Tables of ADES Tags and Structures

October 25, 2023

1 Table of ADES Elements

XML elements are the things which appear as XML tags, such as <permID> value </permID>. The ones in this table are all top-level elements, which means they can be the root of their own XML document and thus validated against XSD individually. The last element in the table, "ades," is intended to be used as the root element for every XML document used for interchange. All elements are written in camelCase with the first character not capitalized.

Elements and their Descriptions

ADES observation sub-elements		
Name	Type	Description
permID	PermIDType	IAU permanent designation, i.e., IAU number
provID	ProvIDType	MPC provisional designation (unpacked form) for unnumbered object
artSat	StringTypeW25	Name of an artificial satellite
trkSub	TrkSubType	Observer-assigned tracklet identifier, unique within submission batch.
obsID	ObsIDType	Globally Unique Observation ID assigned by MPC.
obsSubID	ObsIDType	Observation identifier, optionally included with the submission, that is unique to a given observing program. This element is intended to support extended analyses associated with major observing programs.
trkID	TrkIDType	Globally Unique alphnumeric tracklet ID assigned by MPC

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trkMPC	TrkIDType	MPC-internal tracklet identifier, used in cases where the value of the trkSub element should be considered deprecated.
mode	ModeType	Mode of optical and offset observations.
stn	StationType	Obervatory code from MPC list.
trx	StationType	Station code of transmiting antenna.
rcv	StationType	Station code of receiving antenna.
sys	SysType	Coordinate system for station coordinates and covariance.
ctr	SPICEIDType	Origin of the reference system. Use public SPICE codes, e.g., 399 is the geocenter, 10 is the Sun center. Note; sys=WGS84 implies ctr=399
pos1	DecimalTypeW14	Position of observer per sys, 1st value
pos2	DecimalTypeW14	Position of observer per sys, 2nd value
pos3	DecimalTypeW14	Position of observer per sys, 3rd value
posCov11	DoubleTypeW21	11 covariance per sys
posCov12	DoubleTypeW21	12 covariance per sys
posCov13	DoubleTypeW21	13 covariance per sys
posCov22	DoubleTypeW21	22 covariance per sys
posCov23	DoubleTypeW21	23 covariance per sys
posCov33	DoubleTypeW21	33 covariance per sys
prog	ProgType	Program code as assigned by the MPC.

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obsTime	TimeType	UTC time of the observation in ISO 8601 format, i.e., *yyyy-mm-ddThh:mm:ss.ssZ*.
rmsTime	PosDecimalTypeW8	Random component of the obsTime 1σ uncertainty in seconds as estimated by the observer.
ra	RAType	J2000.0 Astrometric equatorial right ascension in decimal degrees.
dec	DeclinationType	J2000.0 Astrometric equatorial declination in decimal degrees. Positive DEC values may optionally include a + sign
raStar	RAType	J2000.0 RA in decimal degrees of the occulted star
decStar	DeclinationType	J2000.0 DEC in decimal degrees of the occulted star
obsCenter	ObsCenterType	Center of offset observation may be planet or other body with PermID or ProvID
deltaRA	DecimalTypeW10	Measured $\Delta(\mathrm{RA}\cos\mathrm{DEC})$ in arcseconds. For offset measurements of a satellite with respect to its primary, or for occultation observations with respect to the star in rectangular coordinates, J2000.0 frame.

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deltaDec	DecimalTypeW10	Measured ΔDEC in arcseconds. For offset measurements of a satellite with respect to its primary, or for occultation observations with respect to the star in rectangular coordinates, J2000.0 frame
dist	PosDecimalTypeW10	Measured distance in arcseconds. For offset measurements of a satellite with respect to its primary, or for occultation observations with respect to the star in polar coordinates.
pa	RAType	Measured position angle in degrees. For offset measurements of a satellite with respect to its primary, or for occultation observations with respect to the star in polar coordinates.
rmsRA	PosDecimalTypeW7	Random component of the RA cos DEC 1σ uncertainty in arcseconds as estimated by the observer as part of the image processing and astrometric reduction.
rmsDec	PosDecimalTypeW7	Random component of the DEC 1σ uncertainty in arcseconds as estimated by the observer as part of the image processing and astrometric reduction.

