On Monday 25/05/09 morning, during the SFTPRO slow extraction operation, beam losses were observed in LSS5 (in 518), where usually no losses are observed. The newly (during the week before) installed quartz for the crystal experiment was rapidly identified as the culprit. As it was not possible to remove the losses by retracting remotely the quartz to its (maximum) parking position, it was decided to make an intervention to try and move it locally. It was indeed possible to retract the quartz even further by 5 mm (in total), which made the losses disappear. The motor was also disconnected at the same occasion to be sure that nothing would move during beam operation.

1) SPS set-up for the 1st UA9 session: From Thursday 18/06 (~ 20:00) to Friday 19/06 (~ 07:00) to prepare the cycle and test the coast at 120 GeV/c

On Thursday morning a long access was given to UA9 to fix the crystal that was too close to the beam. The access and vacuum recovery took more time than expected (as it was scheduled to restart around 15:00), and was made more complicated by a power cut around lunch time. Coasts with beam only started in the early morning, and many controls issues were encountered and (partially) solved or bypassed. There are a few points to follow up there. Eventually some coasts were made and some basic checks were performed with the UA9 detectors. During the intervention, Jonathan Emery from BI took the opportunity to go to BA5 to investigate false measurements with BLM monitors.

Some references of the cycle used during the MD are given in [1]. The cycle name is MD_25.92_120_L18000_2009_V1, whose length is 15 Basic Periods (of 1.2 s), i.e. 18 s. The SPS user Timing of the pulsed function is LHC2 and the RF MMI target LHCMONO. When we go in coast, a sequence is played where we go through several cycles called COASTPR1 (to prepare the coast), COAST1 (which is the coast cycle), COASTRE1 (to recover from the coast cycle). For each of these four cycles, all the timings should be correctly set up.

Some timing problems were noticed and could not be fixed during the session because they required experts' intervention. The injection transfer line (TT10) magnets were pulsing even when the machine was in coast. In particular the magnet MDSH1197 was pulsing leading to periodic orbit distortions (every 18 s) making the alignment and measurement impossible. This was solved for the next session.

The pulsed RF functions were executed in coast instead of the coast ones, for that reason the RF voltage during the acceleration from 26 to 120 GeV/c had to be kept constant in order to have a constant voltage during the coast. This was solved for the next session.

Several SIS interlocks need to be masked in coast [1] and were not, which led to some time lost, but this first session was devoted exactly for that:

- KICKERS_SPSRING (essentially for the MKD_EARLY_ENABLED).
- POWER_CONVERTERS_TT10 (as some could trip during the coast). Switch off the MDSH1197 (otherwise it will trip).
- BLRING_DUMP_CHANNEL_VET.
- If the scraper and or the collimator is used:
    - The scraper status in the SIS should be masked (as there is no update on the coast cycle).
    - When the collimator or the scraper will be moved, the BIC input 8 in BA5 should be masked, as well as the SIS input SPS_SW_PERMIT / BIS_STATE_SPSRING / BIC_SPS_MASK / BIC_BA5_MASK.

The beam was not injected on the COASTPR1. After some investigation it was found that the beam permit was not given at this user timing. We called Etienne Carlier and he set the beam permit in true position with the expert application, which can be found at https://espace.cern.ch/te-dep-abt-ec/default.aspx [1]. Click on: applications => image1. In the table SPS and the column MKP click on: KITS => image2. Launch the application by entering your personal logging nice not SPSOP. Open the combo box and select: KPSBA1 => image3. Click on the menu on: Control => Controller => Remote Kick Setting. Select the

good user timing with the combo box => image4. Click on the button permit to obtain the green light or the red light which correspond at beam permit true or beam permit false and click on apply.

At ~ 05:00 in the morning, we could start some coasts for life-time measurements. The BLMs acquisition was not working and the BWS519H had not yet the option to work in coast. A knob “Scan Now” was implemented after this MD and used during the following sessions. The orbit had to be corrected on the pulsed function, as one cannot do it in coast. The measured tunes were Qx=26.125 and Qy=26.173.

Frequent trips of the SMQ (main quadrupole) power converter stations were observed at the time of the recovery after a coast. These were in fact understood only after the end of the machine study session of 13-14/07/09 and were found to be due to a timing definition problem.

It was checked, on the tune, that trims on coasts can be done using the last 2 points (on the flat top) of the pulsed function (i.e. here on the user LHC2) in the Trim Editor.

The results put in the logbook can be found in [2].

2) SPS set-up for the 2nd UA9 session: From Tuesday 30/06/09 (08:00) to Wednesday 01/07/09 (07:00)

The SPS Multi-Turn (1000 Turn) application was tested and worked successfully on COAST1. The status for the instrumentation in coasts is the following [1]:

- BCT => Click on the “Acquisition in COAST” button and it works.
- FASTBCT => Click on the “Acquisition in COAST” button and it works.
- ORBIT => Click on the “Acquisition in COAST” button. However, it does not work. Therefore, the orbit has to be adjusted in the pulsed cycle.
- SPS-BLM => Works also in coast.
- BWS => A knob has been implemented this year (2009) in the new application to be able to acquire in coast: click on the "Scan Now" button. Use the FESA Navigator Tool to Enable the “Scan Now”:
    - Favorites / FESA Navigator Tool / File / New / Read Only / BWSPS / OK
    - bws50s / GD000… / ALL / BlockScanNow /
    - disableScanNow / False / Set and it is OK
    - Adjust the gain in the BWS application (as clicking on the button “Scan Now” does not send the HV values) and then one can make a measurement.
- SPS-MultiT => Works also in coast.

As said above, we also had frequent trips of the SMQ (main quadrupole) power converter stations, which were observed at the time of the recovery after a coast. These were in fact understood only after the end of the machine study session of 13-14/07/09 and were found to be due to a timing definition problem.

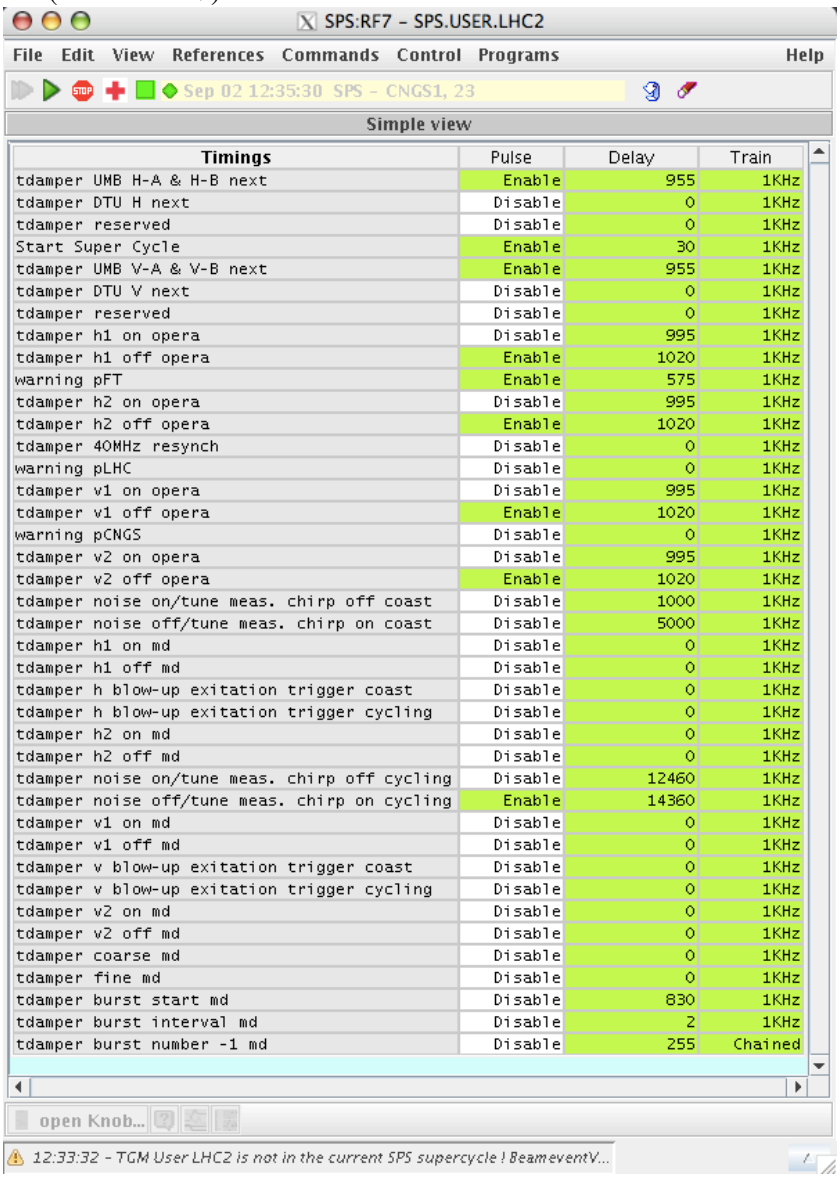
Transverse beam profile measurements were performed with the FWS519H both in pulse and coast mode, and without and with coherent excitation from the transverse dampers, as was used for instance in [3]. In fact for the next MD, a noise excitation, more adapted to the current situation, was implemented and successfully used [1]. The results put in the logbook can be found in [2].

3) SPS set-up for the 3rd UA9 session: From Monday 13/07/09 (17:00) to Tuesday 14/07/09 (09:00)

Wolfgang Hofle requested a reboot of cfv-ba2-ctsrf1 in the morning, which initiated a new timing software for this crate. A noise excitation (in addition to the coherent excitation) from the transverse dampers was now available for this MD, and the way to use one or the other is described below [1]:

- The noise amplitude is controlled by the same ROCS function as the "chirp" for the tune measurement: Chirp for the tune measurement and noise are mutually excluded,

i.e. the timing toggles between chirp and noise. Disable it in the AutoQ otherwise we will excite the beam with the chirp used to measure the tune!
- As concerns the timings (SPS RF7), for the coherent excitation, one has to use tdamper v (or h) blow-up excitation trigger coast (or cycling). This replaces the previous tdamper v (or h) on MD, which should not be used anymore. For the noise excitation (other timings have been defined): tdamper noise on (off) coast (or cycling). We have to enable the ON and to make it OFF, disable the ON and enable the OFF (see Fig. 1).
- For the amplitude there is a function (see Fig. 2) in the Trim Editor (TUNEMEAS), which can be trimmed during the coast (by trimming the last 2 points of the pulsed function at the flat top), for both the horizontal plane (DAMPER-H) and the vertical one (DAMPER-V).



