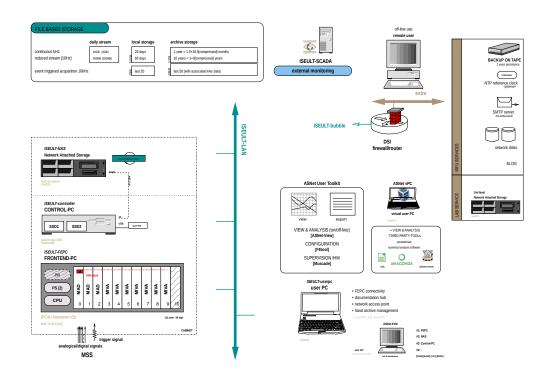
DATA COLLECTION FOR ANALOGICAL MAGNET SECURITY SYSTEMS AT CEA-IRFU

JÉRÔME ALLARD [CEA-IRFU-DIS-LDISC]





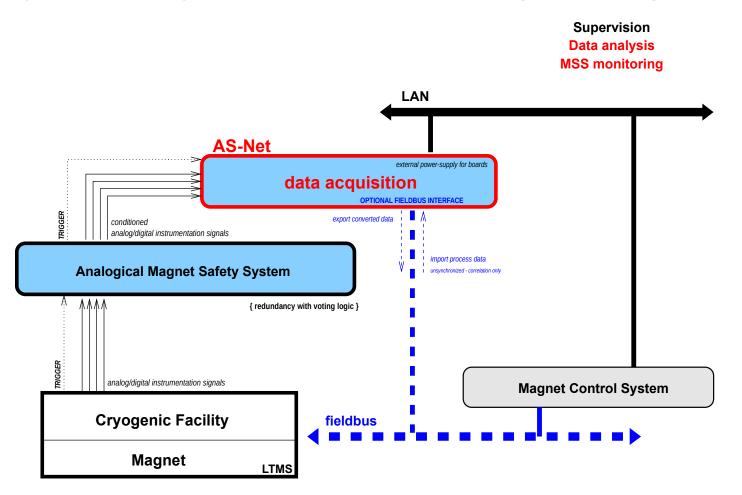
3rd International Workshop of the Superconducting Magnets Test Stands



INTRODUCTION



ASNet stands for Acquisition System over Network. It is designed as an external acquisition module for CEA-IRFU analogical Magnet Safety System. It has been deployed for over 10 years on test stands or around big custom magnet.

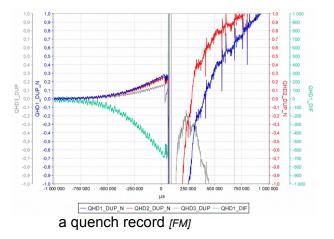


A LAB STORY FROM 2003

A **superconducting magnet** is a tricky machine that may experience a **quench**. **Magnet Safety System** (MSS) will then operate and turn the system off. A posteriori analysis will then follows. But in any case data recording turns out to be essential.

MSS needs an acquisition module

- Reliable quench event recording as a black box
- Oscilloscope feature: on-line & offline as monitoring purpose
- Ability to handle tens/hundreds of channels 50-200 analog or digital
- Compatible with magnet physics 1-100ms celerity & 2min disturbance time windows around trigger
- Slow trends expected to be observable hours, days
- Synchronous acquisition
- Work with physical values & symbols





bundle of signals to record [YQ]



temperature sensor around magnet [YQ]



like an airplane black box as feature n°1



Implementation concepts for <u>Acquisition System on Network</u>

- Industrial PC & embedded general purpose OS a ++ technology basis for development
- Real-time tasks handled in electronics
- Modularity & configurability first channels, sampling, time windows for quench, conversions
- Interactive use for magnet tests or background mode for operation
- Share data with process via local fieldbus
- Offer a long term view for slow trends
- Additional storage system to keep long term data
- AS-Net status visible by a local supervision
- \rightarrow Reliable but non critical system trade off
- \rightarrow Juggle with multiple frequencies source/distribution/storage/extraction

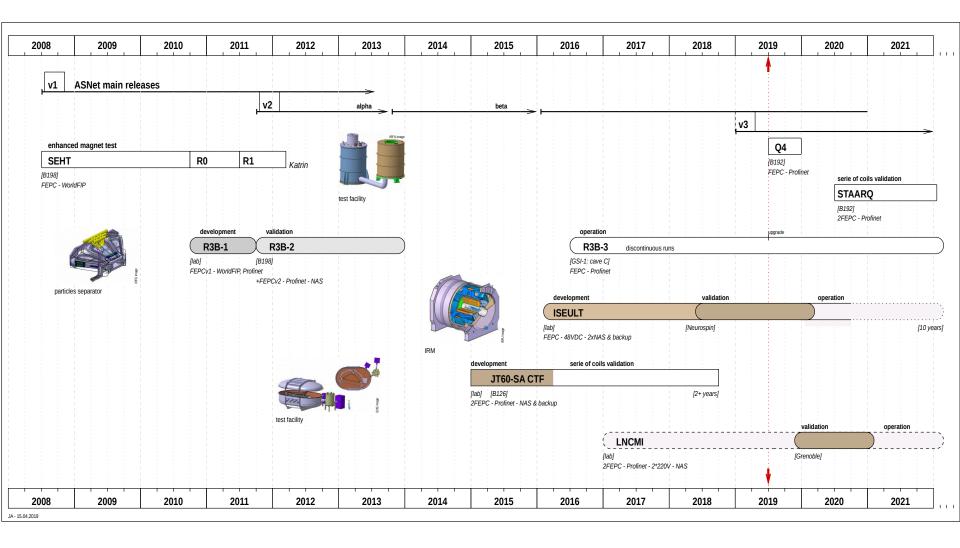
R&D, development and finally first deployment

- 2003 First test with a COTS board DAQ2205
- 2004 R&D developing a custom board: MIVA
- 2008 deployed as 2nd acquisition system for Station Essai Huit Testla



SEHT mechanical view [IRFU]

ASNet FAMILY OVERVIEW

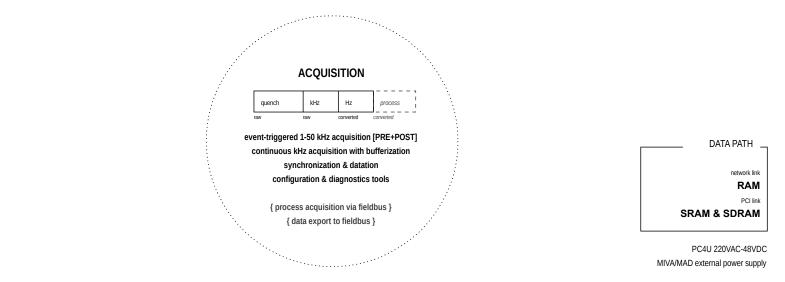




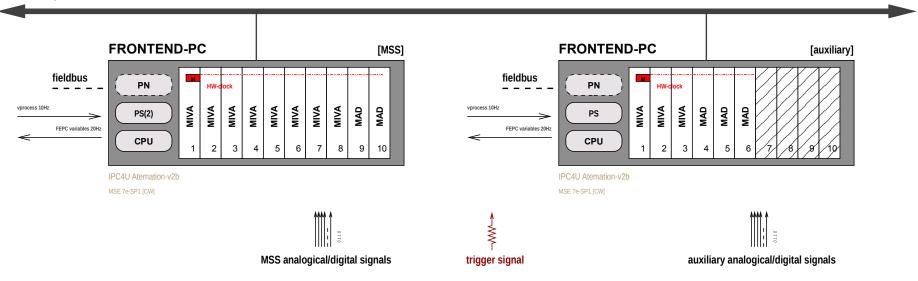
A LAYERED AND MODULAR ARCHITECTURE



ACQUISITION LAYER - OVERVIEW







ACQUISITION LAYER - MIVA & MAD INSIDE [1/2]

A custom analog card: MIVA

- 16 **analog** input channels with 16bits ADC, voltage/current
- 1-50 kHz sampling rate
- Synchronization signal with other boards [master/slave]
- External power supply
- Quench buffer [256 MB SDRAM 8 M samples] black box feature, triggered
- Real-time buffer [6 kB SRAM 500 samples] continuous acquisition feature



