Description of the ascii geo-VLBI data format VGOSDA

Introduction

Ascii geo-VLBI data format VGOSDA, of for short VDA, is designed for support of transferring VLBI Level-2 data between software packages and their editing. Since VDA is in plain ascii, development of a handler for reading/writing is a trivial task and does not require specialized skills of installation of specialized software. The VDA was derived from Mark-3 DBH format used in 1976–2018. A handler for VDA format was implemented in 2006 under name AGVF and incorporated into Solve software package. The library gvh that implements the handler is distributed also as a standalone package.

Since VDA format is ascii, its parsing incurs certain overheads. It is not recommended for adoption as am internal format for data analysis software packages. The main use case of VDA format is a distribution of Level-2 data and results of data analysis of a specific VLBI experiment for geodesy and absolute astrometry between various data analysis software packages. Software analysis packages are supposed to be able to transform from the VDA format to their internal format and vice versus without loss of information.

Level 2 VLBI data in the context of this document means results of fringe fitting program in a form of total group delay, total phase delay rate, and the total phase. The datafile in VDA format contains also other variables that describes the VLBI experiment and results of its analysis. In the context of this document a dataset that originates from processing of indepndently scheduled observations is called **experiment**. Experiment duration varies from 30 minutes to 15 days, althoug durations less than 1 hour and longer than 24 hours are unusual. During an experiment N stations observe M sources. Duration of time when an array or its part observes a given source before slewing to another source is called **scan**. Data collectated by a pair or stations during a scan is called **observation**.

Structure of an VDA file

VDA file consists of records of variable length. Records consists of ascii symbols with codes 32 though 255 (decimal). Characters with codes 128 to 255 are allowed but discouraged. A record consists of words separated by one or more blanks. Records have a prefix in a form of a 4-character long section ID followed by character **.** (dot) followed by the chunk index.

A valid VDA file consists of the format label and one or more chunks. Each chunk consists of 5 mandatory sections in the following order:

- **FILE** section
- **PREA** (preamble) section
- **TOCS** (table of contents) section
- **DATA** section
- **HEAP** heap section. Always empty. Reserved for future use.

Sections **FILE**, **PREA**, and **TOCS** describe the data, Section **DATA** presents the data. The data are considered as a set of four-dimensional arrays of one of the types: CHARACTER*1, INTEGER*2,INTEGER*4, INTEGER*8, REAL*4, REAL*8 and of one of the classes: **SES**, **SCA**, **STA**, **BAS**. Fortran notation is used for describing arrays: a) dimensions starts from 1; b) the index over first dimension runs first, i.e. elements order is a(i,j), a(i+1,j), a(i+2,j) etc. The dimensions 3 and 4 depend on the class of the data.

Throughout this document the strings that should be present in the VDA file are **highlighted**. Examples that are not a part of definitions are also **highlighted**.

For historical reasons an individual array of data is called LCODE. An LCODE defines a 8-character long name, a string or arbitrary length with its description, class, type, and four dimensions. A class determines the scope of the LCODE and dimensions of the high level. Supported classes:

- **SES** The scope of the LCODE is the entire experiment, f.e. instance the experiment name. The dimensions 3 and 4 are 1, 1.
- **SCA** The scope of the LCODE is a given scan. The third dimension is the number of scans, the fourth dimension is 1.
- **STA** The scope of the LCODE is a given station, for instance apriori clock delay used for correlation. The third dimension is the number of observations at a given station, the fourth dimension is the station index.
- **BAS** The scope of the LCODE is a given observation, f.e. group delay. The third dimension is the total number of observations, the fourth dimension is 1.

An LCODE can be defined only once. There are five mandatory LCODEs that should be defined at the beginning of the first chunk. The VDA format does not regulate which other LCODEs should be present, in which order, and in which chunk. The order of codes and their allocation in the chunk is selected by the generating software.

VDA label

The VDA label a string of 64 characters long that identifies the format and its revision. The VDA label is the first record of a valid VDA file.

