CERN openlab Communications

CERN openlab III Major Review Meeting
25 January 2011

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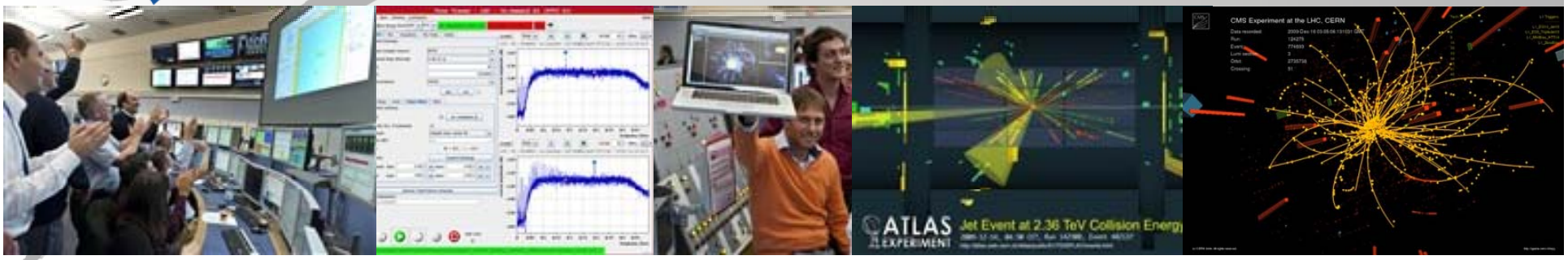
CERN openlab Communications

- 2010 key events and coverage in figures
- Update: articles and mentions
- Upcoming CERN events
- CERN openlab Summer Students 2011
- Timeline

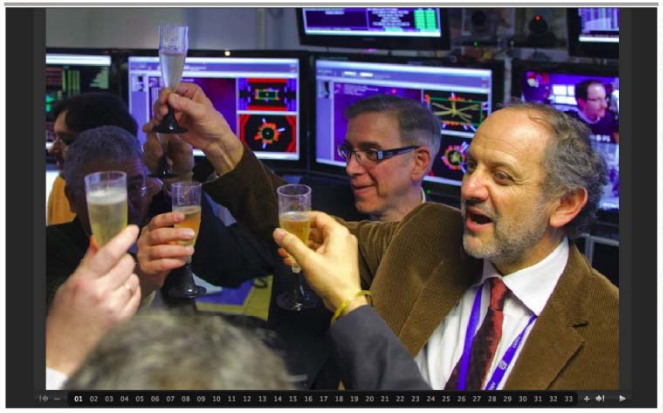
2010 CERN Key Events Coverage



- First Physics Day (30/03/2010): massive press coverage for the first High Energy Physics events!
  - More than 100 journalists from 68 media outlets in 18 countries attended the event at CERN
  - The news of the first 7 TeV collisions was covered by print, radio and television news around the world: 2,200 news articles published in print and online on March 30
  - CERN's public homepage recorded 205,000 visitors (unique IPs) from 185 countries, compared to a normal average of 10,000 visitors per day. The Press Office site (includes LHC First Physics site) recorded 154,000 visitors, up from a usual average of 2,000 per day
  - Twitter: The link to the press release announcing the first 7 TeV collisions was clicked on 58,000 times. the link to the webcast received 11,000 clicks; the link to CCC photos received 16,000 clicks. CERN went from 90,000 to 120,000 followers during the day. The keywords "LHC", "CERN", "TeV" and "experiment" were all global trends on Twitter at some point during the day
  - More than 800 news items were broadcast worldwide using CERN footage available on that day via Eurovision satellite. Includes many big networks such Al Jazeera, ARD, Antena 3, BBC 1, 2, world, TVN24, Globo, TF1, France2, France3, CNN (+ Asia, Arabic, Turkey), FOX, MSNBC, RTL...

