

Operations review 2008 and beam status in the different machines

ATOP days 6/3/2009

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E.Jensen, E.Métral, B.Mikulec, E.Montesinos, R.Scrivens,
E.Siesling, P.Skowronski, P.Sollander, R.Steerenberg,
J.Wenninger, ...**

- ⇒ Beam performance in 2008**
- ⇒ Problems encountered**
- ⇒ Current status and readiness for 2009 beam production.**

Outline

- ⇒ **Electrons**
- ⇒ **Isolde**
- ⇒ **nTOF**
- ⇒ **East Area**
- ⇒ **Pbar / pbar production**
- ⇒ **SFT & CNGS**
- ⇒ **LHC proton beams**
- ⇒ **Ions for LHC**

Electrons

⇒ **Combiner ring recommissioned in 2008, up to 4x recombined (no Delay Loop)**

⇒ **Up to 12A produced, sent to TL2**

⇒ **RF produced in PETS**

⇒ **Problems:**

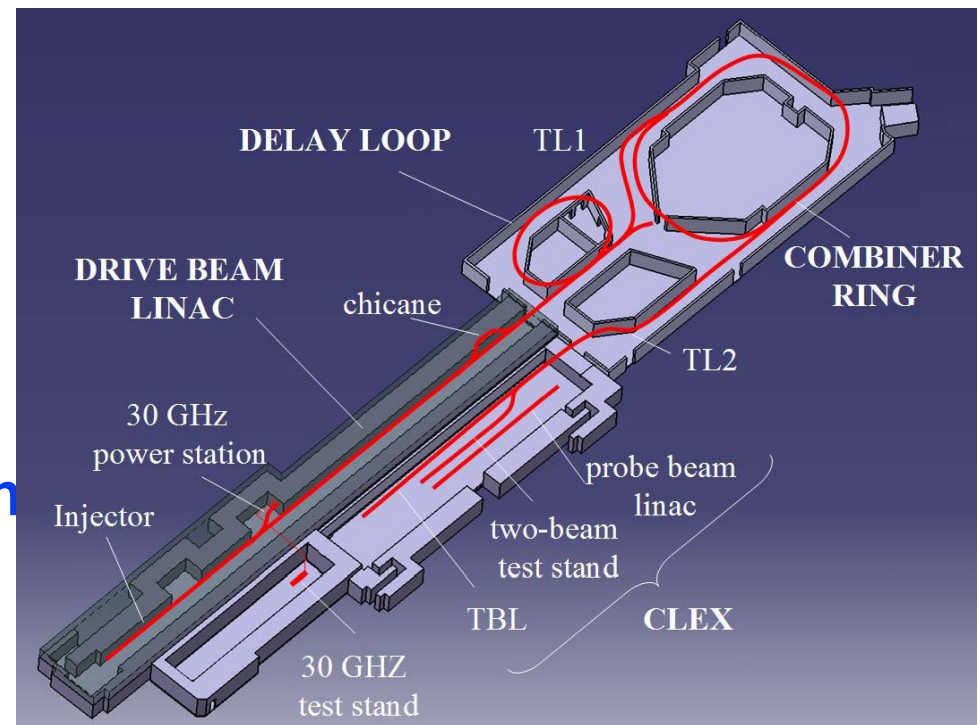
⇒ **Controls, water, radiation**

⇒ **2009:**

⇒ **double intensity
Delay Loop + Combiner Ring**

⇒ **Finish commissioning
probe beam**

⇒ **see Piotr's talk Friday 11:50**



