Managing DEIMOS Removable Elements and Instrument Configuration

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Lick Observatory

Keck Observatory

This poster paper describes tools and methods used to manage DEIMOS removable elements. The iterative process of adapting and refining our basic strategy to the working conditions and requirements of CARA staff is not yet complete; hence this paper should be read as a Work In Progress report.

DEIMOS

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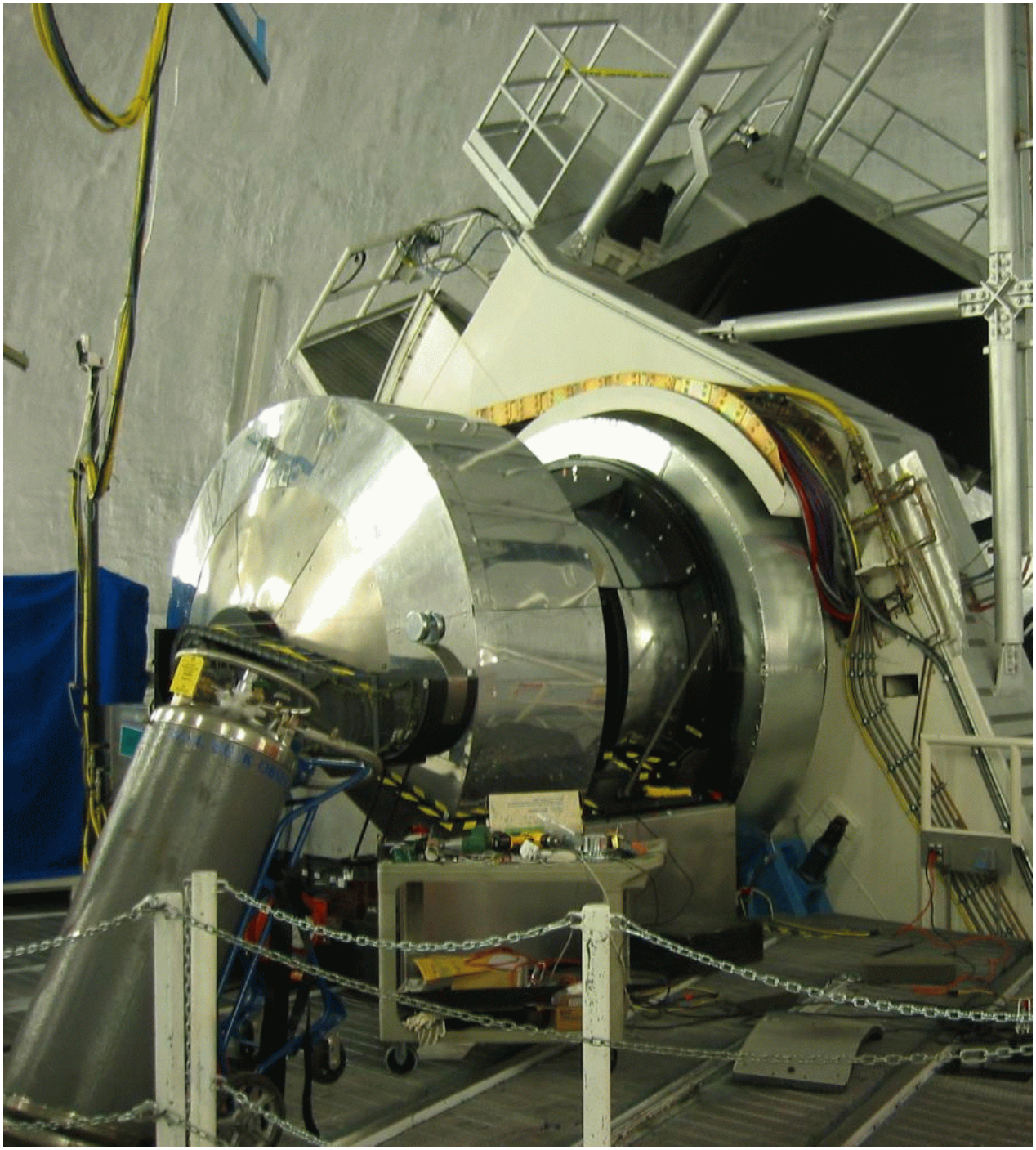
Managing DEIMOS Removable Elements and Instrument Configuration



DEIMOS

on the Keck II
Nasmyth Platform

The instrument is shown
in the observing position.

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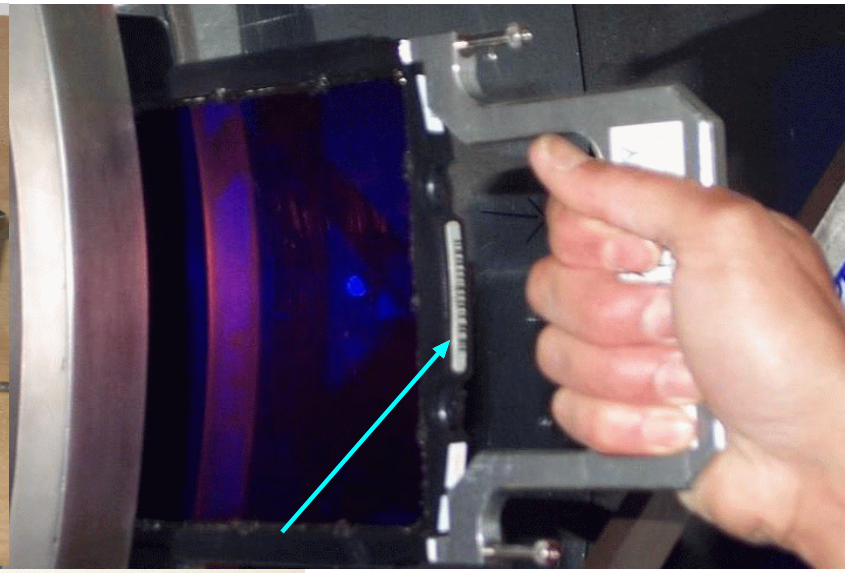
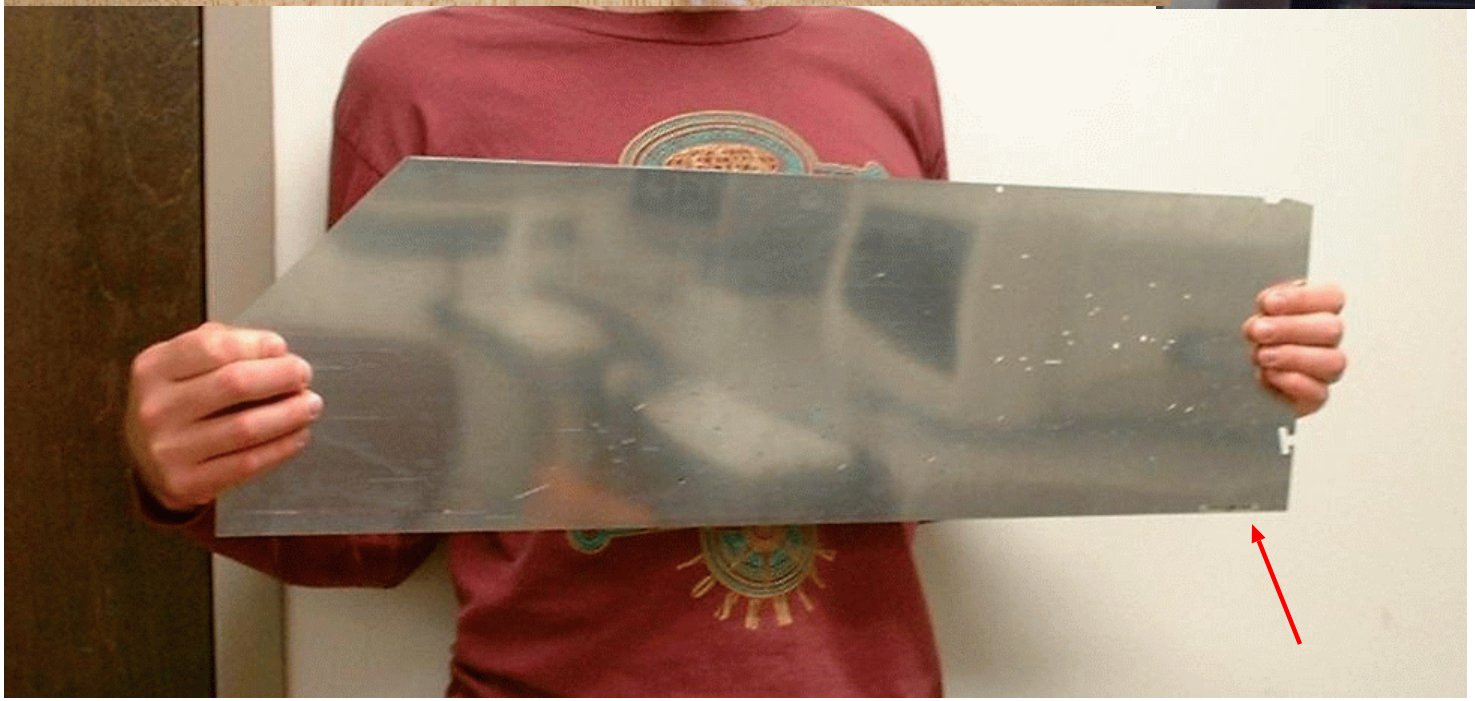
DEIMOS Removable Elements: Filters, Gratings, Slitmasks





