Minutes ILRS/AWG Workshop #10
April 22-23, 2004, Nice, France

Thursday April 22

1. Opening
Welcome by Noomen. Regards passed on from Altamimi, Husson, Berio and Exertier. Noomen thanks the community for their telephone calls and cards while being ill and confined to home. Thanks to Appleby and Shelus for taking over organization and chairing of AWG meeting in Koetzting. Approval of agenda (Table 1). The names and e-mail addresses of the participants are listed in Table 2.

2. Minutes AWG Koetzting
The main subjects of the minutes of the previous AWG meeting (cf. ILRS web pages) are on the agenda for this meeting, so they will not be treated here explicitly. The minutes of this meeting (main body plus appendices) will be distributed in electronic form, rather than the paper form which was in use in previous years.

3. Actions since AWG Koetzting
The action items of the previous meeting in Koetzting were reviewed. About half has been fulfilled; the remainder will appear on the action item list coming out of this Nice meeting.

Three specific remarks: the activity of DGFI to develop a SINEX format checker (*action item Angermann*) is meant only as an in-house activity; other provisions already exist for individual analysts to do a SINEX check themselves. It was recommended that the facilities of NCL be used for the AWG activities.

Secondly, the exact characterization of the station/satellite interaction (center-of-mass correction plus return signal characteristics) remains a very important item (*action item Appleby/Otsubo*). So far it has resulted in a theoretic range of values, which, in the case of LAGEOS, may show a scatter of up to 10 mm, depending on things like detector type, signal strength etc. To quantify this range of uncertainty (based on the actual characteristics of the station hardware) this needs to be tested at the stations. Otsubo and Appleby reiterated, however, that even though theoretical values for CoM were now available, actual absolute CoM values per station would be very difficult to compute, except for those stations working a single photon levels. It was agreed that, under the supervision of the ILRS Signal Processing WG, the stations must be urged to do these tests at short notice; the AWG wants a report on these results in San Fernando (standing *action item Appleby/Otsubo*).

Thirdly, the data re-supply process should be such that if these are submitted within 30 days after the event, they should replace the original NPs (including an elimination of the latter), combined with an entry of this update in the BIAS SINEX file. If the difference between the update and the original date of the measurements exceeds 30 days, just an entry for the BIAS SINEX file is to be given.

4. Announcements

4.1. ILRS related presentations
The proceedings of the International Laser Workshop in Washington DC (October 2002) have been released. All analysts are encouraged (urged) to send an electronic version of their papers, published in the various scientific journals, to the ILRS CB for inclusion in the ILRS web pages.
Gurtner reported on an invitation to give a presentation on ILRS status during the upcoming COSPAR meeting; input will be solicited from various ILRS elements (such as analysts).

Appleby reported on a meeting held with a UK company that is building one of the two GALILEO pilot satellites, due for launch in 2005, both of which will carry LRAs for orbit cal/val.

4.2. ILRS status

Pearlman gave a brief update on the status of the ILRS (Appendix A). He summarized the network situation (Mt. Stromlo coming on line again after being destructed by fire; SALRO doing well, problems with part of the NASA network because of funding problems; HOLLAS closing at the end of 2004; 7835 closing at the end of May 2003; Arequipa operations uncertain; a new JAXA station in Tanegashimi). As for spacecraft, GP-B has been launched on April 20; a re-acquisition is planned for GFO; specs for SLR retro's on Galileo are expected; coordination with IGS for outfitting GPS-III with retro's (*action item Pearlman*); low data yield Meteor-3M. The Central Bureau is affected by a reduction in HTSI support because of NASA funding problems; the proceedings of the IWLR2002 have been printed, whereas the 2002 ILRS Annual Report is in print; the 4th quarter 2003 station report card has been issued and the 1st quarter report card is in the make (*action item Torrence*); INDIGO is funded (support for the centrals bureaus for the IGS, ILRS and IVS CBs). Meetings have been held or will be held in Nice (April 2003), Koetzting (October 2003), Nice (April 2004) and San Fernando (June 2004). Site surveys have been performed in Hartebeesthoek and Shanghai (analysis is in progress), and is planned for Beijing. Finally, the AWG is well on its way to an official ILRS product, NERC is assisting in data screening, the turn-around time for data centers is 5 minutes, and CDDIS is in the process of a revision of the data file structure (cf. agenda item 6.5).

