rtim_Format_File_Scintillation

This section describes version 1.3 of this format.
General features of the format:

- ASCII text file.
- All fields are fixed width fields.
- The file contains one or more epochs. Each epoch contains zero or more data records.
- The file may contain other information, in lines that start with the characters '#' or '%'
    - '%' Marks a comment line. The rest of the line may contain anything.
    - '#' Marks an instruction line. The character is followed by a space, then a string (with no whitespaces) identifying the type of information, then another space. The defined types are listed in the table below.
    - From version 1.1 onwards, the first line of the file must be the “# VERSION” instruction line.
    - Instruction and comment lines may be placed before the first epoch line, between a completed epoch section and the next epoch section, or at the end of the file. They may NOT be placed in the middle of an epoch section.

Change log:

Changes from 1.2 to 1.3:

- The definition of the data record line has been significantly changed.

Changes from 1.1 to 1.2:

- The field “Satellite id number” is replaced by two fields;
  “Satellite system id number” and “Satellite id number”
  Defined values for these fields are listed in tables 1 and 2.

- New data fields added for data from a third frequency.

- New data fields added, to specify tracking type.

List of instruction types	
Start of line	**Description**
“# VERSION ”	The line continues with the major version number, a dot, and the minor version number. The C format string for the entire line is: `“# VERSION %3i.%-3i\n”`
“# RECEIVER ”	The line continues with the 4-character id code of the receiver. The C format string for the entire line is: `“# RECEIVER %4s\n”`
“# AGENCY ”	The line continues with the name of the agency that produced the file. The name may contain spaces and tabs, but not a new-line character. The entire contents of the line following “# AGENCY “ , excluding the newline character, is the agency name.
“# YEARDOY “	The line continues with the year and day-of-year of the first data record in the file. The C format string for the entire line is: `“# YEARDOY %04i %03i\n”`

An epoch section starts with the epoch line, which contains:

- Year (4 digits)
- Month (2 digits)
- Day (2 digits)
- Hour (2 digits)
- Minute (2 digits)
- Second (5 character field, minimum 1 digit after the decimal point)
- The number of records for this epoch (3 digits)

There is one space between each number.

The C format string for the epoch line is:

```
"%4i %02i %02i %02i %02i %5.1f %03i\n"
```

Within the epoch, there is a number of single-line records. This number was specified in the epoch line. Each single-line data record contains:

- Satellite system id number (2 character field)
- Satellite id number (2 character field)
- IPP Longitude [degrees] (7 character field, 2 digits after the decimal point)
- IPP Latitude [degrees] (7 character field, 2 digits after the decimal point)
- Elevation [degrees] (7 character field, 2 digits after the decimal point)
- Azimuth [degrees] (7 character field, 2 digits after the decimal point)
- Number of tracking types (2 character field)
- For each Tracking type:
  - Tracking type (2 character field)

    (Two letters, corresponding to the 2nd and 3rd letter of the RINEX v3 observation codes)
  - S4 (7 character field, 3 digits after the decimal point)
  - σ_φ [radians] (7 character field, 3 digits after the decimal point)
  - Spectrum slope (7 character field, 3 digits after the decimal point)

There is one space between each field.

There is one space at the start of the line.

The C format string for the first part of the data record line is:

```
" %2i %2i %7.2f %7.2f %7.2f %7.2f %2i"
```

The C format string for the one tracking type record is:

```
" %2s %7.3f %7.3f %7.3f"
```

For S4 and σ_φ, a value of -1 indicates no value. (a value of 0 is a valid value)

Satellite system id codes	
Satellite System	**Satellite System Id code**
GPS	1
GLONASS	2
Galileo	3

Table 1: Satellite system id codes

Satellite id numbers	
Satellite System	**Satellite Id number range**
GPS	1 - 32
GLONASS	1 - 24
Galileo	1 - 32

