This is the first draft of the QC procedure foreseen at CERN. Please give your comments to the group in charge of finalizing this procedure: Chekulaev, Kazarinov, Kurchaninov, Langstaff, Oberlack, Oram, Schacht, Snessarev, Strizenec, Wielers.

1 CERN QC Tests

1.1 Mechanical Acceptance Tests

1. Check g-sensors and humidity sensors
2. For rear modules: check torque of all tie rods and adjust it if necessary. For front modules: remove in addition first plate and re-assemble it after adjusting the torque. It is still an open question if this test is really required. The final decision should be taken after re-assembling of the two front modules at CERN.
3. Mechanical 'go-no go' test: use special templates of outer and inner connecting bars.

1.2 Electrical Tests prior to Mounting the PSB Boards

1. Test visually the connections of strip line connectors (signal as well as HV) and board-tabs. Do not remove the kapton sheet for this operation.
2. Disconnect the corresponding 2 HV lines at the HV distribution board and measure R. Compare it with the measurement at the home lab.
3. HV test at 1.5 kV: ground all signal lines at the input to the PSB connector.
4. Capacity measurement at (0.8,2.5,3.0) MHz. An equivalent measurement should be available from the QC test at the home lab. If not, this is the first reference for all later tests.

1.3 Mount PSB Boards

1. Mount the standard set of PSB boards for cold tests.

1.4 First Quick Test in Warm to Be Done Module by Module

1. Place module into the cryostat
2. Do cabling
3. Check cabling: run 'Cable Check' test and check result
4. Signal and noise check: run 'Quick Check' test and check result

The above shown tests have to be done in the cleanroom in case of a beam run. In this case these tests should be repeated after the HEC1 or HEC2 modules have been placed into the cryostat.

1.5 Warm Tests (all Modules inside the Cryostat)

1. Quick signal and noise check: run 'Quick Check' test and check result
2. Run 'Small Calibration' test and check result for dead PA's
3. HV test at 1.5 kV
4. Noise run with HV on
5. Run 'Full Calibration' test
6. Run 'x-talk' test
7. Run Analysis program looking at the output of the 'Full Calibration' test
8. On the basis of the results from the tests given above ⇒ decide if cryostat can be closed

1.6 Cold Tests

1. One day after LAr filling: Signal and noise check: run 'Quick Check' test and check result
2. HV test at 1.8 kV
3. Noise run with HV on
4. Run 'Full Calibration' test
5. Run 'x-talk' test
6. Twice per day: run 'Small Calibration' test and check result for dead PA's
7. Run Analysis program looking at the output of the 'Full Calibration' test
8. On the basis of the results from the tests given above ⇒ main decision on module acceptance

1.7 Warm Tests after Warming up

1. Signal and noise check: run 'Quick Check' test and check result
2. HV test at 1.5 kV
3. Run 'Full Calibration' test

4. Run Analysis program looking at the output of the 'Full Calibration' test
5. On the basis of the results from the tests given above ⇒ final decision on module acceptance.

1.8 Remove PSB Boards

1.9 Prepare for Module Storage

1. Check shipping frame box beam to be free of lose material
2. Check shipping frame that all holes are plugged and inspected
3. Re-unite shipping frame/module
4. Check that all bolts between the shipping frame and the module are in place and tight
5. Put the stabilizers on and check the bolts
6. Put the connection bar on and check the torques
7. Declare the module to be ready for insertion in the wheel (list any shortcomings if not)
8. Double-wrap the module and seal it. Add Desiccant and humidity indicator.
9. Transport module to storage area and note storage place

2 General Remarks

2.1 Rules and Requirements

1. Three databases will be impemented:

   module DB ⇒ interface to QC database

   reference DB ⇒ contains all needed reference numbers or histos

   raw data DB ⇒ where all measured data are stored
2. Use as much as possible standard tested tools. Foresee one interface to test crew - 'Control Center' program for steering the tests, storing the data and displaying the results. Foresee a second 'Display Center' program for the presentation of the data from the tests done.
3. Main input from test crew:

   module ID

   module position in the cryo.

4. All tools have to work with all possible loads of modules and combinations
5. Control Center has to guarantee that only after the completion of the previous test the next test can be started
6. Results from each test have to be displayed to the test crew with clear statement: test passed/failed with well defined windows. Here we need to get some experience from the first runs. The acceptance windows will be frozen only after this initial phase.
7. In case of failure, there are three possible actions:

   repair hardware and repeat test

   book the failed component (dead PA for instance) for next tests

   leave the decision to the experts (display the information needed)
8. Book the reference version used in the comparison tests
9. Do not expect that the Control Center will run the whole test program in one go, it may be interrupted and has to restart from the last position
10. The reference data may be updated, but only by authorized persons
11. The module DB can be changed by the Control Center only
12. The data to be stored in the raw data DB can be sent by the Control Center only or by authorized persons
13. There is no assumption that the test crew has knowledge of the calibration system and the related tools

2.2 Warm HV Tests

All 8 currents should be logged after 0,10,30,60 and 120 minutes. In addition, the temperature, humidity, HV value, module, test crew id, date and time should be logged. Comments might be added to cope with any special situation.

2.3 Action if a Given Test Fails

1. HV resistance not OK: fix problem, remeasure, if OK $\Rightarrow$ test passed
2. PA channel dead: replace PSB board. No QC item for module test.
3. HV problem (warm/cold): if problem can be DEFINITELY IDENTIFIED (e.g.piece of conducting material at the edge), fix problem + repeat HV test, if OK $\Rightarrow$ test passed
4. IF HV problem disappears in warm and was present in cold $\Rightarrow$ test failed. Redo cold test, if again same problem shows up $\Rightarrow$ unstack module

5. ANY OTHER problem: Note on traveller, ask 'QC acceptance subgroup' if module can be accepted or not!