add a new link, the link type must be identified: Uplink, Non-Broadcast Downlink, Broadcast Downlink, Forward Link, Return Link, and Space-To-Space Link. The required parameters are dependent on the link type. Selection boxes are filled based on the previously defined elements. For example, Figure 5 shows the form for an uplink. In this case, a ground station and associated antenna are selected as the transmitting elements. Conversely, a spacecraft and associated antenna are selected to receive.

Figure 5: Uplink Entry Form

In the case of Forward and Return Links, currently the user is prompted for service information specific to NASA's Tracking and Data Relay Satellite System (TDRSS), since that is the only relay system in the database at this time. The user is also queried for various link communication parameters. Some link characteristics are defined once for the link and some are defined on a per channel basis.

7. When all of the data is entered, there are a series of checks that the application will run. These are discussed in the following section.

Mission Submittal

When all of the mission data is supplied, the user is ready to submit the mission. Up to this point, the mission has not been available for viewing by other agencies and is not displayed in the search portion of the site. Before making the data available, users should run a check on the data. This is done by clicking the check image-map. The application will perform a number of system checks, including: boundary checking, unused equipment or resources, and compatibility. Any items where the mission fails should be corrected before the mission is submitted.

Submitting the mission is actually a different function for the entry level and the approval level users. When an entry-level person submits a mission, an email is sent to the approval person to notify them that all of the data has been provided and the mission is

ready for review. Once the agency approval person has verified all of the mission data, they submit the data to the database. Only after the designated agency approval person verifies and submits the data is it available for viewing via the search tool provided.

Search

A user will need an account to search the database. Accounts can be set with only search permissions for those who will not be performing data entry. Users can proceed to the search area by using the navigation on the left hand side of the home page or clicking on the graphic “Search” text on the top of the page. There are two searches available: link search and sensor search.

The link search form has the following options as search criteria: circle around specified location, link type, orbit type, frequency range, agency, mission, and time frame. Figure 6 shows the link search form. Each criterion that is applied will further limit the search. Circle around specified location allows a user to select either a specified mission ground station or enter a specific longitude and latitude. In either case, the radius around the location needs to be supplied. This can be used to limit the search geographically. The link type allows the user to specify the direction of the link. Options are: Uplink, Downlink, Forward, Return, or Space-to-Space. The orbit type parameter allows the user to select one or more orbit type(s) for consideration: geo-synchronous, sun-synchronous, Lagrangian, deep space, or other non-synchronous. The frequency notation and display result are parameters that format the result of the search.

Both the link and sensor forms share these criteria: frequency range, agency, mission, and time frame. The frequency range criterion allows a user to enter a minimum and maximum frequency. The search engine compares these against the frequency ranges in the database. Both agency and mission selections provide the user the ability to limit the number of agencies or missions considered in the search. For the time frame parameter, the user can specify a starting and ending date. This is very important in mission model planning. The sensor form also offers the user the option to specify the sensor type: active, passive, or both.

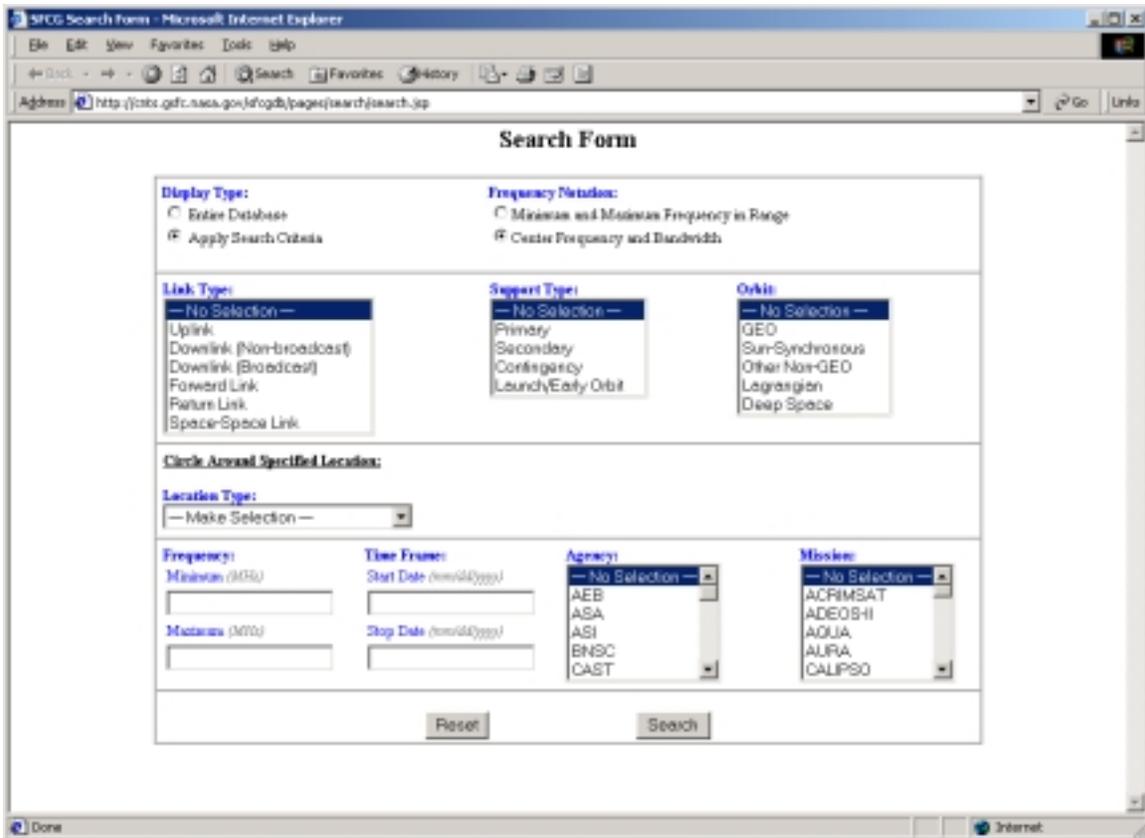


Figure 6: Link Search Form

The search will produce a summary table of high-level information. The user has the option to reorder the display by clicking on any of the column headers that are underlined. The user also has the option to view the data summary in Excel and MSWord formats in addition to the html web page shown in Figure 7.