In addition, Noomen showed results from a simulation study on effects of the reduction of the tracking networks, done by Schrama and Doornbos (Appendix B). For a 2-year time-interval, average sea-level heights have been computed using Jason-1 SLR and DORIS data. Compared to the results obtained with measurements of fully operating networks, the reduction in the SLR network results in an added uncertainty of up to 10 mm (a regression suggests a change of 1.0 mm/yr); the effect of a reduction of the DORIS network (because of malfunctioning of the on-board receiver over the South Atlantic Anomaly) may also range up to 10 mm; here, the trend line suggest an additional effect of 2 mm/yr. In both cases, however, a pure random effect is expected over the long term.

5. SINEX issues

A number of issues have come to light recently. First, there is currently no provision for replacement solutions, beit individual "pos+eop" solutions or combination solutions; replacement ids are currently given *ad hoc*. To remedy this, it has been decided to add a version number to the name of the solutions. As an example, the solution generated by GFZ for the date ending on April 22 should read then "gfz.040422.v1.snx.Z" (and a similar extension for combination solutions). All initial solutions are to be labeled with "v1"; for any update the version number is to be incremented by 1. *Action item analysts*: resubmit all solutions with the new name, both to CDDIS and EDC, and have this done (old solutions) and operational (new solutions) as of May 8. *Action item Noomen*: inform data centers, analysis centers and combination centers on this change in naming convention.

Secondly, there appears to be confusion on the point codes for the stations Zimmerwald (7810) and San Fernando (7824) which originates in the fact that they were re-installed with the same 4-digit SLR code. It has been agreed (confirmed) that the solutions of current coordinates should be labeled with the point code "B" (and of course refer to the current reference point/optical center; the DOMES system of identifying station positions is unambiguous on this). *Action item analysts*: check this point id in the submitted "pos+eop" solutions and re-submit (cf. previous action item).

6. Miscellaneous

6.1. Atmospheric refraction

A number of reports were given on this issue. Pavlis reported that the results derived with a new zenith delay function fit radio wave data at all wavelengths at the level of a few mm; for other elevations a proper mapping function has to be applied. A paper has been submitted to GRL. This aspect, together with (new) provisions for loading, nutation and others, will be included in a new GEODYN version which is expected to become available around the turn of the year. A student, working on gradients using ray tracing techniques is also getting promising results on the refraction effect.
Bianco reports on the experiences at the MLRO system in Matera. This system can work in 2 modes: a double MCP mode (where the signals at the two wavelengths are treated independently), and a real differential mode using a streak camera. The first option is preferred, since it is simpler, but this does not extract maximum information from the unique dual-wavelength capability. For the streak camera observations, no format is available yet. The accuracy of the tropospheric effect value is estimated to be an order of magnitude better when observed by the streak camera than when derived from the independent observations. Bianco will figure out whether observations on one wavelength and streak camera data have been converted into more accurate, refraction-corrected observations on the two individual wavelengths. *Action item Bianco*.
Gurtner reports that Zimmerwald has been affected recently by hardware problems; as a result the system has generated infra-red observations only.
Mareyen reports that TIGO has not submitted much 2-color data recently. *Action item Mareyen*: find out why and urge to correct.

6.2. Analysis center qualification
No developments on this, pending the progress of the AWG "pos+eop" project.

6.3. IERS Conventions: loading and geocenter
Pavlis comments on the issue of geocenter that we follow (currently) the IERS 1996 Standards, so we do not model geocenter motion explicitly. As for loading, the IERS model (after Scherneck) is available for more than a year by now (cf. IERS web pages). Analysts are warned not to model the geocenter effect twice, since, depending on the formulation, it may already be in the loading model.

