

Transceiver Test Tool

WINNCOMM EUROPE 10-10-2016
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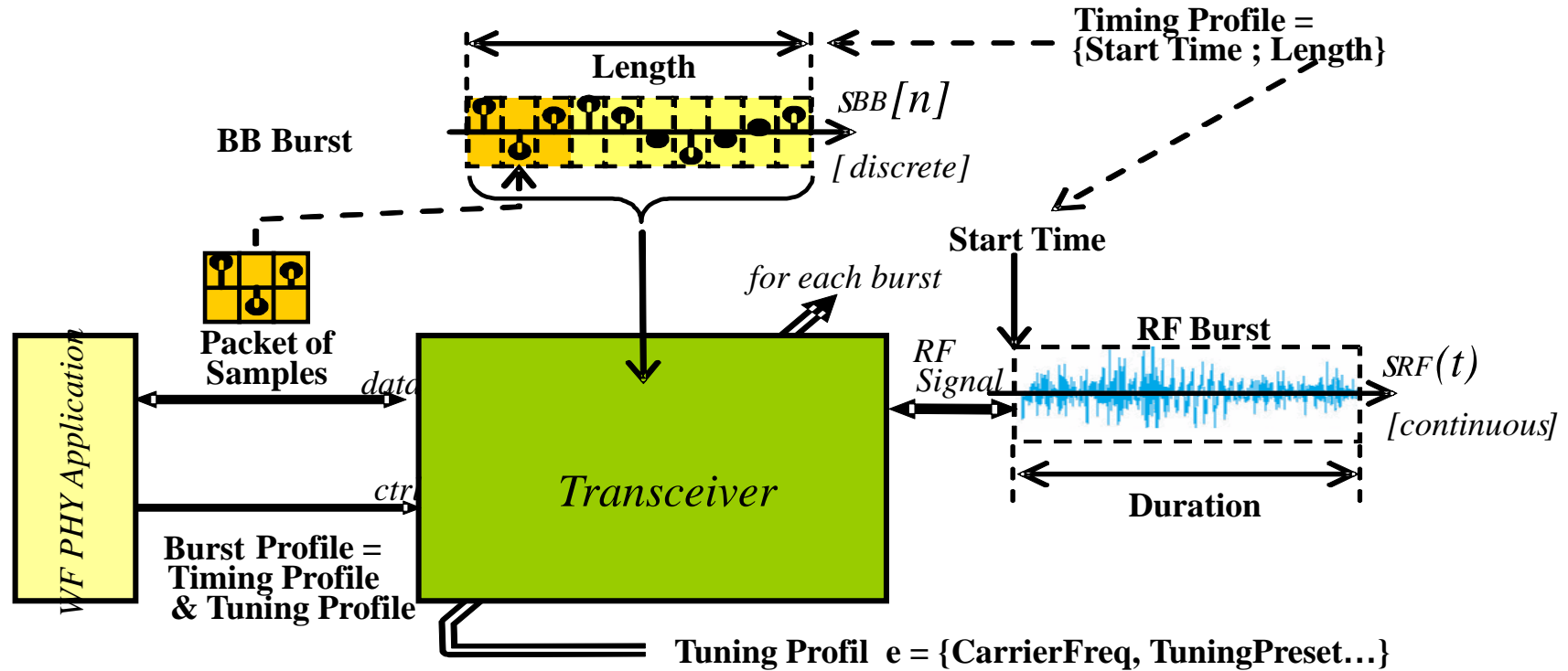
Concepts

- What Transceiver API changed in the system
- Vérification
- WF/PF Integration

Example

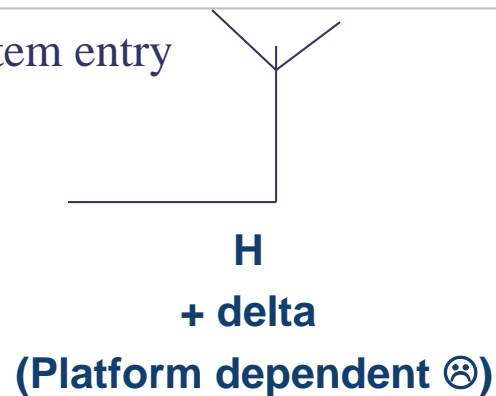
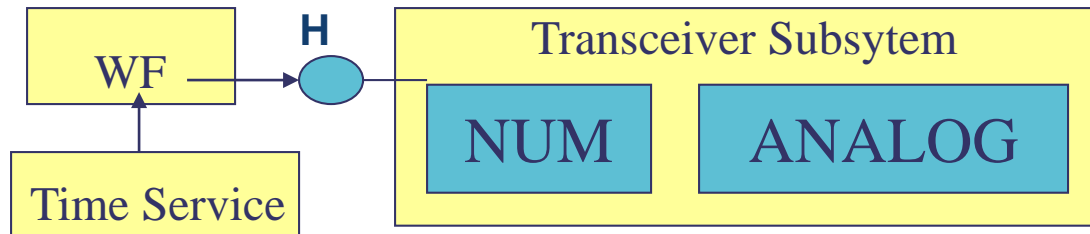
- TimingProfile
- SpectrumMask