Timings	Pulse	Delay	Train
tdamper UMB H-A & H-B next	Enable	955	1KHz
tdamper DTU H next	Disable	0	1KHz
tdamper reserved	Disable	0	1KHz
Start Super Cycle	Enable	30	1KHz
tdamper UMB V-A & V-B next	Enable	955	1KHz
tdamper DTU V next	Disable	0	1KHz
tdamper reserved	Disable	0	1KHz
tdamper h1 on opera	Disable	995	1KHz
tdamper h1 off opera	Enable	1020	1KHz
warning pFT	Enable	575	1KHz
tdamper h2 on opera	Disable	995	1KHz
tdamper h2 off opera	Enable	1020	1KHz
tdamper 40MHz resynch	Disable	0	1KHz
warning pLHC	Disable	0	1KHz
tdamper v1 on opera	Disable	995	1KHz
tdamper v1 off opera	Enable	1020	1KHz
warning pCNGS	Disable	0	1KHz
tdamper v2 on opera	Disable	995	1KHz
tdamper v2 off opera	Enable	1020	1KHz
tdamper noise on/tune meas. chirp off coast	Disable	1000	1KHz
tdamper noise off/tune meas. chirp on coast	Disable	5000	1KHz
tdamper h1 on md	Disable	0	1KHz
tdamper h1 off md	Disable	0	1KHz
tdamper h blow-up exitation trigger coast	Disable	0	1KHz
tdamper h blow-up exitation trigger cycling	Disable	0	1KHz
tdamper h2 on md	Disable	0	1KHz
tdamper h2 off md	Disable	0	1KHz
tdamper noise on/tune meas. chirp off cycling	Disable	12460	1KHz
tdamper noise off/tune meas. chirp on cycling	Enable	14360	1KHz
tdamper v1 on md	Disable	0	1KHz
tdamper v1 off md	Disable	0	1KHz
tdamper v blow-up exitation trigger coast	Disable	0	1KHz
tdamper v blow-up exitation trigger cycling	Disable	0	1KHz
tdamper v2 on md	Disable	0	1KHz
tdamper v2 off md	Disable	0	1KHz
tdamper coarse md	Disable	0	1KHz
tdamper fine md	Disable	0	1KHz
tdamper burst start md	Disable	830	1KHz
tdamper burst interval md	Disable	2	1KHz
tdamper burst number -1 md	Disable	255	Chained

Figure 1: SPS RF 7 timing to enable or disable the coherent or noise excitation in pulsed or coast mode.

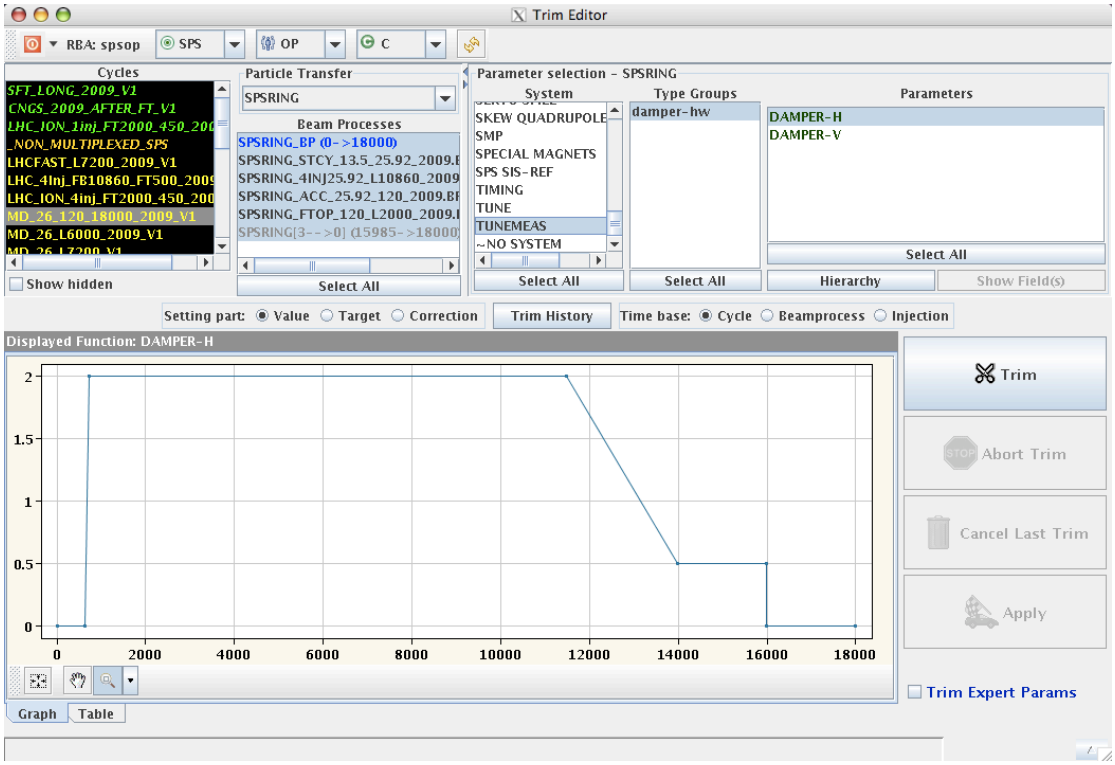


Figure 2: DAMPER-H in the Trim Editor to adjust the amplitude of the noise excitation.

UA9 started its measurements after the replacement of a gas bottle for the GEM detectors. At 19:31, first tests of horizontal emittance blow-up with noise in cycling mode and with a normalized noise amplitude of 2 in the Trim Editor (see Fig. 2) were performed. At 19:58, measurements with the BWS519H during the coast revealed that the horizontal emittance was indeed increased since at the beginning we had ~ 1.5 microm and now we have ~ 4 micrometers. This value increased to ~7 microm at 20:15. At 00:09, a new coast was injected and the horizontal norm. rms emittance was measured to be 1.3 microm (sigmax = 0.9 mm) without blow-up at the beginning of the coast. At 00:27, we started to put some diffusion by step of 0.1. At 03:41, we put the damper gain at 0.25 and at 03:42 at 0.5.

As said above, we also had frequent trips of the SMQ (main quadrupole) power converter stations, which were observed at the time of the recovery after a coast. These were in fact understood only after the end of this machine study and were found to be due to a timing definition problem. During the next UA9 MD in August 10, I checked that in the logbook the issue of the "SMQD I MIN FAULT after COAST recover" did not reappeared again!

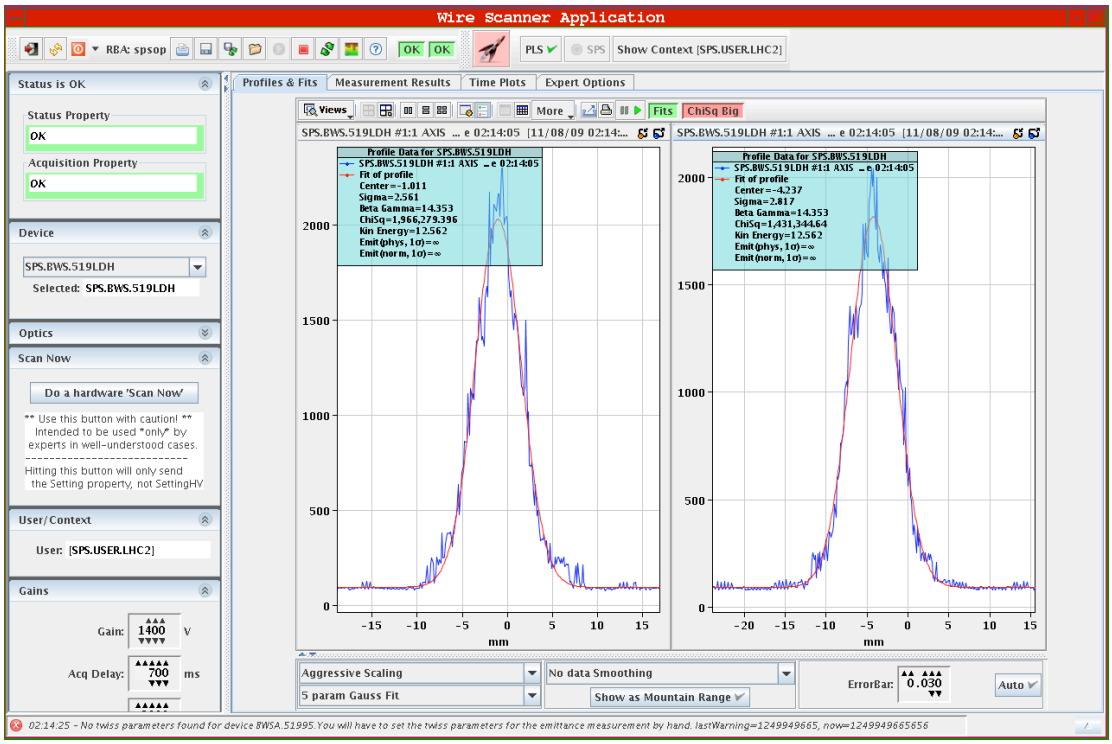
The results put in the logbook can be found in [2].

