New DORIS DGXX Data and associated Products

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The last DORIS equipment will be used on :

Jason-2

AltiKa

Cryosat-2

This equipment includes :

- Full internal cold redundancy of USO, MVR, and with Antenna automatic switch
- Each MVR allows 7 (UT) measurement channels in parallel

The 2GXX receiver performs more accurate and more complete phase, delta-phase and pseudo-range measurements

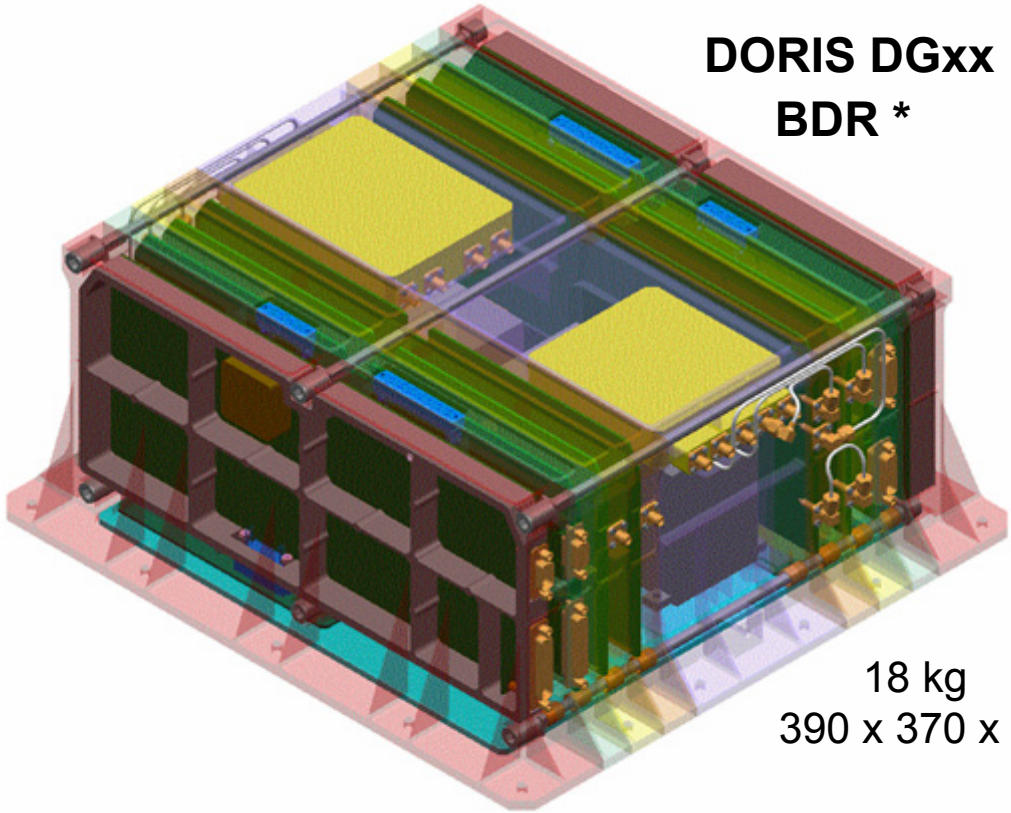
DORIS DGxx dual frequency Instrument

401.25MHz / 2036.25MHz

DORIS antenna

2 kg
h 420 x ϕ160 (mm)

