

Overview

ALICE is a general-purpose heavy-ion detector designed to study the physics of strongly interacting matter and the quark-gluon plasma in nucleus-nucleus collisions at the LHC. It currently includes over 1000 members from close to 100 institutions in some 30 countries.

ALICE consists of a central part, which measures hadrons, electrons and photons, and a forward spectrometer to measure muons. The central part, which covers polar angles from 45° to 135° over the full azimuth, is embedded in the large L3 solenoidal magnet. It consists of an inner tracking system (ITS) of high-resolution silicon tracking detectors, a cylindrical TPC, three particle identification arrays of Time-of-Flight (TOF), Cerenkov (HMPID) and Transition Radiation (TRD) counters and a single-arm electromagnetic calorimeter (PHOS). The forward muon arm (2° - 9°) consists of a complex arrangement of absorbers, a large dipole magnet, and 14 stations of tracking and triggering chambers. Several smaller specialized detectors (ZDC, PMD, FMD, T0, V0) are located at small angles. A calibration trigger on cosmic rays (ACORDE) will be installed on top of the L3 magnet. A proposal by a group of US, Italian, and French institutes to construct an electromagnetic jet calorimeter (EMCAL) is under consideration by the respective funding agencies.

Construction of infrastructure items, supports, the muon magnet and most detectors is completed; detector and services installation has started in mid 2006 and commissioning is progressing on schedule.

Silicon Pixel Detectors

Status: The detector has been installed in the experimental area. The cables and fiber connections have been verified. The MCMs on side C have all been tested and are working well. The test of the MCMs on side A requires access to connections that will be available once the TPC is in the final position. The full detector test requires all the external cooling lines and services; hence it will be done once the mini space-frame is installed. The final commissioning is planned by the end of this year. The FastOR pixel trigger system has been built and is being commissioned.

Changes: No major changes.

Concerns: No major concerns.

Plans: Final commissioning in the experimental area.

Silicon Drift Detectors

Status In March 2007 the SDD and SSD layers of the ITS have been installed on the assembly rails and moved into their parking position inside the ALICE TPC. Since that moment, an extensive commissioning campaign has been conducted, including all aspects of the system. The SDD has been connected on both sides to its final services (on one side through temporary connections) so that the full operation of the cooling system could be checked and optimized. Similarly, every individual module has been read out, verifying the state of the complete readout chain. The next step, after installation of the miniframe, will be the test of the complete system using the final services on both sides.

Changes: No major changes

Concerns: No major concerns

Plans: Commissioning with cosmics.

Silicon Strip Detectors

Status: After installation of the ITS barrel (SSD+SDD) in March 2007, the SSD and its services are being cabled and commissioned. Cable and service connections are completed for one side (C-side) and tests are ongoing with the final setup.

Changes: No major changes.

Concerns: Late delivery of power supplies.

Plans: Connect cooling and A-side cabling for complete testing.

Time Projection Chamber (TPC)

Status: The TPC had been transported to the cavern in Jan 07 in its transport frame. The TPC has since then been in the 'parking position' most of the time, i.e. about 5 m from the interaction point (IP) position, to allow installation and testing of the ITS. As part of the ITS installation sequence, temporary movements of the TPC to the IP were performed without problems. The temporary position at the IP allowed testing the elements designed for connecting to the services in the back frame. The complete front end electronics of all sectors was re-commissioned with several sectors at a time. The cooling plant was commissioned. A somewhat larger than expected spread in the resistance of the LV distribution network was observed and will be corrected.

The TPC was moved to the IP end September and connecting services and final commissioning has started on the C-side, including the gas system, drift field HV and cosmic triggers from ACORDE; connecting the A-side will start later this year after installation of the mini-frame.

Changes: No major changes.

Concerns: No major concerns.

Plans: Commissioning at IP with cosmics Oct 07 (TPC standalone), first global commissioning end 07.

Multigap Resistive Plate Chambers (MRPC) for TOF

Status: Modules: The delivery of mechanical components of the modules has reached 92% of the total and the module's assembly with MRPC strips 78%. The test in the Cosmic Ray Facility at CERN has been completed for 67% of the modules. Electronics: The mass production and delivery of the readout electronic boards is ongoing: 75% of the DRM (Data Readout Module), 82% of the TRM (TDC Readout Module), 78% of the LTM (Local Trigger Module), 100% of the CPDM (Clock and Pulser Distribution Module) cards have been delivered and tested. Two thirds of the custom crates with the LV DC-DC converters has been delivered and tested. The CTTM (Cosmic and Topology Trigger Module) board has been assembled and is under extensive functionality test. SuperModules: After the installation of the first two in October 2006 and the new design of the mechanics in the Backframe side, seven more SuperModules have been assembled and tested; they are ready for installation in autumn. Assembly of two more is currently in advanced progress. Integration and commissioning: The integration with the DAQ, TRIGGER, DCS and ECS systems is very well in progress, the tests have been completed in the TOF assembly hall while the tests at Point 2 with the two installed SuperModules are in progress, as well as the commissioning of all the services (LV, HV, gas, cooling).