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rmsDist	PosDecimalTypeW6	Random component of the distance 1σ uncertainty in arcseconds as estimated by the observer as part of the image processing and astrometric reduction.
rmsPA	PosDecimalTypeW6	Random component of the polar angle 1σ uncertainty in degrees as estimated by the observer as part of the image processing and astrometric reduction.
rmsCorr	CorrDecimalType	Correlation between RA and DEC or dist and PA that may result from the astrometric reduction. This is derived from the RA-DEC or dist-PA covariance matrix, where the off-diagonal term is rmsCorr $*$ rmsRA $*$ rmsDec or rmsCorr $*$ rmsDist $*$ rmsPA.
delay	PosDecimalTypeW14	Observed radar delay value in seconds.
rmsDelay	PosDecimalTypeW6	Measurement 1σ uncertainty in µs for radar delay
doppler	DecimalTypeW14	observed radar doppler value in Hz
rmsDoppler	PosDecimalTypeW6	Measurement 1σ uncertainty in Hz for radar doppler
astCat	CatType	Star catalog used for the astrometric reduction or for the occulted star in the case of occultation observations.)
mag	DecimalTypeW8	Apparent Magnitude in specified band

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rmsMag	PosDecimalTypeW6	Apparent magnitude 1σ uncertainty in magnitudes.
band	BandType	Filter designation for photometry.
photCat	CatType	Star catalog used for photometry measurements.
photAp	PosDecimalTypeW6	Photometric aperture radius in arcseconds.
nucMag	LogicalType	Nuclear magnitude flag for comets. 0 for total magnitude (i.e., for most archival comet observations and all asteroid observations), 1 for nuclear magnitude. Primarily used for archival data as photAp should be used to communicate this information in the new standard
logSNR	DecimalTypeW6	$\log_{10}$ of the signal-to-noise ratio of the source in the image integrated on the entire aperture used for the astrometric centroid.
shapeOcc	LogicalType	For occultation observations, a flag to indicate that the observation reduction assumes a shape-based (non-circular) plane-of-sky cross-section. False implies that a circular cross section was assumed.

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seeing	PosDecimalTypeW6	Size of seeing disc in arcseconds, measured at Full Width Half Maximum (FWHM) of target point spread function (PSF).
exp	PosDecimalTypeW6	Exposure time in s. Total exposure time in the case of stacked image detections
rmsFit	PosDecimalTypeW6	RMS of fit of astrometric comparison stars in arcseconds.
nStars	PosIntegerTypeW6	Number of stars in astrometric fit.
com	LogicalType	Flag to indicate that the observation is reduced to the center of mass. 0 implies a measurement to the peak power position, which is usually interpreted as the leading edge of the target, with the reflection point being modeled one object radius prior to the center of mass.
frq	FrequencyType	Carrier reference frequence in MHz
ref	RefType	Standard reference field used for citations.
disc	DiscType	Discovery flag; '*' marks a new discovery record; '+' marks the first measurement of a previously observed object; otherwise not present

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subFrm	SubFrmType	Reference frame for the original submission of reported angular measurements.
subFmt	SubFmtType	Format in which the observation was originally submitted to the MPC, e.g., M92 for MPC1992 format or A17 for the current standard standard. Filled by the MPC according to a list provided and maintained by the MPC.
precTime	TimePrecType	Precision in millionths of a day of the reported obeservation time for archived MPC1992 data records
precRA	RaDecPrecType	Precision in seconds of the reported RA for archived MPC1992 data records.
precDec	RaDecPrecType	Precision in arcseconds of the reported DEC for archived MPC1992 data records.

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uncTime	PosDecimalTypeW8	Estimated time uncertainty in seconds. Unlike the preceding RMS fields, which indicate random errors, this field indicates a presumed level of systematic clock error. NB: This field is generally only to be used to communicate exceptions and problems with clock calibration and is not intended to be used in routine submissions where clock errors are not a significant source of astrometric error.
notes	NotesType	A set of one-character note flags to communicate observing circumstances.
remarks	RemarkType	Comment field provided by the observer. This field can be used to report additional information that is not reportable in the notes field, but that may be of relevance for interpretation of the observations.
deprecated	DeprecatedType	Marks deprecated observation.
localUse	LocalUseType	For user-defined fields in observations

observations residual sub-elements		
Name	Type	Description

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(continued)

orbProd	StringTypeW100	Orbit producer. Can be institution, individual, or even email address, e.g.'MPC'
orbID	StringTypeW25	Local reference for orbit, e.g., 'JPL 7' or 'MPO 12345'.
resRA	DoubleTypeW7	Residuals in RA cos DEC in arcseconds
resDec	DoubleTypeW7	Residuals in DEC in arcseconds
selAst	SelResType	Inclusion/rejection flag for astrometry
sigRA	PosDecimalTypeW6	Adopted RA cos DEC 1σ uncertainty in arcseconds.
sigDec	PosDecimalTypeW6	Adopted DEC 1σ uncertainty in arcseconds.
sigCorr	CorrDecimalType	Adopted correlation between RA cos DEC and DEC.
sigTime	PosDecimalTypeW8	Adopted 1σ time uncertainty in seconds.
biasRA	DecimalTypeW8	Adopted RA cos DEC bias in arcseconds.
biasDec	DecimalTypeW8	Adopted DEC bias in arcseconds.
biasTime	DecimalTypeW10	Adopted time bias in s.
photProd	StringTypeW100	Producer of photometric residuals. Can be institution, individual, or even email address, e.g.'MPC'
resMag	DoubleTypeW7	Photometric residual in magnitudes
selPhot	SelResType	Inclusion/rejection flag for photometry
sigMag	PosDecimalTypeW6	Adopted 1σ magnitude uncertainy in magnitudees.