DORIS DGxx BDR *

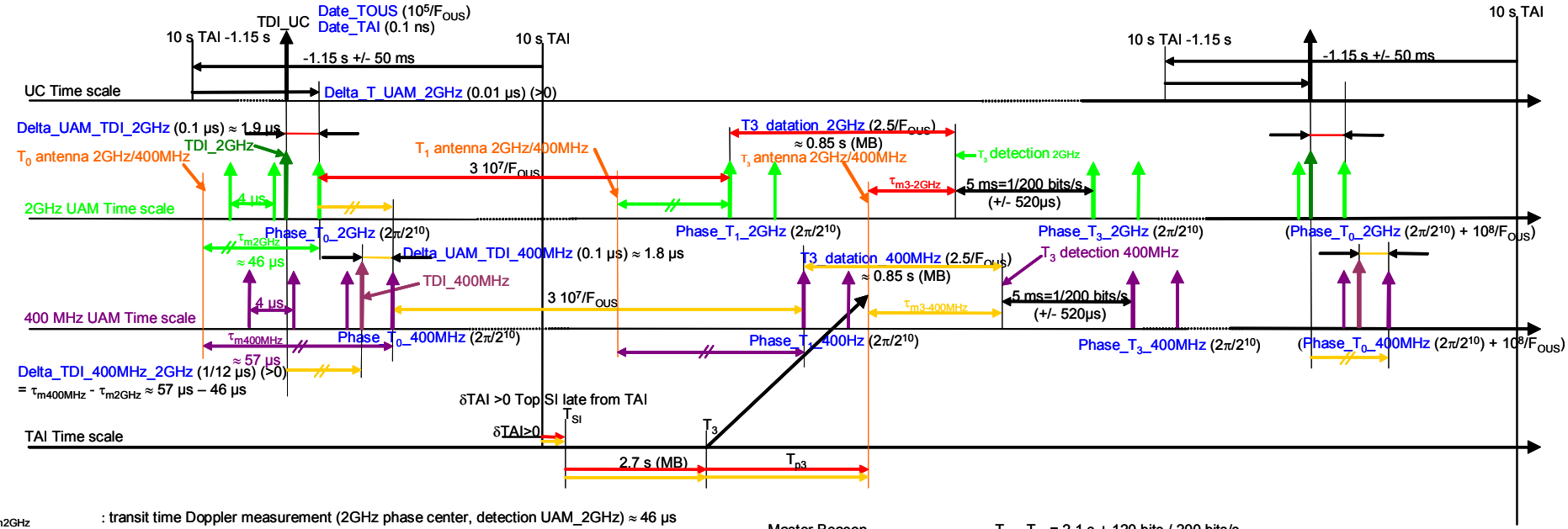


18 kg
390 x 370 x 165 (mm)

