

SURVEY ACTIVITIES FOR INJECTORS DURING LS1

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Agenda

•Complexe SPS

- SPS, TI2, TI8, TT41, TT10, TT20, North area

•Complexe PS

- PSR, PSB, transfer lines
- L4

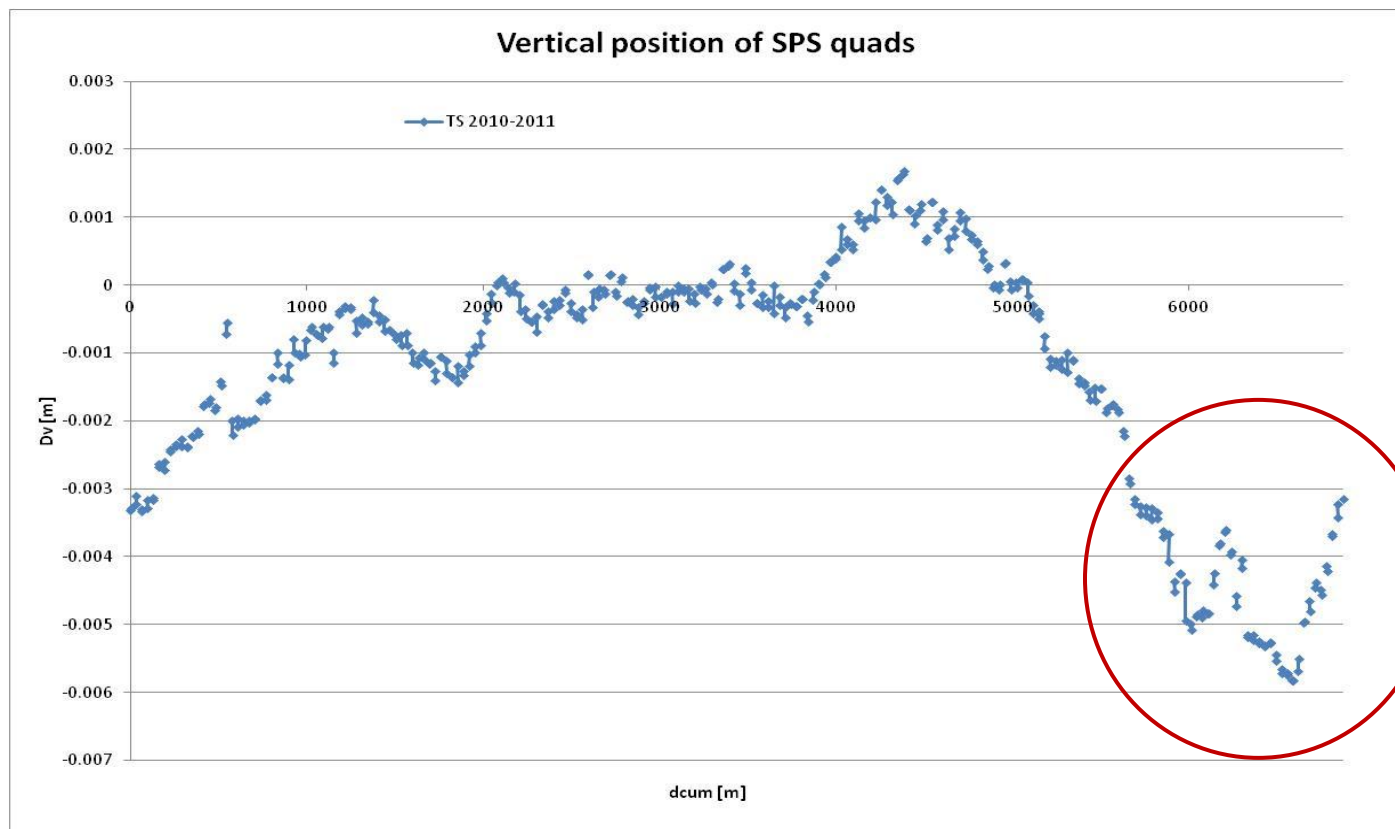
Preliminaries

- Work presented concerns essentially preventive maintenance/operation of alignment proposed either by :
 - ▣ SU when instabilities are well known
 - ▣ By OP or ABP for machine improvement
- It doesn't include the alignment requested for installation of new components which is not known yet
- Terminology
 - ▣ T (tilt) means Transversal inclination (roll angle) of magnet
 - ▣ V means vertical survey
 - ▣ H means perpendicular/tranversal to the beam direction