Table 2: Satellite id numbers

A small example of the format:

```
# VERSION   1.3
# RECEIVER tro2
# AGENCY Norwegian Mapping Authority
# YEARDOY 2018 108
%
% The S4 index is calculated by computing the normalized standard deviation of the detrended signal power time series,
% and correcting for the ambient noise level.
% The signal power is detrended by filtering the measurement time series Iorig(t) with a 6th order Butterworth low-pass filter,
% and then dividing Iorig(t) by the filter output Ifiltered(t).
%
% The sigma phi index is calculated by detrending raw measurements by a 6th order Butterworth high-pass filter, with a cutoff frequency of 0.3 Hz.
% After detrending, the first and last parts of the time series is truncated to avoid any edge effects.
% Finally, the index is calculated based on one minute of data.
%
2018 04 18 13 24  60.0 025
  1  2   18.40   58.60   32.90  123.50  2 1C   0.000   0.021   0.000 2W  -1.000   0.017   0.000
  1  3    3.50   70.50   20.50  352.70  4 5Q   0.041   0.033   0.000 1C   0.049   0.040   0.000 2W   0.000   0.032   0.000 2L  -1.000   0.048   0.000
  1  6   19.10   62.30   39.50   73.80  4 5Q   0.000   0.017   0.000 1C   0.043   0.020   0.000 2W   0.000   0.016   0.000 2L  -1.000   0.025   0.000
  1 12   13.10   59.90   63.60  133.30  3 1C   0.003   0.025   0.000 2W   0.000   0.019   0.000 2L  -1.000   0.026   0.000
  1 14    2.00   61.10   34.50  284.80  2 1C   0.000   0.025   0.000 2W  -1.000   0.021   0.000
  1 17   50.30   69.70    9.10   52.60  3 1C   0.071   0.049   0.000 2W   0.000   0.048   0.000 2L  -1.000   0.094   0.000
  1 19   27.00   65.60   23.40   58.00  2 1C   0.026   0.042   0.000 2W  -1.000   0.033   0.000
  1 22  345.00   70.90   11.20  331.60  2 1C   0.050   0.078   0.000 2W  -1.000   0.074   0.000
  1 24   15.50   54.00   13.60  164.30  5 1C   0.149   0.116   0.000 2W   0.000   0.096   0.000 1W   0.000  -1.000   0.000 2L  -1.000   0.085   0.000 5Q  -1.000   0.056   0.000
  1 25    7.80   59.80   59.50  241.90  5 1C   0.000   0.021   0.000 2W   0.000   0.017   0.000 1W   0.000  -1.000   0.000 2L  -1.000   0.023   0.000 5Q  -1.000   0.017   0.000
  1 31    0.10   62.70   29.80  301.60  3 1C   0.000   0.026   0.000 2W   0.000   0.020   0.000 2L  -1.000   0.042   0.000
  1 32    1.50   58.50   24.40  254.70  5 1C   0.000   0.027   0.000 2W   0.000   0.025   0.000 1W   0.000  -1.000   0.000 2L  -1.000   0.037   0.000 5Q  -1.000   0.023   0.000
  2  4  350.20   58.10    7.70  271.40  2 1C   0.000   0.122   0.000 2C   0.022   0.099   0.000
  2  5    0.90   64.20   30.30  317.10  2 1C   0.000   0.064   0.000 2C   0.000   0.125   0.000
  2  6   17.40   70.00   23.10   21.00  1 1C   0.000   0.094   0.000
  2 13   12.80   59.30   58.20  151.00  2 1C   0.000   0.036   0.000 2C   0.000   0.041   0.000
  2 14    7.00   61.00   60.20  283.80  2 1C   0.000   0.080   0.000 2C   0.000   0.062   0.000
  2 15  353.90   63.40   18.80  302.20  2 1C   0.031   0.059   0.000 2C   0.000   0.095   0.000
  2 22   15.90   63.30   46.20   50.20  2 1C   0.000   0.048   0.000 2C   0.000   0.041   0.000
  2 23   12.60   58.90   54.30  159.00  2 1C   0.000   0.061   0.000 2C   0.000   0.059   0.000
  2 24   10.10   53.80   13.10  189.90  1 1C   0.000   0.077   0.000