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biasMag	DecimalTypeW6	Adopted photometric bias in magnitudes
photMod	PhotModType	Description of the photometric model.
resDelay	DoubleTypeW7	Residual of the radar measurement in µs for delay
selDelay	SelResType	Inclusion/rejection flag for radar astrometry
sigDelay	PosDecimalTypeW6	Adopted uncertainty for the radar measurement in µs for delay
resDoppler	DoubleTypeW7	Residual of the radar measurement in Hz for Doppler
selDoppler	SelResType	Inclusion/rejection flag for radar astrometry
sigDoppler	PosDecimalTypeW6	Adopted uncertainty for the radar measurement in Hz for Doppler

observation-context sub-elements

Name	Type	Description
observatory	ObservatoryType	observatory information block
submitter	SubmitterType	Contact information block
observers	NamesType	list of observer names (initials then surname)
measurers	NamesType	list of measurer names (initials then surnames)
telescope	TelescopeType	Description of telescope
software	SoftwareType	Description of software
coinvestigators	NamesType	list of coinvestigator names (initials then surname)
collaborators	NamesType	list of collaborator names (initials then surname)
fundingSource	StringTypeW100	funding source

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comment	CommentType	comment for observation context

observation types		
Name	Type	Description
optical	OpticalType	optical observation
offset	OffsetType	optical offset
occultation	OccultationType	optical occultation
radar	RadarType	delay or doppler radar

observation-context, obsBlock		
Name	Type	Description
obsContext	ObsContextType	observation context information
obsData	ObsDataType	list of optical or radar observations
obsBlock	ObsBlockType	obsBlock contains an obsContext and obsData

Free-Standing Residuals		
Name	Type	Description
opticalResidual	OpticalResType	optical residual
radarResidual	RadarResType	radar residual

ADES root		
Name	Type	Description
ades	ADESType	document root

2 Table of Restricted Simple Types

Restricted simple types are a single XML value with some additional restrictions, such as requiring an decimal value to be in some range (such as 0.0 to 90.0) or requiring a string to be from an enumerated list. Some of these restrictions, such as the possible station string values, will eventually be pulled out of MPC-provided files and referenced over the web.

Simple Types with their Restrictions

Type	Description
AlphaNumericType base is StringType –pattern: `[A-Za-z0-9_]*`	AlphaNumericType restricts the field to only the ASCII upper- and lower-case letters, ASCII numbers and underscores
BandType base is AlphaNumericType –maxLength: `3`	MPC maintains a list of bands for magnitude observations
CatType base is StringType –pattern: `[.A-Za-z0-9_]*` –maxLength: `8`	MPC maintains a list of current astrometry and photometry catalogs
CorrDecimalType base is xsd:decimal –minInclusive: `-1.0` –maxInclusive: `1.0` –pattern: `[+\-]?(0|1)(\.[0123456789]{0,11})?`	Decimal in range [-1.0, 1.0] with no more that 11 digits after the decimal point. Decimal point is optional, but if present the integer portion must be present (i.e., '.1' and '-.1' are invalid.)
DecimalType base is xsd:decimal –pattern: `[+\-]?(0|([1-9][0-9]*))(\.[0-9]*)?`	Decimal in range (-inf, +inf). Decimal point is optional, but if present the integer portion must be present (i.e., '.1' and '-.1' are invalid.)
DecimalTypeW6 base is DecimalType –pattern: `[+\-]?[0123456789\.]{1,5}`	DecimalType with no more than 5 characters plus optional sign
DecimalTypeW8 base is DecimalType –pattern: `[+\-]?[0123456789\.]{1,7}`	DecimalType with no more than 7 characters plus optional sign
DecimalTypeW10 base is DecimalType –pattern: `[+\-]?[0123456789\.]{1,9}`	DecimalType with no more than 9 characters plus optional sign
DecimalTypeW14 base is DecimalType –pattern: `[+\-]?[0123456789\.]{1,13}`	DecimalType with no more than 13 characters plus optional sign

