

POST-PROCESSOR FOR THE POLE MEASURING MACHINE
(CERN version)

USERS MANUAL

Coil size/E-modulus measurements standard procedure

A standard coil size/E-modulus measurements procedure to be used with the new Pole Measuring Machine (later PMM) is based on the requirements written in IT-2997/LHC/LHC Technical Specification. According to the Annex B9 of this document, the coils shall be measured in single layers and assembled pole configurations. A single coil layer shall be measured each meter in its straight part and the assembled pole at least in three sections. A maximum compressive stress should not exceed 120 MPa for the measurements in the straight part. A layers-jump/splice area is measured in two sections. All the measurements data shall be treated with post-processor and stored in the “Collared coil database”, which is a part of the traveller. For traceability, the names of the original raw data files shall be saved in the database and files should be attached to the traveller. Following to all this requirements a standard coil size/E-modulus measurements procedure is following:

1. The individual coil layers are measured first. The measurements shall be taken at up to 18 longitudinal positions in the straight part of the coil. The PMM software predefines the exact longitudinal position for each of these sections. In case when a decision is taken to do the measurements with a reduced number of sections, they should always be performed at the standard positions.
2. The assembled poles are measured at up to 20 longitudinal positions. Where 18 positions are in the straight part of the coil, and 2 sections are in the layers-jump/splice area. In case when a decision is taken to do the measurements with a reduced number of sections, they should be performed at least in three positions: (preferably at positions 3, 10 and 18).

The PMM calibration procedure, described in the manual of the machine, shall be performed after each startup and after each reconfiguring of the machine for the measurements on coil in different configuration (for example, switch from measurements on the layers to the measurements on poles).

Post-Processor User's Guide

The Post-processor application (CERNPP.vi, later PP) is written in LabVIEW 6.02 for Windows environment. To use it, a LabVIEW 6.02 full software package or at list a LabVIEW Run-Time Engine needs to be installed at the same computer¹ first. The PP is off-line data analysis program and if it will be used at PMM computer, it might be executed at any time as it should not interfere with the main software of PMM. Post-processor allows to extract the relevant information from the raw data files created by the main software of the PMM, view strain-displacement graphs for each recorded measuring cycle, and treat data in a unique approach for all measuring sections and all coils.

¹ The LabVIEW Run-Time Engine includes the libraries and other files necessary to execute LabVIEW-built applications and shared libraries.

Data treatment method and output data files format

PMM, being measuring the coil at one particular section, produces a raw data file, which contains a header with the information about Date and Time of the test, Coil Identification number (Coil ID), User name and type of the machine (1.6MN or 3.2MN). After this header file contains the data from 4 LVDT and 4 pressing prisms (forces in kN and pressures in MPa) together with measuring cycle number and additional information about zero settings for pressure and displacement sensors. One raw data file could contain a data from many measuring cycles, performed at the same section. An example of the raw data file is given in **annex 1**. When the raw data file belongs to one coil, measured at particular longitudinal coil section, is loaded into PP, it can be re-viewed on the strain-displacement graph, cycle by cycle in the same order as it was recorded by the main software of PMM during measurements. At the same time, when the data is viewed, it is also post-processed. For each measuring cycle strain-displacement data set PP creates a fitting model (polynomial of the second order) and runs regression analysis for this data. For this analysis, only data from the loading branches of strain-displacement curves, as a more precise, is used. User of PP is free to view the original entire curves (loading and unloading branches) or fitted once together with the loading branches of original curves. The processed data about E-modulus and coil size is printed into the “Post-processed data” table of PP front panel. There are two steps in the saving procedure for processed data: first data for each longitudinal measuring position is saved into separate files, second, when all sections are being treated, all the files, belongs to the same coil, are collected into one excel file. When user saves the data, 3 types of output files are created or updated:

1. The output file of first type contains the header of the original raw data file and a portion of measurements data from this file, which corresponds to the measurement cycle, was used for post-processing. Generated by PP, the name of this file consists from the Coil ID and longitudinal Section number: “coilIDsectionNN.ppr” and it is saved under C:\Post Processor\”Coil type”\Coil ID\ folder, (if it is not exists, PP creates this folder). “Coil type”- depends from the measured coil configuration and it could be one of three: /Inner layer/, /Outer layer/ or /Pole/. When measurements data, belongs to the same coil, was analyzed for all longitudinal sections, the corresponding to this coil the post-processed data folder contains up to 20 files (18 sections in the straight part and 2 sections in layer-jump-splice region of the coil). The format of these files is shown in **annex 2**. When user saves the data to the Database, all these files are grouped into one excel file (CoilID.xls), to be attached to the traveller. It should be noticed, that for traceability, the names of original raw data files are saved in the headers of “CoilIDSectionNN.ppr” files.
2. The output file of second type contains the summary on processed data for particular coil. This file is a spreadsheet type ASCII-format file with a coil ID as a header and 20 rows of processed data: one row per one longitudinal measuring coil section. PP creates this file for a particular coil when the data from this coil was post-processed at least at one measuring section. The name of this file is “CoilIDsummary.ppr” This file is created under the C:\Post Processor\”Coil type”\Coil ID\ folder, where all output files of the first type are saved. When the summary file is just created for a new coil, it contains only the processed data in one row among 20. When another sections are treated by PP, the summary file is updated with new rows of data. In fact,

user can retrieve the data for a particular coil at any times and re-process the data for one or all measured sections. In that case a corresponding summary file will be loaded into PP and updated. Finally, the summary file is copied into CoilID.xls file.

3. The output file of third type, created by PP, contains the same data as the summary file, but the data is written in string-type file format. This file is used by CERNPP for an automatic data load into the Collared Coil Database.

Post-processor front panel

A front panel (screen) of the PP application is shown in **Figure 1**.

At the upper left corner of the screen there is a “Selected file info:” text-box, which contains the information taken from the header of the raw data file loaded into PP, such as Coil Identification number, User name, Date and Time of test. Below this text-box there are three string-indicators with the data re-created by PP from the raw data file header: a complete coil ID number, the longitudinal position in [m] the measurements were taken and measuring section number (a number from 1 to 20). At the right side of this text-box there are 3 control buttons: “Load new data”, “Save data”, “Save data into DB” and more to the right, two file-path indicators. When the PP application is launched for a first time all the file paths are empty and the user is asked to load the raw data file through the standard file browser window. Important: before proceeding a new file load, the coil configuration, such as “Outer layer”, “Inner layer” or “Pole” has to be selected with the coil type selector, placed at the right side of the “Stop” button. A new data file can be loaded or re-loaded without stopping the program by pressing “Load new data” button. When measurements data is loaded, PP first plotting the original data in the strain-displacement graphs in the upper right part of the PP screen. In this graph window user can view all measuring cycles one by one, selecting them with a “Measuring cycle” selector placed at the lower left corner of this graph. User has an option to use the graph window for viewing the original strain-displacement curves, or the loading branches of these curves together with their polynomial trend lines. In fact, PP treats the data from each measuring cycle at the same time as it is plotted. It calculates the E40, E80 and S100 parameters for each coil layer and each coil side and shows them in the “processed data table”, positioned at the left side of the screen. Before the “Save data” button is pressed, processed data is not saved yet and user can load a new raw data file or re-load the same file and observe the original curves if he wont. When user has decided to save post-processed data for a particular measuring cycle, he has to press a “Save data” button. At this time the “Section number” digital indicator and longitudinal position slider starts blinking and through a message window user will be asked to confirm if the longitudinal section number is correct. In case it is false he has to press a “Cancel” baton. The PP will react to this action with replacing the “Section number” digital indicator by “Section number input” control (also blinking for an easy guiding) and user would need to select a right number of the measuring section². After that, he has to press “Save data” button again. PP will create or update (in case they already exists), three output files under corresponding to the coil type and coil ID directories (see previous chapter for output file formats). After being saved, the data from the summary file is re-loaded back into the PP

² In fact, when PP loads a row data file and reads in its header the longitudinal position in [m], it calculates the corresponding section number, while some time, the result of this calculations could not be correct due to irregular step in longitudinal positions distances, that is why a manual option is kept as well.

and plotted in the “Coil tolerances in longitudinal direction” graph window. At the upper right corner of this graph, there is a parameter selector, which allows user to view different coil parameters one by one. When he does so, the graph’s vertical scale, title and units are updated according to the chosen parameter format. User also can view all the coil sizes at the same graph window by moving the graph type switch to the “All coil sizes” position. This time, at the upper left corner of the graph the plots legends will appear.