Example:

```
VGOSDA Format of 2019.09.09
```

File section (FILE)

A record in the file section has two words. The first word is the record prefix **FILE** and the chunk index separated by dot. Chunks are numbered starting from 1 consecutively. The second word is the the full path file name that contributed to the chunk.

Example:

```
FILE.1 /vlbi/gvf/db/20170117_pr1775_fr1_v001.bgv
```

Preamble section (PREA)

Preamble section contains auxiliary information. A record of the preamble sections has format Prefix Keyword Value Unit separated a blank. Prefix has format: **PREA** and the chunk index separated by dot. Unit can be empty. A preamble section of the first chunk has three mandatory keywords:

- **@section_length:** defines the number of records in the preamble section except this one. This record should be the first record of the section. The first word of the Value is the number of records, the second is unit: keyword.
- **GENERATOR:** defines name and version of the program that generated this section. Version number should be defined in such a way that sorting it alphabetically corresponds to sorting it chronologically.
- **CREATED_AT:** defines the creation date in format YYYY.MM.DD-hh:mm:ss

Example:

```
PREA.1 @section_length:     15 keywords
```

A preamble section of chunks others than the first has only one mandatory keyword: @section_length. An empty preamble section must have value 0 of this keyword.

Text section (TEXT)

Text section consists of auxiliary information, for instance, correlation report, schedule file, etc. Non-ascii text, such as a document in pdf-format can be put in the text section after base64 encoding. Text section consists of one or more chapters. A chapter is a portion of text. A record of the text sections has format Prefix Keyword Value. A keyword is allowed to be empty.

The first record of the text section defines the number of chapters. This is a mandatory record. Format: Prefix Keyword Value Unit.

- **Prefix** — **TEXT** and the chunk index separated by dot.
- **Keyword** — **@section_length:**
- **Value** — the number of chapters in the section as an integer number.
- **Unit** — **chapters**.

Example:

```
TEXT.1 @section_length:      1 chapters
```

The first record of a chapter has 8 mandatory fields followed by the chapter title. Chapter title can be empty. Format: Prefix Keyword1 Value1 Value2 Unit1 Keyword2 Value3 Unit2 [Title]

- **Prefix** — **TEXT** and the chunk index separated by dot.
- **Keyword1** — **@@chapter**
- **Value1** — the chapter index as an integer number. The first chapter has index 1.
- **Value2** — the number of records in this chapter as an integer number. the number of records is zero for an empty chapter
- **Unit1** — **records**
- **Keyword1** — **max_len:**
- **Value2** — the maximum number of characters in any record of this chapter.
- **Unit1** — **characters**.

Example:

```
@@chapter 1      1  records, max_len:      16
```

The following n records have format: **TEXT** and chunk index separated by dot, one blank and the character string.

Table of contents section (TOCS)

The table of contents section defines LCODE names, their class, type, dimension and provides a brief LCODE description. The first record of the TOCS section defines the number of LCODEs defined in this chunk. Format of the first record: Prefix Keyword Value Unit.

- **Prefix** — **TOCS** and the chunk index separated by dot.
- **Keyword** — **@section_length:**
- **Value** — the number of chapters in the section as an integer number.
- **Unit** — **lcodes**.

Example:

```
TOCS.1 @section_length:     53 lcodes
```

The following records have format: Prefix LCODE Class Type Dim1 Dim2 Description

- **Prefix** — **TOCS** and the chunk index separated by dot.
- **Keyword** — LCODE -- a 8-characters long string with LCODE name. LCODE name should not contain blanks inside.
- **Class** — class of the LCODE. One of
  - **SES** — session class with the scope of entire experiment;
  - **SCA** — scan class with the scope of a given scan;
  - **STA** — station class with the scope of a given station;
  - **BAS** — baseline class with the scope of a given observation.
- **Type** — type of the data. One of
  - **C1** — Character*1 data. Each element is one byte;
  - **I2** — Integer*2, or 16-bit singed number;
  - **I4** — Integer*4, or 32-bit singed number;
  - **I8** — Integer*8, or 64-bit singed number;
  - **R4** — Real*4, or 32-bit real number;
  - **R8** — Real*8, or double precision, or 64-bit real number.
- **Dim1** — the first dimension of the data. 1 for scalar data.
- **Dim2** — the second dimension of the data. 1 for scalar or one-dimensional data.
- **Description** — a brief text that describes the LCODE.

