CORONAL DIAGNOSTIC SPECTROMETER
SoHO

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CDS PLANNING TOOL USERS' GUIDE

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1 INTRODUCTION

The CDS version of the Science Planning Tool, MK_PLAN, is an IDL (Interactive Data Language) widget program that allows planning of CDS observations. CDS plans consist currently of four types: SCIENCE, DETAILS, FLAG, and ALTERNATE plans.

SCIENCE: describes general scientific objectives that are defined at the regular science planning meetings.

DETAILS: describes specific CDS scientific studies that are performed to meet general scientific objectives.

FLAG: describes CDS studies to execute in the event of a flag generated by CDS, or any other SOHO instrument with flag capability.

ALTERNATE: describes alternate CDS studies to execute instead of those defined in DETAILS.

MK_PLAN provides functions for browsing, creating, and editing each of the above plan types. These plan types are maintained in a UIT database system [1].

2 GETTING STARTED

MK_PLAN is started from the IDL prompt by typing, e.g.

```
IDL> mk_plan, '95/08/10' [,/nodetach, /reset]
```

The input argument specifies the start date to display. It is optional and can be entered in any CDS standard format. If a start date is not entered the first time MK_PLAN is started, then the current date (starting at 00:00 UT) and a 24 hour display period will be assumed. Subsequent calls to MK_PLAN will use the most recent start date and attempt to restore the last saved configuration in memory. The `/reset` keyword is an optional keyword to reset memory. It is useful in case MK_PLAN crashed and needs to be restarted. By default, the MK_PLAN plot window appears in a resizable widget that is detached from the main widget interface. The `/nodetach` keyword overrides this feature.

The first time MK_PLAN is started, the CDS-DETAILS widget interface shown in Figure 1 will be displayed. The timeline plot window can show from one to several rows. The bottom row is the *editing* row, while the remaining rows are shown for reference and are not editable. The example in Figure 2 shows a timeline of DETAILS plans in the lower editing row, and a timeline of SCIENCE plans in the upper reference row. The appearance and combination of rows can be adjusted via the **Customize Plot** option under the **Operations** button (Section 6). The current plan type that is being edited is displayed in the row marked STATUS as part of the label **EDITING TYPE PLAN**. You can switch to editing a different plan type by pressing the TYPE label button and selecting from the pull-down menu of plan types. Subsequent calls to MK_PLAN within the same IDL session will always restore the most recent customized settings.

