



Browsing the CFIS exposures lists

A single ASCII string is compiled per acquired exposure based on the various information located in the exposure FITS header, the Elixir statistics and the QSO validation flags. This single line contains the basic properties to define and characterize that exposure.

This information, uniform over all the exposures of the survey, aims at setting the first order of data quality assessment of the survey: the higher level statistics proposed on these CFIS DATA pages are derived from these lists of exposures.

A color code is used to differentiate the 2 components of the CFIS dataset:

CFIS u-band

CFIS r-band

A given exposure is documented as:

2074309 | 16Bm07 Jan 27 03:03:44 17 | 17AP30 Nr0051_1 | 10:44:00.0 30:00:00 2000 | 300 | r | 1.02 | 0.50 0.53 687 | OG1 | OB151 | P 1 V Q R |

The separator is the "|" character and there are a total of 11 fields, some having several sub-fields. The following sections describe each of the 11 fields individually.

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The filename: the CFHT odometer number

CFHT uses a unique filename identifier for each exposure. Started in the 90s as a six digits code, it is now well within a 7 digits code. There can't be two exposures with the same odometer number, it is the best identifier for a given exposure.

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The observing run: Elixir run ID

This field is the granularity element used at CFHT to track a MegaCam observing run (given instrument setup from start to end, regardless of semester boundaries). The first three letters define the semester (17A for the first semester of the year 2017) and the last three letters define the [Elixir run ID](#).

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The date of observation: Hawaii local time (not UT) at the end of the exposure readout

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CFIS Run Identifier and Field Name: survey component and pointing

There are 4 run [identifiers](#) for the CFIS, and they do appear in the second position of the string, following the relevant semester which defines how a given observation is charged to a given time allocation for the semester.

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Field coordinates: right ascension, declination and epoch

The fractional seconds on the declination have been removed, but those coordinates are precise enough to define the pointing within a few arcseconds. Note that these are the telescope control system coordinates for the observed field, not the accurate coordinates of the center of field that could be derived from precise astrometry analysis of the image (the difference is a few arcseconds).

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Exposure time: nearest integer value in seconds

The shutter precision is 1 ms, hence it is safe to truncate the exposure time to the nearest integer as the exposures are always defined to be taken with an integral value exposure time.

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Filter: single letter definition

The filters used for the CFIS are Sloan u and r: those are the new MegaCam filters commissioned in 2015 (u.MP9302 and r.MP9602).

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Airmass: airmass at the time of the start of the exposure

The CFIS footprint goes up to a declination of +84 degrees, leading to an airmass of 2.3 at best. All attempts will be made by QSO to observe the CFIS at an airmass lower than 1.5, with special exclusion cases for the most northern sky area.

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Image quality: center and outer "ring" median image quality in arcseconds

As described in the "Technical Considerations" of the MegaCam/MegaPrime pages (1.3 Evaluation of the image quality across the field of view), these two image quality values define the overall quality over the full field of view. A typical offset of 0.05 arcseconds between the center and the the outer part of the field of view is to be expected. When the image has not been registered yet by Elixir, the image quality and background level that are reported come from the summit real-time Elixir analysis: that main number is provided, followed by the flag "RTST".

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Sky background: in ADU on the raw data for the whole length of the exposure

The Elixir statistics analysis provides the sky background (corrected for the detector bias level) on all 36 CCDs of the mosaic. The value presented here is the median value of the stack of these 36 measurements. To convert this value to electrons, apply the median gain of 1.6 e-/ADU.

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QSO Observing Group & Observing Block: as encoded in PH2

The OG numbers are unique within a given [run ID](#) (e.g. P30). They are the exact reference used within QSO. For CFIS an observing block is always a single exposure while an OG can be set of OBs (typically 7 with CFIS-r to ensure LSB mode is enabled, 14 for CFIS-u). The QSO PH2 fixed target (FT) number is unique to CFIS and is adopted directly into the OB naming. This line indicates this exposure covers FT151.

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The five exposure flags: sky transparency, observing rating, exposure validation, observing group qualification, and Elixir registration.

