



SPSC106 summary for EATM

Lau Gatignon / EN

Open Session: COMPASS, ICARUS, OPERA, LBL ν (E-007), g_{PBAR} (I-241)

Closed Session: P347 (SBL ν), AD EXPERIMENTS, DIRAC, CLOUD, NA61/SHINE, NA62, NA63, CAST, OSQAR, UA9

ACCELERATORS

Stefan reported on the start-up and performance of the injector complex.

Rather reliable operation, but slightly lower CNGS flux than in 2011. Recuperate some by lowering the flux for nTOF, while respecting RP limits.

EXPERIMENTAL AREAS

The start-up and operation of the areas was described, following lots of shutdown activities, in particular the repair of all TAX. The BIW situation was mentioned. In general good performance of all beam lines.

SCHEDULE

Horst showed the latest versions of the schedules, taking into account the earlier end of run and using the Pb ion period for some electron beam running in the EHN1 lines. *(See spare slides)*

It was mentioned that there are ongoing discussions to delay the restart after LS1 by 3 months and possibly the end of the 2012 run by up to 2 months. Decision will depend on the 4th of July results and on luminosity increase for LHC.

The consequences for the experiments must be listed rapidly, e.g. NA61 Argon run in 2014, kicker platform move in AD (and thus ELENA), NA62 infrastructure, COMPASS change from DY to DVCS,...

COMPASS

In the **muon data**, COMPASS has seen signals for Collins and Sivers asymmetries. The latter result was improved in statistics and systematics with new data in 2010. Sivers complements DY (2014)! An independent approach to transversity was based on two-hadron asymmetries – clear signals.

Huge statistics from 2008 and 2009 **hadron beam** runs being analysed, now including t' -dependence. Two papers in preparation on $\pi^+\pi^-\pi^-$ analysis and $\pi^-\pi^0\pi^0$ analysis progressing. For the first time a 5π analysis is being performed, using an isobar model.

Now **7 papers** are in the pipeline or published and **5 more are expected this year**.

In **2012** the first half of the year is a Primakoff run with hadron beams, physics started a week ago. Using hadron and muon beams in alternation.

Preparations for the DVCS beam with muon beam in October well on track (after the ion period).

The SPSC **congratulates** the COMPASS collaboration for timely publication of new results on several aspects of the nucleon spin structure.

The SPSC **acknowledges** the progress in the analysis of the hadron beam data and **is looking forward to** publications in this subject area.

The SPSC **notes with pleasure** the successful start of Primakoff data-taking and the progress with the experimental set-up for the DVCS run. The SPSC looks forward to results from the 2012 data-taking.

ICARUS

ICARUS is being improved continuously, e.g. **lifetime is 5 ms**, allowing operation at longer distances. Fully equipped with **SuperDaedalus chip** for local trigger based on deposited charge. The readout of the PMT system was fully redesigned, also for ν_ν measurement. Now 35 MHz trigger rate achieved.

The detector live time was so far 93% and the analysis of CNGS data is ongoing and the results will be presented once they are final. Results are expected for $\nu_\mu \leftrightarrow \nu_e$ **and** $\nu_\mu \leftrightarrow \nu_\tau$ **oscillations**.

Analysis tools are being improved, in particular 3D reconstruction, momentum measurement from MCS, particle ID, vertex finding, calorimetric reconstruction, ... Various calibrations have been done.

ICARUS **excluded superluminal ν 's** by the absence of e^+e^- pair radiation (Cohen-Glashow radiation) and also measured directly the **neutrino velocity** with the bunched beam, consistent with light velocity: $\delta t = -5.1 \pm 1.1$ (stat.) ± 5.5 (syst.) ns preliminary result from the 2012 run.

The SPSC **appreciates** the smooth operation and efficient data collection by ICARUS and the contribution of the collaboration to the neutrino time of flight measurements.

The committee **notes with pleasure** the progress in automated event filtering and reconstruction. The committee **is looking forward** to first physics results.

OPERA

OPERA has chosen a new spokesman: Giovanni De Lellis from Naples.

The **neutrino velocity** measurement has been corrected, with two issues identified: the bad fiber connection between the GPS and the OPERA master clock and a wrong oscillator frequency of the clock. Now result from 2012 run δt consistent with 0: $\delta t = -1.6 \pm 1.1 +6.1, -3.7$ nsec .

Paper will be submitted around mid July.

Data-taking for ν_τ continues, as well as analysis. **A second ν_τ candidate event has been found!**

The decay is into 3 hadrons. The background is estimated to be very low.

