POST-PROCESSOR / VIEWER FOR THE BNN COLLARED COIL SIZE MEASURING MACHINE DATA

USERS MANUAL

I.Vanenkov MMS/LHC

Actual dimension measurement of the size of the collared coil

Actually at BNN the size of the collared coil are measured according to the requirements written in IT-2708/LHC/LHC (IT-2997/LHC/LHC) Technical Specification for the pre-series CM production. According to the Annex B9 of this document, the sizes of the collared coil are measured at 5 longitudinal positions over both magnet ends, at 6 positions over the layer jump/splice region and at every 4500 mm along the straight part of the collared coil. In total, the BNN measurement standard procedure includes 44 measuring positions along the magnet. Additionally to that, two more calibration measurements are made: before the first positions and after the last position. The calibration measurements are done on the master collar-pack piece. The layout of measuring positions for the pre-series production is shown in **Annex 1**.
For each measured collared coil the Coil Size Measuring Machine (CSMM) produces an output MS Excel SLK Data Import format file, shown in **Annex 2.**

The Post-Processor/Viewer for the collared coil size measuring machine data (PPVCC)

1. Post-Processor mode.

In the Post-processor mode (the switch MODE is in position Post-processor, see figure1[1]) the PPVCC reads the CSMM output file and allows pre-viewing of data on the collared coil size measured at 10 points in all measuring positions. The measurements data for all measured points can be seen in the table or plotted for all pre-selected points in the graph window (two points at the time, see figure 3). When user starts the program, he has to load a data file via the standard windows file browser (see figure 2[2]). The program reads in the data file the header, containing the Magnet ID, date of the measurements and statistical data arrays (Nominal, Min and Max, Average values) and show them on the screen. The measurements data is posted into the table. It should be noticed, that during loading the data, program do a check for the tolerances for both calibration measurements. If the calibration data has tolerances more then 0.005 of mm, the user is notified by the message and the tolerance values appear on the upper left corner of the screen (this case is shown on figure 6). The user can continue observing the data, but it is not recommended to transfer this data into the Database, before the calibration is re-checked.
If the data is considered as a correct data, user can do a direct transfer of data into Collared Coil Database. To do so, user should press the button “Save into DB”. The program will start an automation session with MS Access DB and do a data transfer. At the end, the user will be prompted to verify if the data was transferred correctly or not. In case some errors were reported (for example, user has used a wrong magnet ID) user has to make a note about this record and press OK button. The wrong record mast be deleted

[1] The switch MODE should be turned to the wanted position before execution of the program: ones the program is running this switch is disabled. If user wants to change the mode, he should stop running the program first, then turn the MODE switch to desired position and run the program again.
[2] The program sets filters in the load file dialog windows to see only files with an extension .SLK

from the Database first (see manual for the Collared Coil Database) and only after the same data can be treated again with the PPVCC and transferred into database.
It should be noticed, that the PPVCC, as well as the Collared Coil Database were designed, following the IT-2997/LHC/LHC Technical Specification for the series production of Cold Masses of the Superconducting Dipole Magnets. According to this document, the number of measuring sections along the magnet is reduced, compare to the Technical Specification for pre-series production (3 measuring sections at each magnet end, two sections over the layer-jump/splice region and every 4500 mm along straight part). Therefore the data tables in the database can only store the data from 16 measuring sections and one array with the average values. Due to this constrains, and assuming that the data from the measurements taken over the magnet ends and the layer-jump/splice is the more essential for magnet performance analysis, the PPVCC reserves 8 lines in the database file for the data from these sections and the remaining 8 lines are given to the data, belongs to the magnet straight part.[3] Nevertheless, in order to keep possibility to use this software also for pre-series magnet, the PPVCC front panel has a switch "Measurements layout", which has two positions: Pre-series and Series. The user should use this switch to tell to PPVCC which standard was used during the measurements[4]. *Important*: this switch should be in the right position before the program is executed (as an indications, that user has changed the switch position after starting the program, the text inside the button is not centered). In any position of the Measurements layout switch, the data from all sections is plotted in the graph. In order to see the data belongs only to the straight part of the magnet, a switch "All measuring sections / Straight part only" should be used.

2. Viewer mode.

In the Viewer mode (the switch MODE is in position Viewer, see figure 9) the PPVCC creates a Dynamic Data Exchange Link to the "Checked_collared_coil_data" table in the Collared Coil Database and mirroring all records into the table on the screen. User can observe the data in the table and make plots for the selected magnet in the graph window. If user wanted to see a trend graph for selected parameter (measuring points from 1 to 10), he (she) should turn the switch placed above the data table to the right position (Trend graph), this will replace the table by the trend graph window, where user is free to plot the graphs for any measuring points.

[3] The number of measuring sections in the straight part of the magnet might not be necessary fixed: the PPVCC reads the actual number of measuring sections, then calculates the step, and then reads the data from data file using this step.
[4] In case of pre-series standard was used during the measurements, the PPVCC also saves data from 16 measuring sections: the measuring sections N° 2, 3, 4 (C.S.); 7, 9 (LJ); 8 sections with the regular step in the straight part and three sections at N.C.S.: N°41, 42, 43.

Dimension measurement of the size of the collared coil during series production of Cold Masses of the Superconducting Dipole Magnets

CERN recommended procedure.

BNN is free to keep the actual measurement layout also for the series production. In case a new procedure will be set, in order to preserve use of CERN software, the following rules should be followed:

1. The output file format of the CSMM mast be unchanged (the style of header, data body);
2. The first and the last measuring positions are the calibration measurements;
3. The measuring positions starts from C.S. of the magnet (connection side).

CERN recommended measurements sections layout, described in the Annex B9 of theIT-2997/LHC/LHC Technical Specification. It would be preferable also if the measurements in the straight part will be aligned with the ones, made during coil size measurements by IMMG press. In that case, both data can be crosschecked.