Clockwise from upper left: a grating in its cell; a filter being installed; a DEIMOS slitmask

(arrows point to barcode labels)

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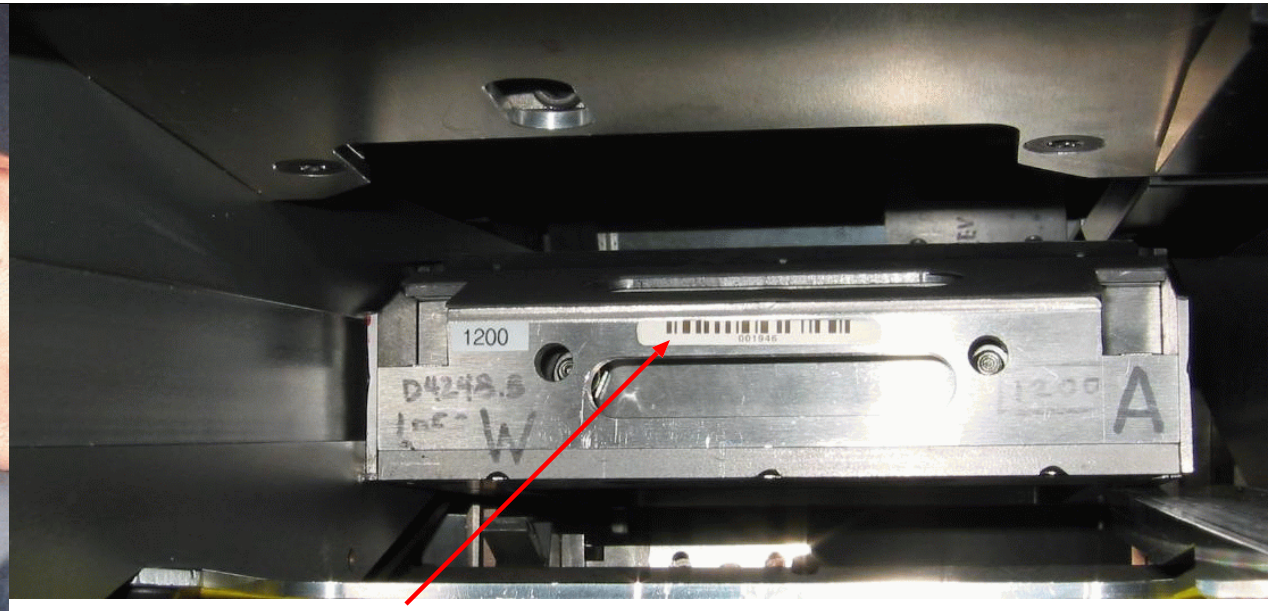
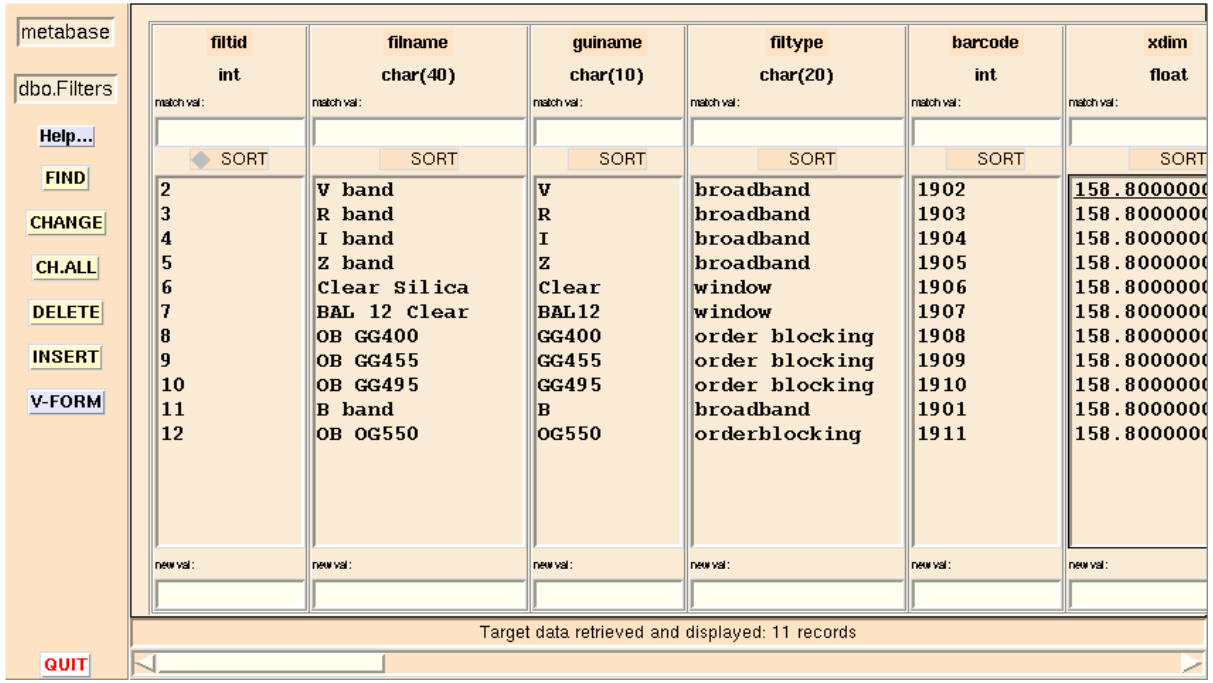
DEIMOS Removable Elements: Filter and Grating Bar Codes



Barcodes can be scanned after the element is mounted in the instrument.

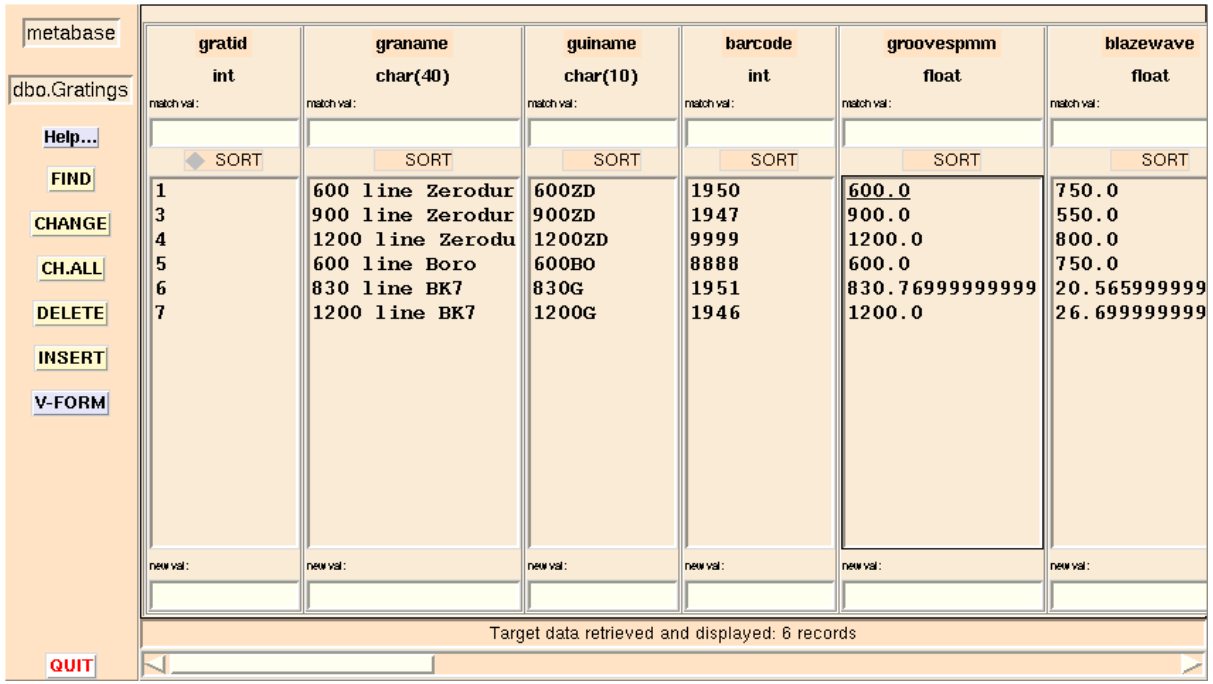
The grating (above) is deeply recessed within the instrument, but the bar code is still visible through the access hatch. The filter wheel housing (left) protrudes from the instrument body and the labelled edges of filter holders in the wheel are very close to the access hatch.

DEIMOS Removable Elements: Filter and Grating Data



A relational database (Sybase server) is used to store descriptive data for filters and gratings. Only a subset of the data can be shown here.

A more complex schema is needed to describe slitmasks.



In each case a unique bar code is the primary key used to identify the element and look up its description.