SPS ring

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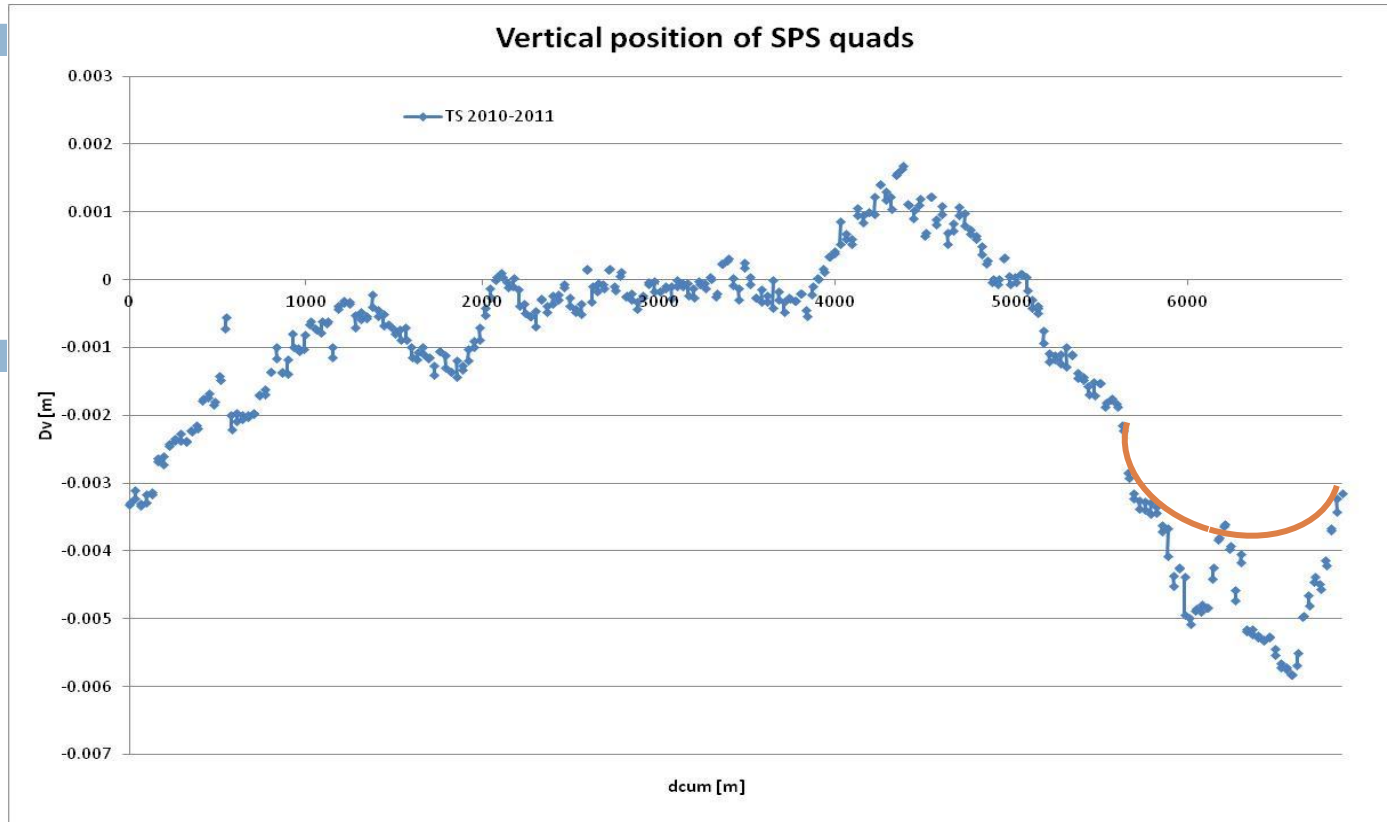
- Vertical Survey of the quads (regular yearly activity not done at the last TS)
 - 20% of quads realigned each time



SPS ring

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□ SPS in Vertical



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SPS ring

6

- in Horizontal
 - ▣ Survey of the quads (it has not been done since 2005)
 - ▣ Realignment of dipoles and intermediate components to be done also