6.4. Other products, analysis activities
Since the "pos+eop" (and related) project(s) appear to converge, and also in view of the threats that SLR/LLR face, Noomen invites the analysts to think of new science subjects, to broaden the scope of the AWG, with the purpose of strengthening the ILRS and give it better visibility and credits in the space geodetic community. Clearly, we can do with more and better recognition in papers. One important aspect is that we should strive for papers in top-ranking and broad-exposure papers like Science and Nature, and also that we must make sure that we get the recognition where relevant. The former element is a shared responsibility of the analysts; the latter can be effectuated better by (1) checking the presence of acknowledgements in case we are doing reviews; (2) include a requirement in the ILRS mission application form for (*i*) an ILRS/SLR/LLR acknowledgement (as a minimum), (*ii*) the reporting of resulting publications (to be included in the ILRS "science" web pages) and (*iii*) the inclusion of SLR and/or ILRS as keyword in resulting papers (*action item Pearlman*), and (3) add something similar as a message that is raised automatically whenever an ftp session to the CDDIS and/or EDC data center is being made (*action item Pearlman*).
Sciaretta proposed POD validation as a new activity for the AWG. This was considered as not feasible, since it would be too much mission-specific.
Appleby suggested to work on a product "LAGEOS orbits" in SP3 format (cf. the minutes of the Koetzting meeting).

6.5. CDDIS file structure
Noll has proposed a new structure for the SLR/LLR data files on CDDIS (cf. Appendix A). This proposal is OK'ed, with the remark that all LLR data have to be brought into a consistent system (rather than

making a distinguishment between pre-1999 and post-1999 data). The monthly files should contain the latest release of the data only. The monthly files should also be updated daily, rather than be produced at the end of a month (*i.e.* become "living documents"). (*action item Noll, Seemueller*).
Also, the AWG wants a full transparency between the data file system at CDDIS and at EDC: organizational and naming-wise, but also contents wise (including deleting of old releases and screening by HTSI). *Action item Seemueller, Noomen*
Analysis groups must be informed of these changes (*action item Noll, Noomen*)

7. Pilot project "harmonization"
With Husson having left the community, this project has effectively ended. However, the QC analysts must play a more active and persistent role. *Action item analysts*: contact stations explicitly when a data problem is detected, and verify that remedial actions are taken. *Action item QC analysts*: check that reports are sent to email exploder slreport. *Action item Gurtner*: check stations in email exploder slreport. *Action item CB*: ask stations to check their site log and configuration file and update where necessary.

8. Pilot project "benchmarking and orbits"
Pavlis gave an update on the benchmarking project (cf. Appendix C). In summary and based on the Koetzting discussions, the qualification will be based on a mixture of 0, A, C and D results (cf. minutes AWG Koetzting). The "0" results show orbit differences of centimeters between GEODYN users, tens of meters between different (non-GEODYN) software packages and tens of kilometers between results of GEODYN users and non-GEODYN users. Even at the initial epoch, differences in the order of meters are observed. This is all very likely related to reference system (implementation) differences.

Mareyen made remarks on the benchmarking project. She emphasized that a service must be installed to do the benchmark check on demand. Mareyen further questioned the feasibility of the choice made in Koetzting to go from a 28-day period (arc) to a 7-day period (arc).

It was noted, however, that strong evidence for the viability of the 7-day arcs was presented at Koezting and the AWG had agreed to go that route. After a lengthy discussion on these issues, it was concluded that a separate pilot project to study the optimum arc length for LAGEOS SLR analyses would be initiated.
Also, it was considered as not feasible to pursue the checks at the levels 0, A and C. The benchmark assessment will be based on the "D" results only, since this is most close to the required end product, and it also contains all other relevant information (data corrections and such). It was agreed that, considering the progress of the pilot project, the timelines defined by the IERS customer, and their involvement in the development of the various pilot project (products), the 5 groups that currently contribute operational products (*e.g.* ASI, DGFI, GFZ, JCET, NERC) are accepted as contributors to the official ILRS product anyhow.
Also, Pavlis was asked to define a second month to do the benchmark evaluation for future candidate contributors; 1 month (with known outcome) can be used for testing by the candidate contributor itself, whereas the other (with an outcome unknown to the candidate contributor) will be used for the "examination" (*action item Pavlis*).