Example:

```
TOCS.1 SITNAMES   SES  C1   8  10  IVS site names
```

In this example LCODE **SITNAMES** is of session type (i.e. with the scope of entire experiment). It has character type and has dimensions 8, 10, 1, 1. The first dimension **8** defines the length of a string. The second dimension **10** defines the number of strings.

There are 5 mandatory keywords that must be defined at the beginning of the first chunk. They all have session class and integer*4 type.

1. **NUMB_OBS** — the total number of observations;
2. **NUMB_STA** — the total number of stations;
3. **NUMB_SCA** — the total number of scans;
4. **NOBS_STA** — a one-dimension array sized as NUMB_STA. Contains the number of observations per stations;
5. **OBS_TAB** — a two dimensional array sized as (3,NUMB_OBS). The first row of the array is the number of scans, the second row is the index of the first station at a baseline for this observation; and the third row is the index of the second station at a baseline for this observation.

Data section (DATA)

One record of the data section keeps one element of the LCODE array.
The first record of DATA section defines the number of Data records present in this chunk. Format of the first record: Prefix Keyword Value Unit.

- **Prefix** — **DATA** and the chunk index separated by dot.
- **Keyword** — **@section_length:**
- **Value** — the number of chapters in the section as an integer number.
- **Unit** — **records**.

Example:

```
DATA.5 @section_length:     650859 records
```

The following records have format: Prefix LCODE Dim3 Dim4 Dim1 Dim2 Value

- **Prefix** — **DATA** and the chunk index separated by dot.
- **Lcode** — LCODE name.
- **Dim3** — the third dimension of the LCODE. The third dimension can be **0** or **1** for data of **SES** class.
- **Dim4** — the fourth dimension of the LCODE. The fourth dimension can be **0** or **1** for data of **STA** or **SES** class.
- **Dim1** — the first dimension of the LCODE.
- **Dim2** — the second dimension of the LCODE.
- **Value** — the value of the array element. Recommended format for float numbers: 1PE15.7 for Real*4 data and for 1PD22.15 Real*8 data. Blanks are not allowed in this field. Blanks should be converted to other symbols, f.e. underscores, before writing.

Example:

```
DATA.1 GR_DELAY 4466 0  1  1 7.267257847095946D-03
DATA.1 GR_DELAY 4466 0  2  1 7.267232471203255D-03
DATA.1 QUALCODE 4488 0  1  1 _8
```

In this example group delay for observation with index 4466 is shown. The group delay was defined as array with dimensions 2,1,4538,1 in the table of contents. The first dimension runs over bands. The first value group delay corresponds to the 1st band and the second to 2nd band. The frequency of bands are determined in another LCODE (REF_FREQ in this case). The VDA itself does not specity the unit of LCODE. Units are supposed to be defined in the LCODE description or in an external document. In the last exanoke original value of lcode "blank eight" was conveerted to "underscore eight" by writing routine. A reading routine is supposed to understand _8 and determine that it is equivalent to "blank eight".

HEAP section (HEAP)

Reserved for future use.

CHUN record

The last record of a data chunk contains the number of records in the chunk, excluding this record. The first line with the VDA formal label is counted. Format of the CHUN record: Prefix Keyword Value Unit:

- **Prefix** — **CHUN** and the chunk index separated by dot.
- **Keyword** — **@chunk_length:**
- **Value** — the number records in the chunk, excluding this record and counting the VDA format label if this is the first chunk.
- **Unit** — **records**.

