



FGC Integration in OASIS & Trigger Synchronization

MSWG, 26 November 2013

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Outline

- FGC Integration in OASIS
- Correlation of FGC Datasources and Analog Signals
- Trigger Synchronization in OASIS
- Summary

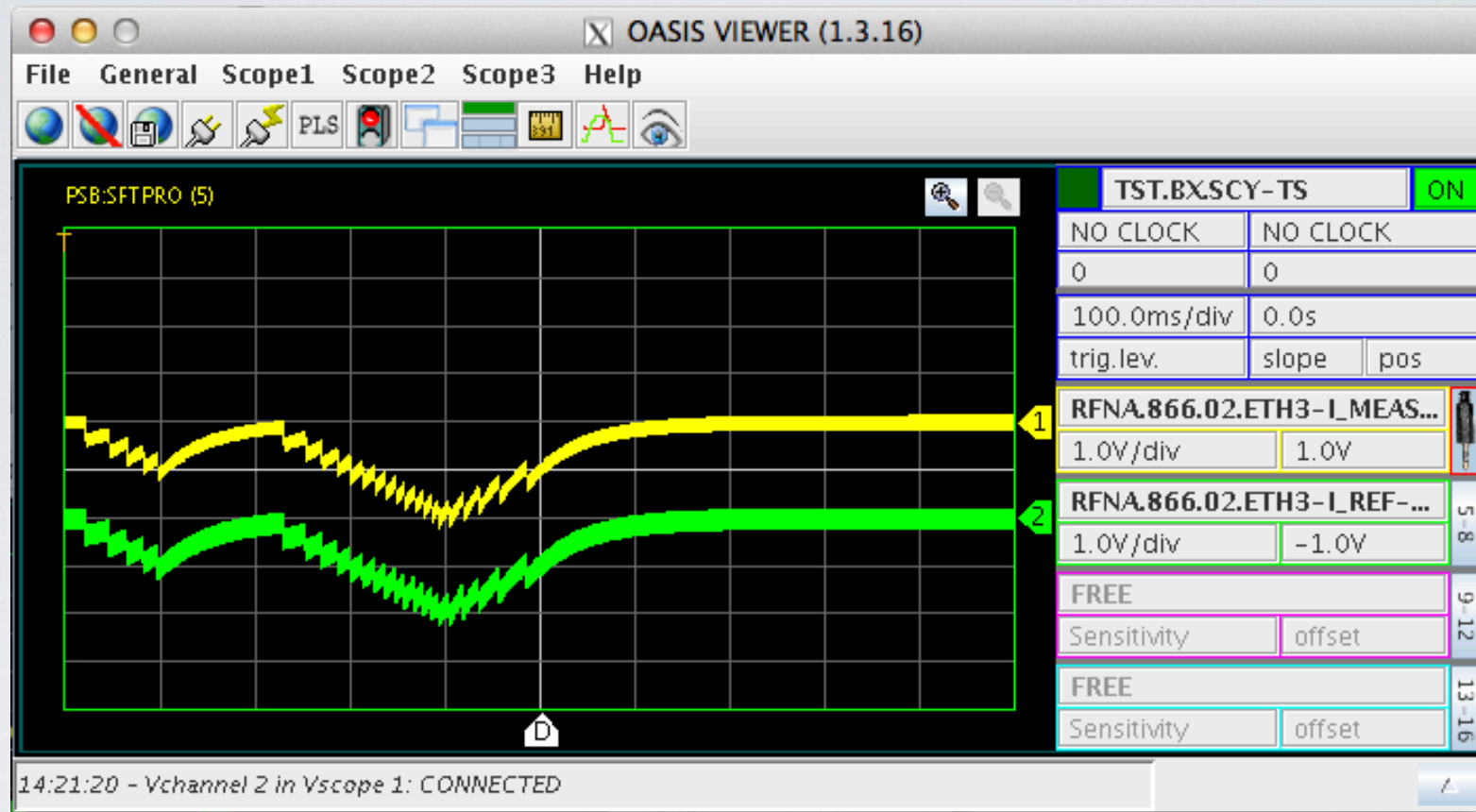


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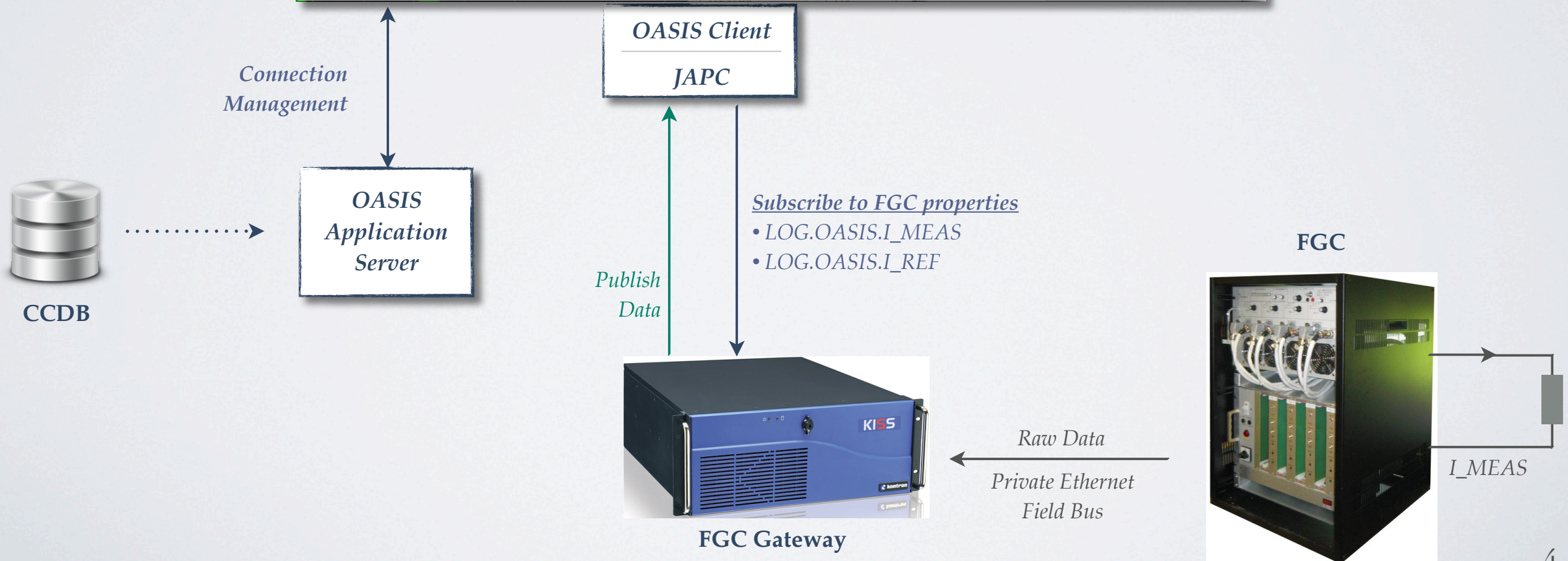
Monitoring of FGC Signals