heigh¿

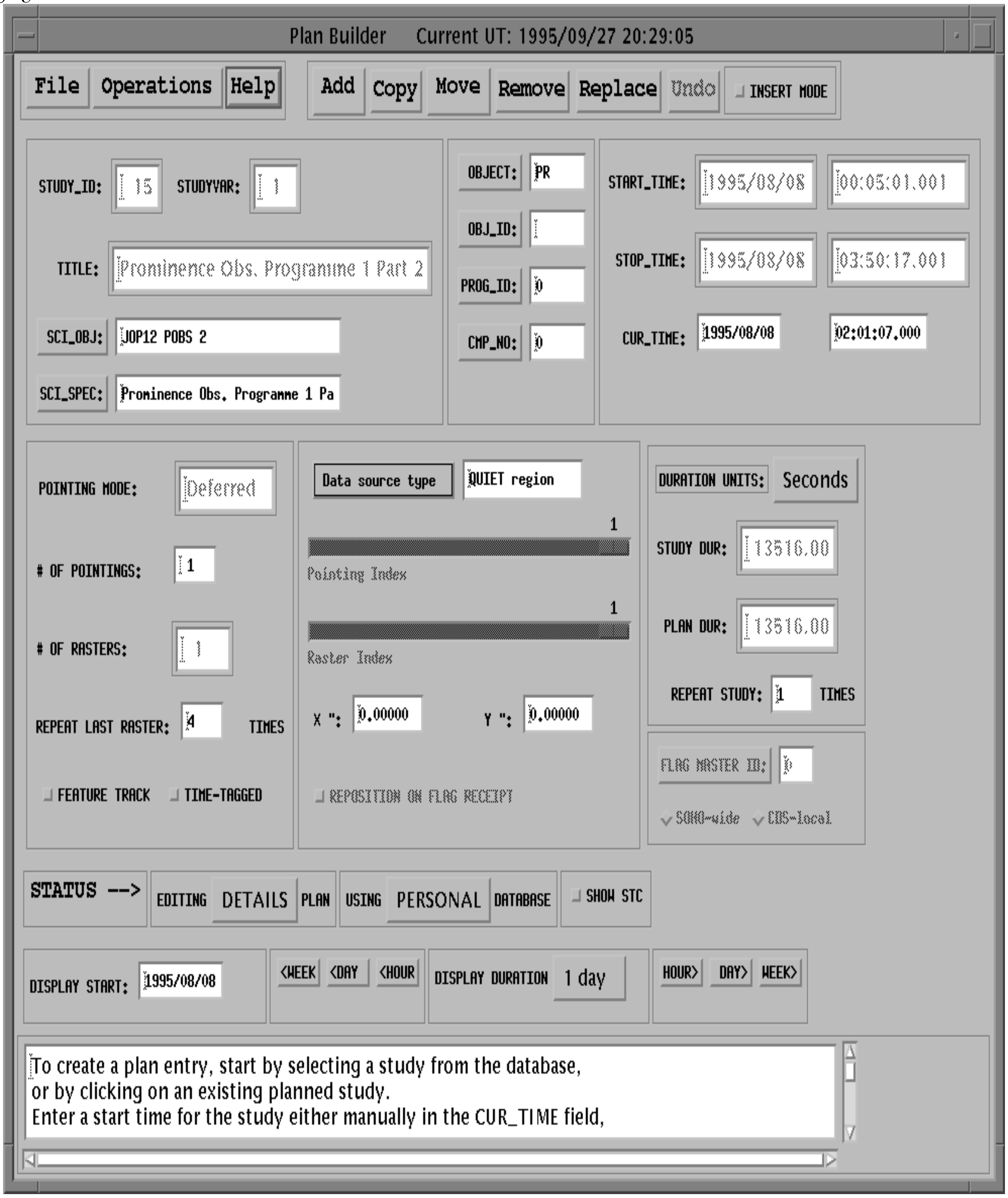

Figure 1: CDS-DETAILS widget interface

2.1 Which Database?

The STATUS row also displays the current CDS database that is being accessed: official or personal. By default, MK_PLAN will access the database that is pointed to by the environment variable ZDBASE.