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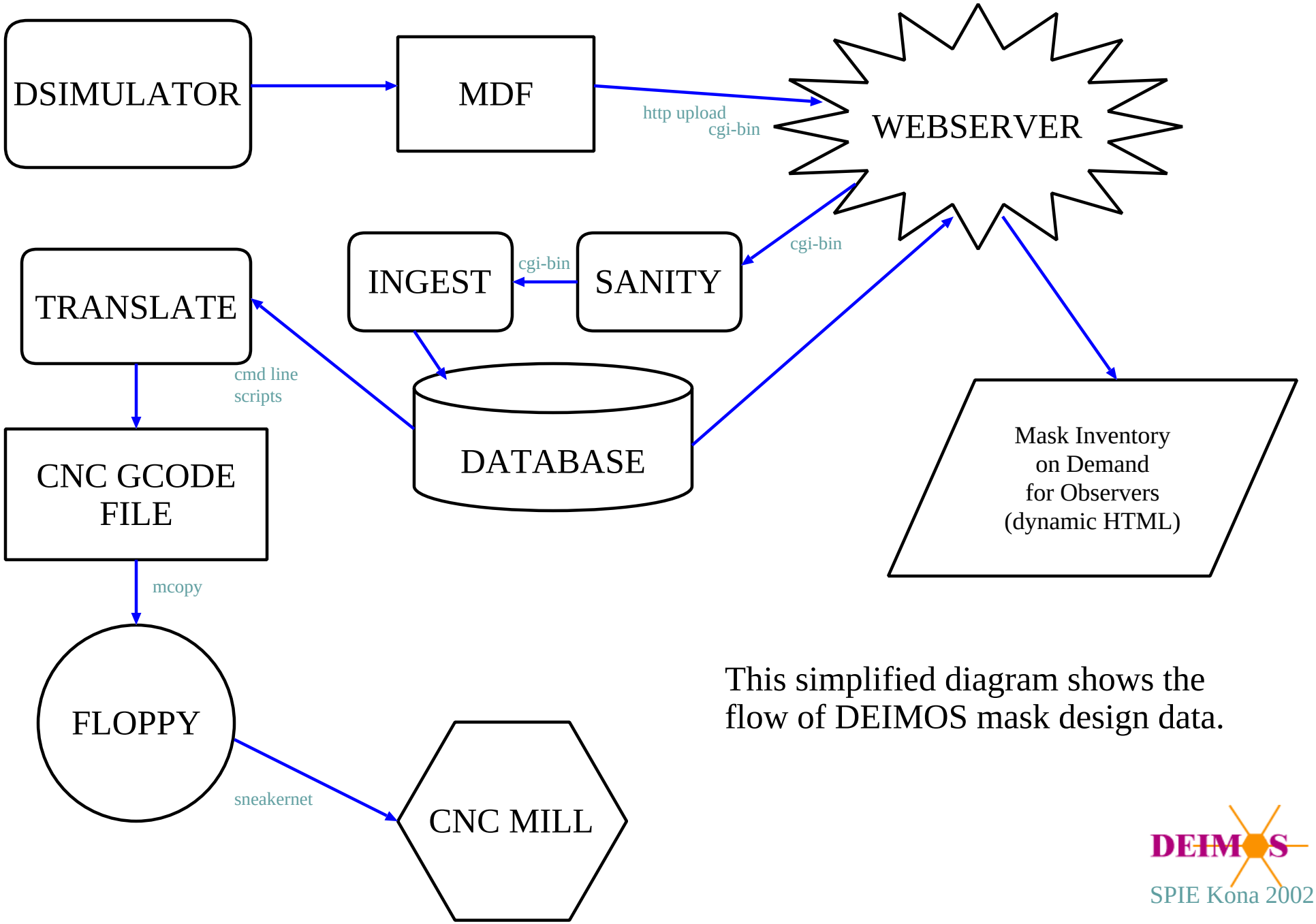
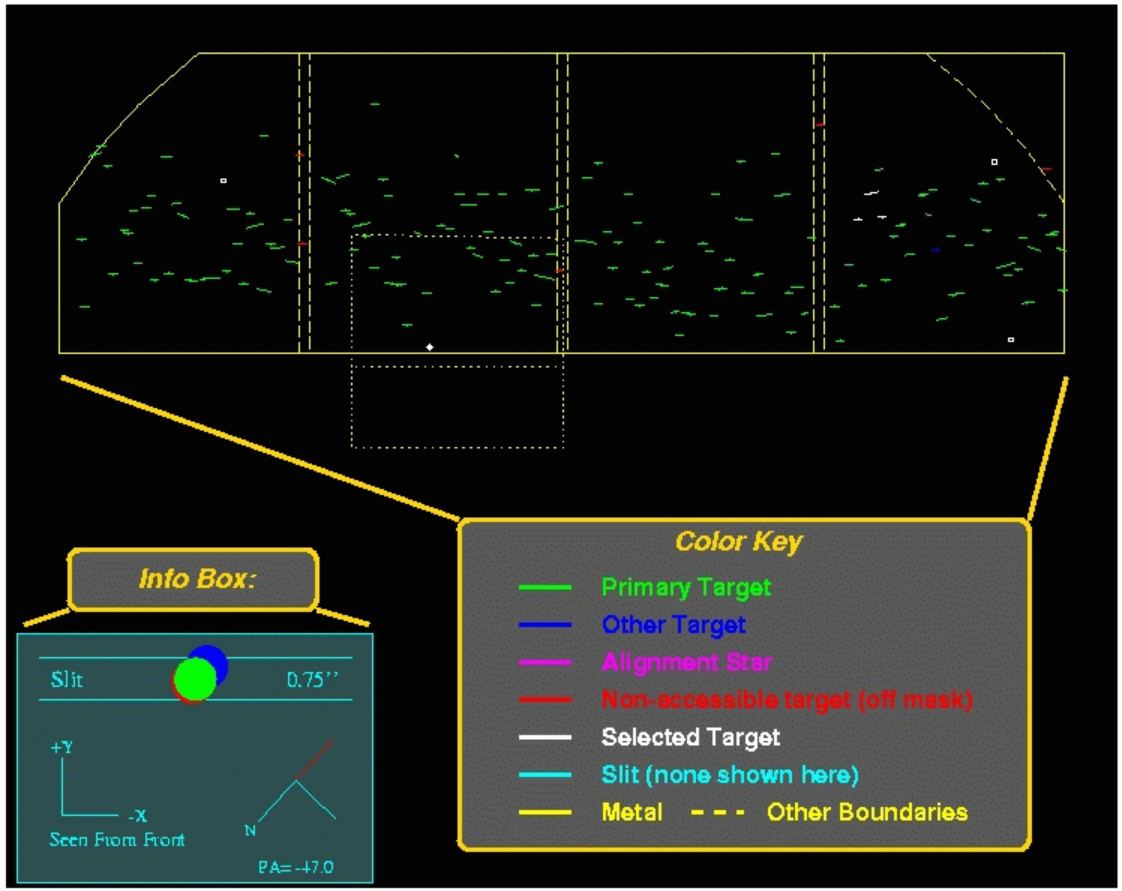
DEIMOS Removable Elements: Slitmask Manufacturing Dataflow



This simplified diagram shows the flow of DEIMOS mask design data.

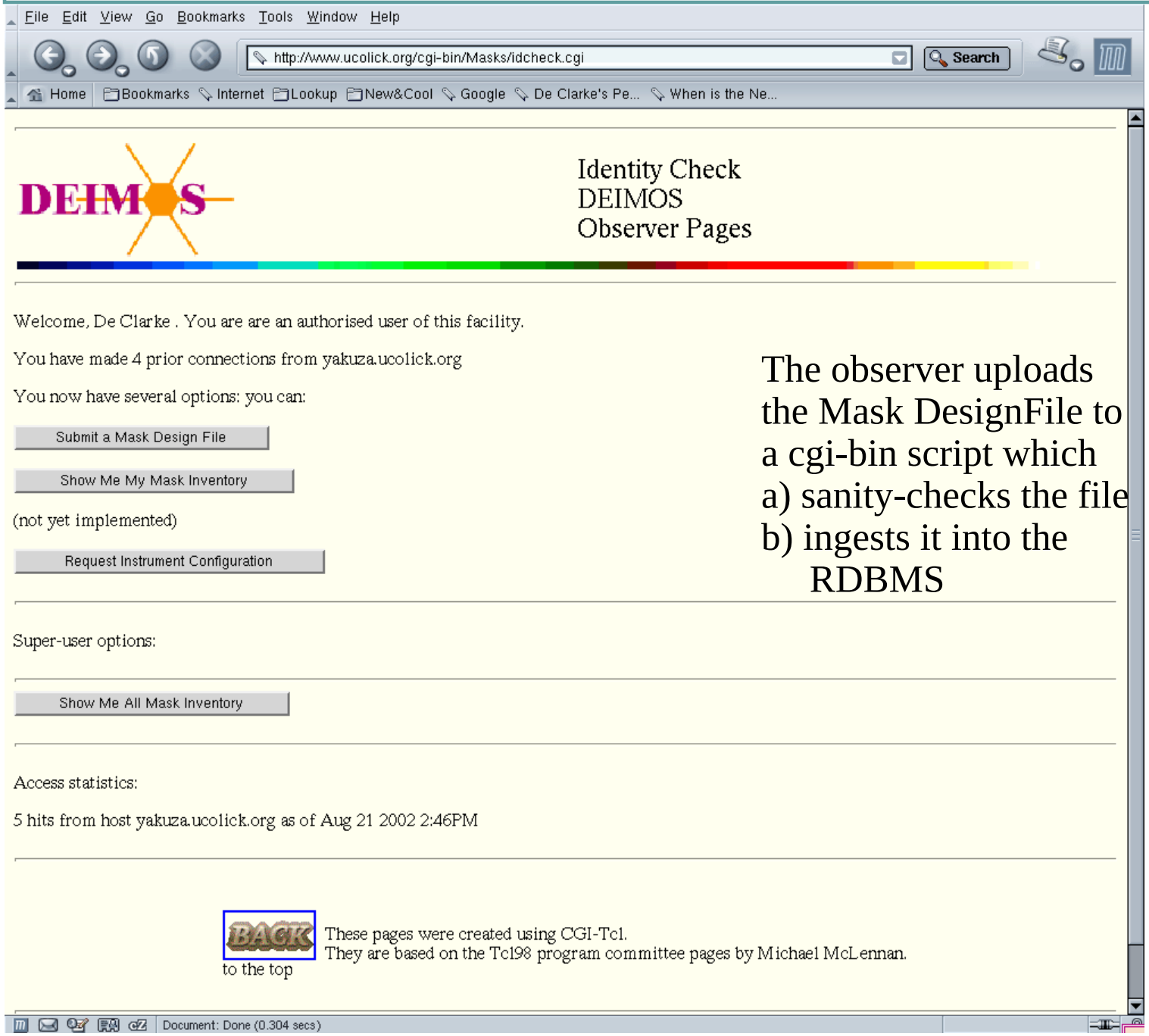
DEIMOS Removable Elements: Creating a Mask Design



