

Test Report

No B41-19-AJ-I1

PRIME 1.4 Certification Tests Cases for Service Nodes

EQUIPMENT UNDER TEST	THREE-PHASE smart meter with integrated PRIME Power Line Communications
MODEL	AM370
FIRMWARE VERSION	01.04.03.01.0002
CERTIFICATION SCOPE	PRIME v1.4: Certification Process Profile: Electricity Meter with PRIME PHY and PRIME MAC. PRIME 1.4 CH1, CH5 • PRIME 1.4 PHY • PRIME 1.4 MAC layer ◦ Excluding security profiles ◦ Excluding backward compatibility. • PRIME 1.4 Convergence layer
DATE OF EXECUTION	21st January to 11th March 2019

Responsible for tests	Smart Data & Protocol Laboratory Manager
	
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NOTE: This test report shows the detailed information associated with the Test Report Summary no. B41-19-AJ-I1 summary

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1.- EQUIPMENT UNDER TEST IDENTIFICATION

Unit:	THREE-PHASE smart meter with integrated PRIME Power Line Communications
Model:	AM370
Trade Mark:	ZPA Smart Energy a.s.
Serial Number:	M1: n° 181105014 (MAC C0:BD:42:00:F4:D2) M2: n° 181105 022 (MAC C0:BD:42:00:F4:CF)
Manufacturer:	ZPA Smart Energy a.s.



The samples were selected and delivered by the applicant.

Equipment characteristics declared by the applicant:

Device type	ENERGY METER WITH PRIME COMMUNICATION
BaudRate	57600
Firmware version	01.04.03.01.0002
Applicable channel	Channels 1 and 5
Previous Tests	The board passed all the tests requested to be compliant with: EN 50065-1:2011 EN 50065-2-3:2003 + Ec:2003 + A1:2005 EN 50065-7:2001 at: Electronic Devices Laboratory of TECNALIA Test Report No. B41-18-AJ-I1

Applicable tests

Profile Electricity Meter with PRIME PHY and PRIME MAC. PRIME 1.4 CH1, CH5 using precertified chipset.

- PRIME 1.4 PHY
- PRIME 1.4 MAC layer according to precertified chipset
 - Excluding security profiles
 - Excluding backwards compatibility
- PRIME 1.4 Convergence layer according to precertified chipset

PRIME PLC MODEM is certified PRIME 1.4 tests report number No B41-19-AI-I1 of the Smart Data & Protocol Laboratory of TECNALIA

2.- SUMMARY OF TEST RESULTS FOR CHANNEL 1

Tools used for Certification

- Microchip Prime Manager Vendor Tool (VT) to configure the DUT, trigger actions, and confirm manually MAC and CL tests result. Also used as auxiliary SW to run some MAC and CL tests.
- Neuron Conformance Test Tool (NT) to run testcases defined in PRIME Certification 1.4 Service Node Test book v2.9.
- Tecnalia Testing Tool (TT) to run testcases defined in PRIME Certification 1.4 Service Node Test book v2.9.
- Tecnalia Lab. Auxiliary tools (LT) to run MAC and CL tests when needed and to check manually testcases to confirm final result.

PRIME 1.4 PHY Layer			Tools
2.5 PHY Test Cases: Transmission and reception test cases			
Type A Frame			
2.3.2.1	Verify error free reception of DBPSK type A frames in channel ch 1	PASS	TT
2.3.2.2	Verify error free transmission of DBPSK type A frames in channel ch 1	PASS	TT
2.3.3.1	Verify error free reception of DBPSK_C type A frames in channel ch 1	PASS	TT
2.3.3.2	Verify error free transmission of DBPSK_C type A frames in channel ch 1	PASS	TT
2.3.4.1	Verify error free reception of DQPSK type A frames in channel ch 1	PASS	TT
2.3.4.2	Verify error free transmission of DQPSK type A frames in channel ch 1	PASS	TT
2.3.5.1	Verify error free reception of DQPSK_C type A frames in channel ch 1	PASS	TT
2.3.5.2	Verify error free transmission of DQPSK_C type A frames in channel ch 1	PASS	TT
2.3.6.1	Verify error free reception of D8PSK type A frames in channel ch 1	PASS	TT
2.3.6.2	Verify error free transmission of D8PSK type A frames in channel ch 1	PASS	TT
2.3.7.1	Verify error free reception of D8PSK_C type A frames in channel ch 1	PASS	TT
2.3.7.2	Verify error free transmission of D8PSK_C type A frames in channel ch 1	PASS	TT

2.3.8.1	Verify error free reception of DBPSK type A frames in channel ch 1 (55°)	PASS	TT
2.3.8.2	Verify error free transmission of DBPSK type A frames in channel ch 1 (55°)	PASS	TT
2.3.9.1	Verify error free reception of D8PSK_C type A frames in channel ch 1 (55°)	PASS	TT
2.3.9.2	Verify error free transmission of D8PSK_C type A frames in channel ch 1 (55°)	PASS	TT
Type B Frame			
2.3.10.1	Verify error free reception of DBPSK type B frames in channel ch 1	PASS	TT
2.3.10.2	Verify error free transmission of DBPSK type B frames in channel ch 1	PASS	TT
2.3.11.1	Verify error free reception of DBPSK_C type B frames in channel ch 1	PASS	TT
2.3.11.2	Verify error free transmission of DBPSK_C type B frames in channel ch 1	PASS	TT
2.3.12.1	Verify error free reception of DQPSK type B frames in channel ch 1	PASS	TT
2.3.12.2	Verify error free transmission of DQPSK type B frames in channel ch 1	PASS	TT
2.3.13.1	Verify error free reception of DQPSK_C type B frames in channel ch 1	PASS	TT
2.3.13.2	Verify error free transmission of DQPSK_C type B frames in channel ch 1	PASS	TT
2.3.14.1	Verify error free reception of D8PSK type B frames in channel ch 1	PASS	TT
2.3.14.2	Verify error free transmission of D8PSK type B frames in channel ch 1	PASS	TT
2.3.15.1	Verify error free reception of D8PSK_C type B frames in channel ch 1	PASS	TT
2.3.15.2	Verify error free transmission of D8PSK_C type B frames in channel ch 1	PASS	TT
2.3.16.1	Verify error free reception of Robust DBPSK type B frames in channel ch 1	PASS	TT
2.3.16.2	Verify error free transmission of Robust DBPSK type B frames in channel ch 1	PASS	TT
2.3.17.1	Verify error free reception of Robust DQPSK type B frames in channel ch 1	PASS	TT
2.3.17.2	Verify error free transmission of Robust DQPSK type B frames in channel ch 1	PASS	TT
2.3.18.1	Verify error free reception of DBPSK type B frames in channel ch 1 (55°)	PASS	TT
2.3.18.2	Verify error free transmission of DBPSK type B frames in channel ch 1 (55°)	PASS	TT
2.3.19.1	Verify error free reception of D8PSK_C type B frames in channel ch 1 (55°)	PASS	TT

2.3.19.2	Verify error free transmission of D8PSK_C type B frames in channel ch 1 (55°)	PASS	TT
Type BC Frame			
2.3.20.1	Verify error free reception of DBPSK type BC frames in channel ch 1	PASS	TT
2.3.20.2	Verify error free transmission of DBPSK type BC frames in channel ch 1	PASS	TT
2.3.21.1	Verify error free reception of DBPSK_C type BC frames in channel ch 1	PASS	TT
2.3.21.2	Verify error free transmission of DBPSK_C type BC frames in channel ch 1	PASS	TT
2.3.22.1	Verify error free reception of DQPSK type BC frames in channel ch 1	PASS	TT
2.3.22.2	Verify error free transmission of DQPSK type BC frames in channel ch 1	PASS	TT
2.3.23.1	Verify error free reception of DQPSK_C type BC frames in channel ch 1	PASS	TT
2.3.23.2	Verify error free transmission of DQPSK_C type BC frames in channel ch 1	PASS	TT
2.3.24.1	Verify error free reception of D8PSK type BC frames in channel ch 1	PASS	TT
2.3.24.2	Verify error free transmission of D8PSK type BC frames in channel ch 1	PASS	TT
2.3.25.1	Verify error free reception of D8PSK_C type BC frames in channel ch 1	PASS	TT
2.3.25.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 1	PASS	TT
2.3.26.1	Verify error free reception of Robust DBPSK type BC frames in channel ch 1	PASS	TT
2.3.26.2	Verify error free transmission of Robust DBPSK type BC frames in channel ch 1	PASS	TT
2.3.27.1	Verify error free reception of Robust DQPSK type BC frames in channel ch 1	PASS	TT
2.3.27.2	Verify error free transmission of Robust DQPSK type BC frames in channel ch 1	PASS	TT
2.3.28.1	Verify error free reception of DBPSK type BC frames in channel ch 1 (55°)	PASS	TT
2.3.28.2	Verify error free transmission of DBPSK type BC frames in channel ch 1 (55°)	PASS	TT
2.3.29.1	Verify error free reception of D8PSK_C type BC frames in channel ch 1 (55°)	PASS	TT
2.3.29.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 1 (55°)	PASS	TT
PHY Test Cases: Regulatory category			
Standards EN 50065-1:2011 EN 50065-2-3:2003 + Ec:2003 + A1:2005 EN 50065-7:2001 See ANNEX II			

PRIME 1.4 MAC layer			Tools
3.2 MAC Test Cases: Service Node Start-up			
3.2.1	Service node start-up (forcing the reception of beacons).	N.A.	--
3.2.2	Service node start-up (No PNPDU are transmitted when DUT receives BPDUs).	N.A.	--
3.2.3	Service node start-up (PNPDUs generation latency, transmission parameters and transmission rate of PNPDU reduced by factor of received PNPDU).	N.A.	--
3.2.4	Service node start-up (Seeking promotion of DUT after an unsuccessful registration process).	N.A.	--
3.2.5	Service Node start-up (Time condition in the transmission of PNPDU)	PASS	NT
3.2.6	Robust mode of Service Node start-up (PNPDU transmission modulation change).	N.A.	--
3.3 MAC Test Cases: Channel Access			
3.3.1	Channel access- Shared Contention Period. Channel is idle	PASS	NT, VT
3.3.2	Channel access- Shared Contention Period. Channel is occupied.	N.A.	--
3.3.3	Channel access- Contention Free Period.	PASS	NT, VT
3.3.4	Channel access- Contention Free Period.	N.A.	--
3.3.5	Channel access-Adaptation to frame structure change (FRA)	N.A.	--
3.3.6	Channel access-Adaptation to frame length change (FRA)	N.A.	--
3.3.7	Switch's beacon transmission time tolerance with respect to frame's beginning time.	N.A.	--
3.4 MAC Test Cases: Registration			
3.4.1	Registration accepted (Base Node available when DUT powers up).	PASS	NT
3.4.2	Registration accepted (Base Node not available when DUT powers up).	N.A.	--
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node).	N.A.	--
3.4.4	Tracking available Switches	N.A.	--
3.4.5	Unregistering process initiated by a terminal node.	N.A.	--
3.4.6	Unregistering process initiated by the Base node.	N.A.	--
3.5 MAC Test Cases: Promotion			
3.5.1	Promotion process initiated by the base node.	N.A.	--
3.5.2	Promotion process initiated by the service node DUT when receiving PNPDU from another device.	PASS	NT
3.5.3	Switching process: 2 levels of switching (DUT1 as a level 1	N.A.	--

	switch).		
3.5.4	Tracking Switches under one node	N.A.	--
3.5.5	Switching process: 2 levels of switching (DUT as a level 2 switch).	N.A.	--
3.5.6	Switching process: Multicast switching	N.A.	--
3.5.7	Switching functions: BPDU transmission	N.A.	--
3.5.8	Switching functions: BPDU modulation change initiated by the Base Node	N.A.	--
3.5.9	Switching functions: BPDU modulation change initiated by the DUT	N.A.	--
3.5.10	Promotion rejected by the base node.	N.A.	--
3.5.11	Demotion process initiated by the base node.	N.A.	--
3.5.12	Double Switching process initiated by the DUT.	N.A.	--
3.5.13	DS-enabling promotion rejection from the base node.	N.A.	--
3.5.14	Full demotion process initiated by the base node.	N.A.	--
3.5.15	Double Switching process initiated by the base node.	N.A.	--
3.5.16	DS-enabling promotion rejection by the DUT.	N.A.	--
3.6 MAC Test Cases: Connection			
3.6.1	Connection establishment initiated by the Base node.	N.A.	--
3.6.2	Connection establishment initiated by the Service node.	PASS	NT, VT
3.6.3	Connection establishment rejected by the Base node.	N.A.	--
3.6.4	Connection closing initiated by the Base node.	N.A.	--
3.6.5	Connection closing initiated by the Service node.	N.A.	--
3.7 MAC Test Cases: ARQ			
3.7.1	Verify correct behaviour of the DUT in a setup where the Base Node does not support ARQ.	N.A.	--
3.7.2	Verify correct behaviour of the DUT in a setup where the Base Node does support ARQ.	N.A.	--
3.7.3	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	--
3.7.4	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	--
3.7.5	Verify that the DUT is able to effectively respond against congestion situation.	N.A.	--
3.7.6	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	--
3.7.7	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	--