Changes: No major changes

Concerns: No major concerns.

Plans: Complete mass production of mechanical and electronic components. Continue module and SuperModule assembly and install about ten new SuperModules between mid October and beginning of December.

High Momentum Particle Identification Detector (HMPID)

Status: Installation and commissioning of the services has been completed as planned with the exception of the C₆F₁₄ circulation system which is ongoing. The detector has been connected to the final gas system and the switching to the backup system has been tested and validated. The cooling system has been continuously and successfully operated during several days. Finally the detector has been fully powered on (LV and HV) under the control of the final DCS and DAQ tests have started. HV tests have been performed with both Ar/CO₂ and pure CO₂ mixtures waiting for the authorization to operate the detector with CH₄, expected before the end of October. While the tests with Ar/CO₂ at nominal gas gain were fully successful, one sector (out of 42) showed instabilities in pure CO₂ which are at present under investigation.

The procurement and assembly of the C₆F₁₄ liquid system is well advanced and will continue after the delivery of the cold trap, due by mid-September.

Changes: The option to remove the detector from the magnet in order to repair the faulty module, if the malfunctioning is confirmed, is under investigation.

Concerns: HV behavior of one sector.

Plans: Completion of the C₆F₁₄ circulation system. Final commissioning of FEE and DAQ systems by the end of November.

Transition Radiation Detector (TRD)

Status: More than two thirds of the readout chambers of the now fully funded TRD have been finished at the five production sites (Bucharest, Frankfurt, Heidelberg, GSI, and JINR) including production of the new Layer 0 chambers. The first super module has been completely assembled and installed in the ALICE space frame and has been used for the commissioning of the detector. The second super module, which has been assembled at Muenster, has been shipped to CERN and has undergone its final test there. The third super module will be shipped to CERN at the end of the month. Production of the fourth super module is scheduled to be completed for an in-beam test at the PS starting at the end of October. There, the final readout architecture including the Global Tracking Unit (GTU) as well as the final gas mixture will be used to yield a large statistics sample of identified pions and electrons at various beam momenta. This data set will constitute the basis for all particle identification algorithms and will crucially determine the initial particle identification capability of the TRD.

All cables are currently being checked prior to installation the next TRD modules. The entire readout chain involving the Global Tracking Unit (GTU) as well as components of the ALICE DAQ has been successfully exercised. The cooling plant has been commissioned. The Detector Control System (DCS) is operational for all components of the TRD (HV, LV, MCM configuration, gas, cooling). A first version of the DCS involving Finite State Machines (FSMs) has been installed at CERN and is being tested with cosmics.

Changes: none

Concerns: tight schedule for the super module production

Plans: production of additional super modules for next installation slot. Beam test of finished super module.

Photon Spectrometer (PHOS)

Status: The first PHOS module has been assembled, pre-commissioned and calibrated with electron beams at the CERN PS. Some improvement of the module has been done. Crystals for two further modules (2&3) have been produced; these will be ready for installation first half 2008. Funds for the production of the mechanics have been allocated in Russia, and for the APD's and preamplifiers in Japan. A revision of the mechanics design has been done and production of modules 2&3 is to be completed by November. The APD's and preamplifiers have been produced and delivered to CERN. Production of FEE cards is to be completed in China by November. Two final modules (4&5) are partially funded. Production of the FEE cards is funded by China, and production of APD's and preamplifiers is funded by Japan. Funds for production in 2008 - 2010 of the crystals and mechanics for these last modules are requested in Russia. The full PHOS with five modules can be completed by the end 2010 provided that additional Russian funds are available.

Plans: Installation of the first module in November. Assembly, test and commissioning of modules 2&3 by the first half 2008.

Changes: No changes.

Concerns: No technical concerns. The production of crystals in Russia has stopped due to lack of funding. Funding from Russia for production of the crystals and mechanics for modules ##4&5 is under review.

