The ISOPHOT Observational Modes and their Pipeline Processing

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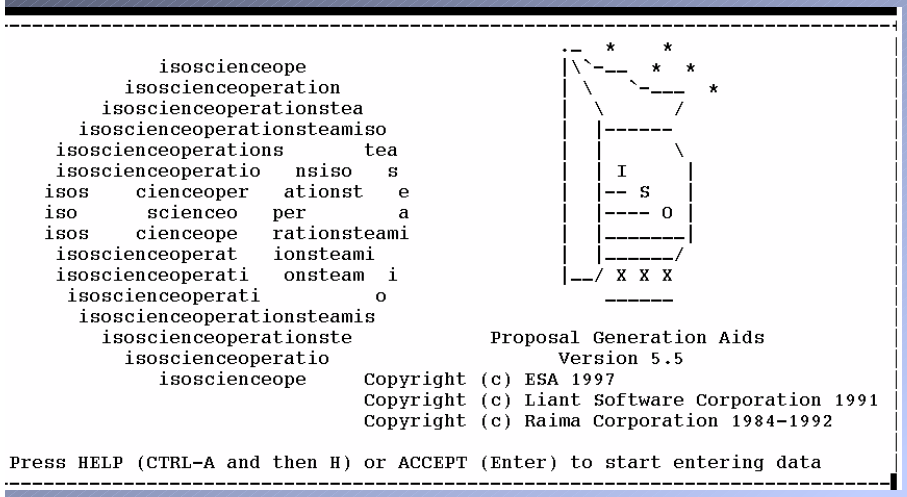
Data Entry for an Astronomical Proposal with Proposal Generation Aids (PGA)

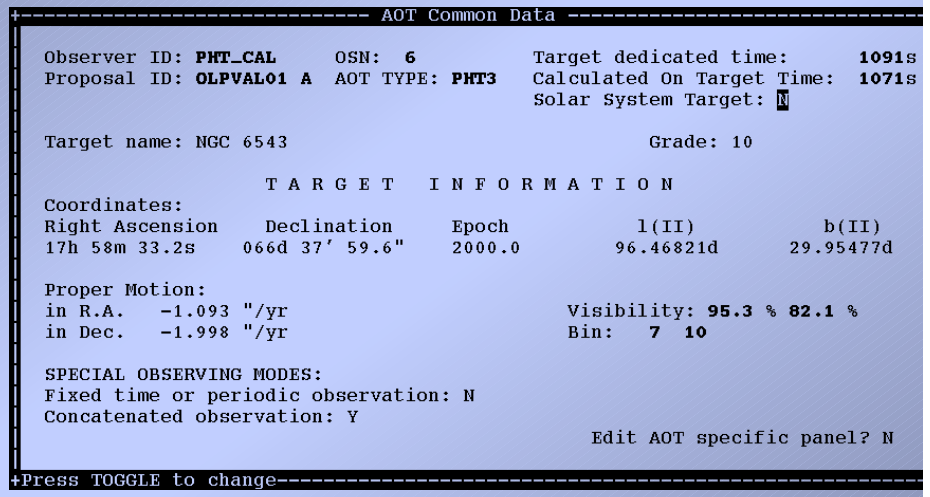
The Observer specifies his/her observation through input panel specifically designed for every observing mode of ISOPHOT. The Input is done in astronomical terms, via Astronomical Observing Templates (AOTs), and does not require a detailed knowledge about the details of the operations and commanding of the instrument. The data is transferred into the ISO mission database.