Friday April 23

The meeting was started with a summary of the main conclusions of the previous day by Noomen.

9. Pilot project "positioning and earth orientation"

Noomen gave a short introduction of this (and other) ILRS AWG pilot projects. So far, this is the 11th AWG workshop (1999 – Florence; 2000 – Frankfurt, Delft, Matera; 2001 – Nice, Toulouse; 2002 – Nice, Lanham; 2003 – Nice, Koetzting; 2004 – Nice). Main achievements are (1) almost all QC centers have shifted to ITRF2000 coordinates, (2) the SINEX format has been "mastered", (3) the specific satellites that are used in these computations have been settled, and (4) the issue of the type of parameters has been resolved. Currently, the benchmark project for the detection of gross errors is active, (2) the "pos+eop" project is in a test phase for the operational products since June 2003 (initially with 28-day data periods, but since November 2003 with 7-day periods), and (3) the "pos+eop" project has "found" a second customer: the IERS Combination Pilot Project, in addition to the IERS Bulletin A.

9.1. IERS CfP

Noomen gave an introduction on this new pilot project. IERS has released a Call for Participation in January 2004, specifically (at least as far as relevant to the ILRS) asking for a technique-specific combination solution including station coordinates (7-day resolution) and EOPs (1-day resolution). The computations would have to be done on a weekly basis, and the test phase would cover 1.5 year (begin in April 2004, with data taken 8 weeks earlier, and continue until October 2005). After consulting the analysis community, the ILRS has reacted positively by sending an official letter of (intended) participation. The specification of the expected input is based on the contributions to the ILRS "pos+eop" pilot project. This has been accepted by IERS, which has specified further details on naming conventions and operations.

9.2. Individual contributions

Noomen gave a brief introduction here, in particular highlighting the contributions flow. Apart from (individual) missing reports, analysis contributions have been received from ASI (030602-040410), DGFI (030630-040410), GFZ (030602-040410), JCET (040214-040417) and NERC (031006-040410). Combination solutions, both for a "pos+eop" product and for an "eop-only" product, have been generated by ASI (030714-040403), DGFI (030721-040410) and NCL (031013-040410; December 2003 is missing completely). These statistics were based on the situation of April 19, 2004.

ASI
Luceri reported on the most recent ASI developments (Appendix D). The procedure is now fully automated, encompasses Etalon data since February 28, 2004). Associate stations are not included, and range biases are estimated for about 10 (non-core) stations. The total WRMS is about 1 cm, whereas w.r.t. ITRF2000 the individual solution shows translations typically smaller than 10 mm, a scale effect smaller than 1 ppb and station coordinates (after 7 Helmert parameters) of about 15 mm WRMS. The change from 28-day periods to 7-day periods results in an increase of the scatter of the various products by a factor 1.5-2, as expected. EOP results show a residual WRMS of about 0.3 mas w.r.t IERS C04, and about 0.17 mas WRMS after removal of a bias. Tests on the treatment of the associate stations seem to indicate that downweighting these with a factor of 1000 w.r.t. "ordinary" stations results in poor overall results and weakened covariance information overall. Better: eliminate or treat in a normal fashion.

DGFI
Müller reported on the DGFI results (Appendix E). Since March 7, the Etalons have been added. Data weighting is an even 1 m for all stations (no downweighting of associate stations). Before the "final" computations are done, a screening procedure is applied first. The analysis system differs from that of others in the sense that EOP solutions are generated at 0.00 hrs epoch; in order to satisfy ILRS AWG requirements the results are later transformed to mid-day (an interpolation between 4 parameters). Various QC elements were highlighted. Orbital fits are about 10 mm, for weekly arcs. The relative weights of the LAGEOS and Etalon normal equations are identical.

