



Elettra Sincrotrone Trieste

ESS IKC DIAG IV FORUM

CEA Paris

20-21 November 2017

STATUS REPORT on the
WIRE SCANNER ACQUISITION SYSTEM
part of the ELETTRA to ESS IKC

Mario Ferianis

on behalf of the Elettra ESS WS Team,

R. De Monte, S. Grulja and S. Cleva



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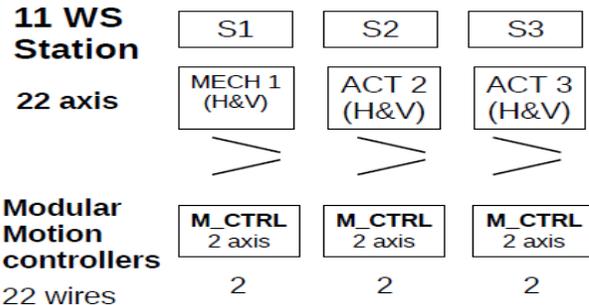
THE BIG TEAM: URGENT UPDATE NEEDED !!!

WBS 11.7.7		Rev. 1.2	05/08/17 MF BC TSh DP		
WBS ID	Task	Ref. person @Elettra (mails below)	Ref. Person @ ESS	mails (externals)	NOTES
11.7.7.1	<i>General issues, mngt. & admins</i>	Mario	Benjamin, Tom & Daniel	benjamin.cheymol@esss.se, thomas.shea@esss.se, Daniel.PisoFernandez@esss.se	Diags and ICS
11.7.7.2	<i>Analog Front End (AFE), SEM</i>	Raffaele	Benjamin		
11.7.7.3	<i>Optical Front End (OFE), Scintillator</i>	Sandi	Benjamin		
11.7.7.3.1	<i>Back End (BE), SEM & Scintillator</i>	Raffaele	Hinko	hinko.kocevar@esss.se	
11.7.7.4	<i>Interfacing to MPS</i>	Sandi	Szandra, Julen	Szandra.Kovecses@esss.se, JulenEtxeberria.Malkorra@esss.se	
11.7.7.5	<i>Motion Controllers</i>	Sandi	Julen, Thomas, Torsten	Thomas.Gahl@esss.se, torsten.bogershausen@esss.se	
11.7.7.6	<i>Mech Integration</i>	Mario	Nick Gazis	nick.gazis@esss.se	integration in the tunnel (FE?)
11.7.7.6.1	<i>Interfacing to ESS Bilbao Mechanics</i>	Mario	Ibon, Ben, Alvaro	ibustinduy@essbilbao.org, avizcaino@essbilbao.org	
11.7.7.6.2	<i>Interfacing to Dan Physic Mechanics</i>	Mario	Ben		
11.7.7.7	<i>Cabling (connectors and cables)</i>	Sandi	Lia	Evangelia.Vaena@esss.se	
11.7.7.7.1	<i>Cabling (on-board rack)</i>	Sandi	Edvard	Edvard.Bergman@esss.se	
11.7.7.8	<i>ICS WS integration</i>	Stefano	Hinko, Julen		
11.7.7.8.1	<i>ICS WS integration (low level)</i>	Stefano	Hinko, Han	han.lee@esss.se	uTCA ADCs CPUs
11.7.7.8.1	<i>ICS WS integration (motion controller)</i>	Stefano	Torsten, Anders	Anders.Sandstrom@esss.se	etherCAT
11.7.7.8.2	<i>ICS WS integration (graphic panel)</i>	Stefano	Ben, Han		engineering and operator
11.7.7.8.3	<i>ICS WS integration (computation)</i>	Stefano	Ben, Han		
11.7.7.8.4	<i>Timing (event system)</i>	Stefano	Timo K.	Timo.Korhonen@esss.se	synchronization issues
11.7.7.9	<i>Handover</i>	Mario	Ben		from ST to ESS ERIC
11.7.7.9.1	<i>Test at Partner Lab. (SACLAY)</i>	Mario	Ben		
11.7.7.9.2	<i>Shipment and delivery</i>	Mario	Hinko, Clement	clement.derrez@esss.se	send and receive, where, when
11.7.7.9.3	<i>On site ESS commissioning</i>	Raffaele	Ben, Hinko		
11.7.7.9.4	<i>Installation</i>	Sandi	Clement		

