

1 COMSAT IOT System Atom Files and Usage

1.1 Introduction

This section describes the operational context and usage of ‘*atom files*’ on the *COMSAT Standard In-Orbit Test System*.

1.2 IOT System Top Window

The IOT System *Top* window is the user’s primary human-computer interface control panel to the IOT System measurements and functions.

The *Top* window *IOT* menu displays the available IOT measurements configured on that particular IOT System e.g.:

- EIRP...*
- G/T...*
- Inband...*
- MultiSlew...*
- NPR...*
- Phase Noise...*
- Slew...*
- Step Attenuator...*
- Spurious Output...*
- Telemetry Mod Index...*

1.3 The Measurement User Interface Window

When an IOT measurement is selected in the *Top* window menu, a *measurement user interface (MUI)* window for that measurement is displayed.

MUI windows are based on the human-computer interface paradigm known as the *graphical user interface (GUI)*.

1.3.1 General MUI Operation

The MUI window enables the user to interactively specify the measurement and to perform atom file operations.

Each MUI window contains several panels of measurement setup information:

- Spacecraft*
- Comments*
- Weather*
- Control*
- Schedule*

Each MUI window also has the following window control pushbuttons:

[OK]
[Restore]
[Close]

When an MUI window is first displayed, it displays default values for operator-accessible controls.

The user can:

- a) leave the controls in their default state;
- b) modify the controls.

In either case, when the user presses the *[OK]* button, the specified measurement is scheduled to run immediately or at a later time by the IOT System's *Scheduler*, a program that is started when the system boots up. Once launched at system boot-up, the *Scheduler* program executes continuously as a background daemon process.

The *Scheduler* process maintains and allocates the system resources required by the IOT measurements. If the resources are available at the time the measurement is scheduled to run, the *Scheduler* allocates the resources to the measurement and the measurement is then performed. Otherwise, it queues the scheduled measurement in a waiting-for-resources list. When the resources do become available, they are allocated to the next waiting measurement and it is then run. If two or more measurements are scheduled to run at the same time, the *Scheduler* process performs the measurements on a "first-come, first-served" basis and queues the others in the waiting-for-resources list.

1.3.2 MUI Window Atom File Operations

The user can also perform IOT measurements via *atom files*. Atom files can be created, edited, printed, scheduled, and executed.

Atom files are uniquely named human-readable ASCII text files created and stored on the IOT System as permanent, non-volatile disk files. An atom file contains all of the configuration and setup information required to perform a particular "*instance*" of an IOT measurement such as a Flux/ EIRP measurement.

MUI windows contain a *File* menu below the window title that enable the following atom file operations to be performed:

New
Open
Save
Save As
Close

1.3.2.1 New Operation

When the *File => New* operation is selected, a new atom file name is displayed in the MUI window title. Measurement controls remain unchanged.

Using the *New* atom operation, a new atom file can be generated in the *"/tmp"* directory, prototyped, and tested before it is moved into a permanent IOT measurement atom file directory.

1.3.2.2 Open Operation

The *File => Open* operation is selected to open an existing atom file previously created.

When *File => Open* is selected, a dialog window is displayed whose title matches that of the MUI window title. The dialog window displays a “*Filter*” text edit field, a “*Directories*” field, a list of atom files contained in the currently selected directory, a “*Selection*” field, and [OK], [*Filter*], and [*Cancel*] buttons.

The *Filter* field specifies the filesystem directory path and filenames of atom files to be displayed e.g.

*/home/iot/atom/**

In above example, the “*” at the end of the string is a “wildcard” character that matches ANY file name in the */home/iot/atom* directory. A more restrictive *Filter* field text string can be specified e.g.,

*/home/iot/eirp**

In this case, only those files in the specified directory whose first four characters match “*e-i-r-p*” are displayed in the “Open A File” list.

The default atom file directory is specified in the IOT System *Preferences* file, *SIOTHOME/pref*.