Example:

```
CHUN.4 @chunk_size: 72856 records
```

Comments on using the VDA format

The VDA format provides sufficient flexibility to carry results of fringe fitting, such as estimates of group delay, delay rate, their formal uncertainties, etc (Level-2A) and results of geodetic preprocessing, such as flags, solution parameterization, correction to weights, etc (Level-2B). VDA is not suitable to carry Level-1 data (raw results of correlation).

Splitting an VDA file into chunks is for facilitating an interface with other formats for Level-2 geodetic VLBI results. A valid VDA file is supposed to have at least one chunk. Splitting data in chunks is determined by the generator process.

Some data are station dependent, for instance cable calibration, some are observation-dependent, for instance group delays. They are stored differently. Array `OBS_TAB` stored at the LCODE with the same name determines relationship between observation index and the indices of station-dependent parameters. For an observation with index **k** station-dependent LCODEs will have indices `OBS_TAB(2,k)` for

the 1st (i.e. reference) station of a baseline and `OBS_TAB(3,k)` for the 2nd (i.e. remote) station of a baseline.

History of LCODE naming is traced in 70s. Renaming LCODEs is discouraged because of a risk of breaking compatibility. Addition of new LCODEs carries a low risk.

Appendix

As an example, LCODEs for the experiment r1775 processed by PIMA are shown below. Only first five LCODEs are mandatory since are used by the handler for processing other LCODEs. LCODEs are grouped into two categories: common that originate from post-correlator analysis software or log-file parsing software that generates a Level-2A dataset and the data analysis specific LCODEs. The LCODEs in the latter category is mainly from geodetic/astrometry data analysis software packages that processes a Level-2A dataset and generates a Level-2B dataset (edited, reweighted, with parameterization stored).