The observer uses a copy of DSIMULATOR at his/her home institution to design a DEIMOS slitmask.

The output from this process is a Mask Design File (a FITS file containing multiple table extensions).

DEIMOS Removable Elements: Uploading a Mask Design File



The observer uploads the Mask DesignFile to a cgi-bin script which
a) sanity-checks the file
b) ingests it into the RDBMS

A web-based interface is provided for the observer who wishes to have DEIMOS slitmask designs milled.

The observer can also view a list of all his/her masks and their status . . . milled, pending, etc.

DEIMOS Removable Elements: Mask Design Files

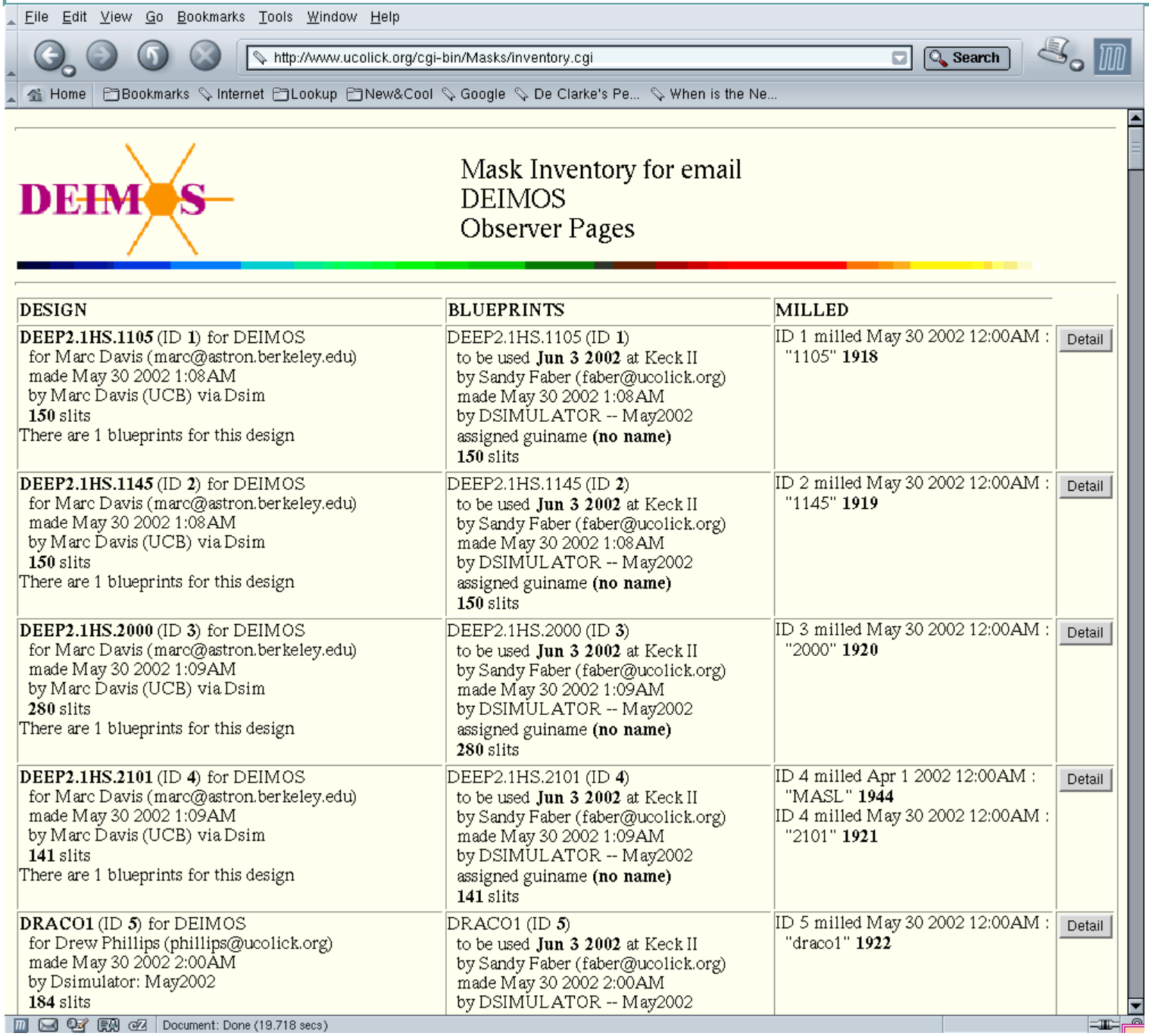
File Edit Help

Index	Extension	Type	Dimension	View		
0	Primary	Image	0	Header	Image	Table
1	ObjectCat	Binary	12 cols X 180 rows	Header	Plot	Table
2	MaskDesign	Binary	19 cols X 1 rows	Header	Plot	Table
3	DesiSlits	Binary	10 cols X 180 rows	Header	Plot	Table
4	SlitObjMap	Binary	5 cols X 180 rows	Header	Plot	Table
5	MaskBlu	Binary	18 cols X 1 rows	Header	Plot	Table
6	BluSlits	Binary	11 cols X 180 rows	Header	Plot	Table

The relational database version of the mask design data uses essentially the same structure as the FITS Mask Design File.

The MDF submitted by the user contains a boilerplate table called ’RDBmap’ which maps FITS tables and fields to database tables and fields. The "ingester" has only to follow the instructions in this map table; hence the MDF created by DSIMULATOR is a form of "self unpacking archive" which contains all the information needed to convert it into database records.

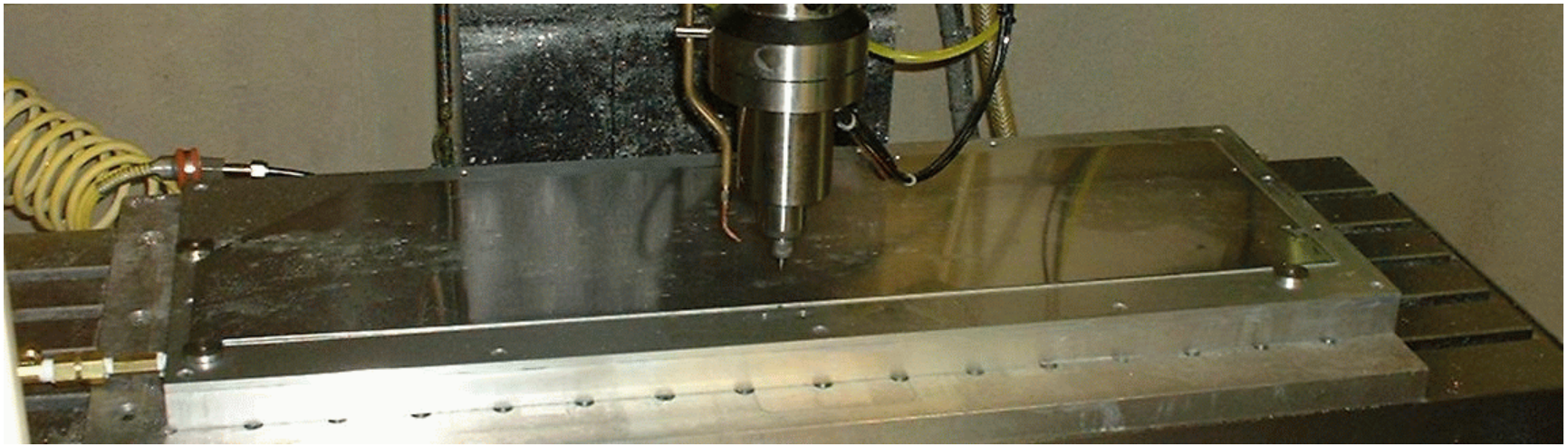
DEIMOS Removable Elements: Reviewing Your Mask Inventory