GFZ
According to König's report (cf. Appendix F), GFZ works with a mixture of automatic procedures and human verification. For QC purposes, a 28-day arc is analyzed in parallel with the 7-day analysis. Without any transformation, the loosely constrained EOPs are estimated with a mean standard deviation of about 1.8 mas / 0.037 ms for the 28-day interval; for the 7-day interval, these values are about a factor 1.8 larger. The accuracy of the EOPs is estimated from overlap comparisons, after removal of a bias the residuals become 0.19 mas and 0.14 ms (28-day) and 0.4 mas / 0.25 ms (7-day). The fits of the SLR data are about 1.27 cm, irrespective of the arc length. GFZ processes LAGEOS data only, at this moment. All measurements are treated with a 1 m weight, irrespective of whether it concerns core, associate or contributing stations. Problematic data are completely rejected in the computations.

JCET
Pavlis provides operational solutions since January 2004 (cf. Appendix G). Three types of solutions are generated each week: (1) the operational SINEX project, *i.e*. the contributions to the ILRS pilot project "pos+eop", (2) an EOP solution with coordinates fixed at ITRF2000 (for inclusion in the NEOS series), and (3) a final product for the yearly ITRF solution (station coordinates plus IERS C04 contribution). Each of these solutions is done twice: once with LAGEOS data only, and once based on LAGEOS and Etalon data, whereby the Etalon data get a weight of 0.25 times the LAGEOS data (in the weighting of the various normal equations, that is). All observations are processed with a weight of 1 m. Pavlis has noticed a weekend-effect in the data yield of the network. *Action item Pavlis*: make an inventory of the weekend-effect for a number of individual years, e.g. 2000 – 2004.

NERC
Appleby reports that his NSGF analysis is based on LAGEOS and Etalon data. Biases are estimated for some (weak) stations. The weekly runs are fully automated, except for upload of the solutions, which is done manually after a QC inspection. Different from the recommendations, and from the criteria applied by others, NERC requires a minimum of 20 normal points for LAGEOS-1 and LAGEOS-2 combined; this will be altered to the standard 10 NPs.

OTHER ACs
In addition to these 5 regularly contributing institutes, the other groups present were also given the opportunity to say a few words on their possible contribution towards this project. NICT (Otsubo) reported that at the moment the software is being upgraded, and that they hope to contribute (again) in the beginning of 2005. The same opinion was ventilated by Andersen (FFI), who likes to contribute to the benchmark project earlier. The situation for CSR (Eanes) is similar to that of NICT. CODE (Gurtner) is busy implementing the SLR technique in their Bernese software; hopes to extend their activities to LAGEOS and Etalon in the coming years. BKG (Mareyen) intends to test 1 week with the support of DGFI, and then contribute to the benchmark project and the "pos+eop" project. DEOS (Noomen) hopes to contribute also somewhere in the course of 2005.

9.3. Comparisons and combinations

ASI
Sciaretta gave an overview of ASI's combination approach (cf. Appendix H). It is based on a so-called "loose combination", which requires any constraints to be removed first. As an advantage, the solution does not need to be mapped into a well-defined reference system (the so-called "fiducial" approach). At this moment, the combination system is fully automated and runs in a Matlab environment (which will be changed to an HP workstation in due course). Modifications were implemented to handle the GFZ solutions (which use the INFO block, *i.e*. solution plus matrix part of normal equation). The combination procedure is based on estimating (and testing) looseness parameters for individual Helmert parameters;

the contributions from the various analysis centers are weighted such that they more-or-less evenly contribute to a total χ^2 (*i.e*. weighted rms-of-fit) of 1.
Two products are generated: an EOP solution (aligned with ITRF2000) and a (loosely constrained) pos+eop combination. The former shows (for the 7-day solutions) an rms difference w.r.t. IERS C04 of 0.25 mas, 0.31 mas and 0.07 ms for X- and Y-pole and LOD, respectively. The combination solution for coordinates shows a 3D WRMS difference w.r.t. ITRF2000 of about 15 mm (7-day periods) or 10 mm (28-day periods). In general, the 3 combination solutions (ASI, DGFI and NCL) show a similar behaviour.