Common LCODES

```
TOCS.1 NUMB_OBS    SES  I4   1   1  Number of observations in the session
TOCS.1 NUMB_SCA    SES  I4   1   1  Number of scans in the session
TOCS.1 NUMB_STA    SES  I4   1   1  Number of sites
TOCS.1 NOBS_STA    SES  I4  10   1  Number of observations per site
TOCS.1 OBS_TAB     SES  I4   3 4538  Observation tables: scan index, indices of the first and the second
TOCS.1 SITNAMES    SES  C1   8  10  IVS site names
TOCS.1 BAND_NAM    SES  C1   2   1  Band names
TOCS.1 CORPLACE    SES  C1  32   1  Correlator place name
TOCS.1 COR_TYPE    SES  C1   8   1  Correlator type: MK3 MK4 K4 S2 VLBA MITAKA-1
TOCS.1 COR_VERS    SES  C1   8   1  Correlator software and/or hardware version
TOCS.1 DEL_RATE    BAS  R8   2   1  Phase delay rates per band (d/l)
TOCS.1 EXP_CODE    SES  C1  32   1  Experiment code
TOCS.1 EXP_DESC    SES  C1  80   1  Experiment description
TOCS.1 EXP_NAME    SES  C1  80   1  Experiment program name
TOCS.1 GDAMBSP     BAS  R8   2   1  Group delay ambiguity spacings per band (sec)
TOCS.1 GRDELERR    BAS  R8   2   1  Group delay errors per band (sec)
TOCS.1 GRRATERR    BAS  R8   2   1  Group delay rate errors per band (d/l)
TOCS.1 GR_DELAY    BAS  R8   2   1  Group delays per band (sec)
TOCS.1 GR_RATE     BAS  R8   2   1  Group delays rate per band (d/l)
TOCS.1 ION_GDEL    BAS  R8   1   1  Ionospheric contribution to group delay at the first band (sec)
TOCS.1 ION_GERR    BAS  R8   1   1  Uncertainty of ionospheric contribution to group delay at the first b
TOCS.1 ION_PRAT    BAS  R8   1   1  Ionospheric contribution to phase delay rate at the first band (sec)
TOCS.1 ION_RERR    BAS  R8   1   1  Uncertainty of ionospheric contribution to phase delay rate at the 1s
TOCS.1 MJD_OBS     SCA  I4   1   1  MJD of fringe reference time at pseudo-UTC timecale for the scan (day
TOCS.1 NUMB_SOU    SES  I4   1   1  Number of observed sources
TOCS.1 NUM_BAND    SES  I4   1   1  Number of frequency bands observed in the experiment
TOCS.1 NUM_CHAN    SES  I4   1   1  Number of frequency channels at all bands
TOCS.1 NUM_CHBN    SES  I4   1   2  Number of frequency channels per band
TOCS.1 N_AVBAND    SES  I4   1   1  Number of frequency bands for which information is availble
TOCS.1 PHDELERR    BAS  R8   2   1  Phase delay error (rad)
TOCS.1 PHRATERR    BAS  R8   2   1  Phase delay rate delay errors per band (d/l)
TOCS.1 PI_NAME     SES  C1  80   1  Name of the principal investigator
TOCS.1 QUALCODE    BAS  C1   2   2  Quality code as char*2 value: 5-9 is good, 0 -- non-detection, letter
TOCS.1 REC_MODE    SES  C1  80   1  Recording mode
TOCS.1 REF_FREQ    BAS  R8   2   1  Reference frequency for phase delay per band (Hz)
TOCS.1 SBDELERR    BAS  R8   2   1  Single-band delay errors per band (sec)