3.7.8	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	--
3.7.9	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	--
3.8 MAC Test Cases: Alive			
3.8.1	Keep-Alive process (response from DUT as Terminal).	N.A.	--
3.8.2	Keep-Alive process (response from DUT as Switch).	PASS	NT
3.8.3	Keep-Alive process (timeout and disconnect).	N.A.	--
3.8.4	Keep-Alive process (timeout refresh of DUT as a Terminal)	N.A.	--
3.8.5	Keep-Alive process (timeout refresh of DUT as a Switch).	N.A.	--
3.8.6	Keep-Alive process (changes in Keep Alive timeout).	N.A.	--
3.8.7	Keep-Alive process (three levels hierarchy with the DUT as the first level Switch).	N.A.	--
3.8.8	Keep-Alive process (1.3.6 mechanism).	N.A.	--
3.9 MAC Test Cases: Management			
3.9.1	Forced modulation scheme	N.A.	--
3.9.2	Modulation scheme updated with packet header information	PASS	NT, VT, LT
3.9.3	Modulation scheme updated with ALIVE mechanism: lost ACK	N.A.	--
3.9.4	Modulation scheme updated with ALIVE mechanism: lost response	N.A.	--
3.10 MAC Test Cases: Backwards Compatibility			
3.10.1	Service node start-up (No PNPDU are transmitted when DUT receives CBCN).	N.A.	--
3.10.2	Backwards Compatibility Capability at registration	N.A.	--
3.10.3	PNPDUs discarding	N.A.	--
3.10.4	Demotion process initiated by the base node.	N.A.	--
3.10.5	DUT connected through a 1.3.6 Switch node	N.A.	--
3.10.6	Unregistering process initiated by the DUT when connected through a 1.3.6 Switch.	N.A.	--
3.10.7	DUT as a Switch node for a 1.3.6 Terminal node	N.A.	--
3.10.8	DUT as a level 2 switch with a 1.4 "parent" and 1.3.6 "son"	N.A.	--
3.10.9	DUT as a level 2 switch with a 1.3.6 "parent" and 1.3.6 "son"	N.A.	--
3.10.10	DUT as a level 2 switch with a 1.3.6 "parent" and 1.4 "son"	N.A.	--
3.10.11	BC Keep-Alive process (response from DUT).	N.A.	--
3.10.12	BC Keep-Alive process (timeout and disconnect).	N.A.	--
3.10.13	BC Keep-Alive process (changes in Keep Alive timeout).	N.A.	--
3.11 MAC Test Cases: Time Reference			

3.11.1	Verify correct behavior of the DUT in a setup where the Base Node does support time reference.	N.A.	--
3.11.2	Verify correct behavior of the DUT (as the Switch Node) between the Base Node and Auxiliary Device (as Service Node) do support time reference.	N.A.	--
3.11.3	Check each zero cross detection circuits available in the DUT.	N.A.	--
3.12 MAC Test Cases: Security			
3.12.1	Registration process with security profile 1	N.A.	--
3.12.2	Registration process with security profile 2	N.A.	--
3.12.3	Registration rejection with security profile 1	N.A.	--
3.12.4	Registration rejection with security profile 2	N.A.	--
3.12.5	Nonce usage	N.A.	--
3.12.6	Keys updating with a correct KWK	N.A.	--
3.12.7	Keys updating rejection when a wrong KWK is used	N.A.	--
3.12.8	SWK usage	N.A.	--
3.12.9	SWK modification handling	N.A.	--

CONVERGENCE LAYER 1.4			
4.2 CL Test Cases: Convergence sublayer procedures			
4.2.1	Correct establishment and disconnection of 4-32 link	PASS	NT, VT
4.2.2	Verify the correct implementation of the Segmentation at the DUT side. Force the lenght of the data being transmitted to 16 bytes at the DUT..	N.A.	--
4.2.3	Verify the correct implementation of the Reassembly Mechanism at the DUT side. Force the lenght of the data being transmitted to 16 bytes at the Base Node.	N.A.	--
4.2.4	Verify the correct implementation of the Reassembly Mechanism when incorrect CRC is received at the DUT side. Force the lenght of the data being transmitted to 16 bytes at the Base Node.	N.A.	--
4.3 CL Test Cases: Firmware Upgrade			
4.3.1	Firmware upgrade process (unicast).	PASS	NT, LT, VT
4.3.2	Firmware upgrade process (multicast).	N.A.	--
4.3.3	Firmware upgrade page retransmission	N.A.	--
4.3.4	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the signature of the image	N.A.	--
4.3.5	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the image	N.A.	--

4.4 CL Test Cases: DLMS traffic over 4-32 connection		
4.4.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	PASS LT, VT
4.5 CL Test Cases: PRIME Management Plane Communication Profile		
4.5.1	Get PIB attribute query	PASS NT
4.5.2	Set PIB attribute query	PASS NT
4.5.3	Reboot device	PASS NT

For more detailed information about the test results see Annex I

3.- SUMMARY OF TEST RESULTS FOR CHANNEL 5

For each extra Channel these are the test-cases required to apply for Certification according to PRIME Certification 1.4 Service Node Test book v2.9.:

- PHY LAYER: COMPLETE
- MAC LAYER: 3.2.5, 3.3.1, 3.3.3, 3.4.1, 3.5.2, 3.6.2, 3.8.2, 3.9.2
- CONVERGENCE LAYER: 4.2.1, 4.3.1, 4.5.1

For the Convergence Layer TECNALIA has added three more tests to be applied considered critical for the conformance of the device under test: 4.4.1, 4.5.2, 4.5.3.

Tools used for Certification

- **Microchip Prime Manager Vendor Tool (VT)** to configure the DUT, trigger actions, and confirm manually MAC and CL tests result. Also used as auxiliary SW to run some MAC and CL tests.
- **Neuron Conformance Test Tool (NT)** to run testcases defined in PRIME Certification 1.4 Service Node Test book v2.9.
- **Tecnalia Testing Tool (TT)** to run testcases defined in PRIME Certification 1.4 Service Node Test book v2.9.
- **Tecnalia Lab. Auxiliary tools (LT)** to run MAC and CL tests when needed and to check manually testcases to confirm final result.

PRIME 1.4 PHY Layer			Tools
2.5 PHY Test Cases: Transmission and reception test cases			
Type A Frame			
2.3.2.1	Verify error free reception of DBPSK type A frames in channel ch 5	PASS	TT
2.3.2.2	Verify error free transmission of DBPSK type A frames in channel ch 5	PASS	TT
2.3.3.1	Verify error free reception of DBPSK_C type A frames in channel ch 5	PASS	TT
2.3.3.2	Verify error free transmission of DBPSK_C type A frames in channel ch 5	PASS	TT
2.3.4.1	Verify error free reception of DQPSK type A frames in channel ch 5	PASS	TT
2.3.4.2	Verify error free transmission of DQPSK type A frames in channel ch 5	PASS	TT
2.3.5.1	Verify error free reception of DQPSK_C type A frames in channel ch 5	PASS	TT
2.3.5.2	Verify error free transmission of DQPSK_C type A frames in channel ch 5	PASS	TT

2.3.6.1	Verify error free reception of D8PSK type A frames in channel ch 5	PASS	TT
2.3.6.2	Verify error free transmission of D8PSK type A frames in channel ch 5	PASS	TT
2.3.7.1	Verify error free reception of D8PSK_C type A frames in channel ch 5	PASS	TT
2.3.7.2	Verify error free transmission of D8PSK_C type A frames in channel ch 5	PASS	TT
2.3.8.1	Verify error free reception of DBPSK type A frames in channel ch 5 (55°)	PASS	TT
2.3.8.2	Verify error free transmission of DBPSK type A frames in channel ch 5 (55°)	PASS	TT
2.3.9.1	Verify error free reception of D8PSK_C type A frames in channel ch 5 (55°)	PASS	TT
2.3.9.2	Verify error free transmission of D8PSK_C type A frames in channel ch 5 (55°)	PASS	TT
Type B Frame			
2.3.10.1	Verify error free reception of DBPSK type B frames in channel ch 5	PASS	TT
2.3.10.2	Verify error free transmission of DBPSK type B frames in channel ch 5	PASS	TT
2.3.11.1	Verify error free reception of DBPSK_C type B frames in channel ch 5	PASS	TT
2.3.11.2	Verify error free transmission of DBPSK_C type B frames in channel ch 5	PASS	TT
2.3.12.1	Verify error free reception of DQPSK type B frames in channel ch 5	PASS	TT
2.3.12.2	Verify error free transmission of DQPSK type B frames in channel ch 5	PASS	TT
2.3.13.1	Verify error free reception of DQPSK_C type B frames in channel ch 5	PASS	TT
2.3.13.2	Verify error free transmission of DQPSK_C type B frames in channel ch 5	PASS	TT
2.3.14.1	Verify error free reception of D8PSK type B frames in channel ch 5	PASS	TT
2.3.14.2	Verify error free transmission of D8PSK type B frames in channel ch 5	PASS	TT
2.3.15.1	Verify error free reception of D8PSK_C type B frames in channel ch 5	PASS	TT
2.3.15.2	Verify error free transmission of D8PSK_C type B frames in channel ch 5	PASS	TT
2.3.16.1	Verify error free reception of Robust DBPSK type B frames in channel ch 5	PASS	TT
2.3.16.2	Verify error free transmission of Robust DBPSK type B frames in channel ch 5	PASS	TT
2.3.17.1	Verify error free reception of Robust DQPSK type B frames in channel ch 5	PASS	TT

2.3.17.2	Verify error free transmission of Robust DQPSK type B frames in channel ch 5	PASS	TT
2.3.18.1	Verify error free reception of DBPSK type B frames in channel ch 5 (55°)	PASS	TT
2.3.18.2	Verify error free transmission of DBPSK type B frames in channel ch 5 (55°)	PASS	TT
2.3.19.1	Verify error free reception of D8PSK_C type B frames in channel ch 5 (55°)	PASS	TT
2.3.19.2	Verify error free transmission of D8PSK_C type B frames in channel ch 5 (55°)	PASS	TT
Type BC Frame			
2.3.20.1	Verify error free reception of DBPSK type BC frames in channel ch 5	PASS	TT
2.3.20.2	Verify error free transmission of DBPSK type BC frames in channel ch 5	PASS	TT
2.3.21.1	Verify error free reception of DBPSK_C type BC frames in channel ch 5	PASS	TT
2.3.21.2	Verify error free transmission of DBPSK_C type BC frames in channel ch 5	PASS	TT
2.3.22.1	Verify error free reception of DQPSK type BC frames in channel ch 5	PASS	TT
2.3.22.2	Verify error free transmission of DQPSK type BC frames in channel ch 5	PASS	TT
2.3.23.1	Verify error free reception of DQPSK_C type BC frames in channel ch 5	PASS	TT
2.3.23.2	Verify error free transmission of DQPSK_C type BC frames in channel ch 5	PASS	TT
2.3.24.1	Verify error free reception of D8PSK type BC frames in channel ch 5	PASS	TT
2.3.24.2	Verify error free transmission of D8PSK type BC frames in channel ch 5	PASS	TT
2.3.25.1	Verify error free reception of D8PSK_C type BC frames in channel ch 5	PASS	TT
2.3.25.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 5	PASS	TT
2.3.26.1	Verify error free reception of Robust DBPSK type BC frames in channel ch 5	PASS	TT
2.3.26.2	Verify error free transmission of Robust DBPSK type BC frames in channel ch 5	PASS	TT
2.3.27.1	Verify error free reception of Robust DQPSK type BC frames in channel ch 5	PASS	TT
2.3.27.2	Verify error free transmission of Robust DQPSK type BC frames in channel ch 5	PASS	TT
2.3.28.1	Verify error free reception of DBPSK type BC frames in channel ch 5 (55°)	PASS	TT
2.3.28.2	Verify error free transmission of DBPSK type BC frames in channel ch 5 (55°)	PASS	TT

