ThalesAlenia Space	NGGM Assessment Study	REF.: **SD-MI-AI-1069**	
		DATE : 19/11/2009	PAGE : 1/5
MINUTES OF MEETING		*PLACE :* TAS-I Torino	

PURPOSE : NGGM CLASSIFICATION : DC

NGGM Assessment Study - Requirements Review Meeting

ATTENDEES	FIRM	SIGNATURE	ATTENDEES	FIRM	SIGNATURE
Miguel AGUIRRE	ESTEC		Matthias RENARD	Deimos Space	
Luca MASSOTTI	ESTEC		Stefania CORNARA	Deimos Space	
Roger HAAGMANS	ESTEC		A. Anselmi	TAS-I	
Pieter VISSER	Delft Uni.		S. Cesare	TAS-I	
Tilo REUBELT	Stuttgard Uni.		G. Sechi	TAS-I	
Thomas GRUBER	Munich Uni.		S. Mottini	TAS-I	
Michael MURBÖCK	Munich Uni.		M. Parish	TAS-I	
Tonie Van DAM	Luxembourg Uni.		F. Cossu	TAS-I	
Bruno CHRISTOPHE	Onera				
WRITTEN BY : A. Anselmi					

CONCLUSION :

The requirements review was held successfully and a near-term work plan was agreed.

DISTRIBUTION : *ATTENDEES*	*FOR FURTHER ACTION :* M. Brescello, A. Cattaneo
	FOR INFORMATION :

APPROVED BY				
NAME	A. Anselmi			
SIGNATURE				

ACTIONS

Agenda

9:00 Welcome and Introduction

9:15 WP1100: Requirements Analysis (ULUX)

13:00 Lunch break

14:00 WP1200: System drivers (TAS-I)

15:30 WP2310: E2E Simulator progress report (TAS-I)

15:45 WP2320: Variable Gravity Model progress report (IAPG)

16:00 Discussion, work plan

17:00 End of meeting

WP1100: Requirements Analysis (ULUX)

Parameters to be defined are measurement accuracy (resolution), spatial resolution, spatial coverage, time resolution, time coverage.

The review is based on Grace which has established time-dependent gravity: however, results still depend to a large extent on modeling and methods of data analysis.

The question is raised (MA) of which future observing systems (not gravity) can establish better models of the ocean tides that will help gravity (and be helped by gravity). A 3rd-generation “Jason” will be addressed in 2 years. Interferometric altimetry and GNSS reflectometry are mentioned.

Uni. Lux formulates recommendations based on the documents review.

Uni. Lux to distribute address of Ftp site to be used to exchange documents, presentations etc — #1 ULux

Email alias for the group: NGGM (unless somebody comes up with some nice mythological reference)

WP1200: System drivers (TASI)

Measured quantity: the original quantity is biased range in Grace; laser gives nm-level resolution in terms of variations from an initial value, not absolute distance (at least, not to nm-level accuracy).

Comment by MA: Lisa-like free floating proof mass is implicitly excluded by the statement of the problem presented by TAS-I. Motivations: lower cost, TRL high for this type of mission.

The impact of the beam steering mechanism (BSM) on the accelerometer is to be studied. The BSM itself is a trade-off item.

DFC trade-off: 4 to 6 d.o.f. attitude/drag control is likely to be needed with smooth actuators (ion thrusters).

Accelero BW: extending bandwidth lower limit to e.g. 10e-4 Hz is limited by thermal stability of the bias. Similar limitations in the very low frequency region apply for laser stability.

Can a radial gradiometer eliminate striping? Question for the study to address.

