

# EPN-TAP V2.0 parameters

Note: from 5 July 2021, these pages are no longer the primary source of the EPN-TAP doc - see instead the IVOA latex source: <https://github.com/ivoa-std/EPNTAP>

## List of EPN-TAP parameters

(refreshed/completed April 2019, Oct 2020, June 2021, Oct 2021) (SE)

You can use this file to keep track of your service parameters: [EPN-TAP\\_parameters\\_List\\_template.xlsx](#)

## EPN-TAP

- EPN-TAP is a VO access protocol dedicated to Planetary Science data. It is based on the TAP mechanism from IVOA, completed with sets of parameters and associated lists of values. In this regard, it is similar to ObsTAP but with a different scope.
- EPN-TAP version 2 is a major update of the protocol to accommodate larger services and simplify setup and use of data services. All parameters are described here.

## Parameters which must be provided

are now clearly identified - those are not only mandatory, they also must provide a value. They are mostly related to service description and granule identification.

+ See notes below the table.

## Thematic extensions

Some science fields will require optional parameters, which need to be used consistently between services addressing the same field. Such extensions have to be designed by sub-groups involved in the corresponding data services, either as providers or users. This includes:

- Lab spectroscopy: parameters to describe mineralogical samples (and possibly other samples)
- Solar System objects: covers orbital/rotational parameters, physical properties, and taxonomy
- APIS: for consistency with APIS service. Contains parameters for observing programs (most parameters are actually included in other extensions)
- Contributive works / observing programs: enlargement of APIS extension to other data
- Exoplanets / planetary systems properties
- Map extension (to be enlarged)
- Events: covers the VOevent standard and other types of events
- Particle spectroscopy (to be finalized)
- Results of planetary 3D modelling run (in progress)
- Bibliographic entries? May be manageable otherwise, through bibcode / doi interpretation

## Support file

You can use this file to keep track of your service parameters: [EPN-TAP\\_parameters\\_List\\_template.xlsx](#)

| Name  | SQL type | Unit | Description                                    | UCD   | UCD in Obscore 1.1 (9/5 /2017 REC version) | Utype (tentative)   | Comments   |
|---|----------|------|--|---|--|---|--|
| <b>EPNCore mandatory parameters</b><br>(Must be present, possibly empty) (bold face: a value is required) |          |      |  | Current value <b>current</b> but <b>dubious</b> or <b>undefined</b> | — ? : closest sense<br>_ : N/A in ObsCore  | from epntap v2 mixin (aug 2017) <b>equivalent</b> /close in ObsCore doc 1.1 |  |
| <b>granule_uid</b>  | Text     |      | Unique ID in data service                      | meta.id   | meta.id                                    |   | Can be alphanum.   |
| <b>granule_gid</b>  | Text     |      | Common to granules of same type                | meta.id   | meta.id                                    |   | E.g. same map projection, or geometry data products. Can be alphanum.  |
| <b>obs_id</b>   | Text     |      | Associates granules derived from the same data | meta.id; obs  | meta.id                                    | <b>obscore: DataID, observationID</b>                                       | E.g. various representations / processing levels. Can be alphanum., may be the ID of original observation. Keep it simple in intricate situations. |

