Overview of Belgrade ATLAS group activity

CERN Delegation visit
8 June 2010
Outline

• Short history
• Hardware contribution
• Group members
• Activities
• Publications
• Plans
Institute of Physics Belgrade (IPB) joined the ATLAS in February 2003.

- Before that IPB had contacts with ATLAS for a long time, interrupted only during the time of war in the Balkan region.
- Some members of the team participated and contributed to ATLAS over these years via JINR Dubna.
- In June 2001 CERN signed a general cooperation agreement with Serbia.
- In January 2003 a Protocol for the ATLAS hardware contribution was signed by CERN, ATLAS and the Serbian MSTD.
- The IPB contributions are the JD shielding disks and A frame forward shielding supports. These parts have a core value of 300 kCHF.
- In February 2003 IPB team led by Dragan Popovic had 6 PhD physicists and 3 PhD students. At that time some team members were already active in ATLAS physics studies.
In the past, ATLAS has offered and encouraged formation of clusters, which allow smaller group to join already existing ATLAS group, represented with one vote in the Collaboration Board (CB).

In July 2008, 2 PhD physicists, Ivanka Bozovic and Mihajlo Mudrinic, from the Vinca Institute of Nuclear Physics and Atlas group from Institute of Physics Belgrade formed Belgrade Cluster with Dragan Popovic as representative at CB.
Hardware contribution- ATLAS Shielding

The ATLAS shielding project is divided into six subprojects.

Seven participants in the project:
- CERN
- Yerevan Physics Institute
- Institute of Physics, Belgrade
- Institute of Experimental and Applied Physics, Czech Technical University in Prague
- Institute of Particle and Nuclear Physics, Charles University in Prague
- Department of Experimental High-Energy Physics, Lund University
- Department of Physics, University of Arizona

IP Belgrade contribution to the ATLAS Shielding project is 2 JD shielding disks and A-frame supports for the forward shielding (JF). JD shielding disks were produced in Serbia under IPB responsibility.
The assembly of the disk shielding in Serbia

Two stainless steel shielding disks, 88.3 t each, produced by Lola Corporation Železnik, Serbia and A-frame supports, produced by Kryooprema, Belgrade, were transported to CERN in December 2004.
“At the end of March, final rotation of the disk shielding was carried out without incident. The two 80-ton heavy shielding assemblies were built in a horizontal position and they had to be first turned upside-down and then rotated to a vertical position during the assembly. The relatively thin disk plate with a diameter of 9 meters, made this operation quite delicate and a lot of calculation work and strengthening of the shielding was carried out before the rotations could take place.”

The Disk Shielding purpose:

- supports the muon chambers in the first forward muon station (the Small Wheel),
- shields these chambers from radiation
- returns the magnetic field from the solenoid magnet in a well defined way.
ATLAS muon spectrometer with the shielding elements

The small wheels roll on

Transport of the small wheel to the ATLAS surface building

February 2008.

Lowering of the final large piece of the detector: small wheel
Institute of Physics Belgrade ATLAS group

9 physicists (4 Research Professors, 3 PhD, and 2 PhD students)

**Research staff:**
- Dragan Popovic, research professor (team leader)
- Djordje Sijacki, (member of Serbian Academy of Sciences and Arts)
- Ljiljana Simic, research professor
- Jelena Krstic, research professor
- Iris Borjanovic PhD (post doc at INFN Lecce)
- Marija Vranjes Milosavljevic PhD, (MSc degree award, now at CERN)
- Predrag Krstonosic PhD, (PhD at University of Hamburg)

**PhD students:**
- Nenad Vranjes, MSc (now at CERN)
- Gordana Milutinovic BSc

**Undergraduate students:** typically 1 per year

**Former members:**
- Dusan Vudragovic, Dusan Reljic
Recent Ph.D. graduates

- Iris Borjanovic (2009)
  also at the INFN/University Lecce 2005-2010
- Marija Vranjes Milosavljevic (2009)
  now at CERN
- Predrag Krstonosic (2008)
  also at University of Hamburg 2004-2008
- Nenad Vranjes (PhD in progress)
  now at CERN

Close collaboration with:
- INFN Lecce/University of Salento,
- University of Athens,
- JINR Dubna
Activities of the IP Belgrade ATLAS group

ATLAS operation tasks:
Tier0 shifts, Muon combined performance DQ shifts, DAQ/HLT shifts and SW validation shifts.

Detector combined performance:
Jet/Etmis, Muon combined

Physics analysis:
SM physics
- Diboson physics study and triple gauge-boson couplings measurement
- Measurement of the top quark mass (all hadronic channel)

BSM physics
- Search for the Supersymmetry within the mSUGRA
- Search for the new heavy charged gauge boson, $W'$
- Search for the neutral pseudoscalar Higgs boson within the MSSM
Activities of the IP Belgrade ATLAS group (II)

Computing/Grid (more details in talk of A. Balaz):

IPB SCL maintain second-largest Serbian Grid site, AEGIS07-IPB-ATLAS.

