# Test Report

## No B41-19-AI-I1

### PRIME 1.4 Certification Tests Cases for Service Nodes

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| **EQUIPMENT UNDER TEST** | SINGLE-PHASE smart meter with integrated PRIME Power Line Communications |
| **MODEL** | AM170 |
| **FIRMWARE VERSION** | 01.04.03.01.0002 |
| **CERTIFICATION SCOPE** | PRIME v1.4: Certification Process<br>Profile: Electricity Meter with PRIME PHY and PRIME MAC. PRIME 1.4 CH1, CH5<br>• PRIME 1.4 PHY<br>• PRIME 1.4 MAC layer<br>  ○ Exclufing security profiles<br>  ○ Excluding backward compatibility<br>• PRIME 1.4 Convergence layer |
| **DATE OF EXECUTION** | 21st January to 5th March 2019 |

| Responsible for tests | Smart Data & Protocol Laboratory Manager |
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| Ibone García-Borreguero | Marta Castro |

Author: Ibone García-Borreguero. Responsible for tests
Reviewer: Marta Castro. Smart Data & Protocol Laboratory Manager

NOTE: This test report shows the detailed information associated with the Test Report Summary no. B41-19-AI-I1 summary

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## 1.- EQUIPMENT UNDER TEST IDENTIFICATION

| | |
|---|---|
| **Unit:** | SINGLE-PHASE smart meter with integrated PRIME Power Line Communications |
| **Model:** | AM170 |
| **Trade Mark:** | ZPA Smart Energy a.s. |
| **Serial Number:** | M1: nº 18101760 (MAC 11:22:33:00:00:3C)<br>M2: nº 18101761 (MAC 11:22:33:00:00:3D) |
| **Manufacturer:** | ZPA Smart Energy a.s. |


The samples were selected and delivered by the applicant.

Equipment characteristics declared by the applicant:

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| **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: |

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| | Electronic Devices Laboratory of TECNALIA<br>Test Report No. B41-18-AW-I1 for channel 1. See ANNEX II |
| **Applicable tests** | Profile Electricity Meter with PRIME PHY and PRIME MAC. PRIME 1.4 CH1, CH5<br>• PRIME 1.4 PHY<br>• PRIME 1.4 MAC layer<br>  ○ Excluding security profiles<br>  ○ Excluding backwards compatibility<br>• PRIME 1.4 Convergence layer |

## 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 |

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| 2.3.8.1 | Verify error free reception of DBPSK type A frames in channel ch 1 (55º) | PASS | TT |
| 2.3.8.2 | Verify error free transmission of DBPSK type A frames in channel ch 1 (55º) | PASS | TT |
| 2.3.9.1 | Verify error free reception of D8PSK_C type A frames in channel ch 1 (55º) | PASS | TT |
| 2.3.9.2 | Verify error free transmission of D8PSK_C type A frames in channel ch 1 (55º) | 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 (55º) | PASS | TT |
| 2.3.18.2 | Verify error free transmission of DBPSK type B frames in channel ch 1 (55º) | PASS | TT |
| 2.3.19.1 | Verify error free reception of D8PSK_C type B frames in channel ch 1 (55º) | PASS | TT |

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| 2.3.19.2 | Verify error free transmission of D8PSK_C type B frames in channel ch 1 (55º) | 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 (55º) | PASS | TT |
| 2.3.28.2 | Verify error free transmission of DBPSK type BC frames in channel ch 1 (55º) | PASS | TT |
| 2.3.29.1 | Verify error free reception of D8PSK_C type BC frames in channel ch 1 (55º) | PASS | TT |
| 2.3.29.2 | Verify error free transmission of D8PSK_C type BC frames in channel ch 1 (55º) | 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 | | | |

