# The ATLAS liquid argon electromagnetic calorimeter construction status

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# The ATLAS liquid argon electromagnetic calorimeter construction status

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The well advanced construction and assembly of the ATLAS liquid argon electromagnetic calorimeter is presented. The final detector qualification steps are described.

## 1. Introduction

The ATLAS detector on the LHC is equipped with a liquid argon electromagnetic (EM) calorimeter [1]. The chosen calorimeter is built with accordion geometry composed of lead absorbers, liquid argon as ionizing medium and highly granular readout electrodes. The ATLAS liquid argon EM calorimeter is composed of the Barrel and the End-cap, both preceded by presampler sectors to ensure complete recovery of the energy resolution. The EM Barrel calorimeter (see figure 1) consists of 32 Barrel modules (2 wheels, M and P) with 54848 readout channels and 64 presampler sectors with 7808 channels. For the EM End-cap calorimeter (see figure 2), there are 16 modules for 2 wheels (ECC and ECA). In total, there are 62208 readout channels for the End-cap, and 1536 for the presampler.

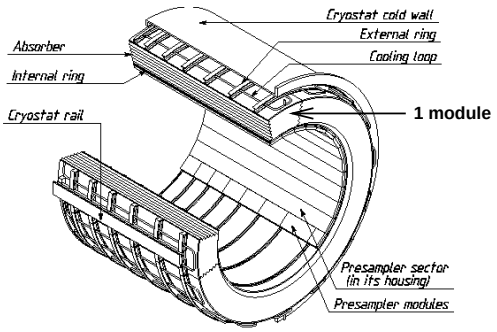


Figure 1. Barrel EM calorimeter.

*On behalf of the ATLAS EM group

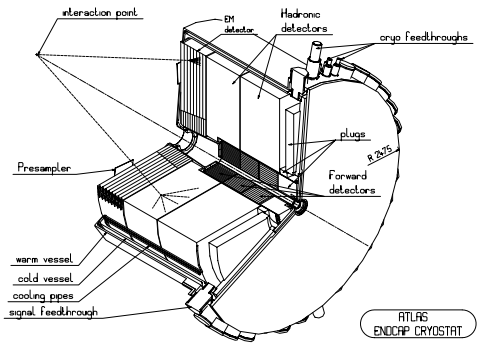


Figure 2. End-cap EM calorimeter together with the other End-cap detectors.

## 2. Qualification tests

During the final construction phase, every component of the detector goes through qualifying steps. In the following, the EM Barrel construction will be described, but the tests are the same for the other EM detectors, only the duration of tests and the HV differ. The principles of the electrical tests are described elsewhere [2]. The first step is the module stacking in accordion geometry assembling the signal and HV electrodes with the spacers and lead absorbers. Geometrical measurements with precision gauge are performed during staking and on the final module. Gap thickness measurements are done with a capacimeter. Electrical continuity of the HV distribution are checked with TBF tests. A low frequency sinusoïd is distributed on the HV lines

with capacitive readout on the signal layer. HV performance is done at 2200V for 1 to 5 days. Assembly takes about two months.

The module is subsequently cabled for the HV distribution, calibration and signal readout. Electrical continuity and HV tests are performed again. The TPA test, sending a pulse through the calibration circuit with signal readout, detects cabling errors and tests the whole calibration chain. Cabling takes a couple of weeks.

The final step consists of repeating the previous tests under cold conditions in liquid argon on site or in beam test at CERN (see contribution by F.Hubaut [3]). The cold test takes about 1 month during which 2000V is kept on the module for 5 days. Each module has to meet the qualifying criteria in order to pass to the next step. The modules are then sent to CERN for the final construction assembly. During this phase, the same tests are again performed on the final calorimeter.

## 3. Conclusion : construction status

The final assembly phase is well under way. The EM Barrel has its first wheel of 16 modules inside the cryostat and is electrically tested(figure 3). The tests on the inserted wheel have shown that the readout channels satisfy the qualification criteria. All modules of the second wheel are done and the second wheel will be inserted in the cryostat during summer 2003. The cold tests in the definitive cryostat will follow. The barrel presampler has its first wheel inserted and tested, last sectors of the second wheel will be ready for June 2003.

The End-cap cryostat is ready and 10 out of 16 End-cap modules are being assembled at CERN. ECC integration is planned for fall 2003 and ECA integration will take place in summer 2004(figure 4). Electrical tests of 36 EM End-cap presampler modules have been finished November 2002.

Figure 3. EM Barrel M wheel transfer to cryostat (February 2003)

Figure 4. EM End-cap ECC wheel assembly (April 2003)

## REFERENCES


1. The ATLAS collaboration. *ATLAS Liquid Argon Calorimeter TDR* CERN/LHCC/96-41, 15 December 1996.
2. N. Massol in : *Proc. VIII Int. Conf. on Calorimetry in High Energy Phys.* , Lisbon, Portugal, June 1999 , p.161.
3. F.Hubaut, *Performance of the ATLAS electromagnetic calorimeter under beam tests* , these proceedings.