It is based on 128 Intel Xeon processors with 32-bit architecture and the total of 96 GB of RAM.

The site supports several virtual organizations (VO), but is mainly dedicated to the ATLAS VO community.

- In addition, IPB ATLAS group uses local Linux cluster (~10 cpu, 2.4 TB disk) for ATLAS data analysis and Monte Carlo production.

Daily usage of AEGIS07-ATLAS
Education and Outreach

- IP Belgrade is a subcontractor of the project Learning With ATLAS @ CERN (LA @ CERN)
  (Related Publication: The ATLAS Student Event Challenge, ATL-OREACH-PUB-2007-001)

- Translated sites in Serbian:
  Particle Adventure  
  The Universe Adventure
  
- Numerous interviews with IP ATLAS members,
- Articles on the LHC including quotes from team leader D.Popovic.
LHC Exhibition organized by Serbian Academy of Sciences, Institute of Physics and Vinca Institute

Belgrade ATLAS group main recent publications

2010

• DIS 2010 conference, talk, Search for SUSY at ATLAS (Borjanovic for ATLAS Coll.)

2009

Expected performance of the ATLAS Experiment Detector, Trigger and Physics, CERN-OPEN-2008-020:

• Prospects for Supersymmetry Discovery Based on Inclusive Searches ATL-PHYS-PUB-2009-066,2009 (...Borjanovic, Krstic,Milosavljevic...)
• Measurements from Supersymmetric events ATL-PHYS-PUB-2009-067,2009 (...Krstic,Milosavljevic...)
• Search for the neutral MSSM Higgs Bosons in the decay Channel A/H/h-> mumu ATL-PHYS-PUB-2009-060,2009 (...Milosavljevic...)
• Lepton plus missing transverse energy signals at high mass ATL-PHYS-PUB-2009-071,2009 (...Vranjes...)
• Diboson Physics studies ATL-PHYS-PUB-2009-038,2009 (...Popovic,Simic, Vranjes...)


Belgrade ATLAS group  main recent publications

2008

- Prospects for stop searches at ATLAS and CMS
  Nuovo Cim. B123, 1219 ,2008 (Blekman, Milosavljevic for ATLAS and CMS)

- Prospects for early SUSY search at LHC
  Nuovo Cim. C 2008 (Borjanovic for ATLAS and CMS)

- SUSY search with b jets
  Proceedings of Science (2008LHC) 110, 2008 (Milosavljevic for ATLAS Coll.)

- Search for W-prime in lepton+missing final state with early data at ATLAS
  Proceedings of Science (2008LHC) 121, 2008 (Vranjes for ATLAS Coll.)

- Diboson physics study with ATLAS
  Proceedings of Science (2008LHC) 112, 2008 (Simic for ATLAS Coll.)

Belgrade ATLAS group main recent publications

2007-2006 (Physics at LHC-2006 conf proc. and ATLAS notes)

- Studies of a low mass SUSY model at ATLAS with full simulation
- $W^+W^-$ production and triple gauge boson couplings at ATLAS
- Studies of a low mass SUSY model at ATLAS with full simulation
  ATL-PHYS-PUB-2006-028, 2006 (Krstic, Milosavljevic, Popovic)
- Prospects for measuring triple gauge boson couplings in $WW$ production at the LHC
  ATL-PHYS-PUB-2006-011, 2006 (Simic, Vranjse, Popovic)
- Discovery potential for the MSSM $H/A \rightarrow \mu\mu$ decays from direct and associated $H/A$ production,
  ATL-PHYS-2006-030, 2006 (Kourkoumelis, Fassouliotis, Milosavljevic)
Belgrade ATLAS group main recent publications

2005-2000

- SUSY studies with Snowmass Point 5 mSUGRA parameters
- Impact of the alignment of the EC muon spectrometer to SM H->4l and
  MSSM H/A reconstruction and detection
  ATL-PHYS-PUB-2005-002, 2005 (Fassouliotis,Kourkumelis,Milosavljevic)
- Investigation of top mass measurements with the ATLAS detector at LHC
- All hadronic decay of top-antitop pairs at LHC,
  ATL-PHYS-2002-009 (Simic, Skoro, Popovovic)
- Top Quark Physics Proceedings of the Workshop on Standard Model
  Physics (and more) at the LHC
  CERN Yellow Report, CERN 2000/004, 2000, 111p (...Simic,Skoro, Popovic...)

In summary, IP Belgrade ATLAS group contributed:
1 ATLAS Scientific Note also pub. in Eur. Phys. J. C
10 ATLAS PUB Notes and 14 publications in various
conference proceedings.
Looking ahead

- Group expansion, special attention to recruitment of graduate students
- Further activities in ATLAS operation and participation in physics working groups
- Setting ATLAS Tier3 site
- Participation in ATLAS upgrade for super LHC