When the data belongs to particular coil was processed for all measured sections, user can save the data from the summary data file into Collared Coil Database file by pressing the “Save into DB” button. PP will create a file named “CoilID_db.dat” under C:\Post Processor\”Coil type”\ folder. He will be prompted to save directly to the database and if he press button “yes”, PP will start automation with MS Access database (start Access application, open DB, open “new data form” and execute the macro which will do a data transfer into the DB). As a last step, PP will start automation with MS Excel and will create a multi-page sped-sheet excel file with all raw and processed data (CoilID.xls file). This file is a subject to be attached to the traveller.

Annex 1 IMMIG PMM raw data file format

DE01#13300#1548-151.csv raw data file: containing data taken on outer layer measured at 13.3 m distance from NCS coil end (here only a portion of more than 1000 rows of data are shown).

Date: 31-05-01
 Time: 3:48 PM
 Coil ID: DE01
 Filename: DE01#13300#1548-151.csv
 Username: User0
 Relative position (m): 13.3

Machine type: 3.2 MN
 Shim values: 0 0 0 0
 (mm)

Pressing Bar offsets: In L(kN) In R(kN) Out L(kN) Out R(kN) In LF(kN) In LR(kN) In RF(kN) In RR(kN) Out LF(kN) Out LR(kN) Out RF(kN) Out RR(kN)
 -1.408539 -0.738914 -3.360913 -0.141162 -0.7643 -0.594657 -0.484281 -0.475688 -0.017909 -0.747869 -1.02868 -0.970087