Muon Tracking Chambers

Status: All the electronics has been delivered. Stations 1, 2, 4 and 5 are installed and largely cabled. Their commissioning has started: stand-alone DAQ read-out commissioning is done for

station 1 and is in progress on stations 2 and 4. The assembly of the four half-chambers of station 3 is finished in SXL2.; the installation has begun in September.

The alignment and monitoring system for the muon spectrometer (GMS) is being installed and commissioned in parallel with chamber installation. A global DAQ test using Trigger Dispatcher has been realized on quadrants of station 1 in the cavern.

Concerns: No major concern.

Plans: Commissioning phase will last till beginning of next year. Stations commissioned in stand-alone mode will enter progressively global running with cosmics.

Muon Trigger Detectors

Status: The complete set of RPCs including FE electronics is installed in its working position. Installation of the service columns and of the translation system has been completed. The signal cables (1500 cables in total) are installed. Thermal tests have been carried out by using the Detector Control System. The installation of the trigger system will be completed by the end of the year.

The Local (242 units in total) and Regional (16 units) trigger electronics are in place and the Global trigger board (1 unit) is ready for installation.

Commissioning of the whole electronics (including cables, FE, trigger electronics, JTAG links for the configuration of the Local boards) has been performed using a pulse generator. Presently all the half planes are fully validated. The readout makes use of the DARC prototype card. Initial problems in the production of the final DARC boards have been solved and the cards are now produced and under test in the laboratory..

Changes: No major changes.

Concerns: No major concerns.

Plans: Installation of the final DARC card and final test of the whole trigger electronics; test of the gas system; detector commissioning.

Forward and Trigger Detectors (ZDC, PMD, FMD, T0, V0, ACORDE)

Status: The four ZDC hadronic calorimeters have been installed in the tunnel. Trigger and readout commissioning is under way. The e.m. ZDC calorimeter (ZEM) will be installed in October.

The ACORDE electronics is being installed and the communication with trigger and DAQ has been successfully tested. The complete scintillator array (60 modules) have been installed. 40 modules are operational., waiting for CAEN multichannel HV boards to put running the complete array. ACORDE DCS system is being installed at Point 2.

The PMD detector (modules, support structure, electronics) has arrived at CERN and surface commissioning is under way. The underground service installation is largely complete and the detector will be ready for installation by end November.

The FMD2 and FMD3 forward multiplicity detectors are now installed in ALICE (about 40.000 channels). FMD3 has been fully commissioned in situ using DAQ, DCS and the ALICE trigger system. FMD2 has been commissioned at CERN in the lab and partially in situ (awaiting the installation of the miniframe and the final cabling). The detector performance agrees fully with that established earlier on in lab and in beam tests. FMD1 will be fully assembled in Copenhagen within the next few weeks and will be installed in ALICE in early 2008, in line with the overall installation schedule.

V0 production is complete for both sides and the V0-C detector has been installed. The electronics is ready and will be commissioned in November. The V0A was calibrated with a pion beam in June.

T0-C was installed in April and the T0 electronics production was completed in September. Electronics installation and testing will be completed before end 2007 and T0-A will be installed early 2008.

Changes: No major changes.

Concerns: No major concerns.

Plans: Complete installation, service connections and commissioning.

Trigger

Status: All five Central Trigger Processor (CTP) systems are now in operation, two in Birmingham and three at CERN, including one at Point 2. The two Birmingham systems are being used for training and system development respectively. One of the CERN systems is connected to test modules in the DAQ lab via 60m cables and fibers, allowing detailed tests of the trigger, DAQ and ECS systems working together. The configuration and control software is ready, and development of monitoring and offline software is continuing. Commissioning of the trigger interfaces of the detectors, using a Local Trigger Unit (LTU) has now been in progress for some time. The tests include a mandatory joint trigger/DAQ/ECS test on the surface prior to installation at Point 2. The fifth CTP system and local trigger crates have been installed at Point 2. This installation has already been used for readout of some detectors, such as the TPC. Tests with trigger input signals from ACORDE are expected to start soon.

Changes: No major changes

Concerns: No major concerns.

Plans: Completion of validation tests on the Meyrin site and continue detector commissioning *in situ*.

Data Acquisition (DAQ)

Status: Most of the detectors have been equipped with the final DDLs. A combined commissioning of the detector electronics and detector elements with the DAQ (DDL and DATE) and the other online systems (Trigger, HLT, DCS, ECS) is being performed in a systematic manner with all teams before the installation of the detectors in the experimental area. Several teams (SPD, SSD, SDD, TPC, TRD, TOF, ACORDE, and HMPID) are commissioning their detector at the experimental area with the central Trigger and DAQ. The ALICE Control Room has been installed and is being used during the detector commissioning. The DAQ has defined and released the system for updating and deploying new software releases on the final system.

