VSOP science header data format

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1 Introduction

We define the format of archiving the science header data in Ku-band telemetry, which is sent to SCG from Greenbank and JPL SVLBI project office. SCG will use this data for generating the correlator input log of the space radio telescope and for monitoring the spacecraft.

2 Basic format

Data asignments are defined in the document (VSOP-5130). The format of the science header data has 16 data patterns, and each pattern repeats 25 times. Each tracking station compresses 25 identical frames to one data frame, and gets 16 frames (or 16 data patterns) per 2 seconds finally. Skipping or duplicating the data patterns are expected because of the inconsistency between the satellite bus clock and the sampler clock.

The archive file consists of one header record and data records. Header record consists of ASCII characters, and the data records are binary. A single data record of the archive file consists of time tag and the raw image of the science header after 1/25 compression.

3 Data record

The structure of the file is shown in figure 1. Data record consists of 6 byte time tag and 16 "7-byte-headers". Each 7-byte-header has the data form word 5(W5) - W11 in VSOP-5130. Science header changes their data pattern every 125 msec, within 16 different data pattern. We identify the data pattern by data ID in W5. Though a single record has all the data pattern if there is no skipped/duplicated pattern, duplicate/skip of the pattern is allowed. And any data IDs are allowed to be located in the first of 16 data. Data ID No. (or W5) for each data pattern is required for the post-processing software to identify which data format now it read.

3.1 Time tag

Time tag has the format of DDDHHMMSS.mmm, which is 6 byte data. DDD is total days in a year, and is counted from DDD=001 for January 1st. Format of the time tag is shown in figure 1. The time tag comes from the station time when the LAST data of a frame is received. The required accuracy of the time tag is the order of 100 msec, so we will not concern whether the time tag is based on the UTC clock or the satellite clock. But SCG recommends to use UTC clock for the time tag to make all file uniform.

3.2 Missing Data

When the data are missed by the interrupt of the link or other reasons, remaining parts of a frame are filled by 'FF' to generate a complete record with the time tag.

4 Data header

The first record of the file should have information of the contents of the data, which begins with '#' character. This record consists of file ID, the name of the satellite tracked, Tracking station name, year (YYYY), start and end time (DDDHHMMSS), the number of data records. This record is free format, which means that these entries are separated by space character(s) (do not include TAB code). Character code set is ASCII and terminated by <LF>. The sample is as follows:

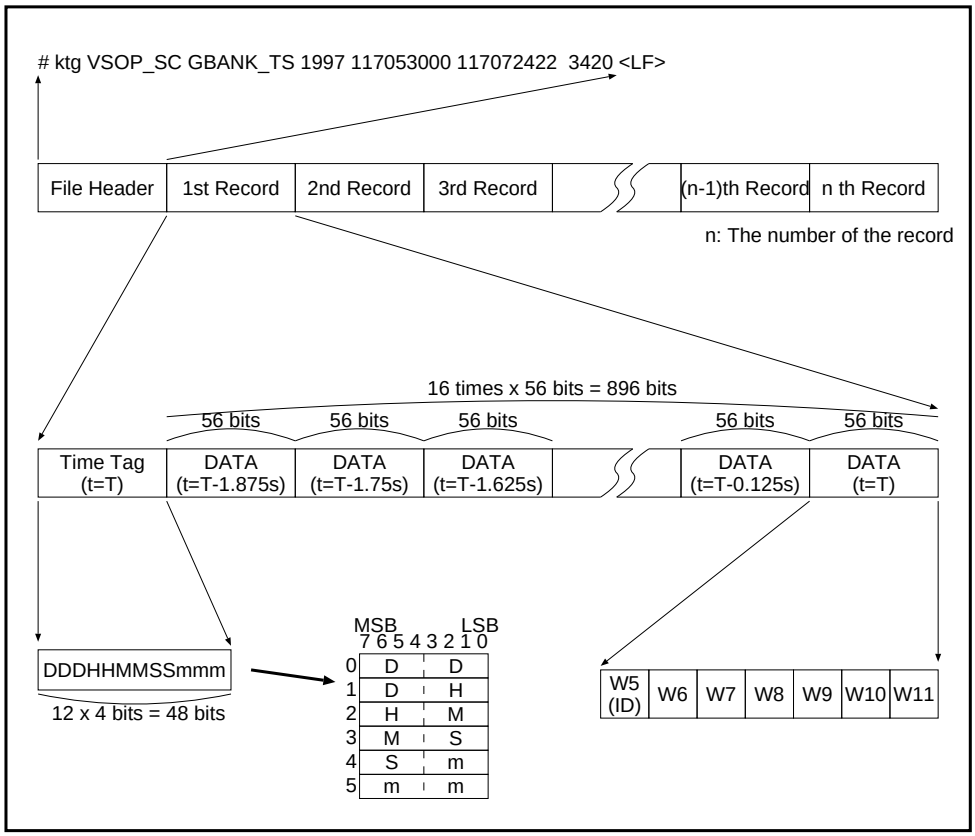

Figure 1: File format of Ku telemetry science header

```
# ktg VSOP_SC GBANK_TS 1997 101223000 102021016 6608

# <file ID> <satellite ID> <tracking station ID> YYYY start-DDDHHMMSS end-DDDHHMMSS <# of records>
```

File ID is used to discriminate many files in ISAS, in this case,

- **"ktg"** means Ku Telemetry header from Green Bank
- **"ktd"** means Ku Telemetry header from Goldstone/DSN
- **"ktt"** means Ku Telemetry header from Tidibinbilla (Canberra)/DSN
- **"ktm"** means Ku Telemetry header from Madrid/DSN
- **"ktu"** means Ku Telemetry header from Usuda

The satellite ID is always '`VSOP_SC`'. The name of the tracking station comes from Space Radio Telescope Schedule (`GBANK_TS, GOLDS_TS, TDBIN_TS, MADRD_TS, USUDA_TS`).

Note 1: Tracking stations do not have to write <end time> and <the number of the records> in the header record, when SCG specially asks tracking stations to serve this file before the end of the tracking pass. These two items should be written when tracking stations serve this file after the tracking pass in the ordinary operation.

Note 2: In case that W9 B0 of the all DATA from Greenbank tracking station is '1', it means that all 56 bit data is old. W9 B0 from DSN is always '0', as being specified in VSOP-5130.