New ALMA Archive Tools: AKF & ASQ

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AKF: ALMA Keyword Filler

This Python code is developed in the framework of the ALMA Archive development plan.
Each method generates a new keyword to be added to the input image FITS header.
Keywords are officially defined in a dedicated ALMA document

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ALMA Science Archive FITS Data product requirements and recommendations.

Version 1.7

Revisions history

Version number	Note	Author	date
Original document	Spreadsheet notes	M. Lacy	2012
Ver 1	Transferred to document format.	E. Muller	2013

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3.3. Observations Time information

TIMESYS *(Suggested. kwd FS3.0)*
Description: The principal time system for time-related keywords and data.
Type: Character
Required value: "UTC"
Currently exists in CASA FITS products.

DATE *Reserved kwd FS3.0*
Description: FITS file creation date (specifically, the date the HDU was created).
Type: String
Required format: Date string of format: YYYY-MM-DDThh:mm:ss[.sss...].
Currently exists in CASA FITS products.

DATE-OBS *(Reserved kwd FS3.0)*
Description: Observation start time.
Type: Character
Required format: Date string with a format of YYYY-MM-DDThh:mm:ss[.sss...].
Does not exist in CASA FITS products.

DATE-END *(new ALMA keyword)*
Description: Time of end observation.
Type: Character
Required format: Date string with a format of YYYY-MM-DDThh:mm:ss[.sss...].
Does not exist in CASA FITS products.

MJD-OBS *(Reserved kwd FS3.0)*
Description: Modified Julian Date (JD − 2,400,000.5) of start of observation.
Type: Character
Required format: Date string with a format of YYYY-MM-DDThh:mm:ss[.sss...].
Does not exist in CASA FITS products.

MJD-AVG *(Reserved kwd FS3.0)*
Description: Modified Julian Date (JD − 2,400,000.5) of the mid-point of the observation.
Type: Character
Required format: Date string with a format of YYYY-MM-DDThh:mm:ss[.sss...].
OBSGEO-? [X/Y/Z] must be correct at the time given by MJD-AVG.
Does not exist in CASA FITS products.

EQUINOX *(Reserved kwd FS3.0)*
Description: Epoch of the mean equator and equinox in years. This keyword is the standard replacement for "EPOCH".
Type: Float
Required value: 2.000000000000E+03
Currently exists in CASA FITS products.

AKF: ALMA Keyword Filler

If run at the end of the imaging process it will complement the information provided by the previous analysis steps and allow more advanced archive searching criteria.

The Inputs
Inputs are **a FITS image** generated as a result of an ALMA data reduction process and the **measurement sets that were used to generate it**
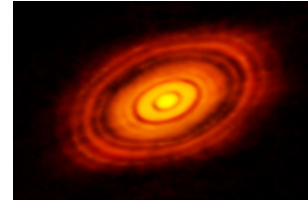
uid___A002_1*.ms
uid___A002_2*.ms
uid___A002_3*.ms
uid___A002_4*.ms
…

RA, DEC
DATE_OBS, MJD_OBS
DATAMAX, DATAMIN
DYNRANGE
STOKES
BNDCTR, BNDWID, BNDRES
MAXANGSC
CHANRMS
SPATRES, UVRANGE
MINEL, EXPTIME
CALIBR, OBSMODE
NANT, PADLIST ...

The Python methods
Each Python method extracts from the image or the ms list the value of a **new keyword not generated by the FITS standard 3.0 or by the pipeline/CASA processing**.

AKF is a standalone library that relies only on CASA toolkits and tasks.

The Output
The header of the input image is updated and the **new keywords are added to the existing ones**.

'], 'MJD-AVG': 57090.394494444437, 'DATE-END': '2015-03-09T10:17:53.32', 'SPATRE
S': '1.15', 'MAXANGSC': '11.01', 'MJD-OBS': 57090.35989944444, 'STOKES': 'I', 'D
ATAMIN': -0.00933791138231754 3, 'NANT7M': {'uid___A002_X9bb7a8_Xed0.ms': [0], 'u
id___A002_X9bb7a8_X10f6.ms': [0]}, 'DYNRANGE': 17.187607518293426, 'MINEL12': {'
uid___A002_X9bb7a8_Xed0.ms': 33.348118459725761, 'uid___A002_X9bb7a8_X10f6.ms':
52.718391141051477}, 'MINEL7': {'uid___A002_X9bb7a8_Xed0.ms': None, 'uid___A002_
X9bb7a8_X10f6.ms': None}, 'DATAMAX': 0.036412525922060013, 'UVRANGE': {'THIRD_QU
ART': 139.01702500566142, 'FIRST_QUART': 52.478969399053966, 'MEDIAN': 88.565402
729637071}, 'BNDRES': 31253000.0, 'MINPRBL': 15.053542848555974, 'PADLIST': ['A1
37', 'A040', 'A068', 'A030', 'A058', 'A070', 'A043', 'A071', 'A013', 'A035', 'A0
19', 'A017', 'A036', 'A075', 'A046', 'A018', 'A066', 'A072', 'A010', 'A016', 'A0
62', 'A031', 'A024', 'A037', 'A027', 'A044', 'A002', 'A033', 'A011', 'A004', 'A0
05'], 'NANT12M': {'uid___A002_X9bb7a8_Xed0.ms': [31], 'uid___A002_X9bb7a8_X10f6.
ms': [31]}, 'MAXPRBL': 327.79104921295027}

I-ASQ: Italian ALMA Sky Query

**This GUI is currently under development in response to PI requests during Cycle 4 proposal preparation.
For a given position/source ID it will query the archive (exploiting the Astroquery engine),
to extract some basic information, and display the frequency coverage of data and images available,
allowing several options for downloads.**

Archive GUI

1. Archive query selection parameters:

Select the source file: [ ] Browse ...

RA (hh:mm:ss): 11:40:43.96

DEC (dd:mm:ss): 22:25:49.1

Selection radius (arcsec): 10.0

Frequency start (GHz):

Frequency stop (GHz):

Band selection: ☐ B3 ☐ B4 ☐ B6 ☐ B7 ☐ B9 ☐ B10

Confirm inputs

Query criteria browser

2. Archive search results:

```
Project code          2011.0.test.S
Spatial resolution    0.488584069427
RA                    11:40:43.96
Dec                   22:25:49.1
Band                  7,3
Frequency resolution  976.5625
Integration           90.72
Velocity resolution   855.843667931
Observation date      2012-10-21 11:01:26
PWV                   0.496916
Project title         test
```

Image details from FITS header

3. Show frequency setup:

Frequency coverage

coverage / freq

3

Interactive band setup inspection

4. Field with individual pointings:

Pointing set-up

Interactive continuum image display

Interactive sky region view including ALMA data pointings and FOV

pix / pix

5.1 Pointing selection:

B3 (example)

Selected pointing list

Filters for different download choices

5.2 Freq markers:

B3 Download
B4 Download
B6 Download
B7 Download
B9 Download
B10 Download

5.3 Pointing filter :

RESET

INSPECT IMAGE ONLY

KEEP DOWNLOAD + IMAGE

The framework and future plans
This tool is intended to be a support to users while the archive interface development
is on-going in the framework of the ALMA Archive development plan.
Soon to be released, new features and tools will be added later to maximize its usability.