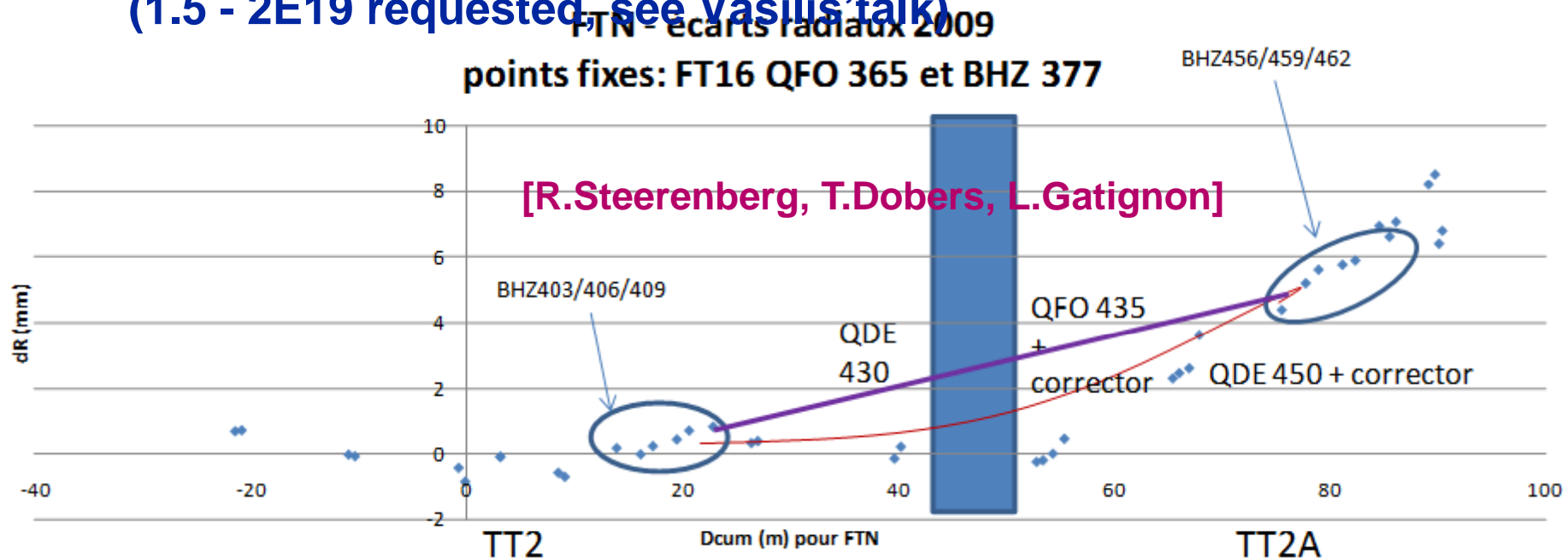
ISOLDE

- ⇒ **Good performance in 2008**
 - ⇒ **NORMHRS & NORMGPS 95% availability**
 - ⇒ **STAGISO 93% availability**
 - ⇒ **Up to 1E13/ring from PSB**
- ⇒ **Machine protection issue**
 - ⇒ **ISOLDE beam occasionally sent to PS**
see Klaus'talk 5/3 9:30
- ⇒ **Main problem: vacuum**
 - ⇒ **Ageing controls**
 - ⇒ **Lack of support**
- ⇒ **2009**
 - ⇒ **Integration of RFQ into HRS controls**
 - ⇒ **New tape station**
(in parallel with old one for calibration)
 - ⇒ **New shielding from REX X-rays**
 - ⇒ **Radioactive air handling:**
see Richard's talk 5/3 10:35



nTOF

- ⇒ **First run since 2004: 1 week in November 2008 for target commissioning**
- ⇒ **OK in PSB & PS**
 - ⇒ $I_p > 7E12$ (nominal)
 - ⇒ **96% beam availability**
- ⇒ **New optics (defoc) for TT2A, showed evidence of misalignment**
- ⇒ **Realignment in progress, ready for 2009**
(1.5 - 2E19 requested, see Vasilis' talk)



