

TC + TM + ranging check  
File: H\_COP\_TTC\_TTC4.xls  
Author: E. Picallo



## Procedure Summary

### Objectives

This procedure describes the steps needed to verify there is no disturbance on the TM due to the ranging.

Perform ranging and send in parallel connection test TC at LR1, LR2 and MBR.

### Summary of Constraints

High rate TM is not compatible with ranging, ranging to be performed in low rate1, low rate 2 and medium bit rate.

There is an expected loss on the downlink carrier due to the ranging being enabled.

This is specified, and the actual value can be compared against the expected rate. (The expected power loss when ranging is applied is 0.79dB, as per the RF subsystem test report.)

This will be difficult to measure exactly, as it is on the limit of that measurable at GS level, a value of 1dB can be taken as the baseline.

### Spacecraft Configuration

#### Start of Procedure

CDMU in default configuration;  
Downlink active via TX1 and TWTAL;  
TM bit rate equal to 150 kbps;  
TC bit rate 4Kbps;  
XPND configuration: CM ON and RNG ON/OFF

#### End of Procedure

CDMU in default configuration;  
Downlink active via TX1 and TWTAL;  
TM bit rate equal to 150 kbps;  
TC bit rate 4Kbps;  
XPND configuration: CM ON and RNG ON/OFF (as required)

### Reference File(s)

#### Input Command Sequences

#### Output Command Sequences

HCRTTC4

### Referenced Displays

ANDs	GRDs	SLDs
ZAZ7I999		(None)

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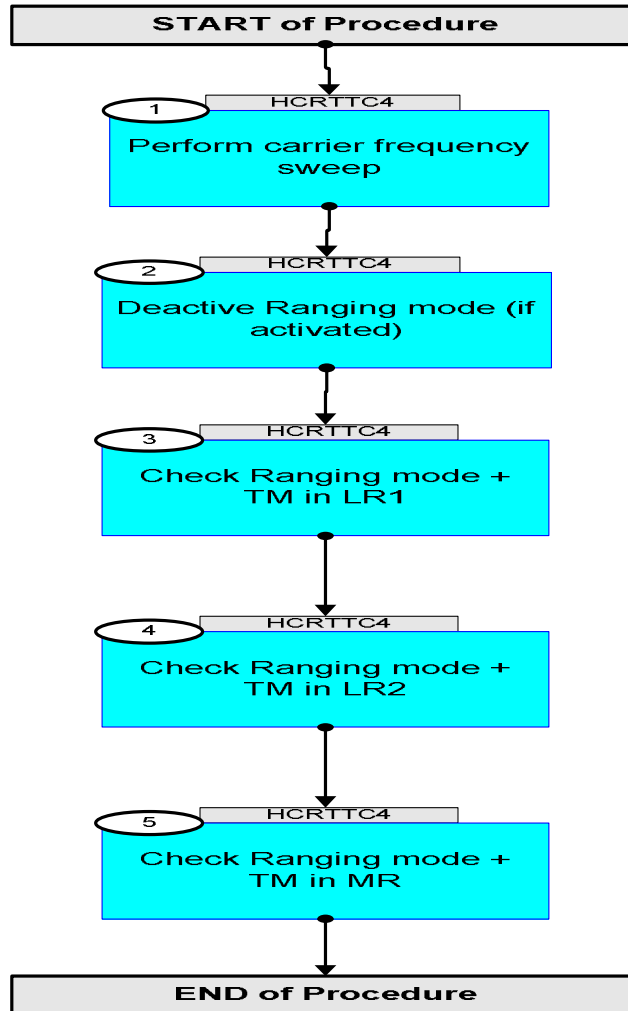
**Configuration Control Information**

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
06/01/09	2	1	Created	E. Picallo	
28/02/09	2.1	2	constrian section updated according to SRE-PT-055178 (COP #08 HP-SVM) MoM inputs	E. Picallo	
16/03/09		2.01	Validation : comment about survial configuration deleted	E. Picallo	
18/03/09	2.2	3	Align to database related to CDMU 3.8.2	E. Picallo	
07/04/09		4	Start XPND configuration: CM ON and RNG ON/OFF End XPND configuration: CM ON and RNG OFF (as required)	E. Picallo	
07/04/09	2.3	4.01	Validation : X1 SqlchSt - SS telemtry check added	E. Picallo	

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### Procedure Flowchart Overview



