

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

USERS MANUAL

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) 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 2²). 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 must 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 measurements⁴. *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 must 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 the IT-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 IMMAG press. In that case, both data can be crosschecked.