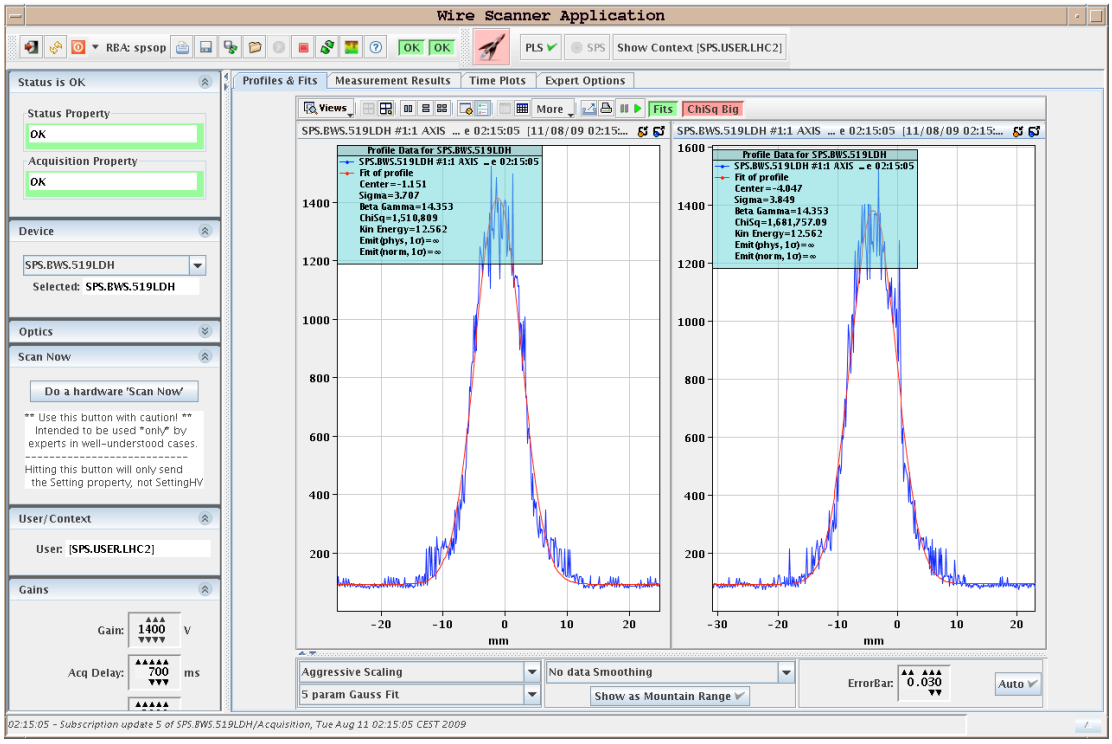
4) SPS set-up for the 4th UA9 session: Tuesday 11/08/09 (01:00 to 17:00)

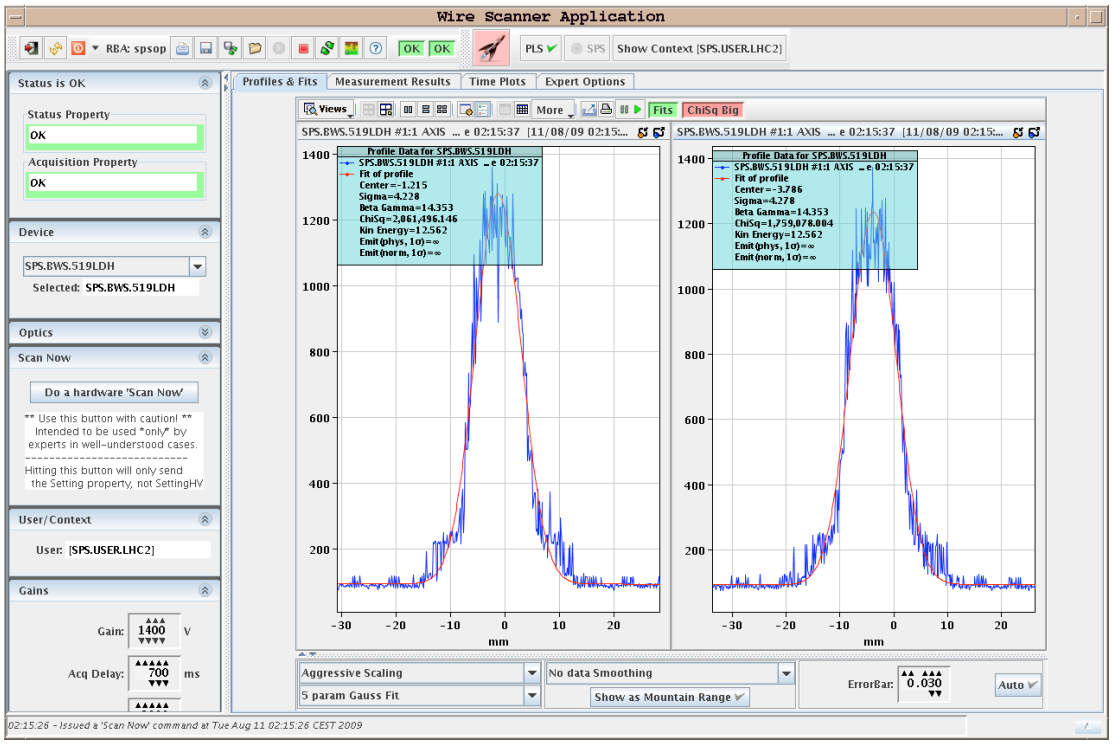
After having installed the same cycle as the one used in the previous MDs and made the same preparation, the first coast was tested at 00:41.

The horizontal emittance was measured in coast vs. time with noise excitation ON (with a trim value of 2, See Fig. 2). The first measurement (already with noise) at 02:14:05 gave a sigmax = 2.6 microm, while a measurement at 02:20:55 gave a sigmax = 8.7 microm, which revealed a clear and fast controlled horizontal blow-up (see Fig. 3). Then it was up to the UA9 MD users to decide on the value of the excitation noise to be used to have a certain blow-up in a certain time. Note that only pictures of transverse emittances were taken and no data were stored (which will have to be corrected during the next MD, and which indeed was). The measured horizontal orbit at 15000 ms is shown in Fig. 4.

At 05:18 the gain of the noise excitation was set up to 0.5 for new coasts to have a slower blow-up, and at 07:17 the transverse damper was stopped.






Wire Scanner Application
RBA: spsop
OK
OK
PLS
SPS
Show Context [SPS.USER.LHC2]
Status is OK
Status Property
OK
Acquisition Property
OK
Device
SPS.BWS.519LDH
Selected: SPS.BWS.519LDH
Optics
Scan Now
Do a hardware 'Scan Now'
** Use this button with caution! **
Intended to be used *only* by
experts in well-understood cases.
Hitting this button will only send
the Setting property, not SettingHV
User/Context
User: [SPS.USER.LHC2]
Gains
Gain: 1400 V
Acq Delay: 700 ms
Profiles & Fits
Measurement Results
Time Plots
Expert Options
Views
More
Fits
ChiSq Big
SPS.BWS.519LDH #1:1 AXIS ... e 02:15:37 [11/08/09 02:15:...
Profile Data for SPS.BWS.519LDH
SPS.BWS.519LDH #1:1 AXIS ... e 02:15:37
Fit of profile
Center=-1.215
Sigma=4.228
Beta Gamma=14.353
ChiSq=2,061,496.146
Kin Energy=12.562
Emit(phys, 1σ)=∞
Emit(norm, 1σ)=∞
Center=-3.786
Sigma=4.278
ChiSq=1,759,078.004
mm
Aggressive Scaling
5 param Gauss Fit
No data Smoothing
Show as Mountain Range
ErrorBar: 0.030
Auto
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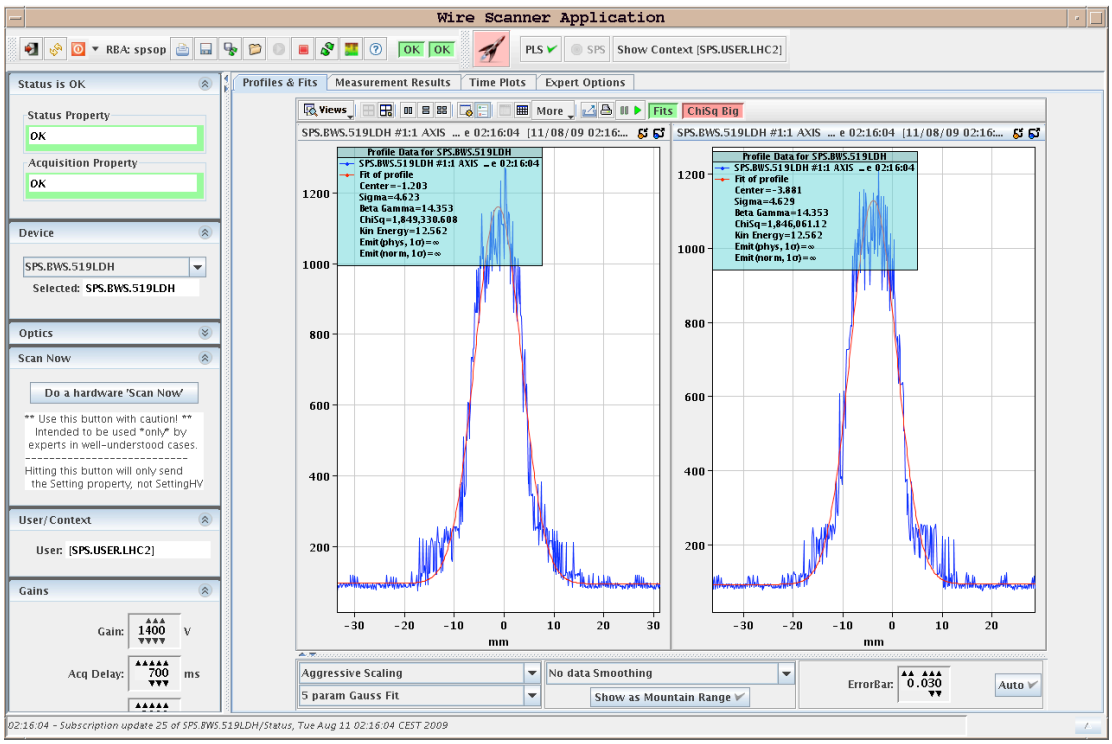
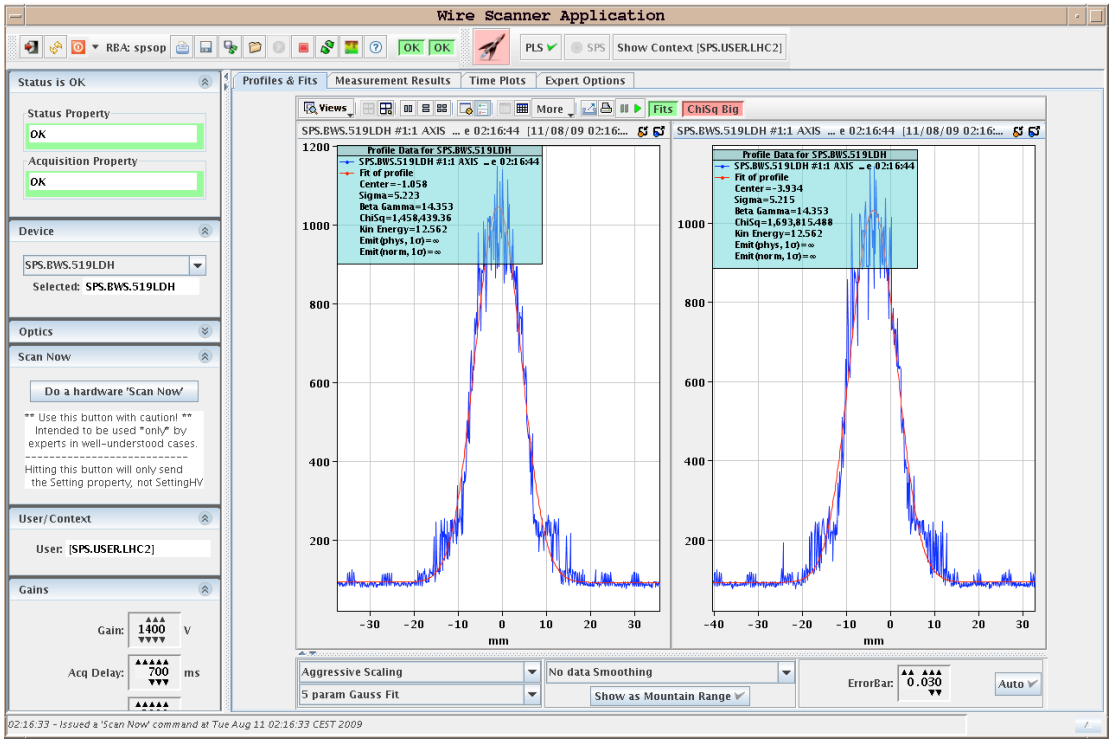

