



Automated Transfer Vehicle - 3 (ATV-3) Mission Summary Status



04/17/12

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Agenda



- Mission Overview
- Network Support
- Documentation
- Network Testing
- Network Mission Overview
- Network Issues
- Lessons Learned
- Undocking/Re-entry Plan
- ATV-4 Mission Preparations
- Open Work
- Open Discussion
- ATV-3 IN Team
- Backup slides
 - WSC Eb/N0
 - Integrated Network (IN) Overview





Mission Overview



- **Launch:** 03/23/12 DOY
083/0434:05 GMT
- **ATV-3 separation:** 03/23/12 DOY
083/0538 GMT
- **Launch Vehicle:** Ariane-5
- **Launch Site:** Kourou, French Guiana
- **Inclination:** 51.6°
- **Operations Site:** Toulouse, France
- **Docking Date/Time:** 03/28/12 DOY
088/22:31:17 GMT
- **Undocking:** 09/03/12 DOY
247/TBD GMT
- **Re-entry:** 09/04/12 DOY
248/TBD GMT





Network Support



ATV-3 Docked to International Space Station (ISS)

Network Support	
Element	Services
Network Integration Center (NIC)	Mission Coordination/Console Support
White Sands Complex (WSC)	S-band Telemetry and Command
Communication Services Office (CSO)/NASA Integrated Services Network (NISN)	Voice/Data
Flight Dynamics Facility (FDF)	ACQ Data, Pointing/Tracking Data
Eastern Range (ER)	Contingency Radars – Was Not Required





Documentation



Document Title	Published Date	Comments
Radio Frequency Interface Control Document (RFICD) for ATV, 450-RFICD-ATV/TDRSS	06/2004 DCN 2 – 09/2011	
ISS Program Requirements Document (PRD) Vol. 1	02/2004, updated 03/2012	
450-TNOSP- ISS, ATV Annex	05/2012	Working copy Annex will be out for review early 05/2012
ISI 001 Pre-mission Status	02/10/12 @ 2200z	
ISI 001 Mission Status	02/29/12 @ 1518z	
ISI 002 Launch Count	02/28/12 @ 1918z	ISI 009 superseded 002 03/28/12 @ 1644z
ISI 003 Mission Meet-me Number	02/29/12 @ 1202z	
ISI 004 Requirements for ATV-3 SN Daily Support Totals	02/29/12 @ 1502z	WSC generate ATV-3 TDRSS Daily Totals Superseded by 008 03/02/12 @ 1736z
ISI 005 HW/SW Freeze	02/29/12 @ 1522z	
ISI 006 Critical/Super Critical Mission Period	02/29/12 @ 1702z *	Superseded by 010-020 (on-going)
ISI 007 C/Band Radar Contingency Call Up Procedure	03/01/12 @ 1620z	Documents C-Band Contingency support for ATV-3
ISI XXX Mission Termination	TBD	JSC to release the Network from ATV-3 mission support after re-entry

**WSC Scheduling has requested that this ISI is generated in the forecast period (L-21 days) to prevent conflicts with other users. Super Critical ISIs must have Network Director (ND) approval*





Network Testing



Test	Date	Comments
System Validation Test-1 (SVT) Antenna Calibration Bremen, Germany	06/11/11	Successful
SVT-1 Bremen, Germany	06/12/11	Successful
Backup Control Center (BCC)-Huntsville Operations Support Center (HOSC) Checkout (c/o)	11/15/11	Successful
SVT-2 Pointing test Kourou, French Guiana	12/12/11	Successful
SVT-2 Readiness Test Kourou, French Guiana	12/14/11	Successful
SVT-2 Test Kourou, French Guiana	12/15/11	Successful
BCC-HOSC Retest	12/21/11 01/13/12 01/17/12 01/19/12	To test Marshall Space Flight Center (MSFC) replaced Data Distribution Switch (DDS). Successful telemetry from WSC to MSFC. Command objective not met





Network Testing (cont'd)



