Minutes from Magnetics Workshop **17 June 02**

Date of Workshop: 6/13/02@ JHU/APL

The follow are the minutes for the Magnetics Workshop held at JHU/APL on 6/13/02. Representatives from APL subsystems, all instruments and GSFC Project were present. The format of the workshop was to review the magnetics watch list, go through actions given at the previous workshop and then address any addition magnetic issues within each subsystem, instrument, GSE and I&T. Additions to the Mag Watch List are in **BOLD CAPS.** Action items are indicated in ***bold italics***. All actions, unless otherwise noted, are due at the next workshop, which will occur in the Sept/Oct 02 time frame. Included after the minutes is the updated Mag Watch List.

Minutes:

- Review of Mag Watch List -
    - TWTA –
        - TWTA model obtained by Mario from the vendor
        - TWTA will have to be compensated with additional magnets (keeping within the vendor specified limits)
        - Mario will handle procurement of new magnets or borrowing magnets from MESSENGER
        - Important that magnets are stable in time and temperature
        - ***ACTION: APL (Ken N.) - Provide Mario with Drawings of S/C Configuration to determine distances between TWTA and mag sensor and possible mounting locations of compensation magnets – DUE July 1***
    - Isolator –
        - Mario has worked with Vendor to improve internal magnetic design of component
        - Vendor agreed to supply another sample that indicates improvements to design.
        - ***ACTION: APL (Paul M.) – Work with vendor to get improved design to GSFC for re-test. - DUE June 21***
        - ***ACTION: GSFC – Perform test on improved design isolator – DUE July 5***
    - Items in which we are using MESSENGER help
        - Remember that Messenger boom size and component layout are different than STEREO
    - Latch Valve
        - Consider shielding – possibly too much for met-glass, possibly use metal shielding?
        - ***ACTION: APL (Ken N)- Provide Mario with Drawings of S/C Configuration to determine distances between Latch Valves and mag sensor and orientation of latch valves relative to one another. – DUE July 1***

        - ***ACTION: APL (Carl E.) – Proceed with ordering sample latch valve and giving to GSFC to test – DUE July 12***
        - ***ACTION: GSFC – Test latch valve in open and closed position. Provide test data to Vacco. – DUE July26 (or 2 weeks following arrival of part)***
    - Thruster Nozzles
        - ****ADD** – THRUSTER NOZZLES TO MAG WATCH LIST: WITH POTENTIAL MAG PROBLEM = NO**
        - Initial mag problem classification based on material properties (Inconel) and size of nozzles
        - Plan to degauss before integration with the spacecraft
    - IMPACT
        - SWEA heaters: frequency of switching increased. Mag field calculated. Mario to get data on field to assess
        - ***ACTION: IMPACT – Provide Data on heater mag fields to Mario- Due July 19***
    - SECCHI
        - SCIP Tubes
            - Tubes are Aluminum or Aluminum coated composite – no mag issues
        - **SCIP CCD and Mirror**
            - ****ADD** - SCIP CCD MOUNT AND EUVI MIRROR TO MAG WATCH LIST: WITH POTENTIAL MAG PROBLEM = NO**
            - Initial mag problem classification based on material properties (Invar) and size of devices (< 5 cm)
            - Plan to degauss before integration within the instrument
        - SCIP Covers motor
            - ****ADD** - SCIP COVER MOTORS TO MAG WATCH LIST: WITH POTENTIAL MAG PROBLEM = NO?**
            - ***ACTION: SECCHI – Provide Motor to Mario for Test - Due July 19***
        - Hollow core motors
            - ***ACTION: SECCHI – Retransmit Data on hollow core motors to Mario- Due July 1***
        - PWM Heaters
            - ***ACTION: SECCHI – ensure that heaters are ordered as "non-inductive"- DUE Sept 2***
    - INSTRUMENTS
        - ***ACTION: SECCHI – Provide APL with instrument parts list – DUE June 21***

        - ***ACTION: APL/GSFC (George C and Mario): Review all instruments parts list for magnetic components – DUE Sept 2***
        - ***ACTION: APL (George C)– re-send Mario's "How to Build a Magnetically Clean Spacecraft" Document and list of potential gotchas including***
            - ***No magnetically attached tools***
            - ***All heaters should be ordered as non-inductive – DUE Sept 2***
- Additional Magnetics Concerns
    - Lifting eyes and Shackles for the Spacecraft duing I&T
        - ****ADD** - LIFTING EYES AND SHACKLES TO MAG WATCH LIST: WITH POTENTIAL MAG PROBLEM = NO**

