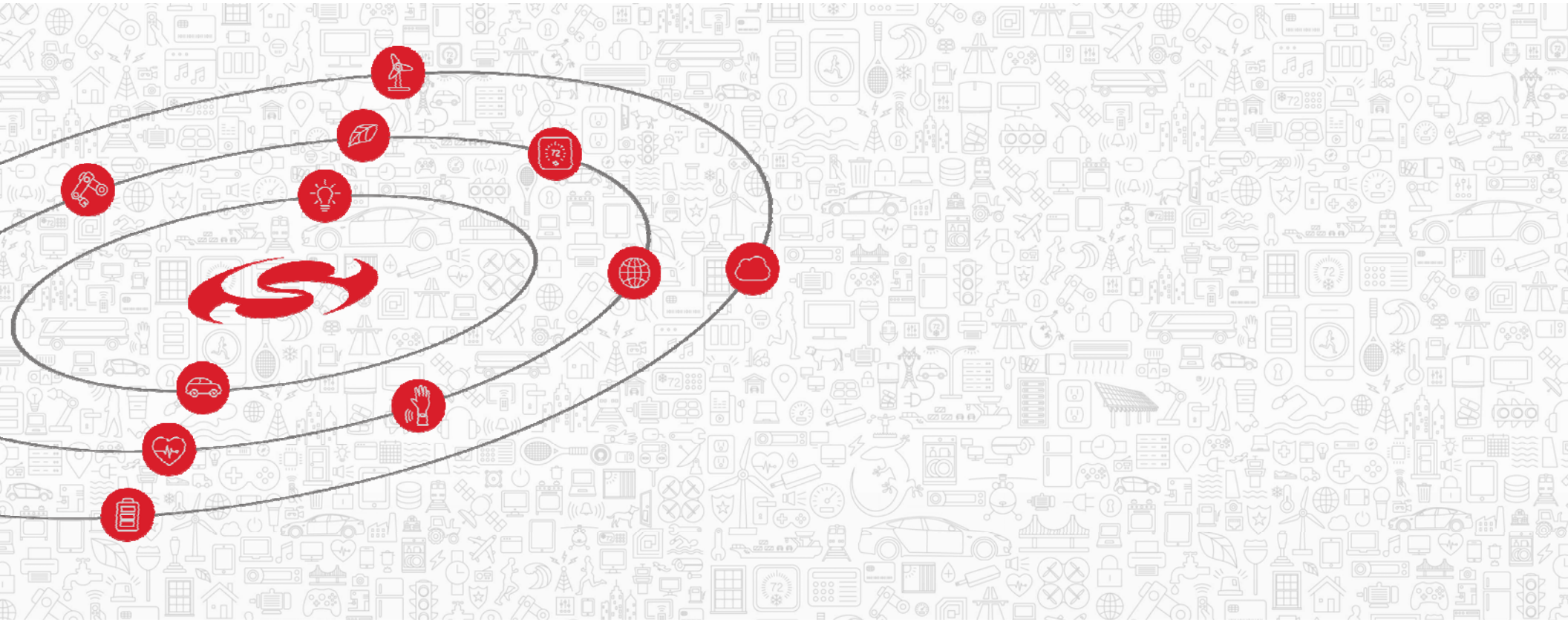

NorDig Unified Test Plan ver 2.5.0 tasks 3:10 and 3:49 Selection between identical services

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SILICON LABS

Outline

- Clarifications needed about tasks 3:10 and 3:49
- Task 3:10 implementation and test results with Silicon Labs devices
- Comments on Teracom test procedure for NorDig task 3:10
- Proposals on Teracom test procedure for NorDig task 3:10

Clarifications needed about tasks 3:10 and 3:49 1/2

- First part measurement record: Receiver channel in test point 11

Requirement	Result DVB-T	Result OK or NOK	Reference conditions in flowchart [1] Annex D
Starting of automatic channel search deletes all services in the service lists.			
After automatic channel search the channel lists do not contain duplicated services.			
Received channel in test point 6			
Received channel in test point 11 Received channel shall be different than it was in point 6 for the OK result.			1 or 5
Received channel in test point 14. Received channel shall be the same it was is point 6 for the OK result.			3 or 7