Concept > Transceiver functionalities

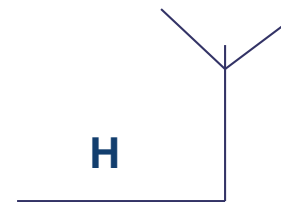
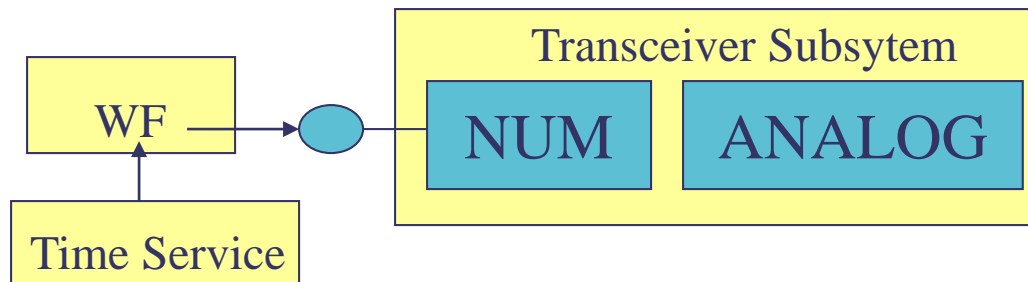


Concept > What Transceiver API changed in the Timing Control

BEFORE : WF Controls Start Time at Transceiver Subsystem entry



XCVR API : WF Controls Start Time at the antenna



Concept > Verification Approach

- In the scope of OE verification
- Transceiver Subsystem
 - Encompass all RF chain from API to Antenna
 - Cannot be tested without configuration, in accordance to a WF profile
- Portability can be assessed after the following Verifications :
 - Software Interfaces
 - Behaviour requirement
 - Performance Criteria
 - Tuning: RF performances
 - Timing: dwell control accuracy
 - Real time performances

**Transceiver Test Tool verify the 3 verification aspect
With 50 Test cases**

Concept > Verification Approach

ESSOR ARCHITECTURE
Performance criteria

ID	Performance Criteria	Category
• XCVR_1	WF mode support	SOAF
• XCVR_2	Tx2Rx Reactivation Time	TP
• XCVR_3	Rx2Tx Reactivation Time	TP
• XCVR_4	Tx Tuning Duration	TP
• XCVR_5	Upconversion Latency	TP
• XCVR_6	Tx Reactivation Time	TP
• XCVR_7	Tx Start Acceptance Time	TP
• XCVR_8	Tx Stop Acceptance Time	TP
• XCVR_9	Packet Storage Duration	TP
• XCVR_10	Tx Time Profile Accuracy	TP
• XCVR_11	Tx Ramp Rise Duration	TP
• XCVR_12	Tx Ramp Early Rise Duration	TP
• XCVR_13	Tx Ramp Late Fall Duration	TP
• XCVR_14	Tx RF Power Accuracy	PQIP
• XCVR_15	Tx Carrier Frequency Accuracy	PQIP
• XCVR_16	Tx Strobe support	SOAF
• XCVR_17	TxBasebandFIFOSize	SC
• XCVR_18	Rx Tuning Duration	TP
• XCVR_19	Downconversion Latency	TP
• XCVR_20	Rx Reactivation Time	TP
• XCVR_21	Rx Start Acceptance Time	TP
• XCVR_22	Rx Stop Acceptance Time	TP
• XCVR_23	Rx Packet Preparation Time	TP
• XCVR_24	Rx Time Profile Accuracy	TP
• XCVR_25	Rx Gain range	SC
• XCVR_26	Rx AGC AttackTime range	SC
• XCVR_27	Rx AGC ReleaseTime range	SC
• XCVR_28	Rx agc HoldTime range	SC
• XCVR_29	Rx Gain Lock Time	TP
• XCVR_30	Estimate Preparation Time	TP
• XCVR_31	Np range	SC
• XCVR_32	Rx Gain Accuracy	PQIP
• XCVR_33	Rx Carrier Frequency Accuracy	PQIP
• XCVR_34	Rx Strobe support	SOAF
• XCVR_35	RxBasebandFIFOSize	SC

SC Support of Configuration
PQIP Precision/Quality of Information and Processing
TP Time Performance
SOAF Support of Optional or Alternative Features

Concept > Test strategies

Validation « with WF specification, »

- Platform is développée / knowing target WF profiles
- Platform is validated with those profiles
- Platform is ready to use for WF porting

Validation « without WF »

- Configuration profiles are not defined during platform development
- Platform is validated with a subset of representative profiles
- Complementary validation is needed before WF porting