Time (sec)	Cycle no #	L1 In (L) (kN)	δ1In (L) (Mpa)	D1 In (L) (mm)	L2 In (R) (kN)	δ2 In (R) (Mpa)	D2 In (R) (mm)	L3 Out (L) (kN)	δ3 Out (L) (Mpa)	D3 Out (L) (mm)	L4 Out (R) (kN)	δ4 Out (R) (Mpa)	D4 Out (R) (mm)	P1 (bar)	P2 (bar)	F1 (in LF) (kN)	F2 (in LR) (kN)
28121.57	0	-0.212	-0.092	-1.539	-0.044	-0.019	-1.549	0.414	0.179	-1.537	0.311	0.135	-1.551	54.336	112.359	-0.205	0.111
28123.33	1	-0.165	-0.071	-1.533	-0.132	-0.057	-1.544	0.471	0.204	-1.531	0.324	0.14	-1.547	61.726	111.732	-0.175	0.067
28123.45	1	-0.045	-0.02	-1.528	-0.076	-0.033	-1.54	0.512	0.222	-1.526	0.354	0.153	-1.543	59.818	111.238	-0.091	0.002
28123.63	1	-0.002	-0.001	-1.522	-0.061	-0.026	-1.533	0.48	0.208	-1.52	0.35	0.152	-1.535	59.128	110.452	-0.19	0.138
28123.77	1	0.127	0.055	-1.518	-0.035	-0.015	-1.527	0.451	0.195	-1.516	0.351	0.152	-1.529	58.402	109.865	-0.227	0.226
28124.01	1	0.046	0.02	-1.511	-0.024	-0.01	-1.519	0.444	0.192	-1.51	0.359	0.155	-1.521	58.517	109.005	-0.322	0.31
28124.13	1	0.26	0.112	-1.506	0.041	0.018	-1.516	0.427	0.185	-1.504	0.365	0.158	-1.518	57.615	108.557	-0.284	0.313
28124.31	1	0.542	0.234	-1.5	0.058	0.025	-1.512	0.469	0.203	-1.498	0.392	0.17	-1.514	57.711	107.864	-0.166	0.253
28124.51	1	-0.323	-0.14	-1.495	-0.119	-0.052	-1.505	0.571	0.247	-1.493	0.424	0.184	-1.508	59.075	106.951	-0.199	0.119
28124.59	1	-0.365	-0.158	-1.492	-0.13	-0.056	-1.5	0.593	0.257	-1.49	0.414	0.179	-1.502	57.935	106.528	-0.263	0.154
28124.75	1	-0.401	-0.174	-1.486	-0.143	-0.062	-1.494	0.574	0.248	-1.485	0.422	0.183	-1.496	57.077	105.832	-0.327	0.191
28124.92	1	-0.418	-0.181	-1.481	-0.172	-0.074	-1.488	0.616	0.266	-1.48	0.444	0.192	-1.49	56.792	105.202	-0.283	0.168
28125.04	1	-0.384	-0.166	-1.476	-0.141	-0.061	-1.485	0.642	0.278	-1.475	0.465	0.201	-1.487	56.516	104.716	-0.195	0.084
28125.26	1	-0.255	-0.111	-1.469	-0.091	-0.04	-1.479	0.658	0.285	-1.467	0.483	0.209	-1.481	55.782	103.949	-0.22	0.117
28125.34	1	0.255	0.111	-1.464	-0.012	-0.005	-1.477	0.64	0.277	-1.462	0.503	0.218	-1.48	55.371	103.743	-0.161	0.139
28125.62	1	-0.367	-0.159	-1.457	-0.132	-0.057	-1.467	0.697	0.302	-1.455	0.505	0.219	-1.47	55.875	102.676	-0.15	0.042
28125.8	1	-0.215	-0.093	-1.45	-0.114	-0.049	-1.461	0.693	0.3	-1.448	0.529	0.229	-1.463	54.707	101.992	-0.177	0.095