|                                    |         |     |  |   |   |   |  |
|------------------------------------|---------|-----|--|---|---|---|--|
| dataprod<br>uct_type               | Text    |     | Organization of the data product, from enumerated list                                       | meta.<br>code.<br>class                             | meta.id   | Epn.<br>dataProductTy<br>pe<br><br>obscure:<br>ObsDataset.<br>dataProductTy<br>pe |  |
| measure<br>ment_type               | Text    |     | UCD(s) defining the data   | meta.ucd  | meta.ucd  | Epn.<br>Measurement_<br>type  | Add ;meta.modelled if simulation or model<br>Add ;stat.uncalib if uncalibrated data - in which<br>case processing_level must be 0 or 1 |
| processin<br>g_level               | Integer |     | Dataset-related encoding, or simplified<br>CODMAC calibration level                          | meta.<br>calibLev<br>el                             | meta.code;<br>obs.calib                                     | ~ obscure:<br>ObsDataset.<br>calibLevel   | To be replaced by PDS4 values in v2.1?   |
| target_na<br>me                    | Text    |     | Standard IAU name of target (must<br>match target_class), case sensitive                     | meta.id;<br>src                                     | meta.id;src   | Epn.<br>TargetName  | Case sensitive<br>Services with no target_name do exist  |
| target_cl<br>ass                   | Text    |     | Type of target, from enumerated list   | src.class   | src.class   | Epn.<br>TargetClass   |  |
| time_min                           | Double  | d   | Start time (in JD). UTC measured at<br>time_origin location (default is<br>observer's frame) | time.<br>start;obs                                  | time.start;<br>obs.exposure                                 | Char.<br>TimeAxis.<br>Coverage.<br>Bounds.Limits.<br>Interval.<br>StartTime       |  |
| time_max                           | Double  | d   | Stop time (in JD). UTC measured at<br>time_origin location (default is<br>observer's frame)  | time.end;<br>obs                                    | time.end;obs.<br>exposure                                   | Char.<br>TimeAxis.<br>Coverage.<br>Bounds.Limits.<br>Interval.<br>StopTime        |  |
| time_sam<br>pling_step<br>_min     | Float   | s   | Min time sampling step   | time.<br>resolutio<br>n;stat.<br>min                | time.<br>resolution   | Epn.Time.<br>Time_samplin<br>g_step_min   |  |
| time_sam<br>pling_step<br>_max     | Float   | s   | Max time sampling step   | time.<br>resolutio<br>n;stat.<br>max                |   | Epn.Time.<br>Time_samplin<br>g_step_max   |  |
| time_exp_<br>min                   | Float   | s   | Min integration time   | time.<br>duration;<br>obs.<br>exposure<br>;stat.min | time.<br>duration;obs.<br>exposure                          | Epn.Time.<br>Time_exp_min   |  |
| time_exp_<br>max                   | Float   | s   | Max integration time   | time.<br>duration;<br>obs.<br>exposure<br>;stat.max |   | Epn.Time.<br>Time_exp_max   |  |
| spectral_r<br>ange_min             | Float   | Hz  | Min spectral range (as frequency)  | em.freq;<br>stat.min                                | em.wl;stat.<br>min (always<br>as wl)                        | Epn.Spectral.<br>Spectral_rang<br>e_min   | Always as frequency  |
| spectral_r<br>ange_max             | Float   | Hz  | Max spectral range (as frequency)  | em.freq;<br>stat.max                                | em.wl;stat.<br>max  | Epn.Spectral.<br>Spectral_rang<br>e_max   |  |
| spectral_s<br>ampling_s<br>tep_min | Float   | Hz  | Min spectral sampling step   | em.freq;<br>spect.<br>binSize;<br>stat.min          | meta.number   | Epn.Spectral.<br>Spectral_samp<br>ling_step_min                                   |  |
| spectral_s<br>ampling_s<br>tep_max | Float   | Hz  | Max spectral sampling step   | em.freq;<br>spect.<br>binSize;<br>stat.max          | meta.number   | Epn.Spectral.<br>Spectral_samp<br>ling_step_max                                   |  |
| spectral_r<br>esolution_<br>min    | Float   |     | Min spectral resolution (resolving power)  | spect.<br>resolutio<br>n;stat.<br>min               | spect.<br>resolution (re<br>lates to<br>resolving<br>power) | Epn.Spectral.<br>Spectral_resol<br>ution_min                                      | Now (2019) provides resolving power $[(\lambda / \Delta(\lambda)) =  f / Df ]$<br>How do we accommodate FWHM for filters?              |
| spectral_r<br>esolution_<br>max    | Float   |     | Max spectral resolution (resolving<br>power)   | spect.<br>resolutio<br>n;stat.<br>max               |   | Epn.Spectral.<br>Spectral_resol<br>ution_max                                      | Now (2019) provides resolving power $[(\lambda / \Delta(\lambda)) =  f / Df ]$<br>How do we accommodate FWHM for filters?              |
| c1min                              | Float   | (1) | Min of first coordinate, depends on the<br>frame   | see<br>table<br>below                               | pos.eq.ra   | Epn.Spatial.<br>Spatial_range.<br>c1min   | Typo in current mixin (-lonG => .lon<br>UCDs for cyl and sph coord are from PEN-<br>UCDlist-20210430                                   |
| c1max                              | Float   | (1) | Max of first coordinate, depends on the<br>frame   |   |   | Epn.Spatial.<br>Spatial_range.<br>c1max   |  |
| c2min                              | Float   | (1) | Min of second coordinate, depends on<br>the frame.   |   | pos.eq.dec  | Epn.Spatial.<br>Spatial_range.<br>c2min   |  |
| c2max                              | Float   | (1) | Max of second coordinate, depends on<br>the frame  |   |   | Epn.Spatial.<br>Spatial_range.<br>c2max   |  |

|                      |           |     |   |                               |                                |  |  |
|----------------------|-----------|-----|---|-------------------------------|--------------------------------|--|--|
| c3min                | Float     | (1) | Min of third coordinate   |                               |                                | Epn.Spatial.<br>Spatial_range.<br>c3min                    |  |
| c3max                | Float     | (1) | Max of third coordinate   |                               |                                | Epn.Spatial.<br>Spatial_range.<br>c3max                    |  |
| s_region             | Text      | (3) | ObsCore-like footprint in 2D (if spatial_frame_type = celestial or body)                                      | pos.outline;<br>obs.field     | pos.outline;<br>obs.field      | obscore:Char.<br>SpatialAxis.<br>Coverage.<br>Support.Area | (was initially instr.fov, to be corrected)<br>ObsCore value updated (was phys.angArea; obs) to phys.outline, then corrected to pos.outline<br><br>Must have xtype= adql:REGION to work with TAP<br>Frame may be identified in q.rd (UNKNOWNFrame).<br>Use value given in spatial_frame_type - very unclear...<br>Do we need another param for GIS interface? |
| c1_resol_min         | Float     | (2) | Min resolution in first coordinate  | (2)                           | pos.angResolution;<br>stat.min | Epn.Spatial.<br>Spatial_resolution.<br>c1_resol_min        | pos.resolution restored in 2018<br>In body fixed frame, use pixelscale_min/max for resolution at the surface   |
| c1_resol_max         | Float     | (2) | Max resolution in first coordinate  | (2)                           | pos.angResolution;<br>stat.max | Epn.Spatial.<br>Spatial_resolution.<br>c1_resol_max        | –  |
| c2_resol_min         | Float     | (2) | Min resolution in second coordinate   | (2)                           |                                | Epn.Spatial.<br>Spatial_resolution.<br>c2_resol_min        | –  |
| c2_resol_max         | Float     | (2) | Max resolution in second coordinate   | (2)                           |                                | Epn.Spatial.<br>Spatial_resolution.<br>c2_resol_max        | –  |
| c3_resol_min         | Float     | (2) | Min resolution in third coordinate  | (2)                           |                                | Epn.Spatial.<br>Spatial_resolution.<br>c3_resol_min        | pos.resolution restored in 2018  |
| c3_resol_max         | Float     | (2) | Max resolution in third coordinate  | (2)                           |                                | Epn.Spatial.<br>Spatial_resolution.<br>c3_resol_max        | pos.resolution restored in 2018  |
| spatial_frame_type   | Text      | (1) | Flavor of coordinate system, defines the nature of coordinates. From enumerated list. Use "none" if undefined | meta.code.class;<br>pos.frame | –                              |  | A value is required by DaCHS (query will return errors if empty)<br>Default value = none   |
| incidence_min        | Float     | deg | Min incidence angle (solar zenithal angle)  | pos.incidenceAng;<br>stat.min | –                              | Epn.View_angle.<br>Incidence_angle_min                     | UCD for angles included in 2018  |
| incidence_max        | Float     | deg | Max incidence angle (solar zenithal angle)  | pos.incidenceAng;<br>stat.max | –                              | Epn.View_angle.<br>Incidence_angle_max                     | UCD for angles included in 2018  |
| emergence_min        | Float     | deg | Min emergence angle   | pos.emergenceAng;<br>stat.min | –                              | Epn.View_angle.<br>Emergence_angle_min                     | UCD for angles included in 2018  |
| emergence_max        | Float     | deg | Max emergence angle   | pos.emergenceAng;<br>stat.max | –                              | Epn.View_angle.<br>Emergence_angle_max                     | UCD for angles included in 2018  |
| phase_min            | Float     | deg | Min phase angle   | pos.phaseAng;<br>stat.min     |                                | Epn.View_angle.<br>Phase_angle_min                         |  |
| phase_max            | Float     | deg | Max phase angle   | pos.phaseAng;<br>stat.max     |                                | Epn.View_angle.<br>Phase_angle_max                         |  |
| instrument_host_name | Text      |     | Standard name of the observatory or spacecraft  | meta.id;instr.obsty           | meta.id;instr.tel              | Provenance.<br>ObsConfig.<br>Facility.name                 |  |
| instrument_name      | Text      |     | Standard name of instrument   | meta.id;instr                 | meta.id;instr                  | Provenance.<br>ObsConfig.<br>Instrument.name               |  |
| service_title        | Text      |     | Title of resource = schema name   | meta.title                    |                                |  | May be used to handle multiservice results   |
| creation_date        | Timestamp | (4) | Date of first entry of this granule   | time.creation                 | time;meta.dataset              |  |  |
| modification_date    | Timestamp | (4) | Date of last modification   | time.processing               |                                |  | Used to handle mirroring<br>UCD value being discussed in 2018  |