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Type	Description
DeclinationType base is xsd:decimal –minInclusive: `-90.0` –maxInclusive: `90.0` –pattern: `[+\-]?([1-9]?[0-9])?(\.[0123456789]{0,9})?`	DEC in degrees in range [-90.0, 90.0] with no more that 9 characters after the decimal
DeprecatedType base is xsd:string –enumeration: `X`	X marks the use of deprecated data
DiscType base is xsd:string –enumeration: `*` –enumeration: `+`	Used to mark the discovery record – must be '*' or '+' if present
DoubleTypeW7 base is xsd:double –pattern: `[+\-]?[+\-Ee0123456789\.]{1,6}`	Double (i.e., decimal or exponential) in range (-inf, +inf) with no more that 6 characters plus optional sign
DoubleTypeW21 base is xsd:double –pattern: `[+\-]?[+\-Ee0123456789\.]{1,20}`	Double (i.e., decimal or exponential) in range (-inf, +inf) with no more that 20 characters plus optional sign
SubFrmType base is StringType –pattern: `([BJ]\d{4}.0)|APP\.`	The submission frame, usually B1950.0 or earlier. If this field is not present, the submission frame was J2000.0

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Type	Description

LeapSecondsHelp
base is xsd:string
–pattern:
`19(72|81|82|83|85|92|93|94|97)-06-30T23:59:60(\.\d+)?Z`
–pattern:
`19(72|73|74|75|76|77|78|79|87|89|90|95|98)-12-31T23:59:60(\.\d+)?Z`
–pattern:
`20(12|15)-06-30T23:59:60(\.\d+)?Z`
–pattern:
`20(05|08|16)-12-31T23:59:60(.\d+)?Z`
–pattern:
`(2[1-9]\d{2}|20[2-9]\d|201[7-9])-12-31T23:59:60(\.\d+)?Z`
–pattern:
`(2[1-9]\d{2}|20[2-9]\d|201[7-9])-06-30T23:59:60(\.\d+)?Z`
–pattern:
`[3-9]\d{3}-06-30T23:59:60(\.\d+)?Z`
–pattern:
`[3-9]\d{3}-12-31T23:59:60(\.\d+)?Z`
	Allowed leap seconds before 2017 are valid leap-seconds; for 2017 and later are all allowed June and December leap-second opportunities.

LogicalType base is xsd:integer –enumeration: `0` –enumeration: `1`	0 for false, 1 for true to match C and FORTRAN
ModeType base is AlphaNumericType –maxLength: `3`	The MPC maintains a list of mode values
ObsCenterType union of PermIDType ProvIDType PlanetNameType ————————————- Submissions Only Allow: ————————————- union of PermIDType ProvIDType PlanetNameType	May be PlanetNameType, PermIDType or ProvIDType for both submissions and in general
NotesType base is AlphaNumericType –maxLength: `6`	up to six single-character notes from MPC table

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Type	Description
ObsIDType base is AlphaNumericType –maxLength: `25`	An obsID is up to twenty-five alphanumeric characters
PermIDType base is StringTypeW25 –pattern: `\d+([IPD](-[A-Z]{1,2})?)?|((Mars|Jupiter|Saturn|Uranus|Neptune) \d{1,3}|\(\d+\) \d{1,3})`	A permID (permanent ID) string may be a positive integer, a positive integer followed by P or D or I (P is for periodic comets; D is for defunct comets; I is for interstellar objects), a planet name followed by a positive integer, or a positive integer in parentheses followed by a postive integer. These indicate a minor planet, a comet or interstellar object, a natural satellite of a planet, and a natural satellite of a minor planet respectively.
PhotModType base is AlphaNumericType –maxLength: `8`	Photometric model is up to eight alphanumeric characters
PlanetNameType base is StringTypeW25 –enumeration: `Mercury` –enumeration: `Venus` –enumeration: `Earth` –enumeration: `Moon` –enumeration: `Mars` –enumeration: `Jupiter` –enumeration: `Saturn` –enumeration: `Uranus` –enumeration: `Neptune`	List of planet names, including Earth's Moon
PosDecimalType base is xsd:decimal –minExclusive: `0.0` –maxExclusive: `100000.0` –pattern: `(0|([1-9][0-9]*))(\.[0-9]*)?`	Unsigned positive decimal in range (0.0, 100,000). Decimal point is optional, but if present the integer portion must be present (i.e., '.1' is invalid.)
PosIntegerTypeW6 base is xsd:positiveInteger –maxExclusive: `1000000`	Positive integer in range (0, 1,000,000). Thus no more than 6 characters.

