Instrument specific keyword value hints

Q: Could you please provide some information regarding the format of APEX 1-D spectra?

A: The format defined in the Phase 3 SDPS for 1-D spectral products applies also in the case of APEX reduced spectra, with few modifications:

1. The following keyword defined as mandatory for spectral products do not apply in the case of APEX spectra: OBID1.

2. While the keyword FEBE1 indicating the Frontend-backend combination becomes mandatory in this case.

Example of the values of some specific keywords:

Primary header

```
ORIGIN = 'APEX'             / Facility
TELSCOP = 'APEX-12m'         / Telescope name I
NSTRUME= 'APEXHET'          / Instrument name
FEBE1   = 'HET230-XFFTS2'    / Frontend-backend combination
OBSTECH = 'SPECTRUM'         / Technique of observation
PRODCATG= 'SCIENCE.SPECTRUM' / Data product category
```

Extension header

```
EXTNAME = 'SPECTRUM'           / FITS Extension name
TTYPE1  = 'FREQ    '           / Label for field 1
TUTYP1  = 'Spectrum.Data.SpectralAxis.Value'
TUNIT1  = 'GHz     '           / Physical unit of field 1
TUCD1   = 'em.freq '           / UCD of field 1
TDMIN1  =  229.011 / Start in spectral coord.
TDMAX1  =  233.000  / Stop in spectral coord.
TTYPE2  = 'FLUX    '           / Label for field 2
TUTYP2  = 'Spectrum.Data.FluxAxis.Value'
TUNIT2  = 'mJy     '           / Physical unit of field 2
```
TUCD2 = 'phot.flux.density;em.freq' / UCD of field 2
TTYPE3 = 'ERR     '           / Label for field 3
UNIT3  = 'mJy     '           / Physical unit of field 3
TUCD3 = 'stat.error;phot.flux.density;em.freq' / UCD of field 3

Please also note that the values of the following keywords need to be provided in nm:

WAVELMIN= 1291867.18750 / [nm] Minimum wavelength

It corresponds to the value of TDMIN1 converted from GHz to nm (conversion factor: 299792458)

WAVELMAX= 1309075.80566 / [nm] Maximum wavelength

It corresponds to the value of TDMAX1 converted from GHz to nm (conversion factor: 299792458)

SPEC_BIN= 111.744273793 / [nm] Wavelength bin size
SPEC_VAL= 1300471.49658 / [nm] Mean Wavelength
SPEC_BW = 17208.6181641 / [nm] Bandpass Width Wmax – Wmin

The following link may be useful to reconstruct the provenance information, it provides the mapping between the original file name to the archive id, and calculating the exposure time:

http://archive.eso.org/wdb/wdb/eso/apex_origfile/form

**Q: What shall I do in the case of GTC data?**

A: The origin keywords shall be set as follows:

ORIGIN = 'GRANTECAN'
TELESCOP = 'GTC'
INSTRUME = 'CANARICAM' or 'OSIRIS'

In addition to the above keywords, the use of GTCPRGID and GTCOBID (to be adopted from the original data) is recommended.

**Q: Possible algorithm for ABMAGSAT computation**

In the case of the VIMOS imaging pipeline, an adaptation of the method used by the PESSTO survey (A&A, 2015, 579, pg. 25) is the following:

ABMAGSAT = zeropoint -2.5*log10(((pi/4.*ln(2)))*(satlev-mean_sky)*(psf_fwhm/pixel_scale)^2)/EFF_EXPT)
where the parameters are those written to the following keywords:

- `satlev` = HIERARCH ESO QC SATURATION
- `zeropoint` = HIERARCH ESO QC MAGZPT
- `mean_sky` = HIERARCH ESO QC MEAN_SKY
- `pdf_fwhm` = PSF_FWHM
- `pixel_scale` = HIERARCH ESO QC WCS_SCALE
- `EFF_EXPT` = the effective exposure time (= CASUEXPT)

**Q: How to compute the MJD-END of a SOFI spectrum?**

The end time of a Phase 3 SOFI 1d spectrum product (MJD-END) must be computed using the following formula:

\[
MJD-END = MJD-OBS \text{ of the last raw observation} + NDIT \ast (DIT + 1.8) / 86400
\]

where the 1.8 seconds accounts for the necessary overheads, and 86400 scales back from seconds to days.

**Q: What is the correct EFFRON for median-combined SOFI images?**

**Example:** There are 7 raw images, each resulting from averaging together 5 detector integrations (NDIT = 5). A science product is generated by reducing and median-combining those 7 raw images.

**In this case:**

\[
EFFRON = 12 \ast \sqrt{\pi/2} / \sqrt{7 \ast 5}
\]

where π is 3.14159, and 12 is the detector readout noise of SOFI in electrons.

**Q: May you please clarify what the OBSTECH keyword values are?**

A: We support the OBSTECH keywords listed in the table below, in addition to those defined by the SDP standard document.

<table>
<thead>
<tr>
<th>INSTRUME</th>
<th>Mode</th>
<th>Origin of keyword value</th>
<th>TELESCOP</th>
<th>OBSTECH</th>
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</table>


<table>
<thead>
<tr>
<th>OSIRIS</th>
<th>Imaging</th>
<th>Broad band (SDSS filters)</th>
<th>OBSMODE</th>
<th>GTC</th>
<th>'IMAGE'</th>
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<td></td>
<td>Medium band (SHARDS filters)</td>
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<td>'IMAGE'</td>
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<td>Long slit</td>
<td>'SPECTRUM'</td>
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**Tags**
- FAQ
- Phase 3

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