|                                |           |       |   |                            |                             |                                 |   |
|--------------------------------|-----------|-------|---|----------------------------|-----------------------------|---------------------------------|---|
| release_date                   | Timestamp | (4)   | Start of public access period (set to creation_date if no proprietary period)   | time.release               | time.release                | obscure: Curation.releaseDate   | The value is in ISO 8601 format reusing this pattern: ("YYYY-MM-DDThh:mm:ss") If release_date is in the future, the data is proprietary.  |
| Common optional parameters     |           |       |   |                            |                             |                                 |   |
| access_url                     | Text      |       | URL of the data file, case sensitive (additional files may be linked through datalink_url). Can point to a script. If present, next 2 parameters must also be present | meta.ref.url;meta.file     | meta.ref.url                | Obs.Access.Reference            | Use this to link data!<br>Could accommodate a datalink with access_format = 'application/x-votable+xml; content=datalink' (from ObsCore)<br>- but this is a funny idea...   |
| access_format                  | Text      |       | RFC 2045 media type (mime), required to be all-lower case   | meta.code.mime             | meta.code.mime              | Obs.Access.Format               |   |
| access_estsize                 | Integer   | kbyte | Estimate file size in kbyte (with this spelling)  | phys.size; meta.file       | phys.size; meta.file        | Obs.Access.Size                 |   |
| access_md5                     | Text      |       | MD5 Hash for the file when available (real file, not script)  | meta.checksum;meta.file    |                             |                                 |   |
| thumbnail_url                  | Text      |       | URL of a thumbnail image with predefined size (png ~200 pix, for use in a client only)  | meta.ref.url;meta.preview  |                             |                                 |   |
| file_name                      | Text      |       | Name of the data file only, case sensitive  | meta.id; meta.file         | meta.title; obs — ?         |                                 | ObsCore obs_title is for a short free text string describing the granule. Do we want this?  |
| datalink_url                   | Text      |       | Provides links to files or services on the server   | meta.ref.url               |                             |                                 | Associated mime-type is 'application/x-votable+xml;content=datalink' (from ObsCore)   |
| bib_reference                  | Text      |       | Bibcode or doi preferred; can be a URL or anything else. Refers to the <i>granule</i>   | meta.bib                   | meta.bib                    | obscure: Curation.reference     | Bibcode & doi can be completed in TOPCAT  |
| publisher                      | Text      |       | Resource publisher  | meta.curation              | meta.ref.uri; meta.curation | ~ obscure: Curation.publisherID |   |
| processing_level_desc          | Text      |       | Describes specificities of the processing level   | meta.note                  |                             |                                 |   |
| internal_reference             | Text      |       | Related granule_uid(s) in the current service   | meta.id.cross              |                             |                                 | Use to link one granule to a set of other granules. To be used only if required - e.g. to solve situations that would otherwise require several tables  |
| external_link                  | Text      |       | <a href="#">Web page providing more details on the granule</a>  | meta.ref.url               |                             |                                 | Link to an individual page in a web site associated to the database, e.g., a planet page in Exoplanets service. This is a way to provide extra granule information which cannot be accommodated in the table.         |
| species                        | Text      |       | Identifies a chemical species, case sensitive   | meta.id; phys.atmol        |                             |                                 | This is the only case sensitive parameter (with target_name)  |
| messenger                      | Text      |       | Vector of measured signal, including electromagnetic band, from enumerated list   | instr.bandpass             |                             |                                 |   |
| filter                         | Text      |       | Identifies filter in use, typically for images  | meta.id; instr.filter      |                             |                                 | Informative only, free format (no list, but see <a href="http://svo2.cab.inta-csic.es/svo/theory/fps3/">http://svo2.cab.inta-csic.es/svo/theory/fps3/</a> ). Search can only rely on spectral range, as ObsCore does. |
| alt_target_name                | Text      |       | Provides alternative target name(s). Can be a hash list   | meta.id; src               |                             |                                 |   |
| feature_name                   | Text      |       | Secondary name (e.g. standard name of a region of interest)   | meta.id; src;obs.field     |                             |                                 |   |
| target_region                  | Text      |       | Type of region or feature of interest   | meta.id; src;obs.field     |                             |                                 |   |
| shape                          | Text      |       | introduces an ascii (ST)MOC, v2 (2D footprint on celestial, spherical, or body-related frames, possibly including time)   | pos.outline; obs.field     |                             |                                 | Must have xtype="MOC" (follow DALI recommendation)<br><br>outline doesn't fit definition (refers to a contour)  |
| spatial_coordinate_description | Text      |       | ID of specific coordinate system and version / properties   | meta.code.class; pos.frame |                             |                                 | ~COOSYS, but includes planetary ones Still TBD, needs to be OGC compliant. Discussion in progress here: <a href="#">EPN-TAP v2: Current discussion topic</a>  |
| spatial_origin                 | Text      |       | Defines the frame origin  | meta.ref; pos.frame        |                             |                                 |   |
| time_reference                 | Text      |       | Defines where the time is measured (e.g., ground vs spacecraft). Default is observer's frame  | meta.ref; time.scale       |                             |                                 | target_time is of course always on target.  |
| time_scale                     | Text      |       | Defaults to UTC in data services - from enumerated list   | time.scale                 |                             |                                 |   |