Test	Date	Comments
ATV-3/HTV-3 BCC-HOSC Command test	01/24/12	Successful Corrected MSFC SCD 3, 4, 5 settings and cabling. WSC updated the Timeout parameter in the MDM ITU to 'Enabled/Yes'. Command and Telemetry will be on different MSFC SCD's
BCC-HOSC End-to-End (E-T-E)	01/27/12	Successful ATV-CC sent commands via MSFC to WSC. JSC received good command echo
Kourou Dress Rehearsal	03/15-16/12	Successful
L-4 Day Ground Check	03/19/12	Successful
Space Network (SN) Vector Verification	03/19/12	Successful
WSC Mission Readiness Test (MRT)	03/19/12	Successful
BCC-HOSC Confidence Test	TBD	After delivery of upgraded MSFC SCDs with 7.0 software, No Earlier Than (NET) 04/30 The test will be performed during docked phase





Network Mission Overview



- **NIC**

- Launch Staffing: L-9 hrs through T+12 hrs
- Coordinated Network Launch Count Activities
- Provided monitor support and assisted in troubleshooting as needed
- Docking Staffing: L-14 hrs through Docking +1 hr
- Issues: None

- **CSO/NISN**

- Staffed for Launch from L-9 hrs
- Provided voice and data circuits
- Issues: None





Network Mission Overview (cont'd)



- **Flight Dynamics Facility (FDF)**

- Received predicted ATV insertion and post-maneuver vectors from JSC Trajectory Operations Officer (TOPO). Provided SN acquisition data and line summary data based on the predicted vectors
- Unable to perform Orbit Determination (OD) post-insertion, as TDRS coherent data was not received, as scheduled
 - Updated SN using a post-insertion vector from ATV-CC via JSC TOPO
 - TDRS coherent tracking data was received by ~ L+12 hours. At that time FDF performed OD and provided JSC TOPO with an ATV OD solution vector
 - Definitive ephemeris data was not provided, as OD was performed outside the nominal post-insertion window
- Received predicted and actual ATV post-maneuver vectors from JSC TOPO after insertion. Provide updated SN acquisition data based on these vectors
- Provided an ATV-3 Early Orbit Tracking Data Report
- Since docking, providing the SN with ATV acquisition data updates on a M/W/F basis based on the FDF ISS OD solution
 - Providing the ATV-CC (via JSC) with TDRS vectors





Network Mission Overview (cont'd)



- **FDF (cont'd)**

- **Issue:**

- FDF received a predicted ATV vector labeled “Insertion” from JSC TOPO with an epoch of 083/05:33:58.316 GMT
 - At approximately L-1 hour, FDF examined the ATV launch count and discovered that ATV separation would occur after the “Insertion” vector epoch. In addition, a 16 second burn would occur just prior to ATV separation
 - The vector labeled “ATV TDRS Transponder On,” received from the TOPO, with an epoch of 083/05:37:54.809, was sent in a set of backup vectors. This was the vector that should have been used for insertion. FDF updated the SN based on the true insertion vector at that time

- **Resolution: FDF receive properly, or more clearly labeled vectors from the TOPO**





Network Mission Overview (cont'd)



- **SN Support**

- Provided support from pre-launch through rendezvous operations utilizing TDRS-171, TDW, TDS, and TDRS-275
- SN provided 3 tape playbacks and 1 command verification during prelaunch events in launch count
 - MAF TDRS 171 event was utilized for command
- TDRS-171 SSA-1 was scheduled at T+0:48:55 minutes at 083/0523:00-0544:40z
 - Non-coherent/8 kbps
 - AOS at 083/0534:20z as expected; $E_b/N_o = 19.60$ dB/Hz
- TDRS-171 SSA-2 was scheduled at 083/0545:00-0552:30z
 - Non-coherent/64kbps; $E_b/N_o = 15.30$ dB/Hz





Network Mission Overview (cont'd)



- **SN Support (cont'd)**

- **TDRS-171 SSA-1 at 083/07:22-07:30z had negative acquisition for the entire event**
 - **Coherent/64 kbps**
- **TDS scheduled at 083/07:30:20-08:02:34z Negative acquisition at AOS**
 - **Coherent/64 kbps**
 - **After ground equipment was reconfigured for Non-Coherent/ 8 kbps; lock was acquired at 07:45z**





Network Mission Overview (cont'd)



- SN Support (cont'd)
 - Discrepancy Reports (DRs)