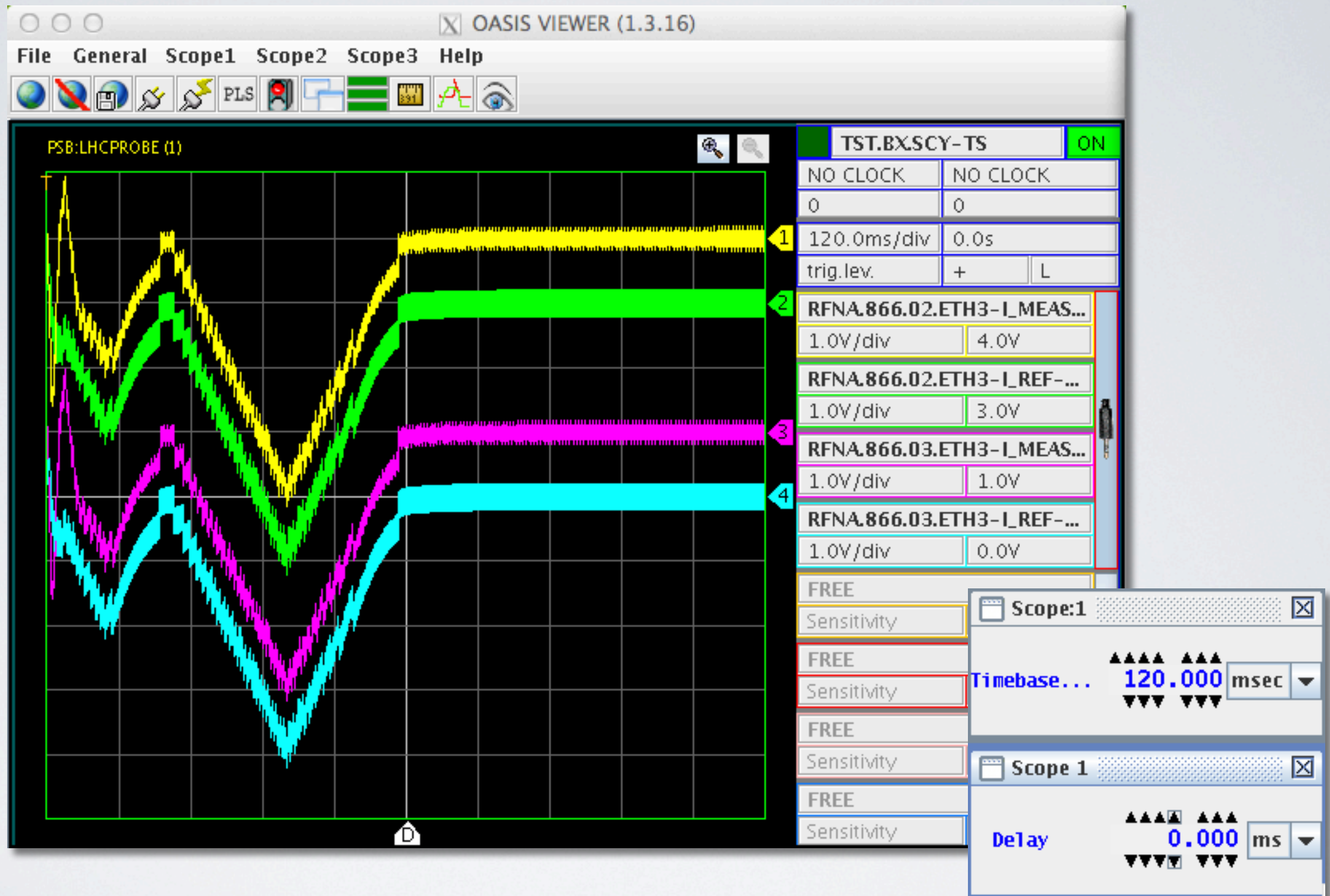
Trigger: BX.SCY-TS

Measured function

Reference function



Visualization of Full Cycle





PLS Selection

OASIS Select PLS line

PLS strings

PSB:LHCPROBE	<input checked="" type="radio"/> Vscope 1	-> 2	-> 3	Options
PSB:ALL	<input type="radio"/> Vscope 2	-> 1	-> 3	Options
ALL:ALL	<input type="radio"/> Vscope 3	-> 1	-> 2	Options