ISO Mission Data Base

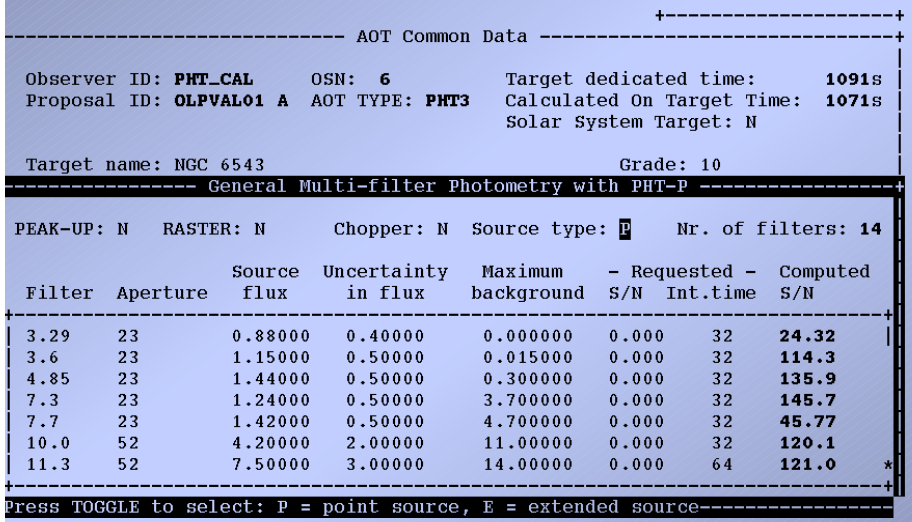
Examples of ISOPHOT PGA Input Panels



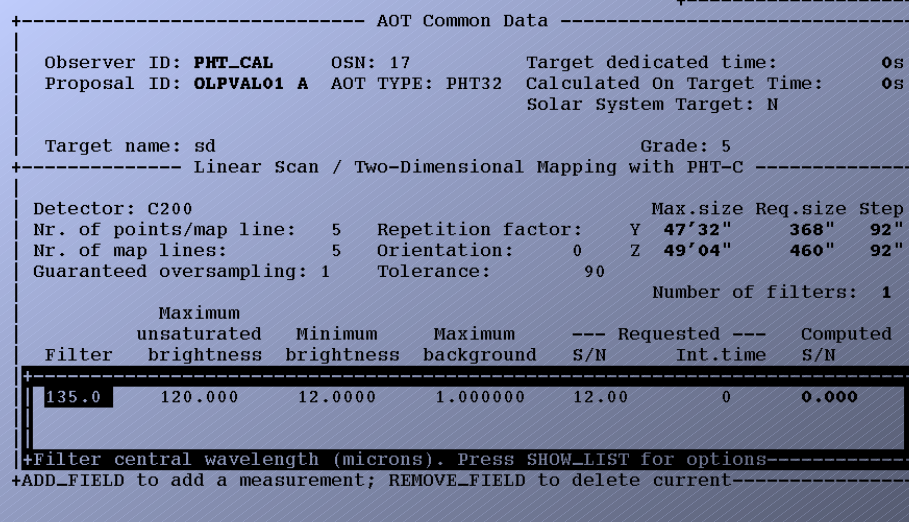
PGA Title Page



Entering Source Parameters



Defining Parameters for a Multi-filter AOT



Planning a 120µm map with P32

The ISOPHOT Astronomical Observation Templates (AOTs)

The Observer has the choice among the following 11 astronomical observation modes for operating the ISOPHOT Instrument:

- **P03 Multi-filter Photometry (Range: 3.3 to 100 μm)**
- **P04 Multi-Aperture Photometry (Range: 3.3 to 100 μm)**
- **P05 Absolute High Precision Photometry (Range: 3.3 to 100 μm)**
- **P17 Multi-Filter Sparse Map (Range: 3.3 to 100 μm, up to 32 individual sky positions)**
- **P22 Multi Filter Photometry (Range: 60 to 240 μm)**
- **P25 Absolute High Precision Photometry (Range: 60 to 240 μm)**
- **P32 High Resolution Oversampled Mapping (Range: 60 to 240 μm, Resolution 15")**
- **P37 Multi-Filter Sparse Map (Range: 60 to 240 μm, up to 32 individual sky positions)**
- **P40 Spectrophotometry (Range: 2.5 to 12 μm, Resolution ~100)**
- **P50 Polarimetry (Range: 3.3 to 100 μm)**
- **P51 Polarimetry (Range: 60 to 240 μm)**

