LOU Tuning Table Release Note

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1 Document Change Record

1.1 History of changes

Date	Issue/revision	Pages	Change
17.08.2006	Issue 0.01	All	New
25.08.2006	Issue 0.02	4	Updated according to changes in the table file format. Refers to configuration with a LO dummy
06.09.2006	Issue 0.03	4	New table file for dummy LOU generated.
08.09.2006	Issue 0.04	4	New table file for dummy LOU generated. Corrected “ut” entries.
15.09.2006	Issue 0.05	4	New table file for dummy LOU generated.
18.09.2006	Issue 0.07	4	Changes in the naming of parameters, to match the MIB entries names.
18.09.2006	Issue 0.08	4	Eng. “9e99” introduced for not-converted values. New calibration dlls used.
09.11.2006	Issue 0.09	4	New table file for dummy LOU generated, with little restrictions. High voltage range in blue and red table, high current range in green table.
15.11.2006	Issue 0.10	4	New table file for dummy LOU generated, GREEN TABLE values according to SRC/LCU/2001-007 Issue 2.7 corrected.
16.11.2006	Issue 0.11	4	New table file for dummy LOU generated, fixing LSU frequency telemetry problem
20.11.2006	Issue 0.12	4	New table file for dummy LOU generated, string 9E99 placed as eng. value in HL_LSUMX_power. Description for LSU telemetry voltage in bands 2a, 3b, 4a changed.
19.03.2007	Issue 0.13	8	Table file for LO dummy, LCU main and redundant. Revised GREENTABLE, SAFETABLE.
31.05.2007	Issue 0.14-IMD2	8	Table file for LO dummy, to be used only with IMD2
29.06.2007	Issue 0.15	10	Table file for LO dummy. Same safe operational tables as in release 0.13. New LCU patch 16 included.
02.07.2007	Issue 0.16	10	Table file for LO dummy. Revised blue limit in bands 6ab and 7ab. New LCU patch 17 included
18.07.2007	Issue 0.17	11	Upload order changed. Table content based on Issue 0.16. LSU table revised, LSU PFM tuning allowed by increased telemetry voltage range in LSU table. LCU patch 17 included
28.09.2007	Issue 0.18	11	Based on Issue 0.17. Corrected a bug in LSU telemetry file for bands 2a,3b,4a. Telemetry voltage decreases with increasing frequency.
22.11.2006	Issue 1.00	5	Table file generated for ILT test configuration. LOUFM, LCUFM, LSUDM.
04.12.2006	Issue 1.01	5	Table file generated for ILT test configuration. LOUFM, LCUFM, LSUPFM.
08.12.2006	Issue 1.02	5	Table file generated for ILT test configuration. LOUFM, LCUFM, LSUPFM. LSU frequency telemetry margins corrected in band 4a.

15.12.2006	Issue 1.03	5	Table file for ILT test configuration. GREENTABLE values revised.
11.01.2007	Issue 1.04	6	Table file for ILT test configuration. GREENTABLE values for T_range 123-135K SAFE values band 4A, 4B revised for M2 stage
18.01.2007	Issue 1.05	7	Table file for ILT test configuration. GREENTABLE values as in FMLCU PROM.
31.01.2007	Issue 1.06	7	Table file for ILT test configuration. GREENTABLE values as in FMLCU PROM. LSUTABLE for LSU redundant.
01.02.2007	Issue 1.07	7	Table files for ILT test configuration, generated two export files one for main and second for redundant part of the subsystem.
05.02.2007	Issue 1.08	7	Table files for ILT test configuration, generated two export files one for main and second for redundant part of the subsystem. Latest .DLL version for HEX to ENGconversion used. LSU redundant table updated.
19.03.2007	Issue 1.09	8	Table files for ILT test configuration, LOUFM with all bands installed. Two sets of export files: main and redundant. Updated SAFETABLE for line resistances. LSUTABLE overlapping increased by 10mV. BLUETABLE adapted.
22.03.2007	Issue 1.10	8	Based on Issue 1.09. Fixed BLUETABLE max error D1V in band 4b.
27.03.2007	Issue 1.11	8	Updated BLUETABLE and SAFETABLE to account for line resistance in bands 6 and 7
28.03.2007	Issue 1.JPL	8	ATTENTION: this is a special safe table with expanded blue and green table limits. Only to be used with MPIfR personnel present during operation.
17.04.2007	Issue 1.12	8	Updated GREENTABLE , fixes out of limit error band 3b
25.05.2007	Issue 1.13	8	Updated GREENTABLE, should fix out of limit errors in band 2b and 3b
31.05.2007	Issue 1.14-IMD2	8	Table file to be used only on LCU IMD2. Created from I1.13 LCU FM, with the proper calibration table for IMD2.
05.06.2007	Issue 1.15-IMD2	8	Table file to be used only on LCU IMD2. Safe and Blue Table revised for line resistance in ILT setup
08.06.2007	Issue 1.16-IMD2	8	Table file to be used only on LCU IMD2. Safe and Blue Table revised. Input from vector-scan HK data performed with Table 1.15-IMD2.
14.06.2007	Issue 1.17-IMD2	8	Table file to be used only on LCU IMD2. Green Table revised. Input from OOL reports.
19.06.2007	Issue 1.18-300K	8	Table file for 300K operation of LOUFM with LCU FM and LSU PFM.
21.06.2007	Issue 1.19-IMD2	8	Table file to be used only on LCU IMD2. Green table in band 3b revised. Input from OOL reports.
26.06.2007	Issue 1.19-IMD2	9	New release note, including patch LCU_FM_15.txt.
26.06.2007	Issue 1.JPL-IMD2	9	ATTENTION: this is a special safe table with expanded blue and green table limits. Only to be used with MPIfR personnel present during operation. This release was prepared for use on LCU IMD2 only.