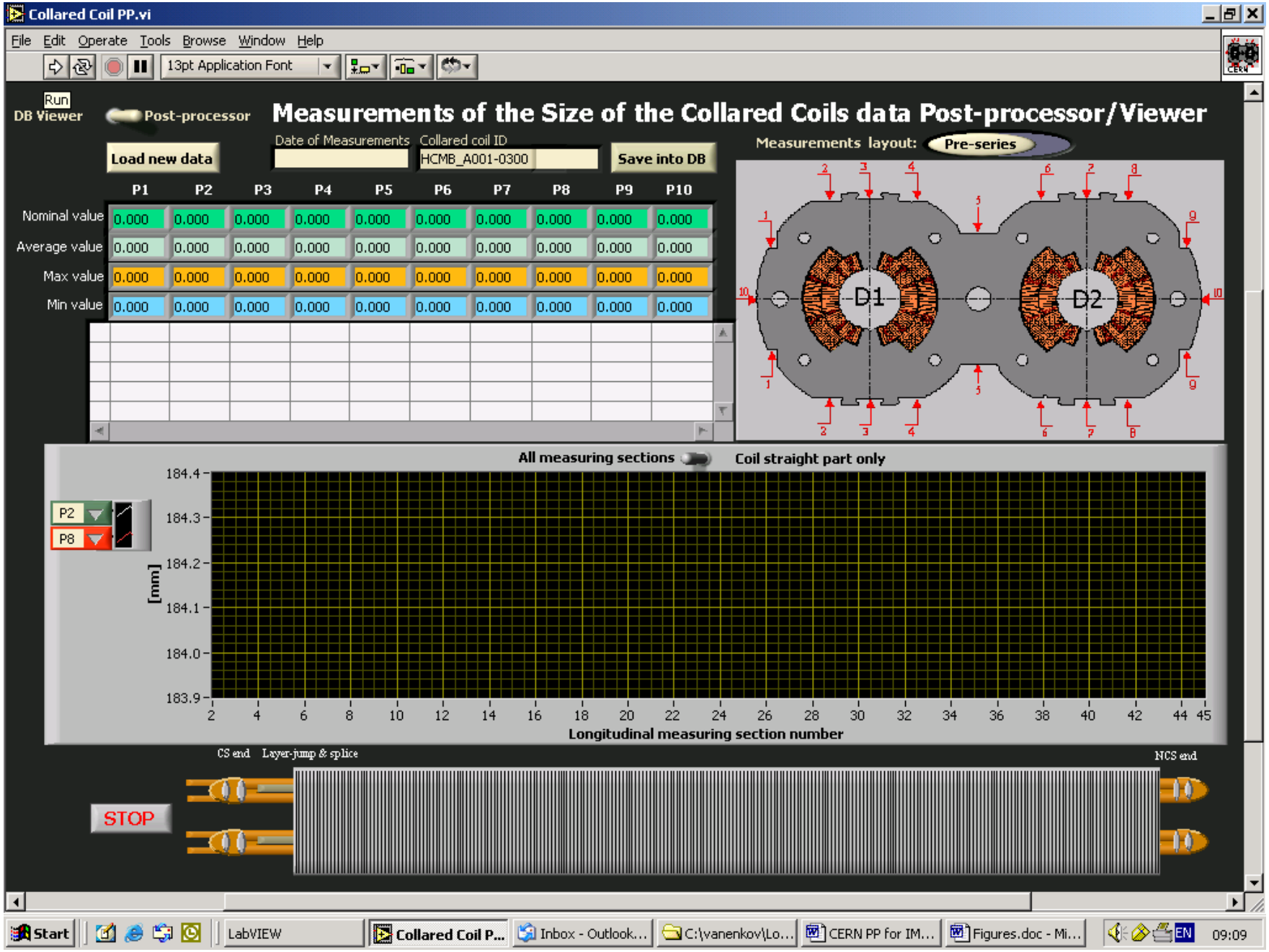

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
13pt Application Font
Run
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Load new data
Date of Measurements
Collared coil ID
HCMB_A001-0300
Save into DB
Measurements layout:
Pre-series
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10
Nominal value
Average value
Max value
Min value
D1
D2
All measuring sections
Coil straight part only
P2
P8
[mm]
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Collared Coil P...
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
09:09

Figure 1

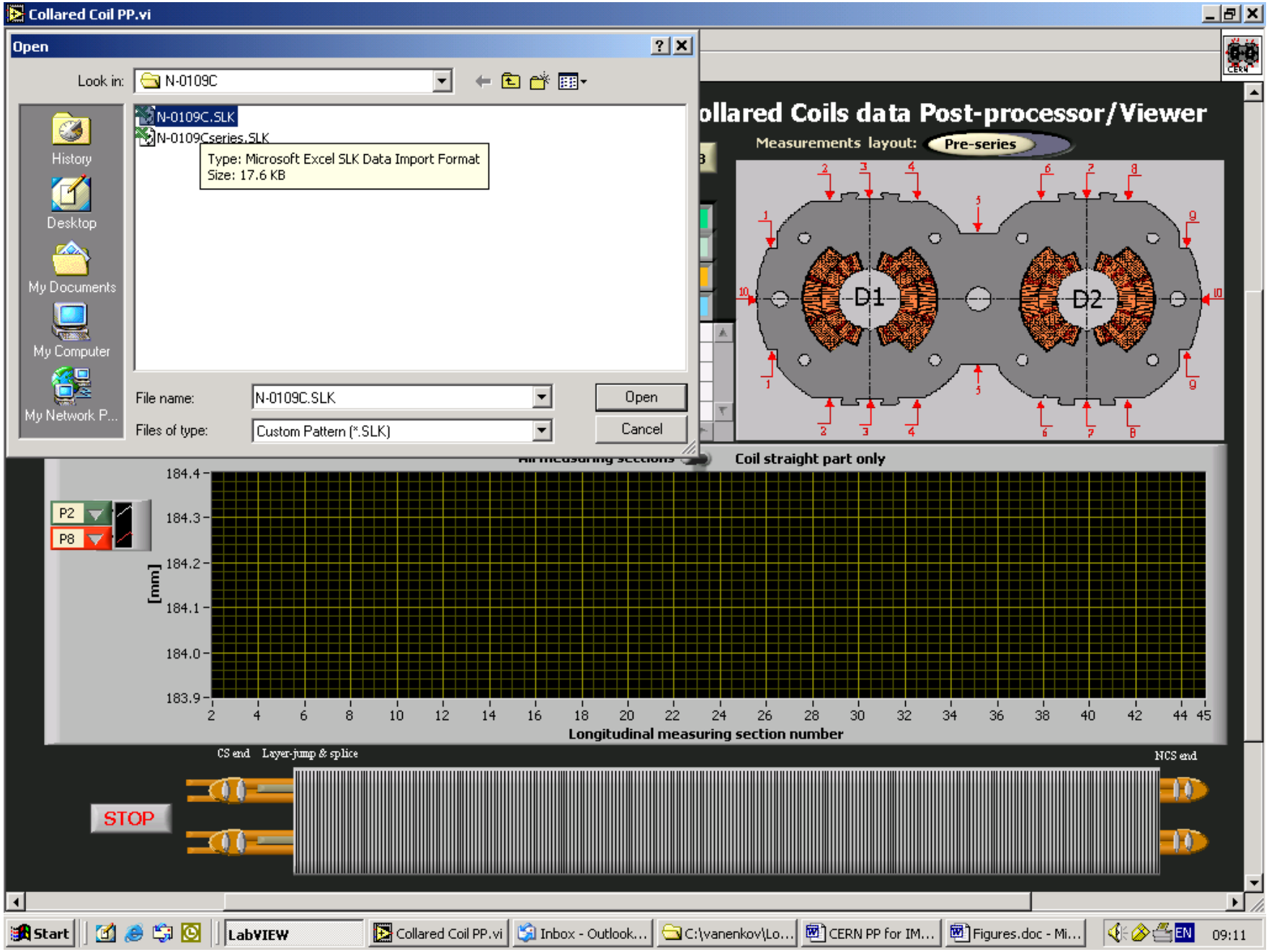

Collared Coil PP.vi
Open
Look in: N-0109C
N-0109C.SLK
N-0109Cseries.SLK
Type: Microsoft Excel SLK Data Import Format
Size: 17.6 KB
History
Desktop
My Documents
My Computer
My Network P...
File name: N-0109C.SLK
Files of type: Custom Pattern (*.SLK)
Open
Cancel
ollared Coils data Post-processor/Viewer
Measurements layout: Pre-series
D1
D2
Coil straight part only
P2
P8
[mm]
184.4
184.3
184.2
184.1
184.0
183.9
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 45
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Collared Coil PP.vi
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
09:11