ISOPHOT Uplink Software

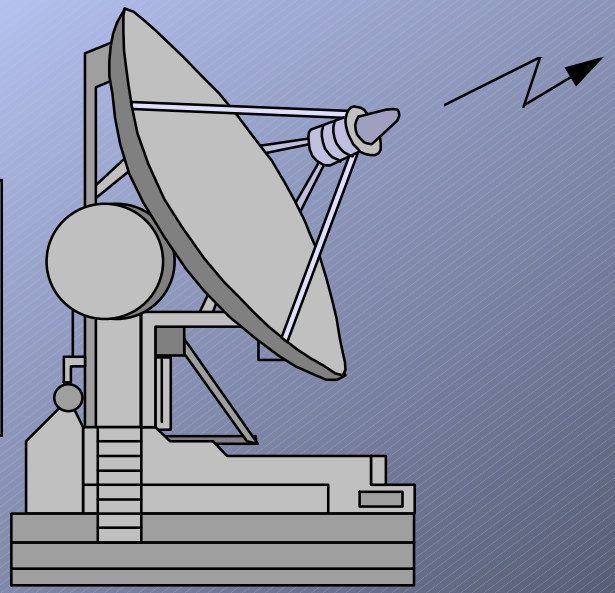
The ISOPHOT Uplink Logic extracts the user information from the ISO Mission Data Base and automatically generates a set of Instrument Command Sequences and Parameters containing commands that can be directly understood by the ISOPHOT on-board computer. Due to consequent modularity the entire ISOPHOT operations can be performed utilizing only 25 ICS templates each containing on average less than 10 individual instrument commands.
In addition the uplink software calculates an exact prediction of the execution times of every Observation with an accuracy of about 1s for mission planning.

Planned Observation File (POF)

Planned Instrument Command File (PICS)

Mission Planning

Spacecraft Command Centre (SCC)



Villafranca/Goldstone

Examples of ISOPHOT Uplink Files

Planned Observation File (PPOF)

```
94277000000 START_TDT            Y          /* Starting a TDT
94277000322 ED(PHTTLM)                      /* Telemetry Reconfiguration
94277000332 TDATA_TDT_N          320001
94277000332 MOUT                 Starting a new Observation ( AOT: P32 )
94277000332 TDATA_OBS_DESCR      MYPROPOSJOHNSMI 11229Ctest          123
94277000332 TDATA_QLA_SIG        01
94277000332 TDATA_AOT            P32
94277000332 TDATA_APERTURE       P2
94277000332 TDATA_TDT_C          OBS
94277000332 TDATA_MESSAGE_1      E                          6009
94277000332 ICSNAME              PS0001001000 /* Switch ON Heating
94277000336 ICSNAME              PS0014001001 /* Switch C100 from STANDBY to ON
94277000344 ICSNAME              PS0002001002 /* Wait for Heating Stabilization
94277000514 ICSNAME              PS0016001003 /* Mechanical Reconfiguration C
94277000522 ICSNAME              PS0021001004 /* Change CRE-co Voltage
94277000526 ICSNAME              PS0020001005 /* Reconfiguration Electronics
94277000530 ICSNAME              PS0005001006 /* FCS Calibration Measurement, Staring
94277000607 ICSNAME              PS0021001007 /* Change CRE-co Voltage
94277000611 ICSNAME              PS0020001008 /* Reconfiguration Electronics
94277000616 TDATA_MESSAGE_1      00.4E          -7.00000-7.0000001.342426009
94277000615 ICSNAME              PS0019001009 /* Measurement, Sawtooth/Triangular Chopping
94277001643 ED(PHTC05)                      /* Stop Exposure
94277001646 TDATA_MESSAGE_1      E                          6009
94277001651 ICSNAME              PS0001001010 /* Switch ON Heating
94277001655 ICSNAME              PS0017001011 /* Reset Electronics after break
94277001659 ICSNAME              PS0014001012 /* Switch C100 from STANDBY to ON
94277001707 ICSNAME              PS0002001013 /* Wait for Heating Stabilization
.
.
.
94277004753 ICSNAME              PS0000001047 /* Configuration Reset
94277000332 TDATA_AOT_VAR        05060268496127105457O2.90       0000913
94277004816 TDATA_EVERYTHING
94277004816 END_TDT
```

The Planned Observation File contains the exact sequence and timing for each ICS, as well as the information necessary to position ISO.

The Instrument Parameter File (PICS)

```
@PS0201999000
@PS0202999001
TRS2_ON
0.7
4
@PS0203999002
M0P6_VOLT
0.3500
-37.00
0_VOLT
0.0000
@PS0001001000
C100
@PS0014001001
M0P6_VOLT
0.4200
M0P25_VOLT
0.2190
0.0000
8
6
@PS0002001002
90
.
.
.
@PS0000001047
M0P25_VOLT
0.1700
M0P25_VOLT
0.1700
M0P25_VOLT
0.1700
M0P25_VOLT
0.1700
M0P6_VOLT
0.3500
-37.00
0_VOLT
0.0000
C200_160_UM
0.0000
8
```