27.06.2007	Issue 1.JPL2-IMD2	9	ATTENTION: this is a special safe table with expanded blue and green table limits. Only to be used with MPIfR personnel present during operation. This release was prepared for use on LCU IMD2 only. Fixed blue limit above red limit problem
28.06.2007	Issue 1.20	9	Updated GREENTABLE to include OOL fixes observed during IMD2 operation.
29.06.2007	Issue 1.21	10	Same safe operational tables as in release 1.20. New LCU patch 16 included
01.07.2007	Issue 1.22-300K	10	Revised version 1.18-300K, table file for 300K operation of LOUFM with LCUFM and LSU PFM. Tuning in bands 5a and 7b limited to EIDP data.
02.07.2007	Issue 1.23-300K	11	Safe table from release 1.22-300K, table file for 300K operation of LOUFM with LCUFM and LSU PFM. Tuning in bands 5a and 7b limited to EIDP data. LCU patch 1.7 included
03.07.2007	Issue 1.24-300K	11	Safe table from release 1.22-300K, CUS export location of SAFE table placed after BLUE TABLE
03.07.2007	Issue1.25-300K	11	Revised BLUE and SAFE table from Issue 1.24-300K for the DxV voltage drop. ATTENTION! THIS SAFE OPERATIONAL TABLE CAN ONLY BE UPLOADED IF ISSUE1.24 IS INSTALLED IN LCU FIRST
17.01.2007	Issue 2.00	7	Table file for flight hardware configuration, generated for FMLCU PROM burning.
19.08.2007	Issue 2.01	10	CUS export file generated from FMLCU PROM data. Upload of safe operational table does not change table memory area of FMLCU. This release also includes LCU patch 1.7.
09.04.2008	Issue 2.02	7, 10, 11	Revised BLUE and SAFE table from Issue 1.25-300 K for flight harness for 300 K operation ONLY!
16.04.2008	Issue 2.03	10, 11	Revised safe tables from Issue 2.02-300 K according to the test performed on 16th April 2008
17.04.2008	Issue 2.04	10, 11	Revised safe tables from Issue 2.03-300 K with restricted limits on blue table
07.05.2008	Issue 2.05	10, 11	Revised safe tables from Issue 2.04-300 K with enlarged limits on green table for the M2 multipliers of bands 5a and 6a. This was necessary due to out of limit errors during diplexer scans.
10.05.2008	Issue 2.06	7	The only change concerns the release note. All tables are unchanged compared to issue 2.05-300K!
21.07.2008	Issue 2.07	7, 10, 11	Revised safe tables from Issue 2.06-300 K with enlarged limit on green table for the M2 multiplier of band 5a. This was necessary due to out of limit errors during diplexer scans.

14.11.2008	Issue 2.08	7, 10, 11, 12	Revised safe tables from Issue 1.21 for operation in temperature range between 123 and 145 K. Values are corrected for the flight line resistances. A table with the resistances is given in Section 2.4. The blue table values in 6a and 7b have been set to the resistance-corrected EIDP values plus 50 mV. This is more restricted than in I1.21. (agreed on TRR 13.11.08 Utrecht). Purity test results of ILT3 for band 7b have been incorporated (agreed on TRR 13.11.08 Utrecht, values distributed by PD email 06.11.2008). The blue table has been changed for M1V (see Section 2.5). No information of the corresponding expected currents for M1I and M2I have been distributed to MPIfR, so that the GREEN TABLE is left unchanged.
16.11.2008	Issue 2.09a	11; 14pages	Safety table release based on issue 2.08. Full set of configlcuXX.config files have been included. M1V settings as per Section 2.5 are included in "configlcu7b.config". Keyfreq_list.txt included with frequencies and D2V settings coded according to Section 2.6 for LO SFT.
25.11.2008	Issue 2.10	13, 14	Revised Safety Tables from Issue 2.09a. The Green Table has been changed according to the results of the SFT on 24.11.2008 in the following parameters: G1C_Max_1B, G2C_Max_3B, D2C_Min_3B, G2C_Max_7B
26.11.2008	Issue 2.11	11, 13, 14	Revised Safety Tables from Issue 2.09b. The Green Table has been changed according to the results of the SFT on 24.11.2008 in the following parameters: G1C_Max_1B, G2C_Max_3B, D2C_Min_3B, G2C_Max_7B, and D1V_Safe for all Indices. The frequency dependent M1V settings in "configlcu7b.config" are set to the original settings discarding the purity test results of ILT3 for band 7b.
27.11.2008	Issue 2.12	13,14	Revised Safety Tables from Issue 2.11. The telemetry-voltage overlap has been enlarged in the LSU tables for main and redundant part.
28.11.2008	Issue 2.13	8, 13, 14	Special Safety Table Release for the "Purity Test" based on Issue 2.12. Tuning is only permitted in bands 3b (Indices 16 – 21) and 7b (Indices 11 – 19). According to the emails of J. Ward and J. Pearson (2008-11-22) the current limit of the multiplier M1 in band 7b was set to 3mA.

01.12.2008	Issue 2.14b	8, 13,12,14	Applicable programmable hardware current limits for the drain stages of LCU included in table 3.8. Revised Safety Tables from Issue 2.12. The Green Table limits have been adjusted after the vector scans of 28th November 2008 to avoid green out of limit events. The Blue Table has been changed to allow for higher VD2 at the band edges of 3b, 4a, 4b. In band 2b VD2 has been changed to sample Best Guess VD2 plus margin. M1V setting of band 7b, as given in the EIDP, are included in "configlcu7b.config".
02.12.2008	Issue 2.15b	13,14	Revised Safety Tables from Issue 2.14b. Changes have been applied to the blue table to avoid conflicts between red and blue table at table upload (due to conversion problems).
04.12.2008	Issue 2.16	11, 13, 14	Revised Safety Tables from Issue 2.15b. The resistances of the cold flight harness are taken into account for the red and blue tables. A table with the resistances is given in Section 3.4.
08.12.2008	Issue 2.17	8, 9, 14, 15	Revised Safety Tables from Issue 2.16. Changes have been applied to the blue table and "configlcu7b.config" file as proposed by JPL (08.12.2008 00:51 CET)
03.04.2009	Issue 2.18-Beta	8, 14, 15, 17, 18	Revised Safety Tables from Issue 2.17 for **test purpose only!** Changes have been applied to the blue and green table (maximum D2V settings and maximum current limits as proposed by JPL 01.04.2009). The "configlcuXX.config" file has been changed in structure. The purified settings at impure frequencies have been applied to the "configlcu3b.config" (see Section 3.5). The SFT frequency for band 5a has been moved to 1124 GHz.
09.04.2009	Issue 2.18	8, 17, 18	The tables of Issue 2.18 are based on the verified Safety Tables from Issue 2.18-Beta. No changes have been applied to the values. Issue 2.18 is intended for flight operation.
28.04.2009	Issue 2.18-Purity	8, 17, 18, 19	Special Safety Table Release for the "Purity Test" based on Issue 2.18. Changes have been applied to the blue table in band 3b to meet the requirements of this test.
28.05.2009	Issue 2.19	8, 14, 19, 20	Revised Safety Tables from Issue 2.18. The impure settings in the "configlcu3b.config" file have been restored. The green table has been updated due to higher currents (M1) in band 5a and 7b.
03.06.2009	Issue 2.20	7, 9, 12, 19, 20	Revised Safety Tables from Issue 2.19. The "**configlcuXXonfig**" files have been updated. **No changes have been applied to the green, blue nor red table!**
10.06.2009	Issue 2.21-Purity-B	7, 10, 20, 21	Special Safety Table Release for the "Purity Test" based on Issue 2.20. Changes have been applied to the blue table in band 3b to meet the requirements of this test. Additionally, the "drain2_v_blmx" values in the frequency range 1850 – 1900 GHz in band 7b have been applied as proposed by JPL (09.06.2009)