This is followed by a more general discussion on the representation of solutions in the SINEX format. At this moment, the options are the "COVA" system and the "INFO" system; they can be handled by (most of) the combination centers. In theory, a complete normal equation might be useful also, but considering the time it takes to implement the required modifications, this option is effectively forbidden in this ILRS application for the time being.

DGFI
The combination results obtained by DGFI are based on ASI, DGFI, GFZ and NERC input so far (Kelm) (cf. Appendix I). The major steps are (1) deconstrain, (2) apply a minimal constraint (for comparison purposes only), (3) compare with each other and with ITRF2000, (4) compute WRMS difference, (5) make a combination of the original deconstrained solutions with rescaling (iterative approach), (6) make a comparison with the input data and ITRF2000, and (7) generate output.
Kelm continued with a comparison of a number of aspects implemented by the 3 combination centers (specifically, relative weighting and constraints for the "pos+eop" solution). The comparison is only useful if a minimum constraint is applied.

A problem that arises is that of editing individual station solutions. If that is done, it is effectively kept fixed at the (wrong) solution value and does have, through its correlations, an effect on the solutions for the other stations as well. This must be avoided, and therefore one should in principle return to the original analysis of the SLR data itself and eliminate the data of that particular station there. This is impossible in an operational approach, but it should be reported to the relevant analysis center. As a good first-order approximation, individual stations (coordinates solutions) can be edited out at the covariance level (and NOT in the normal equation) (*action item combination centers*).

Also, a discussion ensued on the various EOP products. For the IERS inter-technique combination, it is a well-defined product, namely the loosely constrained solution along with station coordinates, as per the ILRS CfP to the analysis centers. However, for the Bulletin A solution, required is an EOP series aligned with ITRF2000. Since not all stations are included, or have erroneous entries in, ITRF2000, even some of the high-performance ones such as Ryadh, AWG agreed to supply to the current combination centers a set of augmented ITRF2000 coordinates and velocities, at epoch 1997.0. This can be achieved at combination stage by using each solution's coordinate table, for an epoch of mid-7-day arc (*action item Noomen/Altamimi*).

NCL
Nurutdinov reported on the NCL combination approach (cf. Appendix J). Here, the unconstrained solutions are transformed to the ITRF2000 solution by using 4 globally-spread stations, and including the formal uncertainties of the ITRF2000 representations for these 4 stations. Even after a long discussion, it remained unclear whether that is a good approach or not (rather than use the maximum number of stations that can be used for this purpose). On statistics, the LOD solutions show a difference of about 0.1 ms rms (individual solutions) or about 0.05 ms rms (combination solutions) w.r.t. the IGS solutions (which are considered as "truth" here); this is after elimination of mean offsets per week. Inspecting NCL's combination procedure, it turns out that the DGFI and NERC contributions get too strong constraints on

orientation; the reason remains unclear. The X/Y-pole solutions show systematic effects when compared with the IGS solutions. The combined solutions do show an improvement w.r.t. the individual solutions.