28125.96	1	-0.338	-0.146	-1.445	-0.115	-0.05	-1.455	0.648	0.28	-1.443	0.531	0.23	-1.457	54.268	101.519	-0.277	0.19
28126.14	1	0.105	0.045	-1.439	-0.021	-0.009	-1.45	0.706	0.306	-1.436	0.561	0.243	-1.453	53.392	100.964	-0.132	0.165
28126.24	1	0.285	0.123	-1.435	0.038	0.016	-1.445	0.611	0.265	-1.433	0.571	0.247	-1.448	52.861	100.69	-0.309	0.37
28126.38	1	-0.161	-0.07	-1.432	-0.086	-0.037	-1.44	0.607	0.263	-1.431	0.58	0.251	-1.442	53.923	100.218	-0.393	0.398
28126.6	1	-0.228	-0.099	-1.424	-0.137	-0.059	-1.435	0.75	0.325	-1.422	0.599	0.259	-1.437	53.715	99.34	-0.246	0.171
28126.74	1	0.078	0.034	-1.419	-0.041	-0.018	-1.43	0.738	0.319	-1.417	0.616	0.267	-1.432	53.809	98.939	-0.222	0.267
28126.98	1	-0.205	-0.089	-1.412	-0.095	-0.041	-1.421	0.776	0.336	-1.41	0.648	0.28	-1.423	53.099	98.055	-0.279	0.21
28127.14	1	-0.021	-0.009	-1.406	-0.078	-0.034	-1.416	0.793	0.343	-1.404	0.673	0.291	-1.419	52.895	97.624	-0.167	0.178
28127.3	1	0.048	0.021	-1.4	-0.054	-0.023	-1.411	0.791	0.342	-1.398	0.672	0.291	-1.414	52.623	97.078	-0.154	0.195
28127.46	1	0.01	0.004	-1.395	-0.055	-0.024	-1.406	0.836	0.362	-1.393	0.705	0.305	-1.408	51.945	96.54	-0.19	0.194
28127.66	1	0.081	0.035	-1.389	-0.06	-0.026	-1.399	0.849	0.368	-1.387	0.731	0.316	-1.402	52.42	95.976	-0.159	0.203
28127.82	1	-0.03	-0.013	-1.383	-0.099	-0.043	-1.394	0.914	0.395	-1.381	0.743	0.321	-1.396	51.875	95.425	-0.188	0.148
28127.98	1	0.161	0.07	-1.378	-0.034	-0.015	-1.388	0.907	0.393	-1.375	0.763	0.33	-1.391	51.534	94.959	-0.192	0.19
28128.14	1	0.054	0.024	-1.372	-0.064	-0.028	-1.383	0.956	0.414	-1.37	0.789	0.342	-1.386	51.999	94.489	-0.194	0.147
28128.3	1	-0.005	-0.002	-1.366	-0.048	-0.021	-1.377	0.97	0.42	-1.364	0.816	0.353	-1.38	50.705	94.029	-0.15	0.157
28128.46	1	0.055	0.024	-1.361	-0.075	-0.032	-1.372	0.963	0.417	-1.359	0.829	0.359	-1.374	50.848	93.63	-0.235	0.225
28128.64	1	-0.061	-0.026	-1.356	-0.025	-0.011	-1.366	0.998	0.432	-1.354	0.849	0.368	-1.368	50.912	93.132	-0.259	0.226
28128.8	1	0.003	0.001	-1.351	-0.044	-0.019	-1.36	1.011	0.438	-1.349	0.869	0.376	-1.363	50.527	92.572	-0.263	0.253
28128.97	1	0.048	0.021	-1.345	-0.085	-0.037	-1.355	1.015	0.44	-1.344	0.899	0.389	-1.357	50.468	92.131	-0.285	0.211
28129.13	1	0.108	0.047	-1.34	-0.076	-0.033	-1.349	1.053	0.456	-1.338	0.926	0.401	-1.352	49.683	91.631	-0.208	0.229