15.06.2009	Issue 2.22	8,10, 16, 21,22	Revised Safety Tables from Issue 2.21-Purity-B. The purified settings at impure frequencies have been applied to the "configlcu3b.config" (see Section 3.5). The blue table has been updated in bands 5a – 7b to the values proposed by JPL (15.06.2009) and in band 3b to meet the requirements of the purified settings.
18.06.2009	Issue 2.23	8, 10, 21, 22	Revised Safety Tables from Issue 2.22. An index 23 (956 – 960 GHz) has been added in band 3b with a maximum of attenuation (Hex: 1F) in the LSU table. Band 3b is intended to be used as heater in this index at 458 GHz.
21.07.2009	Issue 2.24	8, 10, 17, 21, 22	Revised Safety Tables from Issue 2.23. The "**configlcu7b.config**" file has been updated to the outcomes of the stability investigation. All other tables remain unchanged
16.12.2009	Issue 2.25	8, 10, 17, 21, 22	Special Safety Tables for use in DC-SFT. All power indices in the LSU tables (prime/redundant) have been changed to 31 which is the lowest power setting. The green and blue table have been updated to allow for DC operation only. **NOT YET RELEASED!**
16.12.2009	Issue 2.26-1/2	8, 11, 14, 19, 21, 22, 23	Revised Safety Tables from Issue 2.24. The tables have been changed to support the dissipative mode in bands 1, 2, 3, 4, 6, and 7. In these bands a frequency index 30 has been added which allows for DC operation only with very restricted settings (power index 31). The frequencies of index 30 are for dissipative mode tuning only! The green table has been updated to avoid GOOL events detected during CoP. **TEST RELEASE ONLY!**
05.01.2010	Issue 2.27	8, 11, 14, 19, 22, 23, 24	Revised Safety Tables from Issue 2.26. For band 7b frequency-independent index -1 of the green table has been extended for D1C to allow for the dissipative mode. The frequencies of index 30 are for dissipative mode tuning only!
15.01.2010	Issue 2.28	8, 11, 14, 22, 23, 24	Revised Safety Tables from Issue 2.27. D1C at the frequency-independent index -1 has been reset from 1.11 A to 1.0 A (the normal setting) in the green table of band 7b. The safe setting for M2V of band 2b has been set from -5 V to -4 V to prevent reverse currents on M2. Updates have been applied to some of the "configlcuXX.config" to support the dissipative mode properly. The frequencies of index 30 are for dissipative mode tuning only!
25.01.2010	Issue 2.29	8, 11, 14, 22, 23, 24	Revised Safety Tables from Issue 2.28. The safe setting for M2V of band 2b has been set from -4 V to -5 V. The frequencies of index 30 are for dissipative mode tuning only!
09.02.210	Issue 2.30	8, 11, 14, 22, 23, 24	CUS Table file 2.30 is a copy of release 2.29. Changes applied to configlcu7b.config based on input from DT and JP (email correspondence). The frequencies of index 30 are for dissipative mode tuning only!

02.03.2010	Issue 2.31	8, 9, 12, 15, 24, 25, 26	Release 2.31 is based on 2.30, changed BlueMinG1V in Band 6b from -0.62 to -0.92V. configlcu7b.config modified according to HIFI system input (email, JP, DT 24.02.2010) in range 1866GHz to 1888GHz
03.03.2010	Issue 2.32	9, 12, 13, 16, 25, 26	Release 2.32 is based on 2.31. CUS files are just a copy, with changed file names. Configlcu7a.config modified according to HIFI system input (email DT, JP 02.03.2010) in range 1709.1 – 1720.5, M1V to -7V
18.03.2010	Issue 2.33	9, 13, 24, 25, 26	Band 1a M1V bluemx increased to 7.6V. Band 5a LSU table idx 29, 30 revised. configlcu1a.config, configlcu5a.config, configlcu5b.config, configlcu6b.config updated according to HIFI system input (email DT, 11.03.2010)
22.04.2010	Issue 2.34	9, 13, 16, 25, 26	Band 1a M1V bluemx increased to 9V. Band 5a LSU table idx 29,30 revised. Band 6b, G1C GRMN idx -1 to -0.645mA reference: email JP,DT 12.04.2010
30.04.2010	Issue 2.35	9, 13, 16, 25, 26, 27	Table release request by HIFI system and JPL for band5a and b testing, go ahead given by JPL (email JP, 30.04.2010) after config file implementation check.
18.06.2010	Issue 2.36	9, 13 ,14, 26,27,28	Table release request by HIFI system and JPL for band 6b D1C, config files Band1a and Band 7b as per input from DT.