TOCS.1 SB_DELAY    BAS  R8   2   1  Single-band delays per band (sec)
TOCS.1 SCANNAME    SCA  C1  16   1  Scan name
TOCS.1 SCANPIMA    SCA  C1  10   1  Pima internal scan name
TOCS.1 SIT_COOR    SES  R8   3  10  Site coordinates in a crust-fixed terrestrial reference system: X, Y,
TOCS.1 SKYFRQCH    SES  R8  16   1  Sky frequency of channels in Hz
TOCS.1 SNRATIO     BAS  R8   2   1  Fringe amplitude signal to noise ratio (d/l)
TOCS.1 SOU_COOR    SES  R8   2  68  Source coordinates in a baricenteric reference system: right asc. dec
TOCS.1 SOU_IND     SCA  I4   1   1  Source name index
TOCS.1 SRCNAMES    SES  C1   8  68  Source names
TOCS.1 STA_IND     BAS  I4   2   1  Station names indexes
TOCS.1 TOTPHASE    BAS  R8   2   1  Total fringe phases at time of arrival singal at station 1 per band (
TOCS.1 UTC_MTAI    SES  R8   1   1  Difference UTC minus TAI at first time tag of the database (sec)
TOCS.1 UTC_OBS     SCA  R8   1   1  Pseudo-UTC time tag of fringe reference time for the scan (sec)
```

```
TOCS.2 ANT_GAIN   STA  R4   2   1  Antenna gain per band K/Jy
TOCS.2 APRCLOOF   STA  R8   1   1  Apriori clock offset used for correlation
TOCS.2 APRCLORT   STA  R8   1   1  Apriori clock rate used for correlation
TOCS.2 APR_DEL    BAS  R8   2   1  Apriori delay (sec)
TOCS.2 APR_PHAS   BAS  R8   2   1  Apriori fringe phase (rad)
TOCS.2 APR_PHGC   BAS  R8   2   2  Apriori fringe phase per station at the geocenter (rad)
TOCS.2 APR_RATE   BAS  R8   2   1  Apriori delay rate (d/l)
TOCS.2 BITSAMPL   SES  I2   1   1  Number of bits per sample
TOCS.2 CHAN_SDB   SES  I2  16   1  Index of lower (-1) or upper (1) sideband per channel
TOCS.2 CHAN_WDT   SES  R8  16   1  Frequency channel width in Hz per channel
TOCS.2 DELW_CEN   BAS  R8   2   1  Delay window center used for fringe search (sec)
TOCS.2 DELW_WDT   BAS  R8   2   1  Delay window width used for fringe search (sec)
TOCS.2 FRN_AMPL   BAS  R8   2   1  Normalzied fringe amplitude in range [0, 1]
TOCS.2 FRT_OFFS   SCA  R8   2   1  Fringe refrenence time offset relative to the scan start (sec)
TOCS.2 GCRESPHS   BAS  R8   2   1  Residual fringe phase at time of arrival singal at geocenter (rad)
TOCS.2 GC_PHASE   BAS  R8   2   1  Fringe phase at time of arrival singal at the conventionalgeocenter (
TOCS.2 IND_CHN1   BAS  I2  10   1  Indexes of channels used in bandwidth synthesis in band 1
TOCS.2 IND_CHN2   BAS  I2   6   1  Indexes of channels used in bandwidth synthesis in band 2
TOCS.2 NOISERMS   BAS  R4   2   1  RMS of the fringe amplitude noise (d/l)
TOCS.2 NUM_AP1    BAS  I2  10   2  Number of accumulation periods used in band 1 per channel per sideban
TOCS.2 NUM_AP2    BAS  I2   6   2  Number of accumulation periods used in band 2 per channel per sideban