MIVA sister for digital inputs: MAD

Design same as MIVA but for digital inputs 32 digital input channels





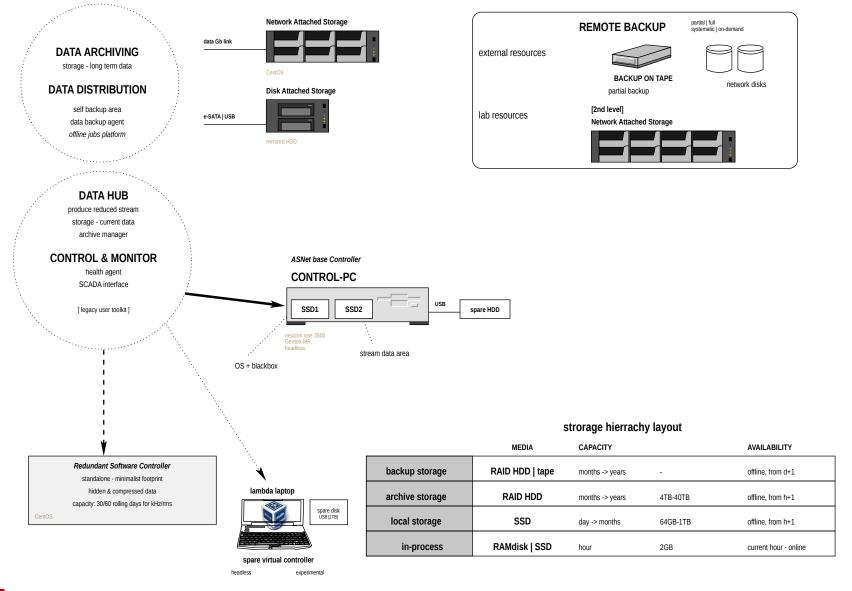
Inside the rack



- PCI board for [PLX bridge]
- Processing via FPGA [VHDL]
- Simulation functions

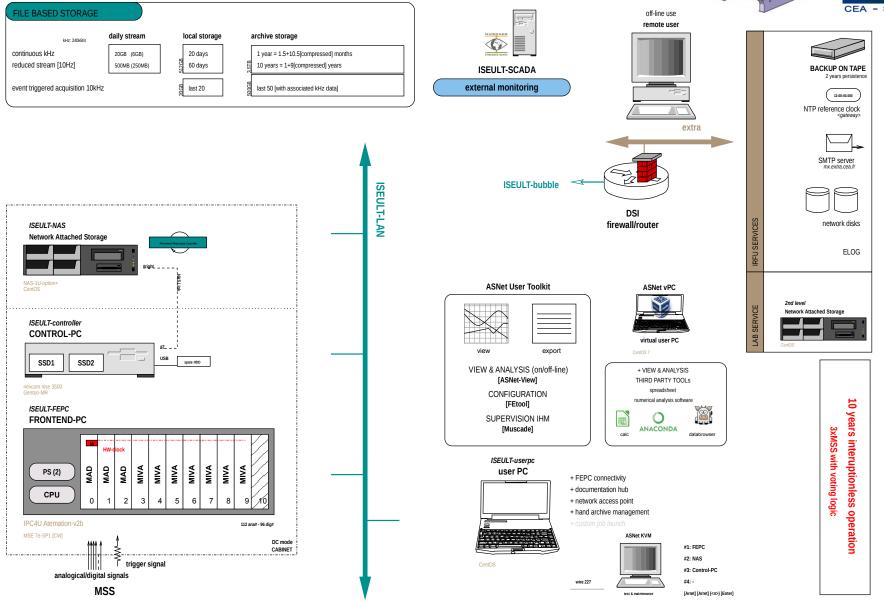
CONTROLLER & ARCHIVING LAYERS





DEPLOYMENT OVERVIEW - ISEULT EXAMPLE





ASNET THROUGH USE CASES



Before use a configuration has first to define through **FEtools**

racks, boards

channels: names, unit, range, conversion...

quench parameters: sampling rate, time window, master

fieldbus interface: variables to export

Each channel must be <u>calibrated</u> with a reference – wizard for linear correction

FRONTAUX.	XML						
)atabase							لقانات
3EHT Configurat	tion 21.02.2008						
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		Setting	Setting	Setting	Setting	Setting	Setting
	ID 1: WorldFIP						
	ID 1. WORDPIE	Display	Display	Display	Display	Display	Display
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		1:QHD1_DUI	1:QHADI2_	1:QISL2_R	1:TT405_M	1:U_ALIM_I	1:PT260
		2:QHD2_DU	2:DQHADIX	2:DQISLX_F	2:TT425_M	2:I_DCCT_	2:PT261
		3:QHD2_DUI	3:QHADI1_	3:QIADI1_M	3:C4_V3	3:E25X_U	3:PT262
	Settings	4:QHSL1_1	4:QHADI2_	4:QIADI2_M	4:TT405_R	4:E25X_I	4:PT263
		5:QHSL2_1	5:DQHADIX	5:DQIADIX_1	5:TT425_R	5:BF240	5:PT215
01-4.0		6:DQHSLX_1	6:UH1	6:QIADI1_R	6	6:BF241	6:PT216
Slot 0		7:QHSL1_2	7:UH2	7:QIADI2_R	7:I_ALIM	7:BF242	7:PT285
	Display	8:QHSL2_2	8:UH1-UH	8:DQIADIX_F	8:U_ALIM	8:BF243	8:PT286
		9:DQHSLX (9:UH3	9:UI1	9:1_DCCT	9:BF244	9:PT324
		10:QHSL1_1	10:PT214	10:UI2	10:TT210A	10:LVDT27(10:DPT268
		11:QHSL2_1	11:QID1_DU	11:UI1-UI2	11:TT211A	11:LVDT271	11:FT129
		12:DQHSLX_	12:QID1_DUI	12:UI3	12:TT212A	12:LVDT27:	12
		13:QHSL1_2	13:QISL1_	13:UQ1	13:TT290M/	13:TT264	13
	Info	14:QHSL2_2	14:QISL2_	14:UQ2	14:TT290R/	14:TT265	14
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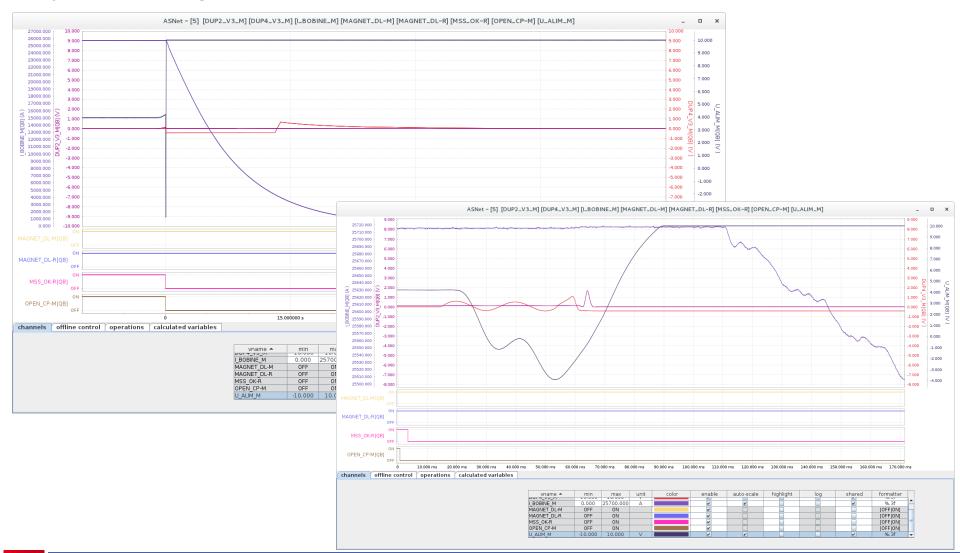
System is user monitored and driven through a **Muscade** interface. This may be integrated to the experiment SCADA, which allows triggering alarms for example to ask for maintenance on NAS disks, to warn about a wrong timing or to notify immediately a quench event.

evious Next Main Command 6/06/02 13:12:37,425 +0200 GMT TCP Bytes:0 Raf:0.5 s H	. Views Scripts	Center Msg/Alm
Configuration controller Configuration identifier : <u>JT60-1.100</u> Controller begin date : <u>29/03/2016-11:26:04 CEST</u> Runtime elapsed time : <u>65-01:46:31</u> Reference time reachable : Reference time - Stratum : <u>2</u> Local time - NTP synchro : SYNCHR0	ASNET OVERVIEW	FEPC-HVI Image: Sampling frequency : 10000 Hz 48 Analog channels Image: Digital channels 10 s Trigger PRE 60 s NTP Stratum : 4 Offset : -0.071 s
Local time - NTP offset : 0.000 sec Local time - NTP stratum : 3	LOCAL STREAM REMANENT	TRIGGER State : FULL Date : 22/04/2016-12:46:07 CEST
TRIGGER Acquisition : ON OFF Autoreset status : OFF RESET LINE SOFT TRIGGER	Free : 9 GB Free : 14 GB 21 GB	Download state : OK Download progress rate : RESET LINE SOFT TRIGGER Download Stop Download Restart
Download Stop Download Restart KHz Acquisition: ON DH DFF	STREAM REMANENT Free: 1238 GB Free: 680 GB 4070 GB 1020 GB	FEPC-MSS Sampling frequency : 10000 Hz 112 Analog channels 128 10 s Trigger PRE 60 s Trigger POST
Process Acquisition : ON OFF	ARCHIVE DEVICE	NTP Stratum : 4 Offset : 0.072 s TRIGGER
RMS Acquisition : OFF ON OFF Frequency : 10,00 Hz	Device type : NAS reculs in program in the line of the	Date: 22/04/2010-12:46:07 CEST Download state: OK Download progress rate: RESET LINE SOFT TRIGGER Download Stop Download Restart