1.2 Detailed list of changes for the current Issue

Issue: 2.18-Beta	**Based on Issue:** 2.17	**Date:** 3rd April, 2009
#	**Change**	**Reference**
1	The maximum D2V settings in the **blue table** have been changed to meet the requirements proposed by JPL. For the bands 1a, 2a, 3b, 4a, and 6b the maximum set values are now equal to the nominal bias settings without RF (Amplifier EIDPs). For band 4b the maximum D2V set value has been reduced to 2.8 V.	"MMICChart.xls" by JPL (01.04.2009)
2	The minimum D2V settings in the **blue table** have been consistently changed to D2V_SAFE – 100 mV.	
3	The **green table** has been updated to meet the current limit requirements proposed by JPL. The settings for the programmable hardware current limits have not been changed (see Section 3.8)	"Technical Note" by JPL (22.01.2009)
4	The structure of the "**configlcuXX.config**" has been changed as proposed by David Teyssier. The column called "drain2_v" has been replaced by two new columns called "drain2_v_blmn"and "drain2_v_blmx". The first one is equal to the blue table minimum. The latter one is equal to the EIDP set value unless this value exceeds the blue max limit for a certain index. In this case the value equals the blue table maximum.	Templates by David Teyssier (24.02.2009)
5	The purified settings, given in Section 3.5, have been applied to the "**configlcu7b.config**" file. They are result of the purity test in the TB/TV test and were proposed by JPL. (Note that these values had been included in Issue 2.17 already).	Updated EIDP for 7b by JPL (08.12.2008)
6	The purified settings, given in Section 3.5, have been applied to the "**configlcu3b.config**" file. They are result of the purity test in the TB/TV test and were proposed by Thomas Klein.	"testblock_1_M3_75.xls" by Thomas Klein (19.03.2009)
7	The SFT frequency in the "**keyfreq_list.txt**" file has been moved to 1124 GHz for band 5a, to avoid problems with 1122 GHz lying on an index border exactly. The D2V for this frequency was set to 2.25 V, which is equal to the set value of the T_{sys}-survey, to have a reference measurement. A list of the SFT frequencies and D2V set values is given in Section 3.6.	

Issue: 2.18	**Based on Issue:** 2.18-Beta	**Date:** 9th April, 2009
#	**Change**	**Reference**
1	None	

Issue: 2.18-Purity	**Based on Issue:** 2.18	**Date:** 28th April, 2009
#	**Change**	**Reference**
1	The blue table has been updated in band 3b to meet the requirements of the "Purity Test": M1V_Min → 3.98V, M2V_Min → -9.52V, M3V_Max → 2.02V.	"testblock_1_M3_75.xls" by Thomas Klein (28.04.2009)

Issue: 2.19	**Based on Issue:** 2.18	**Date:** 27th May, 2009
#	**Change**	**Reference**
1	The impure settings in the "configlcu3b.config" file have been restored.	
2	The green table has been updated in bands 5a and 7b due to slightly higher currents at the first multipliers.	SFT 26.05.2009

Issue: 2.20	**Based on Issue:** 2.19	**Date:** 3rd June, 2009
#	**Change**	**Reference**
1	Frequencies close to the index-borders have been added to the "**configlcuXXonfig**" files to avoid blue-max errors.	

Issue: 2.21-Purity-B	**Based on Issue:** 2.20	**Date:** 10th June, 2009
#	**Change**	**Reference**
1	The blue table has been updated in band 3b to meet the requirements of the "Purity Test": M1V_Min → 3.98V, M2V_Min → -9.52V, M3V_Max → 2.02V, D2V → Indices 16 – 20.	
2	The "drain2_v_blmx" values in the frequency range 930 – 951 GHz "**configlcu3b.config**" file have been updated to achieve the read values of the purity test in TV/TB.	
3	The "drain2_v_blmx" values in the frequency range 1850 – 1900 GHz "**configlcu7b.config**" file have been updated to Blue_Table_Max – 50 mV	Proposed by J. Pearson 09.06.2009

Issue: 2.22	**Based on Issue:** 2.21	**Date:** 15th June, 2009
#	**Change**	**Reference**
1	The purified settings in the "configlcu3b.config" file have been restored.	
2	The D2V_Max values of the blue table have been updated in bands 5a – 7b to the values proposed by JPL.	Proposed by J. Pearson 15.06.2009
3	The blue table has been updated in band 3b to meet the requirements of the purified settings: M1V_Min → 3.68V, M2V_Min → -9.52V, M3V_Max → 2.02V	

Issue: 2.23	**Based on Issue:** 2.22	**Date:** 18th June, 2009
#	**Change**	**Reference**
1	Index 23 has been added in band 3b with a maximum of attenuation (Hex: 1F) to the LSU table.	
2	Index 23 has been added in band 3b to the blue table.	
3	Index 23 has been added in band 3b to the green table.	
4	The frequency range of the "configlcu3b.config" file has been enlarged to 960 GHz due to the index 23.	
5	The frequency range of the "configlo3b.config" file has been enlarged to cover 866 – 960 GHz due to the index 23.	

Issue: 2.24	**Based on Issue:** 2.23	**Date:** 21st July, 2009
#	**Change**	**Reference**
1	The frequencies 1834 GHz (M1=-7.15V, M2=-10.50V) and 1897 GHz (M1= -8.0V, M2=-9.0V) have been added to the "**configlcu7b.config**" file according to the outcomes of the stability investigation. See Section 3.5.	„B7b Stability investigation" by J. Kooi, 20.07.2009

Issue: 2.25	**Based on Issue:** 2.24	**Date:** 16th December, 2009
#	**Change**	**Reference**
1	The power indices in the LSU-tables (prime/redundant) have been changed to the lowest power setting (31)	
2	Green table has been updated to the expected DC-values derived from the TM-pages of the SFT on 26th May 2009.	
3	Blue table has been changed to allow safe settings plus margin (0.1 V) only.	

Issue: 2.26	**Based on Issue:** 2.24	**Date:** 16th December, 2009
#	**Change**	**Reference**
1	The index 30 has been added to the LSU-table (prime/redundant) with the lowest power setting (31) for bands 1, 2, 3, 4, 6, and 7.	
2	For band 5a index 30 of the LSU-table will be used for dissipative mode with the lowest power setting (31). Index 30 of band 5a (1238-1242 GHz) is no longer intended to be used for regular tunings!	
3	For band 5b the LSU-table has been rearranged with larger frequency steps, to allow the usage of index 30 for dissipative mode. Index 30 of band 5b (1188.5-1192.75 GHz) is no longer intended to be used for regular tunings!	
4	Frequency index 30 has been added to the Green table with restricted settings for DC operation only.	
5	Frequency index 30 has been added to the Blue table with restricted settings for DC operation only.	
6	The green table has been updated to avoid GOOL events detected during CoP after anlyzing the TM-pages.	

Issue: 2.27	**Based on Issue:** 2.26	**Date:** 05th January, 2010
#	**Change**	**Reference**
1	For band 7b frequency-independent index -1 of the green table has been extended for D1C_Max from 1 A to 1.11 A to allow for the dissipative mode.	