Impact (Y/N)	DR#	TDRS event	Problem Description	Comments	Current Status	Projected Closure Date
Y	63900	083/0722-0730z TDRS-171 SSA-1 coherent 64kb	Failed to acquire lock during entire event	Multiple GCMR's transmitted, lock not achieved. No WSC equipment anomalies. DR re-assigned to JSC	Open	TBD
Y	63900	083/0730:20-0802:34z TDRS-171 SSA-1 coherent 64kb	Negative acquisition at event start	GCMR transmitted at 0734:43z for non-coherent mode unsuccessful in achieving lock/data. A GCMR transmitted at 0745z for 8kb (LDR) with lock/data achieved at 07454:30z. No WSC equipment anomalies. DR re-assigned to JSC	Open	TBD
Y	63901	083/1632:27-1703:31z TDRS-171 MAF/R coherent 8kb	Unexpected drop in signal	Loss of Lock at 1652:04z. No WSC equipment anomalies. DR re-assigned to JSC	Open	TBD
N	63765	NA	Receiving triplicate Forecast Schedule Request from JSC	JSC scheduling process was updated	Closed	





Network Mission Overview (cont'd)



- **SN Support (cont'd)**
 - **WSC Performance Data (Eb/N0) Requests**

JSC Flight Note Number	Time Period Requested	WSC provided report to JSC
N075356(A/B)	083/0523-0544:40z 083/0545-0552:30z 083/0722-0730z 083/0730:20-0802:34z	03/26/12
N075494A	083/1557:20-1609:59z 083/1612:26-1632:07z 083/1632:27-1703:31z 083/1703:51-1712z 083/1712:20-1732z 083/1732:40-1742:32z 083/1745:14-1816:18z	04/11/12
N075589	093/1810-1830z 093/1950-2010z 093/2130-2150z 093/2300-2320z 094/0045-0105z 094/0216-0236z 094/0355-0415z 094/0535-0555z 094/0718-0738z 094/0902-0922z	





Network Mission Overview (cont'd)



- **SN Support (cont'd)**

- **Media Hold Request**

- **Media hold number:** 282 (WSGT) / 283 (STGT)

- **Tape number:** 12083001 (WSGT) / 12083002 (STGT)

Event/start-stop	TDRS	Service	Data Rate	Ground Station
083/0523:00-0544:40z	171	SA1	8 Kbps	WSGT
083/0545:00-0552:30z	171	SA2	64 Kbps	WSGT
083/0552:50-0629:57z	TDS	SA1	64 Kbps	STGT
083/0632:44-0709:40z	275	SA1	64 Kbps	WSGT
083/0710:00-0720:30z	171	SA1	64 Kbps	WSGT
083/0722:00-0730:30z	171	SA1	64 Kbps	WSGT
083/0730:20-0802:34z	TDS	SA1	64 Kbps	STGT
083/0804:59-0842:16z	275	SA1	64 Kbps	WSGT
083/0842:36-0911:40z	171	SA1	64 Kbps	WSGT





Network Mission Overview (cont'd)



- Critical Periods to Date:**

Event	GMT Start		GMT End	
	DOY	HH:MM:SS	DOY	HH:MM:SS
Launch and Early Orbit Phasing (LEOP)	83	5:22:00	83	11:37:00
Transfer to Phasing Orbit (TPO)	83	11:37:00	83	15:57:00
MC1 Maneuvers	85	3:43:00	85	6:58:00
MC2 Maneuvers	86	18:19:00	86	21:34:00
TIV1 Maneuvers	87	18:30:00	87	23:17:00
TIV2 Maneuvers	88	2:06:00	88	6:55:00
TIV3 Maneuvers/Rendezvous/Docking	88	9:45:00	89	4:34:00
Super Critical - 1	88	16:53:19	88	17:09:22
Super Critical - 2	88	18:33:42	88	18:50:40
Super Critical - 3	88	20:16:12	88	20:28:46
Super Critical - 4	88	21:57:19	88	22:07:27
Super Critical - 5	88	23:35:16	88	23:42:51
Super Critical - 6	89	1:13:06	89	1:18:10
ATV Spacecraft Power Troubleshooting	90	15:37:00	90	21:37:00
ATV Physical Electrical connection to ISS	91	16:00:00	91	18:05:00
ATV Buffer Dump/Prep/ISS AC/Reconfig	91	18:05:00	92	0:20:00
Buffer Dump for ISS Reboost Phase	96	15:05:00	96	15:30:00
ATV Prep/ISS Reboost/ATV Reconfig	96	15:30:00	96	22:00:00
Buffer Dump for ISS Reboost	98	15:10:00	98	15:35:00
ATV Prep/ISS Reboost/ATV Reconfig	98	15:35:00	98	21:20:00
Prox link validation First Test	102	18:00:00	103	0:30:00
Prox link validation Second Test	103	17:15:00	103	22:00:00
Prox link validation Third Test	104	16:15:00	104	21:10:00