WORKING WITH EVENT TRIGGERED DATA

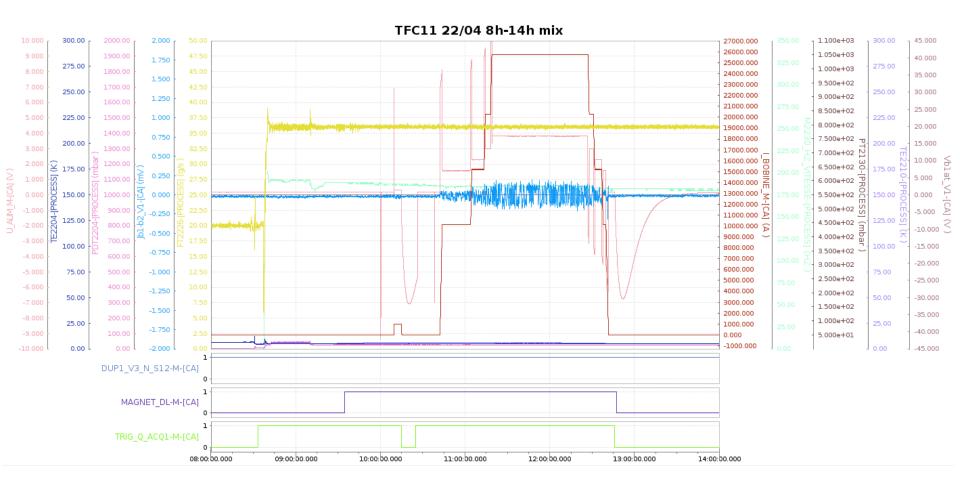


Once a trigger occurs a snapshot around event is made with a resolution up to 20us (*blackbox feature*). Analysis can then begin...





Data acquisition is continuous with a **synchronous kHz** stream and an optional 10Hz fieldbus **process stream**. We can then extract offline, from controller or archive storage, working at hour or ms scale, superimposing source for correlation if necessary...



WORKING WITH CONTINUOUS DATA STREAMS 2/2



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17.500

15.000

12,500

10.000

7.500 5.000

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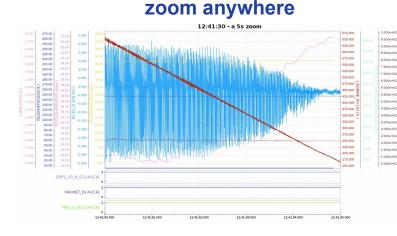
-17.500

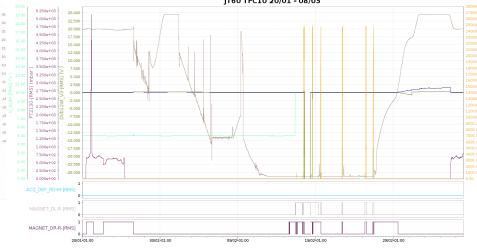
-20.000

-22.500

-25.000

use for long trends





Thanks to reduced stream ASNet is usable with long time windows, typically weeks, for example to follow magnet cooling or summarize a coil testing cycle...

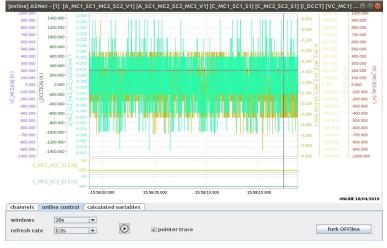
mix source as wanted



access data inside archive

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online oscilloscope feature



On dedicated user PC an online view is available to monitor each channel (kHz or process). It is particularly useful for testbench or full-scale test configurations.

cea



A few **mathematical functions** are available in viewer. So are some **calculated variables**. But for more in depth analysis just **export** a data subset and work elsewhere with a spreadsheet software or other numerical analysis tool