Machine

PSB

User

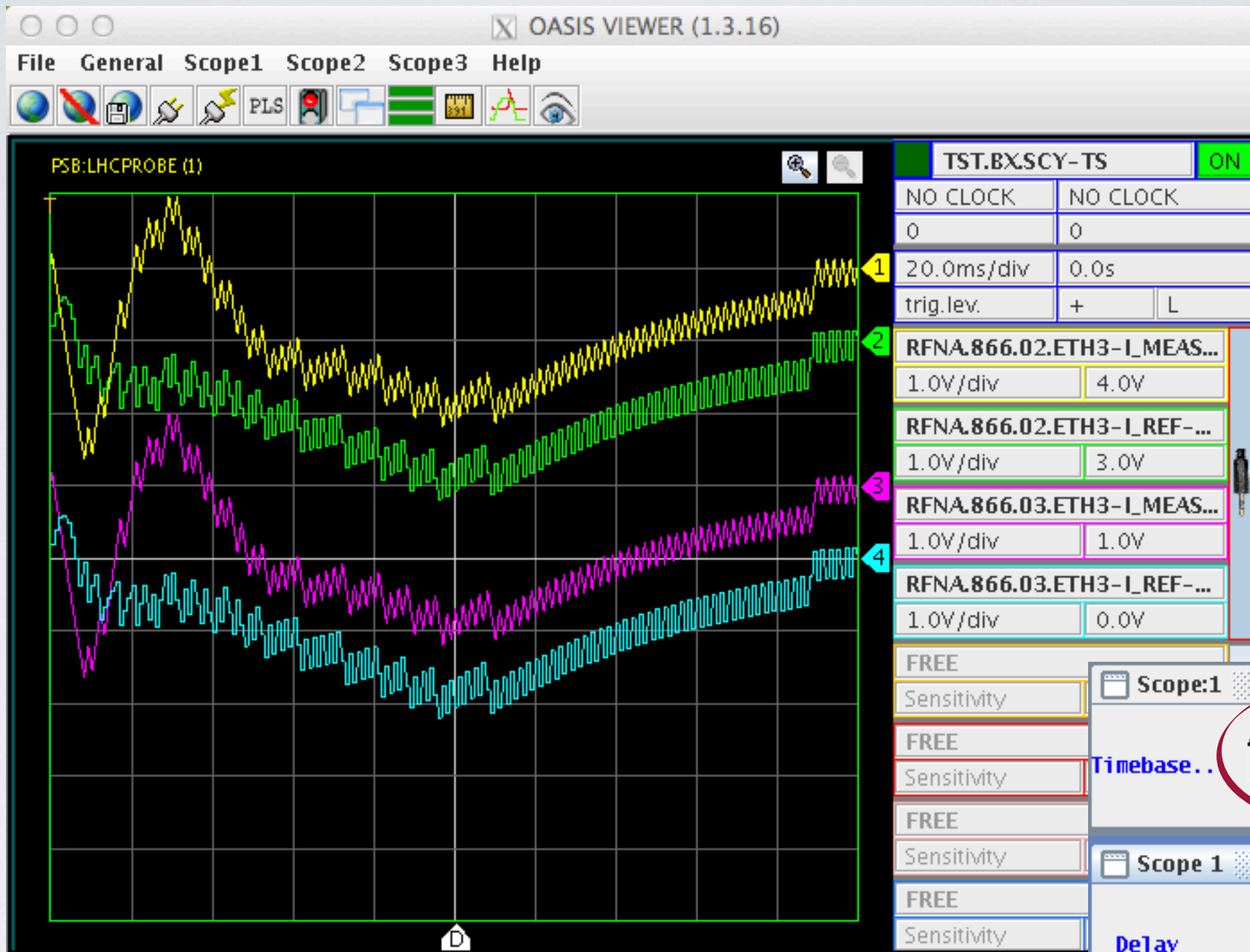
AD (NonResident(PSB:AD))
ALL (NonResident(PSB:ALL))
CNGS (NonResident(PSB:CNGS))
EASTA (NonResident(PSB:EASTA))
EASTB (NonResident(PSB:EASTB))
EASTC (NonResident(PSB:EASTC))
LHCINDIV (NonResident(PSB:LHCINDIV))
LHCPROBE (NonResident(PSB:LHCPROBE))
LHC_A (NonResident(PSB:LHC_A))
LHC_B (NonResident(PSB:LHC_B))
LHC_MD_A (NonResident(PSB:LHC_MD_A))

Select all Deselect all

Ok Cancel



TimeBase & Delay Control (1)