|                           |           |     |  |  |  |  |  |
|---------------------------|-----------|-----|--|--|--|--|--|
| solar_longitude_min       | Float     | deg | Min Solar longitude Ls (location on orbit / season)                            | pos. ecliptic. lon; pos. heliocentric; stat. min |  |  |  |
| solar_longitude_max       | Float     | deg | Max Solar longitude Ls (location on orbit / season)                            | pos. ecliptic. lon; pos. heliocentric; stat. max |  |  |  |
| local_time_min            | Float     | h   | Min local time at observed region  | time. phase; time. period; rotation; stat.min    |  |  |  |
| local_time_max            | Float     | h   | Max local time at observed region  | time. phase; time. period; rotation; stat.max    |  |  |  |
| target_distance_min       | Float     | km  | Min observer-target distance   | pos. distance; stat.min                          |  |  |  |
| target_distance_max       | Float     | km  | Max observer-target distance   | pos. distance; stat.max                          |  |  |  |
| target_time_min           | Timestamp | (4) | Min observing time in target frame   | time. start; src                                 |  |  | (simplest way to look for coordinated observations)  |
| target_time_max           | Timestamp | (4) | Max observing time in target frame   | time. end; src                                   |  |  |  |
| earth_distance_min        | Float     | AU  | Min Earth-target distance  | pos. distance; stat.min                          |  |  |  |
| earth_distance_max        | Float     | AU  | Max Earth-target distance  | pos. distance; stat.max                          |  |  |  |
| sun_distance_min          | Float     | AU  | Min Sun-target distance  | pos. distance; stat.min                          |  |  |  |
| sun_distance_max          | Float     | AU  | Max Sun-target distance  | pos. distance; stat.max                          |  |  |  |
| subobserver_longitude_min | Float     | deg | Minimum sub-observer point longitude (sub-Earth for ground based observations) | pos. bodyrc. lon; stat. min                      |  |  | -  |
| subobserver_longitude_max | Float     | deg | Maximum sub-observer point longitude (sub-Earth for ground based observations) | pos. bodyrc. lon; stat. max                      |  |  | -  |
| subobserver_latitude_min  | Float     | deg | Minimum sub-observer point latitude (sub-Earth for ground based observations)  | pos. bodyrc. lat; stat. min                      |  |  | -  |
| subobserver_latitude_max  | Float     | deg | Maximum sub-observer point latitude (sub-Earth for ground based observations)  | pos. bodyrc. lat; stat. max                      |  |  | -  |
| subsolar_longitude_min    | Float     | deg | Minimum sub-solar point longitude  | pos. bodyrc. lon; stat. min                      |  |  | Provided in the most natural body-related coordinate frame, E-handed - seems to require 'body' |
| subsolar_longitude_max    | Float     | deg | Maximum sub-solar point longitude  | pos. bodyrc. lon; stat. max                      |  |  | Provided in the most natural body-related coordinate frame, E-handed - seems to require 'body' |
| subsolar_latitude_min     | Float     | deg | Minimum sub-solar point latitude   | pos. bodyrc. lat; stat. min                      |  |  | -  |
| subsolar_latitude_max     | Float     | deg | Maximum sub-solar point latitude   | pos. bodyrc. lat; stat. max                      |  |  | -  |
| ra                        | Float     | deg | Right ascension  | pos. eq. ra; meta. main                          |  |  | deg only (like ObsCore)  |
| dec                       | Float     | deg | Declination  | pos. eq. dec; meta. main                         |  |  |  |