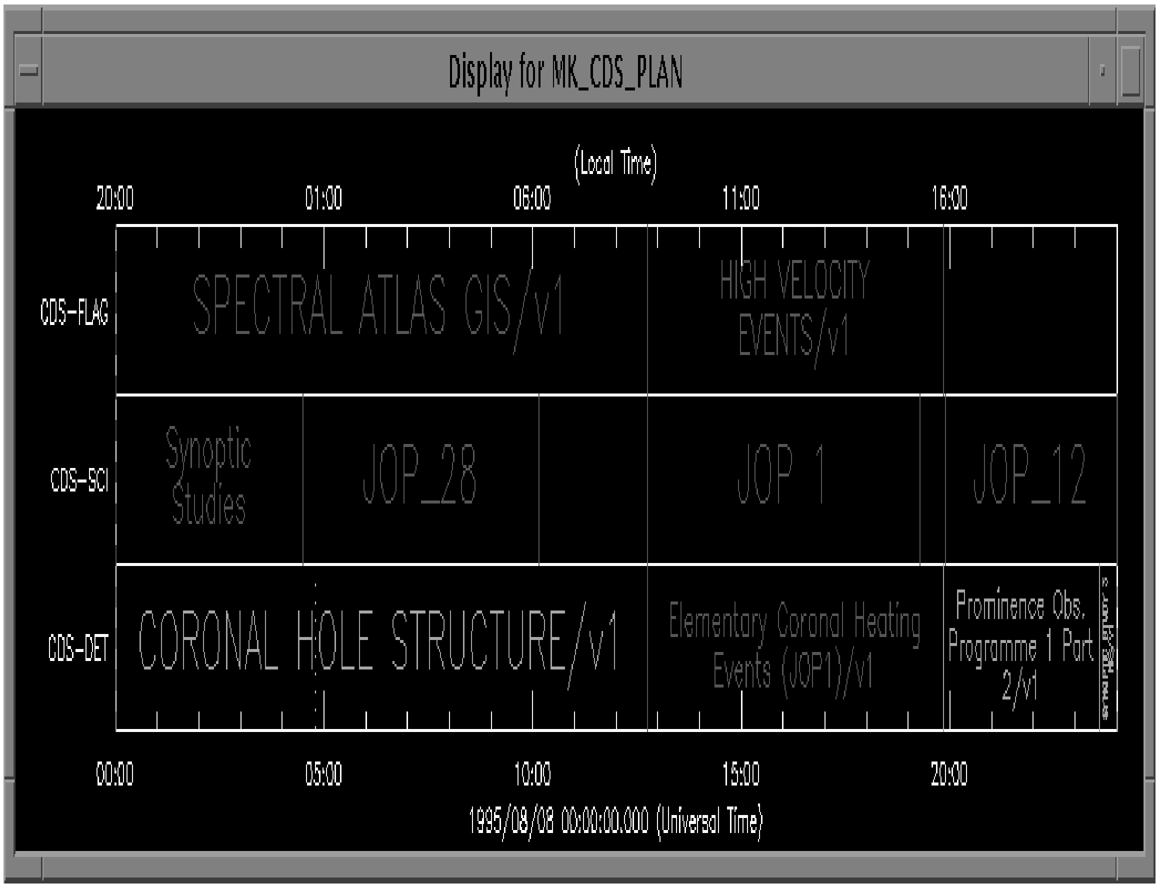

Figure 2: Timeline plot window with CDS-DETAILS (editable) and CDS-SCIENCE (reference).

The official database is protected and cannot be modified without special priviledge. The personal database is a copy of the official database that is located in a non-protected directory and can be modified freely. Provided you have sufficient disk space (about 32 Mb), you can make a personal copy of the CDS database (on a UNIX system) by the following steps:

```
>cp -rp /cds/data/plan/database  /path/db_name
>setenv,'ZDBASE_USER=+/path/db_name'
```

where the first copy command recursively copies all the relevant databases files and associated subdirectories from the official location (`/cds/data/plan/database` currently on `orpheus.nascom.nasa.gov`) to the top directory `/path_name/db_name` (e.g. `/usr/users/zarro/cds/my_cds_db`). The second command sets the environment variable `ZDBASE_USER` to the top directory of the personal database. If not already defined, then it is recommended to define the environment variable `ZDBASE_CDS` to point to the top directory of the official database. For example,

```
>setenv,'ZDBASE_CDS=+/cds/data/plan/database'
```

With the above environment variables defined, you can switch between the official and personal databases by pressing the pull-down button labelled: **USING** `PERSONAL` **DATABASE**.

2.2 Changing The Display Interval

The start time of the timeline plot window is displayed in the text field **DISPLAY START**. The start time can be varied by editing the value in this field. It can also be varied in steps of an hour, week, or day by pressing the appropriate shift buttons, e.g. <**WEEK** to shift one week backward in time, or **DAY**> to shift one day forward in time, etc.

The duration of the timeline plot is displayed in the label button denoted by **DISPLAY DURATION**. This a pull-down button that allows you to vary the duration into 3, 6, or 12 hours units and also in units of 1 to 7 days.

3 CREATING CDS PLANS

3.1 Creating A SCIENCE Plan Entry

Science plans have a similar format for each of the SOHO instruments. Parameters that define individual science plans are outlined and fine-tuned at the monthly, weekly, and daily science meetings. To create a SCIENCE plan entry:

1. Press the **TYPE** button in **Editing TYPE Plan** and select **SCIENCE** from the pull-down menu. The widget interface will switch to the display shown in Figure 3. The bottom editable row of the timeline plot will refer to CDS-SCIENCE plans.

2. Specify a *start* time by moving the cursor in the bottom editing row to the desired time and clicking the *left* button. A dotted vertical line will appear, and the corresponding time will appear in the text field **CUR_TIME**. You can also enter the time directly into the latter text field. *It is extremely important that you do not click onto an existing plan entry, otherwise the parameters defining the existing entry will be loaded into memory.*

3. Specify a *stop* time by moving the cursor in the bottom editing row to the desired time and clicking the *right* button. A dashed vertical line will appear, and the corresponding time will appear in the text field **STOP_TIME**. You can also enter the time directly into the latter text field. Additionally, you can specify the duration by entering it in the text field **PLAN DUR**. The stop time will be adjusted accordingly. The duration units will normally be displayed in seconds, however, these can units can be changed to minutes or hours by pressing the button **DURATION UNITS**.

4. Fill in the following text fields to further define the SCIENCE plan entry.

   SCI_OBJ: A 50 character string describing the general scientific objective of the planned entry. The science objective is defined at the science planning meetings. *This field is mandatory.* Pressing this button will produce a list widget of selectable predefined science objectives.