OPERA also performs a **ν_e search**. So far 19 ν_e events were found with a background of 0.16 events.

Expected 1.5 events from oscillation, 19.2 from the beam ν_e component.

After low-energy selection: observe 4 events for expected 1.1 from oscillation and 3.7 from the beam.

Brick analysis is progressing, with some minor hiccups. Steady optimisation of procedures.

The funding is arriving slower this year than in the past (so far only 50% covered). This lead to some delays in e.g. delivery of chemicals.

The proposal flux was $22.5 \cdot 10^{19}$ pot, the expectation without extension is $18 \cdot 10^{19}$ pot (i.e. 84%).

The September collaboration meeting will be devoted to a decision on the future.

In any case, they request as much beam as possible!

The SPSC **congratulates** the OPERA collaboration on the announcement of the second ν_τ candidate event.

It **is looking forward** to completion of the analysis of the 2010- 2011 data and to the publication thereof.

The Committee **acknowledges** the effort and successful collaboration between CERN, LNGS, LVD, ICARUS, BOREXINO and OPERA, to bring the neutrino time-of-flight measurement to a conclusion. The SPSC is looking forward to the publication of the final results.

LBL- ν (E-007): LBNO

André Rubbia et al submitted an Expression of Interest to the SPSC last weekend: ~150 pages. About 230 authors and 51 institutions.

Physics motivations: CP violation in the lepton sector and mass hierarchy. The T2K result on ν_e appearance last Summer also triggered a revolution and helped to constrain the matrix elements.

LBNO is a next generation long baseline experiment which aims at significantly better sensitivity than T2K, NOVA and reactor experiments combined. Need very large detectors deep underground and very long baseline. Propose a location in Pyhäsalmi / Finland (2300 km from CERN).

The expected sensitivity for the mass hierarchy is $> 5\sigma$ after a few years and for CP violation 2.9σ after 10 years. Could be improved by larger mass or longer running.

The experiment requires very high proton fluxes and hence upgrades of the SPS (cf LIU). Several layout options were shown.

The collaboration calls on CERN to engage in a collaborative effort with the LBNO Collaboration to prepare a full engineering design of the CN2PY beam and to promptly support the necessary R&D and test beams needed to develop a proposal by the end of 2014.

The SPSC **welcomes the received** Expression of Interest for a very long baseline neutrino oscillation experiment (LBNO), SPSC-E-007. The Committee **will further review** the project.

The SPSC asks the accelerator teams to investigate in particular synergies with the short baseline proposal for the beam line.

P347: SBL ν

The short baseline neutrino experiment proposed at the previous meeting for the SPS (North Area) addresses a number of anomalies at the 2-3 σ level.

A list of 23 questions was addressed to the collaboration and to the CERN ATS sector on May 25th, concerning backgrounds, physics potential, competition, detector, beam and infrastructure and collaboration issues. An answer was received on June 12th.

The discussion with the referees started on June 25th. The open issues include additional studies of sensitivity and competition, the high DAQ rate in the near detector (pile-up, backgrounds), collaboration structure.

A joint effort between P347 and the CERN beam division seems mandatory to go further with the review process. A number of questions was addressed to the beams division on June 25th.

They need by 2017 the primary proton beam, target station, secondary beam, detector pits and buildings.

The SPSC **acknowledges** the progress and first feedback by the collaboration addressing the questions by the referees on technical and organisational issues of the proposed experiment.

The Committee **will continue reviewing** the proposal including remaining open questions, *particularly focusing on the following items:*

- *Sensitivity studies,*
- *Near detector location, shielding (background, pile-up rates, systematics),*
- *Near/Far detector design and requested similarities,*
- *Collaboration structure and development plan.*

The committee **recommends** a joint effort between the collaboration and the CERN beams department to carry out the studies necessary to define the experimental setup and to assess the costs and possible schedule for a new neutrino beam line and the experimental infrastructure

Another Letter of Intent was submitted for an experiment at the AD to measure precisely the magnetic moment g of the anti-proton to allow a comparison with the proton one (CPT test) and to improve the present precision from 10^{-3} to 10^{-9} . The collaboration has 5 members from 4 institutes.

The experiment is based on frequency ratio measurements in a cryogenic double Penning trap: $g_p = 2 \omega_L / \omega_c$. For ω_L an inhomogeneous field is needed: quadratic component of Penning trap.

Need 6 weeks of shared beam time for setting up once and later only **a few AD shots per year**.