The PICS file contains for every Instrument Command Sequences the exact set of parameters.
The correct settings like, e.g. the correct on-chip integration time, the detector bias and amplifier settings are automatically derived from the source and background fluxes specified by the observer. The execution times are optimised w.r.t. to the sequence of the instrument operations.
Necessary calibration observations are included into the operations as needed for the later data analysis

ISO Telemetry Handling

Telemetry

TDF First Scan

FITS Conversion

Derivation of Edited Raw Data

Derivation of pointing Information

FITS:

House-keeping Data (GEHK)

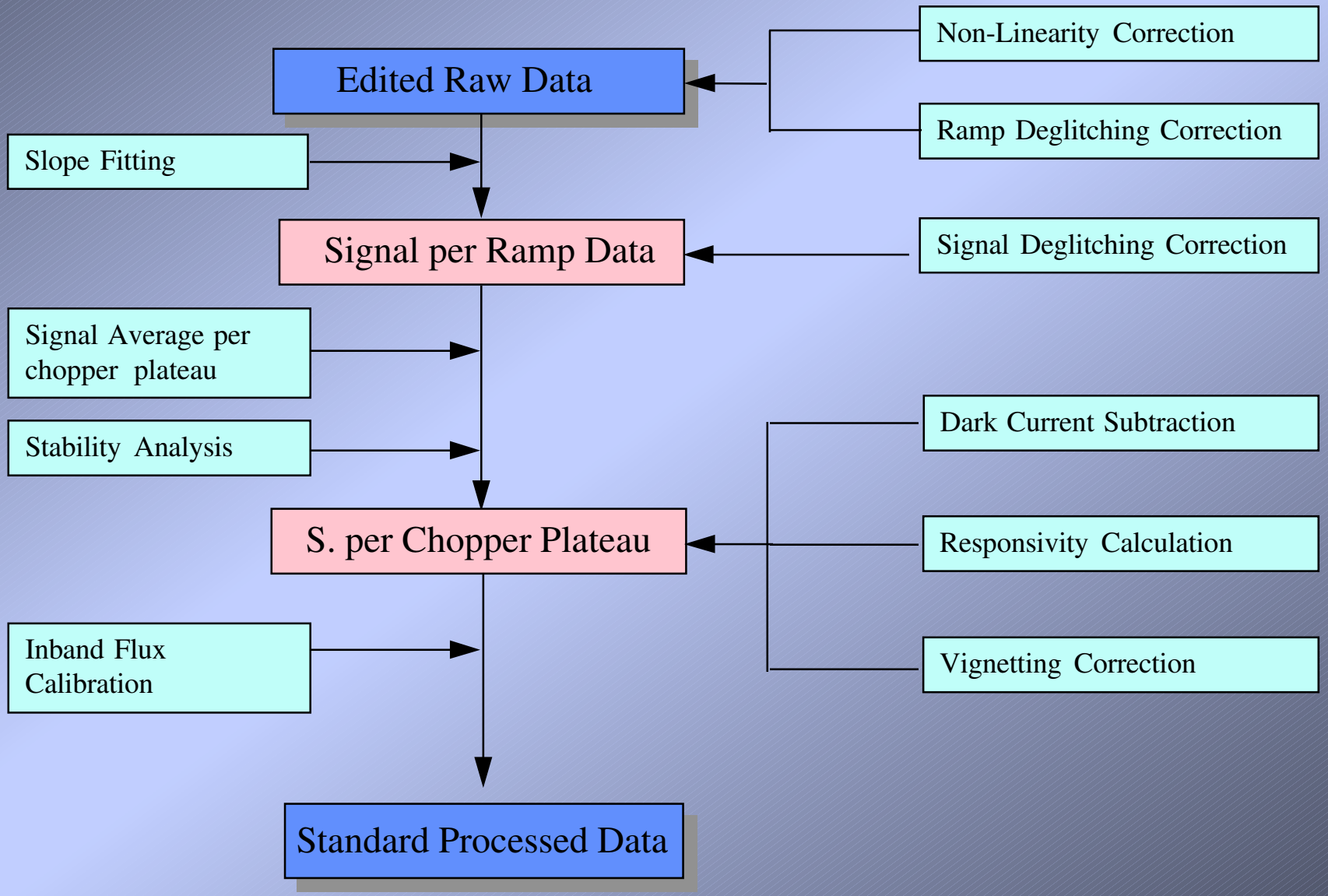
Science Data (ERD,CS,...)