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channels operatic x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] 0 12 marker	's label	11-90.000 12:41:95.000 value	xa xb	12:41:40.0	C3-C26 γ for Σ = 4 (QB context) frequency: 10000H 2 # path = file:/aux/dev/ki/aanet-less 3 # variables = CT-C5 [BOB_1SA_ 4 # range = 4999900 us - ridx=495 5 # filter = no filter 6 # encoding: UTF-8 - line-ending.wi 7 # data-format.text	CT-C5_BOB_1_S/ B z PRE:50000(5.00 tbench/R3B/R3B-e 1B,CT-C5_BOB_3 99 - 21/03/2012-1 n - decimal-separa	Launch export 0000s) POST:50000(5.0 bil:120321-10_21_39.TR SA_2B,CT-C6_BOB_2 1:21:34.784 -> 500000 0cr NaN: NaN - digits-i	000000s) with triager at 21 IIG/ IL_SA_1B,CT-C6_BOB_2 us - ridx=50000 - 21/03/2/ infraction:8	0% 1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76		783 -> 21/03/2012 11:21:4	44.783)
	TRIG_Q_ACQ1-I	M-[CA] 0 1 12 12 marker	iabel 12-M		xa xb	12:41:40.0	C9:C26 for Σ = A # (QB context) frequency: 10000H # path = file:/aux/dev.ki/asnet-tes # variables = CT-C5 BOB_1SA. # mange = 4999900 us - ridx=495 # filter = no filter # ancoding: UTF-8 - line-ending.wi # data-format.text # extraction done by beps.asnet.I. # extraction done by beps.asnet.I.	CT-C5_BOB_1_S/ B z PRE:50000(5.00 tbench/R3B/R3B- 1B,CT-C5_BOB_3 99 21/03/2012-1 n - decimal-separa sxpart at lundi 06-0	Launch export	000000s) with trigger at 21 IIG/ LISA_1B.CT-C6_BOB_21 us - ridx=50000 - 21/03/21 in-fraction:8 ard on 132.166.14.30(sisp	0% 1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.78 0ck30)	M II II II II II II II II II	.783 → 21/03/2012 11:21: 0B_4L_SA_2B,CT-C8_DU	44.783) UP_1-3M_SA_3B
	TRIG_Q_ACQ1-I	M-[CA] 0 12 marker 21_V3_N_S 226 0BINE_M	rs label 12-M	value 1 36.15 g/s 1160.392 A	xa xb	12:41:40.0	C3:C26 ▼ fw ∑ ≡ 1 # QB context) frequency: 10000H 1 2 # path = file:/aux/dev.ki/asnet-tes 2 # path = file:/aux/dev.ki/asnet-tes 3 # variables = CT-C5 BOB 1 SA 4 4 # range = 4999900 us - ridx=498 5 # filter = no filter 6 # nccoling:UTF-8 - line-ending.wi 7 # data-format.jcstt 8 # extraction done by heps asnet.I 9 9 delta in us - sample relative index 1 1 1 1	CT-C5_BOB_1_S/ B PRE:50000(5.00 tbech://R3B/R3B-6 1B,CT-C5_BOB_3 999 - 21/03/2012-1 n - decimal-separa separt at lundi 06-(timestamp(s)	Launch export 0000s) POST:5000(5.0 11-120221-10_21_39.TR SA_2B,CT-C6_BOB_2 1:21:34.784 -> 500000 tor NaN:NaN - digits-1 05-0212_19:08:25 by jalic CT-C5_BOB_1_SA_1B	000006) with trigger at 21 IG/ ILSA 1B.CT-C6 BOB 2 us - fdg=50000 - 21/03/2 in-fraction.8 ard on 132.166.14.30(sisp CT-C5_BOB_3_SA_2B	09 1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 012-11:21:44.76 012-11:21:44.76	 II III II III IIII III IIII IIII IIII IIII III III	783 -> 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU	44.783) UP_1-3M_SA_3B U_SA_1B CT-C7
х: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] 0 1 1 1 1 1 1 1 2 1 2 2 2 2 2 2 2 2 2 2 2 3 8 1 1 2 2 2 3 1 5 2 2 3 1 5 2 2 5 2 5 2 5 5 5 5 5 5 5 5 5 5 5 5 5	iabel 12-M	value 1 36.15 g/s 1160.392 A -0.149 mV	xa xb	12:41:40.(reglin(U_/	C9:C26	CT-CS_BOB_1_S/ B PRE-5000(5.00 tbench/R3B/R3B- 18,CT-C5_BOB_3 99 - 21/03/2012-1 n - decimal-separa Export at lundi 06- timestamp(s) -4,99990000	Launch export 0000s) POST:50000(5.0 11-120321-10_21_39.17 15A_2B_CT-06_BOB_2 121:34.784 -> 5000000 tor Nah:NaN - digits-1 8-2012 19:08:25 by jalla CT-C5_BOB_1_5A 0:00259404	000000s) with trigger at 21 137 137 139 139 139 139 139 145 145 145 145 145 145 145 145	0% 1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 0025430) SCK30) SCT-C6_BOB -0.00534066	139.783 (21/03/2012 11:21:34 57_BOB_4U_SA_18,CT-C7_B 83 _2L_SA_18_CT-C6_BOB_2U _0.00045777	.783 → 21/03/2012 11:21:/ OB_4L_SA_2B,CT-C8_DL 	44.783) UP_1-3M_SA_3B U_SA_1B_CT-C7 -0,004
x: 12:41:24.848	TRIG_Q_ACQ1-I ons vmaths DUP FT22 ions I B0 JD1- M22	M-[CA] 0 12 marker 21_V3_N_S 226 0BINE_M	rs label 12-M	value 1 36.15 g/s 1160.392 A	xa xb	12:41:40. reglin(U_/	C3:C26 ▼ fw ∑ ≡ 1 # QB context) frequency: 10000H 1 2 # path = file:/aux/dev.ki/asnet-tes 2 # path = file:/aux/dev.ki/asnet-tes 3 # variables = CT-C5 BOB 1 SA 4 4 # range = 4999900 us - ridx=498 5 # filter = no filter 6 # nccoling:UTF-8 - line-ending.wi 7 # data-format.jcstt 8 # extraction done by heps asnet.I 9 9 delta in us - sample relative index 1 1 1 1	CT-C5_BOB_1_S/ B PRE:50000(5.00 tbech://R3B/R3B-6 1B,CT-C5_BOB_3 999 - 21/03/2012-1 n - decimal-separa separt at lundi 06-(timestamp(s)	Launch export 0000s) POST.50000(5.0 11-120321-10_21_39.TR 15A_2B_CT-06_BOB_2 121:34.784 ~> 5000000 tor NaN:NaN - digits-1 B-2012_19.08:25 by jalle CT-C5_BOB_1_SA_1B -0,00259404 -0,00229404 -0,003294406	000000s) with trigger at 21 137 137 138 139 139 132, 168, 157, 266, BOB _2 132, 168, 153, 266, 143, 30 132, 166, 143, 30 133, AB 143, 30 152, 99 -0,00015259 -0,00015259 -0,00015255	07 1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 012-11:21:44.76 000534066 0.00595102 -0.00625620	2L_SA_1B 0.00076295 -0.00076295 -0.00076295	.783 → 21/03/2012 11:21:4 OB_4L_SA_2B,CT-C8_DU -0.00076295 -0.00137331 -0.00137331	44.783) UP_1-3M_SA_3B U_SA_1B CT-C7 -0.004 -0.005 -0.005
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] marker 1226 226 227 226 227 230_HZ_VI	Iabel 12-M	value 1 36.15 g/s 1160.392 A -0.149 mV	xa xb	12:41:40.	C9:C26 ▼ fe/ ∑ = 1 # (GB context) frequency: 10000H 1 1 1 4 1	CT-C5_BOB_1_S/ z PRE-50000(5.00 bench/Y38/R384 HB,CT-C5_BOB_3 999 + 21/03/2012-1 n - decimal separa sxort at lundi 064 limestam(r6) 4.9990000 4.9990000 4.9990000	Launch export 0000s) POST:50000(5.0 11-120221-10_21_39.TR 5A_2B_CT-C6_BOB_2 121:34.784 -> 5000000 cor Nah: Nah - digits-i 8-2012 19:08:25 by jaile CT-C5_BOB_1_SA_1B -0.00255404 -0.0025440 -0.0035088	0000005) with trigger at 21 167 167 167 168 168 - 168 - 168 - 168 168 - 168 - 168 - 168 168 - 168 - 168 - 168 - 168 - 168 168 - 168	0% 1/03/2012 11:21 U_SA_2B,CT-C 00[2-11:21:44.76 000534066 -0,00534066 -0,00595102 -0,00625620 -0,0064584	II 139.783 (21/03/2012 11:21:34. 57.BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00075259 -0.00045777	.783 → 21/03/2012 11:21:4 OB_4L_SA_2B,CT-C8_DU _SA_2B_CT-C7_BOB_41 -0,00176295 -0,00137331 -0,0016813 -0,0016813	44.783) UP_1-3M_SA_3B U_SA_1B CT-C7 -0,005 -0,005 -0,005 -0,005
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] M-[CA] marker 1 V3 N Si 226 BINE M b2 V1 SNET_DL-M	Iabel 12-M	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 H2 1	xa xb	12:41:40.	C9:C26 F(w) ∑ = A C9:C26 F(w) ∑ = A F(b) ∑ = F(b)	CT-C5_BOB_1_S/ B z PRE:50000(5.00 tbench/PXB/R38 FB,CT-C5_BOB_3 99 + 21/03/2012-1 n - decimal-separa stat lundi 06-4 timestam(s) -4.99990000 -4.99990000 -4.99960000 -4.99960000	Launch export 0000s) POST:5000(5.0 11-120221-10_21_39.TR 5A_2B_CT-C6_BOB_2 1:21:34.784 -> 500000 0cc NaN:NaN - digits-1 8-2012 19:08:25 by jalls 0:00259404 -0.00329440 -0.00381476 -0.0028922	000006) with trigger at 21 IG/ L SA 1B.CT-C6 BOB 2 in reaction 132 166.14.30(sisp CT-C5 BOB 3 SA 2B -0.00015259 -0.00015259 -0.00045777 -0.00045777	0% 1/03/2012 11:21 U SA 28,CT-C 012-11:21:44.76 -0,00534066 -0,00595102 -0,00595102 -0,00564584 -0,00564584	// // 139.783 (2103/2012 11:21:34) 77 BOB 4U_SA_1B, CT-C7_B 83 _2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00045777 -0.00045777 -0.00045777 -0.00045777 -0.00045777 -0.00045777 -0.00045777 -0.00045777	783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU 	44.783) UP_1-3M_\$A_3B USA_1B_CT-Ci -0.004 -0.005 -0.005 -0.004 -0.004