Magnetics Hot List

SubSys	Item	Mag Problem	Actions	Status	Notes / Possible Plans of Attack
COMM	TWTA	Hot			TWTA can withstand 182dB pT at the tube (12.6 Gauss). Mario has data on tube and model of field from Vendor **PLAN: Compensate with External Magnet**
			Judi - find out maximum external field that would not effect TWTA Performance	Complete	
			Mario - model TWTA in simple spacecraft model	Complete	
			Ken - Provide Mario with S/C configuration drawings to view TWTA mounting and also view potential locations for compensating magnet		
	Isolator	Hot			Magnetically-representative isolator tested at 200nT at 1 m. Isolator becomes mag problem. **PLAN1: Talk to Vendor about changing design** **PLAN2: compensate isolator**
			APL - contact vendor to see if would allow APL to borrow a unit to "sniff"	Complete	
			Mario - Test Unit	Complete	
			APL - get vendor improved design to GSFC for Test		
			Mario - Test Improved Unit		
	RF Switches	Possible			RF Switch sent to GSFC for testing on 6/6/2002. Tested at 100nT at 1 m. **PLAN1: Compensate** **PLAN2: Try to Cancel with other switch when in HGA position (TBR)** **PLAN3: Shield**
			APL - order sample part to test	Complete	
			Mario - perform test of switch	Complete	
	Coax	No			coax runs from diplexer to transponder and from transponder to TWTA. Not an issue as long as copper-weld center conductors are not used.
	Waveguide	No			Not an issue as long as nickel-plating is not used.
PWR	Battery	No?			Wire battery similar to MESSENGER; latching relay selection and location being monitored by Brian Anderson
	Solar Arrays	Possible			Array can be forward biased
			Mike - Provide Mario with Solar Array layout drawings	by CDR	
			Mike - Check with vendor if array diodes can be forward biased	Complete	
	Solar Array Junction Box	No?			Design similar to MESSENGER; Brian Anderson to monitor design
	PDU	No?			Design similar to MESSENGER; Brian Anderson to monitor design
GNC	Reaction Wheels	Possible			Reaction Wheel RFP out. **PLAN1: Wait for Wheel Selection and attempt to work with Vendor to reduce mag by deguassing components** **PLAN2: Met-Glass Shielding (2kg allocated)**
	IMU	No			Use MESSENGER Measurements
MECH	Clamp Band	Open			Clamp Band trade is still open, APL understands titianium is Mag prefered
	HGA Actuator	No?			Estimated at 20nT @ 1 m, using worst case test data of larger actuator from Moog (Type 5 vs. Type 3)
	Fasteners	No			Magnetic stainless fasteners should be avoided, but there use is not prohibited due there small size.
PROP	Latch Valves	Possible			Messenger data shows Mag moments of 19.7 nT m3 along tubing and 81.2 nT m3 perpindicular to mount, both in open configuration. **PLAN1: Try to Cancel Out 1 LV w/ another and mount 3rd to reduce field at Mag sensor** **PLAN2: Shield**
			Carl- Get Valve Mag data from MESSENGER	Complete	
			Carl/Ken - Provide Mario with S/C configuration drawings to view latch valve mounting		
			Carl - Order Latch valve for Testing		
			Mario - Test Unit in open and closed configurations		
	Thruster Nozzles	No			**PLAN: Deguass nozzles prior to s/c integration**
THERM	Heaters	No			Project to not use Nichrome heaters
	Thermostats	No			No Change
I&T	Tools	No			Project to not use Magnetically attached tools; All tools degaussed on a regular schedule
	Load Cells	Possible			Keep load cells away from spacecraft.
	Vibe Table	No			Vibe Table to be compensated
	Lifting Eyes, Shackles	No			

Magnetics Hot List

SubSys	Item	Mag Problem	Actions	Status	Notes / Possible Plans of Attack
SCI	PLASTIC	No			
	IMPACT	No?			SEP magnetic problem has been discussed and found to be acceptable with some test data. Testing will occur in the near future.
			SWEA heaters to be examined - Mario to work with Dave Curtis. **Mag field simulated - get data to Mario**	?	
	SECCHI	Possible			SCIP telescope tubes are coated with Aluminum. SECCHI to order non-inductive heaters
			SCIP telescopes - coating of instrument tubes needs to be non-magnetic	Complete - No Issue	
			L. Spinger - get Mario data on hollow core motors and motors in door mechanisms. **RESEND DATA**	?	
	SECCHI - PWM Heaters	No			**PLAN: Order all heaters "non-inductive"**
			PWM heaters - SECCHI to provide details of design	Complete	
	SECCHI - SCIP CCD/Mirror	No			**PLAN: Deguass Invar Parts prior to instrument assembly**
	SECCHI - Cover Motor	No?			
			Provide Mario with sample unit for Test		
	SWAVES	No			