* Boîtier DORIS Redondé

The DORIS Data measurements

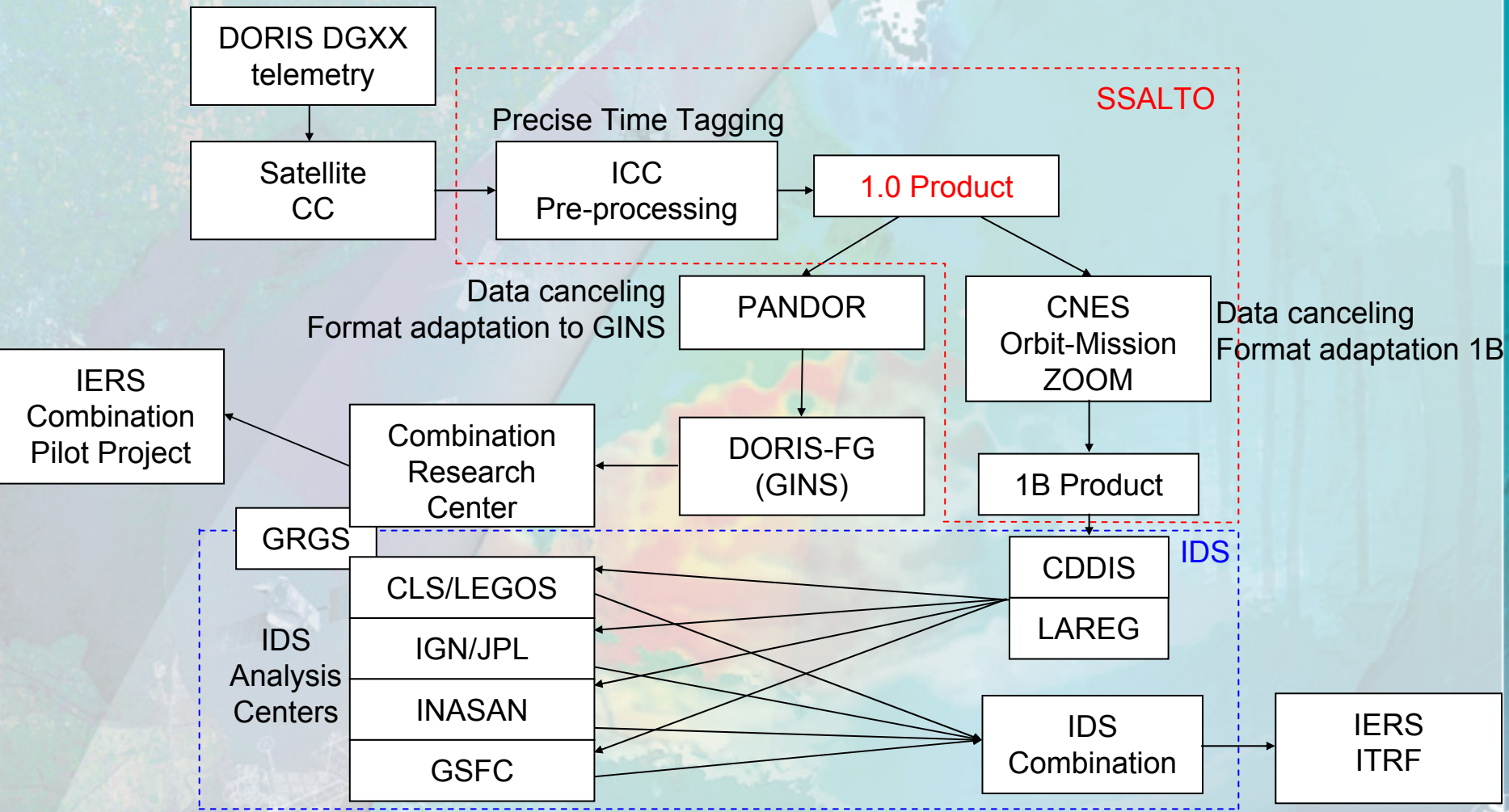
PARAMETER_NAME in TM DGXX
TDI Time Tagging path, on 400 MHz channel
TDI Time tagging path, on 2 GHz channel