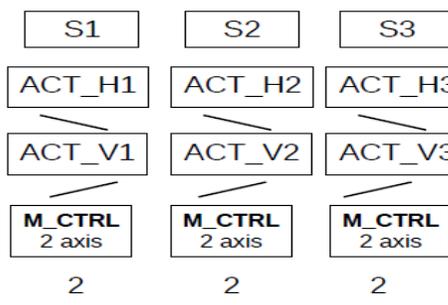
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(LOW LEVEL) LAYOUT OF THE WS ACQ SYS

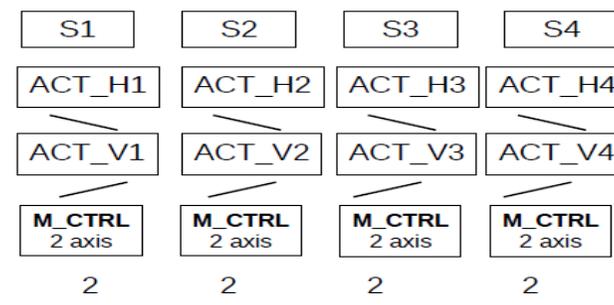
machine section: MEBT



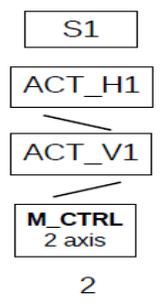
SPOKE



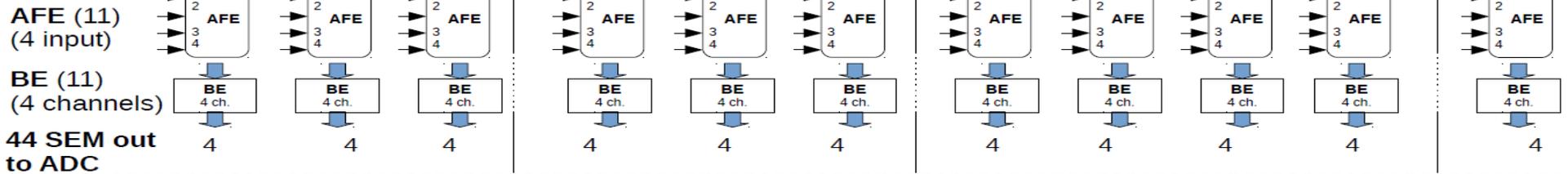
ELLIPTICAL



A2T



SEM



SCINTILLATOR

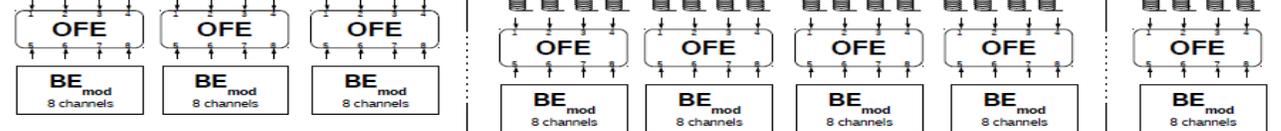
20 Scintillators; 2 fibers each; 40 fibers

OFE, 8 channels
total: 5 OFE (5x8=40 inputs)

1 Be_{mod} / 1 OFE; 5 BE_{mod}

40 SCINT Outputs to ADC

3 OFE (3x8=24 inputs) for FAST WS



AFE 11 + 2 spares=13 AFE;
OFE: 5 + 1 spare= 6 OFE;
3 OFE for fast WS
13 BE and 9 BE_{mod}

LEGEND

ACT *actuator*
AFE *analog front-end module*
OFE *optical front-end module*
BE / BE_{mod} *back-end / modified back-end with PS*

ESS WS SYSTEM LAYOUT
author MF
filename esswslayout.pdf
Rev 1.5.1
Date 17/11/2017