2.3.29.1	Verify error free reception of D8PSK_C type BC frames in channel ch 5 (55°)	PASS	TT
2.3.29.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 5 (55°)	PASS	TT
PHY Test Cases: Regulatory category			
Not tested			

PRIME 1.4 MAC layer			Tools
3.2 MAC Test Cases: Service Node Start-up			
3.2.1	Service node start-up (forcing the reception of beacons).	N.A.	--
3.2.2	Service node start-up (No PNPDU are transmitted when DUT receives BPDUs).	N.A.	--
3.2.3	Service node start-up (PNPDUs generation latency, transmission parameters and transmission rate of PNPDU reduced by factor of received PNPDU).	N.A.	--
3.2.4	Service node start-up (Seeking promotion of DUT after an unsuccessful registration process).	N.A.	--
3.2.5	Service Node start-up (Time condition in the transmission of PNPDU)	PASS	NT
3.2.6	Robust mode of Service Node start-up (PNPDU transmission modulation change).	N.A.	--
3.3 MAC Test Cases: Channel Access			
3.3.1	Channel access- Shared Contention Period. Channel is idle	PASS	NT, VT
3.3.2	Channel access- Shared Contention Period. Channel is occupied.	N.A.	--
3.3.3	Channel access- Contention Free Period.	PASS	NT, VT
3.3.4	Channel access- Contention Free Period.	N.A.	--
3.3.5	Channel access-Adaptation to frame structure change (FRA)	N.A.	--
3.3.6	Channel access-Adaptation to frame length change (FRA)	N.A.	--
3.3.7	Switch's beacon transmission time tolerance with respect to frame's beginning time.	N.A.	--
3.4 MAC Test Cases: Registration			
3.4.1	Registration accepted (Base Node available when DUT powers up).	PASS	NT
3.4.2	Registration accepted (Base Node not available when DUT powers up).	N.A.	--
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node).	N.A.	--
3.4.4	Tracking available Switches	N.A.	--

3.4.5	Unregistering process initiated by a terminal node.	N.A.	--
3.4.6	Unregistering process initiated by the Base node.	N.A.	--
3.5 MAC Test Cases: Promotion			
3.5.1	Promotion process initiated by the base node.	N.A.	--
3.5.2	Promotion process initiated by the service node DUT when receiving PNPDU from another device.	PASS	NT
3.5.3	Switching process: 2 levels of switching (DUT1 as a level 1 switch).	N.A.	--
3.5.4	Tracking Switches under one node	N.A.	--
3.5.5	Switching process: 2 levels of switching (DUT as a level 2 switch).	N.A.	--
3.5.6	Switching process: Multicast switching	N.A.	--
3.5.7	Switching functions: BPDU transmission	N.A.	--
3.5.8	Switching functions: BPDU modulation change initiated by the Base Node	N.A.	--
3.5.9	Switching functions: BPDU modulation change initiated by the DUT	N.A.	--
3.5.10	Promotion rejected by the base node.	N.A.	--
3.5.11	Demotion process initiated by the base node.	N.A.	--
3.5.12	Double Switching process initiated by the DUT.	N.A.	--
3.5.13	DS-enabling promotion rejection from the base node.	N.A.	--
3.5.14	Full demotion process initiated by the base node.	N.A.	--
3.5.15	Double Switching process initiated by the base node.	N.A.	--
3.5.16	DS-enabling promotion rejection by the DUT.	N.A.	--
3.6 MAC Test Cases: Connection			
3.6.1	Connection establishment initiated by the Base node.	N.A.	--
3.6.2	Connection establishment initiated by the Service node.	PASS	NT, VT
3.6.3	Connection establishment rejected by the Base node.	N.A.	--
3.6.4	Connection closing initiated by the Base node.	N.A.	--
3.6.5	Connection closing initiated by the Service node.	N.A.	--
3.7 MAC Test Cases: ARQ			
3.7.1	Verify correct behaviour of the DUT in a setup where the Base Node does not support ARQ.	N.A.	--
3.7.2	Verify correct behaviour of the DUT in a setup where the Base Node does support ARQ.	N.A.	--
3.7.3	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	--
3.7.4	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	--
3.7.5	Verify that the DUT is able to effectively respond against	N.A.	--

	congestion situation.		
3.7.6	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	--
3.7.7	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	--
3.7.8	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	--
3.7.9	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	--
3.8 MAC Test Cases: Alive			
3.8.1	Keep-Alive process (response from DUT as Terminal).	N.A.	--
3.8.2	Keep-Alive process (response from DUT as Switch).	PASS	NT
3.8.3	Keep-Alive process (timeout and disconnect).	N.A.	--
3.8.4	Keep-Alive process (timeout refresh of DUT as a Terminal)	N.A.	--
3.8.5	Keep-Alive process (timeout refresh of DUT as a Switch).	N.A.	--
3.8.6	Keep-Alive process (changes in Keep Alive timeout).	N.A.	--
3.8.7	Keep-Alive process (three levels hierarchy with the DUT as the first level Switch).	N.A.	--
3.8.8	Keep-Alive process (1.3.6 mechanism).	N.A.	--
3.9 MAC Test Cases: Management			
3.9.1	Forced modulation scheme	N.A.	--
3.9.2	Modulation scheme updated with packet header information	PASS	NT, VT, LT
3.9.3	Modulation scheme updated with ALIVE mechanism: lost ACK	N.A.	--
3.9.4	Modulation scheme updated with ALIVE mechanism: lost response	N.A.	--
3.10 MAC Test Cases: Backwards Compatibility			
3.10.1	Service node start-up (No PNPDU are transmitted when DUT receives CBCN).	N.A.	--
3.10.2	Backwards Compatibility Capability at registration	N.A.	--
3.10.3	PNPDUs discarding	N.A.	--
3.10.4	Demotion process initiated by the base node.	N.A.	--
3.10.5	DUT connected through a 1.3.6 Switch node	N.A.	--
3.10.6	Unregistering process initiated by the DUT when connected through a 1.3.6 Switch.	N.A.	--
3.10.7	DUT as a Switch node for a 1.3.6 Terminal node	N.A.	--
3.10.8	DUT as a level 2 switch with a 1.4 "parent" and 1.3.6 "son"	N.A.	--
3.10.9	DUT as a level 2 switch with a 1.3.6 "parent" and 1.3.6 "son"	N.A.	--

3.10.10	DUT as a level 2 switch with a 1.3.6 “parent” and 1.4 “son”	N.A.	--
3.10.11	BC Keep-Alive process (response from DUT).	N.A.	--
3.10.12	BC Keep-Alive process (timeout and disconnect).	N.A.	--
3.10.13	BC Keep-Alive process (changes in Keep Alive timeout).	N.A.	--
3.11 MAC Test Cases: Time Reference			
3.11.1	Verify correct behavior of the DUT in a setup where the Base Node does support time reference.	N.A.	--
3.11.2	Verify correct behavior of the DUT (as the Switch Node) between the Base Node and Auxiliary Device (as Service Node) do support time reference.	N.A.	--
3.11.3	Check each zero cross detection circuits available in the DUT.	N.A.	--
3.12 MAC Test Cases: Security			
3.12.1	Registration process with security profile 1	N.A.	--
3.12.2	Registration process with security profile 2	N.A.	--
3.12.3	Registration rejection with security profile 1	N.A.	--
3.12.4	Registration rejection with security profile 2	N.A.	--
3.12.5	Nonce usage	N.A.	--
3.12.6	Keys updating with a correct KWK	N.A.	--
3.12.7	Keys updating rejection when a wrong KWK is used	N.A.	--
3.12.8	SWK usage	N.A.	--
3.12.9	SWK modification handling	N.A.	--

CONVERGENCE LAYER 1.4		
4.2 CL Test Cases: Convergence sublayer procedures		
4.2.1	Correct establishment and disconnection of 4-32 link	PASS NT, VT
4.2.2	Verify the correct implementation of the Segmentation at the DUT side. Force the lenght of the data being transmitted to 16 bytes at the DUT..	N.A. --
4.2.3	Verify the correct implementation of the Reassembly Mechanism at the DUT side. Force the lenght of the data being transmitted to 16 bytes at the Base Node.	N.A. --
4.2.4	Verify the correct implementation of the Reassembly Mechanism when incorrect CRC is received at the DUT side. Force the lenght of the data being transmitted to 16 bytes at the Base Node.	N.A. --
4.3 CL Test Cases: Firmware Upgrade		
4.3.1	Firmware upgrade process (unicast).	PASS NT, VT, LT

4.3.2	Firmware upgrade process (multicast).	N.A.	--
4.3.3	Firmware upgrade page retransmission	N.A.	--
4.3.4	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the signature of the image	N.A.	--
4.3.5	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the image	N.A.	--
4.4 CL Test Cases: DLMS traffic over 4-32 connection			
4.4.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	PASS	LT, VT
4.5 CL Test Cases: PRIME Management Plane Communication Profile			
4.5.1	Get PIB attribute query	PASS	NT
4.5.2	Set PIB attribute query	PASS	NT
4.5.3	Reboot device	PASS	NT

For more detailed information about the test results see Annex I

4.- APPLICANT

Miran Černý

ZPA Smart Energy a.s.

Komenského 821, 541 01 Trutnov, CZECH REPUBLIC

5.- PLACE OF RECEPTION AND EXECUTION OF THE TESTS

The reception of the equipment took place in the Smart Data & Protocol Laboratory of TECNALIA, in Derio (Spain).

The performing of the test took place in Smart Data & Protocol Laboratory of TECNALIA, in Derio (Spain).

6.- STANDARDS AND TEST PROCEDURES EMPLOYED

Standards:

- PRIME-Specs V1.4: Specification for Power line Intelligent Metering Evolution. Version 1.4
- EN 50065-1 (2001): "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 1: General requirements, frequency bands and electromagnetic disturbances".
- EN 50065-2-3 (2003) + A1 (2005): "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 2-3: Immunity requirements for mains communications equipment and systems operating in the range of frequencies of 3 kHz to 95 kHz and intended for use by electricity suppliers and distributors".
- EN 50065-7 (2001): "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 7: Equipment impedance".

Testing procedures:

- PRIME Certification 1.4 Service Node Test book v2.9.
- PRIME Certification 1.4 Service Node Test book v2.12. Annex H Basic FCC test suite

7.- CONCLUSIONS

In view of the results and in the test conditions expressed in the present report, the tested sample of:

Unit:	THREE-PHASE smart meter with integrated PRIME Power Line Communications
Model:	AM370
Trade Mark:	ZPA Smart Energy a.s.
Serial Number:	M1: nº 181105014 (MAC C0:BD:42:00:F4:D2) M2: nº 181105 022 (MAC C0:BD:42:00:F4:CF)
Manufacturer:	ZPA Smart Energy a.s.

✓ **COMPLIES** with:

- ✓ Profile: Electricity Meter with PRIME PHY and PRIME MAC. PRIME 1.4 CH1, CH5
 - ✓ PRIME 1.4 PHY
 - ✓ PRIME 1.4 MAC layer
 - Excluding security profiles
 - Excluding backward compatibility.
 - ✓ PRIME 1.4 Convergence layer

In the conditions expressed in sections 2 and 3 of this report

- This test report is granted on account of tests made at location of TECNALIA, in Derio (Spain).
- The results of the present report apply only to the samples tested and the moment and conditions under which the measurements were performed.
- The complete results, including remarks and limitations, are laid down in ANNEX I of this report.