Transceiver Test Tool is useful in both test strategy cases

Concept > WF/PF Integration

WF developer will not configure/re-test the transceiver

```
e>host>.: scenario
? Enter Scenario : upp.sci
////////////////////////////////////

// STD_ESSOR_PTF_OE_XD_002 : Create Tx Burst with Absolute Time
////////////////////////////////////
host>e>*IDN?
Sleep for 500.0 ms
e>host>[ 18:493973997] THALES, OEPHY CONTACT, 1, v0
host>e>: BURST: TX: DATASIZE 1000
Sleep for 500.0 ms
e>host>
host>e>: TIME: WF: PUSH
Sleep for 500.0 ms
e>host>[ 0: 14505] : TIME: pushWFTimeData OK
host>e>: BURST: TX: SINGLE 1000000 1 0
Sleep for 500.0 ms
host>e>: BURST: TX: LOOP 1000000
End of Scenario
e>host>[ 0: 999359900] XCVR API:: CreateTxBurst start=[20:493985097],
Preset= 1, Length= 4000 samples,

e>host> 20:799030433] Burst Created at 20,699613880 [ERR_UORTX 0]
e>host> 21: 3031566] Burst Created at 20,903965897 [ERR_UORTX 0]
e>host> 21:207032700] Burst Created at 21,107966880 [ERR_UORTX 0]
e>host> 21:411033833] Burst Created at 21,311968980 [ERR_UORTX 0]
e>host> 21:615034983] Burst Created at 21,515970063 [ERR_UORTX 0]
e>host> 21:819036100] Burst Created at 21,719970825 [ERR_UORTX 0]
```

Transceiver test Tool is provided to WF so they can directly activate the transceiver when they receive the platform prior to any WF/PF integration

Concept > Transceiver Test Tool breakdown

PC Windows Segment

- Gui and/or Command Shell
- Embedded segment control => MHAL protocol
- measuring tools control => IEEE SCPI protocol
- Automatic test report

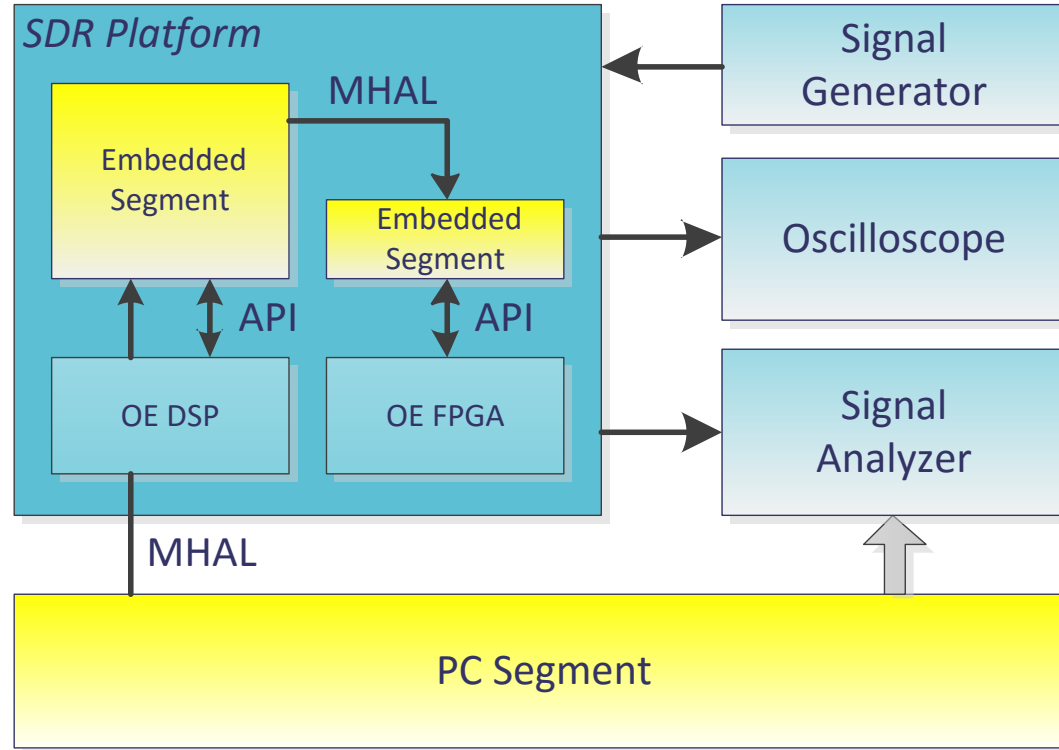
Embedded Segments (DSP et FPGA)

- uses API locally (inside the component in which API is implemented)
- Provide Additional capabilities to speed up the verification process:
 - FFT inside DSP to decrease bandwidth usage between DSP and PC
 - Logic analyzer inside FPGA