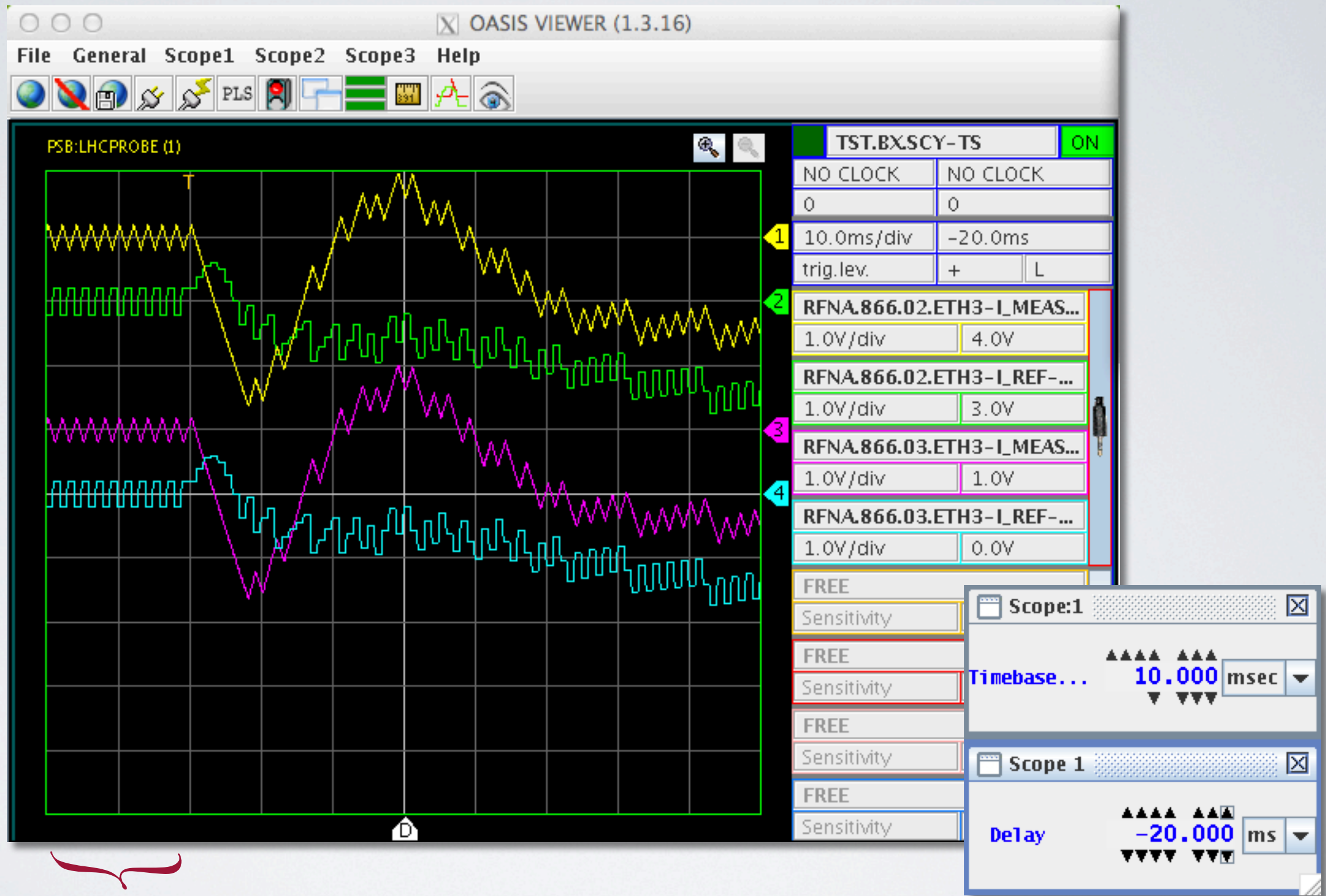


Continuous TimeBase

Scope:1
Timebase... 20.000 msec

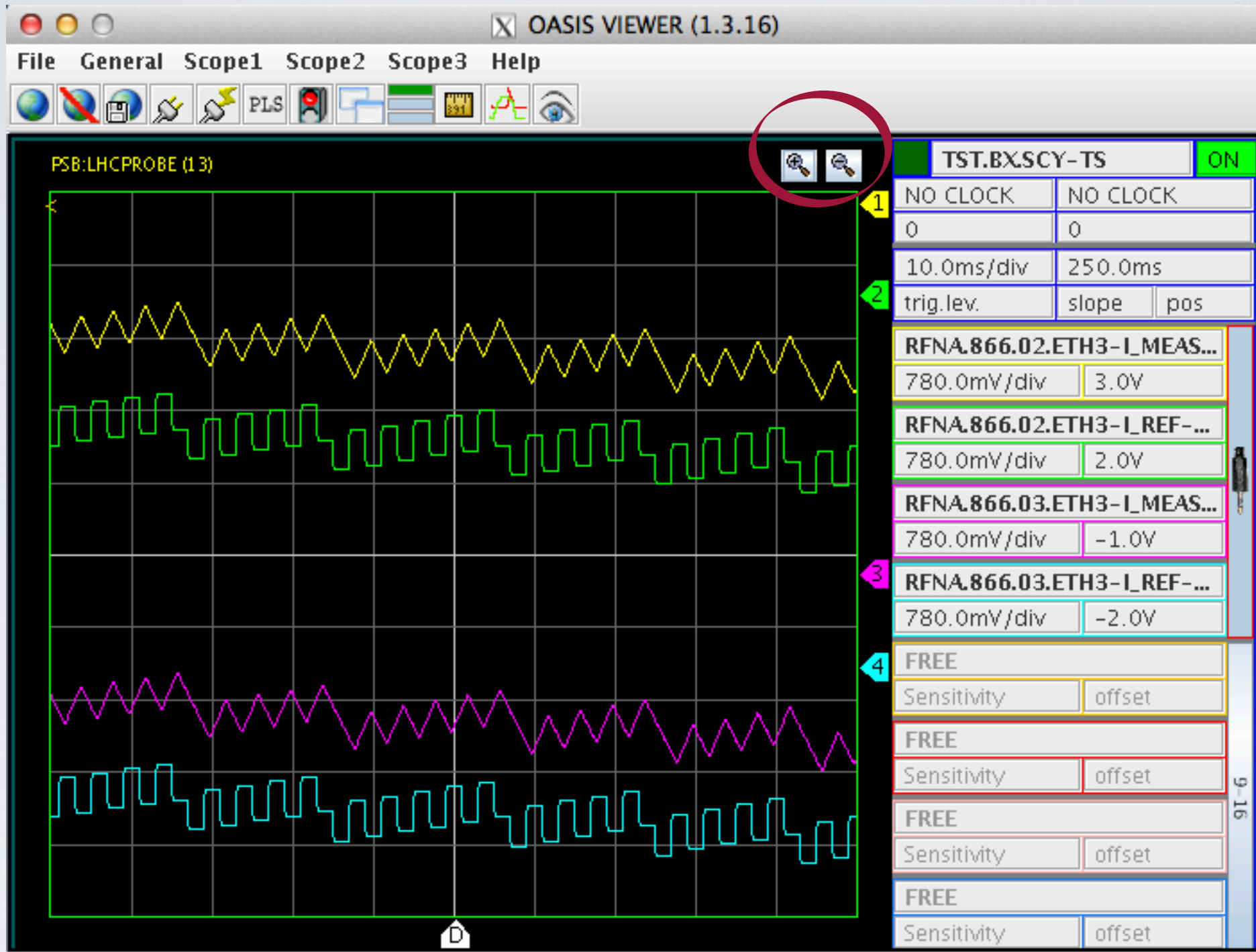
Scope 1
Delay 0.000 ms

TimeBase & Delay Control (2)



previous cycle
if data available

Zoom



FGC: 10kHz, 12kSamples for 1BP



Scrolling Mode

USER: ALL

OASIS VIEWER (1.3.16)

File General Scope1 Scope2 Scope3 Help

PSB:LHC PROBE (13)

TST.BX.SCY-TS ON

NO CLOCK	NO CLOCK
0	0
100.0ms/div	0.0s
trig.lev.	+ L

RFNA.866.02.ETH3-I_MEAS...

1.0V/div	0.0V
FREE	
Sensitivity	offset
FREE	
Sensitivity	offset
FREE	
Sensitivity	offset

5-8 9-12 13-16

PSB:LHC PROBE (13)

TST.BX.SCY-TS ON

NO CLOCK	NO CLOCK
0	0
100.0ms/div	
trig.lev.	