6. Check that the services on the channel list is listed once and not duplicated. Check which channel is received by trying to attenuate the signal level. The services from received channel are frozen when the signal level is too low. Restore the attenuations to a level before you changed it.
7. Fill in OK or NOK in the measurement record depending if the services were deleted.
   Fill in also the received channel in the measurement record.
8. Attenuate the carrier you are receiving (in test point 6) to a level that the QMP1 is fulfilled. The attenuation shall result to input level difference corresponding $\Delta S > 10\%$.
9. Perform automatic channel search.
10. Check that the services on the channel list are from the other carrier (not the same as in test point 6) by trying to attenuate the signal level of that carrier. Restore the attenuation to a level before you changed it.
11. Fill in the received channel in the measurement record.
12. Attenuate the carrier you are receiving to a signal level that the QMP1 is fulfilled. Decrease the attenuation for the carrier received in test point 6 to a level which corresponds good reception quality and verify the signal level of that carrier is higher than the signal level of the received carrier and the attenuation shall result to input level difference corresponding $\Delta S < 10\%$.
13. Perform automatic channel search.
14. Check that the services on channel list are from the other carrier (same as in test point 6) by trying to attenuate the signal level of that carrier. Restore the attenuation to a level before you changed it.
15. Fill in the received channel in the measurement record.

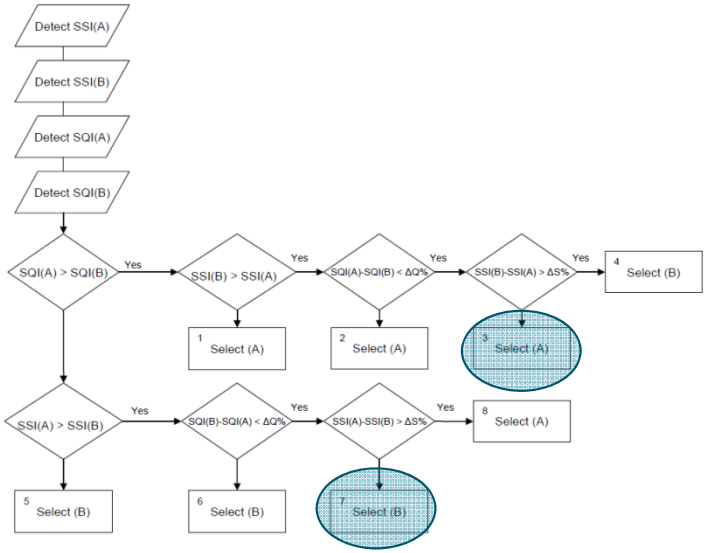
- To be coherent with all other test points, starting with « Check… », received channel in test point 10 is expected.

Could this be confirmed?

Clarifications needed about tasks 3:10 and 3:49 2/2

- First part measurement record: Receiver channel in test point 14

Requirement	Result DVB-T	Result OK or NOK	Reference conditions in flowchart [1] Annex D
Starting of automatic channel search deletes all services in the service lists.			
After automatic channel search the channel lists do not contain duplicated services.			
Received channel in test point 6.			
Received channel in test point 11. Received channel shall be different than it was in point 6 for the OK result.			1 or 5
Received channel in test point 14. Received channel shall be the same it was is point 6 for the OK result.			3 or 7



- Reference condition 3 requires unexpected RSSI inaccuracy such that SSI B > SSI A despite power level A > power level B. Assuming SSI A > SSI B, reference condition 1 is expected. Could this be clarified?
- Note that reference condition 7 requires power level of channels A and B much higher than QMP1 level to get same SQI for both channels while condition 5 requires same high power level (not compliant with test point 12) for both channels to get same SSI and SQI.
- As reference conditions 3 and 7 are validated in test points 23 and 27, it is expected that test point 14 validates conditions 5 or 1. Could this be clarified?