TOCS.2 NUM_SAM1   BAS  R8  10   1  Number of samples used in bandwidth synth. in band 1 per freq. chan a
TOCS.2 NUM_SAM2   BAS  R8   6   2  Number of samples used in bandwidth synth. in band 2 per freq. chan a
TOCS.2 NUSEDCHN   BAS  I2   2   1  Number of channels used in bandwidth synthesis per band
TOCS.2 PCAL_CM1   STA  R4   2  10  Complex phase cal (real/image) per channel at the 1st band
TOCS.2 PCAL_CM2   STA  R4   2   6  Complex phase cal (real/image) per channel at the 2nd band
TOCS.2 PCAL_FR1   STA  R8   1  10  Phase cal frequency per channel at the 1st band
TOCS.2 PCAL_FR2   STA  R8   1   6  Phase cal frequency per channel at the 2nd band
TOCS.2 POLARIZ    BAS  C1   2   2  Polarization label: RR, RL, LR, or LL
TOCS.2 RATE_CEN   BAS  R8   2   1  Rate window center used for fringe search (d/l)
TOCS.2 RATE_WDT   BAS  R8   2   1  Rate window width used for fringe search (d/l)
TOCS.2 RESGRRAT   BAS  R8   2   1  Residual group delay rate (d/l)
TOCS.2 RESMBDEL   BAS  R8   2   1  Residual multiband group delay (sec)
TOCS.2 RESPHAS    BAS  R8   2   1  Residual fringe phase
TOCS.2 RESPHRAT   BAS  R8   2   1  Residual phase delay rate (d/l)
TOCS.2 RESSBDEL   BAS  R8   2   1  Residual singleband group delay (sec)
TOCS.2 RES_GRDL   BAS  R8   2   1  Residual group delay reported by the post-correlator software (sec)
TOCS.2 RES_PHGC   BAS  R8   2   1  Resodual fringe phase per station at the geocenter (rad)
TOCS.2 RES_RATE   BAS  R8   2   1  Apriori phase delay rate reported by the post-correlator software (d/
TOCS.2 SAMPLRAT   SES  R8   1   1  Sample rate in Hz
TOCS.2 SCAN_DUR   BAS  R8   2   1  Scan duration per band (sec)
TOCS.2 SPCH_WDT   SES  R8  16   1  Spectral channel width in Hz per channel
TOCS.2 TSYS1      STA  R4   1  10  System temperature per channel at the 1st band (K)
TOCS.2 TSYS2      STA  R4   1   6  System temperature per channel at the 2nd band (K)
TOCS.2 UVSTAORD   BAS  I2   1   1  Original station order in the baseline: 1 (ascending) or -1 (descendi
TOCS.2 UV_CHN1    BAS  R4   2  10  UV data: real and image part per channel at the 1st band (d/l)
TOCS.2 UV_CHN2    BAS  R4   2   6  UV data: real and image part per channel at the 2nd band (d/l)
TOCS.3 AIR_TEMP   STA  R8   1   1  Air temperature at the station (K)
TOCS.3 ATM_PRES   STA  R8   1   1  Atmospheric pressure at the station (Pa)
TOCS.3 CABL_DEL   STA  R8   1   1  Cable delay (sec)
TOCS.3 CABL_SGN   SES  I2  10   1  Cable sign: +1 or -1
TOCS.3 CAL_INFO   SES  I4   4   1  Information about class and type of available calibrations
TOCS.3 CAL_NAME   SES  C1   8   1  Name of available calibrations
TOCS.3 MEANCABL   SES  R8  10   1  Mean cable delay (sec)
TOCS.3 N_CALIB    SES  I2   1   1  Number of available calibrations
TOCS.3 REL_HUMD   STA  R8   1   1  Relative humidity at the station (0-1)
```