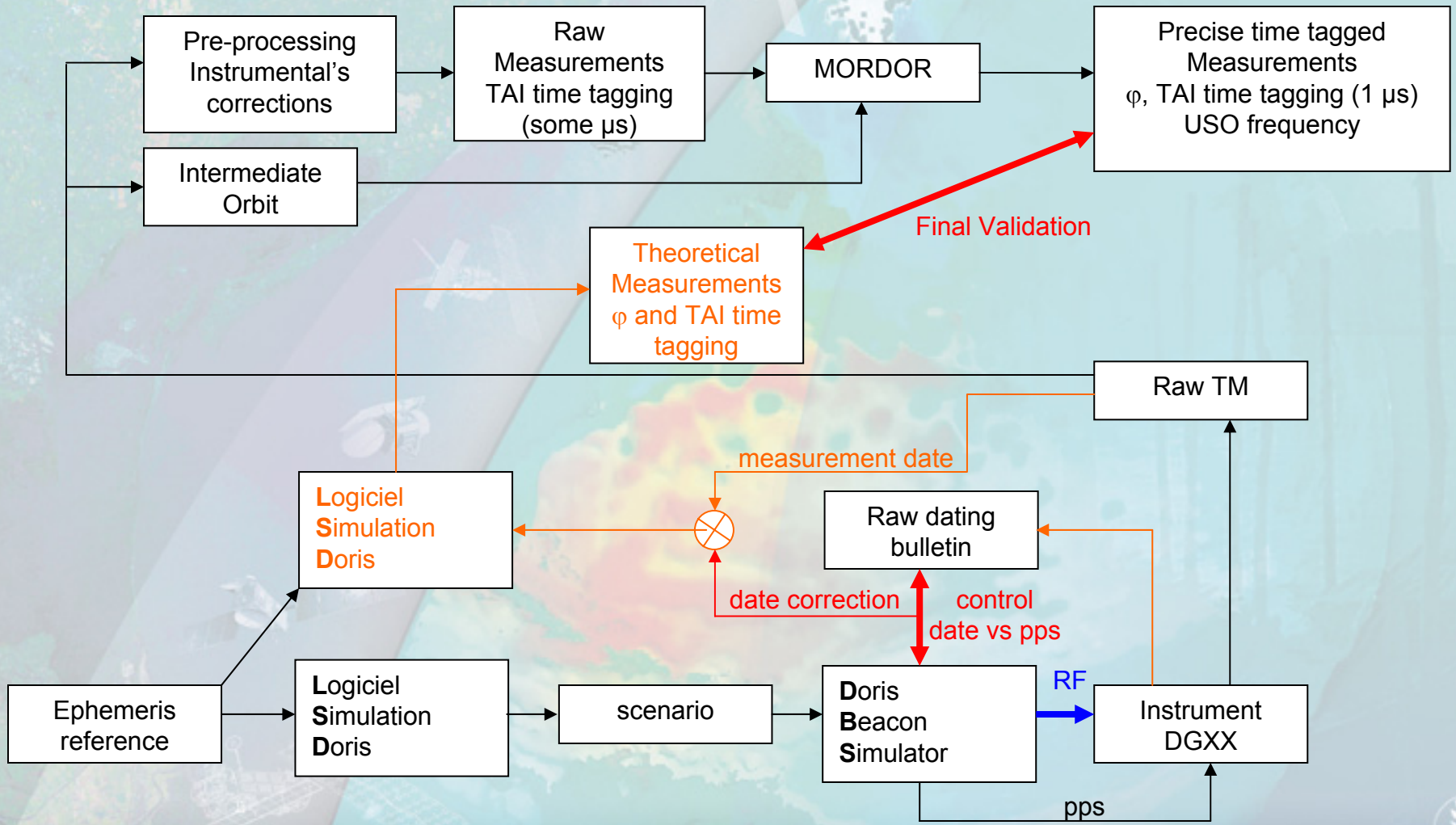
τ_{m2GHz} : transit time Doppler measurement (2GHz phase center, detection UAM_2GHz) ≈ 46 µs
$\tau_{m400MHz}$: transit time Doppler measurement (400MHz phase center, detection UAM_400MHz) ≈ 57 µs
$\tau_{m3\text{-}2GHz}$: transit timeT_3 (2GHz phase center, detection UAM_2GHz) ≈ 324 µs
$\tau_{m3\text{-}400MHz}$: transit time T_3 (400MHz phase center, detection UAM_400MHz) ≈ 864 µs
4 µs transfer time for 40 bits phase measurement (Acos, Asin)
Delta_F = $(F_{OUS}\text{-}10^7)/10^7$ (10^{-14})
Delta_Phase_2GHz = φ_0 à (T_0 2GHz + $10^8/F_{OUS}$) - φ_0 à (T_0 2GHz) ($2\pi/2^{10}$) chained mode
Delta_Phase_2GHz = φ_0 à (T_0 2GHz + $10^8/F_{OUS}$) - φ_1 à (T_0 2GHz + $3.10^7/F_{OUS}$) ($2\pi/2^{10}$) not chained mode
Delta_Phase_400MHz = φ_0 à (T_0 400MHz + $10^8/F_{OUS}$) - φ_0 à (T_0 400MHz) ($2\pi/2^{10}$) chained mode
Delta_Phase_400MHz = φ_0 à (T_0 400MHz + $10^8/F_{OUS}$) - φ_1 à (T_0 400MGHz + $3.10^7/F_{OUS}$) ($2\pi/2^{10}$) not chained mode
δTAI : time bias provided by CNES laboratoire Temps/Fréquence
D = Distance (Sat(T_{SI}+T_3+T_{p3}+δTAI), Sta(T_{SI}+T_3+δTAI))
T_{p3} = (D + Δtropo)/c ; after ionospheric correction