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] M-[CA] marker 1 V3 N Si 226 BINE M b2 V1 SNET_DL-M	Iabel 12-M	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 H2 1	xa xb	12:41:40.	C9:C26 F(a) ∑ = A # [QB context] frequency: 10000H # path = file:/aux/devkt/asnet-tes # variables CT-C5_B08_1_SA, # range = 4999900 us - rigk=495 # filer = no filter # data-format.text #	CT-C5_BOB_1_si B z PRE:50000(5.00 bbncb/P3B/R38- B z PRE:50000(5.00 bbncb/P3B/R38- g99 + 21/03/2012-1 n-decimal separa x.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99940000	Launch export 0000s) POST:50000(5.0 11-120321-10_21_39.TR 5A_2B.CT-06_BOB_2 121:34.784 -> 5000000 tor Nat: NaN - digits-i 8-2012 19:08:25 by jalie CT-C5_BOB_1_SA_1B -0.00259404 -0.00259404 -0.00320440 -0.00381476 -0.00389922	000000s) with trigger at 21 130/ L SA, 1B,CT-C6, BOB 2 us - ridg=50000 - 21/03/20 in-fraction: 8 2 CT-C5, BOB 3, SA, 28 -0,00015259 -0,00015295 -0,00015295 -0,00015295 -0,00015295 -0,00015295 -0,00015295 -0,00015295	0% 1/(03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 0,00534066 -0,00595102 -0,00595102 -0,00564584 -0,00564584	II 339.783 (21/03/2012 11:21:34. 57_BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259	.783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU _SA_2B CT-C7_BOB_41 -0.00076295 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.0016813 -0.00076295 -0.00076295	44.783) UP_1-3M_SA_3E U_SA_1B_CT-C -0.00 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000 -0.000
х: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] marker 21 V3 N S 226 BINE M b2 V1 30 HZ V1 230 HZ V1 230 HZ V1 204	s label 12-M	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 HZ 1 25.17 mbar 2	xa xb	12:41:40.	C3:C26 ▼ feld ∑ = 1 # (QB context) frequency: 10000H 2 # path = file:/aux/dev.ki/asnet-less 2 # path = file:/aux/dev.ki/asnet-less 5 # file:/aux/dev.ki/asnet-less 3 # variables = CT-C5 B05 1, SA. 4 # range = -4999900 us - ridx=-493 5 # filer = no filer 6 # noccing: UTF-8 - line: ending: with the second	CT-C5_BOB_1_S/ B z PRE:50000(5.00 bench/Y8B/R38 4) g99 - 21/03/2012-1 0 - decimal-separa 2004 g1 lundi 064 timestamp(s) -4.99990000 -4.99990000 -4.99990000 -4.99960000 -4.99960000 -4.99960000 -4.99950000	Launch export 0000s) POST:5000(6.0 11-120221-10_21_39.TR 5A_28_CT-C6_6 DOB_2 12:1:34.784 -> 5000000 0cc, - NaN:NaN - digits-1 8-2012_19:08:25 by jalle CT-C5_BOB_1_SA_1B -0,00259404 -0,00329440 -0,00329440 -0,0035958 -0,00289922 -0,00289922 -0,0035958	000005) with trigger at 21 IG/ ILSA 1B.CT-C6_BOB_2 us - ridx=50000 - 21/03/2 in-fraction: 8 CT-C5_BOB_3_SA_2B -0.00015259 -0.00015259 -0.00076255 -0.00045777 -0.00045777 -0.00045777 -0.00045777	09 1/03/2012 11:21 U SA 28.CT-C 012-11:21:44.78 -0.00534066 -0.00595102 -0.00625620 -0.00664584 -0.00564584 -0.00564584 -0.00564584 -0.00564584	A II 139.783 (21/03/2012 11:21:34) 57, BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295	783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU -0,00076295 -0,00137331 -0,0016813 -0,00076295 -0,00076295 -0,00076295 -0,00076295 -0,00076295 -0,00076295	44.783) UP_1-3M_\$A_3E U_SA_1B CT-C -0,000 -0,000 -0,000 -0,000 -0,000 -0,000 -0,000 -0,000 -0,000
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] marker 2266 2266 2264 2264 2205 2205 2005 20	Iabel 12-M	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 HZ 1 25.17 mbar	xa xb	12-41:40.	C9:C26 F(a) ∑ = A # [QB context] frequency: 10000H # path = file:/aux/devkt/asnet-tes # variables CT-C5_B08_1_SA, # trange = 4999900 us - rigk=495 # filer = no filter # data-format.text	CT-C5_BOB_1_si B z PRE:50000(5.00 bbncb/P3B/R38- HB,CT-C5_BOB_3 999 + 21/03/2012-1 n-decimal separa xport at lund 06-4 Limestam(6) 4,99990000 4,99990000 4,99990000 4,99960000 4,99960000 4,99960000 4,99960000 4,99960000 4,99960000	Launch export 0000s) POST:50000(5.0 11-120321-10_21_39.TR 5A_2B.CT-06_BOB_2 121:34.784 -> 5000000 tor Nat: NaN - digits-i 8-2012 19:08:25 by jalie CT-C5_BOB_1_SA_1B -0.00259404 -0.00259404 -0.00320440 -0.00381476 -0.00389922	000000s) with trigger at 21 130/ L SA, 1B,CT-C6, BOB 2 us - ridg=50000 - 21/03/20 in-fraction: 8 2 CT-C5, BOB 3, SA, 28 -0,00015259 -0,00015295 -0,00015295 -0,00015295 -0,00015295 -0,00015295 -0,00015295 -0,00015295	0% 1/(03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 0,00534066 -0,00595102 -0,00595102 -0,00564584 -0,00564584	II 339.783 (21/03/2012 11:21:34. 57_BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259	.783 → 21/03/2012 11:21:- OB_4L_SA_2B,CT-CB_DU -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00137331	44.783) U_SA_1B CT-C -0.000 -0.00
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] marker 21 V3 N S: 226 BINE M b2 V1 30 HZ VI 30 HZ VI 2204 2004 200	s label 12-M ESSE i6[t = _CT_C5_B0B_1_3_5/ I7[p = _CT_C5_B0B_1_5A_1 8[d = _CT_C5_B0B_3_5A]	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 HZ 1 2.1.7 mbar 2.1.7 mbar 4.38; 18; 28;	xa xb	12:41:40.	C9:C26 F(w) ∑ = A A (000 (000	CT-C5_BOB_1_siz B z PRE-50000(5.00 bbnc/r/R3/R38 B z PRE-50000(5.00 bbnc/r/R3/R38 g 99 z 1/03/2012-1 p - decimal-separa xport at lundi 06-4 Limestamp(6) x9990000 x99970000 x99960000 x9990000 x99920000	Launch export 0000s) POST.50000(5.0 11-120321-10_21_39.17 15A_2B_CT-06_BOB_2 121:34.784 -> 5000000 1cr Nabi NaN - digits-1 8-2012 19:08:25 by jalite CT-C5_BOB_1_SA_1B -0.0025940 -0.0025944 -0.00320440 -0.00289922 -0.00259058 -0.00289922 -0.003250958 -0.00289922 -0.003250958	000000s) with trigger at 21 137 137 138 139 139 139 139 139 131 132 132 132 132 133 133 133	1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 -0.00534066 -0.00595102 -0.00564584 -0.00564584 -0.00564584 -0.00564584	II 339.783 (21/03/2012 11:21:34. 57_BOB_4U_SA_18,CT-C7_B 83	783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU -0,00076295 -0,00137331 -0,0016813 -0,00076295 -0,00076295 -0,00076295 -0,00076295 -0,00076295 -0,00076295	44.783) U_SA_1B CT-C -0.00
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] marker marker 226 BBINE M b2 VI 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 2204 201	's] label 12-M TESSE 16 t = _CT_C5_B0B_1_3_SA 17 p = _CT_C5_B0B_1_SA_1 18 dp = _CT_C5_B0B_3_SA 18 dp = _CT_C5_B0B_3_SA. 19 F = he_TOV(t,p,dp,C)	value 1 36.15 g/s 36.15 g/s 1160.392 A -0.149 mV 162.00 HZ 1 12.00 HZ 1 25.17 mbar 4.38; 18; 26; 28; 28; 28; 28; 28; 28; 28; 28; 28; 28	xa xb	12:41:40.	C9:C26 fe/∂ ∑ = 1 # (QB context) frequency: 10000H 1 A 1 # (QB context) frequency: 10000H 2 # path = file:/aux/devkitasnet-test 3 # variables CT-C5, BOB_1SA, 4 # range = 4999900 us - ridx=495 3 # variables CT-C5, BOB_1SA, 4 # range = 4999900 us - ridx=495 5 # filter no filter 6 # extraction done by heps, sared, I 9 delta in us - sample relative index 10 4999900 us - ridx=49999 12 -4999700 us - ridx=49999 11 4999600 us - ridx=49996 13 -499900 us - ridx=49990 15 4999100 us - ridx=49991 16 -499900 us - ridx=49992 16 4999100 us - ridx=49991 19 -499910 us - ridx=49991 1999100 us - ridx=49992 10 19 -499910 us - ridx=49992 10 -499920 us - ridx=49992 18 -499910 us - ridx=49980 14 -499920 19 -499910 us - ridx=49991 19992 4999900 us - ridx=49992 10 -499910 us - ridx=49992 <	CT-C5_BOB_1_s/ B z PRE:50000(5.00 bench/P3B/R38 H.CT-C5_BOB_3 999 +21/03/2012-1 n - decimal separa 5x90f gt lundi 06-4 limestamp(6) 4.99990000 4.99990000 4.99990000 4.99950000 4.99950000 4.99950000 4.99950000 4.99920000 4.99920000 4.99920000 4.99910000 4.99910000 4.99900000 4.99910000 4.99900000 4.99910000 4.99910000 4.9990000 4.999000 4.99900000 4.999000000 4.99900000 4.99900000 4.9	Launch export 0000s) POST:50000(5.0 11-120321-10_21_39.TR 5A_2B.CT-C6_BOB_2 121:34.784 -> 5000000 0rr Nah:NaN - digits-i 8-2012 19:08:25 by jalie CT-C5_BOB_1_SA_1B -0,0025940 -0,0025940 -0,0025940 -0,0025940 -0,00259952 -0,00350958 -0,00289922 -0,00350958 -0,00289922 -0,00350958 -0,00289922 -0,00350958 -0,00289922 -0,00350958 -0,00289922 -0,00350958 -0,00289922 -0,00350958 -0,003595 -0,003595 -0,003595 -0,003595 -0,003595 -0,003595 -0,003595 -0,003595 -0,003595 -0,00359 -0,00359 -0,00359 -0,0035 -0,003 -0,003 -0,003 -0,00 -0,	000000s) with trigger at 21 160/ L SA 1B.CT-C6 BOB 2 us - ridg=50000 - 21/03/2 in-fraction: 8 2 CT-C5 BOB 3 SA 28 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259	09 1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 0-00534066 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00554066 -0.0055406 -0.0055406 -0.0055406 -0.0055406 -0.0055406 -0.00554584	II 339.763 (21/03/2012 11:21:34. 