| 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). | PASS | NT |
| 3.2.2 | Service node start-up (No PNPDUs are transmitted when DUT receives BPDUs). | PASS | NT |
| 3.2.3 | Service node start-up (PNPDUsgeneration latency, transmission parameters and transmission rate of PNPDUs reduced by factor of received PNPDUs). | PASS | NT |
| 3.2.4 | Service node start-up (Seeking promotion of DUT after an unsuccessful registration process). | PASS | NT |
| 3.2.5 | Service Node start-up (Time condition in the transmission of PNPDUs) | PASS | NT |
| 3.2.6 | Robust mode of Service Node start-up (PNPDU transmission modulation change). | PASS | NT |
| **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. | PASS | NT, VT |
| 3.3.3 | Channel access- Contention Free Period. | PASS | NT, VT |
| 3.3.4 | Channel access- Contention Free Period. | PASS | NT, LT |
| 3.3.5 | Channel access-Adaptation to frame structure change (FRA) | PASS | NT, VT |
| 3.3.6 | Channel access-Adaptation to frame length change (FRA) | PASS | NT, LT |
| 3.3.7 | Switch's beacon transmission time tolerance with respect to frame's beginning time. | PASS | NT |
| **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). | PASS | NT |
| 3.4.3 | Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node). | PASS | NT<br>*Attenuators needed |
| 3.4.4 | Tracking available Switches | PASS | NT, VT |
| 3.4.5 | Unregistering process initiated by a terminal node. | PASS | NT, VT |
| 3.4.6 | Unregistering process initiated by the Base node. | PASS | NT |
| **3.5 MAC Test Cases: Promotion** | | | |
| 3.5.1 | Promotion process initiated by the base node. | PASS | NT |
| 3.5.2 | Promotion process initiated by the service node DUT when receiving PNPDUs from another device. | PASS | NT |
| 3.5.3 | Switching process: 2 levels of switching (DUT1 as a level 1 | PASS | NT |

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| | switch). | | |
| 3.5.4 | Tracking Switches under one node | PASS | NT |
| 3.5.5 | Switching process: 2 levels of switching (DUT as a level 2 switch). | PASS | NT *Attenuators needed |
| 3.5.6 | Switching process: Multicast switching | PASS | NT |
| 3.5.7 | Switching functions: BPDU transmission | PASS | NT, LT |
| 3.5.8 | Switching functions: BPDU modulation change initiated by the Base Node | PASS | NT |
| 3.5.9 | Switching functions: BPDU modulation change initiated by the DUT | PASS | NT, VT |
| 3.5.10 | Promotion rejected by the base node. | PASS | NT |
| 3.5.11 | Demotion process initiated by the base node. | PASS | NT |
| 3.5.12 | Double Switching process initiated by the DUT. | PASS | NT, LT |
| 3.5.13 | DS-enabling promotion rejection from the base node. | PASS | NT |
| 3.5.14 | Full demotion process initiated by the base node. | PASS | LT |
| 3.5.15 | Double Switching process initiated by the base node. | PASS | NT |
| 3.5.16 | DS-enabling promotion rejection by the DUT. | PASS | NT |
| **3.6 MAC Test Cases: Connection** | | | |
| 3.6.1 | Connection establishment initiated by the Base node. | PASS | NT |
| 3.6.2 | Connection establishment initiated by the Service node. | PASS | NT, VT |
| 3.6.3 | Connection establishment rejected by the Base node. | PASS | NT |
| 3.6.4 | Connection closing initiated by the Base node. | PASS | NT |
| 3.6.5 | Connection closing initiated by the Service node. | PASS | NT, VT |
| **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. | PASS | NT, VT |
| 3.7.2 | Verify correct behaviour of the DUT in a setup where the Base Node does support ARQ. | PASS | NT |
| 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). | PASS | NT |
| 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). | PASS | NT, VT, LT |
| 3.7.5 | Verify that the DUT is able to effectively respond against congestion situation. | PASS | NT, LT |
| 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). | PASS | NT, LT |
| 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). | PASS | LT, VT |