East Area

- ⇒ **88% average beam availability in 2008**
- ⇒ **PR.W8L (200h)**
 - ⇒ **also for most other beams (AD, SFT, CNGS)**
- ⇒ **SMH57 & SMH61**
 - ⇒ **When supercycle too “heavy”**
- ⇒ **In 2009 (in principle, no nTOF in //):**
 - ⇒ **EASTA -> North (T9, T10, T11)**
 - ⇒ **EASTB -> South Dirac (T8)**
 - ⇒ **EASTC -> South Irradiations (T7)**
- ⇒ **See new layout proposal in Lau’s talk 6/3 9:00**

Antiprotons

- ⇒ **Pbar beam availability 81%**
 - ⇒ ASACUSA 77%, ATRAP 73%, ALPHA 86%, MLINE 96%
- ⇒ **Production beam availability 87%**
 - ⇒ 1.4E13 routinely extracted from PS towards AD
- ⇒ **Optimum AD cycle length = 80 s**
 - ⇒ Long supercycles decrease apparent pbar production by lengthening AD cycle
 - ⇒ Could use more AD cycles in “main” of EASTx
- ⇒ **Pbar yield puzzle ... see Tommy’s talk at 12:00**

SPS Fixed Target

- ⇒ **Overall availability 78%**
- ⇒ **No high intensity required in 2008**
 - ⇒ **$I_p < 2E13$**
- ⇒ **Idem in 2009**

CNGS

- ⇒ Restarted with new shielding in 2008
- ⇒ 1.78E19 Protons on Target delivered (4.5E19 requested)
Beam availability 62%
Intensity limited ~ 4E13 in SPS
(in spite of PSB intensity record 3.8E13)
 - ⇒ PS losses
 - ⇒ SPS-RF, see Erk's talk 5/3 9:45
- ⇒ June 27th Incident reminded us
of beam power (see Rende's talk
at 11:30 and Jorg's talk 5/3 9:00)
- ⇒ SPS Kickers MKE (26h)
- ⇒ Short lifetime of filters for
Horn + reflector cooling
 - ⇒ See Ilias'talk 6/3 9:30
- ⇒ 3.1E19 requested in 2009



CNGS & SFT issues

⇒ ST/EL 18kV

- ⇒ 115h on 25/7
- ⇒ 43h on 30/7
- ⇒ 80h on 13/9

⇒ ST/EL compensators 1 & 3

- ⇒ Total 22h

⇒ PE.W8L (200h , cf EAST, AD ...)

⇒ SEH31 & BFAs (should/will be solved by MTE)

⇒ SPS Multiple RF transmitters trips (mainly TRX3)

- ⇒ Serious problem with spare tubes might jeopardize future CNGS operation or even high intensity LHC (Current spares have already been used, delivery delay ~9 months)

⇒ MTE from PS tested

- ⇒ Restart with CT in 2009, then switch to MTE, see Simone's talk at 10:10

⇒ Flexibility: full ppm needed, tested in 2008, being implemented in 2009

- ⇒ See Jorg's talk 5/3 11:35

⇒ See Session 4, 5/3 14:00
(Peter, Karsten, Davide)