|                                    |         |            |   |  |  |  |
|------------------------------------|---------|------------|---|--|--|--|
| radial_distance_min                | Float   | km         | Min distance from observed area to body center                                  | pos.distance;<br>pos.bodyrc;<br>stat.min |  |  |
| radial_distance_max                | Float   | km         | Max distance from observed area to body center                                  | pos.distance;<br>pos.bodyrc;<br>stat.max |  |  |
| altitude_from_shape_min            | Float   | km         | Min altitude of observed area above shape model / DTM                           | pos.bodyrc.alt;stat.min                  |  |  |
| altitude_from_shape_max            | Float   | km         | Max altitude of observed area above shape model / DTM                           | pos.bodyrc.alt;stat.max                  |  |  |
| <b>Parameters from extensions</b>  |         |            |   |  |  |  |
| <b>APIS extension</b>              |         |            |   |  |  |  |
| obs_mode                           | Text    |            | Observing mode  | meta.code;<br>instr.setup                |  | From APIS + observation extensions (with adapted UCDs)   |
| detector_name                      | Text    |            | Detector name   | meta.id;<br>instr.det                    |  |  |
| opt_elem                           | Text    |            | Optical element name  | meta.id;<br>instr.param                  |  |  |
| instrument_type                    | Text    |            | Type of instrument  | meta.id;<br>instr                        |  | Informative only (not a reliable search parameter); free format, no reference list intended.   |
| acquisition_id                     | Text    |            | ID of the data file/acquisition in the original archive                         | meta.id                                  |  |  |
| proposal_id                        | Text    |            | Proposal identifier   | meta.id;obs.proposal                     |  |  |
| proposal_pi                        | Text    |            | Proposal principal investigator   | meta.id.PI;obs.proposal                  |  |  |
| proposal_title                     | Text    |            | Proposal title  | meta.title;<br>obs.proposal              |  |  |
| campaign                           | Text    |            | Name of the observational campaign  | meta.id;obs.proposal                     |  |  |
| target_description                 | Text    |            | Original target keywords  | meta.note;src                            |  |  |
| proposal_target_name               | Text    |            | Target name as in proposal title  | meta.note;obs.proposal                   |  |  |
| target_apparent_radius             | Float   | arcsec     | Apparent radius of the target   | phys.angSize;<br>src                     |  |  |
| north_pole_position                | Float   | deg        | North pole (of target) position angle with respect to celestial north pole      | pos.posAng                               |  | Group of 5 parameters very specific to APIS. Name is - OK, but actually provides the position angle of the planet axis. Use "orientation" for the image. |
| target_primary_hemisphere          | Text    |            | Primary observed hemisphere   | meta.id;<br>obs.field                    |  |  |
| target_secondary_hemisphere        | Text    |            | Secondary observed hemisphere   | meta.id;<br>obs.field                    |  |  |
| platesc                            | Float   | arcsec/pix | Pixel angular size or platescale (on sky only)                                  | instr.scale                              |  |  |
| orientation                        | Float   | deg        | Position angle of image y axis (on sky only), direct sense from north direction | pos.posAng                               |  | Provides the direction of the polar axis in the image, counted clockwise from north.   |
| measurement_unit                   | Text    |            | Physical unit, same as Bunit in fits  | meta.unit                                |  |  |
| <b>Contributive work extension</b> |         |            |   |  |  |  |
| observer_name                      | Text    |            | Observer name   | meta.id.PI;obs.observer                  |  |  |
| observer_id                        | Integer |            | Observer's numeric identifier   | meta.id.PI                               |  | Group of 5 from PVOL, OK for general use but UCDs have to be changed in PVOL. meta.pubid in PVOL   |

|                                       |        |     |   |                                     |  |  |  |
|---------------------------------------|--------|-----|---|-------------------------------------|--|--|--|
| observer_code                         | Text   |     | Observer's service username   | meta.id.PI                          |  |  | meta.pubcode in PVOL   |
| observer_institute                    | Text   |     | Observer institute  | meta.note                           |  |  |  |
| observer_country                      | Text   |     | Observer's country of residence   | meta.note;obs.observer              |  |  | meta.pubcountry in PVOL  |
| observer_location                     | Text   |     | Broad location of the observer or telescope. Can be used when the exact location cannot be released | pos;obs.observer<br>- not in mixin! |  |  | meta.pubcountry in PVOL  |
| observer_longitude                    | Float  | deg | Observer's approximate longitude  | obs.observer;pos.earth.lon          |  |  | meta.publon in PVOL  |
| observer_latitude                     | Float  | deg | Observer's approximate latitude   | obs.observer;pos.earth.lat          |  |  | meta.publat in PVOL  |
| original_publisher                    | Text   |     | Refers to the source of the data, e.g., in compilations of observations or experimental data        | meta.note                           |  |  | Experimental spectroscopy + contributive work extensions   |
| <b>Solar System objects extension</b> |        |     |   |                                     |  |  |  |
| mean_radius                           | Float  | km  |   | phys.size.radius                    |  |  |  |
| equatorial_radius                     | Float  | km  |   | phys.size.radius                    |  |  |  |
| polar_radius                          | Float  | km  |   | phys.size.radius                    |  |  |  |
| diameter                              | Float  | km  | Target diameter, or equivalent diameter for binary objects  | phys.size.diameter                  |  |  | Used in Inosarecool, not very consistent (use radius?)   |
| mass                                  | Float  | kg  | Mass of object  | phys.mass                           |  |  | Solar System Objects extension (generic values in catalogues, not observations)  |
| sidereal_rotation_period              | Float  | h   | Object rotation rate  | time.period.rotation                |  |  |  |
| semi_major_axis                       | Float  | AU  |   | phys.size.smajAxis                  |  |  |  |
| inclination                           | Float  | deg | Orbit inclination   | src.orbital.inclination             |  |  |  |
| eccentricity                          | Float  |     | Orbit eccentricity  | src.orbital.eccentricity            |  |  |  |
| long_asc                              | Float  | deg | Longitude of ascending node, J2000.0  | src.orbital.node                    |  |  |  |
| arg_perihel                           | Float  | deg | Argument of perihelion, J2000.0   | src.orbital.periastron              |  |  |  |
| mean_anomaly                          | Float  | deg | Mean anomaly at the epoch   | src.orbital.meanAnomaly             |  |  |  |
| epoch                                 | Double | d   | Epoch of interest in JD   | time.epoch                          |  |  |  |
| magnitude                             | Float  | mag | Absolute magnitude. For small bodies, from HG magnitude system                                      | phys.magAbs                         |  |  | Actually depends on service (eg, spectro_planets vs DynAstVO vs Inosarecool). UCD may include mention of the photometric band. |
| flux                                  | Float  | mJy | Target flux   | phot.flux.density                   |  |  |  |
| albedo                                | Float  |     | Target albedo   | phys.albedo                         |  |  |  |
| dynamical_class                       | Text   |     | Class of small body, from enumerated list   | meta.code.class;src                 |  |  |  |
| dynamical_type                        | Text   |     | Subdivision of the class, from enumerated list  | meta.code.class;src                 |  |  |  |
| taxonomy_code                         | Text   |     | Code for target taxonomy  | src.class.color                     |  |  | Possible values depend on target type and possibly on service  |