Task 3:10 implementation and test results with Silicon Labs devices 1/2

- Typical test results performed on Silicon Labs tuner + demodulator evaluation board

Test conditions									Test requirements and results						
Task 3:10 test point	Channel A (666MHz)				Channel B (754MHz)				Delta SSI		Delta SQI		flowchart number (Figure 1 of Annex D)	Spec.	Result
	Signal level [dBm]	CNR [dB]	BER settings		Signal level [dBm]	CNR [dB]	BER settings		Spec.	Result	Spec.	Result			
6-CHA	-60	none	none	none	-60	none	none	none							CHA
10a	-87.3	none	none	none	-60	none	none	none	>10	85		100	5	CHB	CHB
14a	-80	none	none	none	-87.1	none	none	none	<=10	5		92	1	CHA	CHA
									>0	5					
6-CHB	-60	none	none	none	-60	none	none	none							CHB
10b	-60	none	none	none	-87.1	none	none	none	>10	85		100	1	CHA	CHA
14b	-50	none	none	none	-57	none	none	none	<=10	4		0	7	CHB	CHB
									>0	4					
20	-100	none	none	none	-58	none	none	none							CHB
23	-61	none	none	none	-58	20.9	none	none	<=10	5	<20	12	3	CHA	CHA
									>0	5	>0	6			
27	-53	19.9	none	none	-58	20.9	none	none	<=10	3	<20	14	7	CHB	CHB
									>0	3	>0	3			
31	-53	19.9	none	none	-49	17.9	none	none	<=10	3	>=20	28	2	CHA	CHA
									>0	3					
35	-40	15.9	none	none	-49	17.9	none	none	<=10	3	>=20	33	6	CHB	CHB
									>0	3					
			Disabled carriers [start, stop]												
42a	-50	none	3408	4548	-65	none	3408	4458	>10	30	<20	6	8	CHA	CHA
											>0	3			
48a	-65	none	3408	4458	-50	none	3408	4548	>10	30	<20	7	4	CHB	CHB
											>0	4			
			Modulator impairment [Quadrature error]												
42b	-50	none	10		-65	none	none		>10	26	<20	15	8	CHA	CHA
											>0	10			
48b	-65	none	none		-50	none	10		>10	26	<20	15	4	CHB	CHB
											>0	10			

Task 3:10 implementation and test results with Silicon Labs devices 2/2

- SSI and SQI measurements are performed on each channel

Channel A (666MHz) measurements									
Task 3:10 test point	Level [dBm]	CNR [dB]	Disabled carriers: [start, stop] IQ impairment:		SSI min value [%]	SSI max value [%]	SQI min value [%]	SQI max value [%]	Comments
6-CHA	-60	none	none	none	90	90	100	100	
10a	-87.3	none	none	none	5	5	0	0	Minimum level fulfilling QMP1 criteria
14a	-80	none	none	none	10	10	92	93	Level is 7dB higher than channel B to get delta SSI around 5 (7*2/3=4.67)
6-CHB	-60	none	none	none	90	90	100	100	
10b	-60	none	none	none	90	90	100	100	
14b	-50	none	none	none	96	96	100	100	Level is 7dB higher than channel B to get delta SSI around 5 (7*2/3=4.67)
23	-61	none	none	none	86	86	99	100	For test points 23 to 35, 4 measurements shall met condition 0< Delta SSI < 10.
27	-53	19.9	none	none	94	94	79	85	To reduce error due to RSSI accuracy, power levels were selected as much as possible where SSI slope versus level is 2/3 (between -60 and -45dBm,
31	-53	19.9	none	none	94	94	79	85	with typical SSI varying between 90 and 100)
35	-40	15.9	none	none	100	100	10	11	Gaussian noise was set to meet delta SQI criteria with SiLabs demodulators
42a	-50	none	3408	4548	96	96	37	39	Level are set assuming up to +/-3dB accuracy on power level measurement:
48a	-65	none	3408	4458	66	66	42	43	-50dBm corresponds to SSI between 94 and 99, -65dBm corresponds to SSI between 58 and 82.
42b	-50	none	10		96	96	85	90	So delta SSI is at minimum 12, greater than 10 required
48b	-65	none	none		70	70	100	100	Carrier removal or IQ impairment are set to meet delta SQI criteria with SiLabs demodulators