NOTE

SIOTHOME is an environment variable set in the *iot* user’s “.cshrc” file. Its value is a text string that defines the path where project-specific directories and files are located e.g., “*SIOTHOME = /proj/lm*” specifies that the IOT System’s files and directories are located in the */proj/lm* directory.

The user can enter a different specification in the *Filter* field and then press the [*Filter*] button to display atom file filenames in the “Open A File” list that match the *Filter* field specification.

An atom file is selected for opening by selecting a filename in the “Open A File” list as follows:

- a. scroll the “Open A File” list to the atom file to be opened.
- b. select an atom file with the mouse cursor; when an atom file is selected, its path and filename are displayed in the *Selection* field.
- c. press the [OK] button to open the selected atom file.
- d. alternatively, press the [*Cancel*] button to cancel the *Open* atom file operation.

When the [OK] button is pressed, the dialog window closes. The MUI window title bar displays the path and filename of the opened atom file and the MUI window from which the *File => Open* operation was performed displays the parameters in the selected atom file.

The user can now perform the IOT measurement as previously described.

1.3.2.3 Save Operation

The *File => Save* operation saves the displayed MUI window parameters into the atom file that had been previously opened, overwriting the previous contents of the atom file.

NOTE:

The atom file directory and files require appropriate 'read-write-execute' permissions for 'owner', 'group', and 'public' users so that only personnel with appropriate access permissions are permitted to modify existing atom files.

1.3.2.4 Save As Operation

The *File => Save As...* operation saves the displayed MUI window parameters into a new atom file whose path and filename are specified by the user.

NOTE:

The atom file directory and files require appropriate 'read-write-execute' permissions for 'owner', 'group', and 'public' users so that only personnel with appropriate access permissions are permitted to save atom files.

Perform a *File => Save As* operation as follows:

- Click the mouse cursor on the *Save As* operation in the *File* menu; the *Save As* dialog window is displayed
- Enter the atom file's path and filename in the *Selection* field of the *Save As* dialog window
- Press the [OK] button to save the atom file.

1.3.2.5 Close Operation

The *File => Close* operation closes the current MUI window, as follows:

- Click the mouse cursor on the *Close* operation in the *File* menu
- The MUI window closes.

The *File => Close* operation behaves in the same manner as the [Close] button at the bottom of the MUI window.

1.4 Using An Editor

Atom files, which are ASCII text files, can be edited directly using a text editor program such as:

```
'vi'  
window-based Text Editor
```

Consult the system's documentation to use the *vi* and the window-based *Text Editor* programs supplied with the system.

1.5 Atom File Structure and Contents

The file format and content of an atom file is shown in the example below:

```
---Title  
FE  
---Legend  
Mui prog name /proj/lm/bin/mui/flux_ui  
Meas prog name /proj/lm/bin/flxerp  
---Text Stub  
---Title  
IPFD/Eirp  
---Legend  
SC Sim_ACeS  
SC Config.  
Tx Beam L-band  
Rx Beam C-band  
Date 22 Jul 1999 20:55 GMT  
Loc. of SC 77.0 W, 0.0 N  
City  
Rx RX 1  
Chan Forward  
HPA N/A  
Saturate No  
Gain Mode 0  
Power Level [W] N/A  
Sat X 0.0,0.0  
Sat Y 0.0,0.0  
Backoff 0  
Weather Light Clouds  
Comment MC C to L  
sc_conf  
Atom File Name /proj/lm/atom/eirpfl.atm  
---Text Args  
-title Flux/Eirp  
-sfile /tmp/FEaaaa14140  
-display lmiot1.trans.comsat.com:0.0  
-es_el 35.889055  
-es_az 140.089363  
-sc_name Sim_ACeS  
-eirp  
-print  
-flux  
-start_eirp 80.0  
-max_eirp 85.0  
-sb 3.00  
-boff 0
```

```
-mcssl /mcssl2/fat/ini/eirpfl.ini
-dspsa /proj/lm/fat/eirpfl.cdl
-sat No
-ul_config CU/L1
-dl_config LD/L1
-range 38109.653762
-rx_temp 25
-chan Forward:6.455:-4.900000:HORIZ:RHCP
-tube N/A:0.0:0.0
```