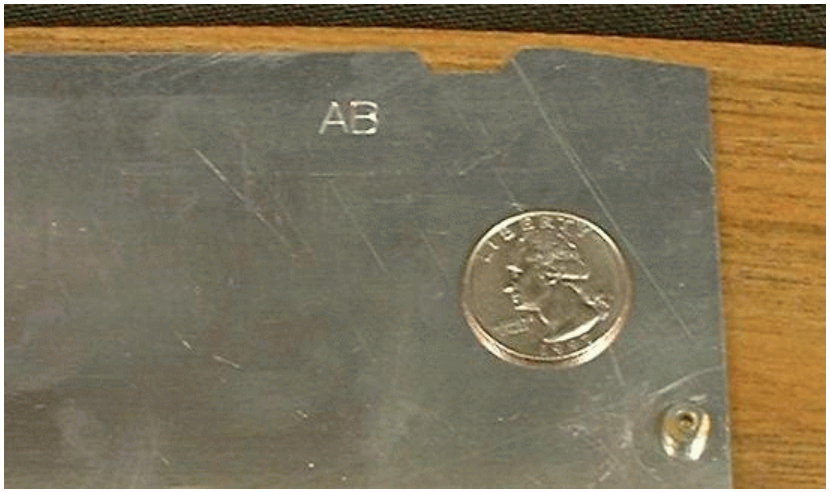


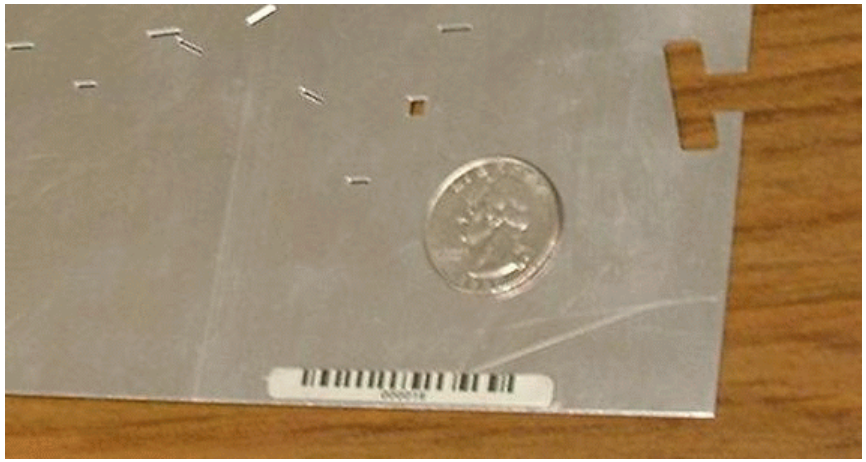
DESIGN	BLUEPRINTS	MILLED	
DEEP2.1HS.1105 (ID **1**) for DEIMOS for Marc Davis (marc@astron.berkeley.edu) made May 30 2002 1:08AM by Marc Davis (UCB) via Dsim **150** slits There are 1 blueprints for this design	DEEP2.1HS.1105 (ID **1**) to be used **Jun 3 2002** at Keck II by Sandy Faber (faber@ucolick.org) made May 30 2002 1:08AM by DSIMULATOR -- May2002 assigned guiname **(no name)** **150** slits	ID 1 milled May 30 2002 12:00AM : "1105" **1918**	Detail
DEEP2.1HS.1145 (ID **2**) for DEIMOS for Marc Davis (marc@astron.berkeley.edu) made May 30 2002 1:08AM by Marc Davis (UCB) via Dsim **150** slits There are 1 blueprints for this design	DEEP2.1HS.1145 (ID **2**) to be used **Jun 3 2002** at Keck II by Sandy Faber (faber@ucolick.org) made May 30 2002 1:08AM by DSIMULATOR -- May2002 assigned guiname **(no name)** **150** slits	ID 2 milled May 30 2002 12:00AM : "1145" **1919**	Detail
DEEP2.1HS.2000 (ID **3**) for DEIMOS for Marc Davis (marc@astron.berkeley.edu) made May 30 2002 1:09AM by Marc Davis (UCB) via Dsim **280** slits There are 1 blueprints for this design	DEEP2.1HS.2000 (ID **3**) to be used **Jun 3 2002** at Keck II by Sandy Faber (faber@ucolick.org) made May 30 2002 1:09AM by DSIMULATOR -- May2002 assigned guiname **(no name)** **280** slits	ID 3 milled May 30 2002 12:00AM : "2000" **1920**	Detail
DEEP2.1HS.2101 (ID **4**) for DEIMOS for Marc Davis (marc@astron.berkeley.edu) made May 30 2002 1:09AM by Marc Davis (UCB) via Dsim **141** slits There are 1 blueprints for this design	DEEP2.1HS.2101 (ID **4**) to be used **Jun 3 2002** at Keck II by Sandy Faber (faber@ucolick.org) made May 30 2002 1:09AM by DSIMULATOR -- May2002 assigned guiname **(no name)** **141** slits	ID 4 milled Apr 1 2002 12:00AM : "MASL" **1944** ID 4 milled May 30 2002 12:00AM : "2101" **1921**	Detail
DRACO1 (ID **5**) for DEIMOS for Drew Phillips (phillips@ucolick.org) made May 30 2002 2:00AM by Dsimulator: May2002 **184** slits	DRACO1 (ID **5**) to be used **Jun 3 2002** at Keck II by Sandy Faber (faber@ucolick.org) made May 30 2002 2:00AM by DSIMULATOR -- May2002	ID 5 milled May 30 2002 12:00AM : "draco1" **1922**	Detail

By clicking on the Detail button the observer can view the complete mask design data.