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| 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). | PASS | NT, LT |
| 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). | PASS | NT, LT |
| **3.8 MAC Test Cases: Alive** | | | |
| 3.8.1 | Keep-Alive process (response from DUT as Terminal). | PASS | NT |
| 3.8.2 | Keep-Alive process (response from DUT as Switch). | PASS | NT |
| 3.8.3 | Keep-Alive process (timeout and disconnect). | PASS | NT |
| 3.8.4 | Keep-Alive process (timeout refresh of DUT as a Terminal) | PASS | NT |
| 3.8.5 | Keep-Alive process (timeout refresh of DUT as a Switch). | PASS | NT |
| 3.8.6 | Keep-Alive process (changes in Keep Alive timeout). | PASS | NT |
| 3.8.7 | Keep-Alive process (three levels hierarchy with the DUT as the first level Switch). | PASS | NT, LT |
| 3.8.8 | Keep-Alive process (1.3.6 mechanism). | PASS | NT |
| **3.9 MAC Test Cases: Management** | | | |
| 3.9.1 | Forced modulation scheme | PASS | NT, VT |
| 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 | PASS | NT, LT |
| 3.9.4 | Modulation scheme updated with ALIVE mechanism: lost response | PASS | NT, LT |
| **3.10 MAC Test Cases: Backwards Compatibility** | | | |
| 3.10.1 | Service node start-up (No PNPDUs 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** | | | |

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| 3.11.1 | Verify correct behavior of the DUT in a setup where the Base Node does support time reference. | PASS | NT, LT |
| 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. | PASS | NT, LT |
| 3.11.3 | Check each zero cross detection circuits available in the DUT. | PASS | NT, VT, LT |
| **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.<br>Force the lenght of the data being transmitted to 16 bytes at the DUT.. | PASS | NT, VT |
| 4.2.3 | Verify the correct implementation of the Reassembly Mechanism at the DUT side.<br>Force the lenght of the data being transmitted to 16 bytes at the Base Node. | PASS | LT, VT |
| 4.2.4 | Verify the correct implementation of the Reassembly Mechanism when incorrect CRC is received at the DUT side.<br>Force the lenght of the data being transmitted to 16 bytes at the Base Node. | PASS | LT, VT |
| **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). | PASS | NT, LT, VT |
| 4.3.3 | Firmware upgrade page retransmission | PASS | NT, LT, VT |
| 4.3.4 | Firmware upgrade process (unicast). EXCEPTION State. Bit error in the signature of the image | PASS | NT, LT, VT |
| 4.3.5 | Firmware upgrade process (unicast). EXCEPTION State. Bit error in the image | PASS | NT, LT, VT |

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| **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.**
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| 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 |

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|---|---|---|---|
| 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 (55º) | PASS | TT |
| 2.3.8.2 | Verify error free transmission of DBPSK type A frames in channel ch 5 (55º) | PASS | TT |
| 2.3.9.1 | Verify error free reception of D8PSK_C type A frames in channel ch 5 (55º) | PASS | TT |
| 2.3.9.2 | Verify error free transmission of D8PSK_C type A frames in channel ch 5 (55º) | 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 |

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| 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 (55º) | PASS | TT |
| 2.3.18.2 | Verify error free transmission of DBPSK type B frames in channel ch 5 (55º) | PASS | TT |
| 2.3.19.1 | Verify error free reception of D8PSK_C type B frames in channel ch 5 (55º) | PASS | TT |
| 2.3.19.2 | Verify error free transmission of D8PSK_C type B frames in channel ch 5 (55º) | 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 (55º) | PASS | TT |
| 2.3.28.2 | Verify error free transmission of DBPSK type BC frames in channel ch 5 (55º) | PASS | TT |

| | | | |
|---|---|---|---|
| 2.3.29.1 | Verify error free reception of D8PSK_C type BC frames in channel ch 5 (55º) | PASS | TT |
| 2.3.29.2 | Verify error free transmission of D8PSK_C type BC frames in channel ch 5 (55º) | 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 PNPDUs are transmitted when DUT receives BPDUs). | N.A. | -- |
| 3.2.3 | Service node start-up (PNPDUsgeneration latency, transmission parameters and transmission rate of PNPDUs reduced by factor of received PNPDUs). | 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 PNPDUs) | 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 PNPDUs 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 PNPDUs 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.<br>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.<br>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.<br>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:** | SINGLE-PHASE smart meter with integrated PRIME Power Line Communications |
| **Model:** | AM170 |
| **Trade Mark:** | ZPA Smart Energy a.s. |
| **Serial Number:** | M1: nº 18101760 (MAC 11:22:33:00:00:3C)<br>M2: nº 18101761 (MAC 11:22:33:00:00:3D) |
| **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 ºC 44% H.R. 1014 mbar