Issue: 2.28	**Based on Issue:** 2.27	**Date:** 15th January, 2010
#	**Change**	**Reference**
1	D1C at the frequency-independent index -1 has been reset from 1.11 A to 1.0 A (the normal setting) in the green table of band 7b.	
2	The safe setting for M2V of band 2b has been set from -5 V to -4 V. The more forwarded biasing of the multiplier should prevent reverse currents.	TK (15.01.2010)
3	Adjustment of M2V_Max in the blue table has been applied for band 2b (-4.5 V → -3.5 V) due to #2.	
4	A small adjustment for the green table (index 13, 14) has been applied for band 2b due to #2.	
5	Updates have been applied to the "**configlcuXX.config**" (XX = 2b, 3b, 4a, 4b, 5a, 6b) to support the dissipative mode properly.	private communication DT & MC (05.01.2010)

Issue: 2.29	**Based on Issue:** 2.28	**Date:** 25th January, 2010
#	**Change**	**Reference**
1	The safe setting for M2V of band 2b has been set from -4 V to -5 V, as per table 2.27	DT, TK (25.01.2010)
2	M2I in green table (index 13,14) has been revised to values of table 2.27, due to #1	

Issue: 2.30	**Based on Issue:** 2.29	**Date:** 9th February, 2010
#	**Change**	**Reference**
1	CUS table files of release 2.30 are a plain copy, but revised filename, from release 2.29.	
2	Changes in "**configlcu7b.config**" for M1/M2V (purity testing) in the frequency range 1892.5 – 1903 GHz.	email conversation DT, JP (09.02.2010)

Issue: 2.31	**Based on Issue:** 2.30	**Date:** 2nd March, 2010
#	**Change**	**Reference**
1	Blue value in band 6b for G1V minimum changed from -0.62 to -0.92V	HIFI system request, email JP, DT (24.02.2010)
2	Changes in "**configlcu7b.config**" for M1/M2Vin the range 1866GHz-1888GHz	email conversation DT, JP (24.02.2010)

Issue: 2.32	**Based on Issue:** 2.31	**Date:** 3rd March, 2010
#	**Change**	**Reference**
1	CUS table files of release 2.32 are a plain copy, but revised filename, from release 2.31	
2	Changes in "**configlcu7a.config**" for M1 in the range 1709.1GHz-1720.5GHz, M1V to -7V	HIFI system request, email JP, DT (02.03.2010)

Issue: 2.33	**Based on Issue:** 2.32	**Date:** 18th March, 2010
#	**Change**	**Reference**
1	CUS table: band 1a M1 bluemx to 7.6V, LSU table 5a idx 29,30 lower limit extended	email DT (11.03.2010)
2	Changes in "**configlcu1a.config**" for M1 in range 525.5GHz-553.5GHz to 7.45V. "**configlcu5a.config**", "**configlcu5b.config**", "**configlcu6b.config**" new frequency points for interpolation included.	HIFI system request, email, DT (11.03.2010)

Issue: 2.34	**Based on Issue:** 2.33	**Date:** 22nd April, 2010
#	**Change**	**Reference**
1	CUS table: band 1a M1 bluemx to 9V	Request by HIFI system for purity testing
2	LSU table band 5a, voltages in index 29 and 30 revised	Frequency OOL above 1234GHz reported
3	G1C in band 6b for index -1 to -0.645mA, for gate1 voltage operation at -0.91V	Reference email JP, DT (12.04.2010)

Issue: 2.35	**Based on Issue:** 2.34	**Date:** 30th April, 2010
#	**Change**	**Reference**
1	CUS table: Band5a, bluemx M2V -3.25 to -2.9V, bluemx D2Vfor all idx +0.25V, GRMMX M2C 1.65 to 2.0mA, GRMX D2C to 1.05A	Request by HIFI system, JPL, see report JPL/HIFI/RP/2010-002 Issue 1, 21April 2010
2	Band5b, bluemx M1V -4.93 to -4V, bluemx D2V for all idx adapted to allow tuning of configlcu5b.config, GRMX M1C 2.3 to 3.0mA, GRMX M2C 1.5 to 1.8mA, GRMX D2C to 1.15A	Request by HIFI system, JPL, see report JPL/HIFI/RP/2010-002 Issue 1, 21April 2010, email JP 30.04.2010
3	configlcu5a.config, revised and implemented changes according to JPL note. File send to JP for implementation cross check, go ahead given to use file	Reference email JP (30.04.2010)
4	configlcu5b.config, revised and implemented changes according to JPL note. File send to JP for implementation cross check, go ahead given to use file	Reference email JP (30.04.2010)

Issue: 2.36	**Based on Issue:** 2.35	**Date:** 18th June, 2010
#	**Change**	**Reference**
1	CUS table: band 6B GRMN D1C from 0.4 to 0.3A	Request by HIFI system,

		email DT 13.06.2010
2	Configlcu1a.config as per eMail from DT	Reference email DT 17.06.2010
3	Configlcu7b.config as per eMail from DT	Reference email DT 15.06.2010

Issue: 2.38	**Based on Issue:** 2.37	**Date:** 25th March, 2011
#	**Change**	**Reference**
1	LSU Table FRQ Telemetry Voltage Limits changed as proposed by DT and CR Modifications have been meade in the LSU redundant table only	Request by HIFI system, email DT xx.xx.2011

Documents

1.3 Applicable Documents

AD	TITLE	REFERENCE	ISSUE
01	Procedure for Exchange and Upload of LCU Safety Tables	SRON-G/HIFI/AIV/2006-022	0.4 - 24.08.2006

1.4 Reference Documents

RD	TITLE	REFERENCE	ISSUE

2 Scope

This document releases the FM LOU tuning tables defined in a file specified below for upload to the LCU.

The release notes numbered with 0.xx belong to test activities with LO-DUMMY.

Issues numbered with 1.xx are applicable in ILT test phase.
For ILT when LCU IMD2 is used, the table release is labeled with extension x.xx-IMD2.

Issue 1.22-300K is applicable for LOU FM warm unit tests during ILT. These tests will be supervised by MPIfR personnel. No action on the LOU FM hardware, this means no switch on, shall be carried out without MPIfR personnel present. Upload of the safe operational tables and the patch of Issue 1.22-300K is allowed.