DEIMOS Removable Elements: Mask Milling

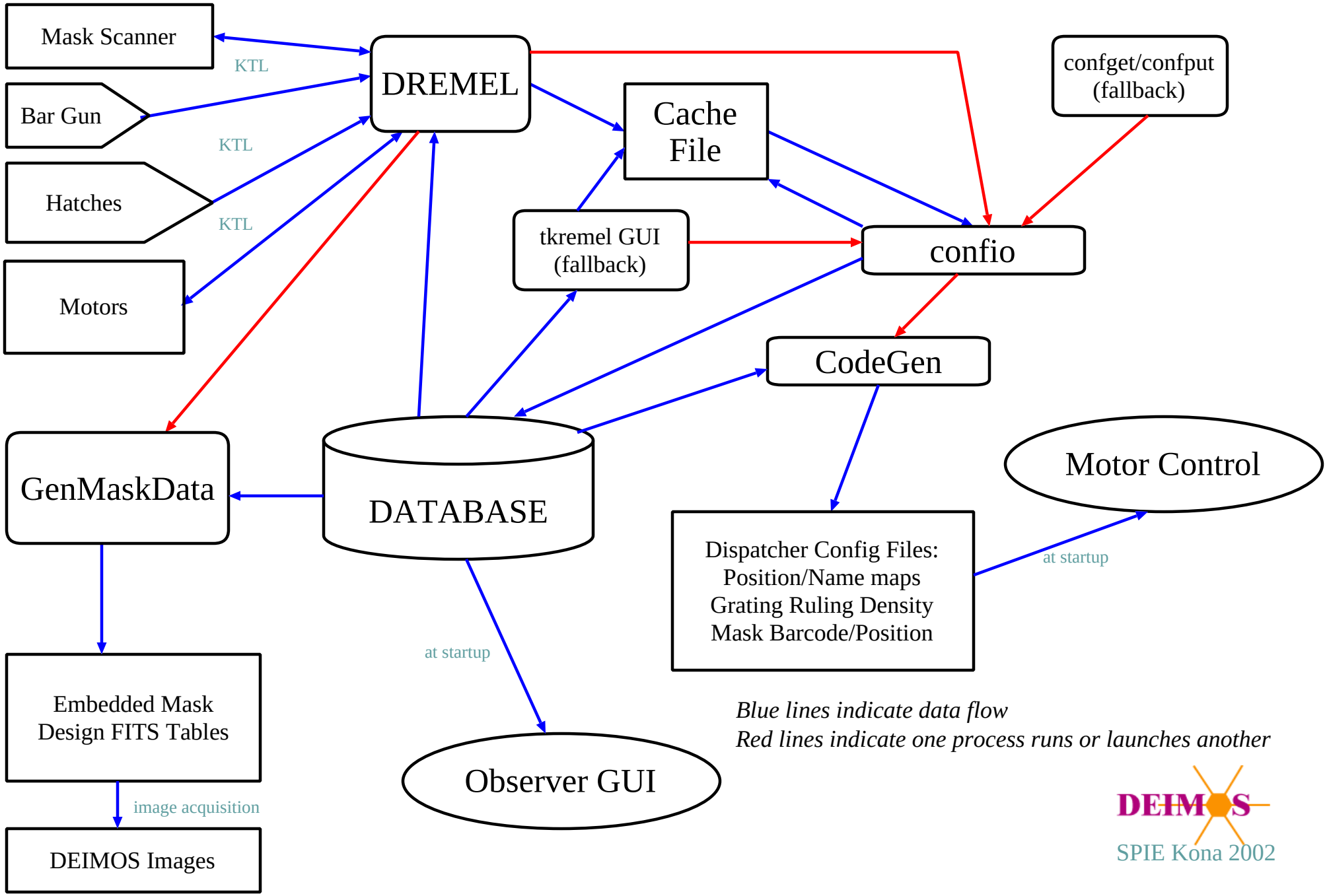




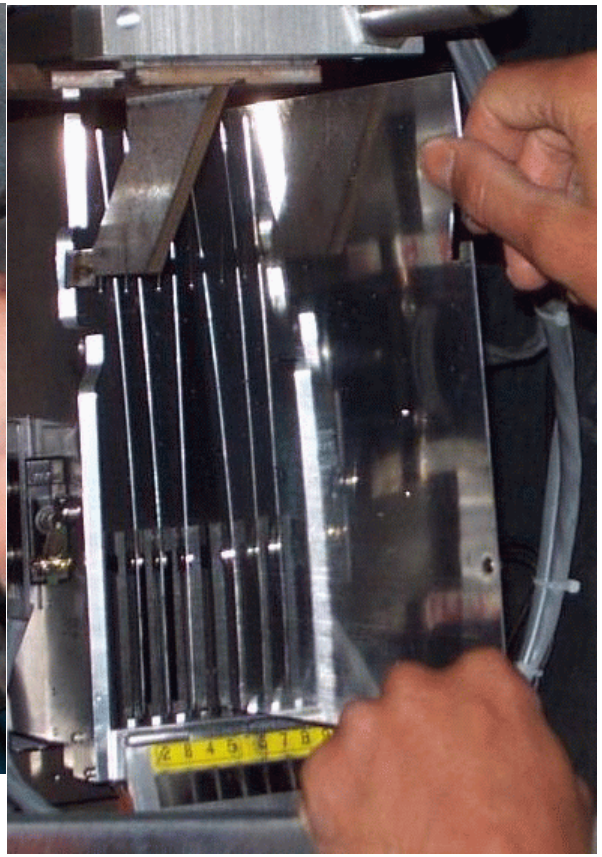


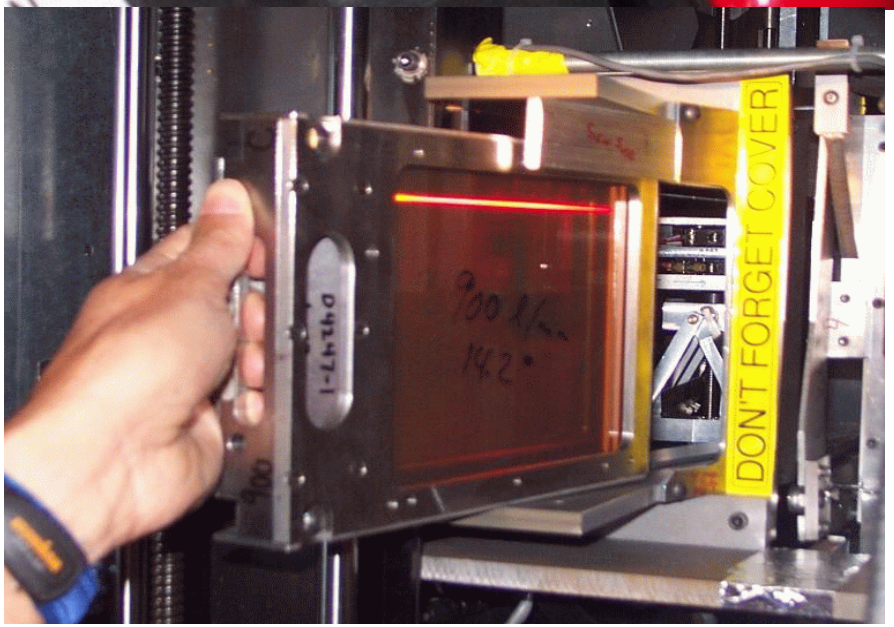
Top: a mask being milled
Lower Left: a milling sequence code engraved into the mask
Lower Right: bar code label applied to finished mask

DEIMOS Removable Elements: Instrument Configuration Dataflow



DEIMOS Configuration: On the Platform





The technician installs elements required for tonight. Filters and gratings are scanned after installation. Slitmasks are automatically scanned by the 'dremel' process.

The technician can send commands to 'dremel' using the bar gun, such as 'COMMIT'.

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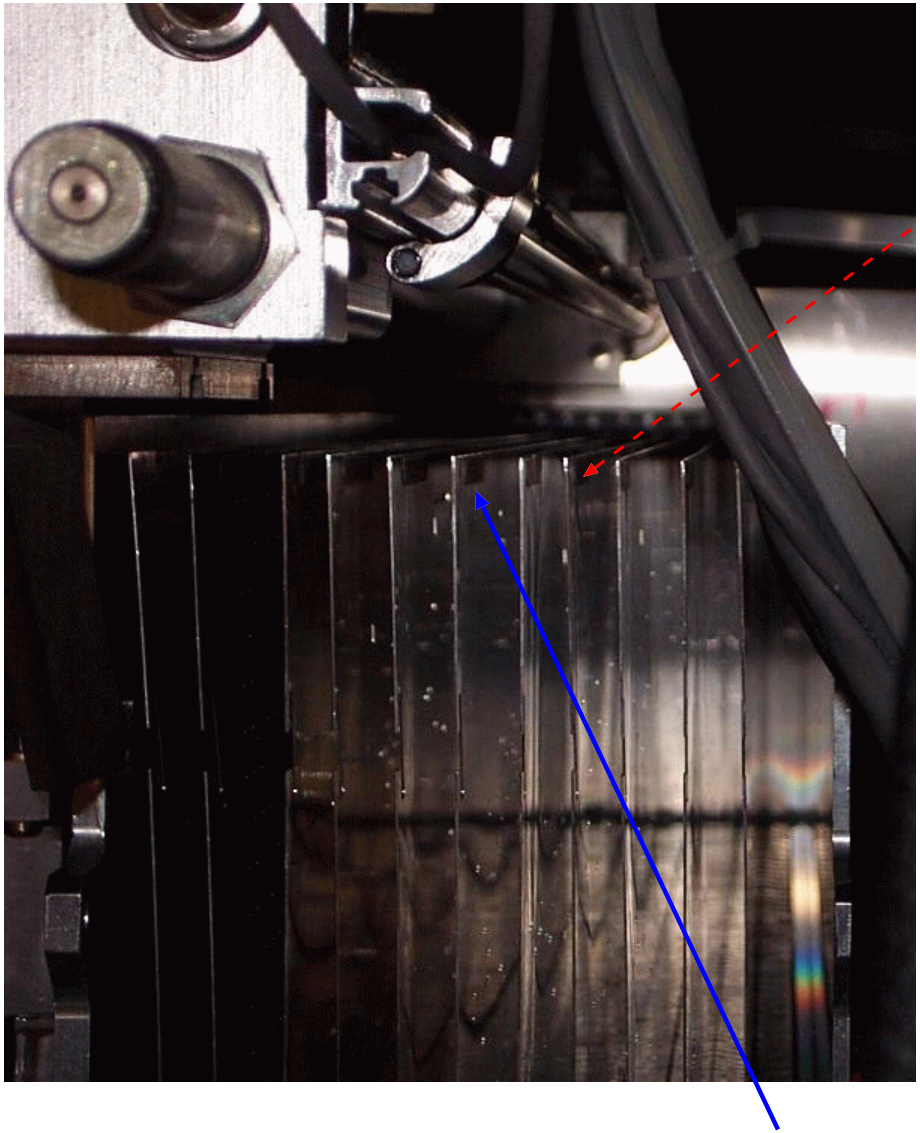
DEIMOS Configuration: Identifying Masks



A fixed mount barcode scanner is installed inside the instrument.

The ’dremel’ process controls the scanner and the cassette. It scans repeatedly while moving the cassette so that each mask passes under the scanner beam (an approximation of which is shown here in red).

’dremel’ reads results from the scanner to determine the bar code on each mask. Having extracted and cached mask design information from the database, it ’knows’ whether the bar code is valid and can associate complete mask design data with each valid code.

This process is automatic and requires no user intervention unless a label is unreadable or there is a mechanical failure.