**Responsible:** Ibone Gª-Borreguero Melero

**Used instruments:**

| | Measurement instruments |
|---|---|
| ***X*** | *Tecnalia 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**)*<br>✓ PRIME v1.4 Conformance Tester (release 2018-09-RC2) |
| ***X*** | *HW Neuron PRIME 1.4 SN Certification Testing Tool*<br>✓ *BASE NODE*<br>✓ *AUX1*<br>✓ *AUX2*<br>✓ *AUX3*<br>✓ *AUX4*<br>✓ *SNIFFER*<br>✓ *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* |

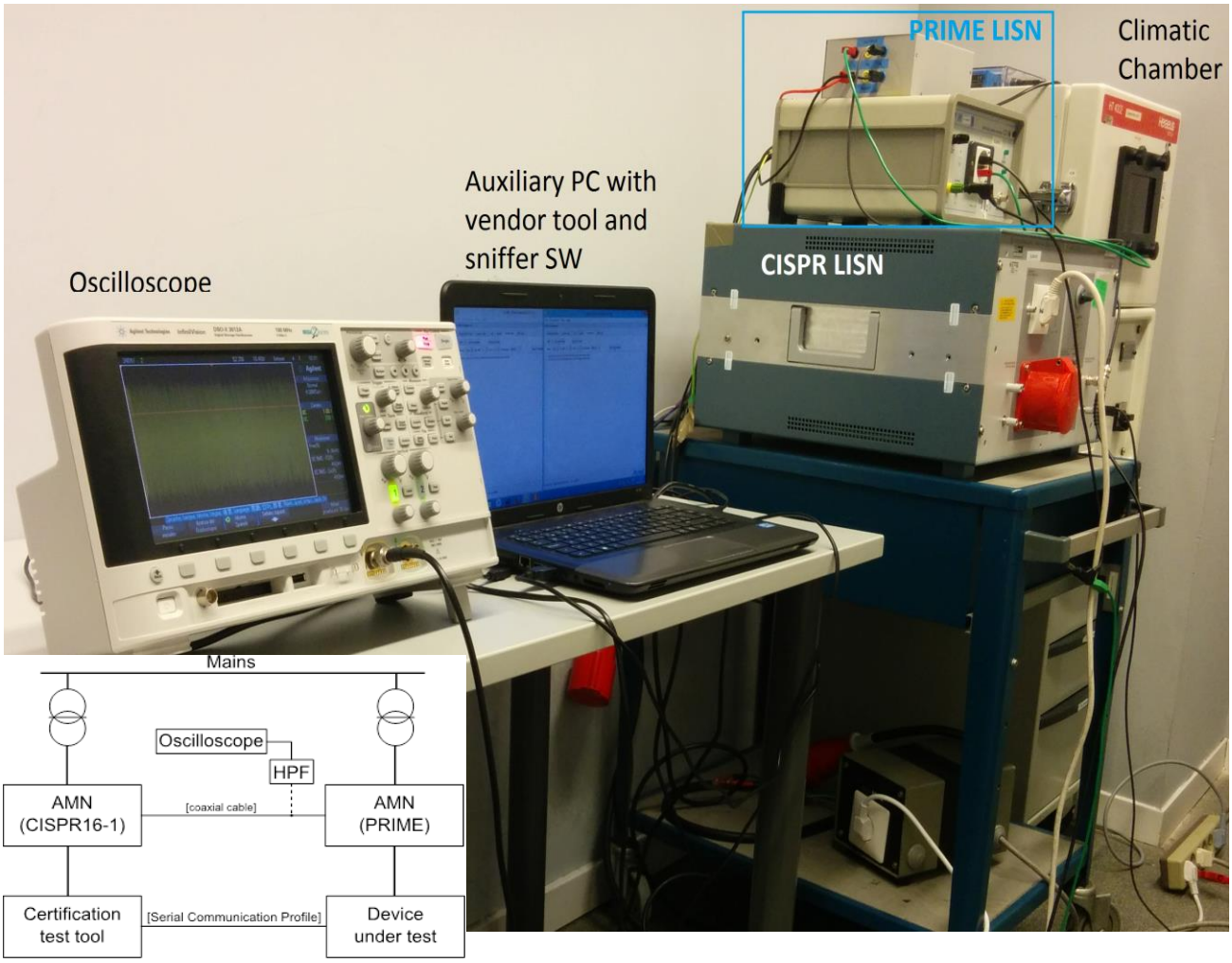
**Used instruments provided by the manufacturer:**