RFNA.866.02.E

2.0V/div	
FREE	
Sensitivity	
FREE	
Sensitivity	offset
FREE	
Sensitivity	offset

9-12 13-16

Set scope mode

- Normal mode
- Scrolling mode 2x
- Scrolling mode 3x
- Scrolling mode 4x
- Scrolling mode 5x
- Scrolling mode 10x**
- Scrolling mode 20x
- Scrolling mode 30x
- Scrolling mode 40x
- Scrolling mode 50x

Show scope options

Force trigger

Use LSA cycle

Show horizontal ruler

Show horizontal scale

17:29:56 - Filter SignalDomainFilter is throwing away invalid data UpdateStatus[flag=NO_DAT...

Vscope settings

Scope:1

Timebase... 100.000 msec

Scope:2

Timebase... 100.000 msec



Scrolling Mode

USER: SFTPRO

OASIS VIEWER (1.3.16)

File General Scope1 Scope2 Scope3 Help

PSB:SFTPRO (25)

TST.BX.SCY-TS ON

NO CLOCK	NO CLOCK
0	0
100.0ms/div	0.0s
trig.lev.	+ L

RFNA.866.02.ETH3-I_MEAS...

1.0V/div	0.0V
FREE	
Sensitivity	offset
FREE	
Sensitivity	offset
FREE	
Sensitivity	offset

Scope:1

Timebase... 100.000 msec

Scope:2

Timebase... 100.000 msec

TST.BX.SCY-TS ON

NO CLOCK	NO CLOCK
0	0
100.0ms/div	
trig.lev.	

RFNA.866.02.E

2.0V/div	
FREE	
Sensitivity	
FREE	
Sensitivity	offset
FREE	
Sensitivity	offset

Set scope mode

- Normal mode
- Scrolling mode 2x
- Scrolling mode 3x
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Show scope options

Force trigger

Use LSA cycle

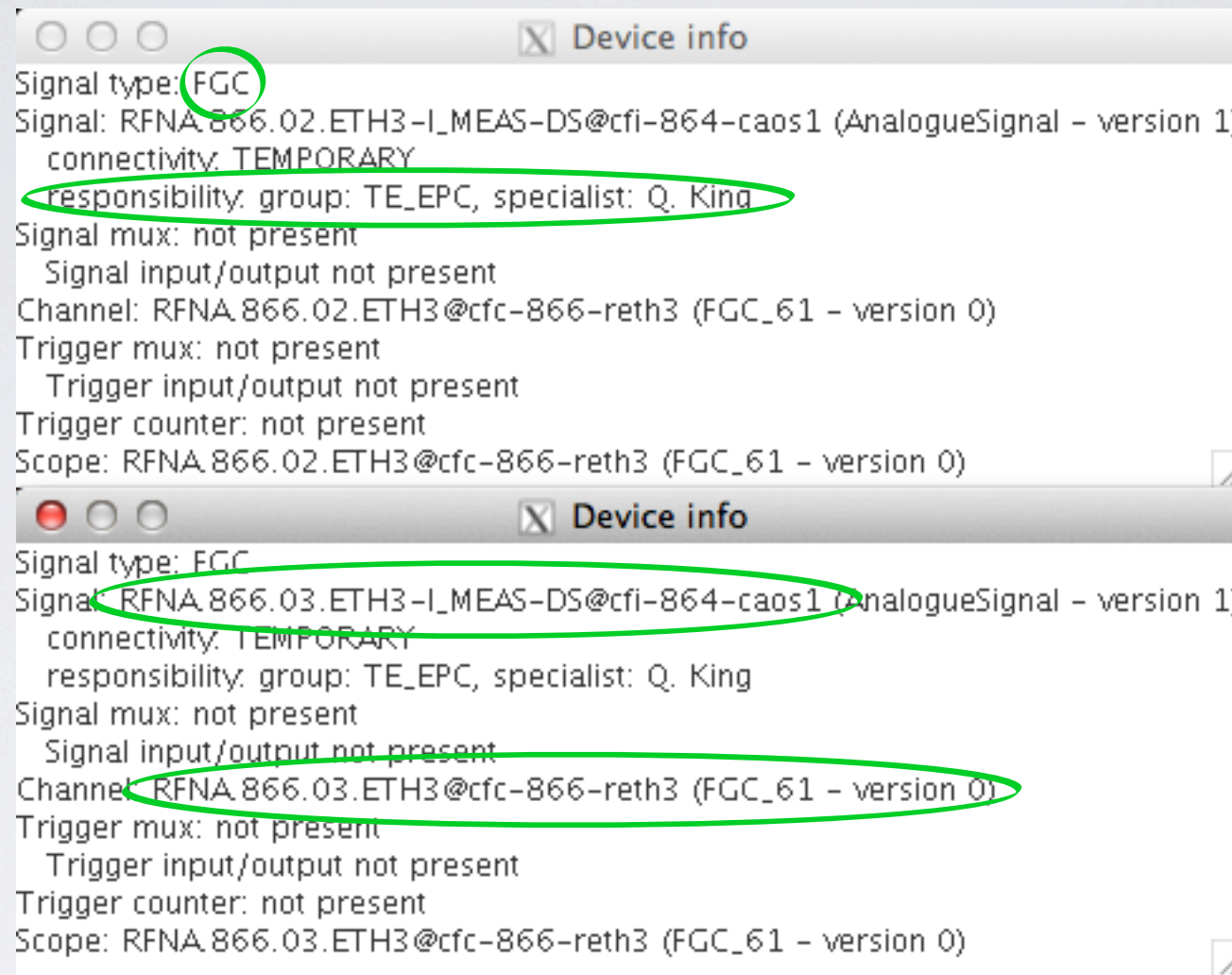
Show horizontal ruler

Show horizontal scale

17:29:56 - Filter SignalDomainFilter is throwing away invalid data UpdateStatus[flag=NO_DAT...