Pointing Data (IRPH,IIPH)

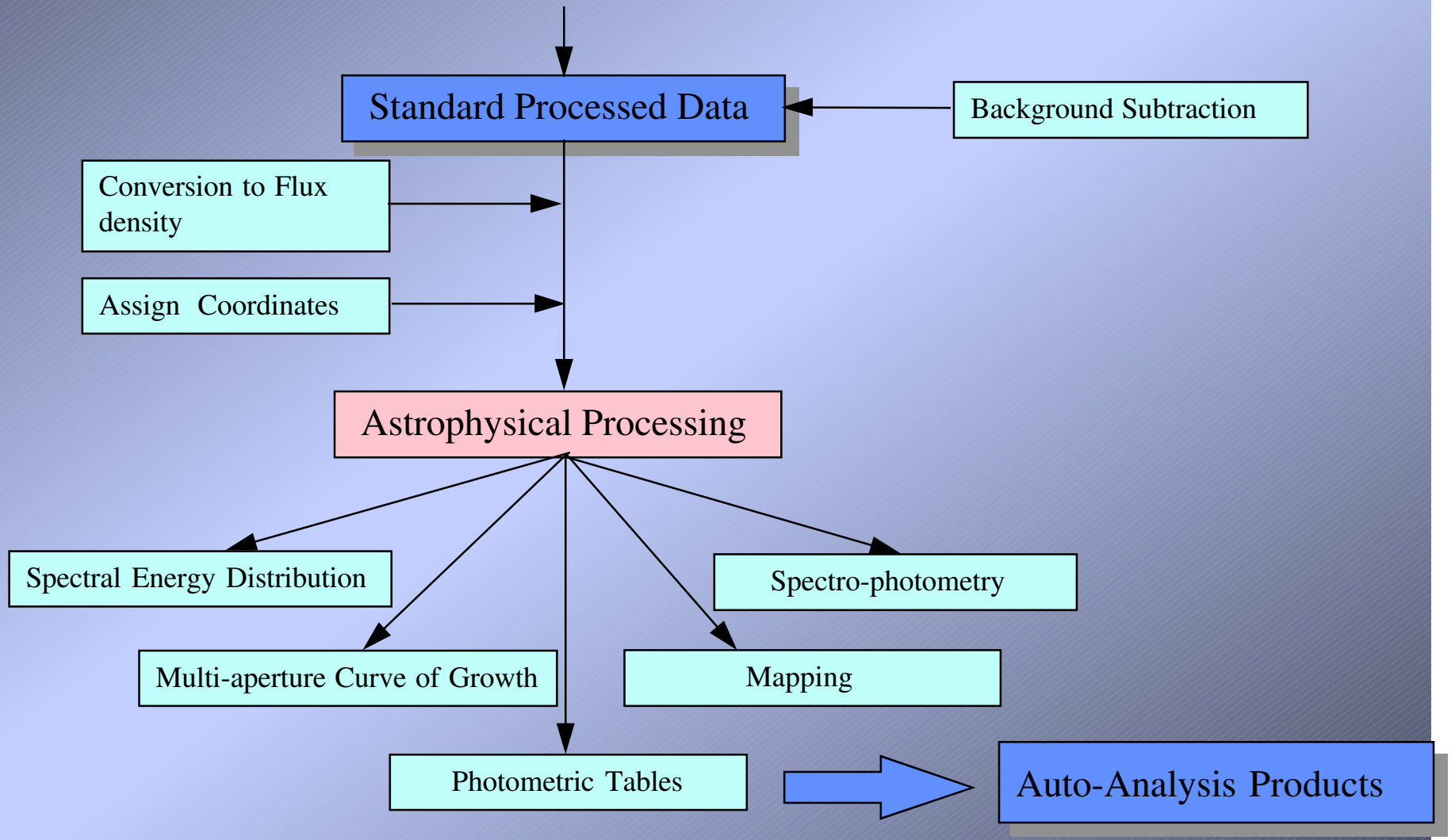
Edited Raw Data to ISO Archive and Observers' CD-ROM for use with Interactive Analysis