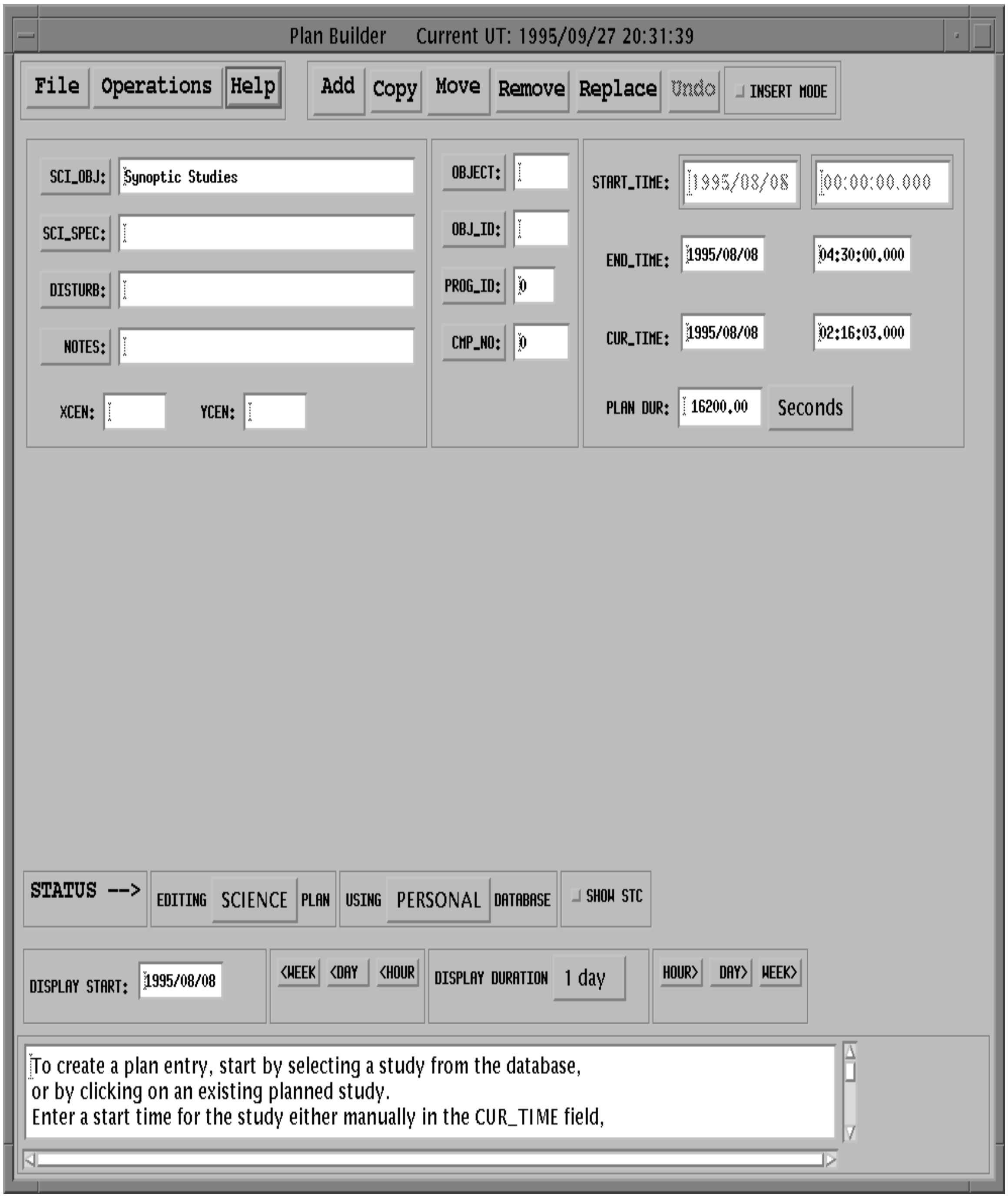

Figure 3: CDS-SCIENCE widget interface

SCI_SPEC: A 50 character string describing the specific scientific objective of the planned entry. Pressing this button will produce a list widget of selectable predefined specific science objectives.

DISTURBANCES: A 50 character string describing any possible disturbances that could be caused by the observation.

NOTES: A 50 character string describing special circumstances (e.g. studies or rasters) associated with the science entry.

XCEN: Character string giving the approximate X coordinate (in arcsecs, + W) of the solar target associated with the science entry.

XCEN: Character string giving the approximate Y coordinate (in arcsecs, + N) of the solar target associated with the science entry.

OBJECT: A 3 character code name for the object to be observed, e.g. "EPR" for Eruptive Prominence. Pressing this button will produce a list widget of selectable predefined object names.

OBJ_ID: A six character identification that further specifies the observation target, e.g., "AR4713" or "S12W15".

PROG_ID: A unique identifier to associate separate observations that are part of the same observing program. Pressing this button will produce a list widget of selectable predefined program numbers.