Specific LCODEs

The following LCODES hold information specific for a given data analysis software:

```
TOCS.1 EXPSERNO   SES  I2   1   1  Experiment serial number at correlator
```

```
TOCS.1 MK3_DBNM   SES  C1  10   1  Mark-3 DBH database name
TOCS.1 PIMA_CNT   SES  C1 128   1  Full path name of pima control file
TOCS.1 PIMA_VER   SES  C1  24   1  Version of PIMA software
TOCS.2 PIND_OBS   BAS  I4   1   1  Internal index of observation used by PIMA
TOCS.2 SRT_OFFS   SCA  R8   1   1  Scan refrenence time offset relative to the scan start (sec)
TOCS.4 ATM_CNS    SES  R8  10  32  Reciprocal weights of constraints on atm. path delay rate per station
TOCS.4 ATM_INTR   SES  R8  32   1  Lenght of time span between spline nodes for atm. path delay per solt
TOCS.4 AUTO_SUP   BAS  I4   1   1  Bit field of automatic suppression status for combination of observab
TOCS.4 BAND_2ND   BAS  I2   1   1  Bit field with status of information about the second band observatio
TOCS.4 BAS_USE    SES  I4  45   1  Bit field of baseline selection status
TOCS.4 BSCL_CNS   SES  R8  45  32  Reciprocal weights of constraints on basdep. clock, per baseline, per
TOCS.4 BSCL_EST   SES  I4  45   1  Estimation status for baseline depedent clock, per baseline
TOCS.4 CAL_STS    SES  I4  10   1  Bit field of using available calibrations per station, per calibratio
TOCS.4 CLO_CNS    SES  R8  10  32  Reciprocal weights of constraints on clock rate per station, per solu
TOCS.4 CLO_INTR   SES  R8  32   1  Lenght of time span between spline nodes for clock function per solty
TOCS.4 DATYP      SES  I2   1   1  Type of the observable or a combination of observables used in the so
TOCS.4 DGCL_EST   SES  I2  10  32  Degree of global clock function polynomial per station, per solution
TOCS.4 EDIT_STS   SES  I4   1   1  Bit field of database editing status for different types of solutions
TOCS.4 EFF_FREQ   BAS  R8   3   2  Effective ionospheric frequencies for gr.del, ph.del, ph.rate per ban
TOCS.4 EOP_CNS    SES  R8  11  32  Reciprocal weights of constraints on EOP related parameters
TOCS.4 EOP_EST    SES  I4  11   1  Estimation status for EOP-related parameters
TOCS.4 NUM_CLBR   SES  I4   1   1  Number of clock breaks in the experiment
TOCS.4 NUM_CLRF   SES  I4   1   1  Number of clock reference stations
TOCS.4 N_GRAMB    BAS  I4   2   1  Number of group delay ambiguities to be added to measured group delay
TOCS.4 N_PHAMB    BAS  I4   2   1  Number of phase delay ambiguities to be added to measured phase delay
TOCS.4 RWBASNAM   SES  C1  16  45  Baseline names for additive baseline-dependent reweighting parameters
TOCS.4 RWDELVAL   SES  R8  32  45  Additive baseline-dependent reweighting parameters for delays (sec)
TOCS.4 RWRATVAL   SES  R8  32  45  Additive baseline-dependent reweighting parameters for delay rates (d
TOCS.4 SOCO_CNS   SES  R8  68  32  Reciprocal weights of constraints on source coordinates per object, p
TOCS.4 SOCO_EST   SES  I4   2  68  Estimation status for source coordinats per component, per object
TOCS.4 SOU_USE    SES  I4  68   1  Bit field of source selection status
TOCS.4 STA_CLRF   SES  C1   8   1  Names of clock reference stations
TOCS.4 STA_USE    SES  I4  10   1  Bit field of station selection status
TOCS.4 STPS_CNS   SES  R8  10  32  Reciprocal weights of constraints on site positions per site, per sol
TOCS.4 STPS_EST   SES  I4   3  10  Estimation status for station positions per component, per station
TOCS.4 SUPMET     SES  I2   1   1  Code of the suppression method used in the solution
TOCS.4 TEC_STS    SES  I4  10   1  Flag of availability/usage of the external ionosphere calibration
TOCS.4 TIL_INTR   SES  R8  32   1  Lenght of time span between spline nodes for atmospphere tilt per sol
TOCS.4 TLOF_CNS   SES  R8  10  32  Reciprocal weights of constraints on atm. tilt offset per station, pe
TOCS.4 TLRT_CNS   SES  R8  10  32  Reciprocal weights of constraints on atm. tilt rate per station, per
TOCS.4 USER_REC   BAS  I4   1   1  Bit field of analyst defined recovery status for combination of obser
TOCS.4 USER_SUP   BAS  I4   1   1  Bit field of analyst defined suppression status for combination of ob
TOCS.5 APR_EOP    BAS  R8   3   2  Aprori EOP array as Euler angles and its derivatives (rad)
TOCS.5 AZIMUTH    STA  R8   1   1  Apparent source azimuth at both stations of the baseline (rad)
TOCS.5 DER_DEL    BAS  R8  64   1  Array of partial derivatives of theoretical path delay wrt parameters
TOCS.5 DER_RAT    BAS  R8  64   1  Array of partial derivatives of theoretical delay rate wrt parameters
TOCS.5 ELEV       STA  R8   1   1  Apparent source elevation at both stations of the baseline (rad)
TOCS.5 EOP_TAB    SES  R8  15   3  Table of aprori EOP as Euler angles with frequencies > 2 cpd filtered
TOCS.5 MJD_EOP    SES  I4   1   1  Modified Julian date of the first epoch for the table of apriori EOP
TOCS.5 NUT_DER    BAS  R8   2   1  Partial derivatives wth nutation deaily offset parameters (sec)
TOCS.5 N_APREOP   SES  I4   1   1  Number of nodes with apriori EOP
TOCS.5 STEP_EOP   SES  I4   1   1  Step of the EOP table of apriori EOP (sec)
TOCS.5 TAI_EOP    SES  I4   1   1  TAI time tag of first epoch of the table of apriori EOP (sec)
TOCS.5 THGR_DEL   BAS  R8   1   1  Theoretical group delay (sec)
TOCS.5 THPH_DEL   BAS  R8   1   1  Theoretical phase delay (sec)
TOCS.5 THPH_RAT   BAS  R8   1   1  Theoretical phase delay date (d/l)
TOCS.5 TH_PROG    SES  C1  64   1  Name and version of the program which computed theoretical path delay
TOCS.5 TH_RUDAT   SES  C1  24   1  Date and time of theoretical delay compuation
TOCS.5 UV_COOR    BAS  R8   2   1  UV coordinates of the baseline vector projectioncalibration
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