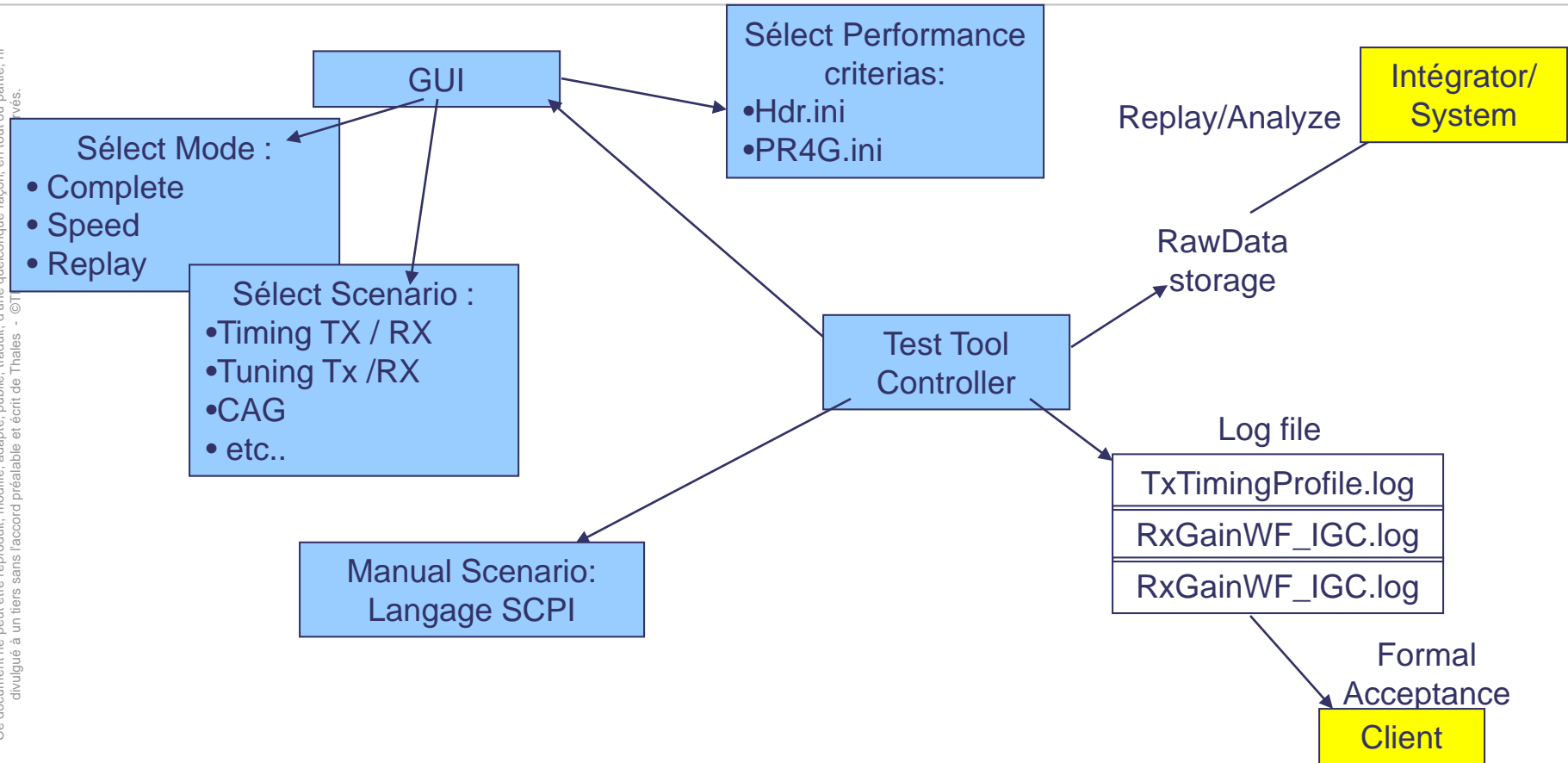
Mesuring Tools

- Rx tests: signal generator
- Tx Tests : oscilloscope, for timing, spectrum Analyzer for tuning

Concept > Transceiver Software breakdown



Concept > PC segment > Test Tool Controller



Concept > Transceiver Test Tool > Properties

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ESSOR Platform Test Tool

Fichier Edition Affichage TestCase Run Profiles Outils Fenêtre ?

MdiChildWindow

Properties

System Transceiver Oscillo Test

Property	Value
:FREQ	300000000
:FREQ:MIN	226000000
:FREQ:MAX	400000000
:FREQ:STEP	1250000
:LEV	-40