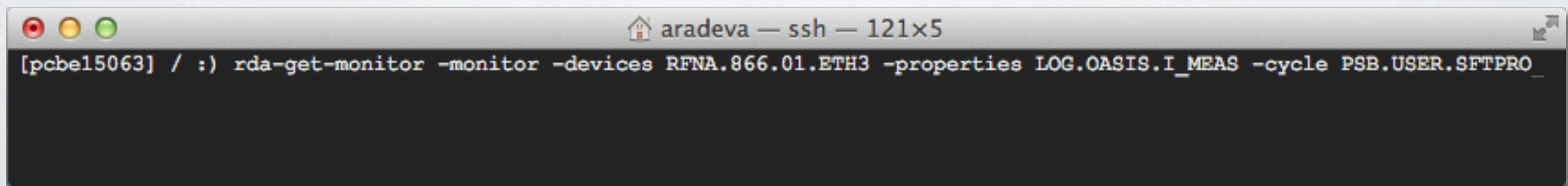


Basic Diagnostics for Datasources



To be extended with
“Diagnostics Information”

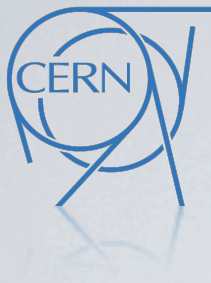
Copy/Paste





Open Points

- **FGC Connectivity**
 - declaring and configuring new signals for FGC
 - managing offline/online FGC signals in CCDB
 - propagation of changes to OASIS
 - keeping menu and globals free of offline FGC signals



Validation in Operation

- Objectives
 - Validate with concrete operational use cases
 - Receive early feedback before the startup in 2014
 - Improve according to the OP feedback
- LN4
 - FGC
 - BI BCTs, BPMs
 - RF Coupler
- Booster
 - FGC
 - BI BCTs



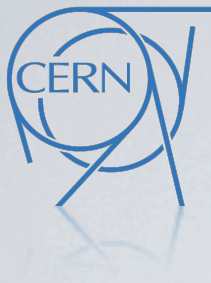
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- **Correlation of FGC Datasources and Analog Signals**
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Signal Correlation

- Analog Signal correlation in OASIS today in PS complex
 - Centrally generated triggers, synchronized with the machine
 - Correlation is based on common triggers
- Delays of the trigger signals
 - due to the cables distribution from bld. 354
 - in the triggers detection due to variety of hardware and the sampling frequency used
- Datasources particularity
 - FGC: publish data for the entire cycle with absolute timestamp
 - BI DS: same problem with timestamp precision as the digitisers
- Problems in operation
 - Jittering signals
 - No precise trigger timestamps



Solution for Startup 2014

- Correlation of Analog Signals
 - based on common triggers as so far
 - generating all triggers centrally in bld. 354
- Correlation of Analog Signals (AS) and Datasources (DS)
 - Triggers: the ones of the AS
 - TimeBase & Delay: the ones of the AS (as before)
 - Trigger timestamp: received from corresponding LTIM device
 - Plotting of AS: as before
 - Plotting of DS: using LTIM trigger stamp as reference