DEIMOS Configuration: Generated Files

```
# mapron.cfg file
# for deimot
# generated Sat Aug 17 10:24:03 HST 2002 by CodeGen 1.24 from KSUMMIT data

# Data in this file are derived from the Memes and Mmaps tables.
# See the file README.mapron for more information.

# WARNING: Ad hoc changes to this file will be overwritten without warning.
#          To make permanent changes, alter the Memes/Mmaps data.
#          Usually, the keywords involved will end in ORD, RAW, NAM.


# Servc DispID  Stage   Flags   Ord     Raw     Nam

deimot  2       SLSEL   0       0       0       Home
deimot  2       SLSEL   0       2       -417000 GOSpH3
deimot  2       SLSEL   0       3       -317000 GOH_X
deimot  2       SLSEL   0       4       -229000 LongA
deimot  2       SLSEL   0       5       -149000 a0_1
deimot  2       SLSEL   0       6       -75000  a3_2
deimot  2       SLSEL   0       7       -8000   2246.W
deimot  2       SLSEL   0       8       53000   2242.W
deimot  2       SLSEL   0       9       109(
deimot  2       SLSEL   0       10      160(
```

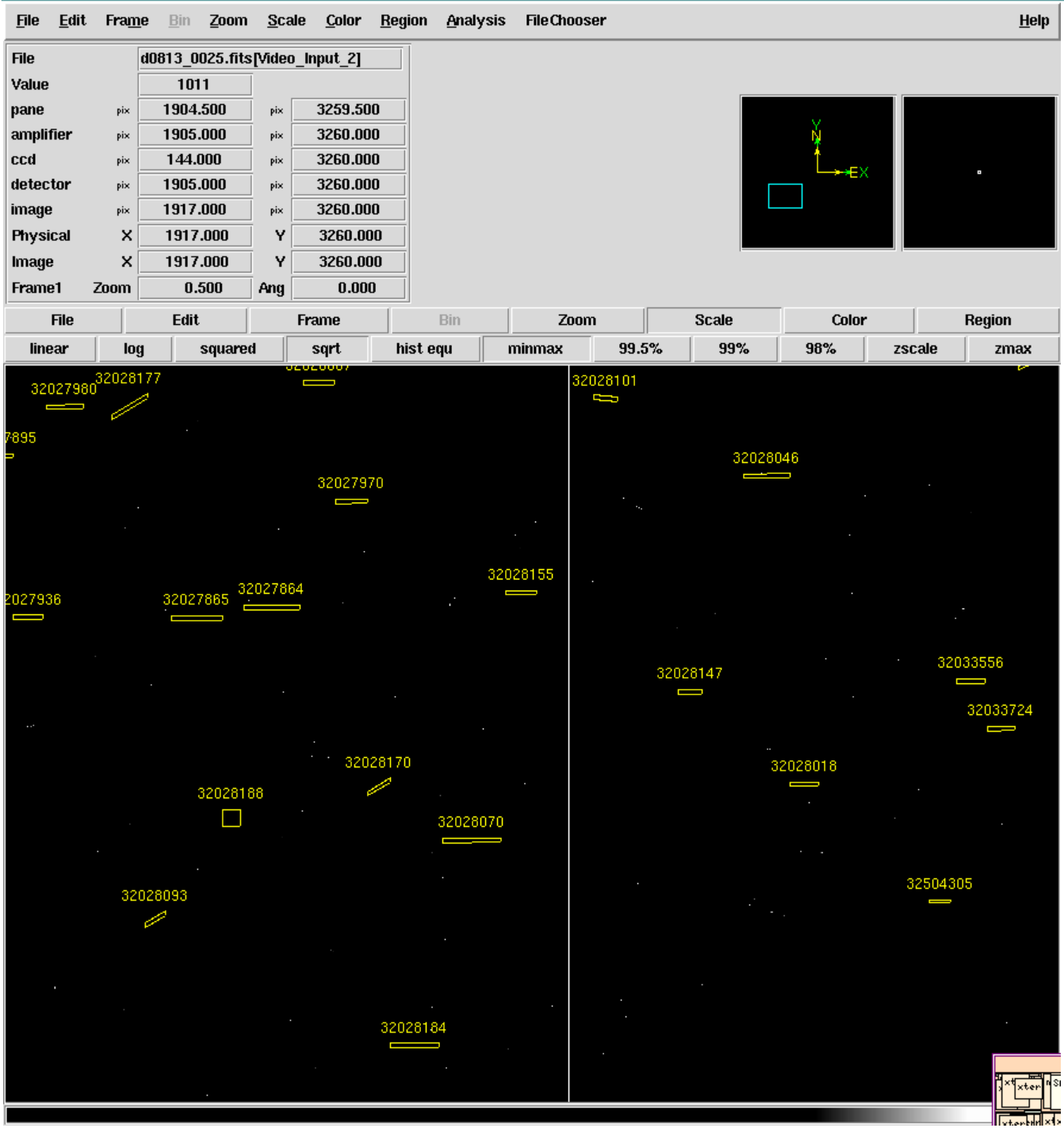
```
# slitmaskbarcodemap.cfg file
# for deimot
# generated by dremel Thu Aug 15 13:08:57 HST 2002
# Data in this file are derived from the Mask table
# Barcocdes are obtained by scanning
#       w/fixed position internal scanner
#Servc  DispID  Slitmask        Barcodes


deimot  2       2       1966
deimot  2       3       1927
deimot  2       4       1891
deimot  2       5       100
deimot  2       6       88
deimot  2       7       56
deimot  2       8       55
deimot  2       9       89
deimot  2       10      None
deimot  2       11      98
deimot  2       12      96
deimot  2       13      None
```

```
# slidermap.cfg file
# for deimot
# generated Sat Aug 17 10:24:03 HST 2002 by CodeGen 1.24 from KSUMMIT data

# Data in this file are derived from the Memes and Mmaps tables AND
# via a hideous hack, from the Gratings table (to get the ruling density).
# See the file README.slidermap for more information.

# WARNING: Ad hoc changes to this file will be overwritten without warning.
#          To make permanent changes, alter the Memes/Mmaps or Gratings data.

# Servc         DispID  DevNam  Slider  Lines

  deimot        2       G1TLT   1       -1
  deimot        2       MIRROR  2       -1
  deimot        2       G3TLT   3       900.0
  deimot        2       G4TLT   4       1200.0
```

Excerpts of typical generated configuration files.

These files are produced by CodeGen from information stored in the RDBMS.

DEIMOS Configuration: Identifying Masks



In addition to the mask design FITS data appended to each DEIMOS spectral image, we generate a documentary ds9 overlay for each mask.

This overlay can help to identify slitlets on a direct image.

We are still working on the mapping of metal coordinates to pixel coordinates. At present the overlay is offset from the actual direct image of the mask.

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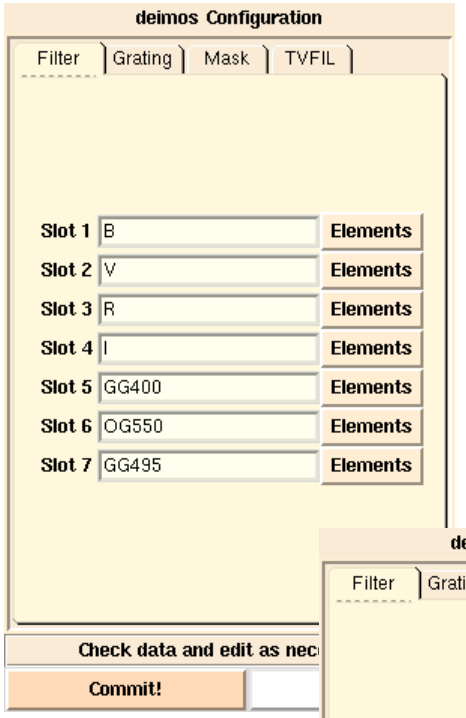
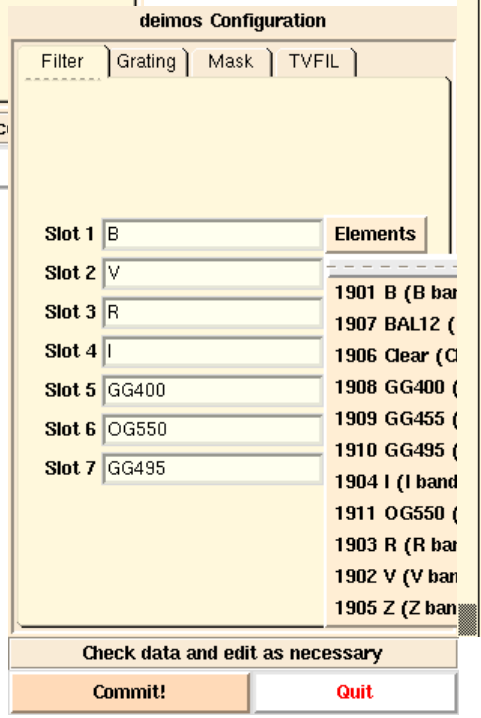
DEIMOS Configuration: Overrides and Workarounds



In the event that automatic methods fail, the technician or instrument scientist can use simple tools