CMP_NO: A unique identifier to associate separate observations that are part of the same observing campaign. Pressing this button will produce a list widget of selectable predefined campaign numbers.

5. Press the **Add** button to add the new plan entry to the database. This button is a pull-down menu with two options:

   `Insert at Cursor Position:` The entry will start at the time shown in the **CUR_TIME** field, i.e. the current cursor position.

   `Append To Last Entry Before Cursor Position:` The entry will be appended to the last entry before the current cursor position.

   In the case where the new entry is the first entry to be added during the displayed time interval, the option to append will be replaced by:

   `Insert at Start of Displayed Interval:` The entry will start at the beginning of the displayed interval (usually the start of the operational day).

3.2 Creating A DETAILS Plan Entry

Details plans consist of specific CDS studies that will be performed to fulfill the objectives defined in the Science Plan. To create a DETAILS plan entry:

1. Press the **TYPE** button in **Editing TYPE Plan** and select **DETAILS** from the pull-down menu. The widget interface will switch to the display shown in Figure 1. The bottom editable row of the timeline plot will refer to CDS-DETAILS plans.

2. Select a study from the database. Press the **Operations** button and choose the **Select Study** option. A widget interface (Figure 4) presenting a list of available studies will appear. You will be asked to select a study ID and a variation. Refer to CDS software Note 2 for further details on the definition of a study. Upon exiting this interface, the predefined parameters of the selected study will be loaded into memory and ready for scheduling. The selected