⇨ The CERN openlab annual report was available to the journalists in the press room

2010 CERN Key Events Coverage



2010 CERN Key Events Coverage

- The LHC First Physics webcast and video coverage proved to be extremely successful as well:
  - The CERN LHC First Physics day-long webcast was visited by 700,000 unique computers (IP addresses). This is an average of about 3 videos viewed by each user.
  - Rebroadcasters:
    * TF1News: 35-40,000 viewers
    * CARNet: 4,307 unique visitors
    * Livestation: 6,749 unique visitors
  - During the month of March, CERN published 10 video stories to the Newsmarket site. 706 video clips were ordered by 80 media outlets including AFP, EFE, APTN, ARD, CNN, Discovery Channel, Globosat, LCI, Reuters, RTL, RTVE, Sky News, El Merucio, IDG News, Spiegel Online, Telegraph, Zoomin...

⇨ The massive coverage of this event reinforced awareness amongst general public and strengthened the high tech image of the organisation. The heavy ion run at the end of the year was a major success as well (including for WLCG).

1st Article on CERN IT Published by Nature

http://www.nature.com/news/2011/110119/pdf/469282a.pdf, 19 January 2011

DOWN THE PETABYTE HIGHWAY

For scientists, collisions at the world's most powerful particle collider are just the start. Nature follows the torrent of data on its circuitous journey around the world.

BY GEOFF BRUMFIEL

ATLAS PARTICLE DETECTOR, SWITZERLAND, 30 MARCH 2010, 13:06 LOCAL TIME

Beneath gently rolling hills between the mountains of Switzerland and France, the world's greatest physics experiment starts its first real run. Two beams of high-energy protons meet head-on at almost the speed of light inside the Large Hadron Collider (LHC), a giant particle accelerator at CERN, Europe's high-energy physics lab. Nanoseconds after the protons crash together, their combined energy gives birth to heavier particles, which decay in an instant into a splatter of lighter debris.

At the collision point, 92 metres underground, the 7,000-tonne ATLAS detector sees everything. The debris particles pass first through the detector's inner tracker — a sophisticated layer of silicon electronics that records their paths. Beyond that lie systems that measure the energies of the particles. Some drag to a stop there, but heavy cousins of electrons called muons barrel along, flying metres from the collision point before being picked up by giant, mustard-coloured sensors.

Microprocessors convert the particles' paths and energies into electronic signals, and select a handful of promising collisions for a closer look. The data from the chosen collisions zip upstairs to a computer farm that discards the majority and creates a digital reconstruction of those that remain.

Even after rejecting 199,999 of every 200,000 collisions, the detector churns out 19 gigabytes of data in the first minute. In total, ATLAS and the three other main detectors at the LHC produced 13 petabytes (13×10^{15} bytes) of data in 2010, which would fill a stack of CDs around 14 kilometres high. That rate outstrips any other scientific effort going on today, even in data-rich fields such as genomics and climate science (see *Nature* 455, 16–21; 2008). And the analyses are more complex too. Particle physicists must study millions of collisions at once to find the signals buried in them — information on dark matter, extra dimensions and new particles that could plug holes in current models of the Universe. Their primary quarry is the Higgs boson, a particle thought to have a central role in determining the mass of all other known particles.

The architects of the LHC decided in 2001 to deal with all that data by dividing and conquering. The results from the giant particle detectors get parcelled up and sent to a vast global network known as the Worldwide LHC Computing Grid, the most sophisticated data-taking and analysis system ever built. The network is as great a technological leap as the collider itself, and without it the project would quickly drown in its own data.

The Grid consists of some 200,000 processing cores and 150 petabytes of disk space, distributed across 34 countries through leased data lines (see 'March of the data'). By combining these resources, the Grid enables scientists to run vast analyses that would push the world's most powerful supercomputers to the edge.

CERN COMPUTING CENTRE, 30 MARCH 2010

Within minutes, the first collisions have made their way to a 1970s-era concrete building on the other side of CERN's campus. In a white, high-ceilinged room, racks containing 50,000 computing cores undertake a careful reconstruction of every selected collision. Details of each sub-detector's calibration, along with temperature readings and other environmental data from the cavern where ATLAS is housed, are used to piece each event back together. ATLAS scientists at CERN pull up reconstructions showing starbursts of narrow lines spreading from the collision points.