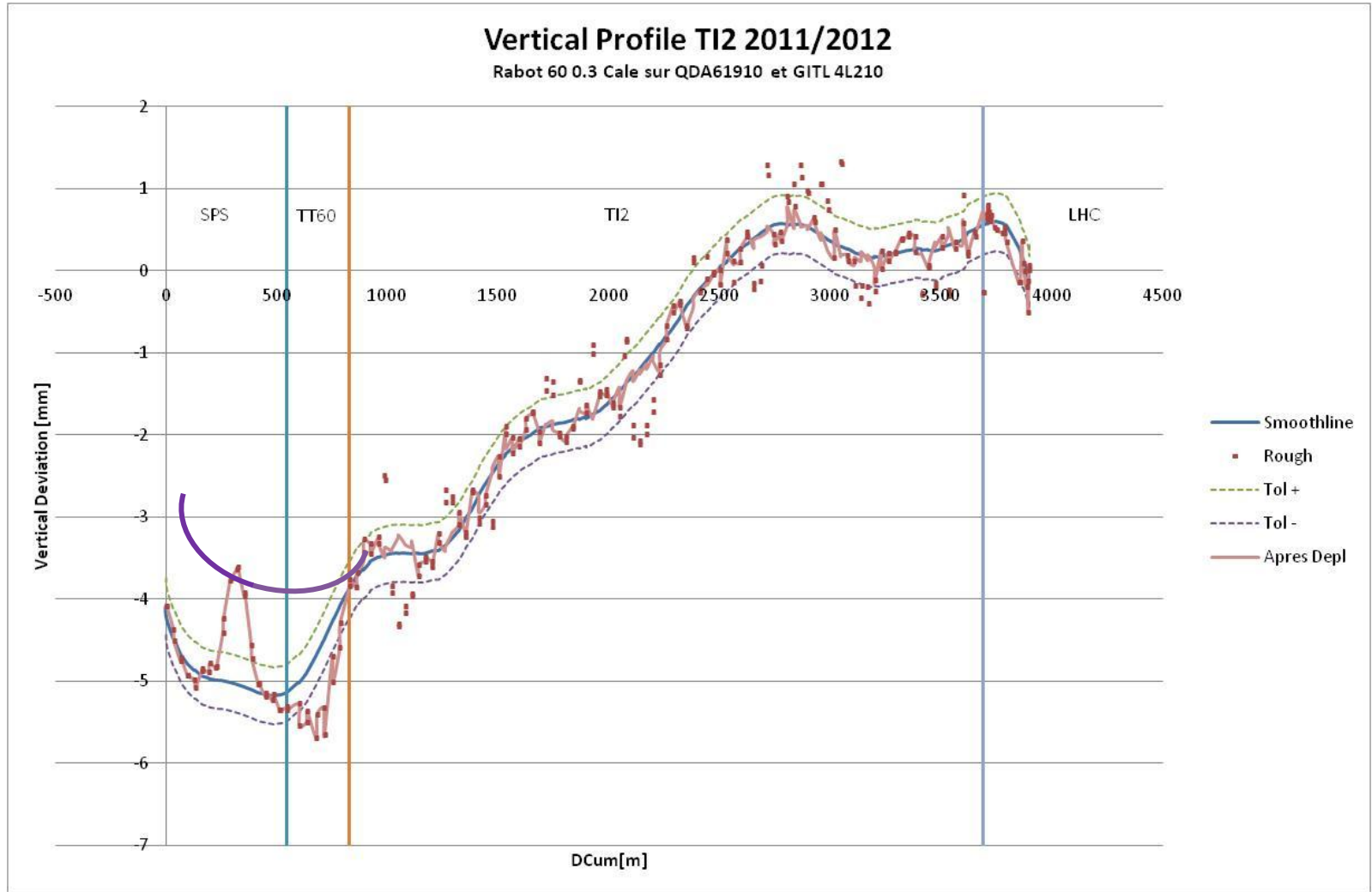
T12

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- ▣ Tilt and Vertical of quads done in TS 2011-2012
 - 50% of quads realigned > becoming an unstable area
- ▣ Proposal for LS1
 - Quads in V and T : 1.5 month
 - Realign the TT60 if SPS is realigned