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
<b>Beginning of Procedure</b>				
<p>TC Seq. Name : HCR TTC4 (TTC4 TC+TM+RNG check)            COP_TTC_04a1 TC+TM+RNG at LR1, LR2 and MR Functional Check</p> <p>TimeTag Type: N            Sub Schedule ID:</p> <p style="text-align: center;"><input type="checkbox"/></p>				
1		Perform carrier frequency sweep		Next Step: 2
		<b>Sweep rate = 500 Hz/s</b> <b>Sweep range = ± 130 kHz</b> <b>TC MI = 1.0 rad</b> <b>U/L power level = - 100 dBm (TBC)</b> <b>TC signal = 4 Kbps</b>		
1.1		Check the Rx1 lock condition		<input type="checkbox"/>
		Verify Telemetry X1 AGC TMUplnk                   RMB20442                   = -100.0 dbmW		AND=ZAZ7I999
		Verify Telemetry X1 Rx Lock - RL                   RMB24442                   = Locked		AND=ZAZ7I999
		Verify Telemetry X1 SqlchSt - SS                   RMB23442                   = ON		AND=ZAZ7I999
		Verify Telemetry RX1 125-4K Stat                   RMB17442                   = 4 Kbps		AND=ZAZ7I999
1.2		Verify Tx1 configuration		<input type="checkbox"/>
		Verify Telemetry X1 Coher MOD-CM                   RMB26442                   = ON		AND=ZAZ7I999
		Verify Telemetry X1 Rang MOD-RM                   RMB27442		AND=ZAZ7I999
2		Deactive Ranging mode (if activated)		Next Step: 3
		Execute Procedure: <b>H_FCP_TTC_TURM</b> <b>Transponder in use Ranging Activation/Deactivation</b>		
3		Check Ranging mode + TM in LR1		Next Step: 4

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
3.1		Set GS TM Back-up chain for LR1 TM		<input type="checkbox"/>
3.2		Set TX and TM encoder in use configuration for LR1		<input type="checkbox"/>
		Execute Procedure: H_CRP_TTC_TUL1 Tx and TM encoder in use configuration for LR1		
3.3		Set GS TM main chain for LR1 TM		<input type="checkbox"/>
3.4		Measure the TX1 downlink signal		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>		
3.5		Activate Ranging Mode		<input type="checkbox"/>
		Execute Procedure: H_FCP_TTC_TURM Transponder in use Ranging Activation/Deactivation		
3.6		Set GS to initiate ranging session		<input type="checkbox"/>
3.7		Check the Rx1 lock condition		<input type="checkbox"/>
		Verify Telemetry X1 AGC TMUpInk RMB20442 = -100.0 dbmW		AND=ZAZ7I999
		Verify Telemetry X1 Rx Lock - RL RMB24442 = Locked		AND=ZAZ7I999
3.8		Measure the TX1 downlink signal		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>  <b>Verify there is no disturbance on the TM due to the ranging.</b>		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p>There is an expected loss on the downlink carrier due to the ranging being enabled.</p> <p>This is specified, and the actual value can be compared against the expected value (The expected loss when ranging is applied is 0.79dB, as per the RF subsystem test report.)</p> <p>This will be difficult to measure exactly, as it is on the limit of that measurable at GS level, a value of 1dB can be taken as the baseline.</p>		
3.9		Send connection test TC (17,1)		<input type="checkbox"/>
		Execute Telecommand <p style="text-align: right;"><b>ConnectionTest</b></p> TC Control Flags : <p style="text-align: right;">GBM IL DSE --Y -- --</p> Subsch. ID : 10 Det. descr. : Perform Connection Test	DC810180	
3.10		Verify connexion report packet TM(17,2)		<input type="checkbox"/>
		Verify Packet Reception <p style="text-align: right;"><b>Link Connection Report</b></p> Packet Details: <p style="text-align: right;">APID: 16 Type: 17 Subtype: 2 PI1: PI2:</p>	LnkConnecRep	
3.11		Set GS to terminate ranging session		<input type="checkbox"/>
3.12		Deactivate Ranging Mode		<input type="checkbox"/>
		Execute Procedure: <b>H_FCP_TTC_TURM</b> <b>Transponder in use Ranging Activation/Deactivation</b>		
3.13		Measure the TX1 downlink signal		<input type="checkbox"/>
		Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
4		Check Ranging mode + TM in LR2		Next Step: 5
4.1		Set GS TM Back-up chain for LR2 TM		<input type="checkbox"/>
4.2		Set TX and TM encoder in use configuration for LR2		<input type="checkbox"/>
		Execute Procedure: H_CRP_TTC_TUL2 Tx and TM encoder in use configuration for LR2		
4.3		Set GS TM main chain for LR2 TM		<input type="checkbox"/>
4.4		Measure the TX1 downlink signal		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>		
4.5		Activate Ranging Mode		<input type="checkbox"/>
		Execute Procedure: H_FCP_TTC_TURM Transponder in use Ranging Activation/Deactivation		
4.6		Set GS to initiate ranging session		<input type="checkbox"/>
4.7		Check the Rx1 lock condition		<input type="checkbox"/>
		Verify Telemetry X1 AGC TMUplnk RMB20442 = -100.0 dbmW		AND=ZAZ7I999
		Verify Telemetry X1 Rx Lock - RL RMB24442 = Locked		AND=ZAZ7I999
4.8		Measure the TX1 downlink signal		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>  <b>Verify there is no disturbance on the TM due to the ranging.</b>		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<p>There is an expected loss on the downlink carrier due to the ranging being enabled.</p> <p>This is specified, and the actual value can be compared against the expected value (The expected loss when ranging is applied is 0.79dB, as per the RF subsystem test report.)</p> <p>This will be difficult to measure exactly, as it is on the limit of that measurable at GS level, a value of 1dB can be taken as the baseline.</p>		
4.9		Send connection test TC (17,1)		<input type="checkbox"/>
		Execute Telecommand <div style="text-align: right;">ConnectionTest</div> TC Control Flags : <div style="text-align: right;">GBM IL DSE --Y -- --</div> Subsch. ID : 10 Det. descr. : Perform Connection Test	DC810180	
4.10		Verify connexion report packet TM(17,2)		<input type="checkbox"/>
		Verify Packet Reception <div style="text-align: right;">Link Connection Report</div> Packet Details: <div style="text-align: right;">APID: 16 Type: 17 Subtype: 2 PI1: PI2:</div>	LnkConnecRep	
4.11		Set GS to terminate ranging session		<input type="checkbox"/>
4.12		Deactivate Ranging Mode		<input type="checkbox"/>
		Execute Procedure: <b>H_FCP_TTC_TURM</b> <b>Transponder in use Ranging Activation/Deactivation</b>		
4.13		Measure the TX1 downlink signal		<input type="checkbox"/>
		Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.		