Channel B (754MHz) measurements									
Task 3:10 test point	Level [dBm]	CNR [dB]	Disabled carriers: [start, stop] IQ impairment:		SSI min value [%]	SSI max value [%]	SQI min value [%]	SQI max value [%]	Comments
6-CHA	-60	none	none	none	90	90	99	100	
10a	-60	none	none	none	90	90	99	100	Level is much higher than channel A to get delta SSI greater than 10
14a	-87.1	none	none	none	5	5	0	0	Level is set to fulfill QMP1 criteria and to have small SSI slope versus level (2/3 for level lower than -80dBm)
6-CHB	-60	none	none	none	90	90	99	100	
10b	-87.1	none	none	none	5	5	0	0	Minimum level fulfilling QMP1 criteria
14b	-57	none	none	none	92	92	100	100	To check flowchart number 7, level is set high enough to get SQI of 100 and to have small SSI slope versus level (2/3 for level higher than -60dBm)
23	-58	20.9	none	none	91	91	88	93	For test points 23 to 35, 4 measurements shall met condition 0< Delta SSI < 10.
27	-58	20.9	none	none	91	91	88	93	To reduce error due to RSSI accuracy, power levels were selected as much as possible where SSI slope versus level is 2/3 (between -60 and -45dBm,
31	-49	17.9	none	none	97	97	44	51	with typical SSI varying between 90 and 100)
35	-49	17.9	none	none	97	97	44	51	Gaussian noise was set to meet delta SQI criteria with SiLabs demodulators
42a	-65	none	3408	4458	66	66	42	43	Level are set assuming up to +/-3dB accuracy on power level measurement:
48a	-50	none	3408	4548	96	96	36	38	-50dBm corresponds to SSI between 94 and 99, -65dBm corresponds to SSI between 58 and 82.
42b	-65	none	none		70	70	100	100	So delta SSI is at minimum 12, greater than 10 required
48b	-50	none	10		96	96	85	90	Carrier removal or IQ impairment are set to meet delta SQI criteria with SiLabs demodulators

Comments on Teracom test procedure for NorDig task 3:10 1/2

- Test procedure currently used for NorDig certification does not match requirements of NorDig Unified Test plan ver 2.5
- Levels currently applied assume perfect accuracy of tuner RSSI
  - Nordig requirements specify tuner RSSI accuracy of +/-5dB between -80 and -60dBm and +/-7dB above -60dBm
  - Silicon Labs is concerned about IRD software modification implemented to blankly comply with current test conditions (for example, bias added to tuner RSSI measurement)
- Channel B frequency of 754MHz belongs to 700MHz band to be released
- Silicon Labs is concerned about some IRD manufacturers considering that these test conditions are fixed, although the signal level and CNR values listed for each test item are only suggested values which should enable the required delta SSI and delta SQI to be achieved to verify flowchart in Annex D of NorDig Unified requirements.