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TASK % DONE /

LEFT TO DO

-
- | | | |
|------------------------------------|------------|--|
| • Design (HW & SW) | 95% | BE _{mod} ; 100% by CDR |
| • PDR-1 & PDR-2 | 100% | 28 Jun 2016 & 13 Dec 2016 |
| • Prototyping HW | 90% | Be _{mod} / 2 nd proto production |
| • Prototyping SW | 70% | synch data storage on EPICS
transverse prof. reconstruction |
| • HW integration into ICS | 90% | OFE interfacing to μ -TCA |
| • Laboratory test (no beam) | 80% | transverse prof. reconstruction |
| • Test with beam (AFE + BE) | 50% | tested on LINAC 4 @ CERN |
| • CDR-1 & CDR-2 | 30% | due by 16 Feb 2018 |
| • Vertical integration @ ESS | 20% | due by 18 May 2018 |

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TASK % DONE

/

LEFT TO DO

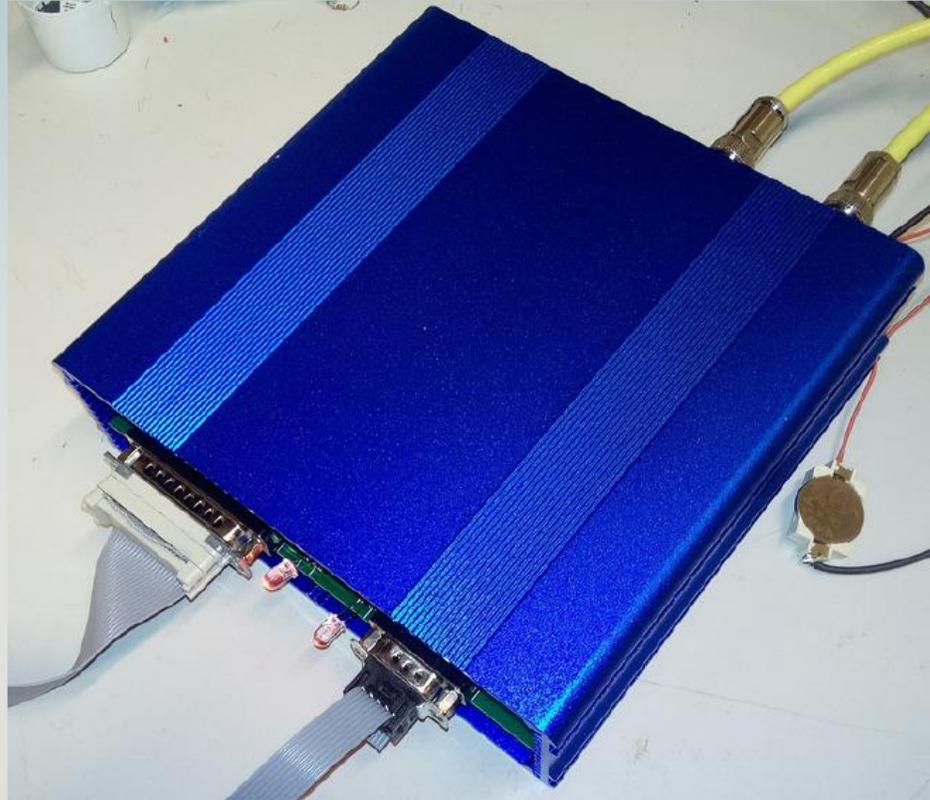
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- | | | |
|---|----|---------------------------------|
| • SEM series production | 0% | Feb-Jun 2018 |
| • 1 st SEM batch delivery | 0% | due by 20 Jul 2018 (MEBT WS) |
| • TRR | 0% | due by 14 Sep 2018 |
| • SAR-1 : SEM series test in Lab | 0% | due by 12 Oct 2018 |
| • Start MEBT installation | 0% | due by 15 Nov 2018 |
| • MEBT beam commissioning | 0% | 15 Jan 2019 |
| • SCINT series production | 0% | May-Oct 2018 |
| • 1 st SCINT batch delivery | 0% | due by 10 Dec 2018 (ELLIPT. WS) |
| • SAR-2 : SCINT series test in Lab | 0% | due by 11 Jan 2019 |
| • End of Installation | 0% | 1 Jun 2020 |