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
5		Check Ranging mode + TM in MR		Next Step: END
5.1		Set GS TM Back-up chain for MR TM		<input type="checkbox"/>
5.2		Set TX and TM encoder in use configuration for MR		<input type="checkbox"/>
		Execute Procedure: H_FCP_TTC_TUMR Tx and TM encoder in use configuration for MR		
5.3		Set GS TM main chain for MR TM		<input type="checkbox"/>
5.4		Measure the TX1 downlink signal		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>		
5.5		Activate Ranging Mode		<input type="checkbox"/>
		Execute Procedure: H_FCP_TTC_TURM Transponder in use Ranging Activation/Deactivation		
5.6		Set GS to initiate ranging session		<input type="checkbox"/>
5.7		Check the Rx1 lock condition		<input type="checkbox"/>
		Verify Telemetry X1 AGC TMUplnk RMB20442 = -100.0 dbmW		AND=ZAZ7I999
		Verify Telemetry X1 Rx Lock - RL RMB24442 = Locked		AND=ZAZ7I999
5.8		Measure the TX1 downlink signal		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>  <b>Verify there is no disturbance on the TM due to the ranging.</b>		

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		<p>There is an expected loss on the downlink carrier due to the ranging being enabled.</p> <p>This is specified, and the actual value can be compared against the expected value (The expected loss when ranging is applied is 0.79dB, as per the RF subsystem test report.)</p> <p>This will be difficult to measure exactly, as it is on the limit of that measurable at GS level, a value of 1dB can be taken as the baseline.</p>		
5.9		Send connection test TC (17,1)		<input type="checkbox"/>
		Execute Telecommand <p style="text-align: right;">ConnectionTest</p> TC Control Flags : <p style="text-align: right;">GBM IL DSE --Y -- --</p> Subsch. ID : 10 Det. descr. : Perform Connection Test	DC810180	
5.10		Verify connexion report packet TM(17,2)		<input type="checkbox"/>
		Verify Packet Reception <p style="text-align: right;">Link Connection Report</p> Packet Details: <p style="text-align: right;">APID: 16 Type: 17 Subtype: 2 PI1: PI2:</p>	LnkConnecRep	
5.11		Set GS to terminate ranging session (as required)		<input type="checkbox"/>
		<p><b>Note: If the next COP TTC procedure to be execute is H_COP_TTC_TTC5 (TM Functional Check), the first step of this procedure is to check MGA in HR. This requires to have ranging mode switch OFF.</b></p> <p><b>Moreover, the procedure H_COP_TTC_TTC5 can be performed in Coherent or non Coherent mode.</b></p>		
5.12		Deactivate Ranging Mode (as required)		<input type="checkbox"/>
		Execute Procedure: <b>H_FCP_TTC_TURM</b> <b>Transponder in use Ranging Activation/Deactivation</b>		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
5.13		Measure the TX1 downlink signal (if RNG OFF)		<input type="checkbox"/>
		<b>Measure and record on-ground the Tx1 carrier frequency value and Tx1 carrier power values.</b>		
<b>End of Procedure</b>				