Wire Scanner Application
RBA: spsop
OK
OK
PLS
SPS
Show Context [SPS.USER.LHC2]
Status is OK
Status Property
OK
Acquisition Property
OK
Device
SPS.BWS.519LDH
Selected: SPS.BWS.519LDH
Optics
Scan Now
Do a hardware 'Scan Now'
** Use this button with caution! **
Intended to be used *only* by
experts in well-understood cases.
Hitting this button will only send
the Setting property, not SettingHV
User/Context
User: [SPS.USER.LHC2]
Gains
Gain: 1400 V
Acq Delay: 700 ms
Profiles & Fits
Measurement Results
Time Plots
Expert Options
Views
More
Fits
ChiSq Big
SPS.BWS.519LDH #1:1 AXIS ... e 02:16:04 [11/08/09 02:16:...
Profile Data for SPS.BWS.519LDH
SPS.BWS.519LDH #1:1 AXIS ... e 02:16:04
Fit of profile
Center=-1.203
Sigma=4.623
Beta Gamma=14.353
ChiSq=1,849,330.608
Kin Energy=12.562
Emit(phys, 1σ)=∞
Emit(norm, 1σ)=∞
Center=-3.881
Sigma=4.629
ChiSq=1,846,061.12
mm
Aggressive Scaling
5 param Gauss Fit
No data Smoothing
Show as Mountain Range
ErrorBar: 0.030
Auto
02:16:04 - Subscription update 25 of SPS.BWS.519LDH/Status, Tue Aug 11 02:16:04 CEST 2009


Wire Scanner Application
RBA: spsop
OK
OK
PLS
SPS
Show Context [SPS.USER.LHC2]
Status is OK
Status Property
OK
Acquisition Property
OK
Device
SPS.BWS.519LDH
Selected: SPS.BWS.519LDH
Optics
Scan Now
Do a hardware 'Scan Now'
** Use this button with caution! **
Intended to be used *only* by
experts in well-understood cases.
Hitting this button will only send
the Setting property, not SettingHV
User/Context
User: [SPS.USER.LHC2]
Gains
Gain: 1400 V
Acq Delay: 700 ms
Profiles & Fits
Measurement Results
Time Plots
Expert Options
Views
More
Fits
ChiSq Big
SPS.BWS.519LDH #1:1 AXIS ... e 02:16:44 [11/08/09 02:16:...
Profile Data for SPS.BWS.519LDH
SPS.BWS.519LDH #1:1 AXIS ... e 02:16:44
Fit of profile
Center=-1.058
Sigma=5.223
Beta Gamma=14.353
ChiSq=1,458,439.36
Kin Energy=12.562
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Emit(norm, 1σ)=∞
Profile Data for SPS.BWS.519LDH
SPS.BWS.519LDH #1:1 AXIS ... e 02:16:44
Fit of profile
Center=-3.934
Sigma=5.215
Beta Gamma=14.353
ChiSq=1,693,815.488
Kin Energy=12.562
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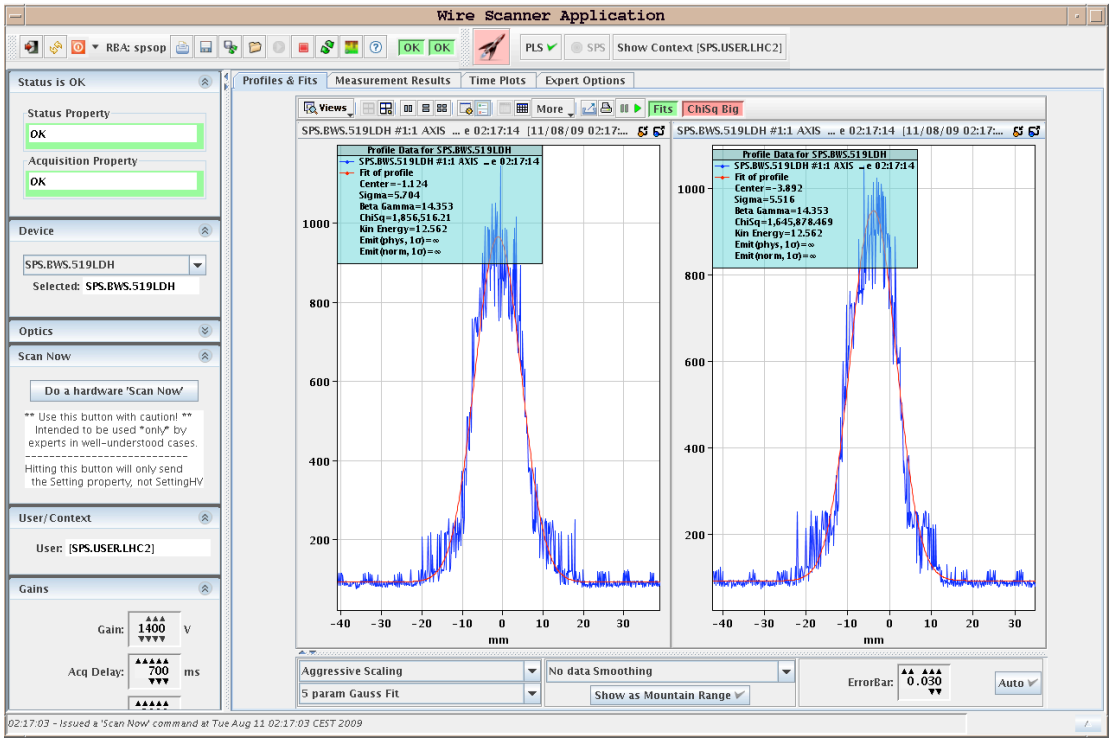
Emit(norm, 1σ)=∞
mm
mm
Aggressive Scaling
5 param Gauss Fit
No data Smoothing
Show as Mountain Range
ErrorBar: 0.030
Auto
02:16:33 - Issued a 'Scan Now' command at Tue Aug 11 02:16:33 CEST 2009


Wire Scanner Application
RBA: spsop
OK
OK
PLS
SPS
Show Context [SPS.USER.LHC2]
Status is OK
Status Property
OK
Acquisition Property
OK
Device
SPS.BWS.519LDH
Selected: SPS.BWS.519LDH
Optics
Scan Now
Do a hardware 'Scan Now'
** Use this button with caution! **
Intended to be used *only* by
experts in well-understood cases.
Hitting this button will only send
the Setting property, not SettingHV
User/Context
User: [SPS.USER.LHC2]
Gains
Gain: 1400 V
Acq Delay: 700 ms
Profiles & Fits
Measurement Results
Time Plots
Expert Options
Views
More
Fits
ChiSq Big
SPS.BWS.519LDH #1:1 AXIS ... e 02:17:14 [11/08/09 02:17:...
Profile Data for SPS.BWS.519LDH
SPS.BWS.519LDH #1:1 AXIS ... e 02:17:14
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Sigma=5.704
Beta Gamma=14.353
ChiSq=1,856,516.21
Kin Energy=12.562
Emit(phys, 1σ)=∞
Emit(norm, 1σ)=∞
Profile Data for SPS.BWS.519LDH
SPS.BWS.519LDH #1:1 AXIS ... e 02:17:14
Fit of profile
Center=-3.892
Sigma=5.516
Beta Gamma=14.353
ChiSq=1,645,878.469
Kin Energy=12.562
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Emit(norm, 1σ)=∞
mm
mm
Aggressive Scaling
5 param Gauss Fit
No data Smoothing
Show as Mountain Range
ErrorBar: 0.030
Auto
02:17:03 - Issued a 'Scan Now' command at Tue Aug 11 02:17:03 CEST 2009