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ACHIEVEMENTS TO DATE - SEM



AFE board

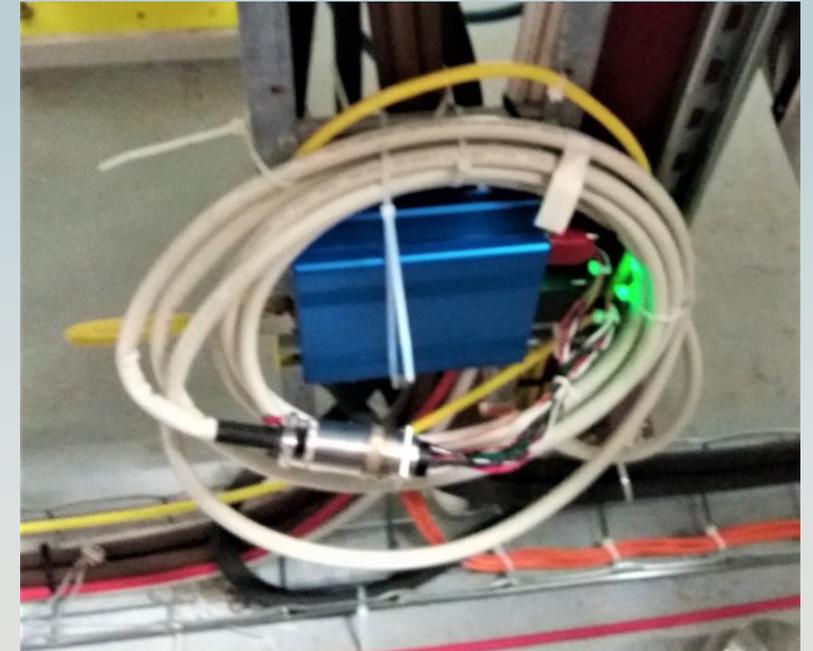
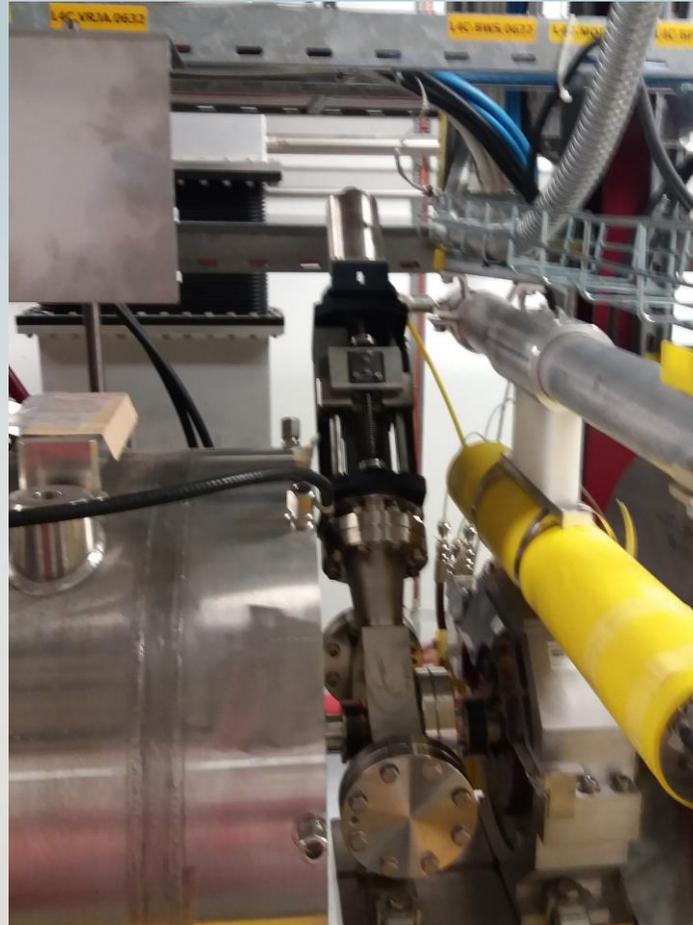