57.BOB_4U_SA_1B,CT-C7_B 83 21_SA_1B CT-C6_BOB_2U 0.00045777 -0.00015259	.783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU .00076295 -0,0017331 -0,0017331 -0,0017631 -0,001	44.783) UP_1-3M_SA_3E UP_1-3M_SA_3E -0.004 -0.005 -0.006
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] M-[CA] marker 1 V3 N S: 226 108INE_M 52 V1 300 HZ VIT 300 HZ VIT 300 HZ VIT 300 HZ VIT 4 4 4 4 4 4 4 4 4 4 4 4 4	s label 12-44 ESSE (f t = _CT_C5_B0B_1_3_S4 (7 p = _CT_C5_B0B_1_SA 18 dp = _CT_C5_B0B_3_SA (9 F = he_f10w(tp, pdp, C, 0) // make plot to vite	value 1 36.15 g/s 36.15 g/s 1160.392 A -0.149 mV 162.00 HZ 1 12.00 HZ 1 25.17 mbar 4.38; 18; 26; 28; 28; 28; 28; 28; 28; 28; 28; 28; 28	xa xb	12:41:40.	C9:C26 F(w) ∑ = A C9:C26 F(w) ∑ = A F(B) ∑ = F(B)	CT-C5_BOB_1_s/ B z PRE_5000(5.00 tbench/R3B/R3B BBCT-C5_BOB_3 g9 + 21/03/2012-1 n - decimal-separa Stopp 4 there Limestamp(s) -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99920000 -4.99920000 -4.99920000 -4.99920000 -4.99930000 -4.99930000 -4.99930000 -4.99930000	Launch export 0000s) POST.50000(5.0 11-120321-10_21_39.TR 58_2B_CT-C6_BOB_2 121:34.784 -> 5000000 0cr NaN:NaN - digits-1 8-2012_19.08:25 by jalle CT-C5_BOB_1_SA_1E -0.00259404 -0.00329440 -0.003294476 -0.0035958 -0.00259922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00229922 -0.0035958 -0.00292 -0.00292 -0.00292 -0.00292 -0.00292 -0.00292 -0.00292 -0.00292 -0.0029 -0.002	000000s) with trigger at 21 13/ 13/ 13/ 13/ 13/ 13/ 13/ 14/ 13/ 14/ 13/ 13/ 16/ 16/ 16/ 16/ 16/ 16/ 16/ 16	1/03/2012 11:21 U_SA_2B.CT-C 012-11:21:44.76 C(30) C(3	339.783 (21/03/2012 11:21:34. 21.39.783 (21/03/2012 11:21:34. 27.BOB_4U_SA_1B,CT-C7_B 83 21.5A_1B CT-C6_BOB_2U 0.00045777 -0.00015259	783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-C8_DU -0,00076295 -0,00137331 -0,00076295 -0,00137331 -0,00076295 -0,00137331 -0,00076295 -0,00137331 -0,00137331 -0,00137331 -0,00137331 -0,00137331 -0,00137331 -0,00137331	44.783) UP_1-3M_SA_3E UP_1-3M_SA_3E -0,000 -0,0
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] marker 1 V3 N S 226 11 V3 N S 226 12 V3 N S 226 130 HZ VI 300	s label 12-M ESSE (6 t = _CT_C5_B0B_1_3_S/ 7 p = _CT_C5_B0B_1_SA_1 8 dp = _CT_C5_B0B_1_SA_1 8 dp = _CT_C5_B0B_3_SA_1 9 F = he_f10w(t.p.dp,C, 0 //make.plot.to.viet 11 scf(0) 21 ccf(0)	value 1 36.15 g/s 36.15 g/s 1160.392 A -0.149 mV 162.00 HZ 1 12.00 HZ 1 25.17 mbar 4.38; 18; 26; 28; 28; 28; 28; 28; 28; 28; 28; 28; 28	xa xb	12:41:40.	C9:C26 fee ∑ = 1 # (CB context) frequency: 10000H 1 A 1 # (CB context) frequency: 10000H 2 # path = file./aux/devkt/asnet-less 3 # variables CT-C5, BOB, 1, SA, 4 # range = 4.999900 us - rigk=495 3 # variables CT-C5, BOB, 1, SA, # # # 4 # range = 4.999900 us - rigk=495 # # # 5 # filter = no filter # # # # # 6 # encoding:UT-F8 - line-ending.vi # # # # # 0 489400 us - rigk=4999 14 4999900 us - rigk=4999 # # # # 12 499700 us - rigk=49990 16 499910 us - rigk=49991 #	CT-C5_BOB_1_si B z PRE:50000(5.00 bbncb/P3B/R38- B z PRE:50000(5.00 bbncb/P3B/R38- g99 - 21/03/2012-1 n- decimal separa checimal separa x99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99990000 4.99980000 4.99890000 4.99890000 4.99890000 4.99890000 4.99890000	Launch export 0000s) POST:50000(5.0 11/20321-10_21_39.TR 5A_2B_CT-06_BOB_2 121:34.784 -> 5000000 tor., - NaN NaN - digits-i 8-2012 19:08:25 by jalia 0-0025940 -0,0025940 -0,0025940 -0,0025940 -0,0025940 -0,00259922 -0,00350958 -0,00289922 -0,00289922 -0,00289922 -0,00289922 -0,00289922 -0,00289922 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,002892 -0,0028 -0,002 -0,0028 -0,002 -0,002 -0,002 -0,002 -0,002 -0,002 -0,	000000s) with trigger at 21 130/ L SA_1B.CT-C6_BOB_2 us - fidx=50000 - 21/03/20 and fraction: 8 and on 132.166.14.30(sisp CT-C5_BOB_3_SA_2B -0.0001529 -0.0001529 -0.00015295 -0.00015295 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00015259 -0.00045777	1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.78 -0.00595102 -0.00595102 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00534066 -0.00534066 -0.00534066 -0.00534066 -0.00534066	II 339.783 (21/03/2012 11:21:34. 57 BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B_CT-C6_BOB_2U 0.00045777 -0.00015259	.783 → 21/03/2012 11:21: OB_4L_SA_2B,CT-CB_DU _SA_2B CT-C7_BOB_41 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00076295 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.0016813	44.783) UP_1-3M_SA_3E UP_1-3M_SA_3E -0.00 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.0000 -0.00000000
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-(CA) marker 1 marker 2266 2204 2204 230 H2 VII 230 H2 VII 2204 24 26 26 26 26 26 26 26 26 26 26	's] abel 12-M TESSE 	Value 1 36.15 g/s 36.15 g/s 1160.392 A -0.149 mV 162.00 HZ 1 1 25.17 mbar 25.17 mbar 4.38; 18; 28; 78; 78; 78; 78; 78; 78; 78; 78; 78; 7	xa xb	12:41:400	C9:C26	CT-C5_BOB_1_S/ B z PRE-50000(5.00 bench/YSB/R38 4) BCT-C5_BOB_3 99 - 21/03/2012-1 n - decimal-separa steedt at lundi 06-4 limestam(s) -4.99980000 -4.99960000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99950000 -4.99850000 -4.99850000	Launch export 0000s) POST:5000(5.0 11-12021-10_21_39.TR 5A_2B,CT-C6 BOB_2 121:34.784 -> 5000000 007 NeN: NeN - digits-1 8-2012_19:08:25 by jaile CT-C5 BOB_1_SA_1B -0.00259404 -0.00381476 -0.00289922 -0.00350958 -0.00289922 -0.0028922 -0.00289922 -0.00289922 -0.00289922 -0.00289922 -0.00289922 -0.002892 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -0.0028 -	000005) with trigger at 21 IG/ I.SA, 1B,CT-C6, BOB,2 us - ridx=50000 - 21/03/2 ard on 132,166,14,30(sisp CT-C5, BOB,3, SA, 2B -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00015259 -0,00045777 -0,0004577 -0,00045777 -0,0004577 -0,00045777 -0,00	1/03/2012 11:21 U_SA_2B_CT-C 012-11:21:44.78 0-00534066 -0.00595102 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00595102 -0.00595102	M II 139.783 (21/03/2012 11:21:34 77.BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00015259	783 → 21/03/2012 11:21: OB_4L_SA_2B_CT-C8_DU 0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00176295 -0.00176295 -0.0017331 -0.0017631 -0.0013735 -0.0013735 -0.0013735 -0.0013735 -0.	44.783) UP_1-3M_SA_3E U_SA_1B CT-C -0,000