Figure 2

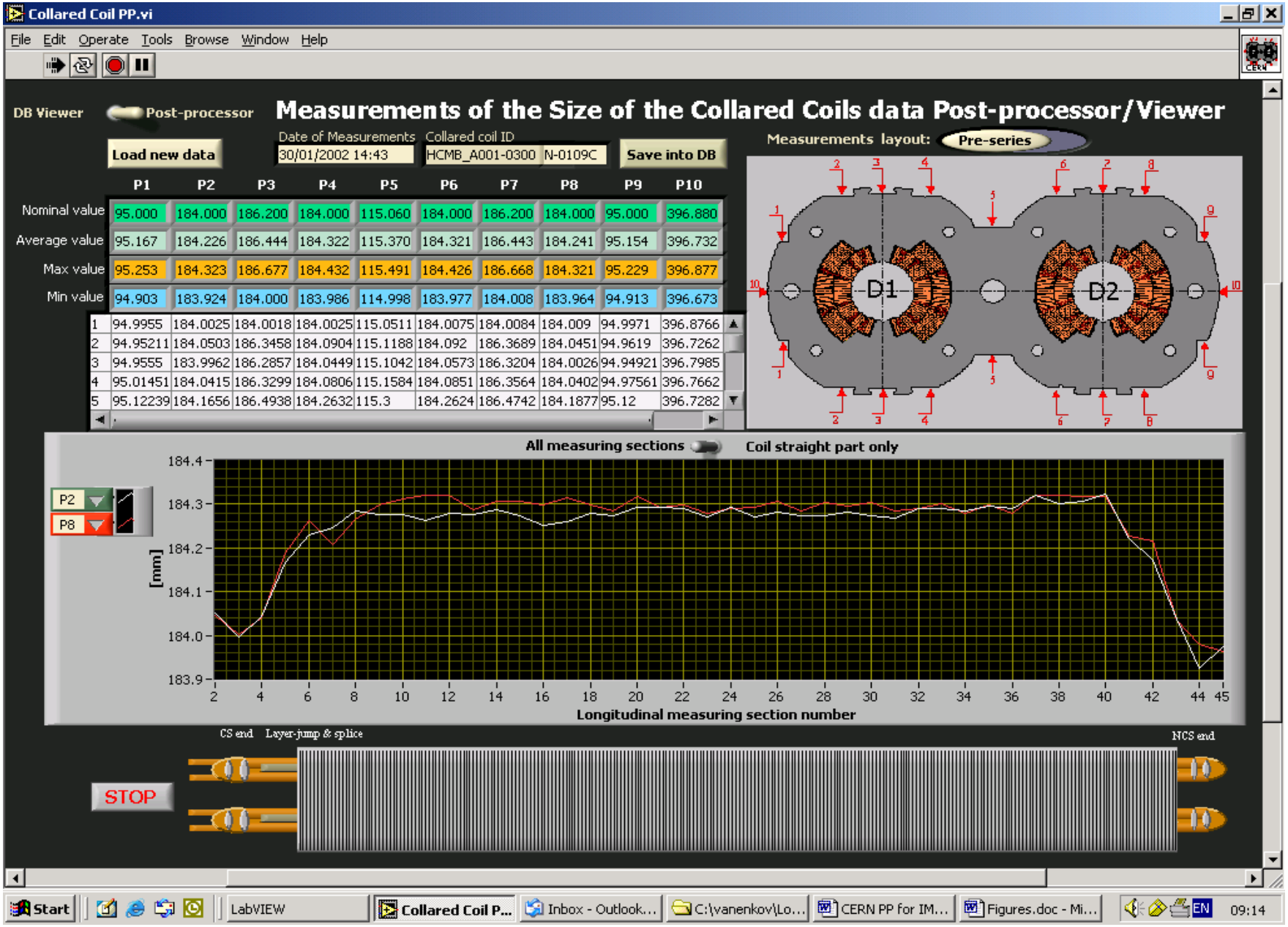

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Load new data
Date of Measurements
30/01/2002 14:43
Collared coil ID
HCMB_A001-0300 N-0109C
Save into DB
Measurements layout:
Pre-series
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10
Nominal value 95.000 184.000 186.200 184.000 115.060 184.000 186.200 184.000 95.000 396.880
Average value 95.167 184.226 186.444 184.322 115.370 184.321 186.443 184.241 95.154 396.732
Max value 95.253 184.323 186.677 184.432 115.491 184.426 186.668 184.321 95.229 396.877
Min value 94.903 183.924 184.000 183.986 114.998 183.977 184.008 183.964 94.913 396.673
1 94.9955 184.0025 184.0018 184.0025 115.0511 184.0075 184.0084 184.009 94.9971 396.8766
2 94.95211 184.0503 186.3458 184.0904 115.1188 184.092 186.3689 184.0451 94.9619 396.7262
3 94.9555 183.9962 186.2857 184.0449 115.1042 184.0573 186.3204 184.0026 94.94921 396.7985
4 95.01451 184.0415 186.3299 184.0806 115.1584 184.0851 186.3564 184.0402 94.97561 396.7662
5 95.12239 184.1656 186.4938 184.2632 115.3 184.2624 186.4742 184.1877 95.12 396.7282
D1
D2
All measuring sections
Coil straight part only
P2
P8
[mm]
184.4
184.3
184.2
184.1
184.0
183.9
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 45
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Collared Coil P...
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
EN
09:14