Analog Front End (AFE) prototype
4 channel IN
4 channel OUT
2 signal \ wire
5 m cable from WS
Up to 100m
to the Back End

ACHIEVEMENTS TO DATE - SEM



**Elettra Team during
WS ACQ SYS installation
on LINAC4 at CERN**



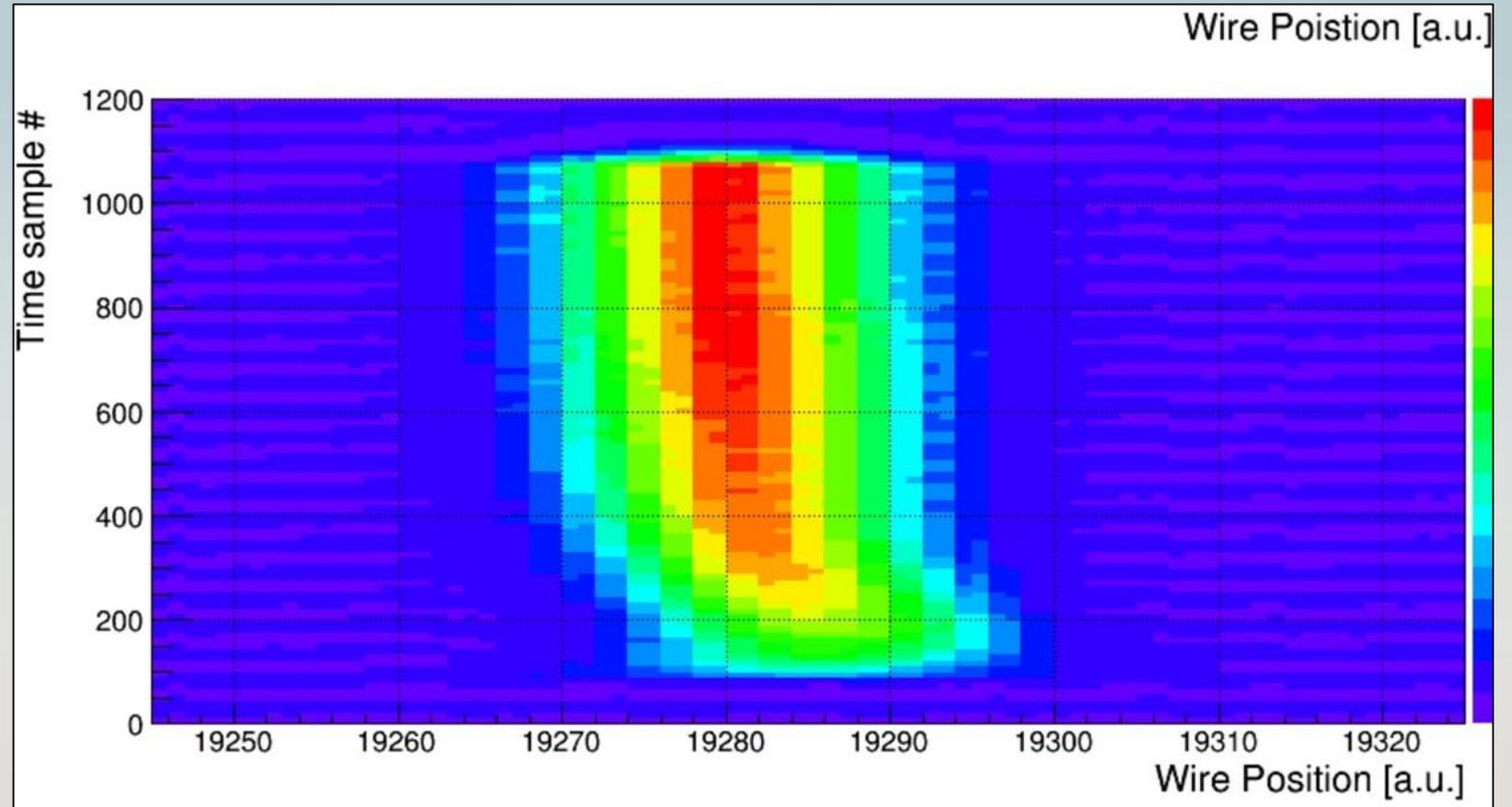
The complete WS ACQ system has been moved and installed on LINAC4: μ -TCA and VME crates + **Back End Analog Front End** in LINAC tunnel

