

**Minutes ILRS/AWG Workshop #11  
June 5, 2004, San Fernando, Spain**

**1. Opening**

Welcome by Noomen. Approval of agenda (Table 1). The names and e-mail addresses of the participants are listed in Table 2.

**2. Pilot project “positioning and earth orientation”**

Noomen gave a short introduction of this ILRS AWG pilot projects, in particular on the customers (IERS Bulletin A, IERS Combination Pilot Project) and the most recent refinements (after the AWG meeting in Nice, April 2004).

**2.1. Individual contributions**

In the discussion that took place during the AWG meeting in Nice, a number of criteria were selected to document and evaluate the quality of the solutions for station coordinates and EOPs. The ones for documentation (like number of stations, number of passes, etcetera; cf. Table 4 of minutes AWG meeting Nice 2004) are not addressed here any further. The ones that have been identified for quality evaluation purposes in particular are reflected in tabular form in Table 3.

The various contributors to the ILRS products were given the opportunity to comment on their most recent activities. The providers of individual solutions present here (ASI, DGFI, JCET and NSGF) as well as the combination centers present (ASI and DGFI) gave a few remarks, where appropriate. The time for this agenda item was mainly filled with the completion of Table 3. This gives an overview of the various numerical estimates of various quality aspects, both of the individual solutions and of combination solutions. After each entry, the name of the source of the specific number is given; in principle, a particular aspect may have been addressed by more than one group. The table has been completed as much as possible.

**2.2. Comparisons and combinations**

See remarks under 2.1 “individual contributions”.

**2.3. External evaluation of combination solutions**

**IGN**

On behalf of Altamimi, Noomen presented the IGN evaluation of the combination solutions generated by ASI. Because of time constraints, Altamimi was unable to address any of the other (individual and/or combination) solutions, and the evaluation of the ASI solutions, too, was restricted to a few aspects only. Altamimi compared the ASI combination solution with an intermediate combination solution, which is based on 10 years of SLR, 6 years of GPS, 14 years of VLBI and 10 years of DORIS data. This may introduce an offset w.r.t. the other comparisons which used ITRF2000 as a reference, and therefore, the results are not included in Table 3, but will be reported in this part of the minutes only. The following ranges were observed for the origin differences of ASI’s combination solution versus this internal IGN solution: -15 - 35 mm (X), -35 – 20 mm (Y) and 0 – 40 mm (Z). Neither clear signals nor significant outliers were detected. As for scale, the values typically range between -15 and 0 mm (corresponding to about -2 – 0 ppb), with an individual outlier of -40 mm (or 6 ppb). The differences w.r.t. this new IGN combination solution show values of, on average, 10 - 20 mm for 2D WRMS, and a similar range (and pattern) for the up component (making the total 3D difference 15 - 30 mm WRMS).

## **OdP**

Based on input provided by Altamimi, Gambis showed a plot of the EOP residuals for x-pole and y-pole of the ASI combination solution w.r.t. IERS C04 (Gambis was not present; Noomen presented on his behalf). The rms value of these differences amounts to about 0.3 mm for the x-component and about 0.4 mm for the y-component (ignoring a small group of individual outliers at the level of up to 20 marcsec).

### **2.4. Selection of ILRS combination center and backup**

In this part of the meeting, two main questions needed to be answered: (i) is the quality of the combination solutions better than that of the individual solutions, and (ii) which institute will act as the official primary ILRS combination center, and what will be the role for the others?

The first question can be answered positively by inspecting Table 3: there is a small improvement in the residual rms w.r.t. ITRF2000, but this can possibly be explained by imperfections in this reference model at the level of a few mm. More striking, however, is that the Helmert parameters (in particular those for our unique products, *i.e.* origin and scale) when mapping into ITRF2000 show a much better consistency (cf. Table 3). Also, EOP statistics for the combination solution (ASI's solution could be evaluated only) turn out to be significantly better than those for the individual solutions. In conclusion, there was a positive conclusion on this part of the evaluation.

The second question proved a bit harder to answer, if only because the information that was present to evaluate and compare the 3 combination solutions was sparse. There was a debate on whether to postpone this important decision or not, but in view of the requirements of our external clients (IERS, with various products) and the likely date for a next AWG meeting, it was generally accepted that a decision was to be made here.

At this point, it was generally agreed by the members present that ASI has done an outstanding performance throughout the pilot phase (history), and has taken a large variety of roles within the ILRS analysis community, always with a positive attitude. After some debate, it was decided to give the role of official primary ILRS combination center to ASI, and the role of official backup ILRS combination center to DGFI. Representatives of the two institutes present agreed with this outcome. It was emphasized by the chairman that it requires strict adherence to the timelines as followed now during the testing phase of the operational procedures, irrespective of the actual role. Holidays and other occasions cannot be taken as an excuse to not have a particular analysis done, by neither of the centers. Since NCL was not present, no information was available on the actual performance of this combination product, and the combination product information to the analysis community has been difficult sometimes, it was decided to give NCL the status of ILRS combination center in development; NCL is strongly encouraged to further develop their procedures and results.

There are a number of action items that come out of this decision: Noomen will iron out the exact details of the combination products (computer location, naming etc.) and will convey the outcome to IERS. The decision will be formalized by sending an official letter on the outcome to ASI and DGFI representatives (*action item Noomen, Pearlman*). The current selection will be effective until the next International Workshop on Laser Ranging, to take place in Canberra in October 2006. Then, the performance of the current two (plus additional candidates, like NCL) combination centers will be evaluated again. It was decided to retain this performance evaluation, of ASI and DGFI as a minimum, as a standard agenda item in upcoming AWG meetings.