1) Sky transparency:

[SkyProbe](#) provides a robust way to define the absolute value of the sky transparency at the time of the observations (1 point every minute in the V-band only, clouds being gray the value applies to both u and r). The service observer looks both at the SkyProbe plot (which is found to be reliable in 97% of the cases), the satellite map, and the guide star flux variations to define in absolute if the conditions are or are not photometric. The photometric flag is set manually in real-time during the night by the observer for each exposure based on these inputs.

The value of the flag can be either "P" for **Photometric** or "A" for **Absorbed**. The actual level of absorption can be derived in the V-band from the SkyProbe plot archive, and the MetaData also provide a table of the SkyProbe zero points throughout the whole night (the tabular version of the plot), allowing for a direct determination of the absorption for a given exposure.

However the "Observer Rating" and the "Coordinator Rating" flags described below can tell a lot on the level of absorption in the case the "Photometric" flag has been set to the absorbed state.

When no data is available, the flag is set to "X".

2) Service Observer rating:

This flag ranges from 1 to 4 and is set in real-time during the night by the observer at the telescope.

- 1: Taken within, or better than, the conditions defined by the Principal Investigator in terms of seeing, sky background, and sky transparency.
- 2: Taken almost within the conditions defined by the Principal Investigator: one of the three parameters (seeing, sky background, sky transparency) is slightly out of boundaries.
- 3: Taken outside the conditions defined by the Principal Investigator: one of the parameters (seeing, sky background, sky transparency) is way out of boundaries, or two, or all of the parameters are out of bound.
- 4: Horrible observing conditions which most likely prevent any science to be done.
- 5: A lost cause, nothing to be done with that exposure.

Note that these three defining parameters are provided in that exposure information line as described above (Image Quality, Sky Background, Sky Transparency), hence if you see the Service Observer rating flag set to 2, 3 or 4, you can easily conclude the reason why the exposure is considered faulty.

When no data is available, the flag is set to "X".

3) QSO exposure validation:

This flag can be set to "V" for "Validated" or "O" for "Observed". The QSO Coordinator checks the Service Observer rating and other comments to define if that exposure fits within the specifications defined by the PI. The fact that an exposure is validated does not however necessarily means that its integration time will be accounted for in the time balance allocated to the observing program: this depends on the observing group validation described below.

- V: the exposure qualifies for the science goals defined by the Principal Investigator. An exposure can be validated even if the Service Observer rating is equal to 2 since a degradation on one of the parameters won't most likely affect the science dramatically.
- O: the exposure does not qualify for the science goals defined by the Principal Investigator. The exposure will be archived, processed, and distributed but the time used to acquire it is not subtracted from the time allocated to the observing program.

When no data is available, the flag is set to "X".

4) QSO Observing Group qualification:

This flag can be set to "Q" for "Qualified" or "D" for "Dismissed".

When an OG is composed of a single OB, a non-validation of the OB implies the OG is dismissed. When an OG is composed of several OBs as in CFIS, the whole OG won't be qualified until all exposures have been successfully acquired (read Validated). This can happen even if the various exposures (OBs) composing the OG were taken some time apart, for example if one or more exposure of the OG was not validated during the first visit, QSO will conduct a repeat of those specific exposures (not the full OG) and the OG is qualified only once these exposures are eventually validated. In that respect, the statistics on the survey focus only on qualified OGs, not simply validated exposures.

In consequence, the lists proposed on these pages won't tell if a given exposure had its integration time deducted for the observing program. The QSO database has more information on these relative connections and can compute very precise statistics actually based on Observing Groups validation. See [this page](#) to consult the QSO based statistics (main page only, stats are not correct for the Large Programs).

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5) Elixir registration:

This flag can be set to **"R"** for "Registered" or **"X"** if the image has yet to be ingested by Elixir. If the flag is set to "X", then the entire line is colored red as it precludes the fine derivation of proper statistics (the fairly close Elixir real-time summit IQ and background estimates are used in the meantime).