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Type	Description
SPICEIDType base is xsd:integer –maxExclusive: `+1000000000` –minExclusive: `-1000000000`	Integer having absolute value strictly less than 1,000,000,000.
PosDecimalTypeW6 base is PosDecimalType –pattern: `[0123456789\.]{1,6}`	PosDecimalType with no more that 6 characters
PosDecimalTypeW7 base is PosDecimalType –pattern: `[0123456789\.]{1,7}`	PosDecimalType with no more that 7 characters
PosDecimalTypeW8 base is PosDecimalType –pattern: `[0123456789\.]{1,8}`	PosDecimalType with no more that 8 characters
PosDecimalTypeW10 base is PosDecimalType –pattern: `[0123456789\.]{1,10}`	PosDecimalType with no more that 10 characters
PosDecimalTypeW14 base is PosDecimalType –pattern: `[0123456789\.]{1,14}`	PosDecimalType with no more that 14 characters
FrequencyType base is xsd:decimal –minExclusive: `0.0` –pattern: `[0123456789\.]{1,16}`	Unsigned decimal in range (0.0, +inf) with no more that 16 characters
ProgType base is AlphaNumericType –maxLength: `2`	MPC maintains a list of 1 and 2 character program codes

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Type	Description
BaseProvIDType base is StringTypeW25 –pattern: `\d{4} [A-HJ-Y][A-HJ-Z]\d*|\d{4} (P-L|T-[123])|[ADCPX]/\d{4} [A-Z]{1,2}\d*(-[A-Z])?|S/\d{4} ((M|J|S|U|N)|\((\d+|\d{4}`	A provID (provisional ID) may be a minor planet provid, which is a 4-digit year followed by a space followd by two letters followed optinally by digits; or a comet id, which is C/ or P/ or D/ or X/ or A/ (for asteroids with comet numbers, which may not have fragments) followed by a 4-digit year follwed by a space followed by one or two digits optinally followed by one or two digits optionally followed by "-[A-Z]" (for a commet fragment); or a satellite, which is S/ followed by a 4-digit year followed a space followed either (by a minor planet PermID in parentheses or the bare letter M, J, S, N, U) followed by a space followed by digits.
OldProvIDType base is StringTypeW25 –pattern: `A[89]\d{2} [A-HJ-Y][A-HJ-Z]`	An old-style provID (provisional ID) for object recorded before 1925 is of the from A903 AA, where A903 means 1903, A888 means 1888. and the two letters are the same as currently

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Type	Description
ProvIDType union of BaseProvIDType OldProvIDType ———————————- Submissions Only Allow: ———————————- union of BaseProvIDType	A provID (provisional ID) is may be a minor planet provid, which is a 4-digit year followed by a space followd by two letters followed optinally by digits; or a comet it, which is C/ or P/ or D/ or X/ or A/ (for asteroids with comet numbers, which may not have fragments) followed by a 4-digit year follwed by a space followed by one or two digits optinally followed by one or two digits optionally followed by "-[A-Z]" (for a commet fragment); or a satellite, which is S/ followed by a 4-digit year followed a space followed either (by a minor planet PermID in parentheses or the bare letter M, J, S, N, U) followed by a space followed by digits. For data before 1926, the OldProvIDType may occur – this is not allowed in new submissions
RaDecPrecType base is xsd:decimal –enumeration: `0.1` –enumeration: `0.6` –enumeration: `0.01` –enumeration: `0.001` –enumeration: `60` –enumeration: `6` –enumeration: `1`	RaDecPrecType is used to describe the precision of a historical decimal value when the orignal measurement was made in sexagesimal. The allowed values are applied to the last sexagesimal element, which may be seconds or arcseconds, and mean (for time) the value is accurate to an hour, 10 minutes, 1 minute, 6 seconds, 1 second, .1 second and so forth. This is not allowed in new submissions
RAType base is xsd:decimal –minInclusive: `0.0` –maxExclusive: `360.0` –pattern: `([1-3][0-9]{2}|[1-9]?[0-9])?(\.[0-9]{0,9})?`	Unsigned RA in degrees limited to [0.0, 360.0) with no more that 9 characters after the decimal
RefType base is StringType –maxLength: `16`	MPC-assigned reference, up to sixteen characters

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Type	Description
RemarkType base is StringType –maxLength: `300`	A remark is a String limited to 300 characters
SelResType base is xsd:string –enumeration: `A` –enumeration: `a` –enumeration: `D` –enumeration: `d`	SelRes must be "A," (automatic accept) "a," (manual accept)"D," (automatic delete) or "d" (manual delete)
StationType base is AlphaNumericType –minLength: `3` –maxLength: `4`	A stn, rov, trx or tcv station. Values vary and are checked by MPC
StringType base is xsd:string –pattern: `[^|]*[^|\s][^|]*`	String follows the ADES specification in that the pipe character is disallowed in PSV. To allow data conversion from XML, it must disallowed in XML as well. Also disallow blank elements. Therefore, all elements must match this pattern
StringTypeW25 base is StringType –maxLength: `25`	A StringType limited to 25 characters
StringTypeW100 base is StringType –maxLength: `100`	A StringType limited to 100 characters
SubFmtType base is AlphaNumericType –maxLength: `4`	MPC maintains a list of allowed submission formats with no extra fields, up to four alphanumeric characters
SysType base is xsd:string –enumeration: `WGS84` –enumeration: `ITRF` –enumeration: `IAU` –enumeration: `ICRF_AU` –enumeration: `ICRF_KM`	Coordinate system for station coordinates. This is used by the pos[123] and poscov[123][123] elements to determine the meaning of coordinates. WGS84, ITRF and IAU are for ground-based stations, ICRF_AU and ICRF_KM are for space-based stations.