Correlation with SCY+del

TRG pulse: 1ms
SCY delay: 0ms
FGC SI: 0.1ms
USER: LHCPROBE

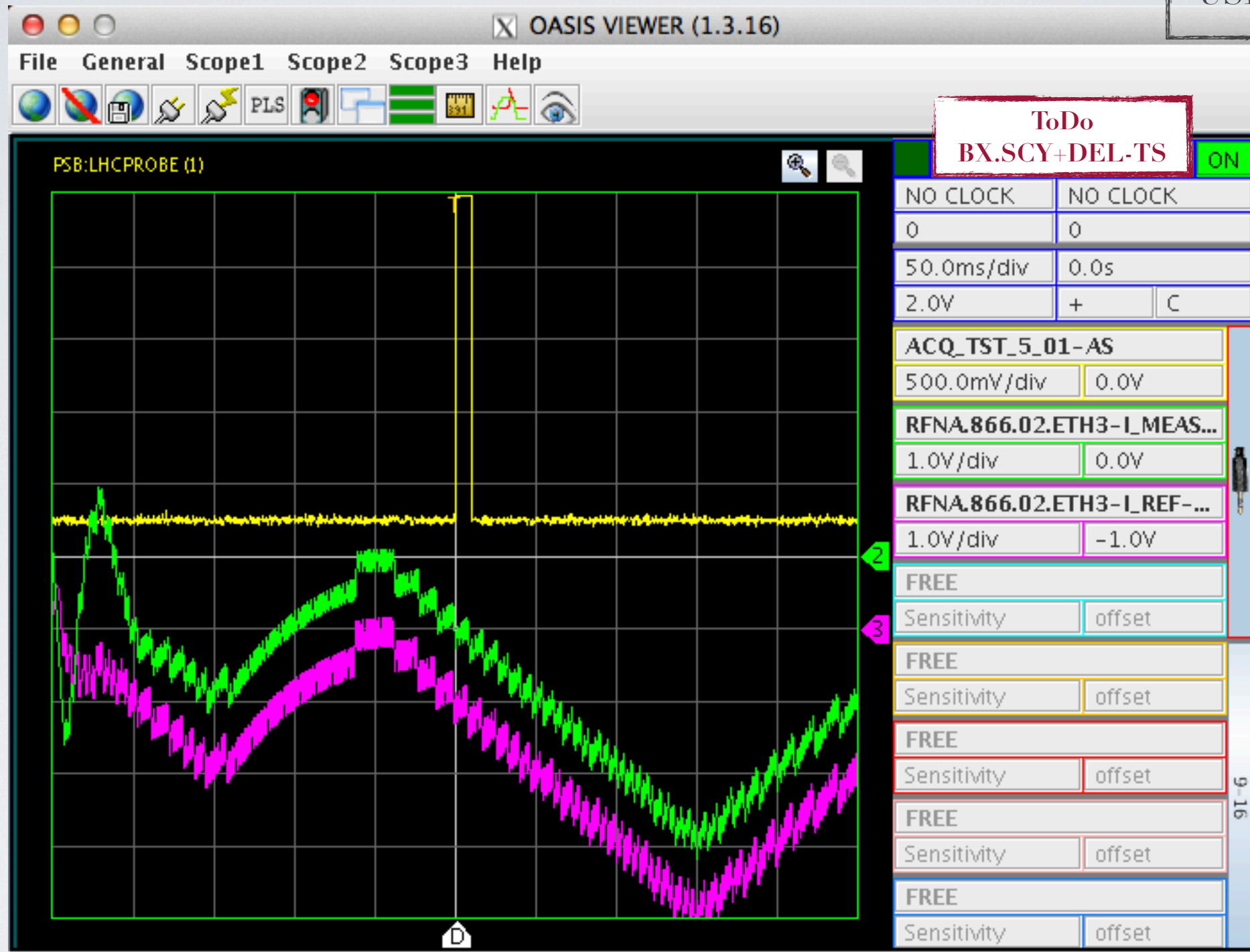


no data
previous cycle



Correlation with SCY+del

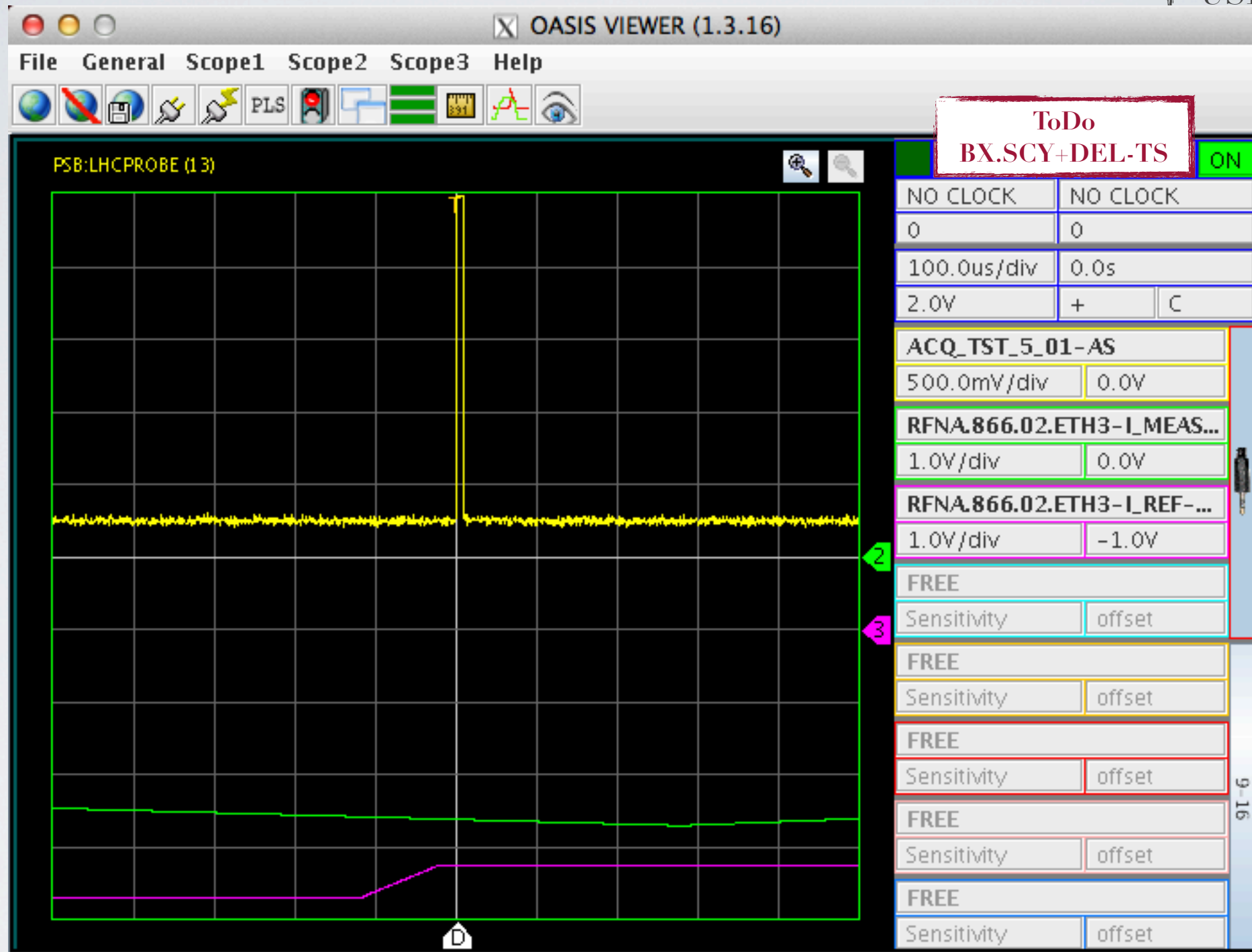
TRG pulse: 10ms
SCY delay: 250ms
FGC SI: 0.1ms
USER: LHCPROBE





Correlation with SCY+del

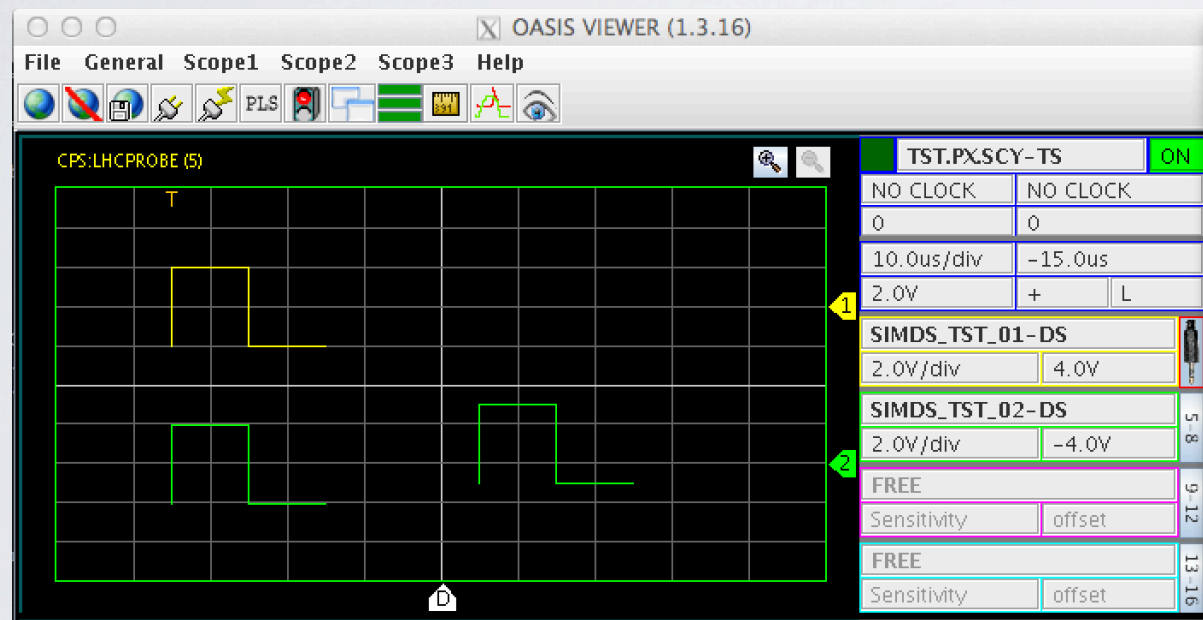
TRG pulse: 0.01ms
SCY delay: 380ms
FGC SI: 0.1ms
USER: LHC PROBE