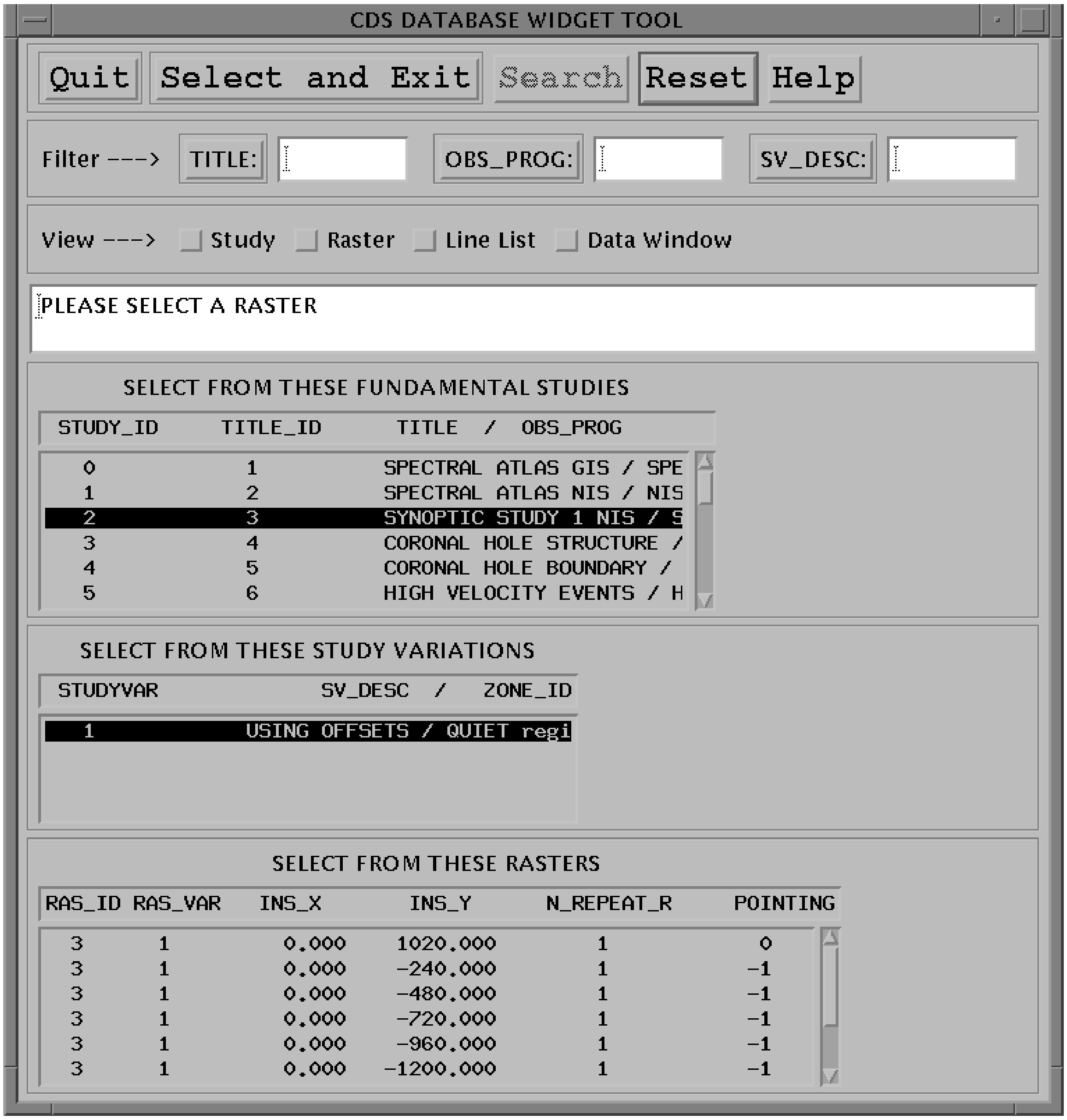

Figure 4: CDS Study Selector widget interface

study ID and variation will be displayed in the text fields **STUDY_ID** and **STUDYVAR**, respectively. The title of the selected study will appear in the text field **TITLE**. These fields are not editable.

3. Specify the start time of the study. Move the cursor in the bottom editing row to the desired start time and click the left button. A dotted vertical line will appear, and the corresponding time will appear in the text field **CUR_TIME**. You can also enter the time directly into the latter text field. *It is extremely important that you do not click onto an existing plan entry, otherwise the parameters defining the existing study will be loaded into memory.*

4. Adjust the study duration. The base duration of a study is essentially fixed by the individual rasters that compose it. This duration will appear in the text field **STUDY DUR**. The study

duration can be extended by varying the number of times to repeat the last raster composing the study. The number of rasters in the study is shown in the text field **# OF RASTERS**. This parameter is not editable. The number of last raster repeats can be adjusted in the text field **REPEAT LAST RASTER**. The study duration can also be extended by repeating the study multiple times. The number of study repeats can be adjusted in the text field **REPEAT STUDY**. In addition, the study duration can also be extended by increasing the number of repeat pointings of individual rasters. This option will be available only if the original study does not have fixed pointings. The type of pointing will be displayed in the text field **POINTING MODE** and can be of type *fixed*, *offset*, or *deferred*. If the pointing mode is fixed, then the individual raster pointing coordinates have been specified already at the study definition level. If the pointing mode is not fixed, then you can adjust the number of repeat pointings in the text field **# OF POINTINGS**. You can also specify the individual raster pointings in the text fields **X"** and **Y"**. Finally, you can browse the pointing coordinates by dragging the sliders labelled **RASTER** and **POINTING** index. The topic of CDS pointing will be discussed further in Section 5.

5. Fill in the following fields to further define the DETAILS plan:

   SCI_OBJ: A 50 character string describing the general scientific objective of the planned study. The science objective is defined at the science planning meetings. *This field is mandatory.* If it is not specified, then `MK_PLAN` will search the SCIENCE database for an entry that overlaps the start time of the planned DETAILS entry and adopt the corresponding science objective. Pressing this button will also produce a list widget of selectable predefined science objectives.

   SCI_SPEC: A 50 character string describing the specific scientific objective of the planned study. This field is optional. If it is not specified, then `MK_PLAN` will construct a specific objective by combining the study title with the study variation ID number, e.g. "Elementary Coronal Heating Events (JOP1)/v1". This field will be used to label the DETAILS entry in the timeline plot. Pressing this button will also produce a list widget of selectable predefined specific science objectives.

   OBJECT, OBJ_ID, PROG_ID, CMP_NO: These optional fields are similar to those described for the science plan entry (Section 3.2) If they are not specified, then `MK_PLAN` will search the science database for a SCIENCE entry that overlaps the start time of the planned DETAILS entry and adopt the corresponding field value.

   FEATURE TRACK: This button turns solar feature tracking on or off.

   Data Source Type: A pull-down menu of predefined descriptions for different observing targets (e.g. Coronal Hole Region). The initial value of this field is obtained from the selected study definition.

6. Press the **Add** button to add the new plan entry to the database. This button is a pull-down menu with two options:

   `Insert at Cursor Position (Time-Tagged):` The study will be *time-tagged* to start at the time shown in the **CUR_TIME** field, i.e. the current cursor position.

   `Append To Last Entry Before Cursor Position (Not Time-Tagged):` The study will start when the last study before the current cursor position is completed. The study is classified as *non time-tagged* as its start time depends on the duration of the previous study. Studies that are not time-tagged will be plotted in *green* in the timeline plot.