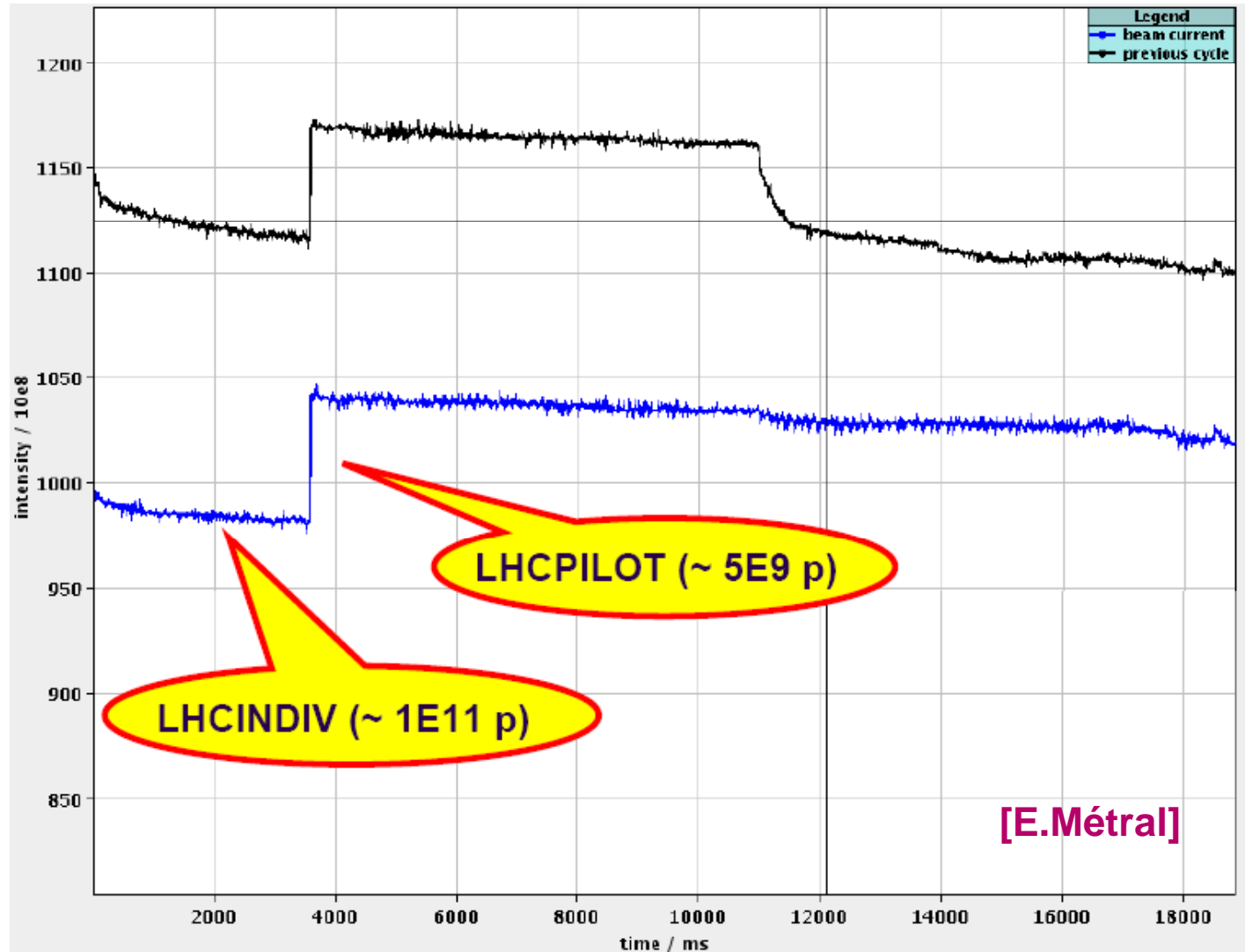
LHC proton beam zoo

	I	Nb	ϵ_{xy}
Probe	<5E9	1	1μm
Pilot	<5E9	1	3μm
Indiv	1E11	1	3μm
25	1E11	72	3μm
50	1E11	36	3μm
75	1E11	24	3μm

LHC proton beam zoo

- ⇒ **Global availability 88% (probe: 100% on 10/9)**
- ⇒ **Probably the healthiest beam(s) due to pressure**
 - ⇒ Extensive MD programme throughout the year
- ⇒ **Flexibility of injector chain**
 - ⇒ **production of all beams (50ns revived) required in 2009-10**
 - ⇒ within or close to specs (lb, long emittance)
 - ⇒ sometimes transverse emittance even too low
 - ⇒ **H/V emittance control in PSB and/or in SPS**
 - ⇒ **Single batch for 50 and 75 produced by PSB**
 - 3 rings H=2, synchronized on H=1
 - To be demonstrated in PS in 2009
- ⇒ **ZS sparking in SPS**
- ⇒ **Lots of fine adjustments in PS RF (many splittings ...)**
- ⇒ **Lack of PSB users for too many beam types**
 - ⇒ Extensive use of archives