Although the decision has been made, Altamimi and Gambis will be asked to complete their evaluation of the results as they are now (*action item Noomen*). Irrespective of the outcome, this will not change the decision made here, but it will be used as additional monitoring input. Preferably this should be ready by

July 15. Kelm and Altamimi need to get in contact on technical problems of the DGFI solutions (*action item Kelm*).

## **2.5. Other issues**

No issues here.

## **3. Next meeting**

The next AWG workshop has not been scheduled yet. Very likely, there will be one in conjunction with the EGU meeting in Spring 2005 (Vienna, Austria). If deemed necessary, an additional AWG meeting may be organized in the mean time, but if possible preference will be given to email correspondence.

## **4. Action items**

In view of the time, no overview of the standing and new action items was given. All standing action items remain, and new ones are added (cf. Table 4).

## **5. Closure**

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

June 25, 2004

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## **Table 1: Agenda.**

ILRS Analysis Working Group workshop #11  
San Fernando, Spain, June 5, 2004

1. opening
2. pilot project "positioning + earth orientation"
  - 2.1. individual contributions
    - . ASI
    - . DGFI
    - . GFZ
    - . JCET
    - . NSGF
  - 2.2. comparisons and combinations
    - . ASI
    - . DGFI
    - . NCL
  - 2.3. external evaluation of combination results
    - . IGN
    - . OdP
  - 2.4. selection of ILRS combination center and backup
  - 2.5. other issues
3. next meeting
4. action items
5. closure

**Table 2: Attendance.**

Graham Appleby	<a href="mailto:graham.appleby@nerc.ac.uk">graham.appleby@nerc.ac.uk</a>
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**Table 3: Overview of aspects for evaluation of individual and combination solutions and their values; institute names after numbers represent source of data.**

aspect	parameter [unit]	ASI (ind)	DGFI (ind)	GFZ (ind)	JCET (ind)	NSGF (ind)	ASI (cmb)	DGFI (cmb)	NCL (cmb)
3D WRMS wrt ITRF2000	[mm]	11 asi 10 dgfi	10 dgfi	10 dgfi	10 jcet 12 dgfi	12 nsgf 18 dgfi	10 asi	9 dgfi	
3D WRMS wrt comb	[mm]	9 asi	10 asi	9 asi	9 asi	19 asi	-----	-----	-----
Helmert wrt ITRF2000	mean X [mm]	-2 asi 5 dgfi	-2 asi 5 dgfi	0 asi 4 dgfi	2 asi 4 dgfi	-3 asi 2 dgfi	-1 asi	4 dgfi	
	mean Y [mm]	-4 asi	-6 asi	-3 asi	-3 asi	-13 asi	-4 asi		
	mean Z [mm]	-8 asi	-10 asi	-8 asi	-11 asi	-15 asi	-9 asi		
	scale [ppb]	-0.6 asi	0.8 asi	-0.3 asi	0.13 asi	-0.25 asi	-0.09 asi		
Helmert wrt comb	mean X [mm]	-1 asi	0 asi	1 asi	1 asi	-3 asi	-----	-----	-----
	mean Y [mm]	1 asi	-3 asi	2 asi	0 asi	-5 asi	-----	-----	-----
	mean Z [mm]	1 asi	-4 asi	0 asi	0 asi	-3 asi	-----	-----	-----
	scale [ppb]	-0.2 asi	0.68 asi	-0.3 asi	0.06 asi	0.5 asi	-----	-----	-----
internal continuity	mean Xpole [_asec]						-8 asi		

EOPs	mean Ypole [ _asec]						13 asi		
	mean LOD [ _s]						0.55 asi		
	sigma Xpole [ _asec]						261 asi		
	sigma Ypole [ _asec]						265 asi		
	sigma LOD [ _s]						72 asi		
diff wrt IERS Bulletin A	mean Xpole [ _asec]	54 asi	-2 asi	77 asi	-62 asi	-31 asi	40 asi		
	mean Ypole [ _asec]	216 asi	255 asi	230 asi	304 asi	39 asi	256 asi		
	mean LOD [ _s]	-32 asi	-111 asi	4 asi	-44 asi	222 asi	-21 asi		
	sigma Xpole [ _asec]	204 asi 200 dgfi	258 asi 230 dgfi	334 asi 200 dgfi	232 asi 180 dgfi	385 asi 400 dgfi	180 asi		
	sigma Ypole [ _asec]	206 asi 150 dgfi	235 asi 180 dgfi	342 asi 200 dgfi	277 asi 250 dgfi	333 asi 250 dgfi	180 asi		
	sigma LOD [ _s]	89 asi	71 asi	117 asi	71 asi	135 asi	50 asi		

**Table 4: 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
Kelm/Altamimi	resolve technical problems with DGFI SINEX files
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
Noomen/Pearlman	write official letter to ASI and DGFI on selection of primary and backup combination center
Noomen	inform Nurutdinov on selection of primary/backup combination center
Noomen	iron out technical details of primary/backup combination; inform IERS
Noomen	ask Altamimi and Gambis to complete their evaluation of "pos+eop" products (July 15 deadline for their action)
Pavlis	determine status of (semi)diurnal geocenter and loading models
Pavlis	update benchmarking: selection of 2 <sup>nd</sup> 30-day period for evaluation, plus update of description
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 1 <sup>st</sup> 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