Fréquency Used during the Test

Level Used during Test

Fréquency Min Modified durant le Test

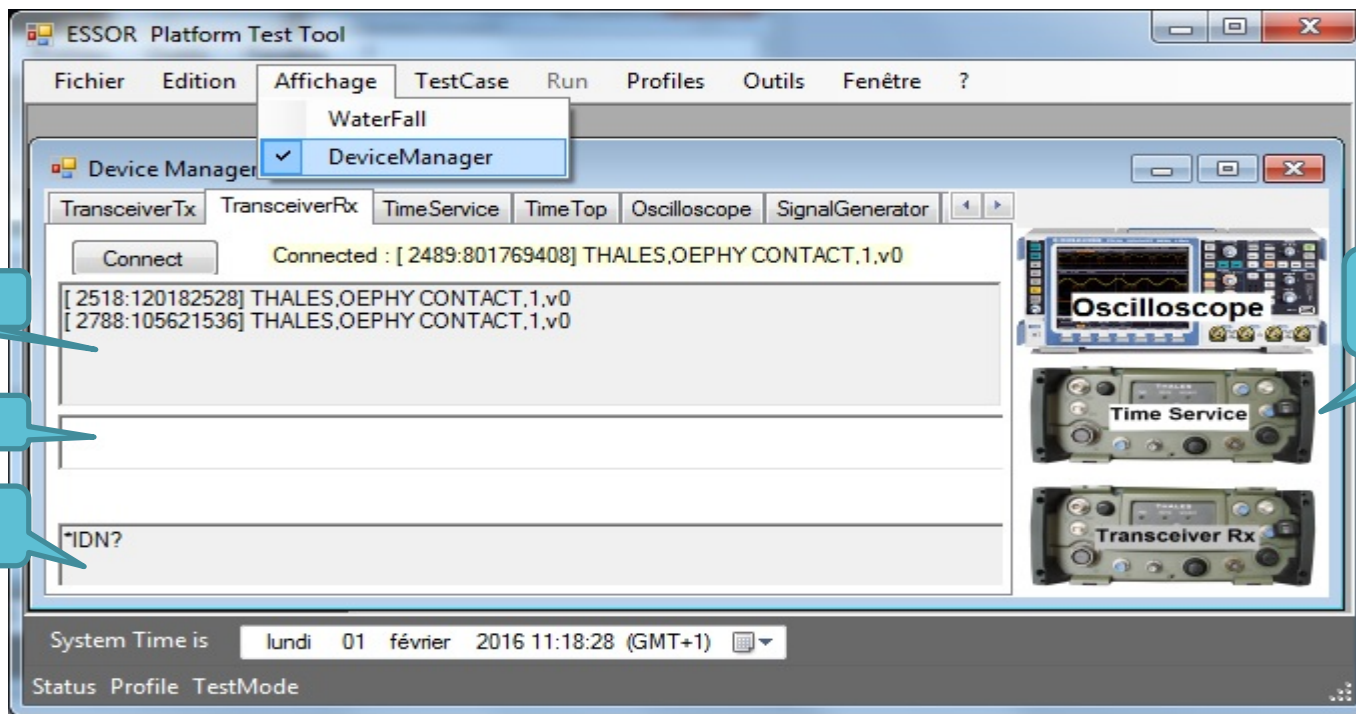
Test RxTimingProfile progress 40,7%

System lundi 18 janvier 2016 18:48:22 (GMT+1)