1.5.1 File Structure, Title, and Legend Sections

Atom files conform to the IOT System *COSDAF* file format. Sections in a COSDAF file are delimited by a ‘*---SectionName*’ keyword, where ‘*SectionName*’ can be any of the following:

```
---Title
---Legend
---Constants
---Text
---Table
```

The “*---Title*” section delimits a title section which may have an optional name. The text on the line following the “*---Title*” section delimiter contains the actual title information i.e., the type of measurement (e.g., ‘*FE*’ for Flux/EIRP)

The “*---Legend*” section delimits legend information. The text on lines following the “*---Legend*” section contain the actual legend information. In the atom file example above there are two lines of legend information:

```
---Legend
Mui prog name      /proj/lm/bin/mui/flux_ui
Meas prog name     /proj/lm/bin/flxerp
```

The lefthand portion of the first line defines the generic parameter e.g., *MUI prog name* (MUI window program name) and the righthand portion specifies the actual MUI program e.g.,

```
/proj/lm/bin/mui/flux_ui.
```

The lefthand portion of the second line defines a second generic parameter e.g., *Meas prog name* (measurement program name) and the righthand portion specifies the actual measurement program e.g.,

```
/proj/lm/bin/flxerp.
```

1.5.2 Stub File Information

The IOT System *Scheduler* process schedules requested measurements as previously described.

When a scheduled measurement runs, it retrieves information from a “*stub file*” containing the following information:

```

measurement title
the name of the spacecraft
an optional spacecraft configuration text string
spacecraft transmit and receive beams
date and time
spacecraft subsatellite point
spacecraft receiver, channel, and amplifier
saturation determination
spacecraft power level
saturation X and Y values
backoff
comment
name of the atom file

```

This information is transferred to the measurement's output file.

Stub file information is contained within an atom file and is delimited by a section named “*---Text Stub*”.

Each item in the stub file section contains a lefthand portion and a righthand portion separated by a *<tab>* character. The lefthand portion defines the generic parameter name e.g., *SC* (for spacecraft) and the righthand portion specifies the actual parameter e.g. “*Sim_ACeS*” (for simulator ACeS)

The “*stub file*” information in the atom file example above is shown again below to illustrate its structure and contents. Explanations to the right of the item are delineated by “*/*” and are not actually in the atom file:

Item name	<i><tab></i>	Item Value	Item explanation
---	Text	Stub	// stub section delimiter
---	Title		// title section delimiter
IPFD/	Eirp		// measurement title
---	Legend		// legend section delimiter
SC		Sim_ACeS	// S/C name
SC		Config.	// S/C configuration string
Tx	Beam	L-band	// S/C transmit antenna beam
Rx	Beam	C-band	// S/C receive antenna beam
Date		22 Jul 1999 20:55 GMT	// GMT date and time
Loc. of	SC	77.0 W, 0.0 N	// S/C subsatellite latitude, longitude
City			// City name (if used)
Rx		RX 1	// S/C receiver
Chan		Forward	// S/C channel e.g., Forward C-to-L link
HPA		N/A	// HPA name (if used)
Saturate		No	// Saturation mode: not enabled
Gain	Mode	0,0	// S/C gain mode
Power	Level [W]	N/A	// S/C power level (if used)
Sat	X	0.0	// saturation X value (dB)
Sat	Y	0.0	// saturation Y value (dB)
Backoff		0	// backoff from reference (dB)
Weather		Light Clouds	// weather condition
Comment		MC C to L	// Comment eg., multicarrier C-to-L
sc_conf			// S/C configuration text string
Atom	File Name	/proj/lm/atom/eirpfl.atm	// atom file path and name

1.5.3 Measurement Arguments

The IOT System *Scheduler* process schedules requested measurements as previously described.

When a scheduled measurement runs, it retrieves information from an “*arguments file*”.

The “*arguments*” file contains the values of the parameters with which the particular “instance” of the measurement is to be performed. Each measurement type e.g., Flux/EIRP, has a unique arguments list.