T12

□ V survey



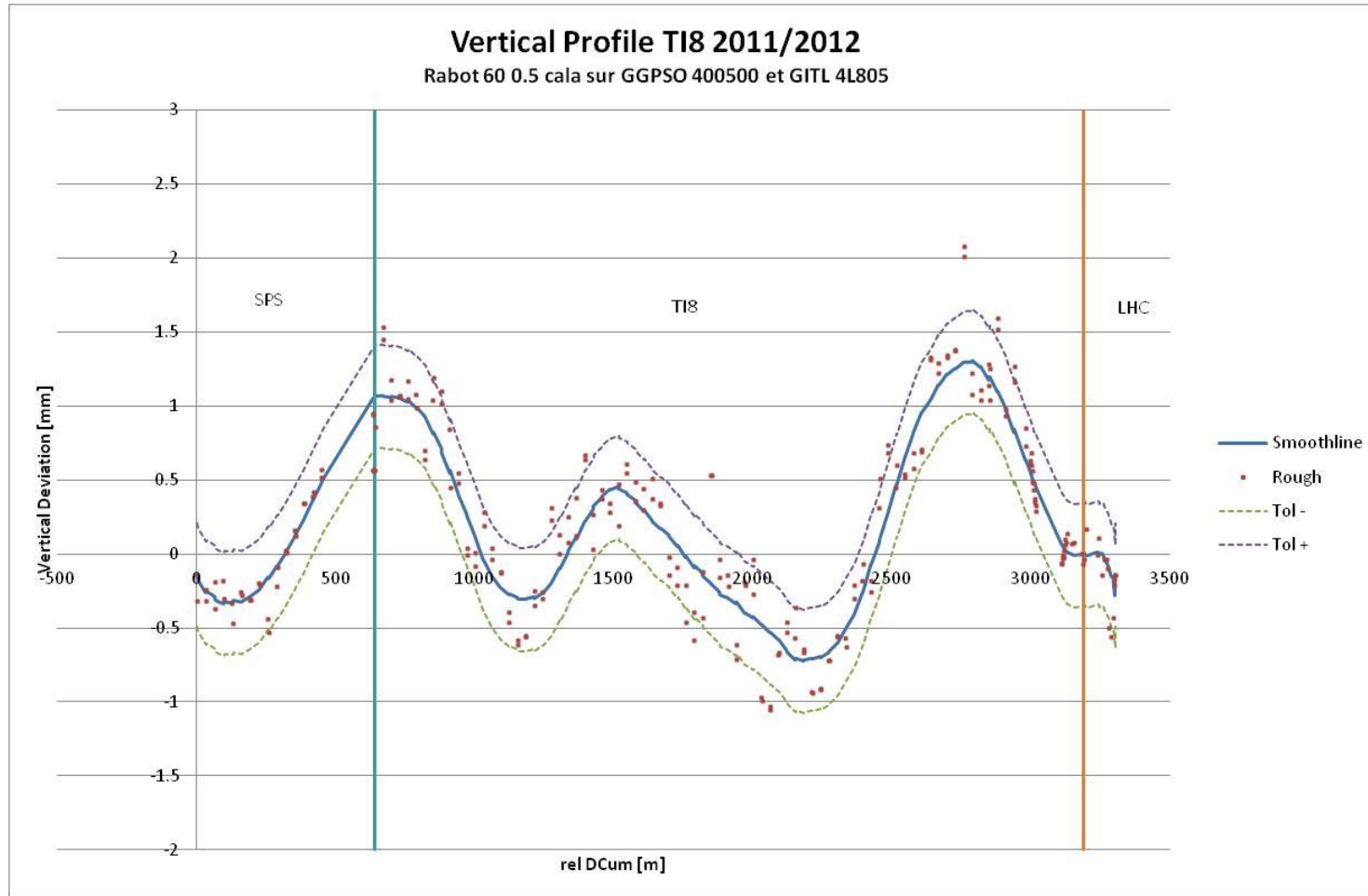
T12

- in H
 - ▣ Quads have not been measured since the first alignment/smoothing in 2006-2007
 - ▣ Proposal for LS1
 - Remeasure and realign quads
 - Hope mvt will be small and that the others components will not have to be realigned

T18

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□ in Vertical



T18

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- T18 is a very unstable area
 - ▣ A tilt and vertical survey is done at each winter TS
 - Last year 80% of the quads were realigned in T and V
 - This year H measurements were done at the bottom of the line > displacements of 2 mm found
 - ▣ Proposal
 - a full survey in T, V and H of all components not only quads
 - Estimated time : 5 months

CNGS

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- TT41 is a also an unstable area
 - ▣ V and T survey done for some portions in 2010 and 2011 upon OP request > misalignments of 2mm found and corrected
 - ▣ H survey done on five half cells in 2012 misalignments of 2mm found and corrected
 - ▣ Proposal for LS1 : Nothing up to now