| | Measurement instruments |
|---|---|
| ***X*** | *SW Microchip*<br>✓ *Vendor Tool: Microchip PRIME Manager Rev 2.1.0rc3 (**VT**)* |

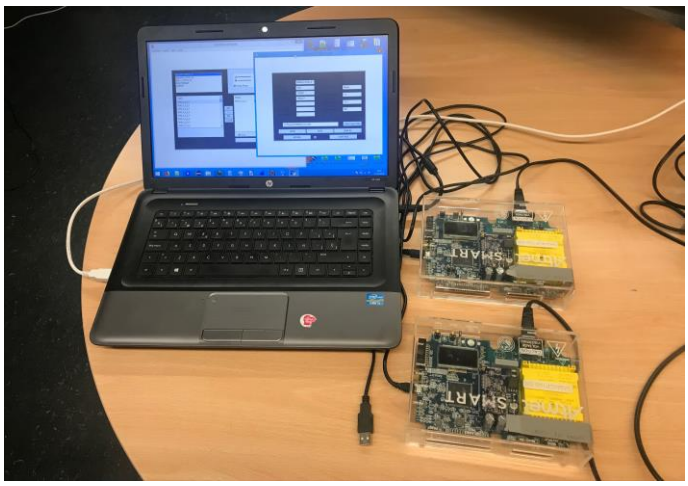
**Results:**

## A.1. PHY layer

### A.1.1. Test setup




✓ TECNALIA PRIME 1.4 SN TESTING TOOL (TT)