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Type	Description
TimeHelp base is xsd:dateTime –pattern: `\d{4}-\d{2}-\d{2}T\d{2}:\d{2}:\d{2}(\.\d{1,6})?Z`	Restrict dateTime to 4-digit positive years and Z for UTC. Allow no more than microsecond precision.
TimePrecType base is xsd:decimal –enumeration: `100000` –enumeration: `10000` –enumeration: `1000` –enumeration: `100` –enumeration: `10` –enumeration: `1` –enumeration: `41667` –enumeration: `4167` –enumeration: `694` –enumeration: `69`	TimePrecType is used to describe the precision of a historical Time value when the orignal measurement was made in fractional days. The accuracy is in millionths of decimal day, so 10 means 1/100,000 of a day, a little better than a second. The large values are only for historic data on comets. Historic data may also have been reported to integer hours (41667), tenths of hours (4167), integer minutes (694) or tenths of minutes (69). This is not allowed in new submissions.
TimeType union of TimeHelp LeapSecondsHelp ————————————- Submissions Only Allow: ————————————- union of TimeHelp LeapSecondsHelp	TimeType is an ISO8601 UTC time in the format yyyy-mm-ddThh:mm:ss(.s+)Z. The trailing Z means it is interpreted as UTC. It is not a restriction of xsd:dateTime because that does not properly validate leapseconds. It allows positive 4-digit years and validates the Gregorian calendar for all dates. Note this works because xsd or's all the restrictions and accepts any match. LeapSecondsHelp matches any leapsecond before 2017 and any potential new leapseconds from 2017.
TrkIDType base is StringType –pattern: `[-A-Za-z0-9_]*` –maxLength: `12`	A trkID is up to twelve alphanumeric characters
BaseTrkSubType base is StringType –pattern: `[-A-Za-z0-9_]*` –maxLength: `8`	A trkSub is up to eight alphanumeric or - characters

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Type	Description
OldTrkSubType base is StringType –pattern: `[- ?+@.()/\\A-Za-z0-9_]*` –maxLength: `8`	A trkSub is up to eight funky characters
TrkSubType union of BaseTrkSubType OldTrkSubType ————————————- Submissions Only Allow: ————————————- union of BaseTrkSubType	A trkSub is up to eight characters. For new submission, the allowed character set is alphanumeric with "-". For older data, a wider character set was allowed
VersionType base is xsd:string –enumeration: `2022`	Version attribute for the current ADES schema must be "2022"

3 Groups

This is the documentation for the groups. Groups are a convenient way of organizing rules in complicated structures, used as components of other groups or of complex types. Unlike complex types, groups may appear inside other complex types or groups with no tag. Because groups act a bit like types, their names are all CamelCase with the first letter capitalized.

grouptype: MPCID

MPCID	**permID or provID or both in that order, or artSat**		
choice			
	sequence		
		element	permID
		element	provID (Optional)
	sequence		
		element	provID
	sequence		
		element	artSat

grouptype: OpticalID

OpticalID	**An MPCID group or trkSub or both in that order. Of permID, provID, artSat or trkSub at least one must be present in an optical observation but all three might be present. Also, MPC will assign unique obsID and trkID fields for distribution**			
sequence				
	choice			
		sequence		
			group	MPCID
			element	trkSub (Optional)
		sequence		
			element	trkSub
	element	obsID	(NoSubmit)	
	element	obsSubID	(Optional)	
	element	trkID	(NoSubmit)	
	element	trkMPC	(NoSubmit)	

grouptype: RadarID

RadarID	**An MPCID group only; radar has no equivalent of the optical "trkSub" field. MPC will add a unique obsID field for distribution**		
sequence			
	group	MPCID	
	element	trkSub	(Optional)
	element	obsID	(NoSubmit)

grouptype: RadarValue

RadarValue	**A RadarValue is used for doppler or delay values and errors in a radar observation.**		
choice			
	sequence		
		element	doppler
		element	rmsDoppler
	sequence		
		element	delay
		element	rmsDelay

grouptype: Precision

Precision	**Precision is primarily for M92 and M47 formats. However, it may be used generally to describe data originally obtained with a certain sexagesimal precision instead of a decimal precision**
sequence	
element	precTime
element	precRA
element	precDec