Executing RxTimingProfile 40,7%

Transceiver Rx

Concept > Transceiver Test Tool > Device Manager



Output

Input

Input History

Connected Devices

Transceiver Test Tool is not dependant of Devices

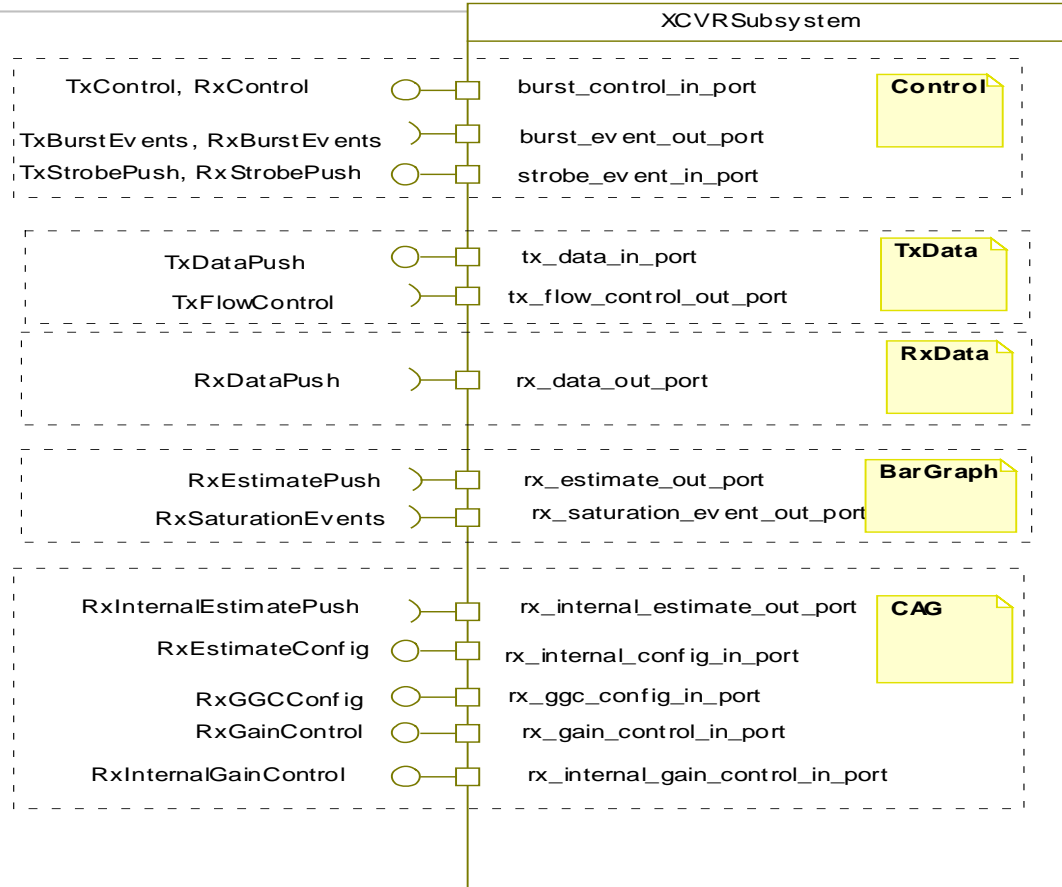
Example > TxTimingProfile



Example > Tx TimeProfile > API involved

DSP

FPGA



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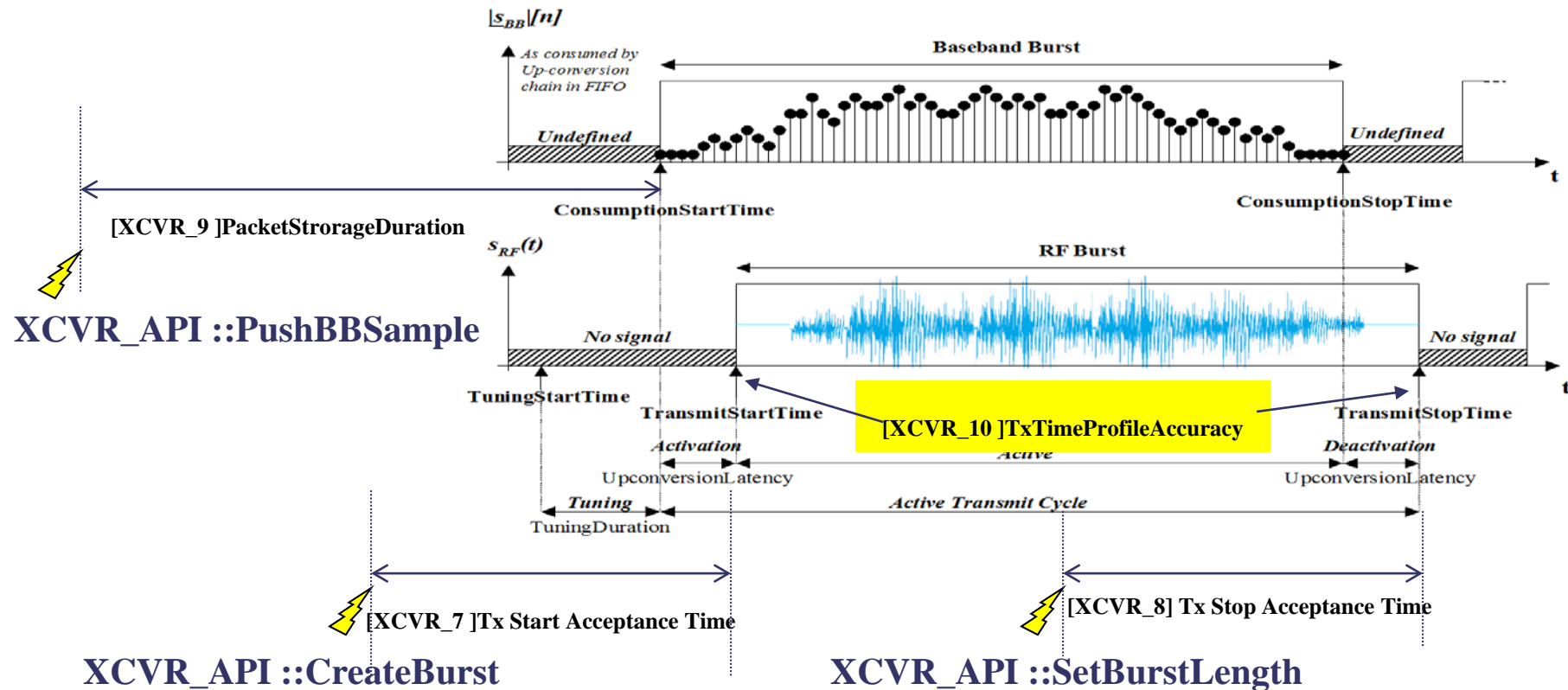


■ *Depends on*

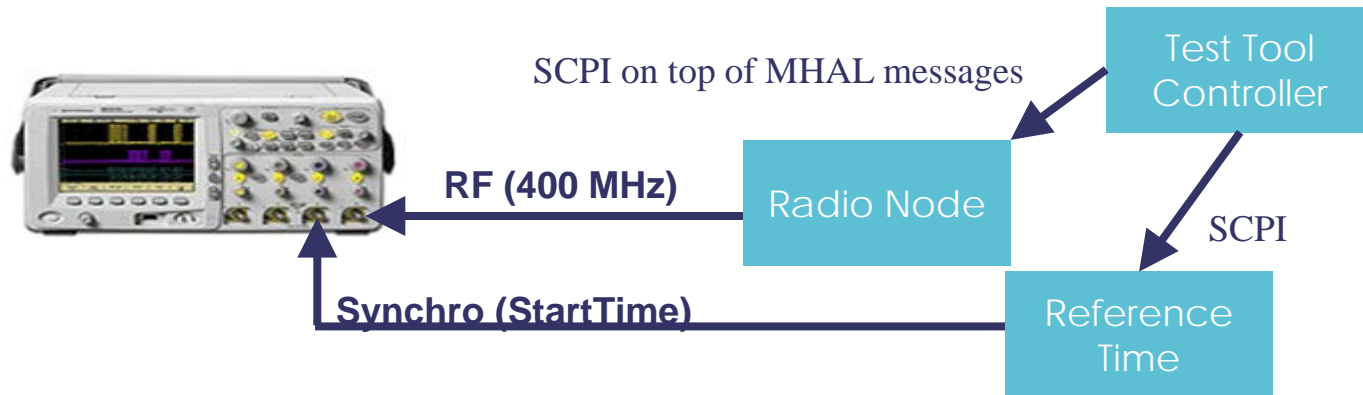
- Sample Chain activation Time
- propagation delay in Sample chain
- Sample Frequency

