JCMT Observing Tool

Introduction

Tips and Tricks
JCMT OT Introduction

- The MSB life cycle.
- Introduction to the OT.
- The MSB libraries.
- Creating an MSB.
- Target information.
- The position editor.
MSB life cycle — what is an MSB?

• “Minimum schedulable block”.

• Smallest useful observing unit.
  - One or more observations.
  - Typically 30 – 60 minutes.
  - Always observed in its entirety.
MSB life cycle — role of the OT

CADC

Hedwig

QT

ORAC-DR

OT

OMP
Introduction — starting the OT

$ wget https://ftp.eao.hawaii.edu/ot/jcmtot.jar
$ java -jar jcmtot.jar
Introduction — fetching a program

To fetch an existing program: enter project ID and log in with Hedwig.
Introduction — components

MSB
Observation
Component
Iterator
“Eye”
Introduction — storing a program

To store a program:
check project ID is correct, and log in again if necessary.
Introduction — the MSB libraries

There are libraries of examples for ACSIS and SCUBA-2.
Creating an MSB — the project

- A new project contains just the “program” entry.

**Project ID**
Used to identify project when uploaded to the OMP.
Creating an MSB — the MSB folder

- An MSB can be added from the toolbar.

Name

Allows you to identify your project's MSBs.
Creating an MSB — the target

- **Name**: Ideally the common name of the target.
- **Coordinates**: Redshift or radial velocity
- **Additional coordinates**: Some types of observations require a reference position.
Creating an MSB — the instrument

**Instrument**

**Bandwidth**

**Number of spectra required**

**Line selection**

(For first spectrum.)
Creating an MSB — chop iterator

- This MSB will use beam-switching ("chopping").
- A chop iterator is added to configure chopping.
Creating an MSB — stare eye

- An “eye” instructs the telescope to take data.

Switching mode

“Beam” switching to match use of chopping.

Time

300 seconds (5 minutes)
The completed MSB

Additional Components
- Site Quality
- DR Recipe
- Note

Total Time
2 × 5 minutes + overhead estimate
The completed MSB — position editor

Chop position
- Defined in Az. / El. coordinates.
- Rotates on sky.
Target information — tips

• Try to give the target’s usual name.
  – Use the name you would want to see in the archive.

• Make use of offset iterators.
  – Define locations relative to a fixed target.
Target information and MSB title

**Target Name**
Give the name you would wish to see used in the archive.

**MSB Title**
Use this for your own identification of the MSB.
Target information — FITS headers

FITS headers:

MSBTITLE= 'Standard:CRL618'  / Title of minimum schedulable block
OBJECT = 'CRL618'            / Object of interest
Target information — CADC

This is how the observation will appear in the search interface at CADC.
Position editor — tips

• This can be used to visualize part of an MSB.
  – Scan areas.
  – Reference and offset positions.

• Common pitfalls.
  – Only shows the currently selected component.
  – Plotting tool only supports some projections.
Position editor — scan area

- **Selected component**: The scan area is being plotted.
- **Feature selection**: Controls what is plotted.
- **Reference**: Base position
Position editor — offset iterator

Selected component
The offset iterator is being plotted.

Offset position #0

Offset position #1
JCMT OT Tips and Tricks

• Aims
  – Simplify science programs.
  – Avoid mistakes, e.g. copy & paste errors.

• OT features
  – Inheritance.
  – Folders.
  – Survey containers.
  – Validation.
  – Common pitfalls.
Inheritance — tips

• Science programs are hierarchical:
  ◆ Top level
    ➔ Folder
    ➔ MSB
    ➔ Observation

• Observations inherit options from parents.
  – Instrument, target, site quality, DR recipe, notes.
Inheritance — example

Inherited Options

MSBs inherit options from parent containers.
Target information without inheritance

Bad Example

- Individual targets in each MSB.
- Define 3 positions along a source.
- Personal target names.
- Uninformative MSB titles.
Inheritance — target information

Better Example

- Standard target name.
- Shared target component.
- Same base position for each MSB:
  - ORAC-DR should automatically co-add maps.

- Personalized MSB titles.
- Offsets for position of each MSB.
  - Avoid having to manually compute offset positions.
Inheritance — notes

Multiple “Show to the Observer” notes.
Inheritance — notes in QT

The OMP combines all of the notes when they are shown in the Query Tool.
Inheritance — warnings

- Parent options **after** the MSB are included too.

- Some components need to be able to find other components:
  - DR recipe must be at same or lower level than instrument.
  - Heterodyne setup must be at same or lower level than target information when using target’s radial velocity.
Folders

• “AND” folders
  - Organize MSBs into groups.

• “OR” folders
  - Select from alternative MSBs.
“AND” folders

Configuration at the top level used by all MSBs.

“AND” folders do not affect when MSBs are observed.

Configuration in the “AND” folder used by the MSBs inside.
“OR” folders

Original Program

- 5 different MSBs
- Want to do 2 of them ("Select" 2)
- 5 observations each (5X)
“Or” folders — during selection

- This MSB has been observed.
- MSB moved outside OR folder.
- Observe counter decreased to 4.

“Select” counter decreased to 1.
“Or” folders — after selection

- “Select” counter now at 0.
- No more MSBs will be chosen.

- 2 MSBs have now been observed.
- Selected MSBs outside folder.
- They will be completed (4X more each).
Survey containers

- Repeat an observation for multiple sources.
- Source list can be loaded from a file.
Survey container — example

MSB inside Survey Container.

**Means:** make a copy of this MSB for each target.
Survey container — in the OMP

Becomes multiple MSBs in the OMP.
Survey container — fetched MSB

MSB fetched from the OMP

System inserts a target from the survey container when MSB is observed.
Survey container in MSB

Survey Container inside MSB.

**Means:** a single MSB to observe all targets in one session.

**Very long time estimate!**
Survey container in MSB — OMP

Single large MSB in the OMP. Normally not what you want!
Validation — overview

• Validation of a single MSB:
  – Internal check only.

• Validation of whole program:
  – Internal check of each MSB.
  – XML schema validation of program.
Validation — internal check

Select an MSB to do internal check only.

Errors and warnings generated by the OT.
Validation — XML schema validation

Select program to do internal check and schema validation.

Cause of error: “country” field is empty.

Technical description of problems in XML file.
Common pitfalls (1/2)

• Some MSBs can be hard to observe:
  - Long time.
  - Strict constraints (e.g. opacity, scheduling).
  - Widely-spaced targets.

• “Observe” counter vs. “Repeat” iterator.
  - MSB “observe” counter: do MSB multiple times.
  - “Repeat” iterator: extends duration of the MSB.
Common pitfalls (2/2)

• Must use Oracle’s version of Java.
  – OpenJDK can appear to work at first but problems often occur.

• Sometimes updates only saved on key-press.
  – Information pasted into the OT (e.g. notes) may not be saved.
Links

OT Resources:

- Download:
  - https://www.eaobservatory.org/jcmt/observing/software-installation/#observing-tool

- Documentation:
  - https://www.eaobservatory.org/JCMT/observing-tool

Tutorials.

- Basics:
  - http://www.eaobservatory.org/JCMT/observing-tool-tutorials/ot_basics_tutorial_files.tar.gz

- Tricks:
  - http://www.eaobservatory.org/JCMT/observing-tool-tutorials/ot_tricks_tutorial_files.tar.gz