Comments on Teracom test procedure for NorDig task 3:10 2/2

Test item	Test conditions									Expected result	flowchart number (Figure 1 of Annex D)	Comments
	task 3:10 test point	Channel A (666MHz)				Channel B (754MHz)						
		Level [dBm]	CNR [dB]	Removed carriers [start, stop]		Level [dBm]	CNR [dB]	Removed carriers [start, stop]				
1	6	-60	none	none	none	-60	none	none	none	delta SSI = 0 delta SQI = 0		CHB is assumed to be received in test point 6
2	10	-50	none	none	none	-61	none	none	none	delta SSI > 10 delta SQI = 0	8 expected to be validated	According to Nordig test requirements, CHA level should be same as in step 6. To comply with delta SSI > 10 with CHB level of -61dBm, Teracom assumes that accuracy of tuner RSSI is perfect and that SSI is rounded to closest integer number (SSI=97 at -50dBm, SSI=86 at -61dBm).
3	NA	-61	none	none	none	-50	none	none	none	delta SSI > 10 delta SQI = 0	5 expected to be validated	same as above
NA	14		none	none	none		none	none	none	0 < delta SSI <= 10	to be clarified	Not tested by Teracom.
4	23	-61	C/N@QMP2+1 dB	none	none	-60	C/N@QMP2+ 0.5dB	none	none	0 < delta SSI <= 10 0 < delta SQI < 20	3 expected to be validated	According Nordig test requirements, CHA should have no noise. CHA level should be defined to ensure that DeltaSSI > 0 for steps 23 to 35.
5	27	-60	C/N@QMP2+0 .5dB	none	none	-61	C/N@QMP2+ 1dB	none	none	0 < delta SSI <= 10 0 < delta SQI < 20	7 expected to be validated	According to Nordig test requirements, CHB level and noise should be same as in step 23. To comply with delta SSI <= 10, Teracom assumes that accuracy of tuner RSSI is perfect (SSI=90 at -60dBm, SSI=86 at -61dBm). Teracom selects channel power levels where SSI slope versus input power level is worse (slope of 4 instead of 0.66).
6	31	-61	none	none	none	-60	C/N@QMP2+ 1dB	none	none	0 < delta SSI <= 10 delta SQI >= 20	2 expected to be validated	According to Nordig test requirements, CHA level and noise should be same as in step 27 and CHB level should be defined to ensure that 0 < DeltaSSI <= 10. Same comment as above regarding Teracom assumption of perfect tuner accuracy and use of channel power levels where SSI slope is worse.
7	35	-60	C/N@QMP2+1 dB	none	none	-61	none	none	none	0 < delta SSI <= 10 delta SQI >= 20	6 expected to be validated	According to step 35 of Nordig test requirements, CHB level and noise should be same as in step 31 and CHA level should be defined to ensure that 0 < DeltaSSI <= 10. Same comment as above regarding Teracom assumption of perfect tuner accuracy and use of channel power levels where SSI slope is worse.
10	42	-50	none	3408	4548	-61	none	3408	4458	delta SSI > 10 0 < delta SQI < 20	8 expected to be validated	TX1 BER > TX2 BER. Range of carriers removed is defined according to performance of SiLabs demodulators. To comply with delta SSI > 10, Teracom assumes with these levels that accuracy of tuner RSSI is perfect (see comment of Test item 2)
11	48	-61	none	3408	4458	-50	none	3408	4548	delta SSI > 10 0 < delta SQI < 20	4 expected to be validated	TX2 BER > TX1 BER. Same comments as above.
8		-50	none	none	none	-60	C/N@QMP2+ 1dB	none	none	0 < delta SSI <= 10 delta SQI >= 20	1 expected to be validated	Specific Teracom tests added To comply with delta SSI <= 10, Teracom assumes that accuracy of tuner RSSI is perfect (SSI=90 at -60dBm, SSI=97 at -50dBm). Test fails if -61dBm is measured instead of -60dBm (SSI=86).
9		-60	C/N@QMP2+1 dB	none	none	-50	none	none	none	0 < delta SSI <= 10 delta SQI >= 20	5 expected to be validated	
12		-60	none	3408	4458	-60	none	3408	4548	delta SSI = 0 0 < delta SQI < 20	1 expected to be validated	
13		-60	none	3408	4548	-60	none	3408	4458	delta SSI = 0 0 < delta SQI < 20	5 expected to be validated	

Proposals on Teracom test procedure for NorDig task 3:10

- Test procedure currently used for NorDig certification does not match requirements of NorDig Unified Test plan ver 2.5
  - Silicon Labs proposal is to update next Nordig Unified Test plan release/addendum to match test procedure
- Levels currently applied assume perfect accuracy of tuner RSSI
  - To enable condition « delta SQI > 10 » for test item 2, 3, 10 and 11, Silicon Labs proposal is to update channel levels from -60 or -61dBm to -65dBm, which fulfill condition for a channel to channel RSSI accuracy of up to +/-3dB
  - To enable condition « 0< delta SQI <= 10 » for test item 4, 5, 6, 7, 8, 9, Silicon Labs proposal is to use channel levels of -57 and -50dBm to benefit from SSI slope versus input power level of 0.66 and fulfill condition for a channel to channel RSSI accuracy of up to +/-3dB
- Channel B frequency of 754MHz belongs to 700MHz band to be released
  - Silicon Labs proposal is to use same channel frequencies as in next Dbook release (474MHz and 690MHz)
- Silicon Labs is concerned about some IRD manufacturers considering that these test conditions are fixed
  - Silicon Labs proposal is to add in measurement record of task 3:10 and 3:49 same comment as in next Dbook release: The signal level and CNR values listed for each test item are suggested values which should enable the required delta SSI and delta SQI to be achieved. However it is still necessary to verify that the resultant delta SSI and delta SQI values meet the requirements for each test and if not the CNR and signal level values can be adjusted until these requirements are met.