9.4. External evaluation of combination solutions

IGN
On behalf of Altamimi, Noomen presented the IGN evaluation of the combination solutions generated by ASI, DGFI and NCL (cf. Appendix K). In general, Altamimi recommended that at least 3 solutions should always be available for combination. Also, he stressed repeatedly to make sure that the most important contributions of SLR analysis results (*i.e*. origin and scale) be preserved, both in the individual solutions and in the combination solutions. In case of a mapping or the application of a minimum constraint, it should be done such (3 rotations) that origin and scale are left intact. These issues are unclear for any of the combination products. Any transformation into ITRF2000 should involve reliable stations only (from a standpoint of both SLR and ITRF2000) (cf. remarks Section 9.3).
In his evaluations, Altamimi used a most recent IGN-internal combination solution (10 years of SLR, 6 years of GPS, 14 years of VLBI and 10 years of DORIS) as a most accurate reference. The evaluation was restricted to the ILRS solutions labeled 040320 only. He found that the mismatch between this solution and the ASI solution is about 1 cm WRMS, a geocenter offset (Z) of less than 1 cm and a scale bias of +3 ppb. The same conclusions were drawn for the DGFI combination solution. As for NCL, the WRMS difference after mapping also amounted to 1 cm, but the geocenter offsets were about a factor 2 larger (about 1 cm for X and Y, and slightly more than 2 cm for Z). Here, too, the +3 ppb scale bias was observed, equivalent to about 18mm in height.

OdP
No contribution was received from Gambis.

9.5. Selection of ILRS combination center and backup
Since it was felt that there was not sufficient information available to make a final conclusion on this issue yet, this decision was postponed until the next AWG meeting (cf. agenda item 10).

9.6. Operational aspects
A first action item here is for all analysis contributors to (if necessary: 7810/7824 reference; data weights; version label in name) redo their analyses since January 1, 2004, and submit these to CDDIS and EDC on May 9 at latest (*action item analysts*). Based on these new solutions, the combination centers will redo their combined solutions and have this finished by May 19 (*action item combination centers*). Altamimi and Gambis will be asked to evaluate the (original and combination) results after that. The selection of the prime and backup combination center(s) will be made during the AWG meeting in conjunction with the International Workshop on Laser Ranging in San Fernando. The question of criteria for the benchmark project ("admittance to the official ILRS product") will be postponed for obvious reasons.

Following a recommendation from Gurtner, that AWG check on the quality of the combined solutions, rather than leaving this all to the outside examiners, it was agreed that we should produce a list of metrics to be produced by the CCs that would demonstrate the quality of their products. Further, to streamline and organize the evaluations, a list with issues was drafted that would have to be completed by all persons/groups involved: the individual analysis institutes, the combination centers, and Altamimi and Gambis. This list is presented in Table 4.

10. Next meeting
The next AWG workshop will be held on Saturday June 5, 2004, in San Fernando, Spain. The meeting will start on 14.00 hrs. The only agenda item will be the "pos+eop" project.

This venue precedes the International Workshop on Laser Ranging, which will take place in the same location in the week from June 6-10.

11. Action items
In view of the time, no overview of the standing and new action items was given.

12. Closure
Noomen thanked the participants for their contributions and their input in the discussions.

May 24, 2004
R. Noomen, G. Appleby, P.J. Shelus

Table 1: Agenda

ILRS Analysis Working Group workshop #10
Nice, France, April 22-23, 2004

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   4.2. ILRS status
5. SINEX issues
6. miscellaneous
   6.1. atmospheric refraction
   6.2. analysis center classification
   6.3. IERS Conventions: loading and geocenter
   6.4. other products, analysis activities
   6.5. CDDIS file structure
7. pilot project "harmonization"
   7.1. status report
   7.2. future
8. pilot project "benchmarking and orbits"
   8.1. status report
   8.2. future
9. pilot project "positioning + earth orientation"
   9.1. IERS CfP
   9.2. individual contributions
      . ASI
      . DGFI
      . GFZ
      . JCET
      . NERC
   9.3. comparisons and combinations
      . ASI
      . DGFI
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   9.4. external evaluation of combination results
      . IGN
      . OdP

9.5. selection of ILRS combination center and backup
9.6. operational time line?
10. next meeting
11. action items
12. closure

Table 2: Attendance

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Table 3: ILRS AWG action items