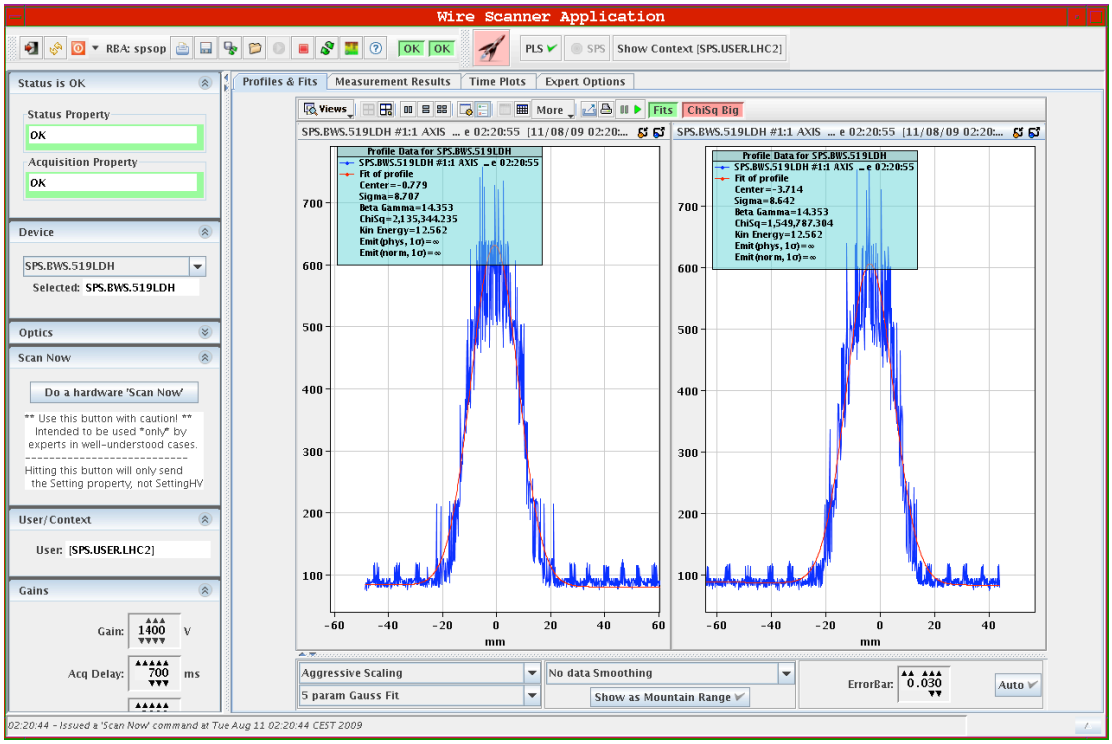


Figure 3: Horizontal emittance measured in coast vs. time with noise excitation ON (with a trim value of 2, See Fig. 2) from 02:14:05 to 02:20:55 (i.e. during ~ 7 min).

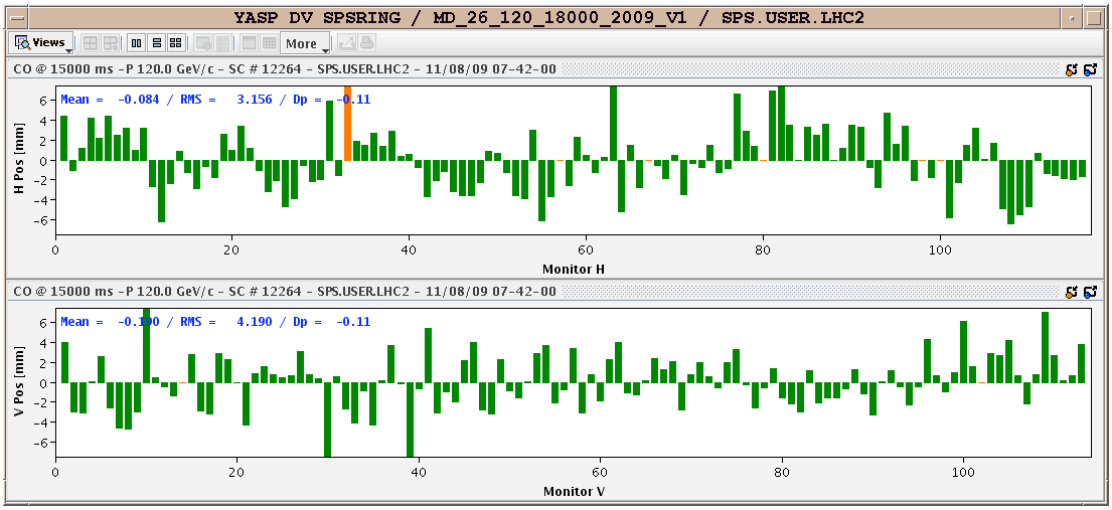


Figure 4: Horizontal orbit measured at 15000 ms.

At 08:26, Bernd Dehning was trying to understand the SPS BLMs, which still exhibited strange behaviours (the same as in the previous MDs).

At 12:45, the BLM integrator gain was set to HIGH and amplifier gain to 64. The reproducibility seemed to be acceptable in Sextant 5/6/1 (see Fig. 5).

At 13:32, the supercycle was changed to have 2 batches of 4 bunches, and at 13:40 the transverse damper was back on with a gain of 0.5. At 13:42, the gain was increased to 1 and then reduced again to 0.5 at 13:46.

Figure 5: Reproducibility of the BLM signal.

The results put in the logbook can be found in [2].

5) SPS set-up for the 5th UA9 session in week 39 (which finally took place with protons and not ions): From Tuesday 22/09/09 (08:00) to Wednesday 23/09/09 (08:00)

During this 24-hour MD, the idea was to devote the first shift of 8 hours (from 08:00 to 16:00 on Tuesday) to prepare the different beams which could be used during the next 2 shifts: the first part dedicated to measurements with low-intensity (for MEDIPIX etc.) and the second to measurements with "high intensity" (for the loss maps etc.).

The planning for the machine setup was decided beforehand and was the following:

1) On Tuesday 22/09/09, from 08:00 to 16:00, do the setup of the different beams which will (might) be used during this session (in each case the maximum intensity per bunch is ~ 1E11 p/b):

1.1) 4 bunches: LHCINDIV in PS and PSB (4 rings) in 1 batch.

1.2) 4 * 4 = 16 bunches: LHCINDIV in PS and PSB (4 rings) in 4 batches.

1.3) 4 * 12 = 48 bunches: TSTLHC25 in PS and LHCA in PSB (4 rings) in 1 batch.

1.4) 4 * 12 = 48 bunches: TSTLHC25 in PS and LHCA in PSB (1 ring) in 4 batches.

2) The 2 sequences were prepared during the week-end by Louis and Serge => https://ab-mgt-md-users.web.cern.ch/ab-mgt-md-

users/2009/MDCycles/SomeReferencesForpCoastAt120GeV/2sequences/Les2 sequences definies pour UA9.docx.

3) On Tuesday 22/09/09 morning, Jonathan Emery (162193, from BI) will come to check the SPS BLM in LSS5, and Stephen Jackson (164559, from BI) will come to see whether he could modify YASP to acquire the orbit in coast.

4) Elias will take care of the logging: SPS BLMs, BCT and FAST BCT, WS, vacuum pressure in LSS5 etc.

As foreseen, we started on Tuesday morning to check the cycle with 4 batches of 4 LHCINDIV bunches, which went quite well. It was the same cycle as the one used in the previous MDs. Only the number of bunches had to be increased to 16, whereas only 8 were used at maximum in the past. The first adjustments were performed as usual with only 1 bunch. The horizontal orbit measured at 15200 can be found in Fig. 6. Then, the chromaticities on the flat top of the pulsed cycle (which will be the values during the coasts) have been reduced to a minimum to try and maximize the beam lifetime. This was done by looking at the (non) decoherence as can be seen in Fig. 7. At 10:40, we tried 4 batches. However, the beam had to be stopped from 11:09 to 13:58 (i.e. during ~ 3 hours) due to a fire of an RF amplifier of the Transmitter TRX8. Without beam the SPS BLM signals were measured and did not seem to be very good (as can be seen in Fig. 8). At 14:15, we had a good beam with 4 batches of 4 bunches equally spaced around the machine circumference (see Fig. 9). At 14:41 we went in coast with this beam.

The sequence was then changed and we tried to redo the same thing with 4 batches of 12 TSTLHC25 bunches. However, more difficulties were faced with this beam after the 3rd batch and some beam was lost at ~ 9200 ms. We did not have much time to study and understand the problem (due to the 3 h lost), since in addition we lost ~ 1 h of beam (between 16:00 and 17:00) due to a water pump problem in the source. After discussion with Walter it was agreed that the beam with 4 batches of 4 LHCINDIV bunches will be sufficient to make the high intensity tests. Therefore, we switched back to the previous sequence and could start the UA9 MD around 17:00. At 17:08, the first coast with 1 bunch and slightly more than 1E11 p/b could be used (see Fig. 10).

However, it was then decided to try and put the momentum scraper (TIDP.11434) to its closest position to the beam (see Fig. 11) and to make a local bump to scrape the beam. This was done by adding several bumps, as the strength of the correctors was not sufficient at this energy (see Fig. 12a). We started to lose beam at ~ -15 mm on the BPH.11408. This was seen both on the BLMs and BCT. The BCT with the maximum (with our scheme) bump in 114 is shown in Fig. 12b, revealing that in this case about half of the beam was lost.

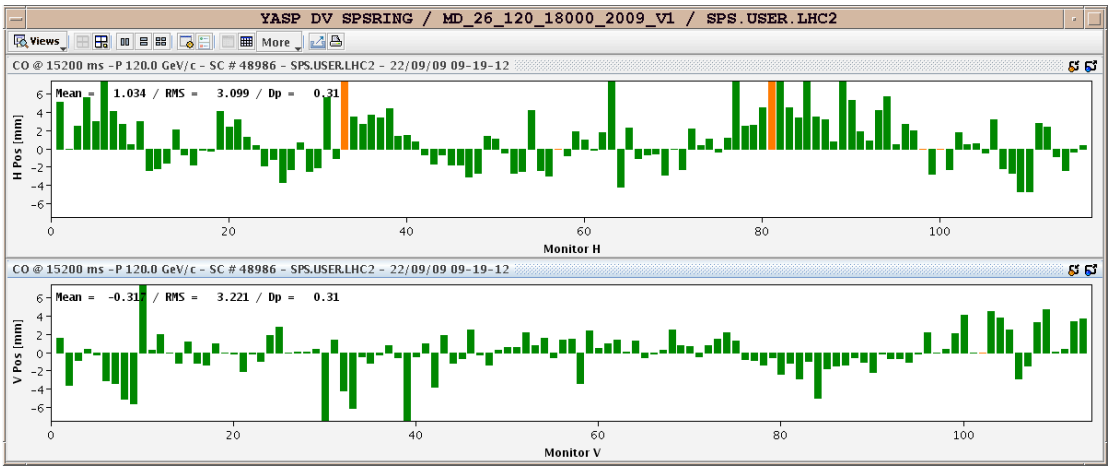


Figure 6: Horizontal orbit measured at 15200 ms.