LHC proton beam: Indiv + Pilot in the SPS



Ions for LHC [1]

⇒ Source: new RF in 2008 (18 GHz vs 14.5 GHz)

- ⇒ 50% increases expected in the long term
- ⇒ 2007 intensity (27 μ A) reproduced in 2008
- ⇒ Time needed to gain experience in new se

⇒ No ions in LEIR, PS or SPS in 2008

⇒ LEIR

- ⇒ Early beam OK in 2007; Nominal 80%
- ⇒ Recommissioning needed (see C.Carli's list)

- Long HW tests period + dry runs.
- Hopefully short cold check-out

⇒ (AD and/or SPS) OP issue for 2009+

- LSA tests (start in March): availability of "old" cycles, from settings generation to trims
- Verify vacuum system (check history of pressures)
- Get hardware ready (e.g. CO system - migration to recent FESA version)
- Test period in May (AD start as well!) well before start with beam (not in strict order):
 - Access system test, patrol
 - Re-test interlock system (with/without power converters)
 - Re-connect all power supplies to electrical distribution
 - Sequencing and timing (coupled mode/stand-alone mode, long plateaus)
 - Pulsing of power converters (double and triple PPM, driven by GFAs ...)
 - GFAs: proper behaviour (undocumented feature of "old" GFAs) at end/start of function
 - Injection bumper (new FESA class or still EMP?): pulse and observe with OASIS
 - Low level RF system (availability of B-train, RF train for damper and ejection timings)
 - Reconditioning of electrostatic injection septum (no access at all!)
 - Ejection kicker (schedule work on hardware): pulse and observe with OASIS
 - Instrumentation: start applications and check as much as possible without beam, e.g.:
 - TV stations: movements and images without beam.
 - Beam couant transformers: signals with calibration via OASIS and values for working sets
 - Test magnet polarity (transfer line: access into PS tunnel needed) and collimators
- Short one week "cold check-out" and LEIR re-start with beam on 6th July
- Controls (first enquiry by Marine): [C.Carli]
 - LSA : status report not yet done
 - FESA: all classes will be migrated to latest FESA version v2.10 before May (report from FESA responsables) . No new FESA framework version before end 2009.
 - GFA cards removed from LEIR FE to be put on other machines: will be replaced by 3 CVORB cards (2 in dleipow1 and 1 in dleipow2). Installation by end of March.
 - New FESA classes (POWDF7000, others ?): no new class announced for current systems
 - Up to date responsibility list for FE crates and FE classes: available
 - Low level RF: complete integration into CO-system (GFAs, LSA ?), status of local oscillator? to be discussed
 - Instrumentation: to be discussed
 - BIPMs (FESA class and/or PC in LCR controlled via remote access)
 - Tune measurements: which program will be used ?
 - Beam current, e.g. for VISTAR
 - Linac3: new interface/controls of energy ramping system to be discussed
- Electron Cooler: covers on connectors of coils
- Interlock system: thorough tests, "supervision" ?
- Magnets: status of measures to reduce water consumption ?
- Ejection kicker: schedule work on hardware (on platform) and tests
- Vacuum: status after long shutdown ... maintenance (HV feedthroughs)?

Ions for LHC [2]

⇒ PS

- ⇒ In good shape for early beam (2007)
- ⇒ Vacuum needs careful monitoring (see 2007)
- ⇒ Nominal still to be produced
 - MD time needed in parallel with SPS commissioning

⇒ SPS

- ⇒ Early accelerated in 2007 (10% extracted due to PS vacuum fault)
- ⇒ In 2009
 - Commissioning of consolidated RF hardware
 - Extraction of synchronized bunches
 - Time permitting: tests of alternative “nominal” filling schemes (Would need nominal beam from PS)