The experiment would cost ~ 1.25 MCHF and the funding is available.

A location has been found behind AEGIS inside the AEGIS zone. Discussions are ongoing.

They hope to start measuring in 2014 and hope to reach $\sim 10^{-6}$ precision already.

Once ELENA comes up, they expect to get a dedicated location, e.g. below the ALPHA control room.

Only there the final precision can be reached (need a 'quiet' area).

The experiment requires a Faraday cage, T stability to 100 mK, P stability to < 0.1 mbar, ultra-high precision power supplies.

ATRAP can also measure the pbar magnetic moment but not at that precision.

The SPSC **welcomes** the Letter of Intent SPSC-I-241 to perform a measurement of the antiproton magnetic moment with a 10^{-9} precision in a two-stage approach.

The committee **recognises** the physics motivation and the opportunity offered at the Antiproton Decelerator.

The Committee **invites the collaboration to submit a technical proposal.**

In view of the stringent stability requirements of the experiment, the Committee **advises** to optimise the setup in close collaboration with the accelerator and experimental area experts and the other AD experiments.

AD EXPERIMENTS

ATRAP had vacuum problems and issues with welds, leading to a cancellation for their first run. They are now pushing the measurement of the antiproton magnetic moment.

ASACUSA has collected good data on antiproton-nucleus collisions and they have installed a new electrostatic quadrupole triplet in the 100 keV beam, in preparation for ELENA.

ALPHA has nearly completed the new solenoid for ALPA-2. The new catching trap has been installed. Commissioning is under way.

AEGIS is preparing, together with the referees, a set of milestones for detailed reviewing. Possibly new collaborators. The progress in the run was very good, commissioning is progressing. They are still on track for producing anti-Hydrogen in 2012.

ACE had a successful run last week. This completes the RBE measurements. They request 3 days including setting up in September to measure the dE/dx produced by the beam. For this they will use a commercial tissue equivalent proportional counter. Takes time from AEGIS. The SPSC supports this request and the scheduling will be defined at the AD User Meeting, minimising the impact on the other experiments..

GBAR is working towards MoU.

OTHER EXPERIMENTS

DIRAC started data-taking only last week due to late delivery of their new magnet.

They want now the maximum number of spills available.

CLOUD just started running, again with promising results.

A manuscript was recently submitted to Science.

FP7 CLOUD-TRAIN Marie-Curie network has been funded with very high score (94.6/100).

They will propose a long-term plan at the time of the next annual review (want to retain T11 beam!)

NA61 just started data-taking. The preparations for Be+Be are completed.

There is now agreement with 8 US groups to study hadron production for NUMI → SPSC107

The test for this was delayed till August because of cooling problems of the VTX-2 magnet.

Late start-up in 2014 may make Argon run in 2014 impossible!

NA62 is on track for the Technical Run starting at the end of October.

First physics run: the Collaboration asks for a timely restart of the SPS in 2014, in order to achieve
~100 days of physics

NA63 is preparing for their run and hope to solve problems with their MIMOSA detector in time.

UA9 got 3/7 days in H8 and will run in SPS next week. Preparations are on track.

The **OSQAR** magnets have been replaced for the LHC and must be replaced → delays!

NEW ACTION ITEMS

Meeting	Experiment	Action item	Comments
SPSC106	All	List possible consequences of a possible delay of LS1 by e.g. 3 months	Urgent
SPSC106	LBL- ν	Investigate synergies between LBL and SBL neutrino beams.	
SPSC106	P347	Joint technical study for SBL neutrino beam and associated infrastructure.	
SPSC106	I-241	Investigate whether an optimised location can be found.	But avoid delays (competition ATRAP)

STILL OPEN ITEMS

Meeting	Experiment	Action item	Comments
SPSC105	CLOUD	Study option to preserve T11 beam and study all implications	Also need justification by CLOUD
SPSC105	CLOUD	Operation without beam through LS1	Power, gas, etc
SPSC105	NA62	Support for infrastructure consolidation	Cranes, CV, ...
SPSC105	P347	Work out operational scenarios and impact on FT program	Parallel vs alternate
SPSC105	P347	Detailed design and evaluate cost and feasibility of beam line	Keep in mind synergies, convergence with LBL
SPSC105	P347	Work out compatibility of installation work with beam operation	Coupling to shutdowns?
SPSC105	P347	Find storage location for T600	In 2013
SPSC105	CNGS	Prepare 100 nsec beam for mid May.	Option for v-bar at the end of the run