28129.29	1	-0.045	-0.019	-1.334	-0.051	-0.022	-1.344	1.084	0.469	-1.332	0.933	0.404	-1.347	49.474	91.136	-0.158	0.232
28129.46	1	-0.06	-0.026	-1.328	-0.034	-0.015	-1.34	1.14	0.494	-1.326	0.977	0.423	-1.342	49.835	90.744	-0.173	0.194
28129.62	1	-0.147	-0.064	-1.323	-0.072	-0.031	-1.334	1.175	0.509	-1.321	0.994	0.43	-1.337	49.771	90.259	-0.267	0.194
28129.78	1	-0.017	-0.007	-1.318	-0.029	-0.013	-1.328	1.166	0.505	-1.316	1.026	0.444	-1.331	49.3	89.761	-0.233	0.251
28129.92	1	0.085	0.037	-1.313	-0.021	-0.009	-1.324	1.22	0.528	-1.311	1.047	0.453	-1.327	48.784	89.398	-0.254	0.242
28130.07	1	0.189	0.082	-1.308	-0.035	-0.015	-1.319	1.227	0.531	-1.306	1.064	0.46	-1.321	48.788	89.021	-0.25	0.271
28130.33	1	0.076	0.033	-1.303	-0.043	-0.019	-1.314	1.237	0.536	-1.301	1.093	0.473	-1.316	48.941	88.29	-0.232	0.24
28130.37	1	0.092	0.04	-1.298	-0.016	-0.007	-1.309	1.248	0.54	-1.296	1.13	0.489	-1.311	48.482	88.191	-0.221	0.224
28130.53	1	-0.048	-0.021	-1.292	-0.055	-0.024	-1.303	1.298	0.562	-1.29	1.156	0.501	-1.305	48.001	87.777	-0.245	0.225
28130.69	1	0.023	0.01	-1.287	-0.068	-0.029	-1.298	1.315	0.569	-1.285	1.169	0.506	-1.301	48.44	87.347	-0.295	0.268
28130.87	1	0.263	0.114	-1.281	0.027	0.012	-1.292	1.343	0.582	-1.278	1.218	0.527	-1.295	47.636	86.919	-0.206	0.276
28130.99	1	-0.026	-0.011	-1.277	-0.056	-0.024	-1.287	1.344	0.582	-1.276	1.22	0.528	-1.29	47.417	86.59	-0.337	0.337
28131.21	1	-0.077	-0.034	-1.269	-0.096	-0.042	-1.282	1.446	0.626	-1.267	1.278	0.553	-1.285	47.336	86.031	-0.187	0.163
28131.35	1	0.13	0.056	-1.264	0.012	0.005	-1.277	1.454	0.629	-1.262	1.31	0.567	-1.281	46.817	85.784	-0.191	0.224
28131.53	1	0.006	0.003	-1.261	-0.046	-0.02	-1.272	1.443	0.625	-1.26	1.319	0.571	-1.275	47.289	85.254	-0.303	0.31
28131.61	1	-0.208	-0.09	-1.258	-0.111	-0.048	-1.267	1.486	0.643	-1.256	1.34	0.58	-1.269	47.648	84.991	-0.345	0.295
28131.75	1	-0.329	-0.142	-1.252	-0.156	-0.068	-1.264	1.577	0.683	-1.25	1.391	0.602	-1.267	47.238	84.658	-0.212	0.126
28131.99	1	-0.352	-0.152	-1.247	-0.158	-0.068	-1.258	1.591	0.689	-1.245	1.412	0.611	-1.261	46.377	84.012	-0.25	0.183
28132.03	1	-0.398	-0.172	-1.243	-0.14	-0.061	-1.253	1.586	0.687	-1.241	1.432	0.62	-1.256	46.379	83.915	-0.315	0.265
28132.19	1	-0.546	-0.236	-1.238	-0.151	-0.065	-1.247	1.636	0.708	-1.236	1.478	0.64	-1.25	46.819	83.46	-0.367	0.217