  3  1  357.60   61.30   23.20  287.20  2 1C   0.013   0.030   0.000 5Q   0.000   0.024   0.000
  3  4  357.60   62.90   24.20  301.40  2 1C   0.025   0.031   0.000 5Q   0.000   0.024   0.000
  3  9    5.40   70.60   21.00  356.60  2 1C   0.022   0.034   0.000 5Q   0.000   0.035   0.000
  3 14   50.30   68.30    8.80   57.10  2 1C   0.000   0.040   0.000 5Q   0.028   0.034   0.000
2018 04 18 13 25  60.0 025
  1  2   18.40   58.70   33.20  123.10  2 1C   0.000   0.024   0.000 2W  -1.000   0.019   0.000
  1  3    3.30   70.50   20.40  352.30  4 5Q   0.069   0.026   0.000 1C   0.056   0.037   0.000 2W   0.000   0.029   0.000 2L  -1.000   0.046   0.000
  1  6   19.10   62.40   39.50   73.20  4 5Q   0.000   0.021   0.000 1C   0.042   0.027   0.000 2W   0.000   0.021   0.000 2L  -1.000   0.028   0.000
  1 12   13.10   59.90   63.20  132.80  3 1C   0.010   0.023   0.000 2W   0.000   0.019   0.000 2L  -1.000   0.023   0.000
  1 14    2.00   61.10   34.40  284.30  2 1C   0.000   0.028   0.000 2W  -1.000   0.023   0.000
  1 17   51.40   69.80    8.60   52.60  3 1C   0.137   0.063   0.000 2W   0.000   0.052   0.000 2L  -1.000   0.079   0.000
  1 19   27.30   65.70   23.00   57.90  2 1C   0.056   0.039   0.000 2W  -1.000   0.031   0.000
  1 22  344.50   70.90   10.90  331.30  2 1C   0.000   0.076   0.000 2W  -1.000   0.077   0.000
  1 24   15.60   53.90   13.10  164.30  5 1C   0.102   0.084   0.000 2W   0.000   0.071   0.000 1W   0.000  -1.000   0.000 2L  -1.000   0.089   0.000 5Q  -1.000   0.049   0.000
  1 25    7.90   59.80   59.90  241.40  5 1C   0.004   0.025   0.000 2W   0.000   0.020   0.000 1W   0.000  -1.000   0.000 2L  -1.000   0.025   0.000 5Q  -1.000   0.020   0.000
  1 31    0.20   62.60   30.20  301.40  3 1C   0.000   0.027   0.000 2W   0.000   0.022   0.000 2L  -1.000   0.040   0.000
  1 32    1.40   58.40   24.10  254.40  5 1C   0.000   0.032   0.000 2W   0.000   0.024   0.000 1W   0.000  -1.000   0.000 2L  -1.000   0.036   0.000 5Q  -1.000   0.026   0.000
  2  4  349.90   58.00    7.20  271.20  2 1C   0.046   0.120   0.000 2C   0.019   0.109   0.000
  2  5    0.80   64.20   30.10  316.60  2 1C   0.008   0.081   0.000 2C   0.000   0.121   0.000
  2  6   17.10   69.90   23.40   20.60  1 1C   0.000   0.106   0.000
  2 13   12.80   59.30   57.70  150.80  2 1C   0.000   0.032   0.000 2C   0.000   0.037   0.000
  2 14    7.10   61.00   60.80  283.40  2 1C   0.000   0.081   0.000 2C   0.000   0.068   0.000
  2 15  354.20   63.40   19.30  302.30  2 1C   0.032   0.062   0.000 2C   0.000   0.112   0.000
  2 22   16.00   63.40   45.70   49.90  2 1C   0.000   0.047   0.000 2C   0.000   0.038   0.000
  2 23   12.60   59.00   54.80  158.50  2 1C   0.000   0.066   0.000 2C   0.000   0.064   0.000
  2 24   10.10   53.90   13.70  190.00  1 1C   0.019   0.143   0.000
  3  1  357.80   61.30   23.50  287.20  2 1C   0.025   0.028   0.000 5Q   0.000   0.024   0.000
  3  4  357.50   62.90   24.00  301.10  2 1C   0.040   0.035   0.000 5Q   0.000   0.027   0.000
  3  9    5.30   70.50   21.10  356.30  2 1C   0.018   0.033   0.000 5Q   0.000   0.033   0.000
  3 14   51.40   68.40    8.40   57.00  2 1C   0.000   0.044   0.000 5Q   0.005   0.031   0.000
```