Many, but not all, of the arguments specified in the atom file are accessible to the user in the MUI window.

Arguments in the atom file are delimited in the atom file by a section named “*---Text Args*”.

The arguments in the previous atom file example are shown below to illustrate. Each item contains a lefthand portion and a righthand portion separated with a *<space>* character. The lefthand portion of the line defines the generic parameter name e.g., *sc_name*” (for spacecraft name) and the righthand portion specifies the parameter value e.g. “*Sim_ACeS*” (ACeS simulator).

Item explanations are delineated by “*/*” and are not actually contained in the atom file:

Item name	<i><space></i>	Item Value	Item explanation
---		TextArgs	// “Text” section
-title		IPFD/Eirp	// measurement title
-sfile		/tmp/FEaaaa14140	// stub file path & name
-display		lmiot1.trans.comsat.com:0.0	// workstation display name
-es_el		35.889055	// earth station (E/S) elevation
-es_az		140.089363	// earth station azimuth
-sc_name		Sim_ACeS	// spacecraft name
-eirp			// EIRP toggle enabled
-print			// screen print toggle enabled
-flux			// Flux toggle enabled
-start_eirp		80.0	// E/S start or reference EIRP
-max_eirp		85.0	// E/S maximum EIRP
-sb		3.00	// Search bandwidth (kHz)
-boff		0	// Backoff from reference(dB)
-mcssl		/mcssl2/fat/ini/eirpfl.ini	// MCSS “ini” file if used
-dspsa		/proj/lm/fat/eirpfl.cdl	// downlink carrier file
-sat		No	// Saturation not enabled
-ul_config		CU/L1	// E/S uplink configuration
-dl_config		LD/L1	// E/S downlink configuration
-range		38109.653762	// E/S-to-S/C range (km)
-rx_temp		25	// S/C receiver temp (C)
-chan		Forward:6.455:-4.900000:HORIZ:RHCP	//channel parameters: name, U/L freq, LO freq, S/C Rx pol, S/C Tx pol
-tube		N/A:0.0:0.0	// S/C tube name, Sat X, Sat Y values

1.6 CDE File Manager Operations On Atom Files

The IOT System runs on a host HP-UX (UNIX) workstation which provides numerous other facilities to the system user.

In particular, when a user logs onto the workstation, a *Common Desktop Environment (CDE)* Tools Palette window is displayed.

The CDE *File Manager* icon on the Tools Palette accesses the system's *File Manager* which enables the user to perform additional operations on atom files.

The CDE *File Manager* is used with atom files in the following manner:

Click the mouse cursor on the *File Manager* icon in the Tools Palette to display the *File Manager* window. Type in the atom file pathname in the directory field in the *File Manager* window e.g.,

```
/home/iot/atom
```

Press the *Enter* key to display the specified atom file directory.
Select an atom file

Several operations can be performed when an atom file is selected while in the *File Manager* window

1.6.1 CDE-Supplied File Operations

When an atom file is selected in the *File Manager* window, the '*Selected*' menu provides the following CDE-supplied operations:

- Move to...*
- Copy to...*
- Copy as link*
- Put in workspace*
- Put in trash*
- Rename*
- Change permissions*
- Select all*
- Deselect all*

Consult the CDE documentation supplied with the system for more detailed descriptions for these CDE-supplied *File Manager* operations.

1.6.2 IOT System-Supplied File Operations

When an atom file is selected in the *File Manager* window, the '*Selected*' menu provides the following IOT System-supplied operations:

- Open*
- EditText*
- ScheduleNow*
- Print*

1.6.2.1 *Open*

Click on the *Open* menu item to display the selected atom file in its MUI window.

1.6.2.2 *EditText*

Click on the *EditText* menu item to open the atom file for editing in the CDE *Text Editor* window.

1.6.2.3 *ScheduleNow*

Click on the *ScheduleNow* menu item to schedule the atom file measurement for running immediately i.e., as soon as the required resources are available.

1.6.2.4 *Print*

Select the *Print* menu item to print the atom file.