In Grid terminology, the CERN computing centre is known as Tier 0. It undertakes an initial analysis of the data and stores one copy. The physics data from ATLAS on the first day of the March run total about 5.2 terabytes (5.2×10^{12} bytes), enough to fill around ten laptop computers, or five of the digital storage tapes kept on the floor below the rows of processors. The first day's harvest is modest compared with what will follow, but the ATLAS experiment has more than a thousand collaborators waiting for results. If all of them logged into CERN and attempted to pull the data from the first collisions back to their home institutions, the network would grind to a halt.

So instead, the Grid automatically spreads copies of the data geographically. Inside a small partitioned section of the computing centre, a wall of panels bristles with bright-orange fibre-optic cable. This is the heart of the system, and it routes data to sites across the globe at a blistering rate of 5 gigabytes per second.

OXFORDSHIRE, UK, 30 MARCH 2010

After CERN finishes the initial analysis, a dedicated fibre-optic link carries some of the data from the first round of collisions more than 800 kilometres to the Rutherford Appleton Laboratory, a sprawling research park nestled among muddy fields in rural Oxfordshire. Here, in a modern office building, a computing farm receives the data through a yellow cable only slightly thicker than a phone line. The lab is one of 11 Tier 1 centres spread around the world, where the data are further refined and split.

Particle physics is a bit like investigating a mid-air collision. Nobody is there to witness it; instead, the debris is painstakingly collected and reassembled to give investigators hints as to what happened. In this case, physicists divide up the different kinds of particles for study. One group looks at muons, for example, while another focuses on high-energy γ-rays. The computers at the lab help by creating dozens of copies of the data, focusing on various aspects of the collision. They are given names like data10_7TeV.00152166.physics_MinBias.merge.DESD_PHOJET.* — which contains data on photons and narrow jets of particles.

CHICAGO, ILLINOIS, 15 MAY 2010

A team of US researchers sends a request for data out on the Grid, and information on several subsets of the collisions from 30 March travels from Oxfordshire via New York to a post-war University of Chicago building just two blocks from the site of the Manhattan Project's first nuclear reactor.

Rob Gardner, the physicist in charge of the computing facility, says, "What we've assembled here is a data centre just about as cheaply as we can put silicon on the floor." It looks like a smaller version of the computing centres in Geneva and Oxfordshire, but with one importance difference: researchers can bring coffee into the Chicago site. "It's not a clean environment," says Gardner.

His cluster of computers is one of the Grid's 140 Tier 2 sites. Unlike Tier 1s, which undertake serious reconstructions of the data, Tier 2 centres mainly provide storage and computing resources and can be accessed by users all over the world.

In an office above the cluster, postdoc Antonio Boveia sits at a metal desk with his laptop. His machine is at the far end of the Grid from CERN, with lines of code scrolling against the black screen. To conduct an analysis — such as one on the decay of the Higgs boson into heavy particles known as W-bosons — he types in commands in the common programming language C++. For just one of Boveia's analyses, he must study tens of millions of collisions. Even if his laptop's hard drive were 4,000 times its current size and could accommodate the data, his processor would still take a few years to complete the work. "It would be impossible," he says.

The Grid makes it possible by splitting the task. When Boveia enters his request, the Grid pulls data from sites such as the one in Oxfordshire, then parcels the analysis into thousands of separate pieces and spreads it across the network. The pieces might be processed at CERN, or at a facility in Italy, or, more likely, in many places at once. In a matter of days, Boveia receives an e-mail alert telling him that the analysis is complete.

The operation does not always work so smoothly. The Tier 1 and Tier 2 centres are managed locally, which means that they each have their own protocols — and problems. In the summer of 2009, as simulated data was flowing through the Grid in advance of the first real collisions, fluff from local cotton wood trees clogged the Chicago centre's air-conditioning unit and forced a shutdown. The same year, road workers severed one of CERN's fibre-optic links in Switzerland, and a fire brought down the Tier 1 centre in Taipei, Taiwan, for months. When things go wrong, alerts are dispatched by e-mail or, occasionally, by phone to an assortment of emergency contacts around the globe.