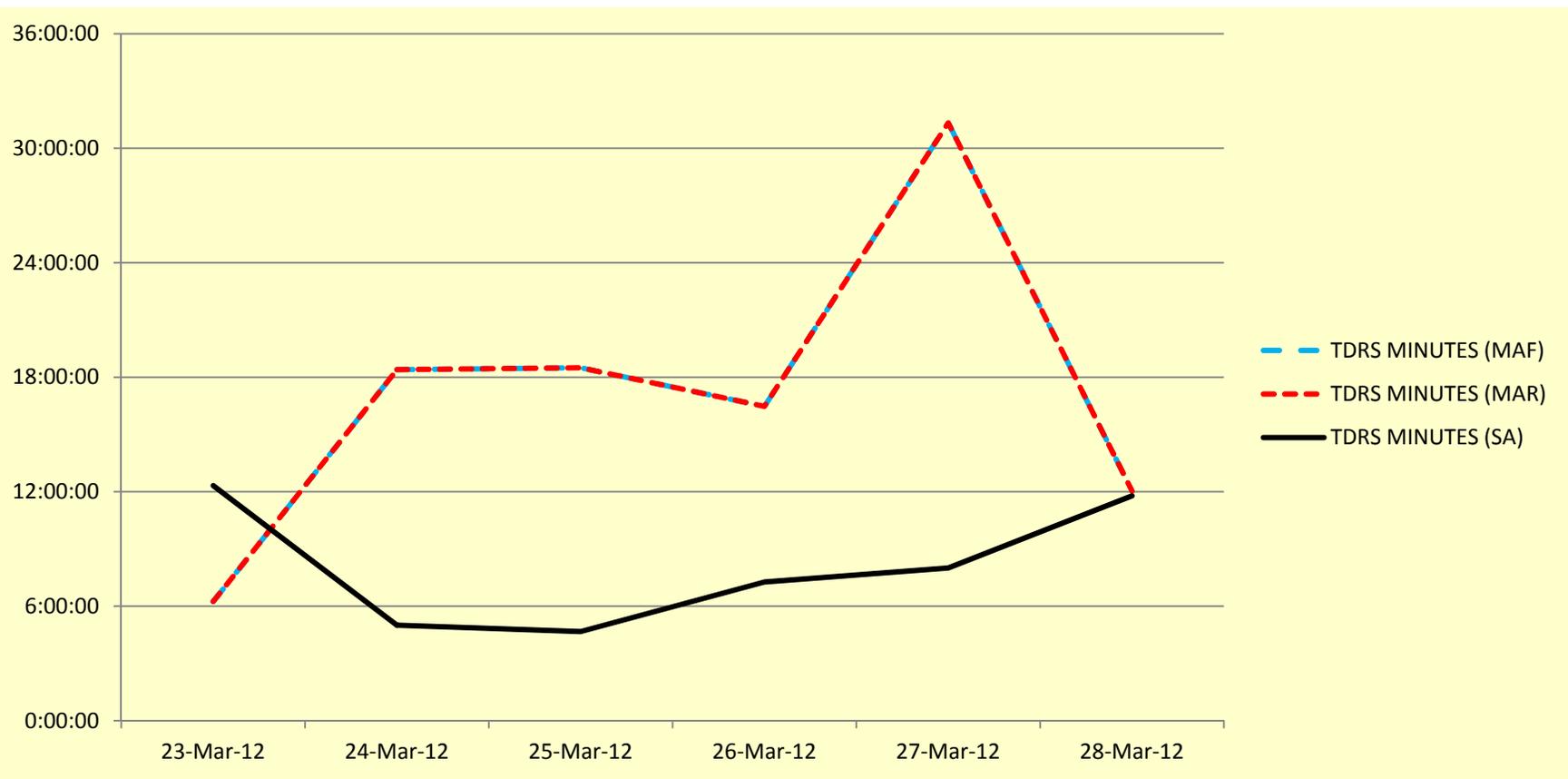




Network Mission Overview (cont'd)