Annex 2 IMMG PMM Post-Processor output data files format (3 types of files):

1. D01Section18.ppr file: a slice (third measuring cycle only) from the raw data file (see annex 1), containing data taken on outer layer measured at 13.3 m distance from NCS coil end (only a portion of 390 rows of data are shown).

Date: 31/05/01
 Time: 3:48 PM
 Coil ID: DE01
 Filename: DE01#13300#1548-151.csv
 Username: User0
 Relative position (m): 13.300

Machine type: 3.2 MN

Inner layer	Inner layer	Inner layer	Inner layer	Inner layer	Inner layer	Outer layer	Outer layer	Outer layer	Outer layer	Outer layer	Outer layer
-0.301	-0.13	-0.626	-0.192	-0.083	-0.626	10.734	4.647	-0.63	11.601	5.022	-0.63
-0.184	-0.08	-0.632	-0.177	-0.077	-0.632	10.319	4.467	-0.635	11.16	4.831	-0.636
-0.215	-0.093	-0.637	-0.162	-0.07	-0.637	10.111	4.377	-0.64	10.904	4.72	-0.64
-0.142	-0.062	-0.631	-0.119	-0.051	-0.631	12.513	5.417	-0.635	13.174	5.703	-0.636
-0.306	-0.133	-0.625	-0.112	-0.049	-0.627	14.006	6.063	-0.629	14.245	6.167	-0.633
-0.085	-0.037	-0.619	-0.004	-0.002	-0.622	15.635	6.768	-0.623	15.307	6.626	-0.628
-0.108	-0.047	-0.614	-0.019	-0.008	-0.617	16.829	7.285	-0.619	16.068	6.956	-0.623
-0.18	-0.078	-0.606	-0.039	-0.017	-0.612	18.177	7.869	-0.611	16.937	7.332	-0.619
-0.263	-0.114	-0.599	-0.055	-0.024	-0.608	19.41	8.403	-0.603	17.74	7.68	-0.616
-0.051	-0.022	-0.592	0.08	0.035	-0.605	20.506	8.877	-0.596	18.491	8.005	-0.613
-0.006	-0.002	-0.586	0.062	0.027	-0.598	21.903	9.482	-0.591	19.426	8.41	-0.607
-0.093	-0.04	-0.577	0	0	-0.59	23.498	10.172	-0.582	20.702	8.962	-0.6
-0.041	-0.018	-0.571	0.055	0.024	-0.584	24.764	10.721	-0.577	21.794	9.434	-0.595
-0.105	-0.046	-0.565	0.039	0.017	-0.579	26.02	11.264	-0.57	22.984	9.95	-0.589
-0.064	-0.028	-0.559	0.072	0.031	-0.572	27.199	11.775	-0.565	24.054	10.413	-0.583
-0.082	-0.036	-0.551	0.072	0.031	-0.564	28.803	12.469	-0.558	25.544	11.058	-0.576
0.057	0.025	-0.545	0.156	0.067	-0.559	30.067	13.016	-0.552	26.664	11.543	-0.57
0.229	0.099	-0.539	0.105	0.045	-0.553	31.374	13.582	-0.546	27.852	12.057	-0.565
0.196	0.085	-0.534	0.089	0.039	-0.548	32.424	14.036	-0.541	28.781	12.459	-0.561
0.188	0.081	-0.525	0.084	0.037	-0.54	34.235	14.82	-0.533	30.468	13.19	-0.553
0.178	0.077	-0.519	0.083	0.036	-0.535	35.429	15.337	-0.528	31.634	13.695	-0.548
0.26	0.113	-0.514	0.106	0.046	-0.53	36.531	15.814	-0.523	32.579	14.103	-0.544
0.348	0.151	-0.509	0.135	0.058	-0.525	37.731	16.334	-0.518	33.763	14.616	-0.539
0.153	0.066	-0.501	0.068	0.03	-0.516	39.566	17.128	-0.511	35.509	15.372	-0.53
0.139	0.06	-0.496	0.098	0.042	-0.51	40.981	17.741	-0.507	36.75	15.909	-0.525
0.438	0.19	-0.488	0.105	0.046	-0.503	42.595	18.439	-0.498	38.25	16.558	-0.519
0.587	0.254	-0.483	0.079	0.034	-0.498	43.85	18.983	-0.494	39.495	17.097	-0.514
0.226	0.098	-0.476	0.042	0.018	-0.49	45.852	19.85	-0.488	41.328	17.891	-0.507
0.377	0.163	-0.469	0.069	0.03	-0.485	47.206	20.436	-0.481	42.611	18.446	-0.502
0.639	0.276	-0.463	0.122	0.053	-0.478	48.928	21.181	-0.475	44.202	19.135	-0.496
0.647	0.28	-0.457	0.104	0.045	-0.472	50.344	21.794	-0.471	45.492	19.693	-0.49
0.689	0.298	-0.449	0.119	0.052	-0.464	52.399	22.684	-0.463	47.517	20.57	-0.483
0.751	0.325	-0.443	0.125	0.054	-0.458	53.886	23.327	-0.458	48.918	21.177	-0.477
0.768	0.332	-0.437	0.145	0.063	-0.451	55.709	24.116	-0.452	50.611	21.91	-0.471
0.943	0.408	-0.432	0.142	0.062	-0.445	57.215	24.768	-0.447	52.082	22.546	-0.466
0.742	0.321	-0.423	0.136	0.059	-0.437	59.419	25.723	-0.439	54.199	23.463	-0.458
0.981	0.425	-0.418	0.148	0.064	-0.432	60.995	26.405	-0.434	55.587	24.064	-0.453
1.004	0.435	-0.411	0.131	0.057	-0.426	62.721	27.152	-0.428	57.287	24.8	-0.448
0.987	0.427	-0.405	0.124	0.054	-0.42	64.441	27.897	-0.423	58.962	25.525	-0.442
0.924	0.4	-0.397	0.061	0.027	-0.413	66.658	28.856	-0.415	61.039	26.424	-0.436
0.908	0.393	-0.392	0.104	0.045	-0.407	68.086	29.475	-0.411	62.456	27.037	-0.431
0.899	0.389	-0.384	0.096	0.041	-0.399	70.442	30.494	-0.403	64.784	28.045	-0.424
1.032	0.447	-0.378	0.133	0.058	-0.393	72.099	31.212	-0.399	66.509	28.792	-0.418
0.926	0.401	-0.373	0.11	0.048	-0.388	73.601	31.862	-0.394	67.944	29.413	-0.414
0.856	0.371	-0.368	0.122	0.053	-0.383	75.099	32.511	-0.39	69.423	30.053	-0.409
0.947	0.41	-0.363	0.169	0.073	-0.377	76.833	33.261	-0.385	71.118	30.787	-0.403
1.047	0.453	-0.357	0.142	0.061	-0.371	78.54	34	-0.379	72.752	31.494	-0.399
1.153	0.499	-0.352	0.12	0.052	-0.367	79.998	34.631	-0.374	74.14	32.095	-0.395
1.14	0.493	-0.347	0.131	0.057	-0.361	81.72	35.376	-0.37	75.832	32.828	-0.389

3. D01_db.dat file: a summary file on the measurements performed at 6 longitudinal positions (out of 19) on the D01 outer coil layer written in database format (string file).