ACHIEVEMENTS TO DATE - SEM

PLOT of wire scanner acquired data

100 μ s long macropulse
LINAC4 trigger at 1Hz
ADC board at 10MSPS (up to 125MSPS)

Merging of
HIGH GAIN & LOW GAIN data



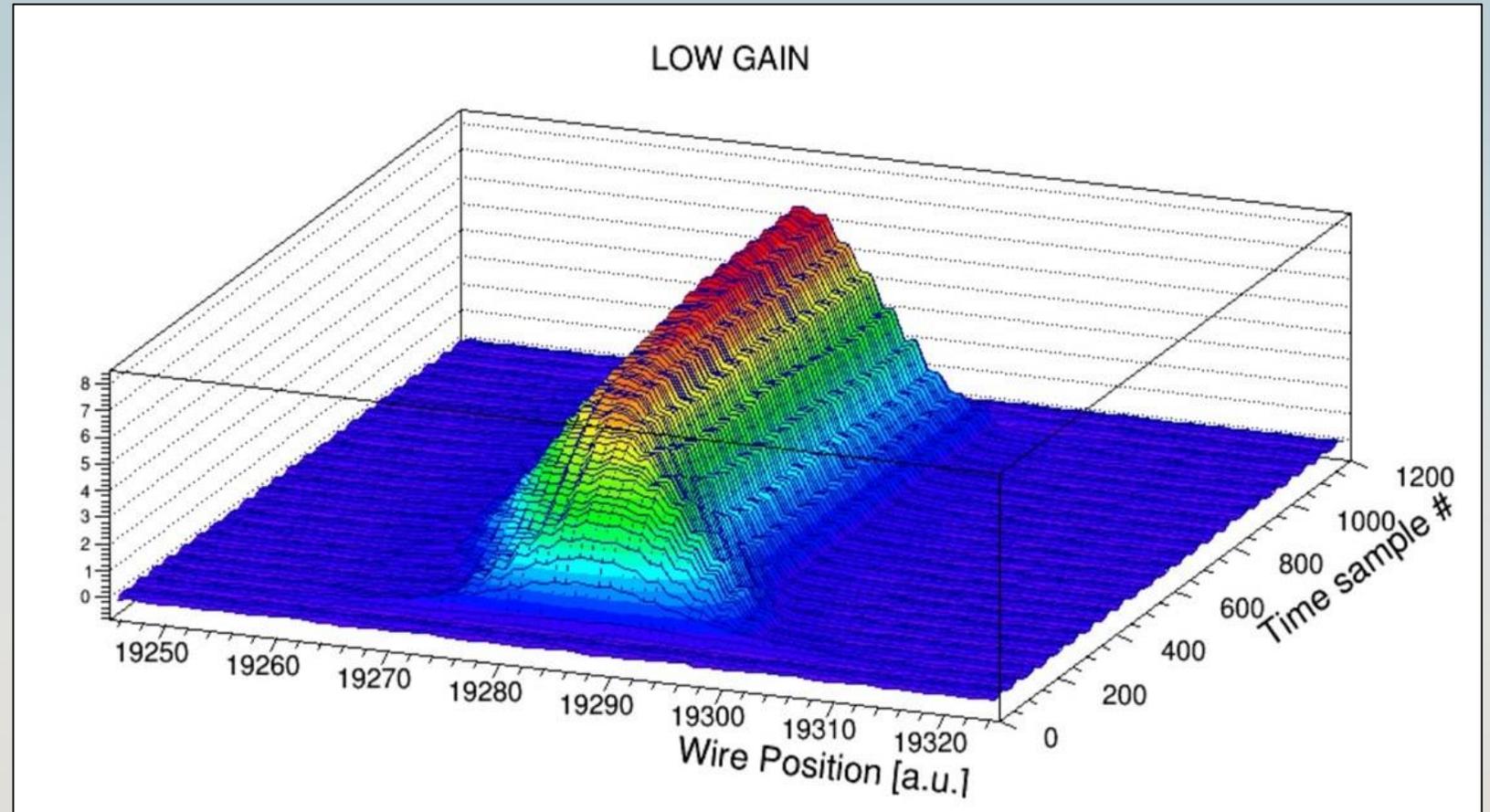
COURTESY OF FEDERICO RONCAROLO AT CERN

ACHIEVEMENTS TO DATE - SEM

3-D PLOT of wire scanner acquired data (vertical profiles)

The high speed (up to 125MSPS)
ADC board allows the bunch
tomography which could be useful in