SPS transfer lines

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□ TT10

- T+V+R survey done in 2007-2008 > significant improvement of the beam
- Proposal for LS1 : Redo the same operation
- 3 months

□ TT20

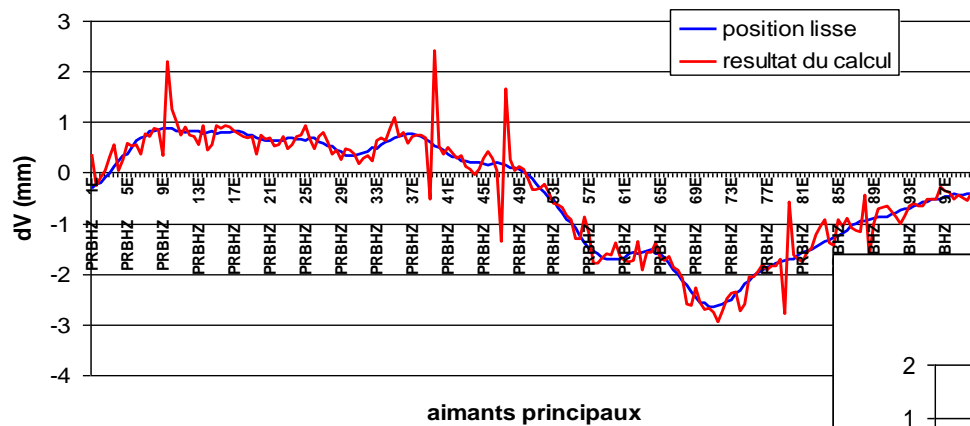
- Survey in T + V for some quads done in 2008-2009
- Proposal for LS1 : full survey of all the components but with a low priority
- 3 months

PS Ring

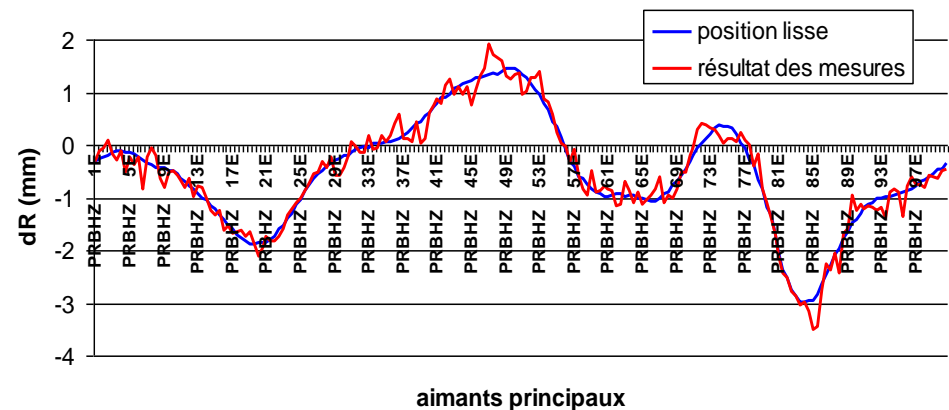
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- Last Survey of main magnets in T, V and H in 2005

PSR - altimétrie - Courbes lisse "rabort" et résultat LGC



PSR - planimétrie- Courbe lisse "rabort" et résultat LGC



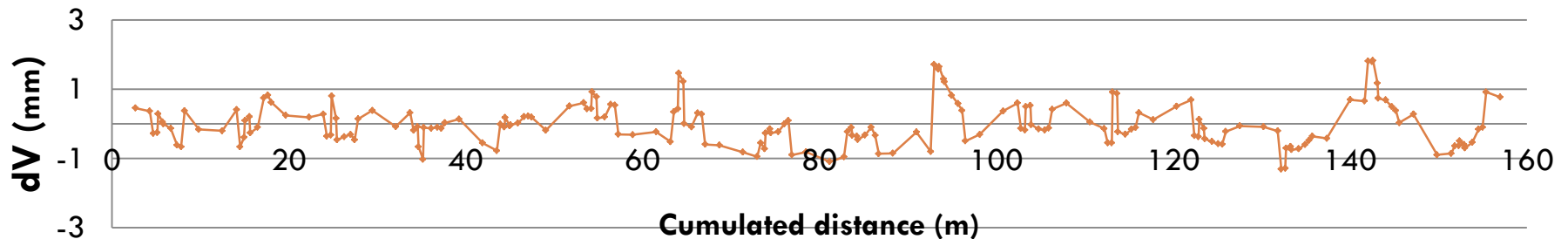
- Proposal for LS1 : as requested by ABP and OP to redo full survey