ATTENTION: Issue 1.25-300K can only be uploaded to LCU if safe operational tables from Issue 1.24 have been installed in LCU before. This is because of limit checking of LCU on the uploaded safe table values against LCU`s internal RED table.

Releases 2.xx are for satellite level only! Issue 2.00 was prepared for integration in the final software of FMLCU PROM. CUS export file in issue 2.01 was generated from FMLCU PROM content. Uploading this safety table does not change the table memory content of FMLCU and changes therefore not the checksum value.

All previous releases to 2.06 for 300 K operation are obsolete and must not be used!

ATTENTION: The releases 2.07 is for 300 K operation only!
The release 2.07 enlarges the current limit for M2 of band 5a. The operation of band 5a at high multiplier current must be of short duration and excessive use has to be avoided!
300K operations shall be minimized to the absolute necessary, such as SFT and other short duration on-time test for a given LO band. Any other room temperature operation of the LOU must be approved by MPIfR.

ATTENTION: The release 2.13 is only intended to be used during the Purity Test. Tuning is only possible in bands 3b (Indices 16 – 21) and 7b (Indices 11 – 19).

ATTENTION: The releases 2.08 (2.18-Beta, 2.18-Purity) are for operation in the temperature range between 123 K and 145 K!

ATTENTION: The release 2.17 is only intended to be used for TV tests. Specific deviations from previous releases are:

1. **This release is based on numbers sent by JPL via email to MPIfR. MPIfR has not created the table entries in a defined process as usual. The entries have not run on the table checker software. MPIfR shall not be responsible for errors due to inconsistencies.**
2. **The table entries are not derived from the process established at MPIfR. MPIfR is not aware of the process, these entries have been derived from.**
3. **MPIfR is not aware of in which specific tests these tables will be used. It has only been stated in a telecon on 08.12.08 (John Pearson, Willem Jellema, Herman Jacobs, Thomas Klein) that these tables shall be used only for the rest of the TV tests. Which specific tests are performed in this phase is unknown to MPIfR. The user of this safety table shall contact JPL for getting clearance for use in a specific test.**

ATTENTION: The release 2.18-Beta is intended for test purpose only!

ATTENTION: The release 2.18-Purity is intended for the "Purity Test" only! This release <u>does not</u> account for changes in the temperature conditions and/or harness resistances occurring in flight operation which may be revealed after HIFI switch-on and LO-SFT! It is designed for the assumed temperature range of 123 K – 145 K.

ATTENTION: The releases 2.19, 2.20, 2.21-Purity-B, 2.22 – 2.28 are for operation in the temperature range between 115 K and 140 K!

ATTENTION: The config-files of release 2.20 are also applicable to release 2.19!

ATTENTION: For releases 2.21-Purity-B the Max_D2V values in the blue table for band 7b (1850 – 1900 GHz) have been modified according to the values proposed by JPL (09.06.2009): Blue_Table_Max_D2V – 50 mV

ATTENTION: For release 2.22 the Max_D2V values in the blue table for bands 5a to 7b have been updated to the values proposed by JPL.

ATTENTION: With release 2.23 index 23 (956 – 960 GHz) has been added to band 3b. It is intended to be used as "heater" at 958 GHz.

ATTENTION: The release 2.25 is intended for the use in "DC-SFT" only! The LSU power settings are set to minimum power (31). NOT RELEASED!!!

ATTENTION: The release 2.26 includes the dissipative mode with minimum power (31) at the frequency-index 30 and is released in two versions for TEST PURPOSE ONLY!

ATTENTION: The release 2.27 includes the extended DC settings for D1C in band 7b and should be replaced as soon as possible after the LO-SFT! The frequencies of index 30 are for dissipative mode tuning only! In particular the indexes 30 of band 5a (1238–1242 GHz) and 5b (1188.5–1192.75 GHz) are no longer intended to be used for regular tunings!

ATTENTION: With release 2.28 the extended DC settings for D1C in band 7b are removed and set to normal values. The safe setting for M2V of band 2b has been changed to -4 V to prevent reverse currents. The dissipative mode tuning is only allowed in index 30!

ATTENTION: With release 2.29 the safe setting for M2V of band 2b has been changed from -4V back to -5 V, as in release 2.27 and previous. The dissipative mode tuning is only allowed in index 30!

ATTENTION: With release 2.30, the bias voltages of multipliers M1 and M2 have been changed, by input from JPL, in the range 1892.5 – 1903GHz. This affects only the config file: configlcu7b.config. The CUS upload file is as per release 2.29, only filenames are updated.

ATTENTION: With release 2.31, the bias voltages of multipliers M1 and M2 have been changed, by input from HIFI system and JPL, in the range 1866 – 1888GHz. This affects only the config file: configlcu7b.config. The CUS upload file was modified in Band 6b for blue min value of G1V, changed from -0.62 to -0.92V.

ATTENTION: With release 2.32, the bias voltages of multipliers M1 have been changed, by input from HIFI system and JPL, in the range 1709.5 – 1720.5GHz. This affects only the config file: configlcu7a.config. The CUS upload file is as per release 2.31, only filenames are updated.

ATTENTION: With release 2.33, requests by HIFI system included.

ATTENTION: With release 2.34, requests by HIFI system included.

ATTENTION: With release 2.35, requests by HIFI system and JPL included for tests on band 5a and band 5b. Implemented data by JPL note JPL/HIFI/RP/2010-002, Issue 1, 21April, 2010. Configuration files checked by JPL, and go ahead for files was given (see email JP, 30.04.2010).

In case that a LCU on-board software patch is required together with the safe operational table upload, it is stated in section 3.2. The signed software release note will be made available by the software engineer who prepared

the patch. The below given checksum values are only valid in case that LCU was power cycled before safe operational table upload and not put into NORMAL mode afterwards. Otherwise, only the NORMAL mode checksum value stated below is valid.