Sensor Summary Table
4 Record(s) matched

<u>Sensor Link Identifier</u>	<u>Mission</u>	<u>Agency</u>	<u>Center Frequency</u> (MHz)	<u>Bandwidth</u> (MHz)	<u>Sensor Type</u>	<u>Phenomenon Measured</u>	<u>Mission Start</u> (yyyy-mm-dd)	<u>Mission Stop</u> (yyyy-mm-dd)
Test 1/1_2000	FAST	NASA GSFC	1.2000	12.0000	Active	Clouds, humidity, nitrous oxide	1996-08-21	
Test 2/1_3000	ICESAT	NASA GSFC	1.3000	13.0000	Passive	Chlorine oxide	2001-12-15	
Test 2/2_3000	ICESAT	NASA GSFC	2.3000	23.0000	Passive	Chlorine oxide	2001-12-15	
Test 2/3_3000	ICESAT	NASA GSFC	3.3000	33.0000	Passive	Chlorine oxide	2001-12-15	

Figure 7: Sensor Summary Table Display

The left-most column contains the unique link identifier. Clicking on this link text will update the page to display the details of the selected link. The detailed display for the sensor is shown in Figure 8. The arrow buttons at the top of the page allow the user to view the details of other links contained in the summary table without having to go back to the summary each time. The buttons (from left to right) allow the user to go to the first entry in the list, the previous record, the next record, and the last record entry in the summary table.

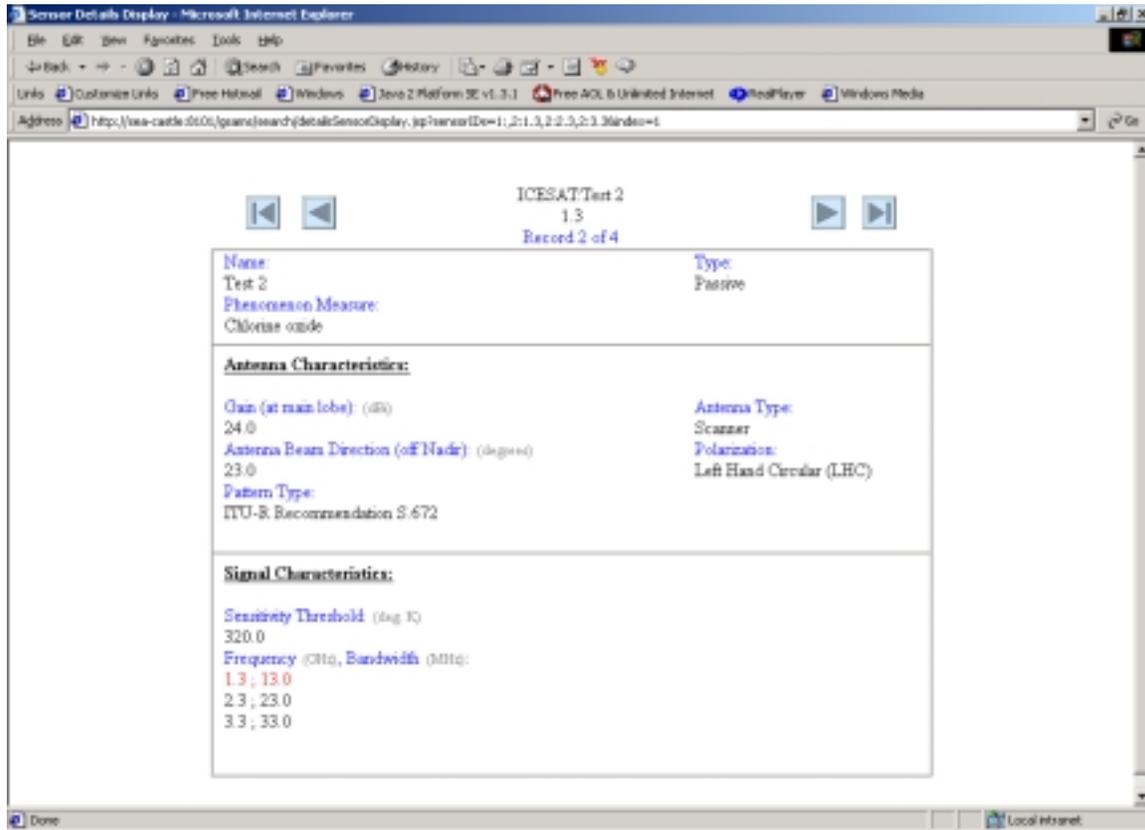


Figure 8: Sensor Search Detailed Display

Summary

This document should provide the user with enough guidance to begin entering mission data. There is a brief help section available on-line; it is accessible by clicking on "Help" in the left navigation panel. If there are further questions about data entry, or the site in general, please contact the appropriate person as listed on the contact page. For search and display options, please contact the person listed as responsible for "Site Functionality Questions/Problems" on the contact page.