Figure 3

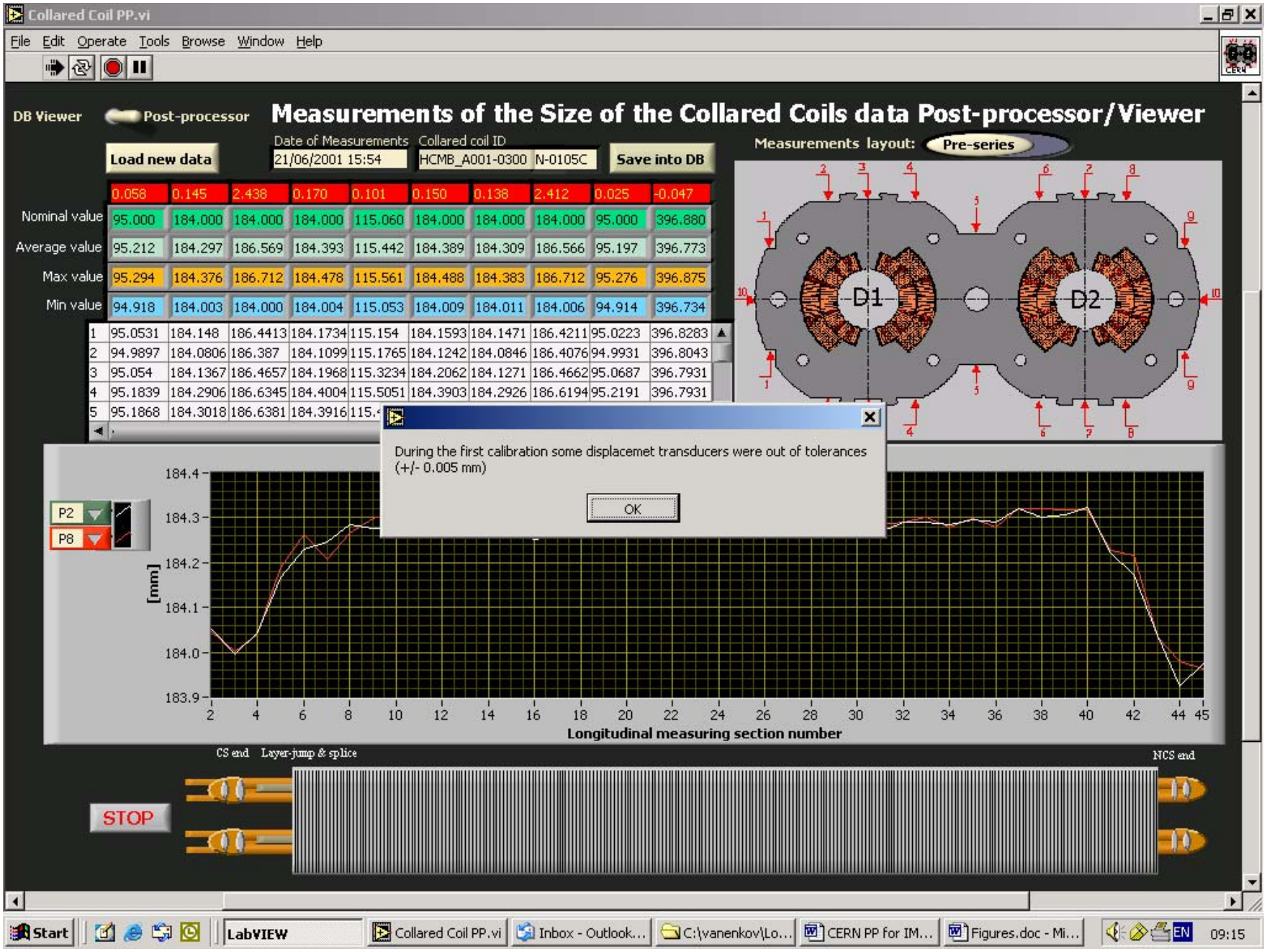

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Date of Measurements
21/06/2001 15:54
Collared coil ID
HCMB_A001-0300
N-0105C
Load new data
Save into DB
Measurements layout:
Pre-series
0.058 0.145 2.438 0.170 0.101 0.150 0.138 2.412 0.025 -0.047
Nominal value 95.000 184.000 184.000 184.000 115.060 184.000 184.000 184.000 95.000 396.880
Average value 95.212 184.297 186.569 184.393 115.442 184.389 184.309 186.566 95.197 396.773
Max value 95.294 184.376 186.712 184.478 115.561 184.488 184.383 186.712 95.276 396.875
Min value 94.918 184.003 184.000 184.004 115.053 184.009 184.011 184.006 94.914 396.734
1 95.0531 184.148 186.4413 184.1734 115.154 184.1593 184.1471 186.4211 95.0223 396.8283
2 94.9897 184.0806 186.387 184.1099 115.1765 184.1242 184.0846 186.4076 94.9931 396.8043
3 95.054 184.1367 186.4657 184.1968 115.3234 184.2062 184.1271 186.4662 95.0687 396.7931
4 95.1839 184.2906 186.6345 184.4004 115.5051 184.3903 184.2926 186.6194 95.2191 396.7931
5 95.1868 184.3018 186.6381 184.3916
D1
D2
During the first calibration some displacemet transducers were out of tolerances
(+/- 0.005 mm)
OK
P2
P8
[mm]
184.4
184.3
184.2
184.1
184.0
183.9
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 45
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Collared Coil PP.vi
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
EN
09:15

Figure 4

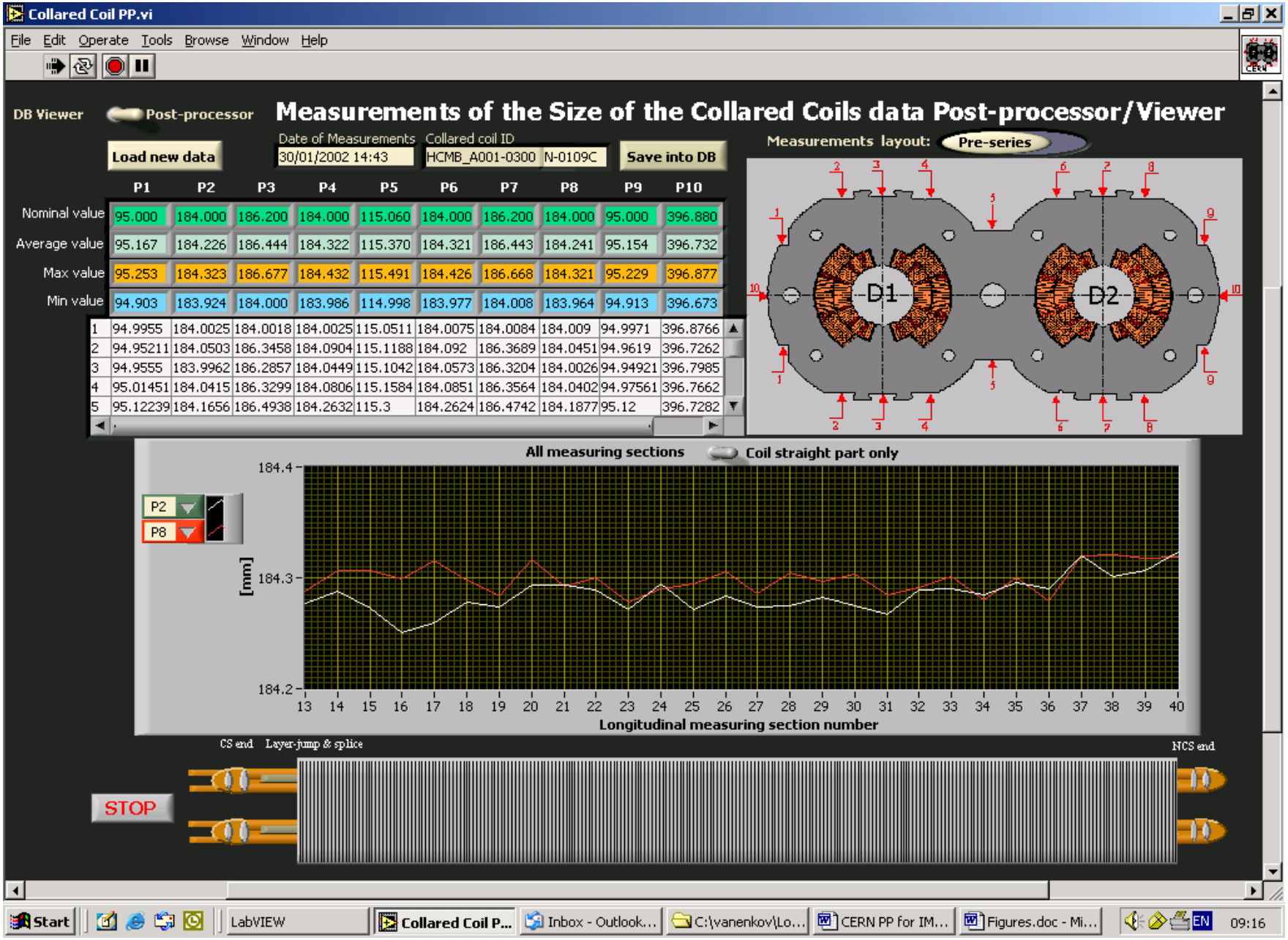

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Load new data
Date of Measurements
30/01/2002 14:43
Collared coil ID
HCMB_A001-0300 N-0109C
Save into DB
Measurements layout:
Pre-series
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10
Nominal value 95.000 184.000 186.200 184.000 115.060 184.000 186.200 184.000 95.000 396.880
Average value 95.167 184.226 186.444 184.322 115.370 184.321 186.443 184.241 95.154 396.732
Max value 95.253 184.323 186.677 184.432 115.491 184.426 186.668 184.321 95.229 396.877
Min value 94.903 183.924 184.000 183.986 114.998 183.977 184.008 183.964 94.913 396.673
1 94.9955 184.0025 184.0018 184.0025 115.0511 184.0075 184.0084 184.009 94.9971 396.8766
2 94.95211 184.0503 186.3458 184.0904 115.1188 184.092 186.3689 184.0451 94.9619 396.7262
3 94.9555 183.9962 186.2857 184.0449 115.1042 184.0573 186.3204 184.0026 94.94921 396.7985
4 95.01451 184.0415 186.3299 184.0806 115.1584 184.0851 186.3564 184.0402 94.97561 396.7662
5 95.12239 184.1656 186.4938 184.2632 115.3 184.2624 186.4742 184.1877 95.12 396.7282
D1
D2
All measuring sections
Coil straight part only
P2
P8
184.4
184.3
184.2
[mm]
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Collared Coil P...
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
EN
09:16