3 Applicable Subsystem Configuration

3.1 Unit Configuration

LOU Model: LOU FM	**Section: N.A.**	
LCU Model: LCU FM	**Section: Main/Redundant**	**PROM Version: 0x2917**
LSU Model: LSU PFM	**Section: Main/Redundant**	

3.2 Required LCU On-Board Software Patches

Patch	LCU Model	Section	Change
patch_LCUFM_24	**FM**	**Prime or Redundant in FM**	

3.3 Harness Configuration

LOU BAND	LOUFM – LCUFM	LOUFM – LSUFM
1a	Satellite Harness for BAND I A	HIFI WAVEGUIDE ASSEMBLY for BAND I A
1b	Satellite Harness for BAND I B	HIFI WAVEGUIDE ASSEMBLY for BAND I B
2a	Satellite Harness for BAND II A	HIFI WAVEGUIDE ASSEMBLY for BAND II A
2b	Satellite Harness for BAND II B	HIFI WAVEGUIDE ASSEMBLY for BAND II B
3a	Satellite Harness for BAND III A	HIFI WAVEGUIDE ASSEMBLY for BAND III A
3b	Satellite Harness for BAND III B	HIFI WAVEGUIDE ASSEMBLY for BAND III B
4a	Satellite Harness for BAND IV A	HIFI WAVEGUIDE ASSEMBLY for BAND IV A
4b	Satellite Harness for BAND IV B	HIFI WAVEGUIDE ASSEMBLY for BAND IV A
5a	Satellite Harness for BAND V A	HIFI WAVEGUIDE ASSEMBLY for BAND V A
5b	Satellite Harness for BAND V B	HIFI WAVEGUIDE ASSEMBLY for BAND V B
6a	Satellite Harness for BAND VI A	HIFI WAVEGUIDE ASSEMBLY for BAND VI A **with attenuator SRON ATT5DB**
6b	Satellite Harness for BAND VI B	HIFI WAVEGUIDE ASSEMBLY for BAND VI B **with attenuator SRON ATT6DB-SN3**
7a	Satellite Harness for BAND VII A	HIFI WAVEGUIDE ASSEMBLY for BAND VII A **with attenuator SRON ATT6DB-SN4**
7b	Satellite Harness for BAND VII B	HIFI WAVEGUIDE ASSEMBLY for BAND VII B **with attenuator SRON ATT6DB-SN1**

3.4 Harness Line Resistances Drain 2

LOU Band	R in ILT3 [mOhm]	R_{warm} IST [mOhm]	R_{Cold} SOVT-2 [mOhm]	R_{Cold} COP [mOhm]	R_{Cold} COP_2 [mOhm]
1a	411.5	281.1	233.3	232.2	234.3
1b	422.0	295.6	246.0	245.4	233.3
2a	412.1	288.7	234.1	234.1	238.6
2b	426.6	299.0	245.0	244.4	234.9
3a	399.2	285.2	236.0	234.9	240.2
3b	404.6	301.5	249.6	248.6	238.9
4a	394.3	275.1	222.8	221.9	224.5
4b	396.4	284.5	232.8	232.5	224.2
5a	390.6	258.7	205.5	204.7	206.6
5b	390.1	265.3	216.4	209.6	202.6
6a	393.8	269.0	216.8	215.5	217.2
6b	390.0	279.7	228.6	227.3	217.7
7a	399.5	258.0	206.2	205.0	207.4
7b	388.3	267.6	216.9	215.9	208.2

3.5 Results of purity test in COP for bands 3b and 7b

Frequency [GHz]	M1V [V]	M2V [V]	M3V [V]
930.000	10.000	-7.500	1.200
931.500	10.000	-7.500	1.200
931.999	9.667	-7.666	1.300
932.000	9.667	-7.667	1.300
933.000	9.000	-8.000	1.500
934.000	7.000	-8.000	1.500
934.500	6.000	-8.000	1.500
934.800	6.500	-8.500	1.446
935.800	5.500	-8.500	1.265
935.88462	7.000	-9.000	1.250
935.999	6.752	-9.000	1.238
936.000	6.750	-9.000	1.237
936.34615	6.000	-9.000	1.200
936.80769	5.500	-9.000	1.200
937.26923	5.000	-9.000	1.200
937.500	4.850	-9.000	1.210
937.73077	4.700	-9.000	1.220
938.000	4.700	-9.000	1.267
938.19231	4.700	-9.000	1.300
938.65385	4.700	-9.000	1.400
939.000	4.550	-9.375	1.475
939.11539	4.500	-9.500	1.500
939.57692	3.700	-9.500	1.500
939.999	3.700	-9.500	1.500
940.000	3.700	-9.500	1.500
940.03846	3.700	-9.500	1.500
940.500	5.000	-8.500	1.500
941.000	5.500	-8.500	1.600
942.000	5.500	-8.500	1.933
942.200	5.500	-8.500	2.000
943.400	6.000	-8.500	1.250
943.500	6.167	-8.500	1.263
943.999	6.998	-8.500	1.325
944.000	7.000	-8.500	1.325
944.600	8.000	-8.500	1.400
945.000	10.000	-8.000	1.421
945.800	9.000	-8.000	1.463
946.000	9.000	-8.000	1.474
946.500	9.000	-8.000	1.500
947.999	7.236	-8.441	1.235
948.000	7.235	-8.441	1.235
948.200	7.000	-8.500	1.200
949.400	6.500	-8.500	1.200
949.500	6.500	-8.500	1.200
950.000	6.500	-8.500	1.200
950.600	6.500	-8.500	1.200
951.000	6.000	-8.500	1.200

Settings for band 3b

Frequency [GHz]	M1V [V]	M2V [V]
1827.00	-6.90	-9.85
1831.50	-6.90	-9.39
1834.00	-7.15	-10.50
1836.00	-6.90	-8.24
1840.50	-6.90	-7.54
1842.75	-6.90	-8.46
1845.00	-6.90	-9.74
1849.50	-6.90	-9.66
1854.00	-6.90	-9.88
1858.50	-7.13	-10.39
1863.00	-7.70	-10.40
1865.25	-7.70	-10.23
1867.50	-7.96	-10.68
1872.00	-8.47	-11.18
1876.50	-8.52	-10.49
1878.75	-8.28	-10.47
1881.00	-8.00	-11.53
1885.50	-7.50	-12.00
1890.00	-7.50	-9.30
1894.50	-7.50	-11.00
1897.00	-8.00	-9.00
1899.00	-7.60	-12.00
1903.50	-7.60	-12.00
1908.00	-7.60	-11.28

Settings for band 7b

3.6 Frequency List for LO SFT (cold) and D2V settings for Prime and Redundant

LOU Band	Frequency [GHz]	D2Vset [V]
1a	520.0	2.60
1b	579.0	2.63
2a	652.0	2.35
2b	732.0	2.32
3a	845.5	2.79
3b	882.0	2.40
4a	991.0	2.33
4b	1070.0	2.31
5a	1124.0	2.05
5b	1167.0	2.09
6a	1568.0	2.15
6b	1584.0	2.74
7a	1768.5	2.07
7b	1723.5	2.04