Master Beacon	$T_3 - T_{SI}$ = 2.1 s + 120 bits / 200 bits/s
Beacon 3rd generation	$T_3 - T_{SI}$ = 4.7 s + 120 bits / 200 bits/s
Beacon 1st, 2nd generation	$T_3 - T_{SI}$ = 4.9 s + 80 bits / 200 bits/s

The DORIS Data exchange



The DORIS Data pre-processing validation



The DORIS 1.0 product Data format

satellite			
	satellite identifying	JASON_2	* 7 characters
Measurement Type			
	measurement identifying	DORIS_DOP	* 9 characters
Time scale			
	scale identifying	TAI	* 3 characters
Station			
	station identifying		
	mnemonic	TLHA	* 4 characters
	station code	1234	

φ0 phase measurement & Pseudo-Range T0

Date TAI		
Julian day	12345	* 00000 if not chained
Seconds in the day	12345	* s, 00000 if not chained
Part of second	1234567	* 1/10th µs, 0000000 if not chained
Date TOUS		
Julian day	12345	* 00000 if not chained
Seconds in the day	12345	* s, 00000 if not chained
Part of second	1234567	* 1/10th µs, 0000000 if not chained
Phase measurement 2GHz		
Phase	+/-12345678	* 2π radians signed, +00000000 if not chained
Part of phase	12345	* 10^{-5} * 2π radian, 00000 if not chained
Phase measurement 400MHz		
Phase	+/-12345678	* 2π radians signed, +00000000 if not chained
Part of phase	12345	* 10^{-5} * 2π radian, 00000 if not chained
Pseudo range measurement		
Pseudo-range	+/-12345678	* m, +00000000 if not chained
Part of pseudo-range	123456	* µm, 000000 if not chained

The DORIS 1.0 product Data format

φ1 phase measurement & Pseudo-Range T1

Date TAI		
Julian day	12345	*
Seconds in the day	12345	* s
Part of second	1234567	* 1/10th µs
Date TOUS		
Julian day	12345	*
Seconds in the day	12345	* s
Part of second	1234567	* 1/10th µs
Phase measurement 2GHz		
Phase	+/-12345678	* 2π radians signed
Part of phase	12345	* 10^{-5} * 2π radian
Phase measurement 400MHz		
Phase	+/-12345678	* 2π radians signed
Part of phase	12345	* 10^{-5} * 2π radian
Pseudo range measurement		
Pseudo-range	+/-12345678	* m
Part of pseudo-range	123456	* µm

φ3 phase measurement & Pseudo-Range T3

Date TAI		
Julian day	12345	*
Seconds in the day	12345	* s
Part of second	1234567	* 1/10th µs
Date TOUS		
Julian day	12345	*
Seconds in the day	12345	* s
Part of second	1234567	* 1/10th µs
Phase measurement 2GHz		
Phase	+/-12345678	* 2π radians signed
Part of phase	12345	* 10^{-5} * 2π radian
Phase measurement 400MHz		
Phase	+/-12345678	* 2π radians signed
Part of phase	12345	* 10^{-5} * 2π radian
Pseudo range measurement		
Pseudo-range	+/-12345678	* m
Part of pseudo-range	123456	* µm