TAS-I /ESA (A. Gabriele) to agree on the definition of “LISA” and “LISA-like” missions.	#2 TASI
Comment by PV: The so-called “Colombo-Nyquist” rule (maximum resolvable geopotential spherical harmonic degree = half the number of orbital revolutions in 1 repeat cycle) has been revisited: see Attachment 5.	
TAS-I to establish a range of altitudes defined by upper and lower limits that produce “almost the same” overall performance.	#3 TASI
Quick-look tool and formations (Uni. Stuttgart, GIS)	
Capabilities and limitations of quick-look tool for trade-offs are illustrated.	
The secular effects on Cartwheel and LISA formations (related for instance to the change of argument of perigee) increase the accuracy of retrieving the static gravity field but are detrimental for the time varying gravity field. The study shall verify the performance impacts of compensating such effects by orbit control.	
More generally, the performance prediction should take into account events such as (a) data outage, (b) drag-free compensation not available due to thruster saturation, (c) data taken at different altitudes (selected to maintain the thrusters inside their dynamic range as function of epoch in the solar cycle).	
Mass Variation Models (Uni. Munich, IAPG)	
Sources of unrealistic trends in global « real-world » models have been identified. These trends (or a large part thereof) will be removed from the models.	
Near term work plan	
Uni. Lux to provide technical note output of WP 1100.	#4 Ulux
TAS-I to provide technical note output of WP 1200.	#5 TAS-I
The first task in Phase 2 of the study will be to assess the ultimate limits of a 1-sat-pair architecture, progressing from the simplest configuration up (in-line SSO, in-line non-SSO, cartwheel, pendulum, …). The purpose is to assess the ability of this (the simplest) architecture to (partially) remove GRACE drawbacks by (a) increased SST resolution, (b) better orbit control, (c) better attitude control, (d) different orbit, (e) gravity sampling in different directions, etc. Later on, multiple-pair architectures will be addressed.	
The recommended range of the mission-defining parameters is in Table 1. Next week, TAS-I will circulate a detailed, proposed work plan to the study team.	
The next progress meeting will be held in Torino on Jan. 27th-28th, beginning in the afternoon of Jan 27th, and ending in the early afternoon of Jan 28th.	

Attachments

1. ULux Presentation charts
2. TAS-I presentation charts
3. GIS Presentation charts
4. IAPG presentation charts
5. IAG09_PV "Dependency of resolvable gravitational spatial resolution on space-borne observation techniques"

Table 1 – Variation of mission architecture parameters

1. Circular orbit altitude: 300, 350, 400 km
2. Inclination: 97 deg (SSO), 89 deg TBC, 60 deg TBC [a]
3. Repeat cycle: ESA/science team to advise
4. Mission duration: 6 years [b]
5. Inter-satellite distance: 1, 10, 100 km
6. Gradiometer configuration: 1-axis in-track and/or 1 axis radial
7. SST relative measurement accuracy $\delta L/L$ = 5e-13 m/m/$Hz^{-½}$, 5e-12 m/m/$Hz^{-½}$
8. Non-grav. acceleration measurement accuracy: 0.1, 1x10^{-10} m/s^2/$Hz^{-½}$ (see TAS-I presentation, page 66)
9. Architecture options: 1 pair in-line, cartwheel, pendulum, LISA [c]

Notes:

[a] ESA/science team to advise on range of variation around 90 deg and around 60 deg
[b] the simulation will encompass 1 month (TBC by science team)
[c] the first objective is to address the in-line pair architecture by PM1 (end Jan. 010)

ACTIONS					DATE
Origin	N°	Status	Description	Actionee	Due
SD-MI-AI-1069	**1**	Open	TvD to distribute address of Ftp site to be used to exchange documents, presentations etc	U. Lux	23-11-09
SD-MI-AI-1069	**2**	Open	TAS-I /ESA (A. Gabriele) to agree on the definition of “LISA” and “LISA-like” missions	TAS-I	4-12-09
SD-MI-AI-1069	**3**	Open	TAS-I to establish a candidate range of altitudes defined by upper and lower limits that produce “almost the same” overall performance.	TAS-I	4-12-09
SD-MI-AI-1069	**4**	Open	Uni. Lux to provide technical note, output of WP 1100.	U. Lux	4-12-09
SD-MI-AI-1069	**5**	Open	TAS-I to provide technical note output, of WP 1200.	TAS-I	4-12-09