grouptype: Location

Location	**location data for a rover station.**	
sequence		
element	sys	
element	ctr	
element	pos1	
element	pos2	
element	pos3	
element	posCov11	(Optional)
element	posCov12	(Optional)
element	posCov13	(Optional)
element	posCov22	(Optional)
element	posCov23	(Optional)
element	posCov33	(Optional)

grouptype: Photometry

Photometry	**The Photometry group is optional in all optical observation types (optical, offset, and occultation). The "mag" and "band" fields must be present; the rest are optional but can only occur if "mag" and "band" are present to define this as a Photometry group**		
sequence			
	element	mag	
	element	rmsMag	(Optional)
	element	band	
	element	photCat	(Optional)
	element	photAp	(Optional)
	element	nucMag	(NoSubmit)

grouptype: OffsetVal

OffsetVal	**OffsetVal allows either rectangular or polar coordinates for the offset measurement. The rectangular coordinates are deltaRA and deltaDec; the polar coordinates are dist and polar angle.**		
choice			
	sequence		
	element	deltaRA	
	element	deltaDec	
	element	rmsRA	(Optional)
	element	rmsDec	(Optional)
	element	rmsCorr	(Optional)
	sequence		
	element	dist	
	element	pa	
	element	rmsDist	(Optional)
	element	rmsPA	(Optional)
	element	rmsCorr	(Optional)

grouptype: OpticalRes

OpticalRes	OpticalRes is optional for the OpticalResiduals group		
sequence			
	element	resRA	
	element	resDec	
	element	selAst	
	element	sigRA	
	element	sigDec	
	element	sigCorr	(Optional)
	element	sigTime	(Optional)
	element	biasRA	(Optional)
	element	biasDec	(Optional)
	element	biasTime	(Optional)

grouptype: OpticalResMag

OpticalResMag	OpticalRes is optional for the OpticalResiduals group		
sequence			
	element	photProd	(Optional)
	element	resMag	
	element	selPhot	
	element	sigMag	
	element	biasMag	(Optional)
	element	photMod	(Optional)

grouptype: OpticalResiduals

OpticalResiduals	**The OpticalResiduals group is optional for adding residuals to optical observations, or as a separate obsResidual element tagged by obsID**	
sequence		
element	orbProd	
element	orbID	
group	OpticalRes	(Optional)
group	OpticalResMag	(Optional)

grouptype: RadarResiduals

RadarResiduals	**The RadarResiduals group is optional for adding residuals to optical observations, or as a separate obsResidual element tagged by obsID**	
sequence		
element	orbProd	
element	orbID	
choice		
sequence		
element	resDelay	
element	selDelay	
element	sigDelay	
sequence		
element	resDoppler	
element	selDoppler	
element	sigDoppler	

4 Complex Types

This is the documentation for the complex types, which may be used directly as similarly-named elements or as components of other complex types and groups. Unlike a group, a complex type is always the only thing inside a tag. The names of complex types, like groups and simple types, are all CamelCase with the first letter capitalized.

complextype: NamesType

NamesType	List of one or more names of type String		
sequence			
	type StringTypeW100	name	(Unbounded)

complextype: ObservatoryType

ObservatoryType	Observatory Identification		
all			
	type StationType	mpcCode	
	type StringTypeW100	name	(Optional)

complextype: SubmitterType

SubmitterType	Submitter information. A name field (initials plus surname), an institution string		
all			
	type StringTypeW100	name	
	type StringTypeW100	institution	(Optional)

complextype: TelescopeType

TelescopeType	telescope information		
all			
type StringTypeW100		name	(Optional)
type StringTypeW25		design	
type PosDecimalTypeW6		aperture	
type StringTypeW25		detector	
type PosDecimalTypeW6		fRatio	(Optional)
type StringTypeW25		filter	(Optional)
type StringTypeW25		arraySize	(Optional)
type PosDecimalTypeW6		pixelScale	(Optional)

complextype: SoftwareType

SoftwareType	information about software used in processing		
all			
type StringTypeW100		astrometry	(Optional)
type StringTypeW25		fitOrder	(Optional)
type StringTypeW100		photometry	(Optional)
type StringTypeW100		objectDetection	(Optional)

complextype: CommentType

CommentType	List of one or more lines of type String		
sequence			
type StringTypeW100		line	(Unbounded)

complextype: LocalUseType

LocalUseType	This element is to allow arbitrary fields for private data interchange
sequence	
any	