Instrument Specific Pipeline Processing

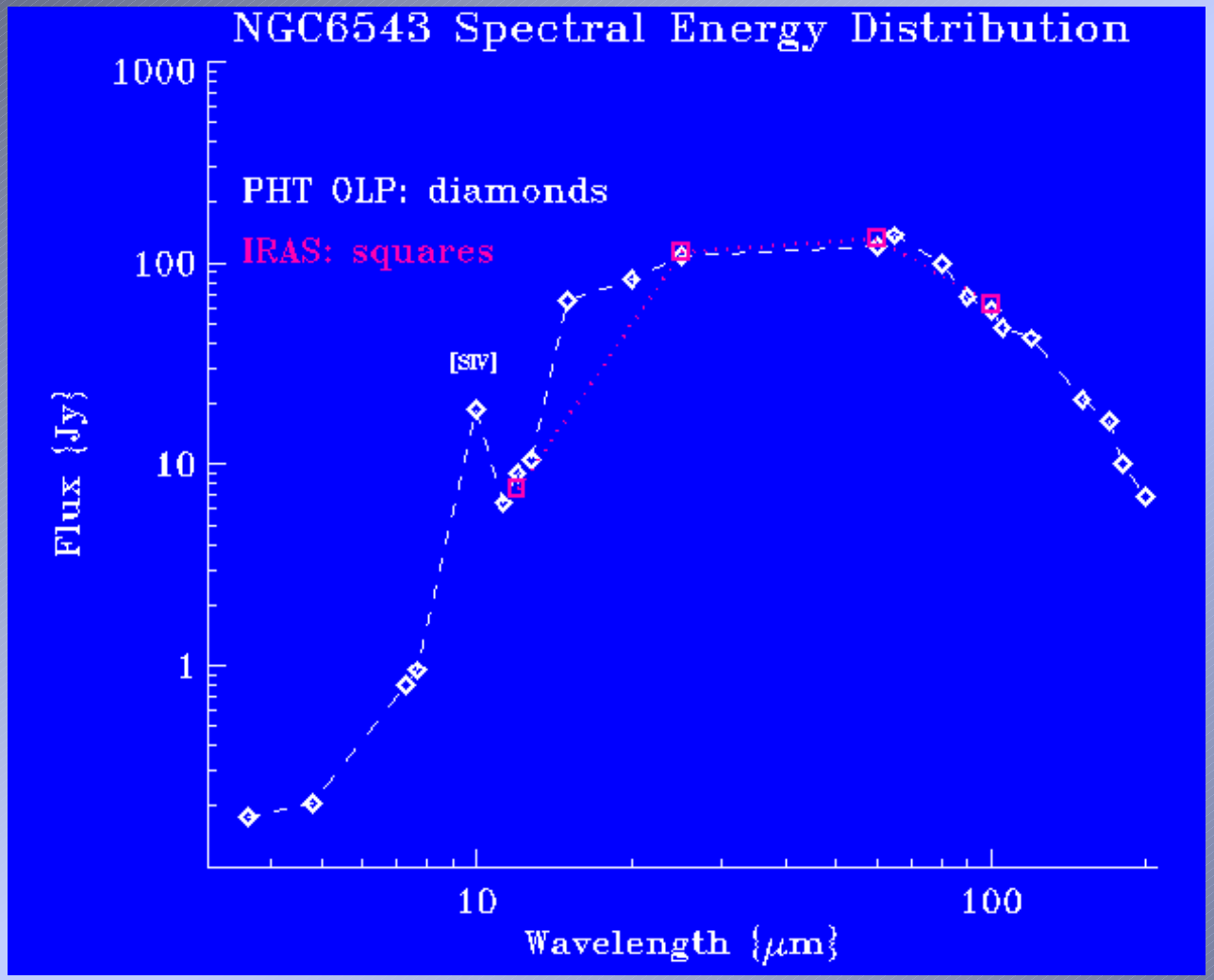
The Derivation of Standard Processed Data (SPD)



The Derivation of Auto-Analysis Products (AAP)