Figure 5

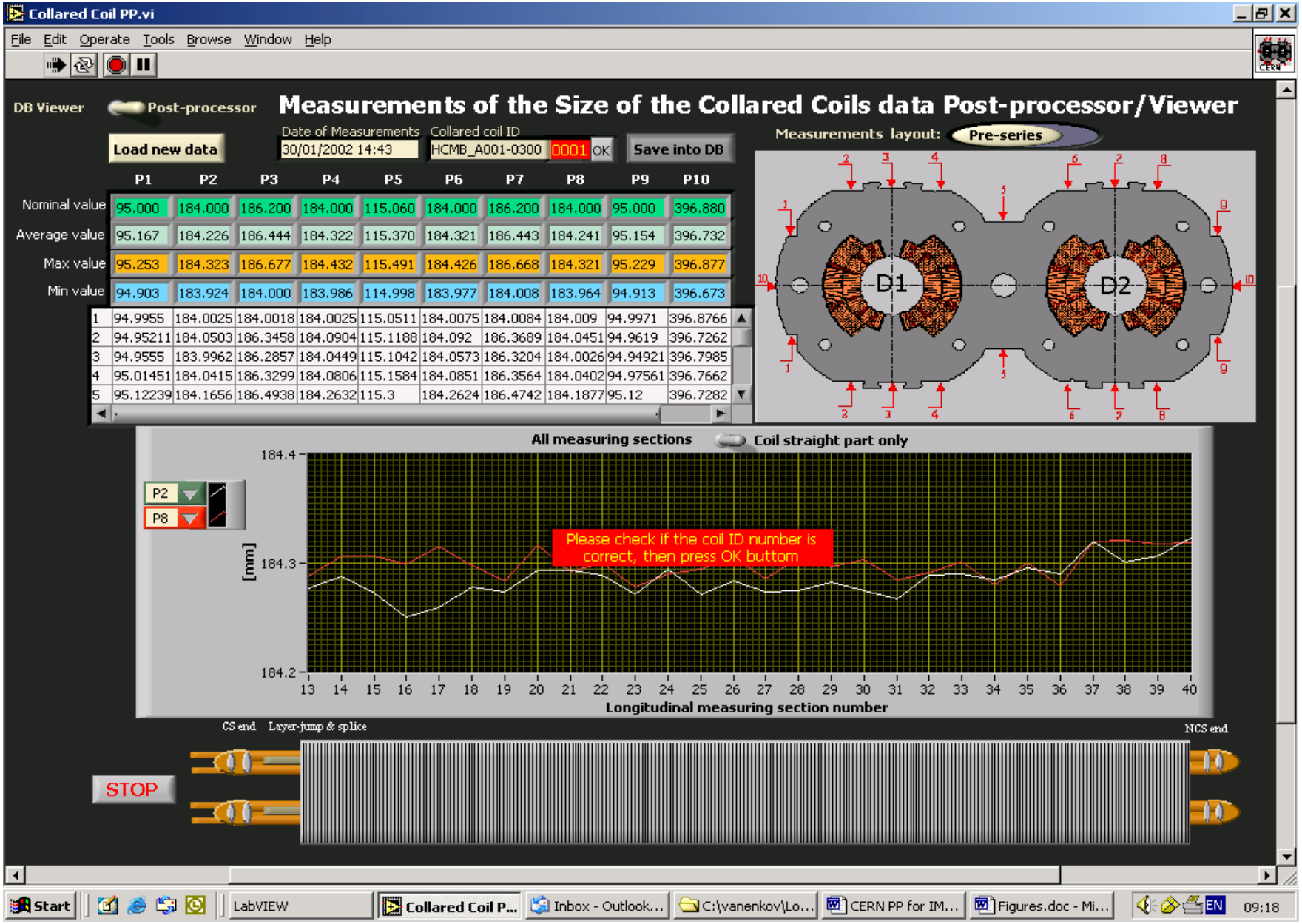

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Load new data
Date of Measurements
30/01/2002 14:43
Collared coil ID
HCMB_A001-0300
0001
OK
Save into DB
Measurements layout:
Pre-series
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10
Nominal value 95.000 184.000 186.200 184.000 115.060 184.000 186.200 184.000 95.000 396.880
Average value 95.167 184.226 186.444 184.322 115.370 184.321 186.443 184.241 95.154 396.732
Max value 95.253 184.323 186.677 184.432 115.491 184.426 186.668 184.321 95.229 396.877
Min value 94.903 183.924 184.000 183.986 114.998 183.977 184.008 183.964 94.913 396.673
1 94.9955 184.0025 184.0018 184.0025 115.0511 184.0075 184.0084 184.009 94.9971 396.8766
2 94.95211 184.0503 186.3458 184.0904 115.1188 184.092 186.3689 184.0451 94.9619 396.7262
3 94.9555 183.9962 186.2857 184.0449 115.1042 184.0573 186.3204 184.0026 94.94921 396.7985
4 95.01451 184.0415 186.3299 184.0806 115.1584 184.0851 186.3564 184.0402 94.97561 396.7662
5 95.12239 184.1656 186.4938 184.2632 115.3 184.2624 186.4742 184.1877 95.12 396.7282
D1
D2
All measuring sections
Coil straight part only
P2
P8
184.4
184.3
184.2
[mm]
Please check if the coil ID number is correct, then press OK buttom
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Collared Coil P...
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
EN
09:18