In the case where the new study is the first entry to be added during the displayed time interval, the option to append will be replaced by:

`Insert at Start of Displayed Interval (Time-Tagged):` The study will be time-tagged to start at the beginning of the displayed interval (usually the start of the operational day).

Once a new plan entry is added to the database, its final parameters will be reflected in the various widget fields. It is important to be aware of the following caveats when adding a new study:

- If the end time of a new study extends over into another study that is time-tagged, then the new study will be interrupted by the time-tagged study. In this case, the apparent duration appearing in the **PLAN_DUR** field will be *shorter* than the actual duration in **STUDY_DUR**.
- If the subsequent study is non-time-tagged, then its start time will be delayed until the new study is completed. In this case, the value in the **START_TIME** field will differ from the original specified start time and correspond to the end time of the previous study.
- If you try to add a study between two time-tagged studies then you may get an error:

  `Cannot ADD/INSERT entry.  Insufficient space`

  In this case, you should either make room by shifting the start time of the second study, or untime-tagging the second study (see Section 4.1).

3.2.1 Planning to use CDS as a Flag-Master

Instruments on board SOHO can generate flags by calculating some statistic of their own data which defines the occurrence of an event. Upon recognition of such an event, the solar location of that event can be placed in a register which is polled by the spacecraft software. The spacecraft software then distributes the information to all instruments. Individual instruments are free to decide whether to act upon any such information they receive, although the decision whether to cooperate in any flag activity will have been taken at the planning meetings.

CDS can act as both a flag-master (i.e. generator) and a flag-receiver. Flag-reciever mode is discussed in Section 3.3. In flag-master mode, CDS examines the science data from a raster immediately after the exposure is finished and, using a statistic defined previously on the ground, will decide if an event has occurred or not. A CDS study can be a flag-master only if flag windows are defined for each of its constituent rasters. Flag windows are defined in the raster definition program `MK_RASTER`. Up to three data windows may be defined – meaning that the data from them may be used by the onboard event detection software. If a selected study can act as flag-master, then you can specify the type of flag criterion by pressing the pull-down button menu `FLAG MASTER ID` and selecting from the available ID options. In addition, you can specify whether the generated flag is to be made available to all the SOHO instruments or internally to CDS only by pressing the appropriate buttons: `SOHO-wide` or `CDS-local`, respectively. Either may be selected, although the former implies a degree of inter-experiment planning and agreement has already occurred.

3.3 Creating A FLAG Plan Entry

When CDS is in flag-receiver mode, it is anticipated that it will, upon receipt of a flag (either from another instrument or CDS itself), stop the DETAILS study that it is currently executing and start an alternative study, known as the FLAG study, instead. Before specifying a FLAG study, you must first create a DETAILS entry. Currently, each DETAILS entry can have only one associated FLAG entry. To create a FLAG plan entry:

1. Select **FLAG** from the pull-down menu under the **Editing TYPE Plan** button. The widget interface will switch to the CDS-DETAILS interface shown in Figure 1. The bottom editable row of the timeline plot will refer to CDS-FLAG plans. The timeline plot will also show the current DETAILS plan timeline for reference.

2. Press **Operations** and select a study to execute in response to a flag. Move the cursor to the interval below the DETAILS entry that will be associated with the flag and click the *left* cursor. Two vertical dotted and dashed lines corresponding to the start and end times, respectively, of the DETAILS entry will appear. These lines define the start and end times of the interval when CDS will be in flag-receiver mode. When the FLAG study is completed, CDS will return to the initial DETAILS study. If the FLAG study is not completed by the time of the next scheduled DETAILS study, then it will be interrupted by the next DETAILS study.

3. Fill in the text fields **SCI_OBJ**, **SCI_SPEC**, **OBJECT**, etc. These fields are identical to those used for DETAILS. If a field is not specified, then `MK_PLAN` will adopt a corresponding value from from a SCIENCE entry that overlaps the flag-receiver start time.

4. Press **Add** to write the entry to the database. You will not be given a choice where to add the entry, since the receiver start and end times have been predetermined by the initial DETAILS entry. Accordingly, the options to time-tag and repeat a study are not available for FLAGS.