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TxTimeProfileAccuracy criteria

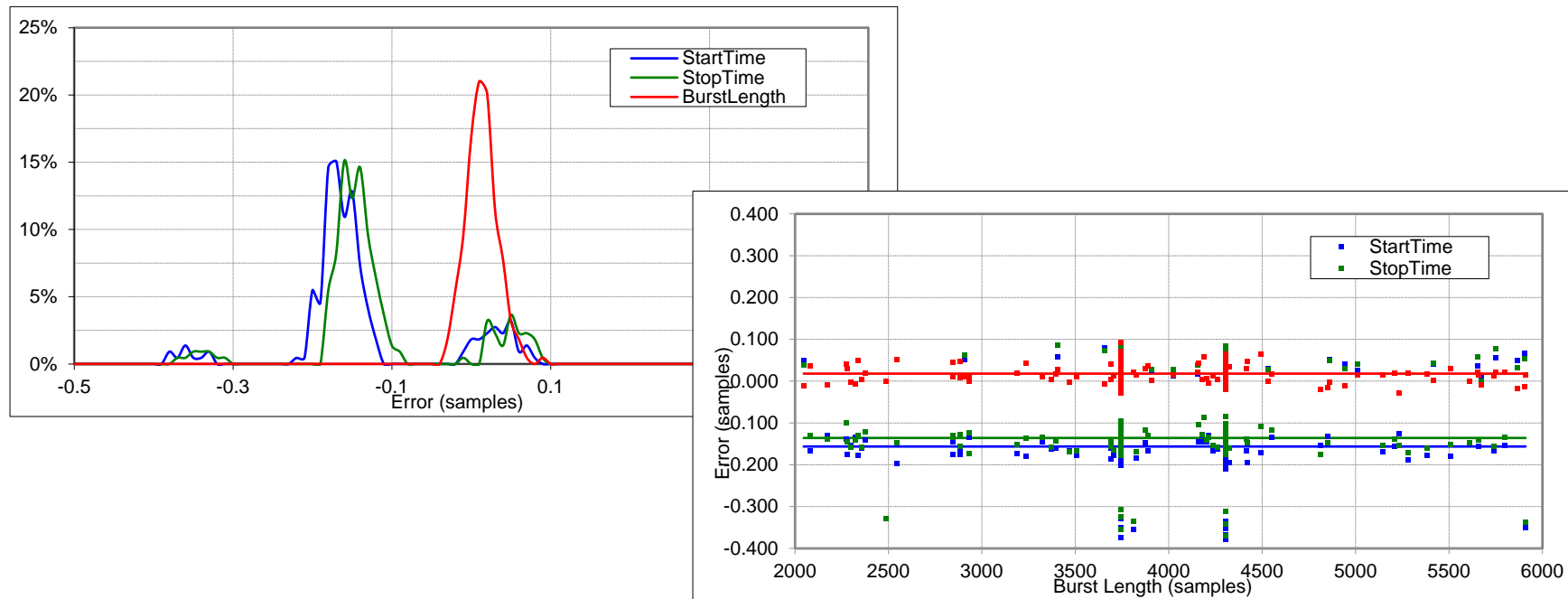


Example > Tx TimeProfile > test Bed



- Radio Node generate dedicated signal at Start Time
- Dedicated marker are inserted in the signal generated by Radio Node
- Oscilloscope record signal from Radio Node
- triggered by Time Reference

Demo Example > Tx TimeProfile > Results



Temporal Jitter in Tx Channel « Absolute Mode »