- TDRS Service Usage from Launch to Docking



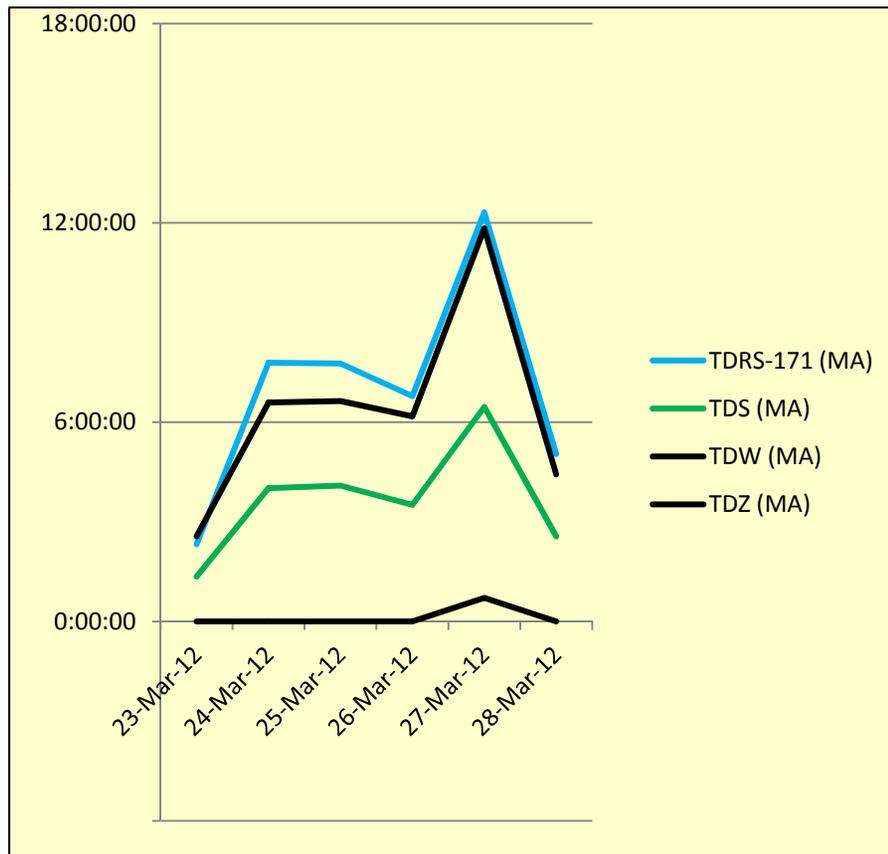


Network Mission Overview (cont'd)