|  |       |        |  |  |  |  |  |
|--|-------|--------|--|--|--|--|--|
| <b>Map extension</b>                       |       |        |  |  |  |  |  |
| map_projection                             | Text  |        | ID from enumerated list, or string with parameters (referring to a standard)   | pos. projection  |  |  | Map extension                              |
| map_height                                 | Float | pix    | Map size in px   | phys. size   |  |  |  |
| map_width                                  | Float | pix    | Map size in px   | phys. size   |  |  |  |
| map_scale                                  | Text  |        | Preferably a ratio (e. g., "1:50000")  | pos.wcs.scale  |  |  |  |
| pixelscale_min                             | Float | km/pix | Min pixel size on a surface  | instr. scale; stat.min   |  |  |  |
| pixelscale_max                             | Float | km/pix | Max pixel size on a surface  | instr. scale; stat.max   |  |  |  |
| <b>Particle spectroscopy extension</b>     |       |        |  |  |  |  |  |
| particle_spectral_type                     | Text  |        | From enumerated list   | meta.id; phys. particle  |  |  |  |
| particle_spectral_range_min                | Float |        |  | phys. energy; phys. particle; stat.min<br><br>phys. mass; phys. particle; stat.min |  |  |  |
| particle_spectral_range_max                | Float |        |  | phys. energy; phys. particle; stat.max<br><br>phys. mass; phys. particle; stat.max |  |  |  |
| particle_spectral_sampling_step_min        | Float |        |  | spect. resolution; phys. particle; stat.min  |  |  |  |
| particle_spectral_sampling_step_max        | Float |        |  | spect. resolution; phys. particle; stat.max  |  |  |  |
| particle_spectral_resolution_min           | Float |        |  | spect. resolution; phys. particle; stat.min  |  |  |  |
| particle_spectral_resolution_max           | Float |        |  | spect. resolution; phys. particle; stat.max  |  |  |  |
| <b>Experimental spectroscopy extension</b> |       |        |  |  |  |  |  |
| producer_name                              | Text  |        | Data producer name, especially in compilations of experimental data            | meta. note   |  |  |  |
| producer_institute                         | Text  |        | Data producer institute, e. g., in compilations of experimental data           | meta. note   |  |  |  |
| sample_id                                  | Text  |        | Provides a local ID in an existing catalogue                                   | meta.id; src   |  |  | In addition to target_name                 |
| sample_classification                      | Text  |        | Information related to class, sub-class, species... as hash list               | meta. note; phys. composition  |  |  | This uses standard names for classes...    |
| sample_desc                                | Text  |        | Describes the sample, its origin, and possible preparation. Can be a hash list | meta. note   |  |  |  |
| species_indexkey                           | Text  |        | Fixed length string identifying the species. Can be a hash list                | meta.id; phys. atmol   |  |  | Follows IUPAC standard (Heller et al 2015) |

|                        |       |     |  |                            |  |   |
|------------------------|-------|-----|--|----------------------------|--|---|
| grain_size_min         | Float | um  | Min sample particle size   | phys. size;stat. min       |  |   |
| grain_size_max         | Float | um  | Max sample particle size   | phys. size;stat. max       |  |   |
| azimuth_min            | Float | deg | Min azimuth angle for illumination   | pos. azimuth; stat.min     |  | Check meaning/requirements for <0 values? UCD added in 2018 (instead of pos. azimuthAng requested - OK) |
| azimuth_max            | Float | deg | Max azimuth angle for illumination   | pos. azimuth; stat.max     |  | UCD added in 2018   |
| pressure               | Float | bar | Ambient pressure   | phys. pressure             |  | VOunits says: Pascal.   |
| measurement_atmosphere | Text  |     | Describes experimental conditions. "vacuum" for measurements under vacuum  | meta. note; phys. pressure |  |   |
| temperature            | Float | K   | Ambient temperature  | phys. temperature          |  |   |
| setup_desc             | Text  |     | Describes the experimental setup. Can be a hash list                       | meta. note                 |  | May include Aperture (size of sample measured), etc   |
| data_calibration_desc  | Text  |     | Provides information on post-processing. Can be a hash list                | meta. note                 |  | (preferably to a "comment" parameter)   |
| geometry_type          | Text  |     | Type of observation, from enumerated list. Can be a hash list              | meta. note;instr. setup    |  |   |
| spectrum_type          | Text  |     | Type of spectral observation, from enumerated list TBD. Can be a hash list | meta. note;instr. setup    |  | Alternative to UCD, very detailed   |
| <b>Event extension</b> |       |     |  |                            |  |   |
| event_type             | Text  |     | Type of event from enumerated list   | meta. code. class          |  | Events extension<br>If dataproduct_type = ev<br>UCDs should be provided with the standard               |
| event_status           | Text  |     | From enumerated list   | meta. code. status         |  |   |
| event_cite             | Text  |     | From enumerated list   | meta. code. status         |  |   |

(1): depending on context (as given by spatial\_frame\_type), see table below

Longitude and RA range from 0. to 360; Latitude and Dec range from -90. to +90.