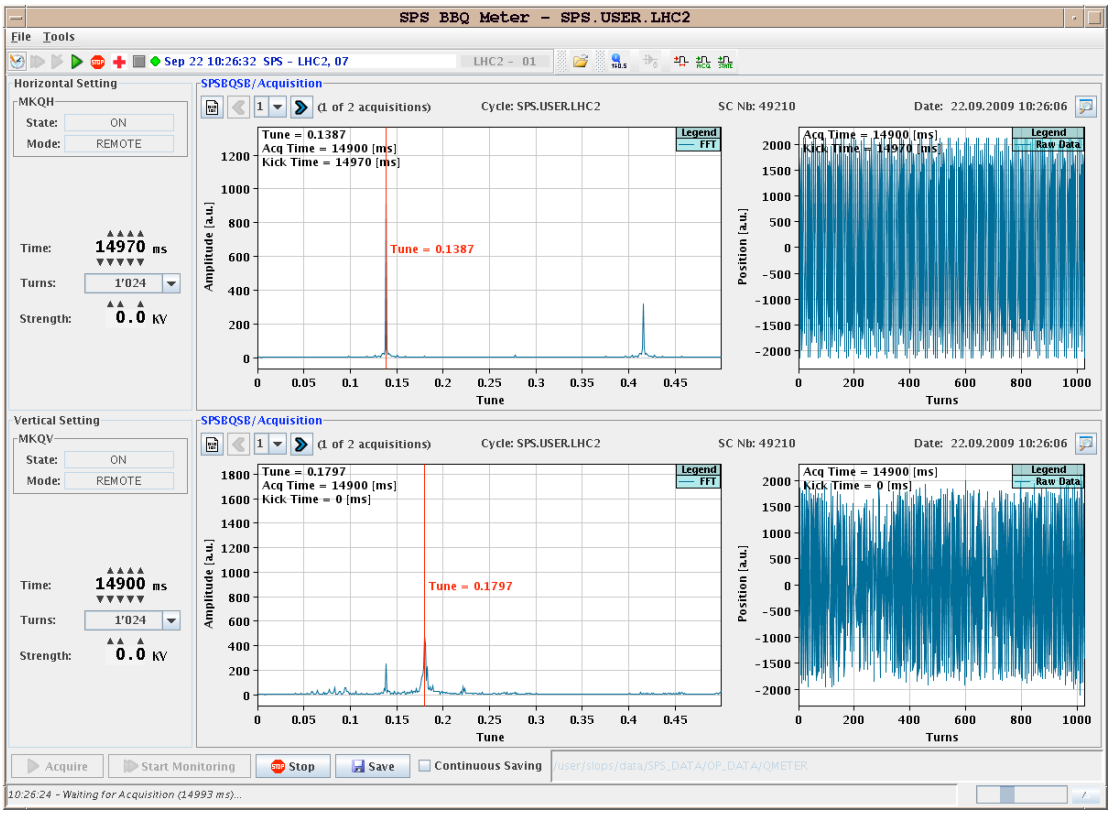


Figure 7: Reduction of the chromaticities on the flat top of the pulse cycle to try and maximize the beam lifetime.

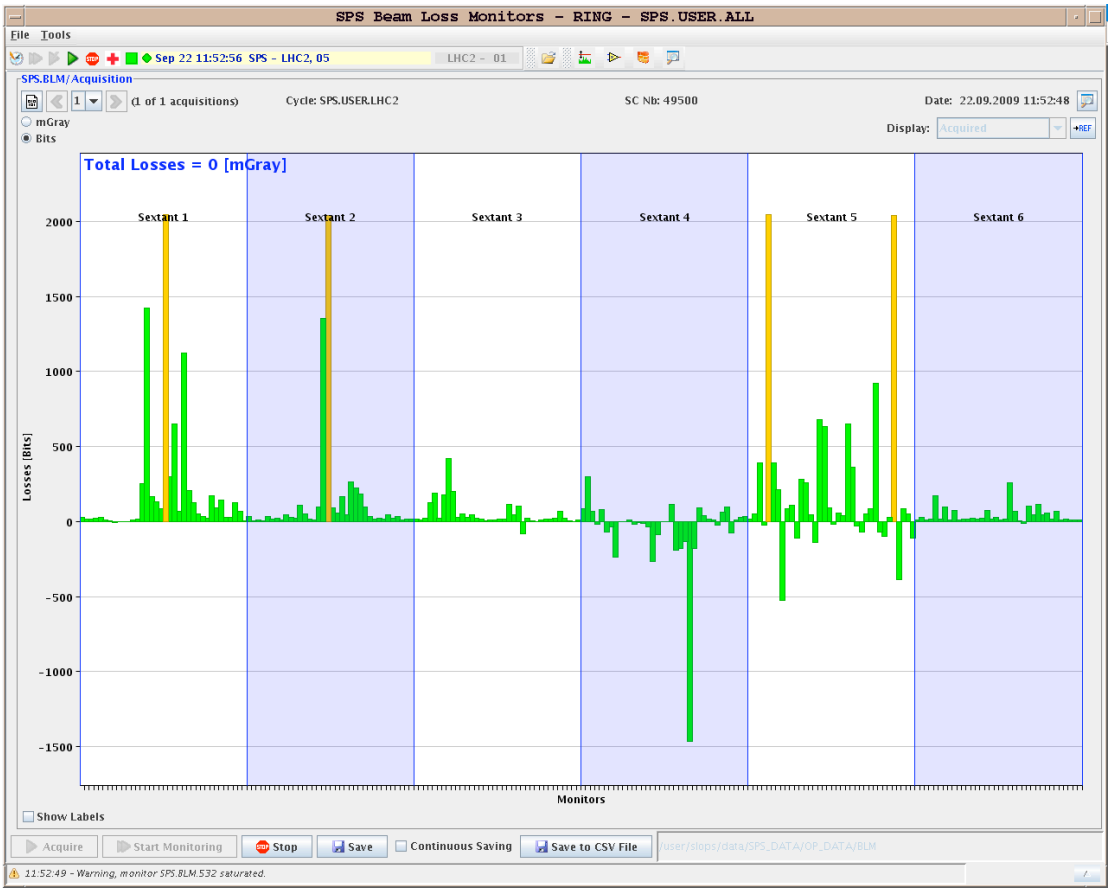


Figure 8: SPS BLM signals without beam.

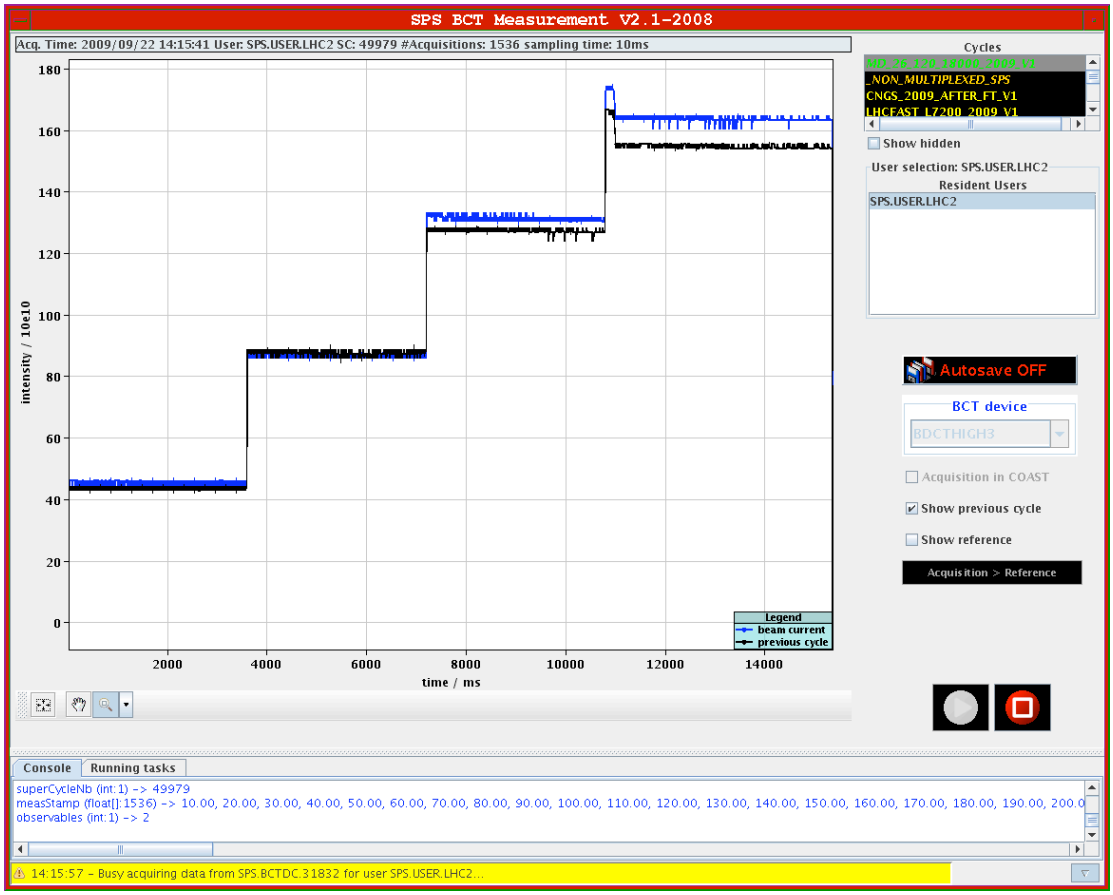


Figure 9: BCT (Beam Current Transformer) with 4 batches of 4 LHCINDIV bunches.