x: 12:41:24.848	TRIG_Q_ACQ1-I	M-(CA) marker 1 marker 2266 2204 2204 230 H2 VII 230 H2 VII 2204 24 26 26 26 26 26 26 26 26 26 26	<pre>'s label label l2-M 'ESSE 'f = _CT_C5_B0B_1_3_S4 'f = _CT_C5_B0B_1_SA l8 dp = _CT_C5_B0B_3_SA l9 F = he_f10w(tp, hdp, C, 0 // make plot to vic il scf(0) 2 cclf(0) 3 subplot(2,1,1) 3 subplot(2,1,1)</pre>	Value 1 36.15 g/s 36.15 g/s 1160.392 A -0.149 mV 182.00 HZ 1 25.17 mbar 25.17 mbar 4.38; 18; 28; 78H0) 59W if (*%s@*,varSymbols)	xa xb	12-41:40 reglin(U_	C9:C26 fer ∑ = 1 # (CB context) frequency: 10000H 2 # path = file./au/devki/fasnel-less 3 # variables CT-C5_ BOS_1_SA_4 4 # range = 4999900 us - tidx=495 5 # filgs = no filgs 6 # encoding: UTF-8 - line-ending:wi 7 # data-formatity 8 # extraction done by heps_asnel. I 9 delta in us - sample relative index 12 -4999700 us - tidx=-49995 13 -4999800 us - tidx=-49996 14 -4996700 us - tidx=-49996 14 -4999710 us - tidx=-49991 15 -4999400 us - tidx=-49992 16 -4999500 us - tidx=-49992 17 -4999200 us - tidx=-49993 18 -4999100 us - tidx=-49992 1999200 us - tidx=-49992 -4999200 us - tidx=-49992 1999200 us - tidx=-49992 -4999300 us - tidx=-49993 20 -4999300 us - tidx=-49993 21 -4998670 us - tidx=-49986 22 -4998670 us - tidx=-49986 23 -4998670 us - tidx=-49	CT-C5_BOB_1_sig B z PRE-50000(5.00 bbnch/YR3/R38 B z PRE-50000(5.00 bbnch/YR3/R38 B z PRE-5000(5.00 B g9 - 21/03/2012-1 p - decimal-separa xport at lundi 06-4 Limestam(c) x.99970000 x.99960000 x.99960000 x.99960000 x.99960000 x.9990000 x.9990000 x.9990000 x.99900000 x.99900000 x.99900000 x.99900000 x.99900000 x.99900000 x.99900000 x.99900000 x.99900000 x.99800000 x.99800000 x	Launch export 0000s) POST.50000(5.0 11-120321-10_21_39.178 5A_2B_CT-06_BOB_2 121:34.784 -> 5000000 1cr Nabi NaN - digits-1 8-2012 19:08:25 by jalite CT-05_BOB_1_SA_1B -0.00325440 -0.0025944 -0.003250458 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028922 -0.00350958 -0.0028952 -0.00350958 -0.0028952 -0.00350958 -0.0028952 -0.00350958 -0.0028952 -0.00350958 -0.0028952 -0.00350958 -0.002895 -0.00350958 -0.003595 -0.0035958 -0.003595 -0.0035958 -0.0035958 -0.0035958 -0.0035958 -0.0035958 -0.0035958 -0.0035958 -0.0035958 -0.003595 -0.0035958 -0.003595 -0.003595 -0.003595 -0.003595 -0.003595 -0.003595 -0.003595 -0.00359 -0.003595 -0.00359 -0.003595 -0.0035 -0.005 -0.005 -0.005 -0.005 -0.005 -0.	000000s) with trigger at 21 137 137 138 139 139 139 139 139 139 139 139	1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 -0.00534066 -0.00595102 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00595102 -0.005951	II 339.783 (21/03/2012 11:21:34. 57_BOB_4U_SA_18,CT-C7_B 83 2L_SA_1B_CT-C6_BOB_2U 0.00045777 -0.00015259	.783 → 21/03/2012 11:21:- OB_4L_SA_2B,CT-CB_DU -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.0016813 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00137331 -0.00167649	44.783) UP_1-3M_SA_3B UP_1-3M_SA_3
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x: 12:41:24.848	TRIG_Q_ACQ1-I	M-[CA] 1 1 1 1 1 1 1 1 226 1 1 1 1 226 1 1 1 1 1 1 1 1 1 1 1 1 1	<pre>s label l2-M rESSE f =CT_C5_BOB_1_3_SA rp =CT_C5_BOB_1_SA_1 g =CT_C5_BOB_1_SA_1 g =CT_C5_BOB_3_SA g =bT_C0w(t,p,dp,C,C) g /make plot to vie l scf100 s subplct(2,1,1) 4 varset_str = spintfif (s xitle("f(time) if warset</pre>	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 HZ 1 12.17 mbar - 25.17 mbar - 27.17 mbar - 28; FRH0) - writ - reged] '; ; t_str)		12:41:40.	C9:C26 F(w) ∑ = A C9:C26 F(w) ∑ = A F(w) ∑ = F(w)	CT-C5_BOB_1_siz B z PRE-50000(5.00 Ubench/PK3B/R36 BLCT-C5_BOB_3 99 21/03/2012-1 0 decimal-separa xpsprd at lundi 06-4 Limestamp(5) 4,99950000 4,99950000 4,99950000 4,99950000 4,99950000 4,99950000 4,99950000 4,99940000 4,99940000 4,99950000 4,99940000 4,99950000 4,99940000 4,99940000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,99870000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,9980000 4,998000	Launch export 0000s) POST:50000(5.0 11-120321-10_21_39.TR 5A_2B_CT-C6_BOB_2 121:34.784 -> 5000000 0cr Neth NelN - digits-1 8-2012 19:08:25 by jaile CT-C5_BOB_1_SA_1B -0.00259440 -0.00381476 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.00289922 -0.00350958 -0.0035095 -0.0035095 -0.0035095 -0.0035095 -0.0035095 -0.0035095	0000005) with trigger at 21 113/ 113/ 113/ 113/ 113/ 114/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 115/ 100/ 100/ 115/ 100/ 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	II 39.783 (21/03/2012 11:21:34. 57.BOB_4U_SA_1B_CT-C7_B 83 2L_SA_1B_CT-C6_BOB_2U 0.00045777 -0.00015259	783 → 21/03/2012 11:21: OB_4L_SA_2B_CT-C8_DU 0.00076295 -0.00137331 -0.00137331 -0.0016813 -0.00137331 -0.0013735 -0.0013735 -0.0013735 -0.0013735 -0	44.783) UP_1-3M_SA_3B
x: 12:41:24.848	TRIG_Q_ACQ1-I	0 M-[CA] 0 12 12 12 12 12 226 19 NE M 12 226 19 NE M 12 2204 12 204 204 204 204 204 205 205 205 205 205 205 205 205	<pre>s label l2-M rESSE f =CT_C5_BOB_1_3_SA rp =CT_C5_BOB_1_SA_1 g =CT_C5_BOB_1_SA_1 g =CT_C5_BOB_3_SA g =bT_C0w(t,p,dp,C,C) g /make plot to vie l scf100 s subplct(2,1,1) 4 varset_str = spintfif (s xitle("f(time) if warset</pre>	value 1 36.15 g/s 1160.392 A -0.149 mV 182.00 HZ 1 125.17 mbar - 25.17 mbar - 27.17 mbar - 28; FRHO) - writ - regel ''; -		12-41:40. reglin(U_	C9:C26 fw ∑ = A # CIB context] frequency: 100001 2 # path = file:/aux/dev/ki/asnet/leg # path = file:/aux/dev/ki/asnet/leg 3 # variables CT-C5 B05 1_SA, # file:/aux/dev/ki/asnet/leg 4 # range = 4999900 us - tdx=495 # tdx=495 5 # filter = no filter # extraction done by heps asnet. 9 detta in us - sample relative index. 4999900 us - tdx=4999 14 4999800 us - tdx=49991 4999900 us - tdx=49991 12 4999700 us - tdx=49991 14999900 us - tdx=49991 14 4999600 us - tdx=49991 15 499970 us - tdx=49991 15 4999100 us - tdx=49991 16 4999300 us - tdx=49992 14 4999200 us - tdx=49992 1499920 us - tdx=49992 14 4999200 us - tdx=49992 1499920 us - tdx=49993 15 499900 us - tdx=49993 1499900 us - tdx=49993 14 4999200 us - tdx=49993 1499920 us - tdx=49993 15 499900 us - tdx=49993 1499900 us - tdx=49993 16 4999300 us - tdx=49993 14999300 us - tdx=49993 17 499820 us - tdx=49986 1499850 us - tdx=49986 21 4998600 us - tdx=49986 1499860 us - tdx=49986 22 4998700 us - tdx=49986 14998650 us - tdx=49986	CT-C5_BOB_1_s/ B z PRE-50000(5.00 Ubench/PK3/PK36 BECT-C5_BOB_3 B z PRE-50000(5.00 B g9 - 21/03/2012-1 n - decimal-separa Szpert at lundi 06-4 Limestam(c) 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99950000 4.99960000 4.99850000 4.99850000 4.99850000 4.99850000 4.99850000 4.99850000 4.99850000 4.99850000 4.99850000 4.99840000	Launch export 0000s) POST.50000(5.0 11/20321-10_21_39.178 5A_2B_CT-C6_BOB_2 121:34.784 -> 5000000 1cr Nabi NaN - digits-1 8-2012 19:08:25 by jalite CT-C5_BOB_1_SA_1B -0.00329440 -0.0025944 -0.00329440 -0.00289922 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.00350958 -0.0028992 -0.0035095 -0.0028992 -0.0035095 -0.0028992 -0.0035095 -0.0028992 -0.0035095 -0.0028992 -0.0028992 -0.0028992 -0.0028992 -0.0028992 -0.0028992 -0.0028992 -0.0028992 -0.00289 -0.0028 -0.0028 -0.	000000s) with trigger at 21 137 137 138 139 139 139 139 139 139 139 139	1/03/2012 11:21 U_SA_2B,CT-C 012-11:21:44.76 -0.00534066 -0.00595102 -0.0064584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00564584 -0.00595102 -0.00564584 -0.00595102 -0.00564584 -0.00595102 -0.00564584 -0.00595102 -0.00564584 -0.00595102 -0.00564584 -0.00595102 -0.00564584 -0.00595102 -0.00564584	III 339.783 (21/03/2012 11:21:34. 57_BOB_4U_SA_1B,CT-C7_B 83 2L_SA_1B CT-C6_BOB_2U 0.00045777 -0.00015259 <	783 → 21/03/2012 11:21: OB_4L_SA_2B_CT-CB_DU -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.00076295 -0.00137331 -0.0016813 -0.00137331 -0.0013733	44.783) UP_1-3M_SA_3B UP_1-3M_SA_3B UP_1-3M_SA_3B UP_1-3M_SA_3B -0.005 -