complextype: OpticalType

OpticalType	Optical Observation with RA and Dec		
sequence			
	group	OpticalID	
	element	mode	
	element	stn	
	group	Location	(Optional)
	element	prog	(NoSubmit)
	element	obsTime	
	element	rmsTime	(Optional)
	element	ra	
	element	dec	
	element	rmsRA	(Optional)
	element	rmsDec	(Optional)
	element	rmsCorr	(Optional)
	element	astCat	
	group	Photometry	(Optional)
	element	logSNR	(Optional)
	element	seeing	(Optional)
	element	exp	(Optional)
	element	rmsFit	(Optional)
	element	nStars	(Optional)
	element	ref	(NoSubmit)
	element	disc	(Optional)
	element	subFrm	(NoSubmit)
	element	subFmt	(NoSubmit)
	group	Precision	(NoSubmit)
	element	uncTime	(Optional)
	element	notes	(Optional)
	element	remarks	(Optional)
	group	OpticalResiduals	(NoSubmit)
	element	deprecated	(NoSubmit)
	element	localUse	(NoSubmit)

complextype: OffsetType

OffsetType	Optical Offset Observation with RA and Dec		
sequence			
	group	OpticalID	
	element	mode	
	element	stn	
	group	Location	(Optional)
	element	prog	(NoSubmit)
	element	obsTime	
	element	rmsTime	(Optional)
	element	obsCenter	
	group	OffsetVal	
	group	Photometry	(Optional)
	element	logSNR	(Optional)
	element	seeing	(Optional)
	element	exp	(Optional)
	element	rmsFit	(Optional)
	element	nStars	(Optional)
	element	ref	(NoSubmit)
	element	disc	(Optional)
	element	subFrm	(NoSubmit)
	element	subFmt	(NoSubmit)
	group	Precision	(NoSubmit)
	element	uncTime	(Optional)
	element	notes	(Optional)
	element	remarks	(Optional)
	group	OpticalResiduals	(NoSubmit)
	element	deprecated	(NoSubmit)
	element	localUse	(NoSubmit)

complextype: OccultationType

OccultationType		Optical Occultation Observation with deltaRA, deltaDec, raStar and decStar	
sequence			
	group	OpticalID	
	element	mode	
	element	stn	
	group	Location	(Optional)
	element	prog	(NoSubmit)
	element	obsTime	
	element	rmsTime	(Optional)
	element	raStar	
	element	decStar	
	group	OffsetVal	
	element	astCat	
	group	Photometry	(Optional)
	element	logSNR	(Optional)
	element	shapeOcc	(Optional)
	element	seeing	(Optional)
	element	ref	(NoSubmit)
	element	disc	(Optional)
	element	subFrm	(NoSubmit)
	element	subFmt	(NoSubmit)
	group	Precision	(NoSubmit)
	element	uncTime	(Optional)
	element	notes	(Optional)
	element	remarks	(Optional)
	group	OpticalResiduals	(NoSubmit)
	element	deprecated	(NoSubmit)
	element	localUse	(NoSubmit)

complextype: RadarType

RadarType	Radar Observation using either doppler or delay values from RadarValue		
sequence			
	group	RadarID	
	element	trx	
	element	rcv	
	element	prog	(NoSubmit)
	element	obsTime	
	group	RadarValue	
	element	logSNR	(Optional)
	element	com	(Optional)
	element	frq	
	element	ref	(NoSubmit)
	element	remarks	(Optional)
	group	RadarResiduals	(NoSubmit)
	element	localUse	(NoSubmit)

complextype: ObsContextType

ObsContextType	observation context header type		
all			
	element	observatory	
	element	submitter	
	element	observers	
	element	measurers	
	element	telescope	
	element	software	(Optional)
	element	coinvestigators	(Optional)
	element	collaborators	(Optional)
	element	fundingSource	(Optional)
	element	comment	(Optional)

complextype: ObsDataType

ObsDataType	A list of all optical or all radar observations		
choice			
	element	optical	(Unbounded)
	element	offset	(Unbounded)
	element	occultation	(Unbounded)
	element	radar	(Unbounded)

complextype: ObsBlockType

ObsBlockType	A list of all optical or all radar observations, with context	
sequence		
	element	obsContext
	element	obsData

complextype: OpticalResType

OpticalResType	Optical Residual outside of the optical/occulatation/offset structure	
sequence		
	group	OpticalID
	element	obsTime
	group	OpticalResiduals

complextype: RadarResType

RadarResType	Radar Residual outside of the radar structure	
sequence		
	group	RadarID
	element	obsTime
	group	RadarResiduals

complextype: ADESType

ADESType	This is what is allowed in ades documents – any of these in any order		
attribute	version	VersionType	(requiredAttribute)
choice	(Unbounded)		
	element	optical	(NoSubmit)
	element	offset	(NoSubmit)
	element	occultation	(NoSubmit)
	element	radar	(NoSubmit)
	element	opticalResidual	(NoSubmit)
	element	radarResidual	(NoSubmit)
	element	obsBlock	