LINAC tuning (low losses)

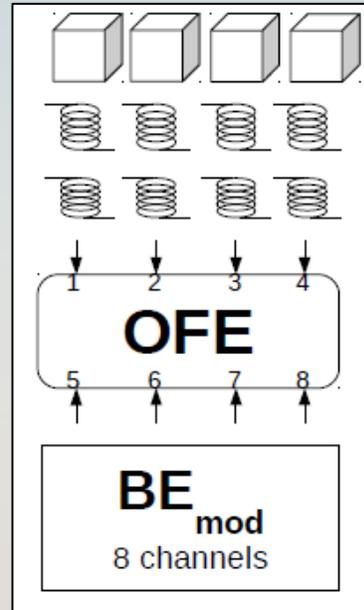
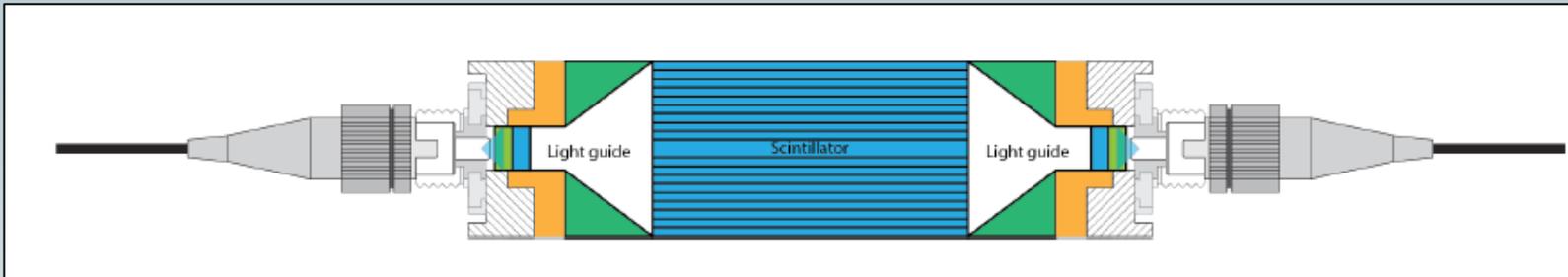
Also, the high speed ADC will be
most useful for ESS 5 μ sec bunch
acquisition



COURTESY OF FEDERICO RONCAROLO AT CERN

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ACHIEVEMENTS TO DATE - SCINT



Optical Front End (OFE) prototype

8 channel IN

8 channel OUT

2 signal \ SCINT

4 SCINT \ WS

FO from WS to OFE

Up to 150m

Modified Back End (BE_{mod})