Example > TxSpectrumMask



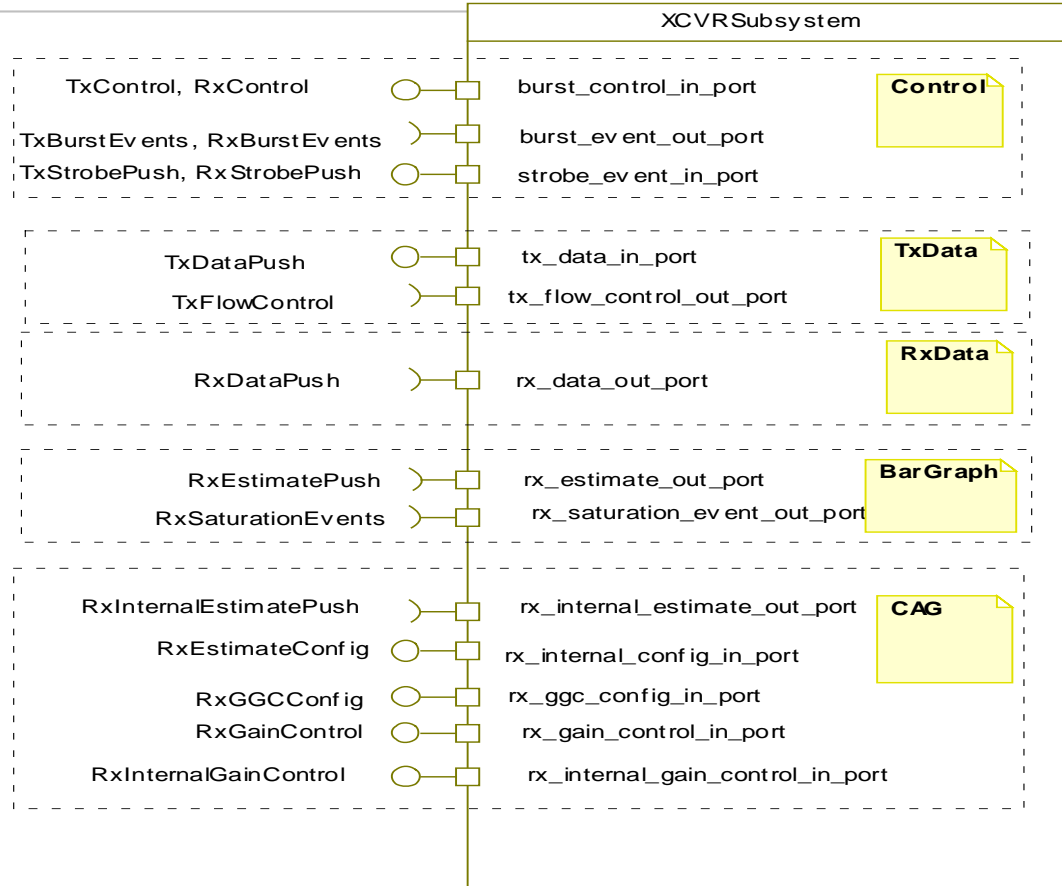
Example > Tx Spectrum Mask > API involved

DSP

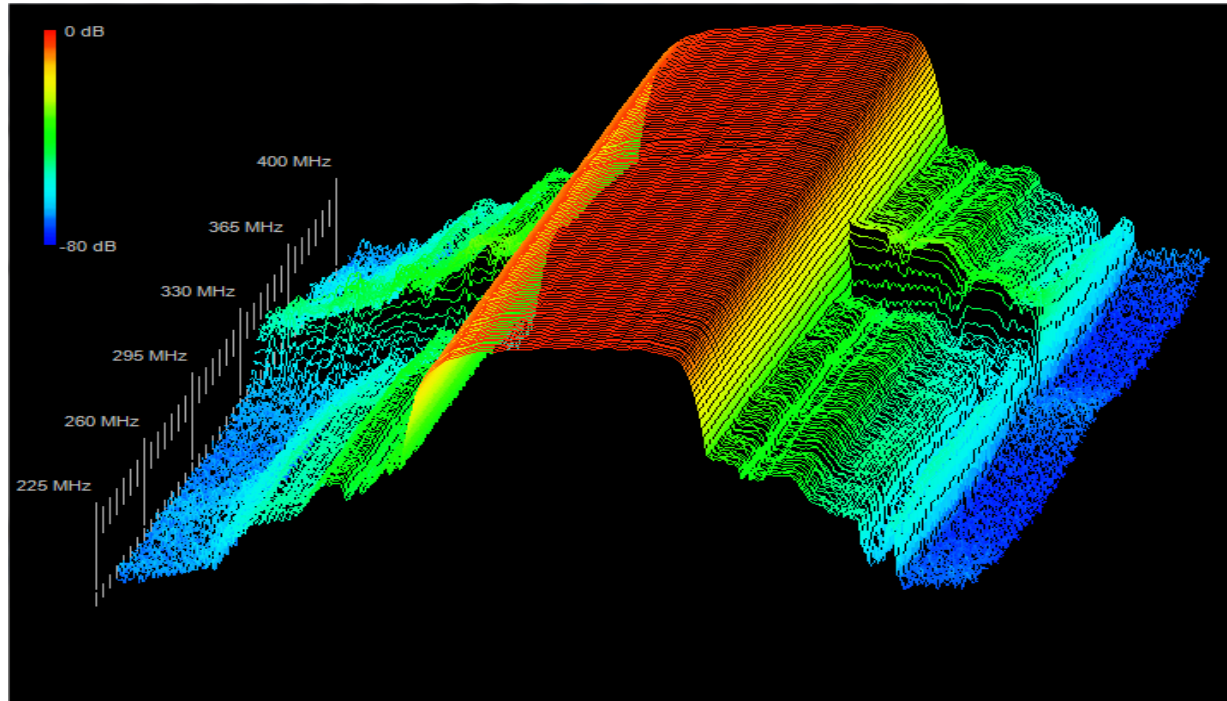
FPGA

Critere de performance XCVR_38

Ripple = +/- x dB @1 Mhz



Example > Tx Spectrum Mask > Test Results



« SpectrumMask » of all Tx Channels

THANKS FOR YOUR ATTENTION

SDR paradigm splits system into platform and waveform

Transceiver **T**est **T**ools

Transceiver Test Tools makes Platform and Waveform developpers communicate()*

() as far as Transceiver is concerned*