The system relies on goodwill, says Jamie Shiers, a group leader in CERN's computing department. "We have no line management over these people whatsoever," he says. But somehow, the global cooperative produces results.

CERN, 24 DECEMBER 2010, 11:54

The ATLAS team posts an initial analysis from the Chicago group onto the pre-print server arXiv.org (ATLAS Collaboration. Preprint at http://arxiv.org/abs/1012.5382; 2010). The report — on W-bosons produced through mechanisms other than the decay of Higgs bosons — includes collisions from the first day's run, along with many others. Measurements of the W-bosons produced show good agreement with existing theories.

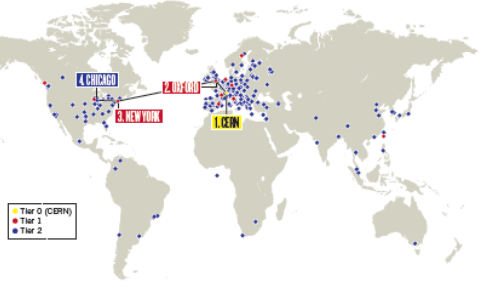
The physics data set from 30 March now makes up just 0.02% of the total data collected by the ATLAS detector. Most physicists on the collaboration are using that initial set without even realizing, as they acquire sections for analysis and combine them with other data sets. The first hints of a Higgs boson may already be stored on a computer disk in Mumbai, Melbourne or one of the many other sites to which LHC data are distributed. But even if it is there, the Higgs will stay hidden until many more petabytes have flowed through the Grid. ■

Geoff Brumfiel is a senior reporter for Nature *based in London.*

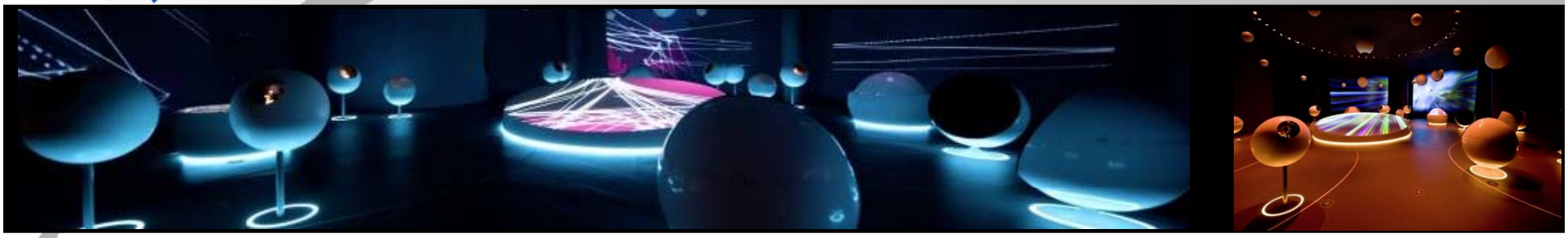
NATURE.COM For more on the Large Hadron Collider, visit: go.nature.com/lctuo9

MARCH OF THE DATA

The Worldwide LHC Computing Grid harnesses 200,000 computing cores in 34 countries. The central node of the Grid, called Tier 0, is housed at CERN in Geneva, Switzerland; there are 11 Tier 1 sites and 140 Tier 2 sites. This story follows data on a trip from CERN to Chicago, Illinois.