3.7 Frequency List for dissipative mode and D2V safe settings

LOU Band	Frequency [GHz]	Index	D2Vset [V]
1a	519.0	30	1.45
1b	594.0	30	1.58
2a	672.0	30	1.45
2b	795.0	30	1.45
3a	804.5	30	1.56
3b	958.0	30	1.47
4a	1055.0	30	1.45
4b	1134.0	30	1.45
5a	1240.0	30	1.13
5b	1190.0	30	1.12
6a	1411.0	30	1.14
6b	1741.0	30	1.10
7a	1688.0	30	1.14
7b	1816.0	30	1.15

3.8 Setting for the programmable hardware current limits on the drain stages of LCU

The settings for the programmable hardware current limits on the drain stages shall be as in the cold phase of ILT. As reference they are given in the table below.

LOU Band	Parameter	Current Limit [A]	LOU Band	Parameter	Current Limit [A]
1a	drain 1	1.22	1b	drain 1	1.22
	drain 2	1.30		drain 2	1.22
2a	drain 1	1.22	2b	drain 1	1.30
	drain 2	1.40		drain 2	1.30
3a	drain 1	1.22	3b	drain 1	1.22
	drain 2	1.22		drain 2	1.40
4a	drain 1	1.22	4b	drain 1	1.30
	drain 2	1.40		drain 2	1.40
5a	drain 1	1.30	5b	drain 1	1.30
	drain 2	1.22		drain 2	1.30
6a	drain 1	1.30	6b	drain 1	1.22
	drain 2	1.30		drain 2	1.40
7a	drain 1	1.22	7b	drain 1	1.22
	drain 2	1.22		drain 2	1.30

4 Applicable LOU Temperature Range

LOU Operational Temperature Range	**T_min: 115K**	**T_max: 140K**

5 Verification of the tables

The following has been checked on the tables of the current Issue.

Issue: 2.36		**Date:** 18th June, 2010
Table	**Test**	**Checked**
LSU	All bands (1a – 7b) are present in the table	OK
LSU	Format of all lines is correct	OK
LSU	MIN_ LSUFRQ_Voltage < MAX_LSUFRQ_Voltage	OK
Red/Blue	All bands (1a – 7b) are present in the table	OK
Red/Blue	Format of all lines is correct	OK
Red/Blue	MIN_RED < SAFE_RED < MAX_RED	OK
Red/Blue	MIN_BLUE > MIN_RED and SAFE_Red > MIN_BLUE	OK
Red/Blue	MAX_BLUE < Max_RED and SAFE_Red < MAX_BLUE	OK
Red/Blue	MAX_BLUE_D2V < MAX_RED and SAFE_RED < MAX_BLUE_D2V	OK
Green	All bands (1a – 7b) are present in the table	OK
Green	Format of all lines is correct	OK
Green	MIN_GREEN < MAX_GREEN	OK
Green	MIN_GREEN ≥ INDEX -1	OK
Green	Is MAX_GREEN ≤ INDEX -1	OK
CUS	All values of the red, blue, and green table are equal to the corresponding values of the CUS-table	OK
ConfiglcuXX.config	All parameters (M1, M2, M3, G1, G2, D1) are within blue limits	OK
ConfiglcuXX.config	All values for G1, G2, D1 are equal to the safe values	OK
ConfiglcuXX.config	D2V_MIN = MIN_BLUE	OK
ConfiglcuXX.config	D2V_MAX = MAX_BLUE / MAX_EIDP	OK
ConfigloXX.config	Current Limits are correct	OK

All configuration files are a copy of release I2.35 except: configlcu1a.config and configlcu7b.config as per eMail from DT included.

Filename / CHEKSUM Value / HASH Value for MAIN Section

		Signature
LCUFM MAIN, LSUFM MAIN, LOUFM		
File Identification MAIN	**101021_I2-37_CUS-Table_115-140K_FLIGHT_DISS_MAIN.txt**	**TK**
Calculated Hash Value Date: 18.10.2010 Time 18:59:32	**34ae2cb7ffea58bde141b341d7f22cb3**	
Check with "Table_Checker_Tool" Vers. 2.8	**Successful**	**CL**
LCU On-Board Software Patch		**Refer to LCU On-Board Software Release Note: SRC/LCU/PR/2000-601 Issue 2.4 19.02.2010**
File Identification	**100217_LCU-patch24.txt**	
Calculated CHEKSUM Value after patch upload	**STANDBY mode: 0x0E71**	
Calculated CHEKSUM Value with uploaded safe operational table and after patch upload (If command HL_DEF_SAFE **followed by command** HIFI_check_LCU_memory **is send after table upload in STANDBY mode, checksum value changes to its final value which is equal to the stated NORMAL mode value)**	**STANDBY mode: 0xFE9D** **NORMAL mode: 0x05FC**	
LCU on-board software version changes to	**292A**	
Calculated Hash Value	**89a794d2c383ff080f172aba14fd9446**	

6 Filename / CHEKSUM Value / HASH Value for Redundant Section

		Signature
LCUFM REDUNDANT, LSUFM REDUNDANT, LOUFM		
File Identification REDUNDANT	106018_l2-38_CUS-Table_115-140K_FLIGHT_DISS_RED.txt	TK
Calculated Hash Value Date: 25.03.2011 Time 12:58:07	bff12ad35abf23996ff446a0cc64b408	
Check with "Table_Checker_Tool" Vers. 2.8	Successful	CL
LCU On-Board Software Patch		
File Identification	100217_LCU-patch24.txt	
Calculated CHEKSUM Value after patch upload	STANDBY mode: 0x0E71	
Calculated CHEKSUM Value with uploaded safe operational table and after patch upload (If command HL_DEF_SAFE followed by command HIFI_check_LCU_memory is send after table upload in STANDBY mode, checksum value changes to its final value which is equal to the stated NORMAL mode value)	STANDBY mode: 0xF2CD NORMAL mode: 0xFA2A	Refer to LCU On-Board Software Release Note: SRC/LCU/PR/2000-601 Issue 2.4 19.02.2010
LCU on-board software version changes to	292A	
Calculated Hash Value	89a794d2c383ff080f172aba14fd9446	