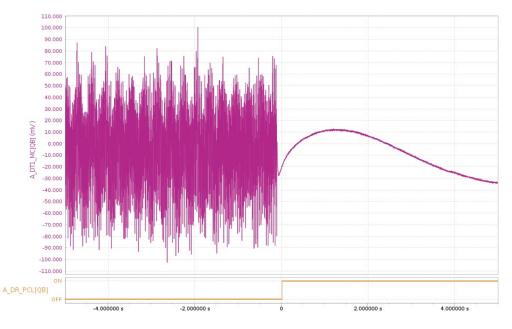
SPECIAL USES



[JT60] Due to data proximity and computational resource NAS may be used for offline jobs. In JT60 we use it to produce a user defined data compilation for each tested coil.

Open 🔻 🖪	F4E-coil_TFC20.cfg ~/asnet-applications/F4E-export/conf	Save	≡ –		×
# export id. test-set = TFC2	typically based on coil number				
variabl # from API_DL- I_BOBINE_M, MAG # from Vblat_V Vb5g1_V1, Vb6at # li # for e (ex:TRIGGER20	st of MSS & HVI variables es = MSS> 4. API DR-M, CP F-M, DUP1 V3 M, DUP2 V3 M, DUP3 V3 M, DUP4 V3 M, DUF HET DL-M, MAGNET_DR-M, MSS_DL-M, MSS_DR-M, OPEM_CP-M, SL1-M, VI_M, SL VIT > , Vb1g1 V1, Vb2at_V2, Vb2g1 V2, Vb3at_V1, Vb3g1 V1, Vb4at_V2, Vb4g1	.2-M_V2_M, L_V2, Vb5a	U_ĀLIM t_V1,		
# ex:	ss settings /process days. we can also use intervals. 25/01/2016, [01/02/2016 > 08/03/2016] [05/01/2018 > 23/01/2018]				
variabl # from Jb1-b2 Vb2at_V2, Vb3at # from CP_F-M, # li # ex: [st HVI & MSS variables es = VI > /1, Jb2-b3 V2, Jb3-b4 V1, Jb4-b5 V2, Jb5-b6_V1, Jbob-LS1_V1, Jbob-LS V1, Vb4T V2, Vb5at V1, Vb6at V2, Vbtat V2, Vpickat V2,				
	Plain Text 👻 Tab Width: 8 💌	Ln 1, Col	1 .	- 11	

[ISEULT - experimental] we are currently trying to analyze miscellaneous noise for instance in correlation with power supply mode. Idea is that in continuous magnet mode, a noise change may indicate something significant.

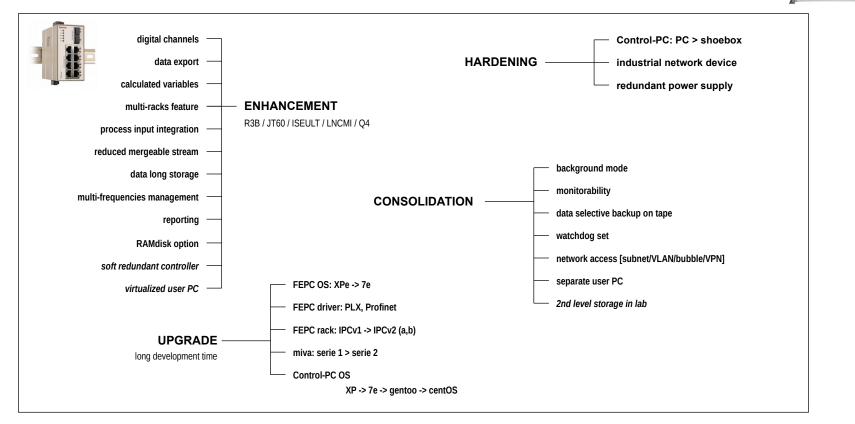


[STAARQ test stand facility (future)] Both analog and digital MSS will be installed. Our legacy analog MSS acquisition system will make its traditional job. It will also record digital MSS input signals and be used as reference for a new acquisition implementation attempt.

ASNET INTERNALS

HANDLING BOTH OPERATION AND DEVELOPMENT

- Sum additional project requests & contexts manage a modular and homogeneous version
- Have an operational & validated solution for operation moderate upgrade, use versioning
- Take into account expected long lifetime choose robust hardware, buy spare
- Allow system evolution work on new deployment window, test on redundant chain, use idle facility, cross project feedback
- Offer maximum availability implement redundancy, add monitoring & reporting, fault-tolerance. Virtualization may also help
- Reduce maintenance constraints be tolerant to degraded mode, include remote access









Feedback on typical unexpected incidents

- Out of order system disk on NAS
- Unexplained NAS ECC memory error with a temporary loss of a 4GB stick
- Emergency stop punch on cabinet before electrical maintenance we were not aware...
- Cement dust environment in an experience hall...
- Flooding in remote backup room after severe weather and building issue

SSD: sensitive use & a bit specific compared to HDD

good bandwidth, constant time access, parallelism prone but caution with write intensive application $\rightarrow \dagger$

- Weared symptoms : file system errors, read-only file system
- Caution with write amplification effect: you may write much more than expected
- On linux compulsory use of ext4 with noatime & discard options
- Caution with swap: no swap or minimize it via swapiness variable
- Increasing disk size gives more lifetime (linear)
- Accurate Monitoring via SMART (nowadays)
- Intermediate RAMdisk minimizes SSD wear



CEA - Saclay

Main limitations:

- \rightarrow Custom hardware is painful to produce & test. Nowadays COTS boards exist
- \rightarrow System is too much person dependent
- \rightarrow Bad initial options we live with: legacy file format, time stamping, FEPC windows platform

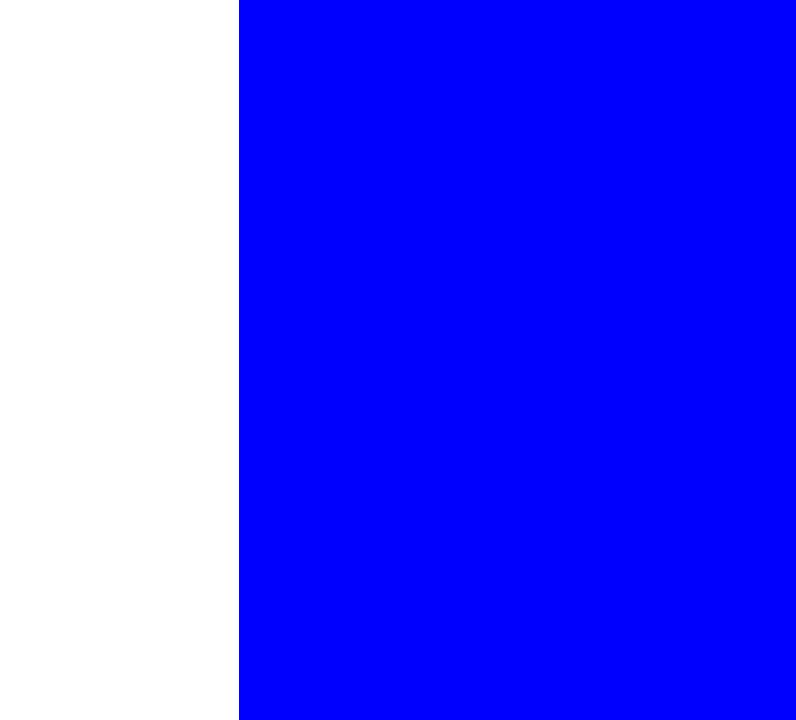
Make it work better (developpement & test in-progress...)

- enhanced anaconda python console for immediate expert analysis
- more integrated math functions: derivative, integration, FFT
- export to standard format: hdf,...
- out-of-band management option
- rewrite fieldbus interface
- data transparency rms / kHz / trigger
- on-line mode with long time windows
- on-demand archiving
- manage acquisition configuration
- manage a experiment database for users

Make it work further

- Use standard framework (EPICS?)
- Use COTS hardware for acquisition layer (CompactRIO, PXI, uTCA?)

RE-BASEMENT NEEDED TO BE COMPATIBLE WITH DIGITAL MSS





A PROTOTYPE IN OPERATION WITH A BEST EFFORT POLICY LONG LIFETIME EXPECTED DEVELOPMENT STILL IN PROGRESS... RE-BASEMENT NEEDED FOR FUTURE

A TEAM WORK

Electronics works project management	F.Molinié
MIVA/MAD design	S.Sube, P.DeAntoni
MIVA/MAD embedded programming	S.Sube
Frontend custom code	C.Walter, J.Allard
Fieldbus interface WordFip/Profinet	G.Durand, J-L.Fallou
Controller core code	C.Walter, J.Allard
Data extraction	C.Walter, J.Allard
Archive, distribution, backup	A.Gomes, P-F.Honoré, J.F.Lecointe, J.Allard
Configuration tool	C.Walter
Visualization tool	J.Allard
Network	C.Walter, A.Gomes, J.Allard
OS	C.Walter, P.Mattei ,J.F.Le cointe, J.Allard
Experience support	C.Walter, J.F.Lecointe, J.Allard
Electrical support	A.Lotodé

THANKS FOR YOUR ATTENTION