ANNEX I. TEST RESULTS

Place: Smart Data & Protocol Laboratory in TECNALIA
Electronic devices Laboratory in TECNALIA

Climatic conditions: 19 °C 44% H.R. 1014 mbar

Responsible: Ibone G^a-Borreguero Melero

Used instruments:

Measurement instruments	
X	Tecnaia PRIME 1.4 SN Testing Tool (TT)
X	SD&P Laboratory auxiliary tools (LT)
X	SW Neuron PRIME 1.4 SN Certification Testing Tool (NT)
✓	PRIME v1.4 Conformance Tester (release 2018-09-RC2)
X	HW Neuron PRIME 1.4 SN Certification Testing Tool
✓	BASE NODE
✓	AUX1
✓	AUX2
✓	AUX3
✓	AUX4
✓	SNIFFER
✓	CONTROL UNIT
X	EL092142 – LISN
X	EL092115 – LISN PRIME
X	EL052008 - CLIMATIC CHAMBER
X	EL022011 - DIGITAL OSCILLOSCOPE
X	EL082055 – ISOLATING TRANSFORM
Data registers storage place	
C.U.	Neuron PRIME 1.4 SN CTT Control Unit
LAB. PC1	C:/Clientes/PRIME14_ELECTROMETER_TRIF

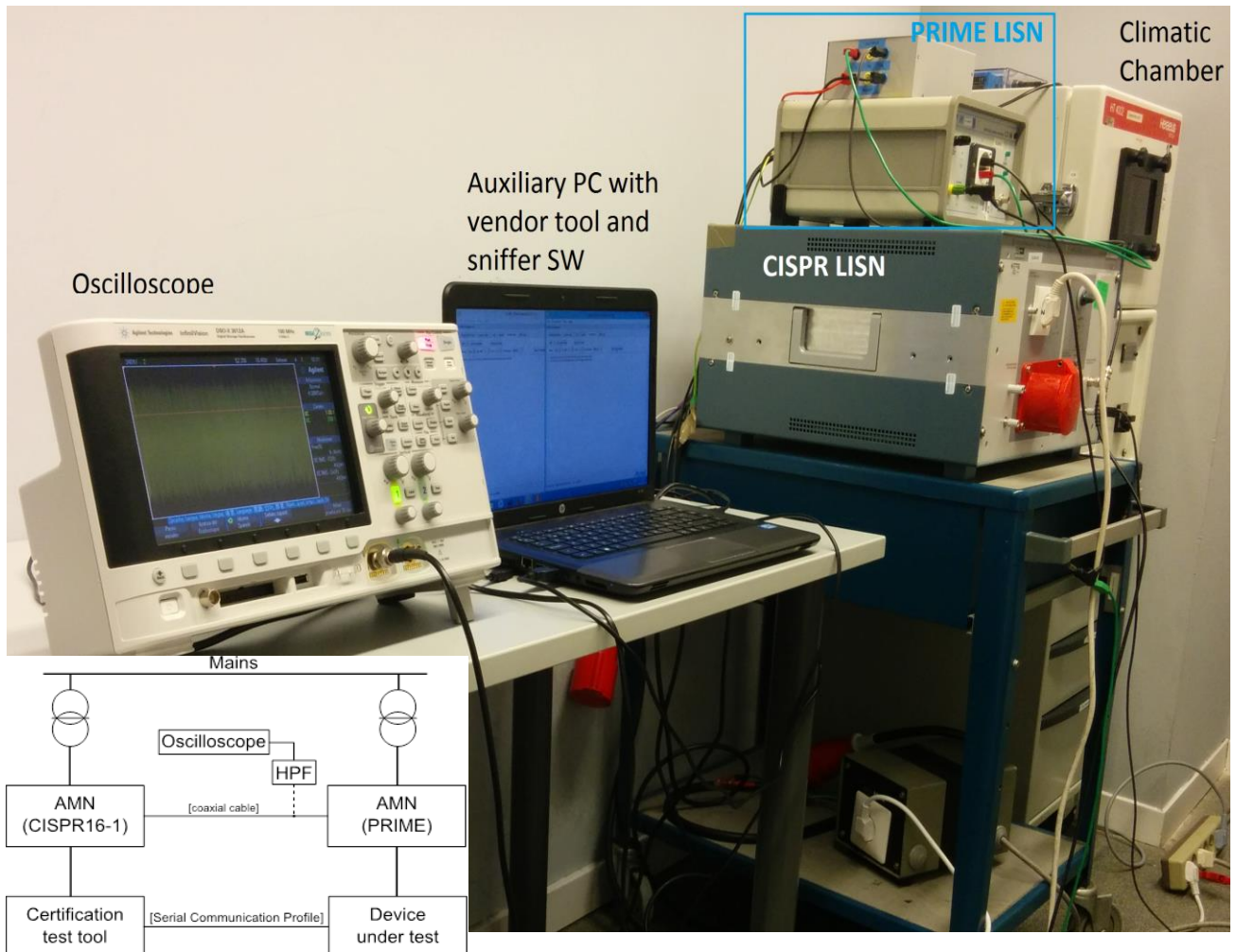
Used instruments provided by the manufacturer:

Measurement instruments	
X	SW Microchip
✓	Vendor Tool: Microchip PRIME Manager Rev 2.1.0rc3 (VT)

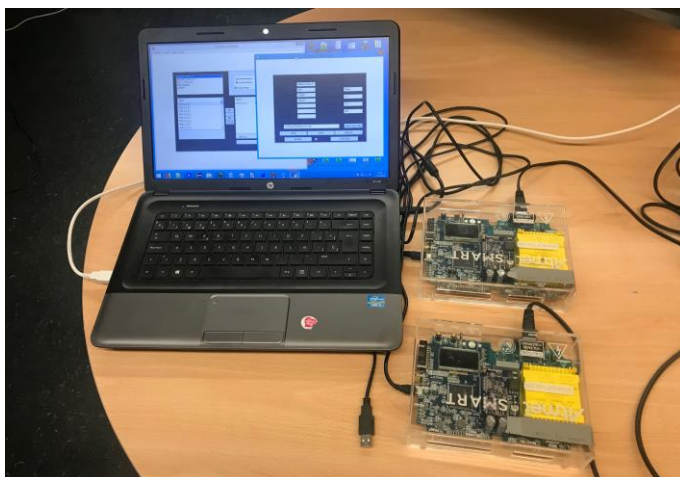
Results:

A.1. PHY layer

A.1.1. Test setup



✓ TECNALIA PRIME 1.4 SN TESTING TOOL (TT)

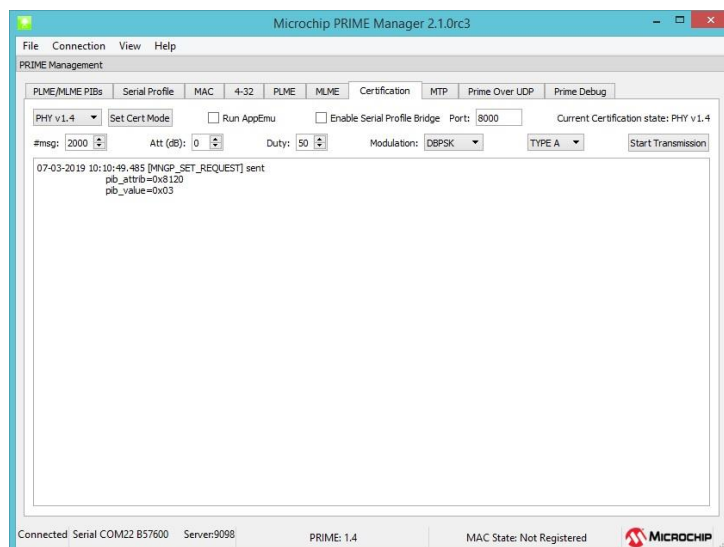


DUT connections:



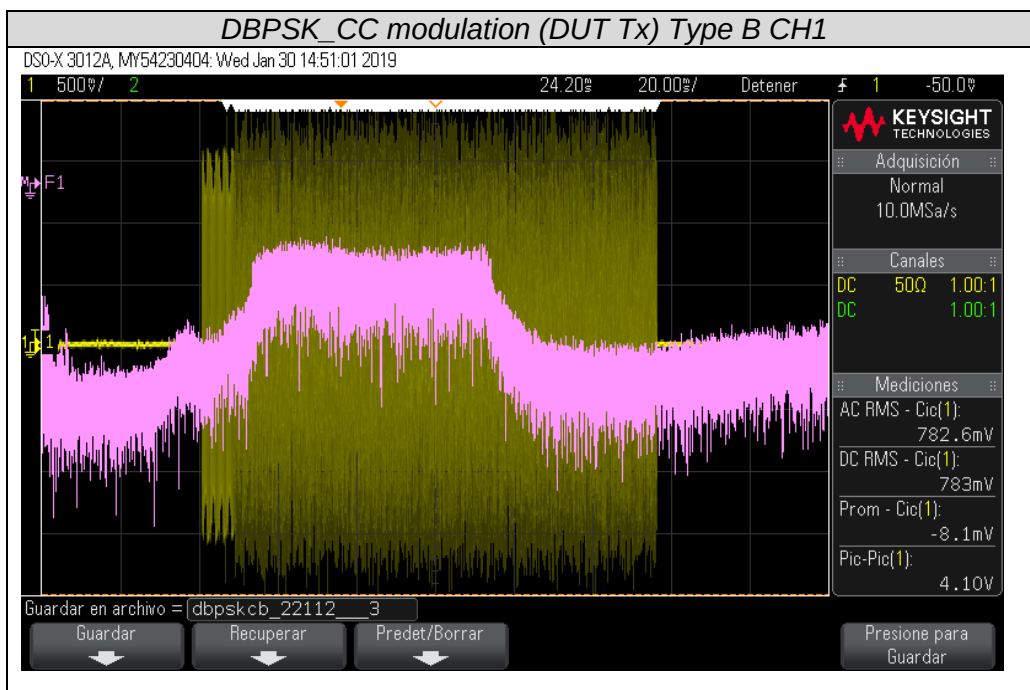
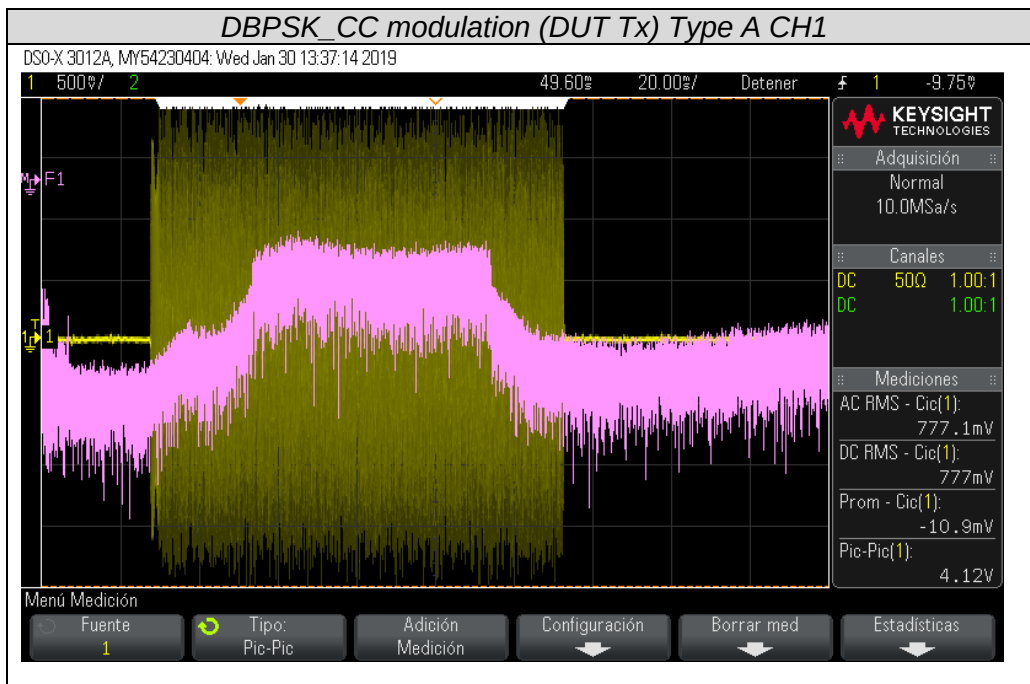
Serial Port:

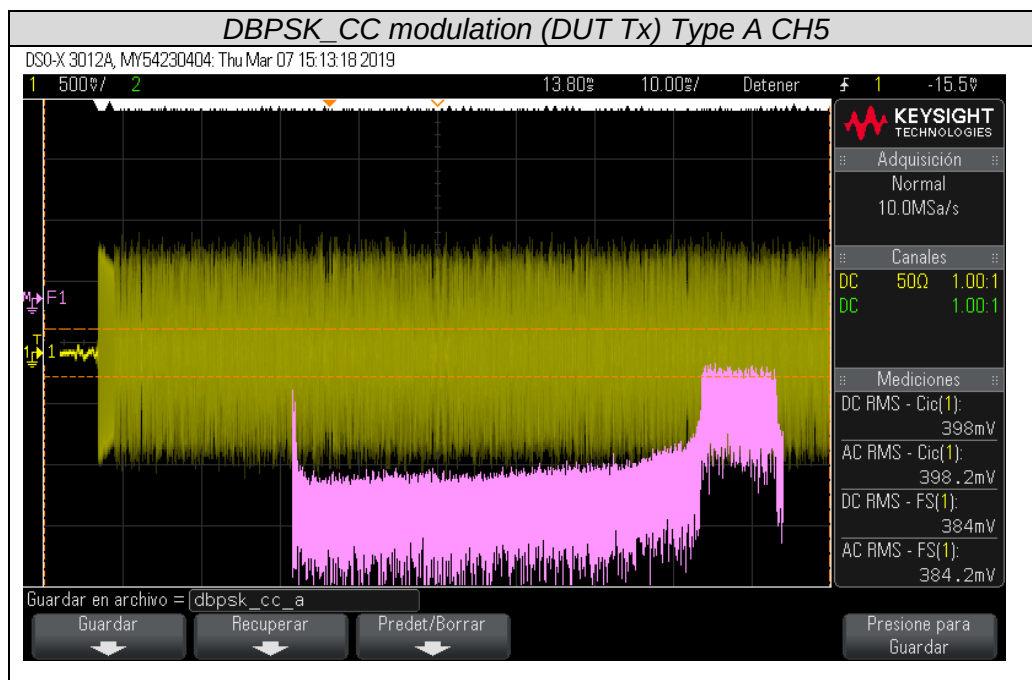
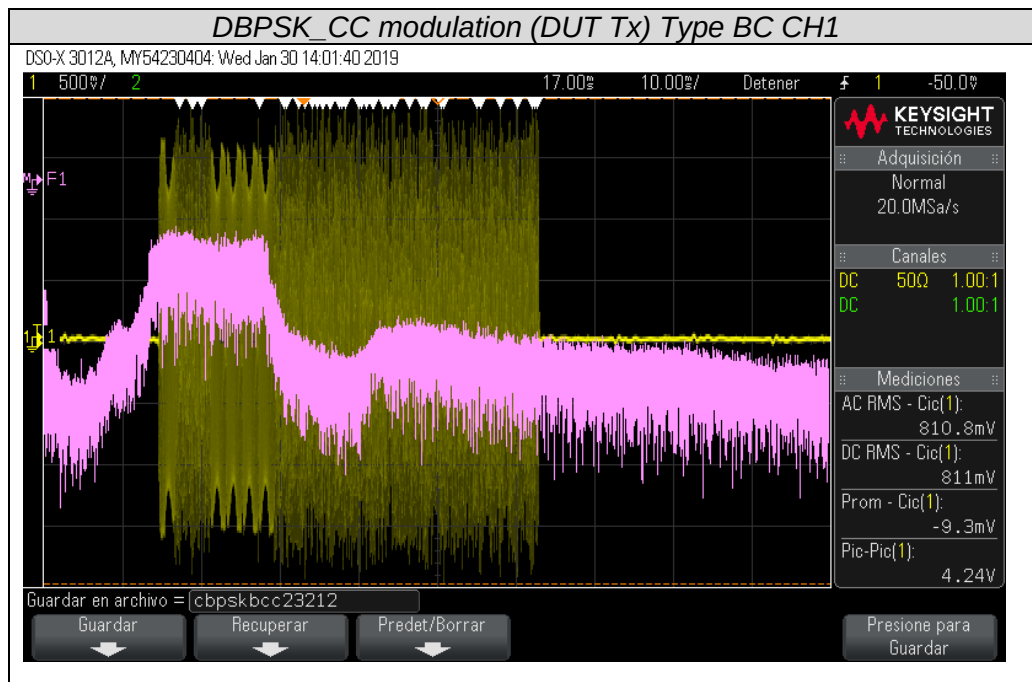
- to manage the DUT
- connected to auxiliary PC to configure the DUT in different modes (PHY tx, PHY rx)
- to access to PIB values
- DUT has to be configured in PHY reception and PHY transmission mode.
- Microchip Prime Manager Vendor Tool and serial terminal emulator Putty:
 - to manage and configure the DUT in PHY mode RX/TX
 - to read PIB attributes

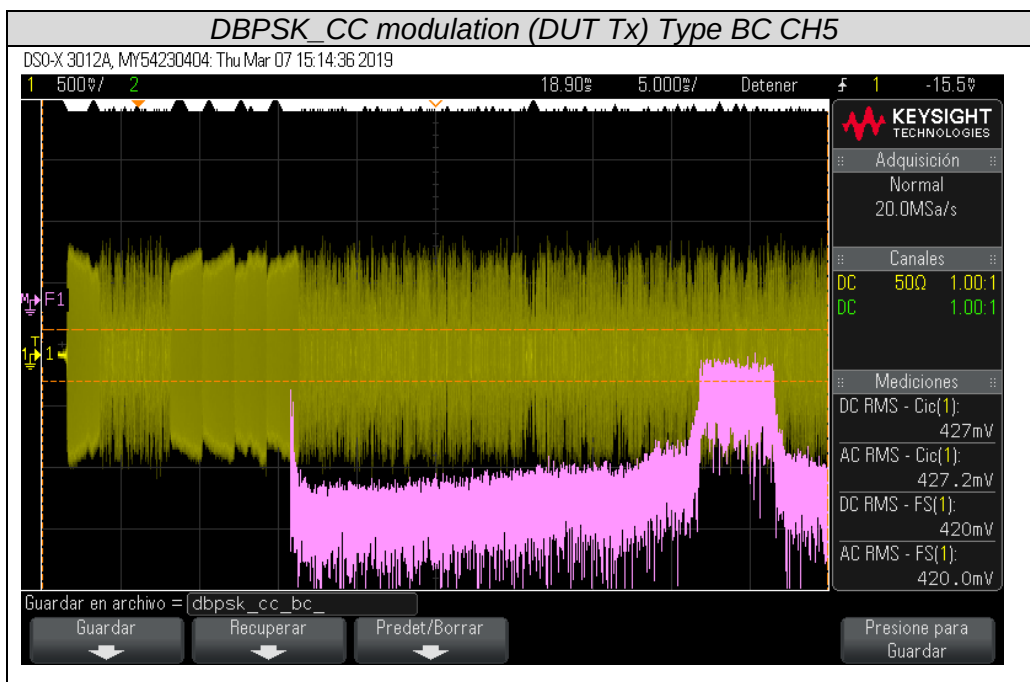
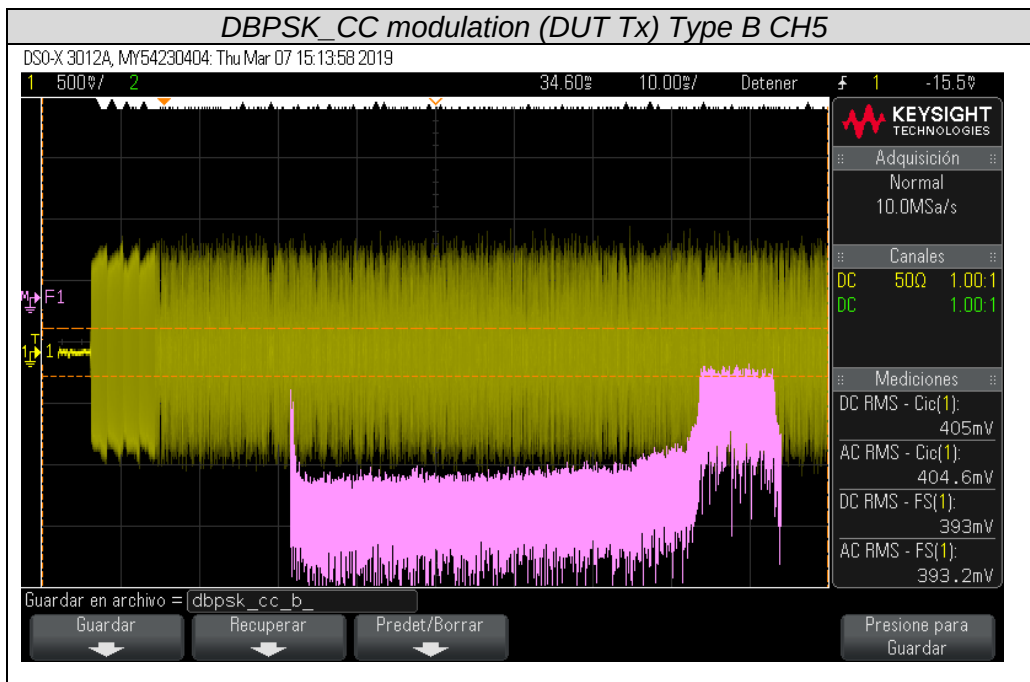