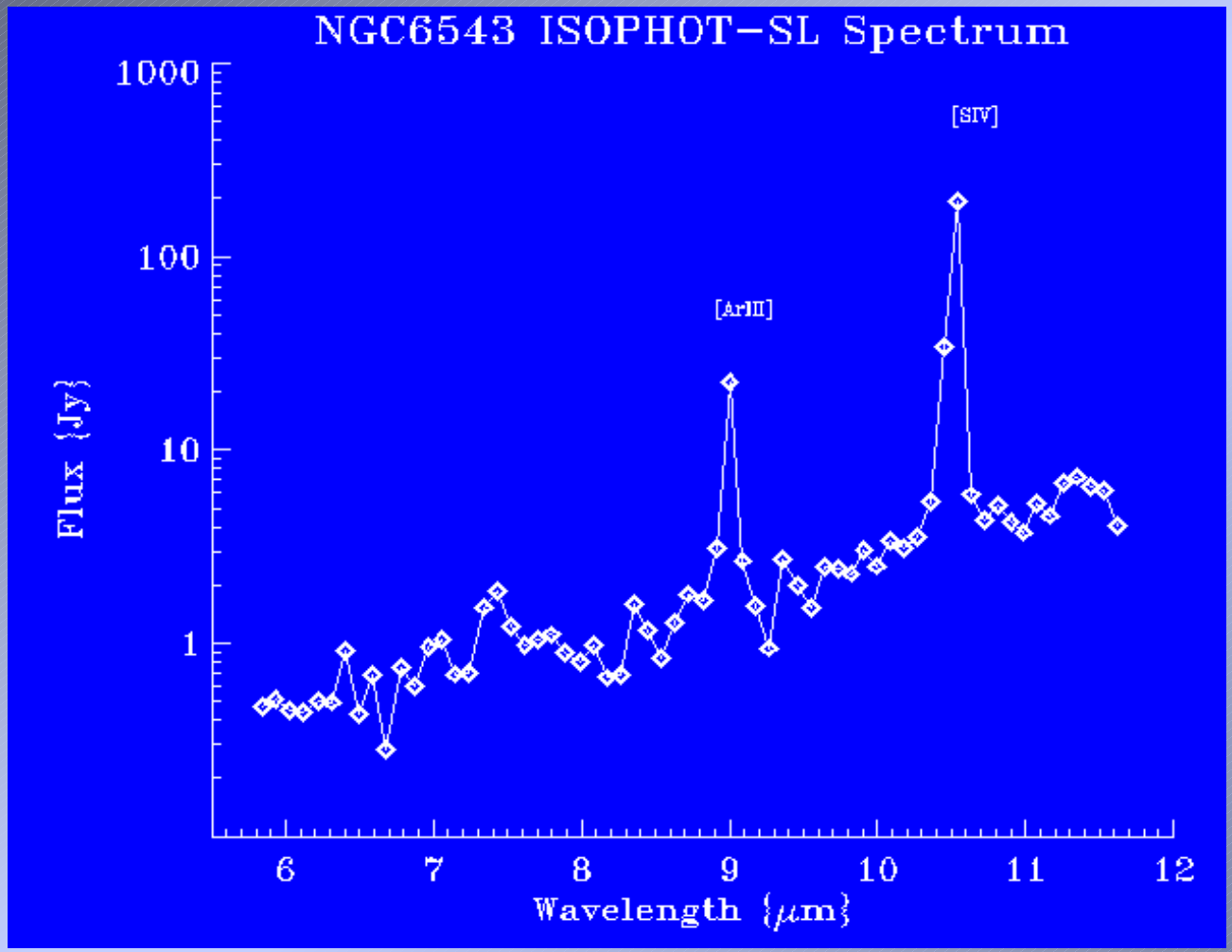


Spectral Energy Distribution
NGC6543



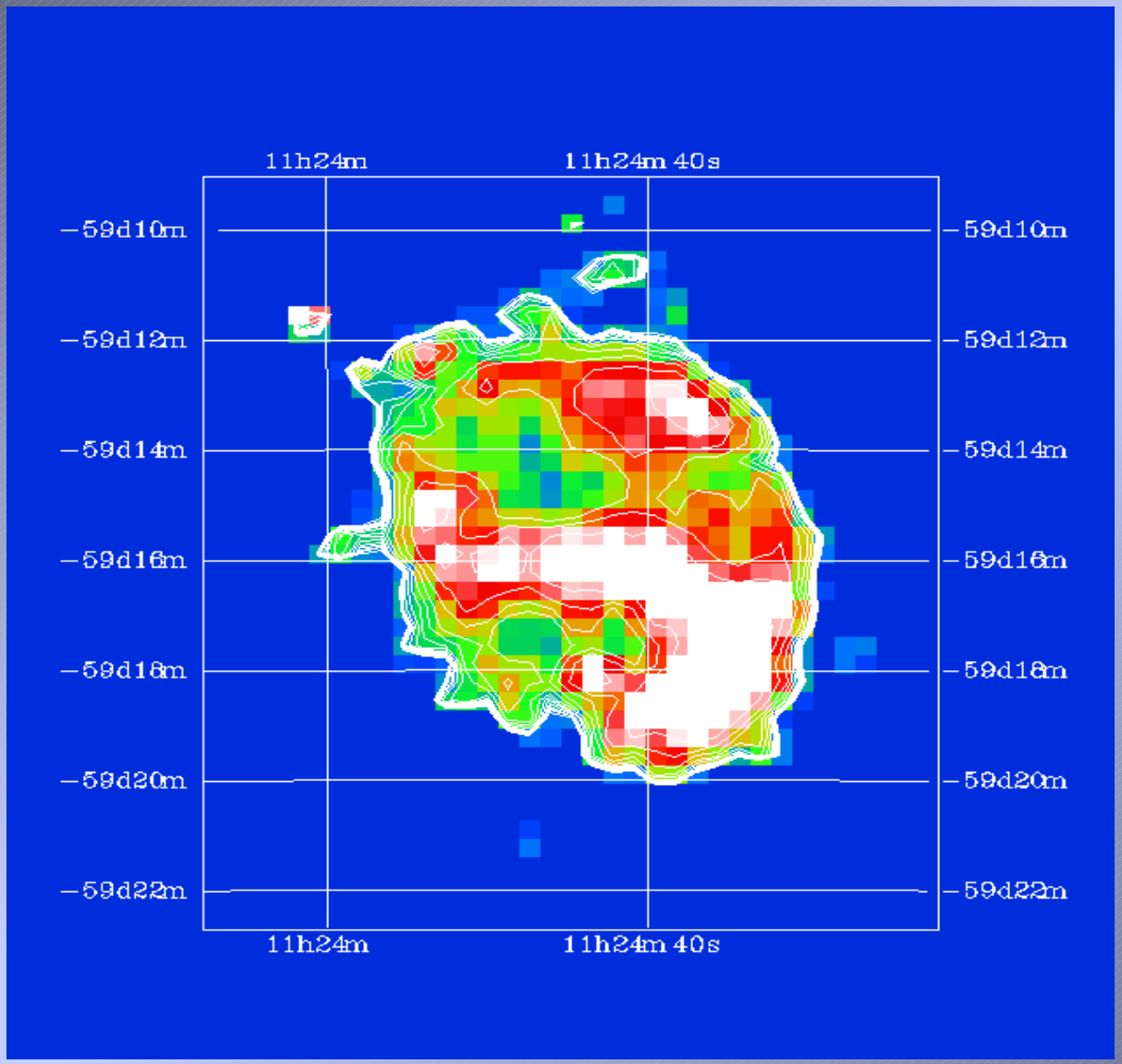
Unpublished Data obtained by the ISOPHOT Instrument Dedicated Team (PIDT) for the Scientific Validation of ISOPHOT Pipeline Software.
The plot contains data from two multi-filter AOTs (P03 and P22). They were processed using the ISOPHOT pipeline software version 6.0 and the calibration files version 3.0. The plot shows the contents of the two auto-analysis products as distributed to the observer without any further processing applied to data.

6 to 12 μm Spectrum of NGC6543