Appleby/Otsubo	complete and provide satellite center-of-mass correction table (station dependent); in coordination with ILRS SPWG chair?
Bianco	check conversion of 1-wavelength data plus streak camera data into dual wavelength data
Eanes	implement ITRF2000 in QC analysis
Glotov	implement ITRF2000 in QC analysis
Gurtner	check stations in "slreport"
Husson	finalize (other than 1999), keep up-to-date and announce table with LAGEOS data problems (SINEX format). -→ action item to be taken over as combined action by analysts (detecting), stations (actual physical assessment) and CB (inclusion in table)
Husson/Torrence (??)	develop references for benchmarking (100% "D")
Husson (??)	evaluate individual benchmark solutions
Husson (??)	develop autom. system for assessing "Core" stations for AWG purposes
Mareyen	check why TIGO dual-wavelength data output is low
Noll/Seemueller	modify SLR and LLR data file structure and contents
Noll/Noomen	inform analysts of changes in data file naming convention and contents
Noomen	install new TDF
Noomen/Appleby/Shelus	minutes of meeting
Noomen/Appleby/Shelus	update CfP "pos+eop"
Noomen	inform data centers and analysts of new naming "pos+eop" solutions
Noomen/Altamimi	generate list of most reliable ITRF2000 stations to be used for mapping
Pavlis	determine status of (semi)diurnal geocenter and loading models

Pavlis	update benchmarking: selection of 2nd 30-day period for evaluation, plus update of description
Pavlis	study weekend-effect in LAGEOS data for individual years (2000-2004)
Pearlman	contact IGS for retro's on GPS-III
Pearlman	modify ILRS mission request form to emphasize credits
Pearlman	arrange automatic message for credits when doing an ftp to CDDIS and/or EDC
Seemueller/Noomen	modify EDC data file structure and contents, to be exact copy of CDDIS
Shelus	(new) distinguishment between ILRS ACs and AACs
Torrence	station report card 1st quarter 2004
all	send electronic version of presentations to Noomen
analysts	update weekly solutions for test phase "pos+eop" (associate stations, 7810/7824 ref., naming conventions) (May 9)
analysts	if possible, participate in evaluation of new Mt. Stromlo data
CB	ask stations for check/update site log and configuration file
combination centers	check treatment of individual station outliers
combination centers	redo combinations (May 19)
QC analysts	get in direct contact with stations in case of detected problems and make sure they correct
QC analysts	verify that reports are sent to "slreport"
QC analysts	report updates in used coordinates
CB	ask stations for check/update site log and configuration file

Table 4: Items required for evaluation individual and combination solutions

Whereever applicable, these issues need to be completed by the persons/groups involved. When a comparison w.r.t. ITRF2000 is requested, this should be based on reliable (cf. action item Noomen/Altamimi) stations only.

- List of stations and # NPs LAGEOS-1 + LAGEOS-2
- # input solutions
- # stations per solution
- rms-of-fit of SLR observations
- # SLR observations

for individual solutions:

- 3D WRMS coordinates difference of input solutions w.r.t. ITRF2000, based on full covariance matrix and after application of a minimum ("inner") constraint w.r.t. ITRF2000 (effectively, 3 rotations)
- idem, w.r.t. the combination solution
- Helmert parameters for translation and scale w.r.t. ITRF2000
- Idem, w.r.t. combination solution
- Continuity in EOPs between last EOP solution in solution N and 1st EOP solution in solution N+1 (based on a 14-parameter fit and estimation of a jump)
- WRMS of EOPs w.r.t. the USNO "final daily" solutions (cf. USNO web pages)

Idem, for combination solutions

Table 5: Appendices

A	ILRS status (Pearlman)
B	SLR and DORIS network reduction effects (Schrama and Doornbos)

C Benchmarking/orbits project (Pavlis)
D “pos+eop” solution ASI (Luceri)
E “pos+eop” solution DGFI (Müller)
F “pos+eop” solution GFZ (Koenig)
G “pos+eop” solution JCET (Pavlis)
H “pos+eop” comparison/combination ASI (Sciarretta)
I “pos+eop” comparison/combination DGFI (Kelm)
J “pos+eop” comparison/combination NCL (Nurutdinov)
K “pos+eop” evaluation IGN (Altamimi)