For spatial\_frame\_type = "none": no value is provided, UCD are empty strings (""), and no unit is provided

(2) Spatial resolution parameters have the same unit as spatial coordinate parameters. The associated UCD combine either pos. resolution (if linear) or pos.angResolution (if angular) with secondary stat.min or stat.max

c1: only body and celestial are angular; c2: only cartesian is linear; c3: only spherical is angular

(3): Any contour type that works with ADQL's geometry operators (CONTAINS, INTERSECTS...) is legal here

(4): Timestamps are provided as ISO-8601 String as specified by DALI. On VOTable output, xtype="timestamp" attribute is required.

| Frame coordinates UCD /units | celestial               | body                    | cartesian                                   | spherical                                  | cylindrical                                   |
|------------------------------|-------------------------|-------------------------|---|--|---|
| <b>c1min</b>                 | pos.eq.ra;<br>stat.min  | pos.bodyrc.lon;stat.min | pos.cartesian.x;<br>stat.min<br><br>(in km) | pos.spherical.r;<br>stat.min<br><br>(in m) | pos.cylindrical.r;<br>stat.min<br><br>(in km) |
| <b>c1max</b>                 | pos.eq.ra;<br>stat.max  | pos.bodyrc.lon;stat.max | pos.cartesian.x;<br>stat.max<br><br>(in km) | pos.spherical.r;<br>stat.max<br><br>(in m) | pos.cylindrical.r;<br>stat.max<br><br>(in km) |
| <b>c2min</b>                 | pos.eq.dec;<br>stat.min | pos.bodyrc.lat;stat.min | pos.cartesian.y;<br>stat.min<br><br>(in km) | pos.spherical.colat;stat.min               | pos.cylindrical.azi<br>;stat.min              |
| <b>c2max</b>                 | pos.eq.dec;<br>stat.max | pos.bodyrc.lat;stat.max | pos.cartesian.y;<br>stat.max<br><br>(in km) | pos.spherical.colat;stat.max               | pos.cylindrical.azi<br>;stat.max              |

|              |  |  |   |                                |   |
|--------------|--|--|---|--------------------------------|---|
| <b>c3min</b> | pos.distance;<br>stat.min<br><br>(in AU) | pos.bodyrc.alt;stat.min (from surface only,<br>implicitly from reference level)<br>or<br><del>pos.distance;pos.bodyrc.stat.min (from center)?</del><br><br>(in km) | pos.cartesian.z;<br>stat.min<br><br>(in km) | pos.spherical.azi;<br>stat.min | pos.cylindrical.z;<br>stat.min<br><br>(height, in km) |
| <b>c3max</b> | pos.distance;<br>stat.max<br><br>(in AU) | pos.bodyrc.alt;stat.max (from surface only,<br>implicitly from reference level)<br>or<br><del>pos.distance;pos.bodyrc.stat.max (from center)?</del><br><br>(in km) | pos.cartesian.z;<br>stat.max<br><br>(in km) | pos.spherical.azi;<br>stat.max | pos.cylindrical.z;<br>stat.max<br><br>(height, in km) |

## Example table for IDs:

| File name-type | granule_uid | granule_gid | obs_id |
|----------------|-------------|-------------|--------|
| A-Raw          | 1           | native      | A      |
| A-Calib        | 2           | calibrated  | A      |
| A-geom         | 3           | geometry    | A      |
| A-proj         | 4           | projected   | A      |
| B-Raw          | 5           | native      | B      |
| B-Calib        | 6           | calibrated  | B      |
| B-geom         | 7           | geometry    | B      |
| B-proj         | 8           | projected   | B      |

## Syntax

- **multivalued lists** = first entry#second entry#...#last entry, or scalar (with no #)

Values separator = #

No quotes around the list

This can be parsed by ADQL/RegTAP function `ivo_hashlist_has` like this:

```
select * from vxex.epn_core where 1 = ivo_hashlist_has(lower(target_name), 'Venus')
```

Where the `lower` function is mandatory to handle values possibly containing upper cases (this is implicit on the 2nd argument)

Beware that only complete elements between separators will be found. The provider has to split the string according to expected searches, e.g.:

`Composite Infrared Spectrometer#CIRS`

**not** ~~`Composite Infrared Spectrometer (CIRS)`~~

Parameters supporting multivalued lists include:

`dataproduct_type` (only when present in the same file; best avoided when possible)

`target_name` (for different targets only, but only one target can be described in the granule; use `alt_target_name` for other names of the same target)

`alt_target_name`

`target_class` (in association with `target_name`)

`instrument_host_name` (e.g. acronym and full name)

`instrument_name` (e.g. acronym and full name)

`measurement_type` (when present in the same file)

`processing_level` (when present in the same file)

`bib_reference`

- **NULL and special values:**

A standard query on a parameter will not return granules with NULL/void value. E.g. `target_name LIKE '%toto%'` will only select granules with this value (standard ADQL behavior).

NULL/void has to be tested specifically (e.g., when it means "I don't know") using the IS operator (IS is used only to test the NULL value in ADQL):

```
target_name LIKE '%toto%' OR target_name IS NULL
```

Syntax IS NULL stands for both strings and numerical parameters (the = operator is accepted in this context only by latest DaCHS servers)

No inf, inf, or NaN value in ADQL? At least Inf/-Inf should be there, as per DALI.