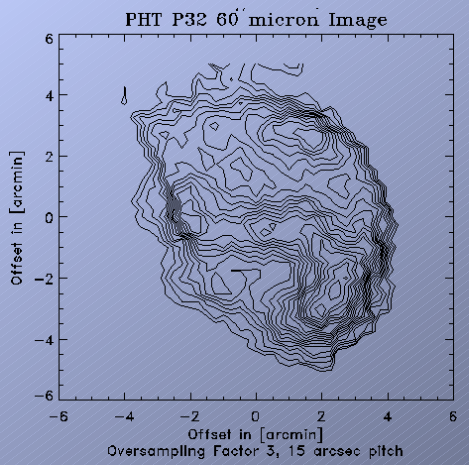


Un-published data obtained by the ISOSPHOT Instrument Dedicated Team (PIDT) for calibration purposes.

High Resolution 60μm Image
MSH 11-54



Auto-analysis data of an observation performed by ISOPHOT Instrument Dedicated Team (PIDT) during Performance Verification Phase for AOT validation.



For comparison Interactive Analysis Result taken from: Ingolf Heinrichsen, Richard Tuffs, Deborah Levine : *"Deep ISOPHOT Observations of the SNR MSH 11-54"* , Taking ISO to the Limits: Exploring the Faintest Sources in the Infrared", ESA-SSD Proceedings 3.2.1997