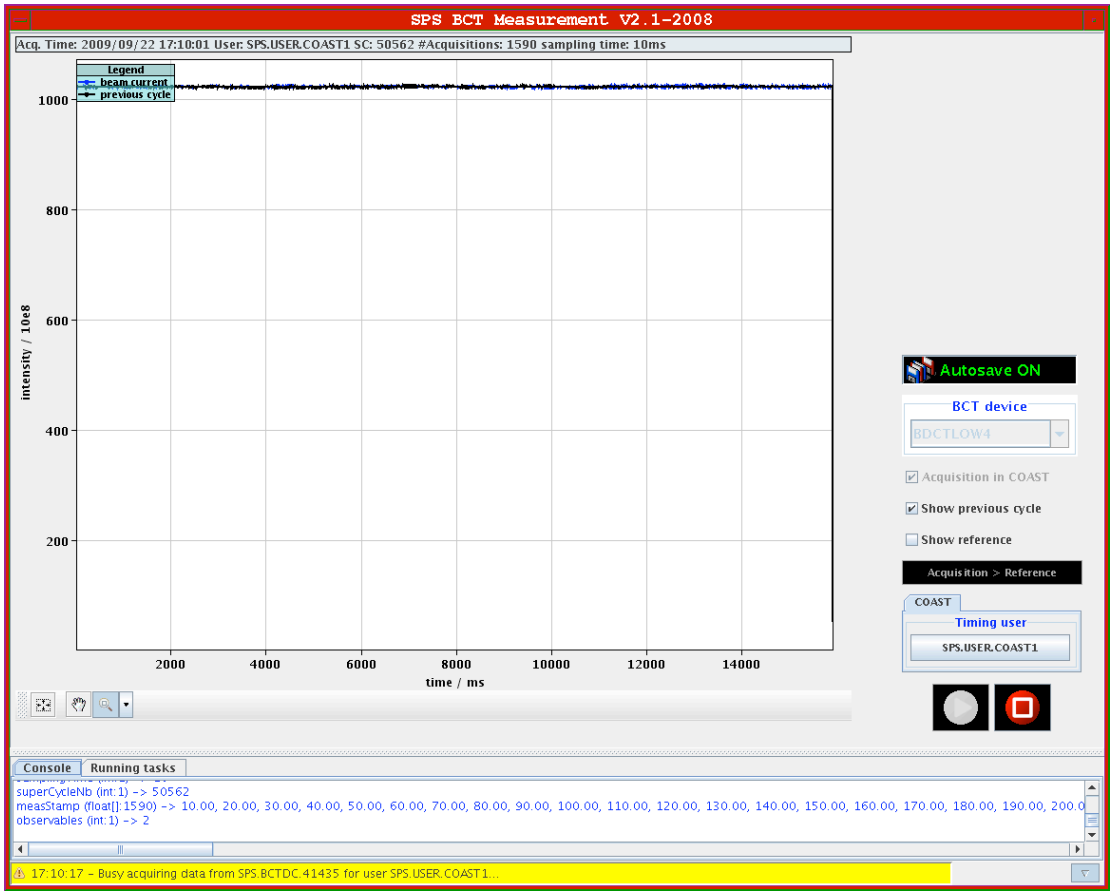


Figure 10: First coast used for the UA9 MD with 1 LHCINDIV bunch.

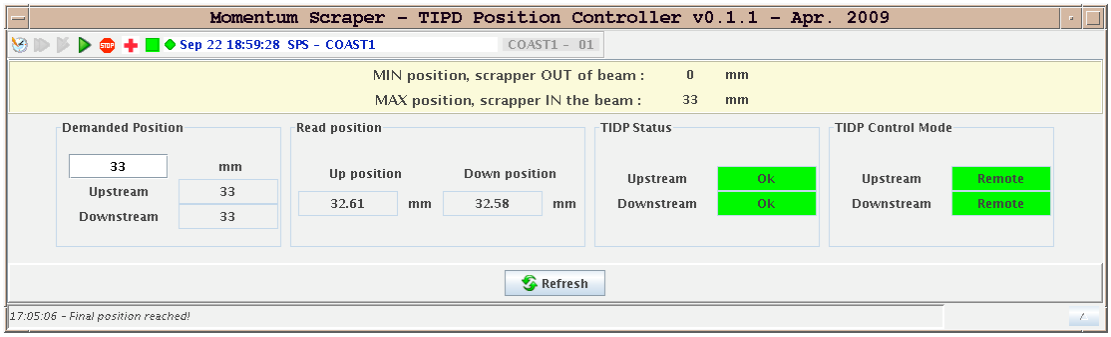
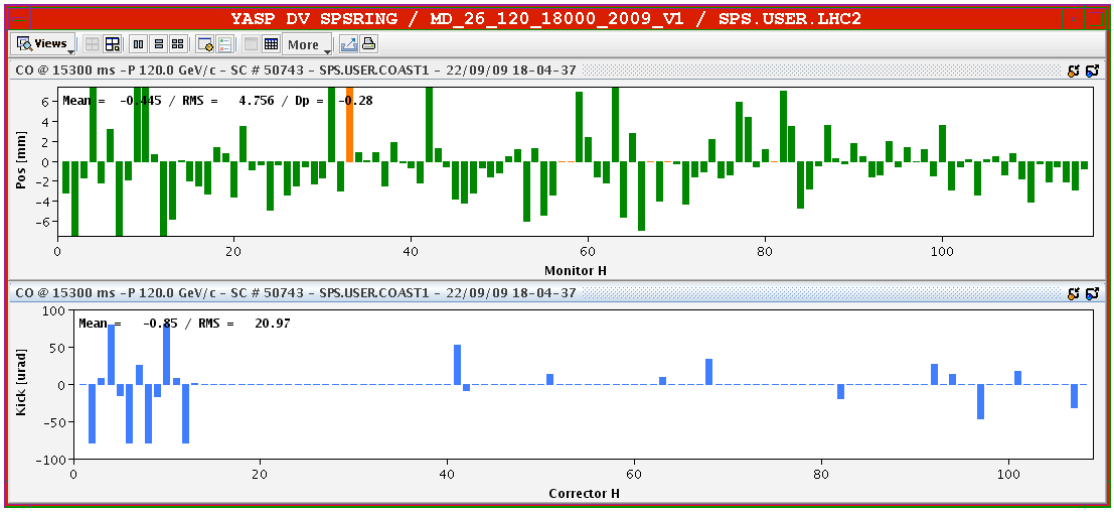


Figure 11: Momentum scraper TIDP.11434 put at its closest position to the beam (~ 33 mm).



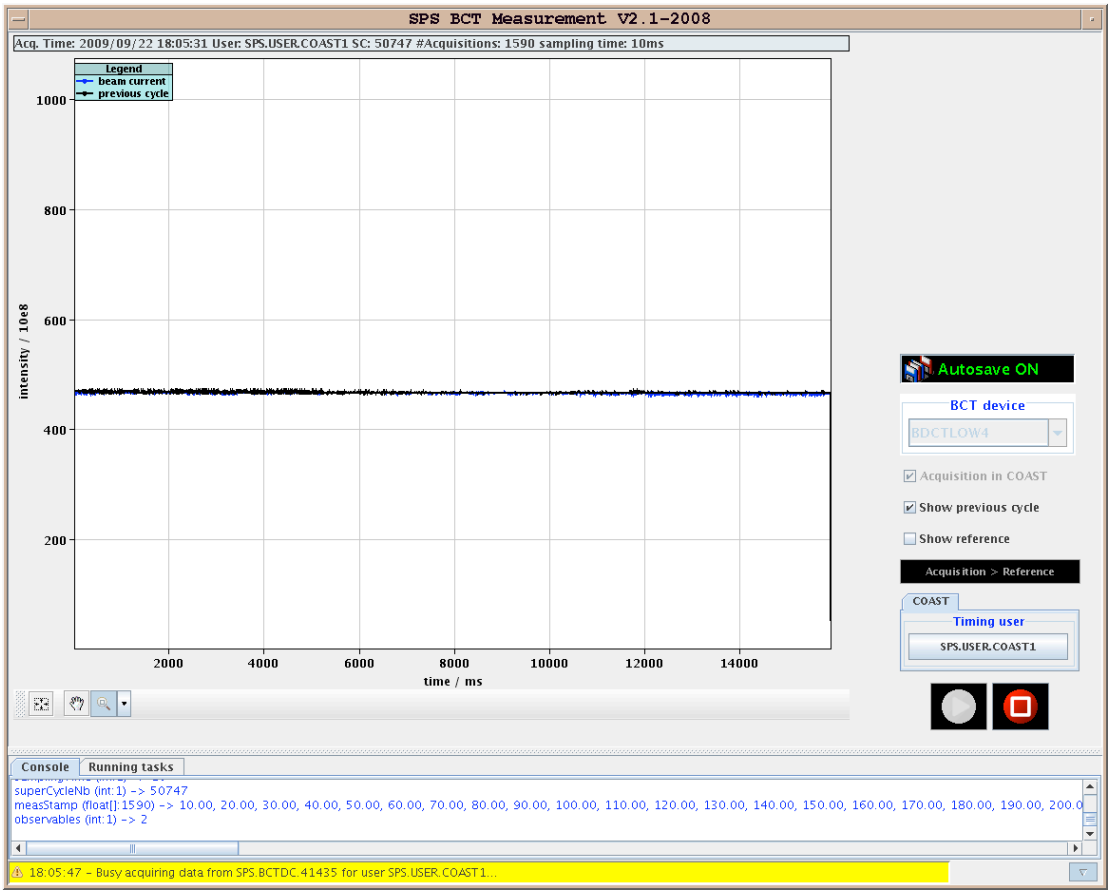


Figure 12: (a) Resonant bump around the momentum scraper TIDP.11434, and (b) BCT with the maximum (with our scheme) bump.

During this MD the raw data for some horizontal emittance measurements were also saved at /user/spsop/data/2009/OP_DATA/SPS.BWS.519LDH. The data of the BCT, FBCT and BLM were also saved at /user/slops/data/SPS_DATA/MD_DATA/SPS_UA9_22_09_09. The evolution of the vacuum close to the UA9 equipments (on the gauges VGHB_51877 and VGHB_52060) were also stored and can be found at https://ab-mgt-md-users.web.cern.ch/ab-mgt-md-

users/2009/MDCycles/SomeReferencesForpCoastAt120GeV/LSS5VacuumDuringMDWeek39/VacuumLSS5_22_09_09.xls. Furthermore, during this MD no noise excitation was used and it was found to perturb too much the detectors.

At 20:24, a new coast was injected with an intensity of ~ 3E10 p/b and this low intensity was used during several hours.