2010 CERN Key Events in Figures



- Visits Service: 58,000 visitors (compared to 40,000 in 2009 and 25,000 in 2008) and still many more requests.
- New permanent exhibition ('Universe of Particles' in the Globe for Science and Innovation): 36,000 visitors since its opening (July 2010)
- Total of 282 VIP visits (Head of States, Ministers, etc.) in the last two years
- Teachers Programme: 984 in 2010 (830 participants in 2009): limit of present capacity...
  - Possibility to partner with you on the educational activities (e.g. Intel ISEF students came to visit CERN in 2009 and 2010, possibility to partner on workshops, to organise visits)

Physics World top 10 breakthroughs 2010

Dec 20, 2010: http://physicsworld.com/cws/article/news/44618

1. **CERN Antihydrogen success**

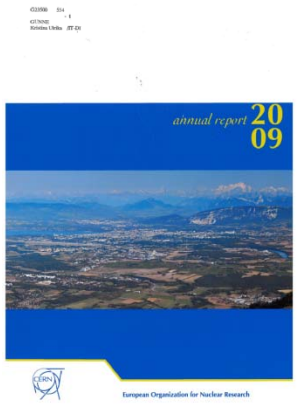
   'It was a tough decision, given all the fantastic physics done in 2010. But we have decided to award the Physics World 2010 Breakthrough of the Year to two international teams of physicists at CERN, who have created new ways of controlling antiatoms of hydrogen.'

2. Exoplanet's atmosphere is laid bare
3. Quantum effects seen in a visible object
4. Visible-light cloaking of large objects
5. Hail the first sound lasers
6. A Bose–Einstein condensate from light
7. Relativity with a human touch
8. Towards a *Star Wars* telepresence
9. Proton is smaller than we thought
10. **10th place: CERN achieves landmark collisions**

    'We couldn't have a top 10 list that does not include the significant breakthroughs in accelerator technology at CERN's Large Hadron Collider (LHC). In March, LHC physicists achieved the first 7 TeV proton–proton collisions ever achieved in a particle accelerator. And what's more, in November the LHC moved seamlessly into the business of colliding lead ions in a successful bid to recreate the conditions of just after the Big Bang. Both runs generated copious amounts of data that will keep physicists busy until the accelerator starts up again next year.'

Overview of 2010 CERN openlab coverage

mentioned in…



Computing chapter of the CERN annual report 2009

- Copies given to Science ministries and Head of States of all CERN member states

+

More than 60 press articles focused on the openlab activities this year (more to come when the full year checking review will be done): www.cern.ch/openlab-press

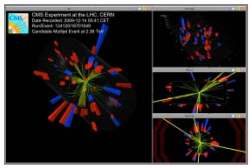
Detailed tracking done in parallel (details such as sponsors quoted, media, number of words, etc.) ⇨ *Feel free to contact me for any specific request concerning the specific coverage related to openlab and your company*

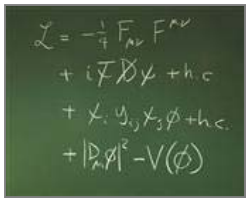
CERN openlab annual report

12 technical reports available at: www.cern.ch/openlab-reports

23 news published on the website: www.cern.ch/openlab-newsletter

Upcoming CERN Events or CERN Related Events





- CERN and partnering labs just launched a new media (a blog): http://www.quantumdiaries.org/author/cern/ .
- CERN DG, Rolf Heuer, invited to speak at the World Economic Forum in Davos this week.
- First 2011 Collisions by the end of February. First communication about 'real' science could also happen quite soon:

  'To my mind, there are excellent prospects for Higgs Boson discovery or exclusion in 2011-2012'
  CERN DG, Rolf Heuer, 12/01/2011

- To know more about CERN scientific programme 2011-2012, feel free to watch the webcast related to the Chamonix workshop on 09/02/2011 (time is not known yet): http://webcast.cern.ch/ . A press release will also be published on Friday this week.
- One hundred years anniversary of supraconductivity: CERN will be involved together with the University of Geneva.