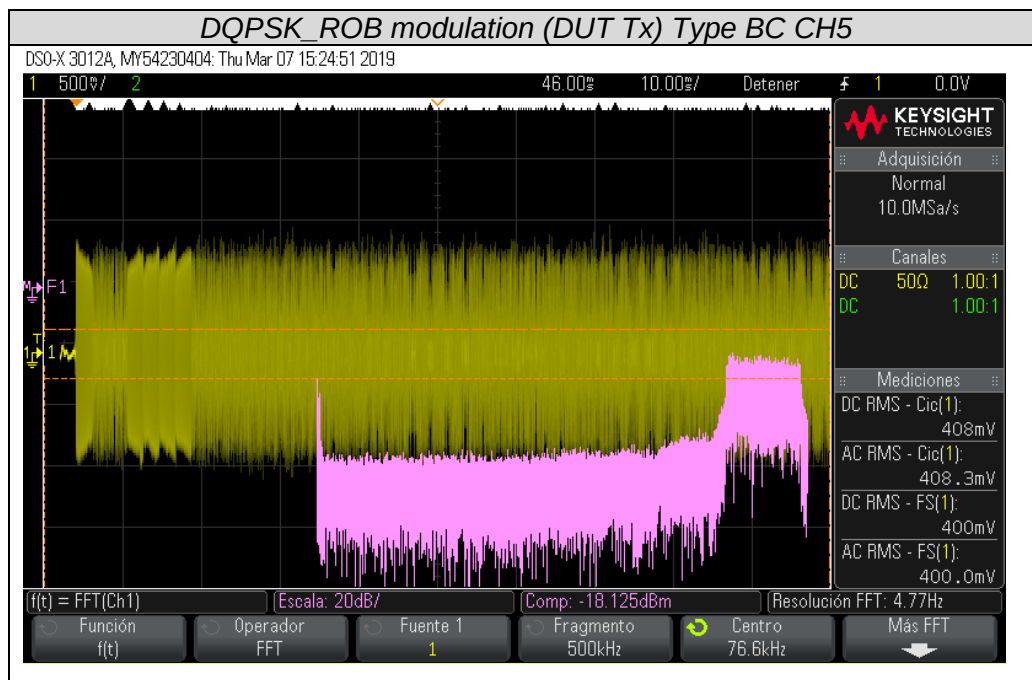
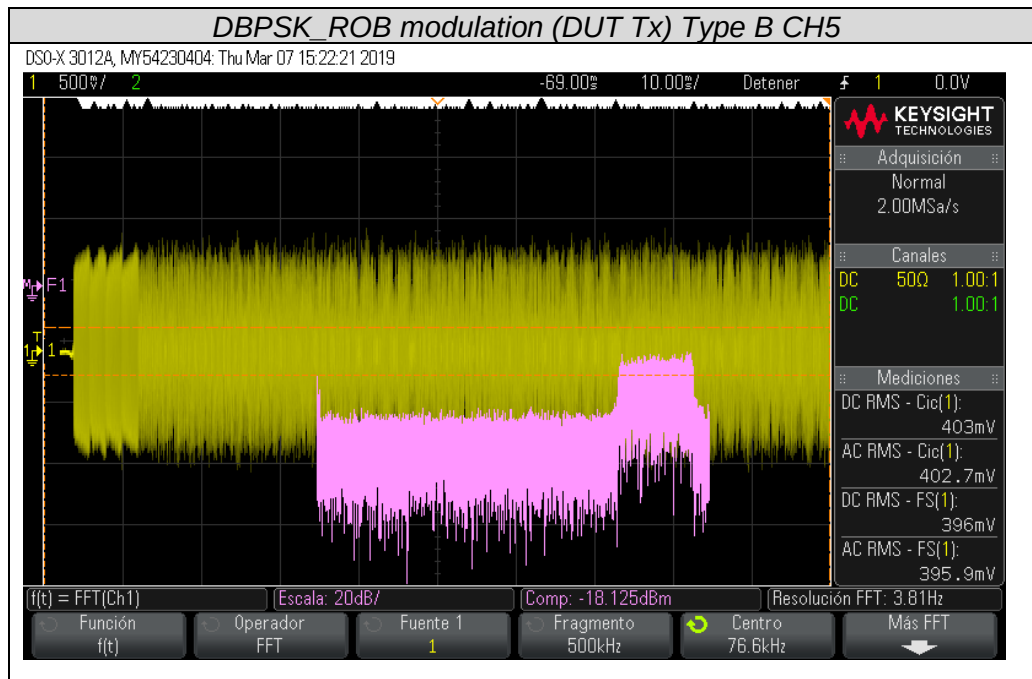
Oscilloscope:

- To measure the frequency band
- To measure the output level of the PRIME signal









A.1.2. PHY Test results for CHANNEL 1

PHY LAYER 1.4						
CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS	TOOL
2.5 PHY Test Cases: Transmission and reception test cases						
Type A Frame						
2.3.2.1	Verify error free reception of DBPSK type A frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.2.2	Verify error free transmission of DBPSK type A frames in channel ch 1	Frames: 1998	at least 1996 frames	PASS	Sample: M1	TT
2.3.3.1	Verify error free reception of DBPSK_C type A frames in channel ch 1	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.3.2	Verify error free transmission of DBPSK_C type A frames in channel ch 1	Frames: 1998	at least 1996 frames	PASS	Sample: M1	TT
2.3.4.1	Verify error free reception of DQPSK type A frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.4.2	Verify error free transmission of DQPSK type A frames in channel ch 1	Frames: 1998	at least 1996 frames	PASS	Sample: M1	TT
2.3.5.1	Verify error free reception of DQPSK_C type A frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.5.2	Verify error free transmission of DQPSK_C type A frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.6.1	Verify error free reception of D8PSK type A frames in channel ch 1	Frames: 1999 18,07 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.6.2	Verify error free transmission of D8PSK type A frames in channel ch 1	Frames: 2000 18,15 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.7.1	Verify error free reception of D8PSK_C type A frames in channel ch 1	Frames: 1998	at least 1996 frames	PASS	Sample: M1	TT
2.3.7.2	Verify error free transmission of D8PSK_C type A frames in channel ch 1	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.8.1	Verify error free reception of DBPSK type A frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.8.2	Verify error free transmission of DBPSK type A frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.9.1	Verify error free reception of D8PSK_C type A frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.9.2	Verify error free transmission of DBPSK_C type A frames in channel ch 1 (55°)	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
Type B Frame						
2.3.10.1	Verify error free reception of DBPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.10.2	Verify error free transmission of DBPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.11.1	Verify error free reception of DBPSK_C type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.11.2	Verify error free transmission of DBPSK_C type B frames in channel ch 1	Frames: 1998	at least 1996 frames	PASS	Sample: M1	TT
2.3.12.1	Verify error free reception of DQPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.12.2	Verify error free transmission of DQPSK type B frames in channel ch 1	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.13.1	Verify error free reception of DQPSK_C type B frames in channel ch 1	Frames: 1997	at least 1996 frames	PASS	Sample: M1	TT

2.3.13.2	Verify error free transmission of DQPSK_C type B frames in channel ch 1	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.14.1	Verify error free reception of D8PSK type B frames in channel ch 1	Frames: 2000 18,06 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.14.2	Verify error free transmission of D8PSK type B frames in channel ch 1	Frames: 2000 18,13 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.15.1	Verify error free reception of D8PSK_C type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.15.2	Verify error free transmission of D8PSK_C type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.16.1	Verify error free reception of Robust DBPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.16.2	Verify error free transmission of Robust DBPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.17.1	Verify error free reception of Robust DQPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.17.2	Verify error free transmission of Robust DQPSK type B frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.18.1	Verify error free reception of DBPSK type B frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.18.2	Verify error free transmission of DBPSK type B frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.19.1	Verify error free reception of D8PSK_C type B frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.19.2	Verify error free transmission of D8PSK_C type B frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
Type BC Frame						
2.3.20.1	Verify error free reception of DBPSK type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.20.2	Verify error free transmission of DBPSK type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.21.1	Verify error free reception of DBPSK_C type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.21.2	Verify error free transmission of DBPSK_C type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.22.1	Verify error free reception of DQPSK type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.22.2	Verify error free transmission of DQPSK type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.23.1	Verify error free reception of DQPSK_C type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.23.2	Verify error free transmission of DQPSK_C type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.24.1	Verify error free reception of D8PSK type BC frames in channel ch 1	Frames: 2000 18,10 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.24.2	Verify error free transmission of D8PSK type BC frames in channel ch 1	Frames: 2000 18,16 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT

2.3.25.1	Verify error free reception of D8PSK_C type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.25.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.26.1	Verify error free reception of Robust DBPSK type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.26.2	Verify error free transmission of Robust DBPSK type BC frames in channel ch 1	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.27.1	Verify error free reception of Robust DQPSK type BC frames in channel ch 1	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.27.2	Verify error free transmission of Robust DQPSK type BC frames in channel ch 1	Frames: 1998	at least 1996 frames	PASS	Sample: M1	TT
2.3.28.1	Verify error free reception of DBPSK type BC frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.28.2	Verify error free transmission of DBPSK type BC frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.29.1	Verify error free reception of D8PSK_C type BC frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.29.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 1 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

A.1.3. PHY Test results for CHANNEL 5

PHY LAYER 1.4						
CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS	TOOL
2.5 PHY Test Cases: Transmission and reception test cases						
Type A Frame						
2.3.2.1	Verify error free reception of DBPSK type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.2.2	Verify error free transmission of DBPSK type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.3.1	Verify error free reception of DBPSK_C type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.3.2	Verify error free transmission of DBPSK_C type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.4.1	Verify error free reception of DQPSK type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.4.2	Verify error free transmission of DQPSK type A frames in channel ch 5	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.5.1	Verify error free reception of DQPSK_C type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.5.2	Verify error free transmission of DQPSK_C type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.6.1	Verify error free reception of D8PSK type A frames in channel ch 5	Frames: 2000 18,15 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.6.2	Verify error free transmission of D8PSK type A frames in channel ch 5	Frames: 2000 18,15 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.7.1	Verify error free reception of D8PSK_C type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.7.2	Verify error free transmission of D8PSK_C type A frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.8.1	Verify error free reception of DBPSK type A frames in channel ch 5 (55°)	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.8.2	Verify error free transmission of DBPSK type A frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.9.1	Verify error free reception of D8PSK_C type A frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.9.2	Verify error free transmission of D8PSK_C type A frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
Type B Frame						
2.3.10.1	Verify error free reception of DBPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.10.2	Verify error free transmission of DBPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.11.1	Verify error free reception of DBPSK_C type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.11.2	Verify error free transmission of DBPSK_C type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.12.1	Verify error free reception of DQPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.12.2	Verify error free transmission of DQPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.13.1	Verify error free reception of DQPSK_C type B frames in channel ch 5	Frames: 1997	at least 1996 frames	PASS	Sample: M1	TT
2.3.13.2	Verify error free transmission of DQPSK_C type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.14.1	Verify error free reception of D8PSK type B frames in channel ch 5	Frames: 2000 18,15 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.14.2	Verify error free transmission of D8PSK type B frames in channel ch 5	Frames: 2000 18,21 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT

2.3.15.1	Verify error free reception of D8PSK_C type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.15.2	Verify error free transmission of D8PSK_C type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.16.1	Verify error free reception of Robust DBPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.16.2	Verify error free transmission of Robust DBPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.17.1	Verify error free reception of Robust DQPSK type B frames in channel ch 5	Frames: 1999	at least 1996 frames	PASS	Sample: M1	TT
2.3.17.2	Verify error free transmission of Robust DQPSK type B frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.18.1	Verify error free reception of DBPSK type B frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.18.2	Verify error free transmission of DBPSK type B frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.19.1	Verify error free reception of D8PSK_C type B frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.19.2	Verify error free transmission of D8PSK_C type B frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
Type BC Frame						
2.3.20.1	Verify error free reception of DBPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.20.2	Verify error free transmission of DBPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.21.1	Verify error free reception of DBPSK_C type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.21.2	Verify error free transmission of DBPSK_C type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.22.1	Verify error free reception of DQPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.22.2	Verify error free transmission of DQPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.23.1	Verify error free reception of DQPSK_C type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.23.2	Verify error free transmission of DQPSK_C type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.24.1	Verify error free reception of D8PSK type BC frames in channel ch 5	Frames: 2000 18,18 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.24.2	Verify error free transmission of D8PSK type BC frames in channel ch 5	Frames: 2000 18,16 dB	at least 1996 frames EVM above 17dB	PASS	Sample: M1	TT
2.3.25.1	Verify error free reception of D8PSK_C type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.25.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.26.1	Verify error free reception of Robust DBPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.26.2	Verify error free transmission of Robust DBPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

2.3.27.1	Verify error free reception of Robust DQPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.27.2	Verify error free transmission of Robust DQPSK type BC frames in channel ch 5	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.28.1	Verify error free reception of DBPSK type BC frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.28.2	Verify error free transmission of DBPSK type BC frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.29.1	Verify error free reception of D8PSK_C type BC frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT
2.3.29.2	Verify error free transmission of D8PSK_C type BC frames in channel ch 5 (55°)	Frames: 2000	at least 1996 frames	PASS	Sample: M1	TT

A.1.4. PHY Test Cases: Regulatory category for channel 1

DUT is EN50065-1, EN50065-2-3 and EN50065-7 compliant in order to be PRIME compliant.

- According to Test reports No. B41-18-AY-I1 of the Electronic Devices Laboratory of TECNALIA. DUT identification

And the tested sample of:

Unit:	Single-phase smart meter with integrated Prime PLC
Brand:	ZPA SMART ENERGY, A.S.
Model:	AM170
Manufacturer:	ZPA SMART ENERGY, A.S.
PRIME version:	01.03.09.07.0001
Serial number:	n° 0000000030

- **COMPLIES** with EN 50065-1:2011.
- **COMPLIES** with EN 50065-2-3:2003+A1:2005.
- **COMPLIES** with EN 50065-7:2001.