PS Booster

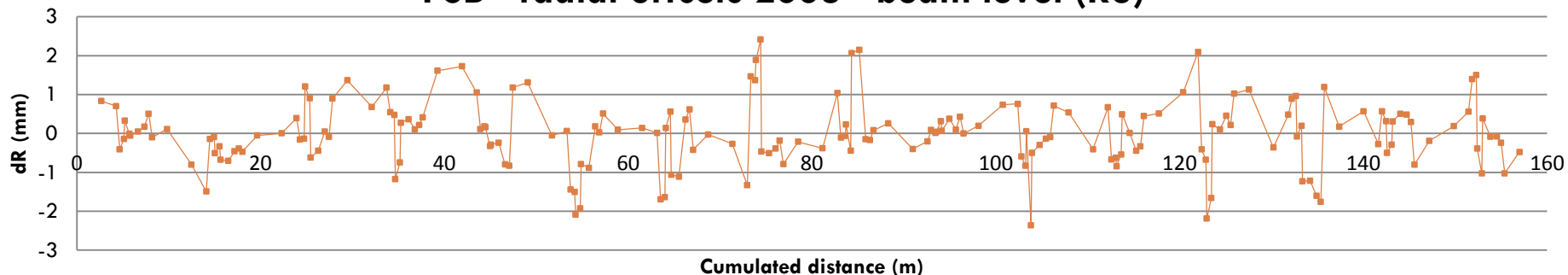
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- Last Survey in T, V and H in 2008

PSB - vertical offsets 2008 - beam level (R3)



PSB - radial offsets 2008 - beam level (R3)



- Proposal for LS1 : as requested by OP, measurement and realignment of quads and dipoles

PS transfer lines

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- ▣ TT2/FT16
 - Survey in T, V and H of the quads

- ▣ BTM, BTY, BT, BI and FTA
 - Survey and alignment of all components
 - BI will be done in the frame of the LIU project

Linac4

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▣ Linac4 :

■ Important delay

- For manufacturing of components
- For installation : supporting jacks will not be there before september

■ Fiducialisation and alignment will place in 2013 and 2014 which was not expected

- Fiducialisation
- Alignment

Other areas

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- 20 Targets for TDC2 to prepare and fiducialise on the surface

- Non-LHC Experiments areas
 - Isolde/AD areas/PS areas
 - SPS areas H2-H8/Na62
 - CAST
 - 20 months/ 1 team

Manpower/Planning

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- Most of the field work is done by a Manpower contract under the supervision of CERN staff
 - Contract people can be increased rather easily
- Preparation , Supervision, Coordination, data post processing, quality checks are done by CERN staff

- SU would like to do the major part of the injector works in 2013 because of heavy work load in LHC from sept 2013 to mid 2014

Time estimation

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Accel/ Transfer line	Operation	Time (months)/t eam	when
SPS	Quads T + V	1.5	2013
	Quads H	2	2013
	Other components in T,V and H	5	2013
	Realignment of Sext 5 and 6 (extra time)	2	2013
TI2	Quads in T, V and H	2.5	2013
TI8	All components in V, T and H	5	2014
TT10	Quads in T, V and H	3	2014
TT20	Quads in T, V and H (if time available)	3	2013

- ▣ Total of 24 months
- ▣ Manpower : 4 FTE over 15 months/supervision by staff will be a bit difficult

Time estimate

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Accel/ Transfer line	Operation	Time (months) /team	When
PSR	Main magnets	2.5	2014
PSB	Quads and dipoles	2	2013
BTM, BTY	All components	2	2013
BI, BT, FTA	All components	2	2013
TT2	Quads in T, V and H	1	2013
Linac4	First alignment and smoothing of all components	8	2013 2014
	Metrology and fiducialisation	8	2013 2014

- ▣ Total of 9.5 months for CPS
- ▣ For L4 the problem will be the supervision of the contract team
 - 1 person to be allocated at 100% during this period

Conclusions

- Huge amount of work to be done during LS1
- It should be possible to include all the activities with the 15 months of shut-down from the planning point of view
- Decision has to be taken on the realignment of sext5-6 of SPS
- L4 delay of component readiness is not favorable at all for SU
 - 1 person missing to supervise the contract team for L4 because of heavy work load
- The survey of the injectors is only a piece of the puzzle for LS1