# AMBER/FINITO: RMNREC data description

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## Contents

## 1 General

When the FINITO fringe tracker[2] is used with AMBER[3], real time data are recorded along the raw AMBER frames. These additional data can be used to refine the data reduction of AMBER[5, 4]. They are generated by continuously recording the content of the Reflective Memory Netwrok[1] (RMN) and can be found as binary extension in the AMBER FITS files: **'FNT1', 'FNT2', 'OPDC1' and 'OPDC2'**. FNT extensions refer to the raw FINITO data, whereas the OPDC tables contain data regarding the active control of the optical path delay, as the name suggests: OPDC stands for Optical Path Delay Controller.

### 1.1 In main header

The main header contains a lot of information, and allows in particular to reconstruct the configuration of the VLTI af the time of the observations:

- telescope's stations configuration is retrieved: `HIERARCH ESO ISS CONF STATIONi`, for i in [1,2,3]

- AMBER configuration (its three beams) corresponds to VLTI input channels: `HIERARCH ESO ISS CONF INPUTi` for i in [1,2,3]

- `HIERARCH ESO DEL FT SENSOR` is set to 'FINITO' if FINITO was used, 'NONE' otherwise.

FINITO beams are denoted 0,1,2. The correspondance can be quite confusing bu the following table gives the standard configuration:

| Input channel | AMBER | FINITO |
|---|---|---|
| 1 | 1 | 2 |
| 3 | 2 | 0 |
| 5 | 3 | 1 |

Other FINITO important parameters can be found with keywords starting with `HIERARCH ESO ISS FNT`

## 1.2 Timing issue

Each AMBER frame has a time stamp in MJD (column TIME). RMNREC data use microseconds since the date `HIERARCH ESO PCR ACQ START` in the main header. The two are not synchronized perfectly, because:

- Unlike FINITO, AMBER is not on the reflective memory network (RMN) of the VLTI: it means fine time alignement is required in post processing to aligne FINITO data on the AMBER data.

- AMBER frames are tagged in MJD with a time accuracy of 1e-8 days, or 0.87 milliseconds. This is an ESO standard and cannot be changed easily.

While converting UT times to MJD, It is a good idea to check the UT date to MJD formula using the Header the values of "MJD-OBS" and "DATE-OBS".

## 2  OPDC1, OPDC2:

These two tables are for the channel 1 and 2 of FINITO, which corresponds to the optical combination of FNT0-FNT1 and FNT0-FNT2 respectively, that is AMBER beam2-beam3 and AMBER beam1-beam2.

- `TIME`: in micro seconds since "HIERARCH ESO PCR ACQ START"

- `rtOffset`: real time offset, pure accumulated tracking of FINITO, in meters

- `fringeFlag`: obsolete

- `offValid`: obsolete

- `opdcState`: state machine controller

| state | |
|---|---|
| 0 | idle |
| 1 | fringe search |
| 2 | on hold |
| 3 | group delay jump |
| 4 | group delay tracking |
| 5 | on hold |
| 6 | phase jump |
| 7 | phase tracking |

- `uwrapPhase`: unwrapped phase. **This is actually in radians, not meters: files before April 2013 were wrongly labeled**.

- `fullOffset`: offset between the zero OPD prediction and actual position, including instrument offset, refraction and so on. This is in meters.

During the states 2 and 5, no fringe tracking commands are sent as the controller waits for the signal-to-noise ratio to rise above a given level (known as the "close" level). In states 3 and 6, the controller decided that the offset between the target and current position is too large and needs to be corrected via a jump.

## 3 FNT1, FNT2

As for the OPDC tables, these two tables are for the channel 1 and 2 of FINITO, which corresponds to the optical combination of FNT0-FNT1 and FNT0-FNT2 respectively, that is AMBER beam2-beam3 and AMBER beam1-beam2.

- `TIME`: in micro seconds since "HIERARCH ESO PCR ACQ START"

- `Coher`: group delay, **in radians, not meters: files before April 2013 were wrongly labeled**

- `CoherFlag`: Obsolete

- Phase: fringes' phase as measured by FINITO, **in radians, not meters: files before April 2013 were wrongly labeled**

- `PhaseFlag`: Obsolete

- `SNR`: Signal-to-noise ratio of the fringes.

- `MOD`: modulation **in radians, not meters: files before April 2013 were wrongly labeled**

- `FNTX1` (resp. `2` for FNT2), `FNTX0`: photometric channels for 1 (2) and 0 (raw data, in ADU)

- `FNTX1A` (resp. `2` for FNT2), `FNTX1B` (resp. `2` for FNT2): interferometric channels (raw data, ADU)

## References

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