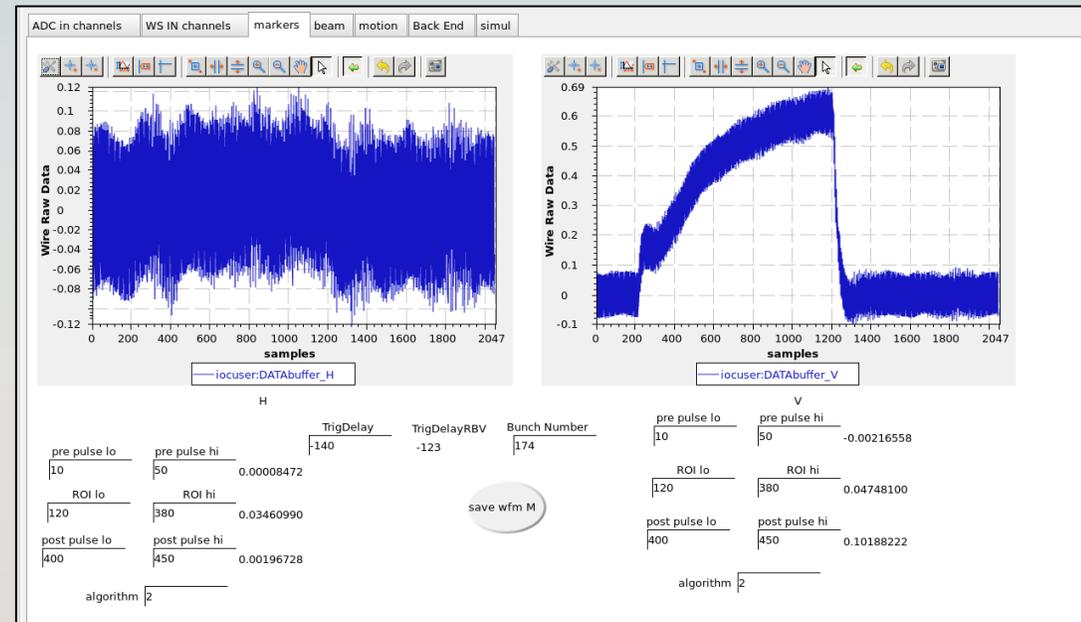
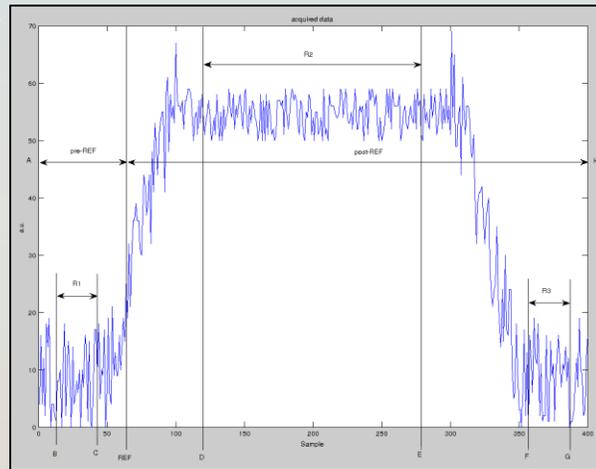
ALL DETAILS AND MUCH MORE IN SANDI'S TALK



ACHIEVEMENTS TO DATE - SW

- ESS development environment: set-up and running
- Both μ -TCA (CPU,ADC, Ev_Rx) and VME (Ev_Gen) systems running
- Acquisition FW done
- Control Panels: prototype running
- Successfully field tested at CERN
- Profile processing algorithm: under development
- Synchronous data storage: under development

COURTESY OF STEFANO



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NEXT STEPS – OPEN ISSUES

ASAP

Need a strong joint commitment to the bi-lateral **ESS-ST Contract signature**

>>> it will un-lock resources at ST, enabling series production in 2018

CDR-1 & CDR-2 milestone in **early 2018** (Jan/Feb)

Careful **cables, cabling and installation (racks)** double check (**RUNNING!**)

Vertical integration tests (**mid 2018, the latest**):

- > wire scanner mechanics to motion controller and acquisition system
- > WS acquisition system interfacing to ESS ICS and timing
- > WS ACQ SYS interfacing to MPS

Delivery and **in-house acceptance** procedure (what, where and when)

In-situ WS ACQ SYS installation infrastructure set-up (1 by 1 WS stations)



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Thank you for your attention