Outer_Layer_ID 1_E30_O_L 1_E30_O_R 1_S30_O_L 1_S30_O_R 2_E40_O_L 2_E80_O_L 2_S100_O_L 2_E40_O_R
 HCMB_A012-03000 DE01

2_E80_O_R 2_S100_O_R 3_E40_O_L 3_E80_O_L 3_S100_O_L 3_E40_O_R 3_E80_O_R 3_S100_O_R 4_E40_O_L
 - - - - - - - - - 6.705

5_E80_O_R 5_S100_O_R 6_E40_O_L 6_E80_O_L 6_S100_O_L 6_E40_O_R 6_E80_O_R 6_S100_O_R 7_E40_O_L
 - - 7.547 10.538 -0.028 7.505 10.381 -0.048 -

4_E80_O_L 4_S100_O_L 4_E40_O_R 4_E80_O_R 4_S100_O_R 5_E40_O_L 5_E80_O_L 5_S100_O_L 5_E40_O_R
 9.725 -0.058 6.819 9.828 -0.052 - - - -

5_E40_O_L 5_E80_O_L 5_S100_O_L 5_E40_O_R 5_E80_O_R 5_S100_O_R 6_E40_O_L 6_E80_O_L 6_S100_O_L
 - - - - - - 7.547 10.538 -0.028

6_E40_O_R 6_E80_O_R 6_S100_O_R 7_E40_O_L 7_E80_O_L 7_S100_O_L 7_E40_O_R 7_E80_O_R 7_S100_O_R
 7.505 10.381 -0.048 - - - - - -

8_E40_O_L 8_E80_O_L 8_S100_O_L 8_E40_O_R 8_E80_O_R 8_S100_O_R 9_E40_O_L 9_E80_O_L 9_S100_O_L
 - - - - - - - - - -

9_E40_O_R 9_E80_O_R 9_S100_O_R 10_E40_O_L 10_E80_O_L 10_S100_O_L 10_E40_O_R 10_E80_O_R 10_S100_O_R
 - - - 6.934 9.596 -0.132 6.936 9.734 -0.136

11_E40_O_L 11_E80_O_L 11_S100_O_L 11_E40_O_R 11_E80_O_R 11_S100_O_R 12_E40_O_L 12_E80_O_L 12_S100_O_L
 - - - - - - - - - -

12_E40_O_R 12_E80_O_R 12_S100_O_R 13_E40_O_L 13_E80_O_L 13_S100_O_L 13_E40_O_R 13_E80_O_R 13_S100_O_R
 - - - - - - - - - -

14_E40_O_L 14_E80_O_L 14_S100_O_L 14_E40_O_R 14_E80_O_R 14_S100_O_R 15_E40_O_L 15_E80_O_L 15_S100_O_L
 5.923 8.742 -0.074 5.893 8.742 -0.067 7.396 10.501 -0.08

15_E40_O_R 15_E80_O_R 15_S100_O_R 16_E40_O_L 16_E80_O_L 16_S100_O_L 16_E40_O_R 16_E80_O_R 16_S100_O_R
 7.664 10.93 -0.082 - - - - - -

17_E40_O_L 17_E80_O_L 17_S100_O_L 17_E40_O_R 17_E80_O_R 17_S100_O_R 18_E40_O_L 18_E80_O_L 18_S100_O_L
 - - - - - - 7.532 10.354 -0.038

18_E40_O_R 18_E80_O_R 18_S100_O_R 19_E30_O_L 19_E30_O_R 19_S30_O_L 19_S30_O_R filename Data_checked_by
 7.615 10.563 -0.046 DE01Summary.ppr

Date_of_check Data_approved_by Date_of_approval Status_layer Av_S100_O_L Av_S100_O_R
 -0.068 -0.072

Selected file info:
 Date: 11/02/02
 Time: 10:08 AM
 Coil ID: P030
 Filename: P030#20#1008-042.csv
 Username: User1
 Relative position (m): 14.485
 Machine type: 1.6 MN

Raw data file path:
 C:\vanenkov\Long dipoles\
 Pre-series\ANSALDO\DATAPMM\
 P030\P030#20#1008-042.csv
 Postprocessed data file path:
 C:\CERN Post Processor\
 Measurements data\Pole\P030

Coil type: Pole
 Inner layer ID: 0001
 Outer layer ID: 0001

Processed data table:	S100 [mm]	E40 [GPa]	E80 [GPa]	Shim [mm]	Average S100 [mm]
Outer layer left side	0.145	4.175	4.813	0.000	-0.063
Inner layer left side	0.077	4.341	5.114	0.000	-0.070
Inner layer right side	0.011	5.030	5.384	0.000	-0.080
Outer layer right side	0.130	4.471	5.099	0.000	-0.051
Nominal value:	inner outer	+/- 0.05 mm 9.5 GPa 7.0 GPa	11.5 GPa 9.0 GPa		+/- 0.05