A.2. MAC and CONVERGENCE layer

A.2.1. Test setup

DUT connections:



- Serial port:
 - to configure the DUT in different modes (PHY tx, PHY rx, AppEmu, MAC)
 - to manage the DUT
 - connected to auxiliary PC
 - to access to PIB values with Vendor Tool
 - connected to Neuron Prime 1.4 Certification Testing Tool

Auxiliary PC with the following Software:

- Microchip Vendor Tool PRIME Manager and serial terminal emulator Putty. To configure the DUT in different modes and manage the DUT

DUT configuration for MAC test cases

- Connect serial port to Vendor Tool (VT) or to Putty in auxiliary PC

Testing tools needed for MAC and CL testcases:

- Neuron Prime 1.4 Certification Testing Tool (**NT**)
- Tecnalia Lab. auxiliary tools (**LT**) when needed (external sniffers, base nodes and auxiliary Prime 1.4 service nodes, noise generator, oscilloscope)
- Vendor Tool Microchip PRIME Manager Rev 2.1.0rc3 (**VT**)

A.2.2. MAC Test results for CHANNEL 1

PRIME 1.4 MAC layer						
CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS	TOOLS
3.2 MAC Test Cases: Service Node Start-up						
3.2.1	Service node start-up (forcing the reception of beacons).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.2	Service node start-up (No PNPDU are transmitted when DUT receives BPDUs).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.3	Service node start-up (PNPDUs generation latency, transmission parameters and transmission rate of PNPDU reduced by factor of received PNPDU).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.4	Service node start-up (Seeking promotion of DUT after an unsuccessful registration process).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.5	Service Node start-up (Time condition in the transmission of PNPDU)	Correct Time condition in TX of PNPDU	Correct randomness in TX of PNPDU	PASS	Sample: M2	NT
3.2.6	Robust mode of Service Node start-up (PNPDU transmission modulation change).	N.A.	N.A.	N.A.	N.A.	N.A.
3.3 MAC Test Cases: Channel Access						

3.3.1	Channel access-Shared Contention Period. Channel is idle	Data sent during SCP	Data sent during SCP	PASS	Sample: M2	NT, VT to Trigger TX_DATA Burst
3.3.2	Channel access-Shared Contention Period. Channel is occupied.	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.3	Channel access-Contention Free Period.	DUT does not transmit during CFP	DUT does not transmit during CFP	PASS	Sample: M2	NT, VT to Trigger TX_DATA Burst
3.3.4	Channel access-Contention Free Period.	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.5	Channel access-Adaptation to frame structure change (FRA)	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.6	Channel access-Adaptation to frame length change (FRA)	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.7	Switch's beacon transmission time tolerance with respect to frame's beginning time.	N.A.	N.A.	N.A.	N.A.	N.A.
3.4 MAC Test Cases: Registration						
3.4.1	Registration accepted (Base Node available when DUT powers up).	Successful registration to Base Node	Successful registration to Base Node	PASS	Sample: M2	NT
3.4.2	Registration accepted (Base Node not available when DUT powers up).	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the	N.A.	N.A.	N.A.	N.A.	N.A.

	Base Node).					
3.4.4	Tracking available Switches	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.5	Unregistering process initiated by a terminal node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.6	Unregistering process initiated by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5 MAC Test Cases: Promotion						
3.5.1	Promotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.2	Promotion process initiated by the service node DUT when receiving PNPDU from another device.	Successful promotion process	Successful promotion process	PASS	Sample: M2	NT
3.5.3	Switching process: 2 levels of switching (DUT1 as a level 1 switch).	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.4	Tracking Switches under one node	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.5	Switching process: 2 levels of switching (DUT as a level 2 switch).	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.6	Switching process: Multicast switching	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.7	Switching functions: BPDU transmission	N.A.	N.A.	N.A.	N.A.	N.A.

3.5.8	Switching functions: BPDU modulation change initiated by the Base Node	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.9	Switching functions: BPDU modulation change initiated by the DUT	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.10	Promotion rejected by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.11	Demotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.12	Double Switching process initiated by the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.13	DS-enabling promotion rejection from the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.14	Full demotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.15	Double Switching process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.16	DS-enabling promotion rejection by the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6 MAC Test Cases: Connection						
3.6.1	Connection establishment initiated by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.

3.6.2	Connection establishment initiated by the Service node.	Successful connection establishment	Successful connection establishment	PASS	Sample: M2	NT, VT to trigger 4_32 conn
3.6.3	Connection establishment rejected by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6.4	Connection closing initiated by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6.5	Connection closing initiated by the Service node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7 MAC Test Cases: ARQ						
3.7.1	Verify correct behaviour of the DUT in a setup where the Base Node does not support ARQ.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.2	Verify correct behaviour of the DUT in a setup where the Base Node does support ARQ.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.3	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.4	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	N.A.	N.A.	N.A.	N.A.

3.7.5	Verify that the DUT is able to effectively respond against congestion situation.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.6	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.7	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.8	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.9	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8 MAC Test Cases: Alive						

3.8.1	Keep-Alive process (response from DUT as Terminal).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.2	Keep-Alive process (response from DUT as Switch).	ALV control packets are transacted with its correct priority	ALV control packets are transacted with its correct priority	PASS	Sample: M2	NT
3.8.3	Keep-Alive process (timeout and disconnect).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.4	Keep-Alive process (timeout refresh of DUT as a Terminal)	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.5	Keep-Alive process (timeout refresh of DUT as a Switch).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.6	Keep-Alive process (changes in Keep Alive timeout).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.7	Keep-Alive process (three levels hierarchy with the DUT as the first level Switch).	N.A.	N.A.	N.A.	N.A.	N.A.

3.8.8	Keep-Alive process (1.3.6 mechanism).	N.A.	N.A.	N.A.	N.A.	N.A.
3.9 MAC Test Cases: Management						
3.9.1	Forced modulation scheme	N.A.	N.A.	N.A.	N.A.	N.A.
3.9.2	Modulation scheme updated with packet header information	Modulation scheme of the first message from the DUT is the most robust one available	Modulation scheme of the first message from the DUT is the most robust one available	PASS	Sample: M1	NT, VT, LT to confirm manually
3.9.3	Modulation scheme updated with ALIVE mechanism: lost ACK	N.A.	N.A.	N.A.	N.A.	N.A.
3.9.4	Modulation scheme updated with ALIVE mechanism: lost response	N.A.	N.A.	N.A.	N.A.	N.A.
3.10 MAC Test Cases: Backwards Compatibility						
3.10.1	Service node start-up (No PNPDU are transmitted when DUT receives CBCN).	N.A.	N.A.	N.A.		N.A.
3.10.2	Backwards Compatibility Capability at registration	N.A.	N.A.	N.A.		N.A.

3.10.3	PNPDUs discarding	N.A.	N.A.	N.A.	N.A.
3.10.4	Demotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.
3.10.5	DUT connected through a 1.3.6 Switch node	N.A.	N.A.	N.A.	N.A.
3.10.6	Unregistering process initiated by the DUT when connected through a 1.3.6 Switch.	N.A.	N.A.	N.A.	N.A.
3.10.7	DUT as a Switch node for a 1.3.6 Terminal node	N.A.	N.A.	N.A.	N.A.
3.10.8	DUT as a level 2 switch with a 1.4 “parent” and 1.3.6 “son”	N.A.	N.A.	N.A.	N.A.
3.10.9	DUT as a level 2 switch with a 1.3.6 “parent” and 1.3.6 “son”	N.A.	N.A.	N.A.	N.A.
3.10.10	DUT as a level 2 switch with a 1.3.6 “parent” and 1.4 “son”	N.A.	N.A.	N.A.	N.A.
3.10.11	BC Keep-Alive process (response from DUT).	N.A.	N.A.	N.A.	N.A.
3.10.12	BC Keep-Alive process (timeout and disconnect).	N.A.	N.A.	N.A.	N.A.
3.10.13	BC Keep-Alive process (changes in Keep Alive timeout).	N.A.	N.A.	N.A.	N.A.
3.11 MAC Test Cases: Time Reference					

3.11.1	Verify correct behavior of the DUT in a setup where the Base Node does support time reference.	N.A.	N.A.	N.A.	N.A.	N.A.
3.11.2	Verify correct behavior of the DUT (as the Switch Node) between the Base Node and Auxiliary Device (as Service Node) do support time reference.	N.A.	N.A.	N.A.	N.A.	N.A.
3.11.3	Check each zero cross detection circuits available in the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
3.12 MAC Test Cases: Security						
3.12.1	Registration process with security profile 1	N.A.	N.A.	N.A.		N.A.
3.12.2	Registration process with security profile 2	N.A.	N.A.	N.A.		N.A.
3.12.3	Registration rejection with security profile 1	N.A.	N.A.	N.A.		N.A.
3.12.4	Registration rejection with security profile 2	N.A.	N.A.	N.A.		N.A.
3.12.5	Nonce usage	N.A.	N.A.	N.A.		N.A.
3.12.6	Keys updating with a correct KWK	N.A.	N.A.	N.A.		N.A.

3.12.7	Keys updating rejection when a wrong KWK is used	N.A.	N.A.	N.A.	N.A.
3.12.8	SWK usage	N.A.	N.A.	N.A.	N.A.
3.12.9	SWK modification handling	N.A.	N.A.	N.A.	N.A.

A.2.3. MAC Test results for CHANNEL 5

PRIME 1.4 MAC layer						
CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS	TOOLS
3.2 MAC Test Cases: Service Node Start-up						
3.2.1	Service node start-up (forcing the reception of beacons).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.2	Service node start-up (No PNPDU are transmitted when DUT receives BPDUs).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.3	Service node start-up (PNPDUs generation latency, transmission parameters and transmission rate of PNPDU reduced by factor of received PNPDU).	N.A.	N.A.	N.A.	N.A.	N.A.
3.2.4	Service node start-up (Seeking promotion of DUT after an unsuccessful registration)	N.A.	N.A.	N.A.	N.A.	N.A.

	process).					
3.2.5	Service Node start-up (Time condition in the transmission of PNPDU)	Correct Time condition in TX of PNPDU	Correct randomness in TX of PNPDU	PASS	Sample: M2	NT
3.2.6	Robust mode of Service Node start-up (PNPDU transmission modulation change).	N.A.	N.A.	N.A.	N.A.	N.A.
3.3 MAC Test Cases: Channel Access						
3.3.1	Channel access-Shared Contention Period. Channel is idle	Data sent during SCP	Data sent during SCP	PASS	Sample: M2	NT, VT to Trigger TX_DATA Burst
3.3.2	Channel access-Shared Contention Period. Channel is occupied.	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.3	Channel access-Contention Free Period.	DUT does not transmit during CFP	DUT does not transmit during CFP	PASS	Sample: M2	NT, VT to Trigger TX_DATA Burst
3.3.4	Channel access-Contention Free Period.	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.5	Channel access-Adaptation to frame structure change (FRA)	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.6	Channel access-Adaptation to frame length change (FRA)	N.A.	N.A.	N.A.	N.A.	N.A.
3.3.7	Switch's beacon transmission time tolerance with respect to frame's beginning time.	N.A.	N.A.	N.A.	N.A.	N.A.
3.4 MAC Test Cases: Registration						

3.4.1	Registration accepted (Base Node available when DUT powers up).	Successful registration to Base Node	Successful registration to Base Node	PASS	Sample: M2	NT
3.4.2	Registration accepted (Base Node not available when DUT powers up).	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node).	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.4	Tracking available Switches	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.5	Unregistering process initiated by a terminal node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.4.6	Unregistering process initiated by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5 MAC Test Cases: Promotion						
3.5.1	Promotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.2	Promotion process initiated by the service node DUT when receiving PNPDU from another device.	Successful promotion process	Successful promotion process	PASS	Sample: M2	NT
3.5.3	Switching process: 2 levels of switching (DUT1 as a level 1 switch).	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.4	Tracking Switches under one node	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.5	Switching process: 2 levels of switching (DUT as a level 2 switch).	N.A.	N.A.	N.A.	N.A.	N.A.