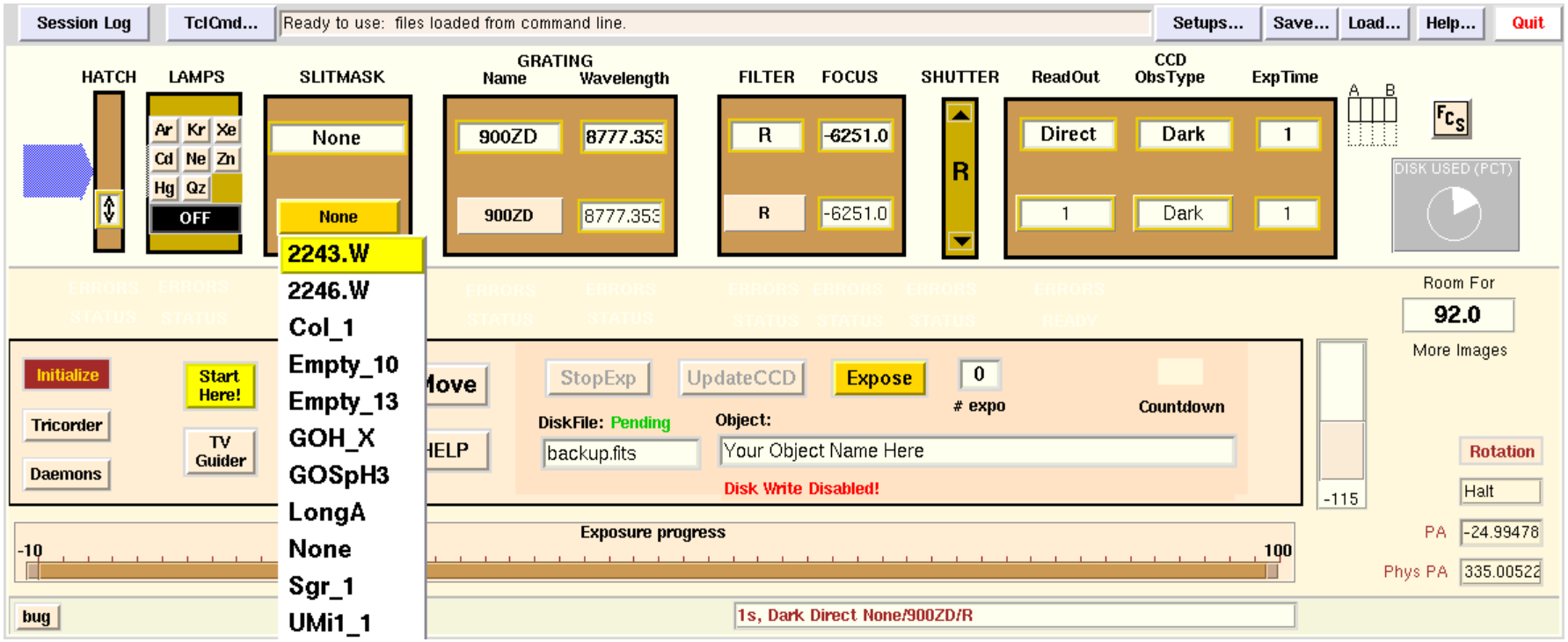


to configure the instrument manually.

The ultimate fallback is to acquire (*confget*) the current configuration as a plain text file, edit it (using any editor), and commit it (*confput*).

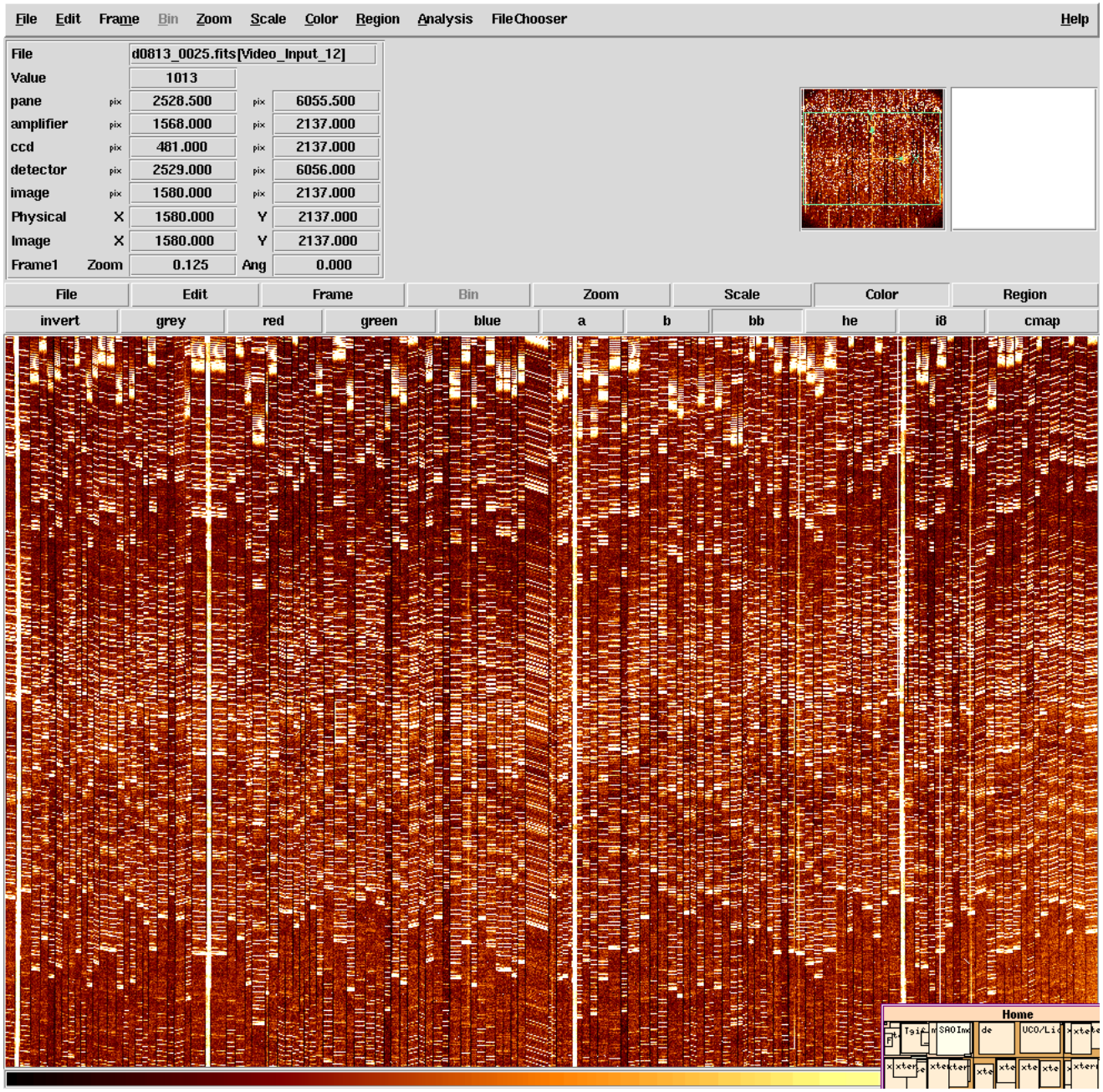
```
# this file written by confio, a ktui utility;
# source for confio is in cvs/kroot/util/ktui;
# dumps dynamic instrument configuration from database or
# loads dynamic instrument configuration to database.
# this file produced by confio in OUTPUT mode.
# Tue Aug 13 15:48:30 HST 2002
# INSTRUMENT deimot (mid 5339)
#
# HOW TO USE THIS FILE:
# 1) the 'defaults' entries are for your reference only.
#    it is counterproductive to comment them in, as they are
#    already in the database as the factory default settings.
# 2) adjust or create the NONcommented lines to reflect
#    the actual installed removable elements.
# 3) feed this file back in to the database using confio
#    again, but with the 'in' flag.

#
#
# GRSEL
# (dynamically configured)
deimot   GRSEL   -12000000       1       NonOp
deimot   GRSEL   -9306000        2       Mirror
deimot   GRSEL   -4394700        3       1200G
deimot   GRSEL   -1500   4       900ZD
#
# (factory defaults)
# deimot         GRSEL   10000   1       Grating_1
# deimot         GRSEL   -9308000        2       Mirror
# deimot         GRSEL   -4398200        3       Grating_3
# deimot         GRSEL   -4000   4       Grating_4
#
# SLSEL
# (dynamically configured)
deimot   SLSEL   -417000 2       GOSpH3
deimot   SLSEL   -317000 3       GOH_X
deimot   SLSEL   -229000 4       LongA
deimot   SLSEL   -149000 5       3249.E
```

DEIMOS Configuration: User Interface



When instrument configuration is successfully completed, the instrument control GUI comes up "knowing" which removable elements are in which positions. The user is able to refer to these elements transparently by their names.

DEIMOS Removable Elements: Data Reduction



Semi-automated reduction of DEIMOS spectral images such as this one is only possible if the instrument configuration and mask design are stored correctly in the FITS image file.

Correct configuration of the instrument is essential to later success in data reduction.

The size of a DEIMOS spectral image is about 140MB

DEIMOS Removable Elements: Acknowledgements, Thanks, and URLs

Thanks to G. Wirth for digital photos of DEIMOS configuration; to W Joye for the many hours he spent making ds9 work for DEIMOS images; to Bill Cheng for the graphic tool 'tgif' which was used to create these presentation pages.

The DEIMOS team would like to thank the staff of Keck Observatory for their support and co-operation during DEIMOS commissioning.

For more information, please visit the following URLs

http://deimos.ucolick.org
http://www.ucolick.org/cgi-bin/Tcl/document
http://www.ucolick.org/~sla/fits/mosaic/
http://hea-www.harvard.edu/RD/ds9/

and read the full text of this poster/paper in the SPIE *Proceedings*