3.4 Creating An ALTERNATE Plan Entry

The CDS-ALT plan database consists of DETAILS studies that are to be executed as alternative studies. They are similar to FLAG studies, except that they are initiated by ground commands. To create an ALT plan entry, select **ALT** from the pull-down menu under the **Editing TYPE Plan** button. The bottom editable row of the timeline plot will then refer to CDS-ALT plans. The widget interface will switch to the CDS-DETAILS interface shown in Figure 1. The steps for creating an ALT are similar to those performed for DETAILS, except for several differences:

1. Press **Operations** and select a study to execute.

2. Specify the start and end times during which the ALT entry can be activated by using the left and right cursor buttons, respectively, or by editing the **CUR_TIME** and **STOP_TIME** fields. You can also specify the time span during which the ALT entry can be initiated by entering a value in the **PLAN DUR** field.

3. Fill in the corresponding text fields (**SCI_OBJ**, etc) with the defining information and then press **Add** to write the entry to the database.

4 EDITING CDS PLANS

4.1 Editing Buttons

Once a plan entry has been created and added to the database, it can be modified using a variety of editing functions. Recall that you can select the plan type to be edited by pressing the **Editing TYPE Plan** button in the STATUS row. To edit an existing plan entry, move and press the left cursor onto the entry in the editing row. The entry will become highlighted in yellow and its defining parameters will be loaded into the appropriate text widgets. Depending on the plan type, you can invoke the following functions:

Copy: Pressing this button will allow you to graphically copy a plan entry to a new location by a simple "drag and drop" operation, leaving the original entry in place. The highlighted plan will be surrounded by a flashing box cursor. While pressing the left cursor, drag the box cursor to the location in the timeline where you wish to make a new copy of the entry, then press the right cursor to perform the copy. Note that if the entry is copied onto an existing plan entry, then the latter entry will truncated inorder for the copied entry to commence at the specified time. By definition, the new copied entry will be time-tagged to start at the specified time.

Move: This button is similar to **Copy** except that the original entry will be deleted. This is a pull-down button with the following options:

- `Move To New Cursor Position:` Move the entry to start at the time specified in the **CUR_TIME** field, i.e. the current cursor position. Before pressing this button, it is important to first highlight the entry in question and then move the cursor to the time position required.
- `Move Graphically:` Move the entry graphically to any time in the editing window.

Remove: Delete the currently highlighted plan entry from the database. If the deleted entry was followed by a non-time-tagged entry, then the non-time-tagged entry will be shifted automatically back in time to start after the last entry.

Replace: Replace defining parameters of the highlighted plan entry with new parameters. Here are some examples:

- To change any of the character text fields (such as Science Objective), edit the field and then press **Replace**.
- To change a DETAILS entry from time-tagged to non-time-tagged, or vice-versa, press the button **TIME-TAGGED**, followed by **Replace**.
- To change the plan duration (except for DETAILS or FLAG types), edit the **PLAN DUR** field, edit the **STOP_TIME** field, or use the right cursor button, and then press **Replace**.

You cannot use **Replace** to change the plan start time. This operation can be performed only via the **Move** button. Note also that the start and stop times of the highlighted plan being edited will be displayed in the **START_TIME** and **STOP_TIME** fields, respectively. The **START_TIME** field is *never* editable. The **STOP_TIME** field is not editable for DETAILS and FLAG plans.

Undo: Undo any of the above editing operations.

4.2 Operation Buttons

The **Operations** button provides additional editing tools via a pull-down menu with the following options:

Clear Plan: Delete *all* entries in the editing timeline that start within the current display. This feature is useful when you wish to reconstruct plans for a day or several days. Entries that start before the current display period and extend into the display period will not be deleted.

Clone Plan: Clone plans from a given day onto a series of new days. This feature is useful when constructing a set of plans for several days that are similar and but may require minor modification.

Reset Plan: Reset the widget fields and replot the timeline window. This feature is useful to undo edits that you have made but not yet implemented via the editing buttons.

Select Study From DB: Except when editing SCIENCE plans, you can select a new study from the database at any time. The parameters defining the study will be loaded into the corresponding text widgets. This feature is useful when you wish to **Replace** the study in an existing plan entry with a new study.

Create New Study: Often the list of available predefined studies in the database may not contain a study that is suitable for performing a specific observation. This button invokes the program `MK_STUDY` which is an IDL widget interface that allows you to create a new study and load it into the database.

5 ADJUSTING CDS POINTING

6 CUSTOMIZING THE TIMELINE

7 FINISHING UP

You can exit `MK_PLAN` by pressing the **File** button and selecting the **Quit** option in the pull-down menu. Before exiting, you will be asked whether you wish to purge the database. Purging is recommended if you have made many modifications. Additional options in the **File** pull-down menu are:

Hard Copy Plan:

Print Highlighted Plan Entry:

Update From Latest KAP:

Write IAP:

References

[1] W. B. Landsman. The UIT database system. 1993.