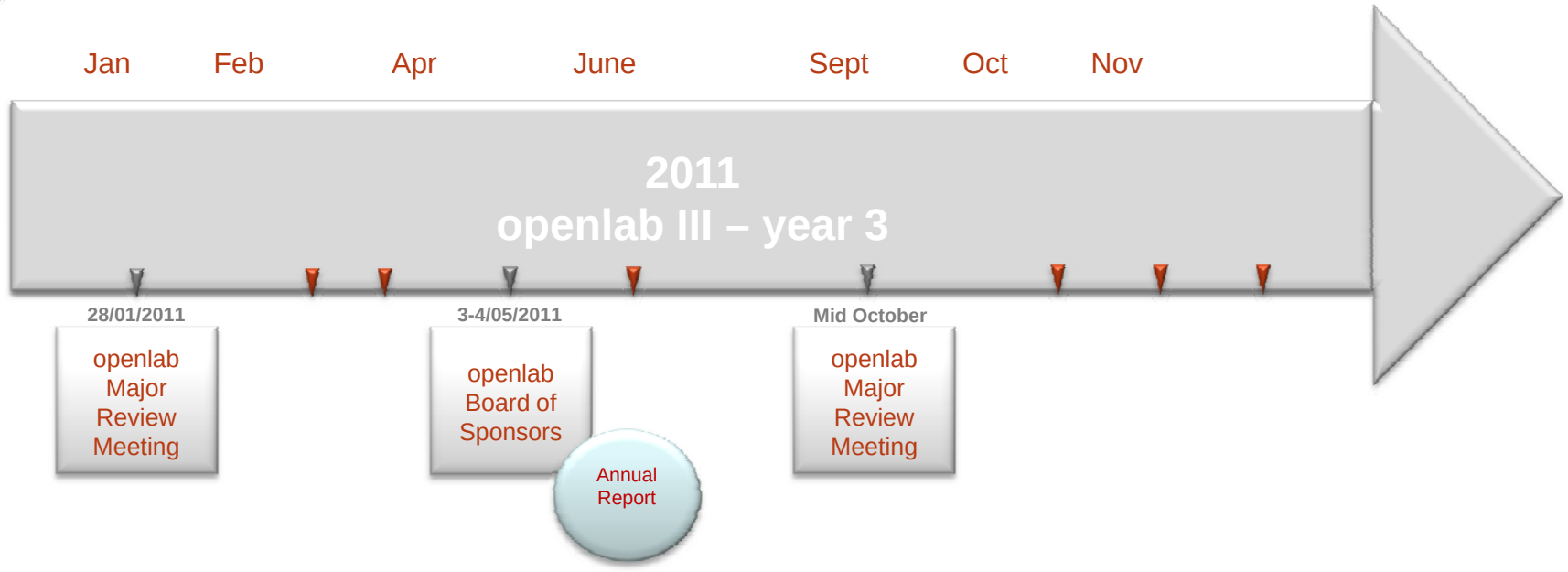
openlab Summer Student Programme

- The programme:
  - Exists since 2003
  - 14 students from 12 nationalities participated this summer (Albania, Austria, Bulgaria, China, Croatia, Czech Republic, France, Macedonia, India, Italy, Romania, Spain)
  - Tripartite funding: Industry, Universities and CERN (about half of the students are funded by openlab partners and work on openlab related projects)
  - 2-month stay between June and September 2010
- Timeline 2011:
  - Leaflet and poster 2011 will be available next week on www.cern.ch/openlab-students
  - Call for projects in IT by 28th February 2011
  - Student applications by 31st March 2011 (and will open next week)
  - **Goodies very much welcome by the students working on the openlab projects!**

- Communication:

  Next week:
  - Postings on the CERN openlab website, CERN Courier website (job section), Brightrecruit, Euraxess (European Commission job website for researchers), as well as key technology universities career websites.
  - E-mailing to 130 targeted contacts: the Computer Science Departments, the alumni organizations and the Career Information Officers of 48 key technology universities part of CERN member countries.

Timeline


Jan
Feb
Apr
June
Sept
Oct
Nov
2011
openlab III – year 3
28/01/2011
openlab Major Review Meeting
3-4/05/2011
openlab Board of Sponsors
Annual Report
Mid October
openlab Major Review Meeting
Minor Review Meetings (Technical Meetings)

Q & A