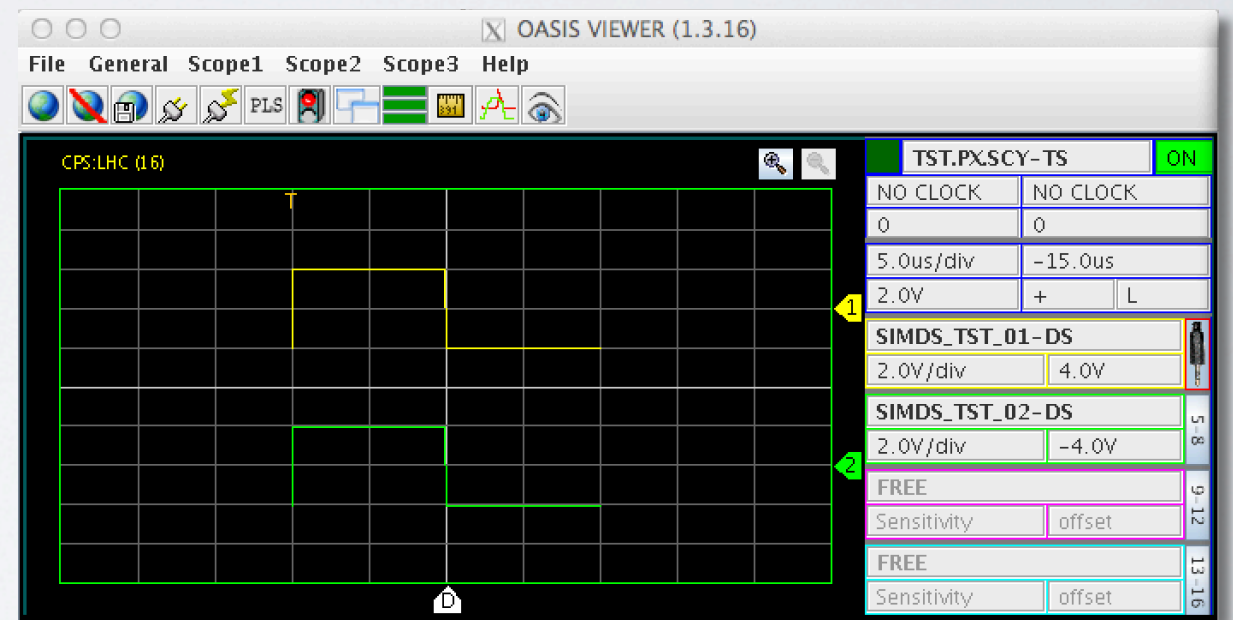
Multi-trigger Acquisitions

- Use case: Mutli-injections for BI BCTs DS (LN4, PSB)
 - waveforms plotted horizontally (not as mountain range)

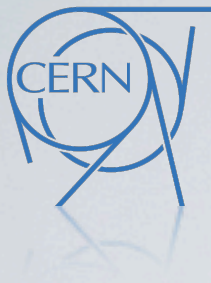
Simulation



2nd injection
fits the window



2nd injection
outside the window



Open Points

- Correlation of Signals
 - digitizers: common trigger and the visualization is blocked till the reception of all data
 - data sources: open question due to:
 - different triggers (might not be pulsing)
 - different buffer sizes (might not fit the window)



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Solution for Trigger Synchronization

PS complex, SPS

- **Trigger Generation**
 - centrally generated and synchronized triggers (as today)
 - locally generated triggers
- **Central Triggers Distribution**
 - dedicated private White Rabbit network
 - triggers broadcasted
- **Trigger Reception**
 - WR compatible FMC digitizers: receive trigger + timestamp
 - non-WR compatible digitizers: need extra hardware for extracting the timestamp
- **New OASIS Trigger System**



Milestones

- Deployment of such a solution implies
 - Modification of existing FE installations (39 CO in PS Complex + SPS)
 - Eradication of all legacy VXI HP digitizers and crates
- Renovation of Booster OASIS installations (2013)
 - FMC ADC, Acqiris, VD80
- OASIS Hardware consolidation (2014 - 2016)
 - the rest of PS complex (PS, LN3, AD) and SPS
- Distribution of triggers over White Rabbit network
 - Design specification phase - in progress (CO-HT)
 - Topology and cabling: to be launch in Q3-2014
 - Prototype solution for OASIS in Booster: Q2-2015



Summary

- **FGC Integration in OASIS**
 - basic visualization: completed
 - runtime management of operational equipment in CCDB: Q1-2014
- **Correlation of Analog Signals & Datasources, e.g. FGC, BCT**
 - solution: based on precise LTIM timestamps
 - development phase: finalizing
 - beta version: December 2013
 - deployed to operation: February 2014
 - “Diagnostics Information” for independent diagnosing (rda-based)
- **Trigger Synchronization in OASIS**
 - 3 years project on its own: to be launched in 2014
 - dependent on the OASIS hardware consolidation (2014-2016)
 - deployed progressively in parallel to the existing triggering system