Figure 6

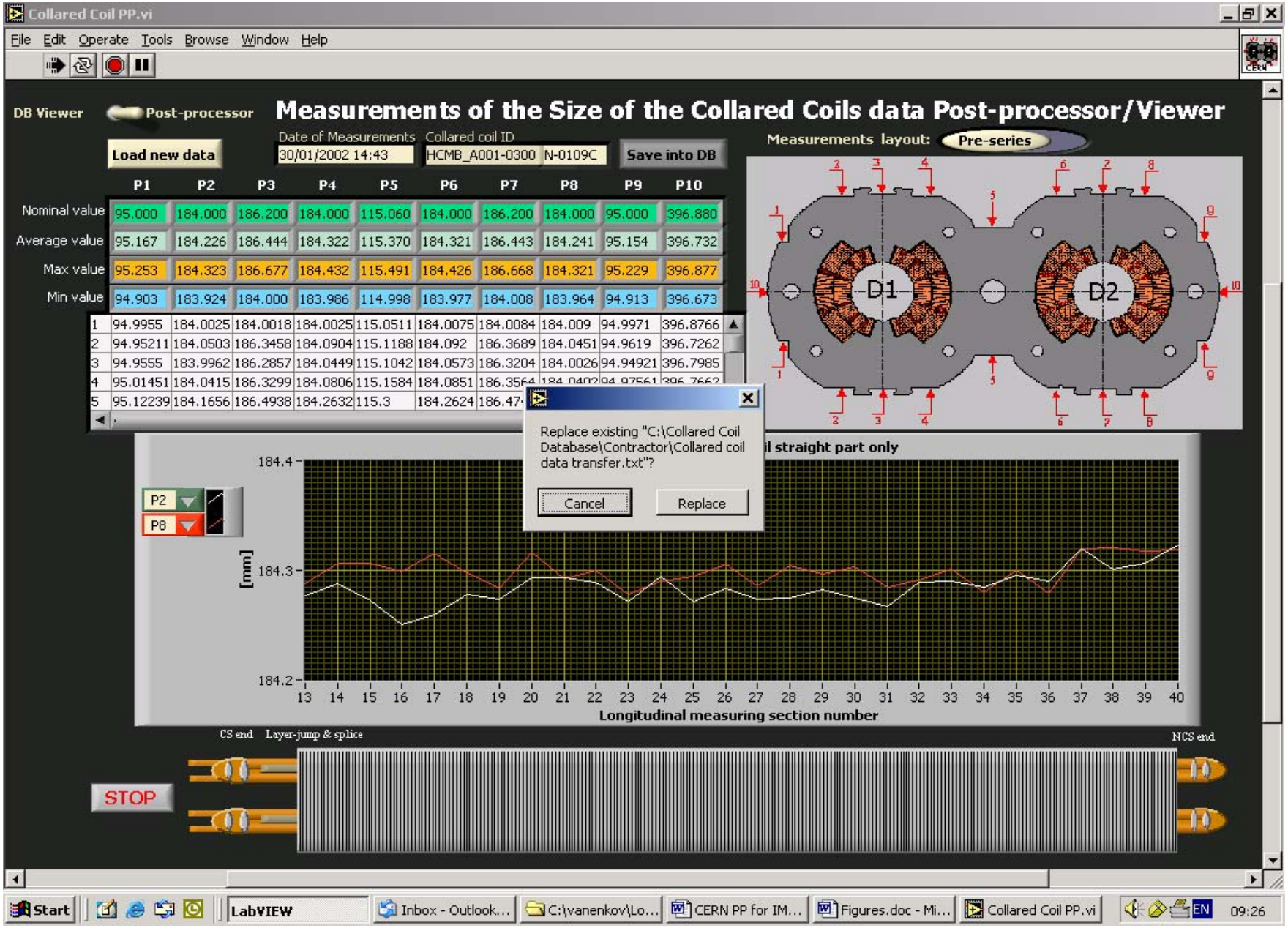

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Load new data
Date of Measurements
30/01/2002 14:43
Collared coil ID
HCMB_A001-0300 N-0109C
Save into DB
Measurements layout:
Pre-series
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10
Nominal value 95.000 184.000 186.200 184.000 115.060 184.000 186.200 184.000 95.000 396.880
Average value 95.167 184.226 186.444 184.322 115.370 184.321 186.443 184.241 95.154 396.732
Max value 95.253 184.323 186.677 184.432 115.491 184.426 186.668 184.321 95.229 396.877
Min value 94.903 183.924 184.000 183.986 114.998 183.977 184.008 183.964 94.913 396.673
1 94.9955 184.0025 184.0018 184.0025 115.0511 184.0075 184.0084 184.009 94.9971 396.8766
2 94.95211 184.0503 186.3458 184.0904 115.1188 184.092 186.3689 184.0451 94.9619 396.7262
3 94.9555 183.9962 186.2857 184.0449 115.1042 184.0573 186.3204 184.0026 94.94921 396.7985
4 95.01451 184.0415 186.3299 184.0806 115.1584 184.0851
5 95.12239 184.1656 186.4938 184.2632 115.3 184.2624
D1
D2
Replace existing "C:\Collared Coil Database\Contractor\Collared coil data transfer.txt"?
Cancel
Replace
straight part only
P2
P8
184.4
184.3
184.2
[mm]
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Inbox - Outlook...
C:\vanenkov\Lo...
CERN PP for IM...
Figures.doc - Mi...
Collared Coil PP.vi
EN
09:26