Changes: No major changes.

Concerns: No major concerns.

Plans: Continue integration of DAQ/ECS with detector subsystems.

High Level Trigger (HLT)

Status: The infrastructure for the first year running is setup at Point-2. All computers, the interfaces to other online systems and the network are operational. The H-RORC cards have been upgraded to PCI-X with full 64 bit addressing for larger input buffers. All optical fibers from DAQ to HLT are installed and tested.

The HLT was used successfully during the TPC commissioning and also for several TPC calibration tasks. PHOS is using the HLT successfully for calibration and first level data compression in cosmic tests. Full TPC analysis and calibration is running at Point-2 using simulated data. The on-line analysis and calibration software for the TRD, DiMuon and PHOS detectors are currently being commissioned. Appropriate compression algorithms for the TPC, PHOS and TRD are currently being evaluated. The chain for calibration data has been tested and is operational and Off-line grid software has been installed.

Changes: No major changes.

Concerns: No major concerns.

Plans: Calibration of the TPC, TRD and PHOS as large scale use case and reliability tests of the detector analysis and calibration code. 'Full dress rehearsal' with on-line and off-line systems.

Offline

Status: Software: A new release policy of the AliRoot software has been adopted favoring long term stability of the release. The ESD and AOD have been redesigned to provide more flexibility for analysis and for data members. The analysis framework allows data processing in interactive local mode, in interactive mode on the CAF operated by PROOF and in batch mode on the Grid. The strategy for the scheduled analysis has been elaborated and a prototype has been implemented. The code is continuously revised in order to optimize the need of CPU time, memory and data size.

Full Dress Rehearsal: All the elements required for the online and the offline data processing have been validated individually. The full chain will be build by adding progressively the various elements and a preliminary chain should be ready before the end of the year to be tested during the ALICE commissioning.

Physics Data Challenge: Monte-Carlo productions requested by the Physics Working Groups are run continuously since the beginning of the year. Peaks of 6000 concurrently running jobs have been reached. The availability of the services has been greatly improved.

Resources: Thanks to a strict monitoring of the usage of resources, more than 90% of the updated pledged CPU resources are now delivered but this exercise confirmed that the pledged resources cover only about 50% of the resources required in the Computing-TDR.

Grid Services: The new version of the AliEn file catalog with faster access and improved scalability has been deployed and is used for PDC07. The AliEn-ARC interface is undergoing stress tests using the University of Bergen computational cluster. The xrootd-DPM, and xrootd-Cache interfaces have been tested and are being deployed at the sites. The xrootd-Castor2 interface has been tested at CERN and results indicate that this installation will be a big improvement for data availability at CERN.

Changes: none

Concerns: The situation of the computing resources made available to ALICE remains a concern. More pledged resources become slowly available (NDGF, Poland, US). Additional resources are promised but have not yet materialized. The stabilisation of 3-4 staff on long term positions at CERN in the Core Offline remains a priority.

Plans: Commissioning of the offline framework together with the detector commissioning, full dress rehearsal, user driven analysis challenge, discuss with the sites the availability of more resources.

Installation & Assembly activities

Status: The installation of the TPC and ITS detectors together with the major part of the Alice vacuum chamber was successfully completed. The TPC and ITS detector were individually moved into their final positions surrounding the central Beryllium Vacuum chamber. The work on service installations continue and individual commissioning of the installed sub-detectors has started. The initial commissioning concentrates on the verification and testing of cables, gas and cooling connections and subsequent powering of electronics. A number of errors have been detected and corrected. The large support frame for the EMCal detector has been assembled at Point 2 and equipped with services.

Changes: The installation schedule has been aligned with the LHC installation program.

Concerns: Protection of the installed detector units.

Plans: Installation of the EMCal support frame, completion of service installations.

MILESTONES

The planning shown as 'baseline' in the plot below was established in early 2005, aiming at closing the detector in April 2007. The achieved milestones show a delay with respect to this plan but are well in line with the revised LHC schedule. The ITS system, which has been on the critical path in the past, has been installed and is under commissioning. Installation of some parts of the modular detectors (PHOS, TOF, and TRD) as well as the EMCAL will continue beyond 2008.

ALICE LHCC Milestones - September 2007