At 04:49, the high-intensity beam made of 4 batches of 12 TSTLHC25 bunches was requested but some problems were found by the operators. This was expected (see before) as this beam could not be correctly set up and it was decided to use only the 4 batches with 4 LHCINDIV bunches. However, it seems that there was a communication problem. Nevertheless, at 05:54 two batches of ~ 1E12 p each (therefore with a total intensity of ~ 2E12 p) could be injected and then used for the high-intensity studies. The MD finished at 08:00 as foreseen.

Summary of the investigations on the SPS BLM in LSS5 by Jonathan Emery: Negative and positive offsets of the BLR of the SPS at high gain and amplification. Preceding the MD of this week we have recalculated the charge and current at gain = High (x200) and Amplification = 32 (settings used for the MD). At this high amplification, the measurement of the output current of the ionisation chamber becomes a issue. One bit at 13s (STFLONG 1 cycle) is 59 fA! and the full scale is 120pA! According to the designer of the system (FERIOLI Gianfranco) the only way to measure at this settings is to make differential measurement between a reference signal (Beam off or controlled initial conditions) and the measured event. This will remove the negative or positive offset (Pico ampere order!) due to various factors including the cable length (900m!). If one channel is saturating, the use of a lower amplification should be considered. The noise at this setting is in the range of 100 bits (as observed) corresponding to something like 1 uGray. We are at the limit of what the system can do with 900 m cable and the offsets and leakages of the electronics (the OpAmp used is already a very good one). Gianfranco advised to limit the use of BLR if going higher that gain = High (x200) and Amplification = 2 (1 bit = 0.939 pA, FS = 1.92 nA at 13 s cycle). Therefore, the proposition is to use a reference signal to be subtracted from the measurements to remove the parasitic offsets.

Summary of the investigations on the acquisition of the orbit in coast by Stephen Jackson: The acquisition of the orbit in coast did not work in the previous MDs as the electronics configuration of the COAST1 user was incorrect. It was still set to trigger on the prepulse1 instead of the warning event. This has the effect of not starting the acquisition and old data being returned on subsequent orbit requests. For some reason, rebooting all 6 crates seems to be necessary when passing in to COAST. Maybe the software or the electronics gets confused when triggering on pre-pulse or the MTG event. It seems that in previous attempts to measure during coast, we either had bad configuration, or the MTG events needed were not being transmitted. Now it seems everything is working fine. The remaining issue is the precise time when the measurement is made, as there is still some uncertainty. One should therefore make the measurements at 0 ms and this should be fine within some few turns.

The results put in the logbook can be found in [2].

6) SPS set-up for the 6th UA9 session in week 41, which should have been done with ions in coast at 120 GeV/c (but it was finally cancelled due to a problem with the PS injection septum 42)

Some references of the cycle which could be used during this MD are given in [4]. The cycle name is MD_ION_4inj_FT2000_120_2009_V1, whose length is 12 Basic Periods (of 1.2 s), i.e. 14.4 s. The SPS user Timing of the pulsed function is MD1 and the RF MMI target LHCION. When we go in coast, a sequence is played where we go through several cycles called COASTPR2 (to prepare the coast), COAST2 (which is the coast cycle), COASTRE2 (to recover from the coast cycle). For each of these four cycles, the timings are already set up [4].

7) SPS set-up for the 6th UA9 session in week 45: On Wednesday 04/11/09 (from 05:00 to 23:00)

During this 18-hour MD, after having installed the same cycle as the one used in the previous MDs (only protons were finally used in 2009) and made the same preparation, the first coast was obtained around 05:50. Two bunches of ~ 1E11 p/b were injected in 2 batches. The transverse emittances could not be measured with the wire scanner, and therefore a full beam scraping with the collimator was done in order to have a reference beam size measurement for an a posteriori analysis. A measurement of the beam lifetime of ~ 8h was then performed. At 06:53, the TAL was out and the alignment of crystal 1 was started. At 07:03, the crystal was out and the alignment of medipix (RP1-H1) was started. At 07:26, the crystal 2 was aligned, while the scatter was aligned at 07:26.

At 08:20, it was mentioned that since a couple of minutes, a spiky behaviour of the BLM at the crystal position was observed. We tried to switch off many power supplies but we could never get rid of them. These spikes on the BLM signals perturbed us most of the day (they were also seen at other equipments such as the TAL) and "seemed to be correlated with normal working hours as they seemed to stop during usual breaks…".

At 10:25, we were unable to get YASP acquisitions due to TGM timeout. We saw that the TGM video was also blocked and we called Ioan Kozsar.

At ~ 17:44, after having approached the momentum scraper (TIDP.11434) at its closest position to the beam, a scan in amplitude of a bump at the beam position monitor BPH.11408 was performed. When the TIDP was primary, it was clearly seen on the BCT and on the SPS.BLM.115 (see Fig. 13). In fact, there were two types of losses: (1) a constant loss from cycle to cycle of about some E08, and (2) a loss produced by the 3C-bump at BPH.11408 of ~1E09 (see Fig. 14). The idea was then to retract the bump and/or the TIDP and observe if there was some leakage of the collimation system.

At 19:13, the Integration gain of the BLM was changed from "Low gain" to "High gain" and the Amplification gain from 64 to 16 (and the SIS interlock "BLRING_GAIN" was masked). The same scan as before was then repeated with this improved resolution of the SPS BLM.

The UA9 MD finally finished on Thursday morning at 01:13.

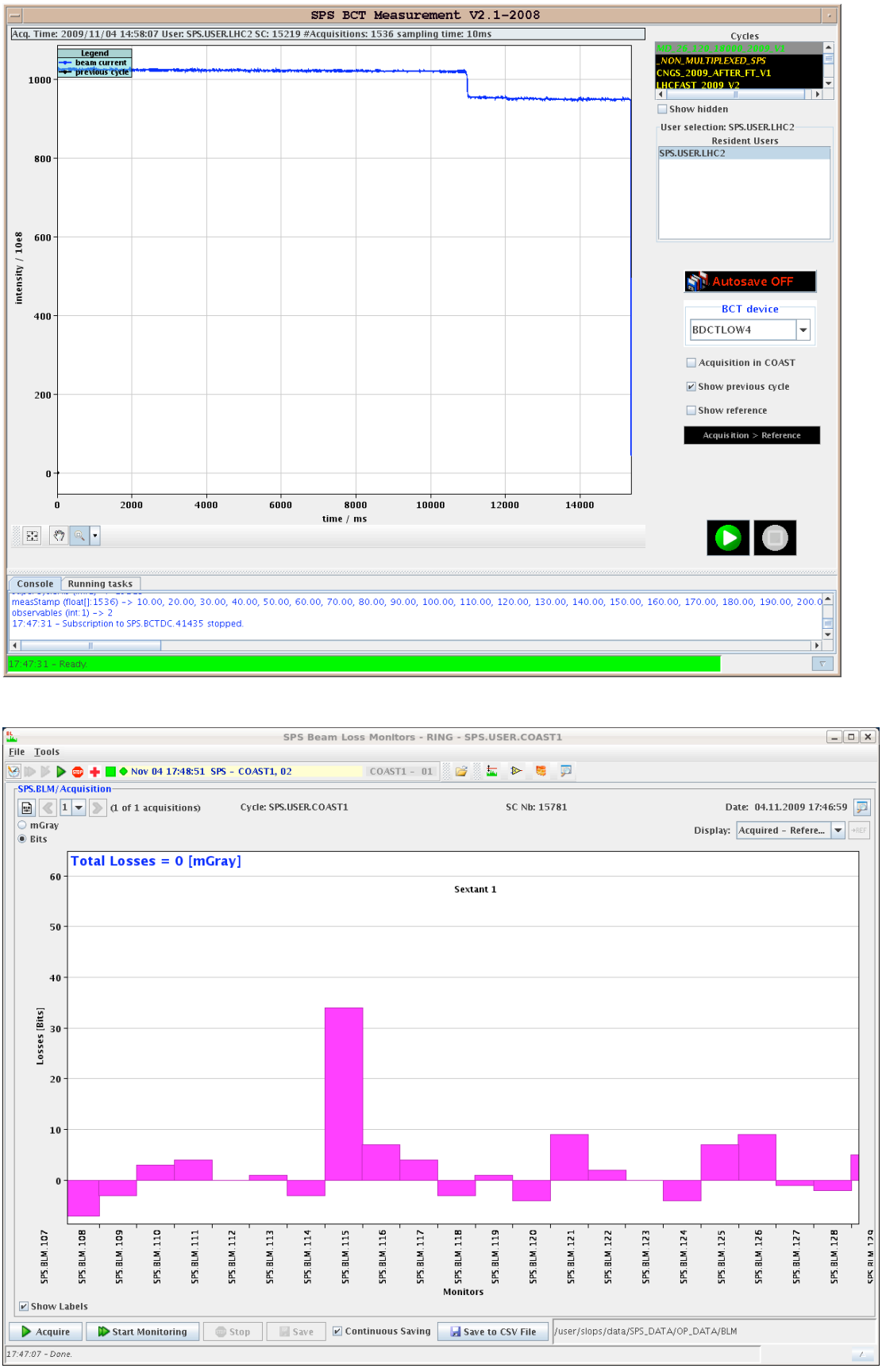


Figure 13: (Upper) BCT and (lower) SPS.BLM.115 for a measured amplitude of a bump on BPH.11408 of -24.5 mm.

Figure 14: (Upper) BCT and (lower) SPS.BLM.115 for a measured amplitude of a bump on BPH.11408 of -26.5 mm.

SOME REFERENCES/LINKS ON THE MD PAGES

[1] Some references for the 120 GeV/c coast with protons: https://ab-mgt-md-users.web.cern.ch/ab-mgt-md-users/2009/MDCycles/SomeReferencesForpCoastAt120GeV/Ref.htm.
[2] Reports on the ELogBook: https://ab-mgt-md-users.web.cern.ch/ab-mgt-md-users/2009/MDCycles/SomeReferencesForpCoastAt120GeV/ELogBook.htm.
[3] E. Métral et al., Controlled Transverse Emittance Blow-Up in the CERN SPS, Proc. PAC09, May 4-8 2009, Vancouver, Canada, http://cdsweb.cern.ch/record/1208359/files/CERN-ATS-2009-039.pdf.
[4] Some references for the 120 GeV/c coast with ions: https://ab-mgt-md-users.web.cern.ch/ab-mgt-md-users/2009/MDCycles/SomeReferencesForIonCoastAt120GeV/Ref.htm.