- **UCDs:** the above table has been reviewed against the UCD documents, including latest discussions (4/2019). [Review against PDS4 and IPDA to be performed.](#)

2018 discussions / conclusions have been included here: <https://wiki.ivoa.net/wiki/bin/view/IVOA/UCDList1dot42017June2018FebRFM>

- **\*\_min vs \*\_max parameters:**

If only one value is available, it must appear in both fields

- **Optional parameters:** some of these come in sets that are logically related; if one is present, the related ones must be present also (e.g., 3 `access_*` parameters)

- **Granule\_gid:** any general indication to providers? I.e.: preview, native, calibrated, geometry...

[A client should be able to display the values present in a service \(feasible in TOPCAT\)](#)

- Reshuffle previous "service parameters":

- Mandatory :
  - [publisher - make it mandatory???](#)
  - [add publisher\\_did as in Obscore? \(for DaCHS/registry; provides unique ID of service for this publisher/server\), with UCD = meta.ref.uri;meta.curation](#)
- Optional
  - `spatial_coordinate_description` (default = none)
  - `spatial_origin` (default = body center or SS barycenter? Or observer location)
  - `time_origin` (default = observer)
  - `time_scale` (default = UTC – no other values allowed in *data* services? [only in computational services, e.g. ephemeris])Same values to be used in registry declaration

- **Call-back parameters / reference**

Currently using `service_title` (= schema name) + `granule_uid`.

May use `ivolD` in the future.

- **Other parameters**

The most recent extra parameters often have names starting in prefix\_\*, where prefix identify the scope or context (e.g., `spase_`, `vims_`, `image_`, etc). Seems to be a good practice.

`Accref` is introduced by the EPN-TAP localfile mixin, but not used - in principle not included in TAP response, be may be present anyway. It may be better to hide it also in the portal.

- **Parameters introducing error bars/uncertainties**

Some parameters providing a scalar value X in the EPN-TAP table may be associated with an error bar in a related parameter. This is currently (4/2019) entered as:

In Basecom: `Xerr` (to be changed when upgrading to mixin version)

In DynAstVO: `X_error`

In Exoplanets: `X_error_min`; `X_error_max`

In planets: `X_uncertainty`

TNOsarecool: `X_sigma_plus`, `X_sigma_minus` (to be changed?)

The associated UCDs **start** with `stat.error`; or `stat.error;stat.min`; & `stat.error;stat.max`;

- **Support for PDS3 detached labels** (proposal)

Solution with `datalink` seems OK: data files under `access_url` and detached labels provided under `datalink_url` in a link table - although no attempt made to read them from the portal yet (use VIR unpublished service to test this).

- **Utypes**

Need to clean up current doc (2.0). Utypes are = DM fields. They are supposedly used to identify the meaning of parameters and help e.g. tools to grab required quantities - This will not work in some areas though, e.g. with spectral tools as they currently use UCD instead of Utype for this purpose (not many tools appear to actually rely on Utype in fact). See discussion here for usage (a bit old?): <http://www.ivoa.net/documents/Notes/UTypesUsage/20130213/NOTE-utypes-usage-1.0-20130213.html>

To handle this in practice:

- Associate each parameter to a specific Utype in EPNCORE - all names need to start with the `epncore:` prefix/namespace.
- Then map `epncore` Utype to other DM (find equivalent parameter, or trace back the original templates of EPNCORE parameters - often from ObsCore)
- Reuse Utype from other DM each times it makes sense - TBC: the `epncore:` namespace is still required (even when using Utypes from other DM)

This allows tools to handle EPNCORE parameters like existing parameters from other DM, i.e., with no specific implementation Pb is that small differences in the use of parameters may preclude reusing the same Utype (TBC: does that applies to units also?)
- Cross our fingers: known Utype (from other DMs) may be usable in existing tools (e.g. a tool supporting Provenance would grab equivalent info in EPN-TAP services transparently)

Unclear if the use of the namespace makes it more complicated in tools.

## Example of V2 with APIS database:

EPNcore Table v2

| granule_uid         | granule_gid            | obs_id    | access_url                          | access_format | thumbnail_url                             |
|---------------------|------------------------|-----------|-------------------------------------|---------------|---|
| o5g202x4q_x2d       | original_data          | o5g202x4q | <a href="#">o5g202x4q_x2d.fits</a>  | image/fits    | <a href="#">o5g202x4q_x2d_small.jpg</a>   |
| o5g202x4q_x2d_prev  | original_data_preview  | o5g202x4q | <a href="#">o5g202x4q_x2d.jpg</a>   | image/jpg     | <a href="#">o5g202x4q_x2d_small.jpg</a>   |
| o5g202x4q_proc      | processed_data         | o5g202x4q | <a href="#">o5g202x4q_proc.fits</a> | image/fits    | <a href="#">o5g202x4q_proc_small.jpg</a>  |
| o5g202x4q_proc_prev | processed_data_preview | o5g202x4q | <a href="#">o5g202x4q_proc.jpg</a>  | image/jpg     | <a href="#">o5g202x4q_proc_small.jpg</a>  |
| o5g202x4q_cyl       | cylindrical_projection | o5g202x4q | <a href="#">o5g202x4q_cyl.jpg</a>   | image/jpg     | <a href="#">o5g202x4q_cyl_small.jpg</a>   |
| o5g202x4q_pol_n     | polar_projection_north | o5g202x4q | <a href="#">o5g202x4q_pol_n.jpg</a> | image/jpg     | <a href="#">o5g202x4q_pol_n_small.jpg</a> |
| o5g202x4q_pol_s     | polar_projection_south | o5g202x4q | <a href="#">o5g202x4q_pol_s.jpg</a> | image/jpg     | <a href="#">o5g202x4q_pol_s_small.jpg</a> |