Figure 7

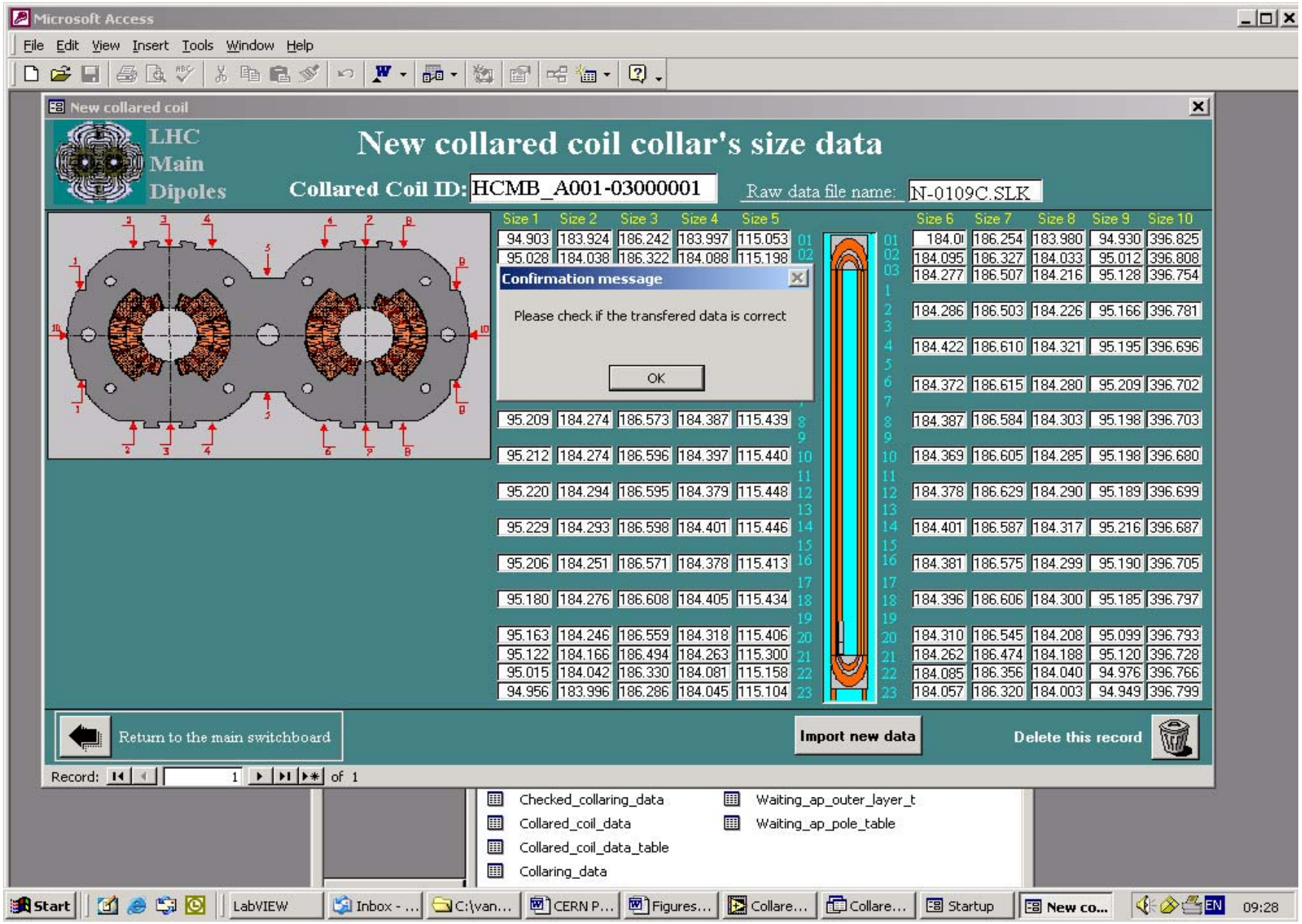

Microsoft Access
File Edit View Insert Tools Window Help
New collared coil
LHC Main Dipoles
New collared coil collar's size data
Collared Coil ID: HCMB_A001-03000001
Raw data file name: N-0109C.SLK
Size 1 Size 2 Size 3 Size 4 Size 5
Size 6 Size 7 Size 8 Size 9 Size 10
94.903 183.924 186.242 183.997 115.053 184.0 186.254 183.980 94.930 396.825
95.028 184.038 186.322 184.088 115.198 184.095 186.327 184.033 95.012 396.808
184.277 186.507 184.216 95.128 396.754
184.286 186.503 184.226 95.166 396.781
184.422 186.610 184.321 95.195 396.696
184.372 186.615 184.280 95.209 396.702
95.209 184.274 186.573 184.387 115.439 184.387 186.584 184.303 95.198 396.703
95.212 184.274 186.596 184.397 115.440 184.369 186.605 184.285 95.198 396.680
95.220 184.294 186.595 184.379 115.448 184.378 186.629 184.290 95.189 396.699
95.229 184.293 186.598 184.401 115.446 184.401 186.587 184.317 95.216 396.687
95.206 184.251 186.571 184.378 115.413 184.381 186.575 184.299 95.190 396.705
95.180 184.276 186.608 184.405 115.434 184.396 186.606 184.300 95.185 396.797
95.163 184.246 186.559 184.318 115.406 184.310 186.545 184.208 95.099 396.793
95.122 184.166 186.494 184.263 115.300 184.262 186.474 184.188 95.120 396.728
95.015 184.042 186.330 184.081 115.158 184.085 186.356 184.040 94.976 396.766
94.956 183.996 186.286 184.045 115.104 184.057 186.320 184.003 94.949 396.799
Confirmation message
Please check if the transfered data is correct
OK
Return to the main switchboard
Import new data
Delete this record
Record: 1 of 1
Checked_collaring_data
Collared_coil_data
Collared_coil_data_table
Collaring_data
Waiting_ap_outer_layer_t
Waiting_ap_pole_table
Start
LabVIEW
Inbox - ...
C:\van...
CERN P...
Figures...
Collare...
Collare...
Startup
New co...
09:28

Figure 8

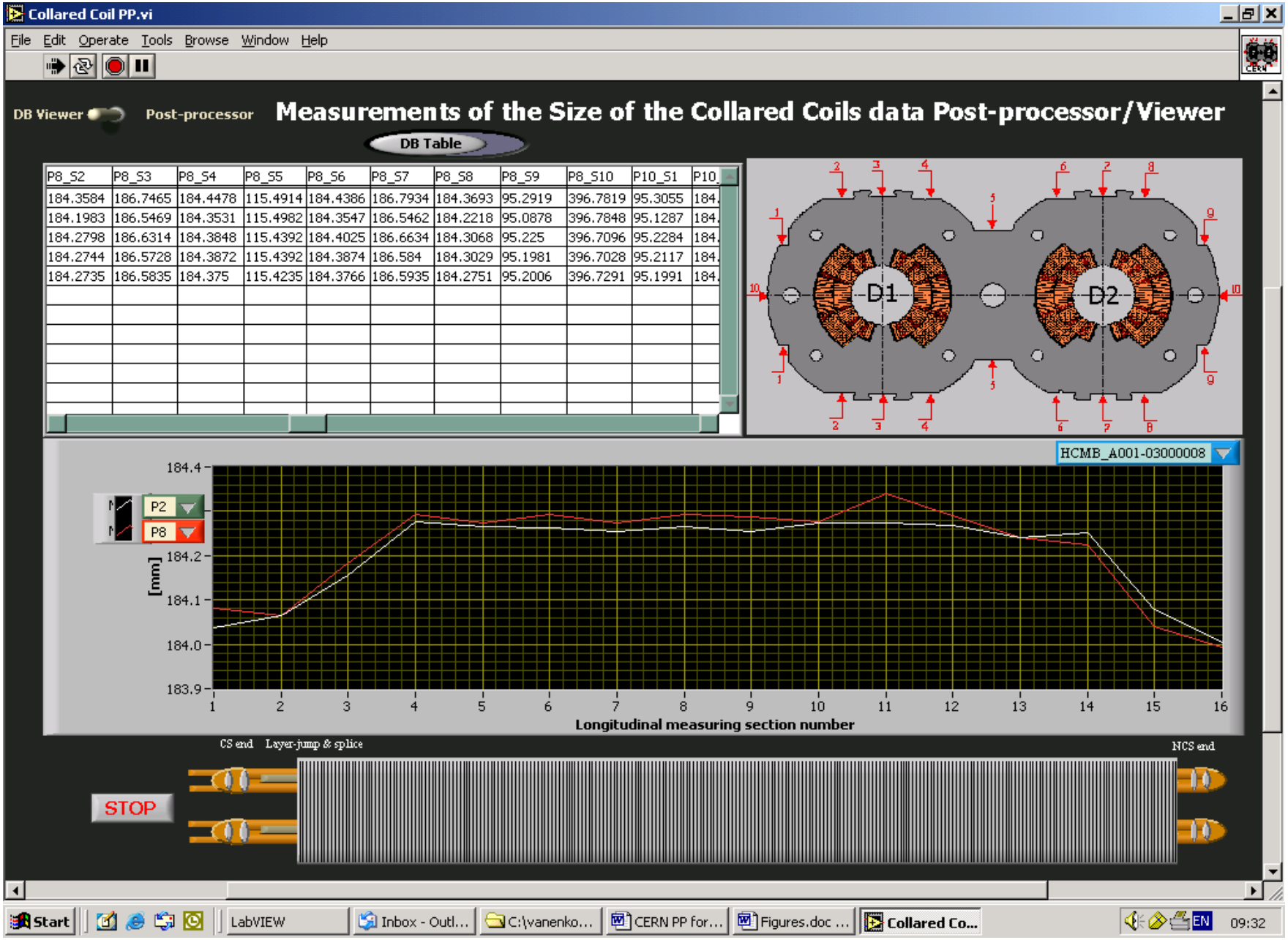
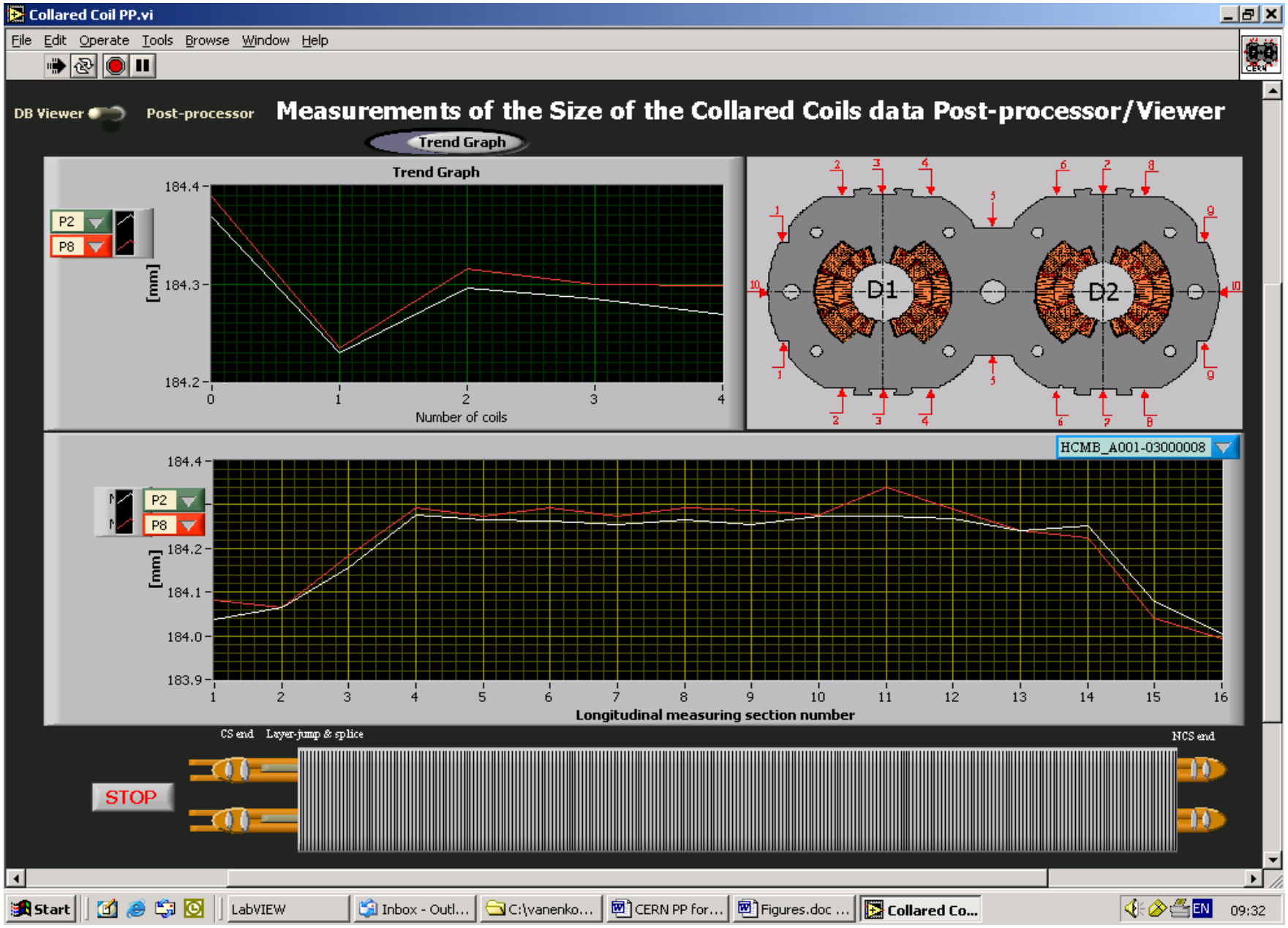

Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
DB Table
P8_S2 P8_S3 P8_S4 P8_S5 P8_S6 P8_S7 P8_S8 P8_S9 P8_S10 P10_S1 P10_
184.3584 186.7465 184.4478 115.4914 184.4386 186.7934 184.3693 95.2919 396.7819 95.3055 184.
184.1983 186.5469 184.3531 115.4982 184.3547 186.5462 184.2218 95.0878 396.7848 95.1287 184.
184.2798 186.6314 184.3848 115.4392 184.4025 186.6634 184.3068 95.225 396.7096 95.2284 184.
184.2744 186.5728 184.3872 115.4392 184.3874 186.584 184.3029 95.1981 396.7028 95.2117 184.
184.2735 186.5835 184.375 115.4235 184.3766 186.5935 184.2751 95.2006 396.7291 95.1991 184.
D1
D2
HCMB_A001-03000008
P2
P8
184.4
184.2
184.1
184.0
183.9
[mm]
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Longitudinal measuring section number
CS end
Layer-jump & splice
NCS end
STOP
Start
LabVIEW
Inbox - Outl...
C:\vanenko...
CERN PP for...
Figures.doc ...
Collared Co...
EN
09:32

Figure 9


Collared Coil PP.vi
File Edit Operate Tools Browse Window Help
DB Viewer
Post-processor
Measurements of the Size of the Collared Coils data Post-processor/Viewer
Trend Graph
Trend Graph
P2
P8
[mm]
184.4
184.3
184.2
0
1
2
3
4
Number of coils
D1
D2
HCMB_A001-03000008
184.4
184.2
184.1
184.0
183.9
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Longitudinal measuring section number
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NCS end
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Collared Co...
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Figure 10

Annex 1 The layout of collared coil size measuring positions for the pre-series production at BNN

BABCOCK BORSIG POWER SERVICE BABCOCK NOELL NUCLEAR GMBH	**Prüfbericht / *Inspection Report***	**Auftrag-Nr. / *Order-No.*:** **91300**

Dok.-Nr. / *Doc.-ID-No.*: **QC0035_0**	Interne Kennzeichnung / *Internal Identification:* #VALUE!	Seite / *Page:*

Projekt / *Project:* LHC-Dipolmagnete 30 Kalte Massen CERN No. F 303/LHC/LHC

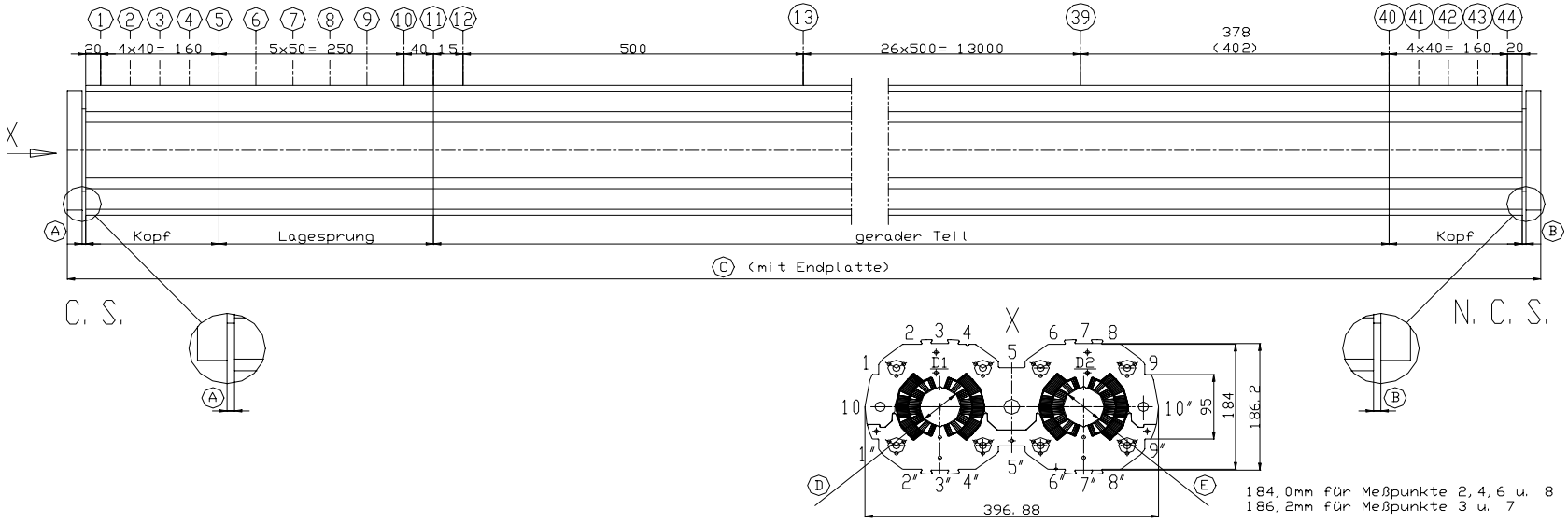
Titel / *Title:*

Ist-Maßaufnahme der Größe der gecollerten Spule /
Actual dimension measurement of the size of the collared coil

- [X] Enddokumentation
- [ ] Arbeitsdokument
- [ ] Belegdokument

Skizze / *Sketch:*

Messposition / *Measuring points*:



Noell-Collared Coil-Nr. / *Noell-Collared Coil-No.:* **N-0111C**	QIPP-Dok-Nr. / *Qipp-Doc.-No.:* CC0009_0	Spezifikations-Nr. / *Specification-No.:* LHC-MMS/98-198, Rev. 1.1	Anhang / Annex: B 9