The DORIS 1.0 product Data format

delta phase tagging to T_0 + 10^8/Fous			
Date TAI			
	Julian day	12345	
	Seconds in the day	12345	* s
	Part of second	1234567	* 1/10th µs
Date TOUS			
	Julian day	12345	*
	Seconds in the day	12345	* s
	Part of second	1234567	* 1/10th µs
delta phase 2GHz			
	Phase	+/-1234567	* 2π radians signed
	Part of phase	12345	* 10^{-5} * 2π radian
delta phase 400MHz			
	Phase	+/-1234567	* 2π radians signed
	Part of phase	12345	* 10^{-5} * 2π radian
Corrections			
	Tropospheric	+/-123456	* 10^{-6} m/s signed from a model
	Ionospheric	+/-123456	* 10^{-6} m/s signed

The DORIS 1.0 product Data format

IT3		
Date TAI		
Julian day	12345	
Seconds in the day	12345	* s
Part of second	1234567	* 1/10th µs
Date TOUS		
Julian day	12345	
Seconds in the day	12345	* s
Part of second	1234567	* 1/10th µs
IT3 measurement 2GHz		
Seconds	1	
Part of second	1234567	* 1/10th µs
IT3 measurement 400MHz		
Seconds	1	
Part of second	1234567	* 1/10th µs
Power level received		
Power on 2GHz	-123456	* m dBm
Power on 400MHz	-123456	* m dBm
On-Board frequency over the sequence		
Delta-Frequency	+/-1234567890 * 10^{-14} (Fous - 10^7)/ 10^7 signed	
Measurement Channels		
channel identifier	ONONONON	* UT 1 to 8, O for a measure performed on this UT, N otherwise
Measurement Flags		
Central frequency measurement 2GHz	O/N	
Central frequency measurement 400MHz	O/N	

The DORIS 1.0 product Data format

Beacon Information		
Link to TAI for Time Beacon only		
Time Bias	+/-1234567890 * ns signed, +0000000000 if NA	
Delta-Frequency	+/-1234567890 * 10^{-14} (F_{bea} - 5 10^6)/ 5 10^6 signed, +0000000000 if NA	
Frequency shift		
K Factor	+/-12	* signed
Meteorological parameters		
Temperature	+/-123	* 1/10e °C signed
Pressure	1234	* mb
Humidity	123	* %
Meteorological Indicator	NNN	* Model temperature, Model pressure et Model humidity : O or N
Beacon Type		
TYP	1	* 0 - 1st generation, 2 - 2nd generation and 1 - 3rd generation
Beacon Status		
ReStart	O/N	* O if RS=1 3rd generation beacon in ReStart mode, N otherwise
DOUS	1	* Warm up USO duration, for 3rd generation beacon ; 0 (<4h), 1 (<24h), 2 (<72h), 3 (<240h), 4 (<720h), 5 (<1440h), 6 (<2046h) , 7 (>2046h), 9 for other beacon generation
External oscillator H	O/N	* external frequency reference, cesium oscillator
Synchronization to TAI, SY	O/N	* synchronized to external 1Hz pulse

The DORIS 1.0 product Data format

REMARKS :

The data are organized sequentially by growing measurement date and by 1st UT number.

The measurement are time tagged at the phase center of the antenna.

The Date TOUS takes into account the date of the last RAZ,

The phase measurements are non ambiguous (no modulo) over a path.

All instrumental's corrections will be applied to the Raw Telemetry Data

The file format is to be defined :

- by line as 1B product, one line per measurement
- by several lines per measurement
- by HTML descriptor
- …

CONCLUSION

This file will be produced once a day.

All the data provided in this file will have a time tagging accuracy close to1 µs.

This file contains all the data needed to compute your own time tagging.

All the data of this file are as close as possible of the Raw Data.

All instrumental's corrections will be applied to the Raw Data, and described at the beginning of the file.

All measurements will be time tagged at the phase center of the antenna, in order to be instrumental independent.

No measurement doublet in the file.

Is there an interest for IDS Analysis Centers to access to this kind of data ?