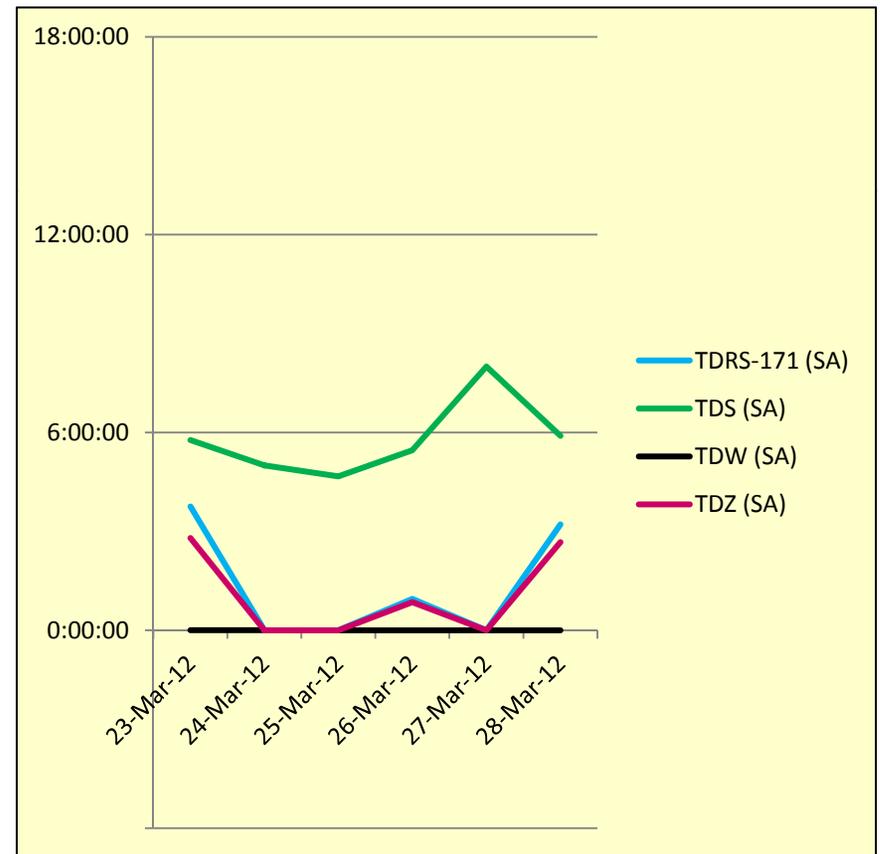


- TDRS / Service Usage from Launch through Docking

MA



SA





Network Issues



- **Late receipt of ATV-3 1 Day Launch Slip and No Ariane 5 Second Boost Contingency TDRS Schedule Request Files**
- **Trajectory delivery dates stated in the Requirements are different than actually received**
 - **L-90 day Preliminary Planning Products not received**
 - **L-30 days products not received until L-21 days**
 - **Resulting in delayed transmission of FDF deliverables**



Lessons Learned



- **Problem Title**
 - WSC Voice circuits not configured as expected for Launch Support
- **Problem Statement**
 - WSC was unable to identify where voice circuits were configured on their keyset on the day of Launch
- **Resolution**
 - A Network L-1 (or as close to launch as possible) Voice check will be scheduled. Test will be documented in Briefing Message (BM). Voice circuits will be frozen at the conclusion of the test





Lessons Learned (cont'd)



- **Problem Title**
 - WSC/GSFC/JSC Pre-mission Scheduling Meeting
- **Problem Statement**
 - To conduct a meeting with WSC, SMM and JSC GC at L-30 day to identify TDRS support, Critical periods, and WSC activities
- **Resolution**
 - Will be held prior to all Visiting Vehicle (VV) Launches



Lessons Learned (cont'd)



- **Problem Title**

- JSC test to verify transmitting ATV TDRS Scheduling Window (TSW) and TDRS schedules to WSC caused an overload of the Network Protocol Gateway (NPG), which in turn, caused load shedding of the Network Control Center Data System (NCCDS)

- **Problem Statement**

- Test was not properly coordinated and performed too close to launch

- **Resolution**

- A Schedule Request (SR) and Briefing Message to be provided for any testing utilizing WSC equipment and personnel





Lessons Learned (cont'd)



- **Problem Title**

- Vector not resident in the NCCDS for the TDRS event for the Command Checkout during the Launch Count at L-6:55

- **Problem Statement**

- Requirement for FDF not provided. FDF had to generate vector prior to event start; no impact

- **Resolution**

- Vector information will be documented in the Launch Briefing Message/Launch Count





Lessons Learned (cont'd)



- **Problem Title**
 - WSC auto-throughput disabled prior to docking
- **Problem Statement**
 - WSC auto-throughput did not remain enabled through docking as per the Launch Count
- **Resolution**
 - A separate ISI will be issued for auto-throughput management and documented in the Launch Count



Undocking/Re-entry Plan



- Undocking is scheduled on 09/03/12 247/TBD GMT
- Re-entry is scheduled on 09/04/12 248/TBD GMT
- The IN will support from L-4 hours of Critical Period start through Reentry/loss of TDRS telemetry
- Documentation:
 - Network post- undocking/re-entry report
 - Mission Termination ISI
 - SN Media Hold request
- FDF requirement to provide orbit determination
 - Provide No Later Than (NLT) 2 hours before the first de-orbit burn, a state vector based off TDRS coherent mode tracking
 - Provide NLT 2 hours after the first de-orbit burn, a second state vector based on TDRS coherent mode tracking based on orbit determination after the first de-orbit burn
- JSC to provide times of coherent events after undocking





ATV-4 Mission Preparations



- **SVT-1 will be performed during the ATV-3 mission**
 - Date is To Be Determined (TBD)
 - Test Support Identification Code (SIC)
 - M8003MS will not be used. Test SUPIDEN to be utilized MxxxxSM
 - Separate SIC needed for TDRS accountability and Vector Management
 - WSC Database will be updated:
 - » Test SIC will be populated with ATV parameters
 - » Configuration Codes will be generated
- **Test events not to run simultaneous with ATV-3 TDRS events**
 - Interface conflict
- **JSC will be responsible for Radio Frequency (RF) management**