3.5.6	Switching process: Multicast switching	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.7	Switching functions: BPDU transmission	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.8	Switching functions: BPDU modulation change initiated by the Base Node	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.9	Switching functions: BPDU modulation change initiated by the DUT	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.10	Promotion rejected by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.11	Demotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.12	Double Switching process initiated by the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.13	DS-enabling promotion rejection from the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.14	Full demotion process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.15	Double Switching process initiated by the base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.5.16	DS-enabling promotion rejection by the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6 MAC Test Cases: Connection						

3.6.1	Connection establishment initiated by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6.2	Connection establishment initiated by the Service node.	Successful connection establishment	Successful connection establishment	PASS	Sample: M2	NT, VT to trigger 4_32 conn
3.6.3	Connection establishment rejected by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6.4	Connection closing initiated by the Base node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.6.5	Connection closing initiated by the Service node.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7 MAC Test Cases: ARQ						
3.7.1	Verify correct behaviour of the DUT in a setup where the Base Node does not support ARQ.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.2	Verify correct behaviour of the DUT in a setup where the Base Node does support ARQ.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.3	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	N.A.	N.A.	N.A.	N.A.

3.7.4	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.5	Verify that the DUT is able to effectively respond against congestion situation.	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.6	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.7	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as RX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.8	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	N.A.	N.A.	N.A.	N.A.
3.7.9	Verify correct behaviour of the DUT during a transmission of PPDUs in a setup where the Base Node does support ARQ (DUT as TX).	N.A.	N.A.	N.A.	N.A.	N.A.

3.8 MAC Test Cases: Alive						
3.8.1	Keep-Alive process (response from DUT as Terminal).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.2	Keep-Alive process (response from DUT as Switch).	ALV control packets are transacted with its correct priority	ALV control packets are transacted with its correct priority	PASS	Sample: M2	NT
3.8.3	Keep-Alive process (timeout and disconnect).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.4	Keep-Alive process (timeout refresh of DUT as a Terminal)	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.5	Keep-Alive process (timeout refresh of DUT as a Switch).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.6	Keep-Alive process (changes in Keep Alive timeout).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.7	Keep-Alive process (three levels hierarchy with the DUT as the first level Switch).	N.A.	N.A.	N.A.	N.A.	N.A.
3.8.8	Keep-Alive process (1.3.6 mechanism).	N.A.	N.A.	N.A.	N.A.	N.A.
3.9 MAC Test Cases: Management						
3.9.1	Forced modulation scheme	N.A.	N.A.	N.A.	N.A.	N.A.
3.9.2	Modulation scheme updated with packet header information	Modulation scheme of the first message from the DUT is the most robust one available	Modulation scheme of the first message from the DUT is the most robust one available	PASS	Sample: M1	NT, VT, LT to confirm manually

3.9.3	Modulation scheme updated with ALIVE mechanism: lost ACK	N.A.	N.A.	N.A.	N.A.	N.A.
3.9.4	Modulation scheme updated with ALIVE mechanism: lost response	N.A.	N.A.	N.A.	N.A.	N.A.
3.10 MAC Test Cases: Backwards Compatibility						
3.10.1	Service node start-up (No PNPDU's are transmitted when DUT receives CBCN).	N.A.	N.A.	N.A.		N.A.
3.10.2	Backwards Compatibility Capability at registration	N.A.	N.A.	N.A.		N.A.
3.10.3	PNPDUs discarding	N.A.	N.A.	N.A.		N.A.
3.10.4	Demotion process initiated by the base node.	N.A.	N.A.	N.A.		N.A.
3.10.5	DUT connected through a 1.3.6 Switch node	N.A.	N.A.	N.A.		N.A.
3.10.6	Unregistering process initiated by the DUT when connected through a 1.3.6 Switch.	N.A.	N.A.	N.A.		N.A.
3.10.7	DUT as a Switch node for a 1.3.6 Terminal node	N.A.	N.A.	N.A.		N.A.
3.10.8	DUT as a level 2 switch with a 1.4 "parent" and 1.3.6 "son"	N.A.	N.A.	N.A.		N.A.
3.10.9	DUT as a level 2 switch with a 1.3.6 "parent" and 1.3.6 "son"	N.A.	N.A.	N.A.		N.A.

3.10.10	DUT as a level 2 switch with a 1.3.6 “parent” and 1.4 “son”	N.A.	N.A.	N.A.	N.A.	N.A.
3.10.11	BC Keep-Alive process (response from DUT).	N.A.	N.A.	N.A.	N.A.	N.A.
3.10.12	BC Keep-Alive process (timeout and disconnect).	N.A.	N.A.	N.A.	N.A.	N.A.
3.10.13	BC Keep-Alive process (changes in Keep Alive timeout).	N.A.	N.A.	N.A.	N.A.	N.A.
3.11 MAC Test Cases: Time Reference						
3.11.1	Verify correct behavior of the DUT in a setup where the Base Node does support time reference.	N.A.	N.A.	N.A.	N.A.	N.A.
3.11.2	Verify correct behavior of the DUT (as the Switch Node) between the Base Node and Auxiliary Device (as Service Node) do support time reference.	N.A.	N.A.	N.A.	N.A.	N.A.
3.11.3	Check each zero cross detection circuits available in the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
3.12 MAC Test Cases: Security						
3.12.1	Registration process with security profile 1	N.A.	N.A.	N.A.	N.A.	N.A.
3.12.2	Registration process with security profile 2	N.A.	N.A.	N.A.	N.A.	N.A.
3.12.3	Registration rejection with security profile 1	N.A.	N.A.	N.A.	N.A.	N.A.

3.12.4	Registration rejection with security profile 2	N.A.	N.A.	N.A.	N.A.
3.12.5	Nonce usage	N.A.	N.A.	N.A.	N.A.
3.12.6	Keys updating with a correct KWK	N.A.	N.A.	N.A.	N.A.
3.12.7	Keys updating rejection when a wrong KWK is used	N.A.	N.A.	N.A.	N.A.
3.12.8	SWK usage	N.A.	N.A.	N.A.	N.A.
3.12.9	SWK modification handling	N.A.	N.A.	N.A.	N.A.

A.2.5. CL Test results for CHANEL 1

CONVERGENCE LAYER 1.4						
CODE	DESCRIPTION	RESULT	EXPECTED	STAT	COMMENTS	TOOLS
4.2 CL Test Cases: Convergence sublayer procedures						
4.2.1	Correct establishment and disconnection of 4-32 link	Successful 4-32 communication	Successful 4-32 communication	PASS	Sample: M2	NT, VT to trigger 4_32 conn
4.2.2	Verify the correct implementation of the Segmentation at the DUT side. Force the length of the data being transmitted to 16 bytes at the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
4.2.3	Verify the correct implementation of the Reassembly Mechanism at the DUT side. Force the length of the data being transmitted to 16 bytes at the Base Node.	N.A.	N.A.	N.A.	N.A.	N.A.
4.2.4	Verify the correct implementation of the Reassembly Mechanism when incorrect CRC is received at the DUT side. Force the length of the data being transmitted to 16 bytes at the Base Node.	N.A.	N.A.	N.A.	N.A.	N.A.
4.3 CL Test Cases: Firmware Upgrade						
4.3.1	Firmware upgrade process (unicast).	Successful unicast FW Upgrade	Successful unicast FW Upgrade	PASS	Sample: M2	NT, LT to force ideal setup, VT to check manually

4.3.2	Firmware upgrade process (multicast).	N.A.	N.A.	N.A.	N.A.	N.A.
4.3.3	Firmware upgrade page retransmission	N.A.	N.A.	N.A.	N.A.	N.A.
4.3.4	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the signature of the image	N.A.	N.A.	N.A.	N.A.	N.A.
4.3.5	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the image	N.A.	N.A.	N.A.	N.A.	N.A.
4.4 CL Test Cases: DLMS traffic over 4-32 connection						
4.4.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	DLMS parameter is correctly obtained	DLMS parameter is correctly obtained	PASS	Sample: M1	LT, VT
4.5 CL Test Cases: PRIME Management Plane Communication Profile						
4.5.1	Get PIB attribute query	Successful reading of PIB attribute	Successful reading of PIB attribute	PASS	Sample: M2	NT
4.5.2	Set PIB attribute query	Successful setting of PIB attribute	Successful setting of PIB attribute	PASS	Sample: M2	NT
4.5.3	Reboot device	Successful rebooting of device	Successful rebooting of device	PASS	Sample: M2	NT

A.2.6. CL Test results for CHANEL 5

CONVERGENCE LAYER 1.4						
CODE	DESCRIPTION	RESULT	EXPECTED	STAT	COMMENTS	TOOLS
4.2 CL Test Cases: Convergence sublayer procedures						
4.2.1	Correct establishment and disconnection of 4-32 link	Successful 4-32 communication	Successful 4-32 communication	PASS	Sample: M2	NT, VT to trigger 4_32 conn
4.2.2	Verify the correct implementation of the Segmentation at the DUT side. Force the length of the data being transmitted to 16 bytes at the DUT.	N.A.	N.A.	N.A.	N.A.	N.A.
4.2.3	Verify the correct implementation of the Reassembly Mechanism at the DUT side. Force the length of the data being transmitted to 16 bytes at the Base Node.	N.A.	N.A.	N.A.	N.A.	N.A.
4.2.4	Verify the correct implementation of the Reassembly Mechanism when incorrect CRC is received at the DUT side. Force the length of the data being transmitted to 16 bytes at the Base Node.	N.A.	N.A.	N.A.	N.A.	N.A.
4.3 CL Test Cases: Firmware Upgrade						
4.3.1	Firmware upgrade process (unicast).	Successful unicast FW Upgrade	Successful unicast FW Upgrade	PASS	Sample: M2	NT, LT to force ideal setup, VT to check manually

4.3.2	Firmware upgrade process (multicast).	N.A.	N.A.	N.A.	N.A.	N.A.
4.3.3	Firmware upgrade page retransmission	N.A.	N.A.	N.A.	N.A.	N.A.
4.3.4	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the signature of the image	N.A.	N.A.	N.A.	N.A.	N.A.
4.3.5	Firmware upgrade process (unicast). EXCEPTION State. Bit error in the image	N.A.	N.A.	N.A.	N.A.	N.A.
4.4 CL Test Cases: DLMS traffic over 4-32 connection						
4.4.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	DLMS parameter is correctly obtained	DLMS parameter is correctly obtained	PASS	Sample: M1	LT, VT
4.5 CL Test Cases: PRIME Management Plane Communication Profile						
4.5.1	Get PIB attribute query	Successful reading of PIB attribute	Successful reading of PIB attribute	PASS	Sample: M1	NT
4.5.2	Set PIB attribute query	Successful setting of PIB attribute	Successful setting of PIB attribute	PASS	Sample: M2	NT
4.5.3	Reboot device	Successful rebooting of device	Successful rebooting of device	PASS	Sample: M2	NT

ANNEX II. MODIFICATIONS FROM PRIME 1.3.6 CERTIFIED MODEL AM370 TO CURRENT PRIME 1.4 MODEL MANUFACTURER/DEVELOPER DECLARATION



TECNALIA
Electronic Devices Lab
Smart Data & Protocols Lab
Área DIGITAL SERVICES
Parque Tecnológico de Bizkaia., Edif. 700
48160 Derio (Bizkaia) SPAIN

Trutnov, March 07, 2019

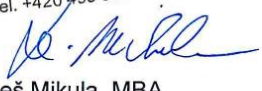
Declaration on AMx70 Electricity Meter Hardware

WHEREAS we, ZPA Smart Energy a.s., member of the El Sewedy group, are a reputable manufacturer having factories at Komenského 821, 541 01 Trutnov - Czech Republic, and also bear full responsibility for the development of the Single-phase bidirectional static electricity meter **AM170** and the Three-phase bidirectional static electricity meter **AM370**,

THEREFORE, we do hereby solemnly declare the following:

All the results obtained during the tests carried out on **AM170 PRIME 1.3.6** and **AM370 PRIME 1.3.6** meters as per norm **CENELEC EN50065**, are still valid for **AM170 PRIME 1.4** and **AM370 PRIME 1.4** meters, since they are based on the same HW and only the additional part for PRIME 1.4 is active in the latter.

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