Open Work



- **Testing**
 - BCC-HOSC Testing
 - Engineering test for SMA at 64 kbps - Is this going to be performed?
- **TDRSS Accountability**
 - Duration of the Mission
- **Flight Note attachments**
 - GC's working to get Electronic Flight Note (EFN) access for the SMM's
 - Used to Request Performance Data from WSC and being used as a time tag for TDRS cancellations for accountability





ATV-3 IN Team



Team Members	Location	Role	Contact Information
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Open Discussion



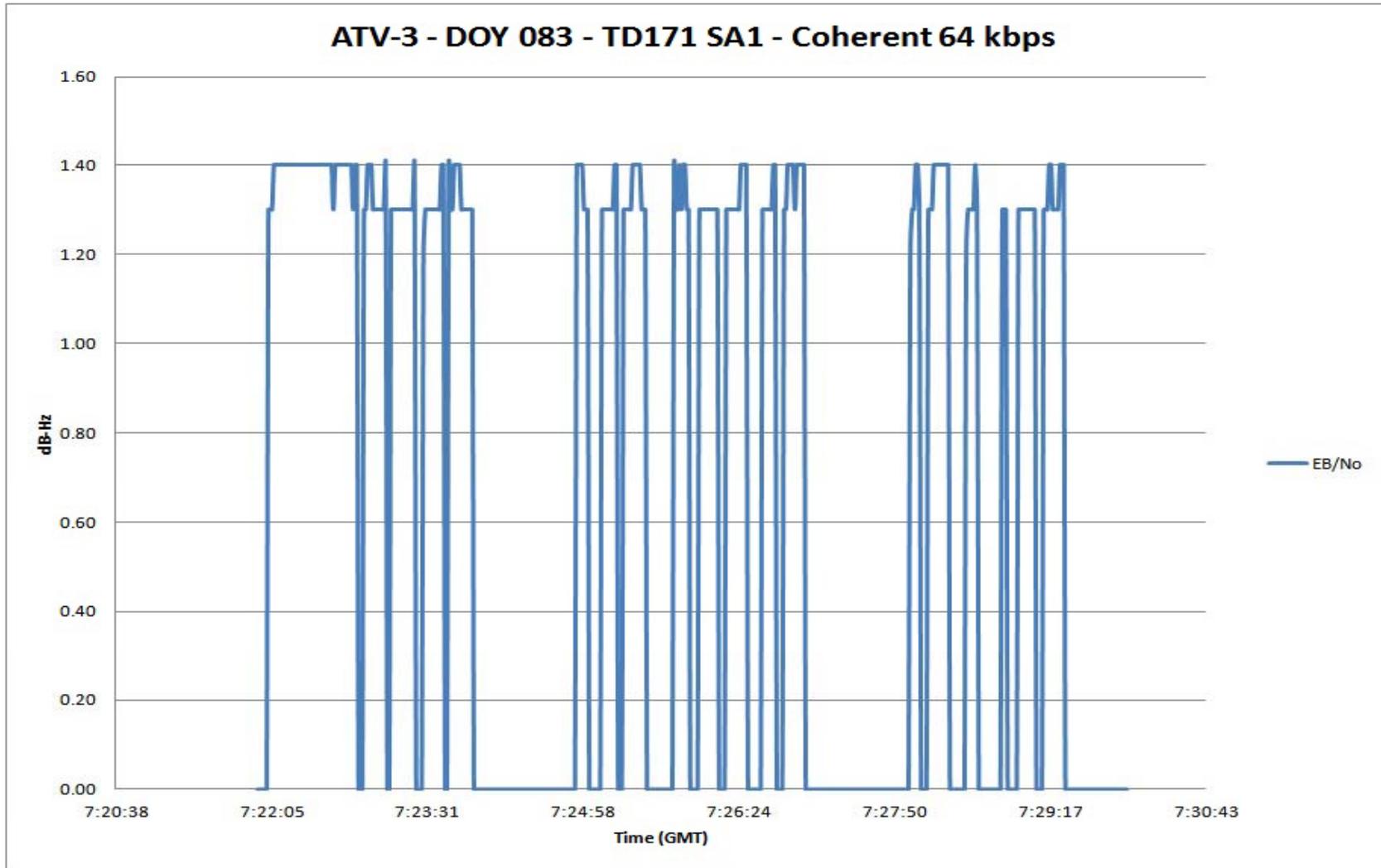


Backup Slides



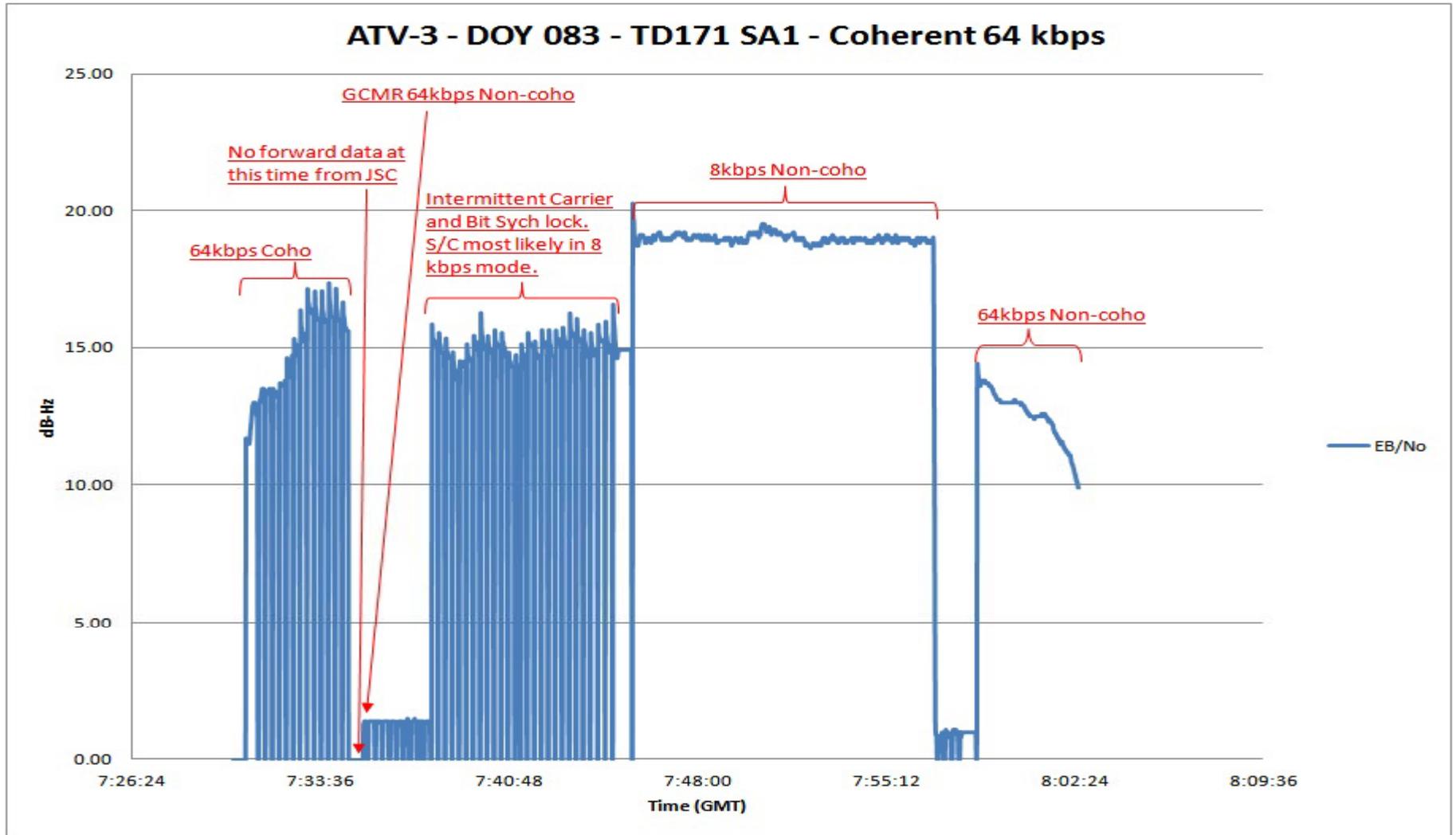


WSC Eb/N0





WSC Eb/N0 (cont'd)





IN Overview