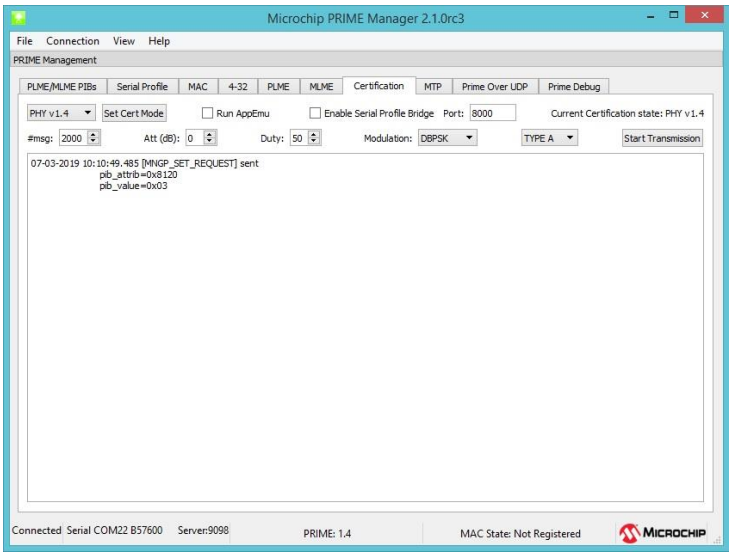


**DUT connections:**


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

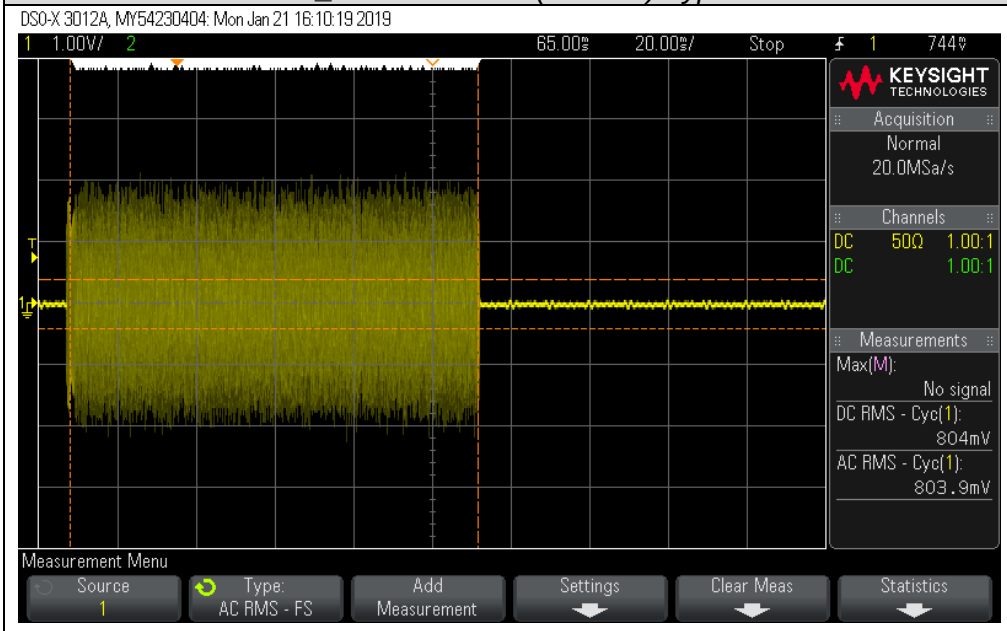
- DUT has to be configured in PHY reception and PHY transmission mode.
- Microchip Prime Manager Vendor Tool and serial terminal emulator Putty:
  - to manage and configure the DUT in PHY mode RX/TX
  - to read PIB attributes



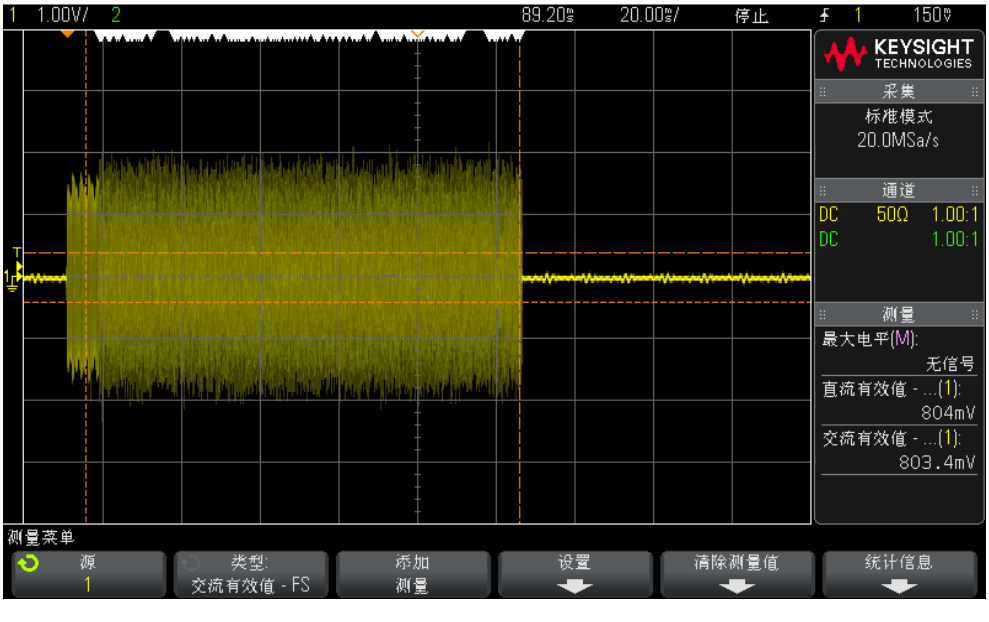
Oscilloscope:

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

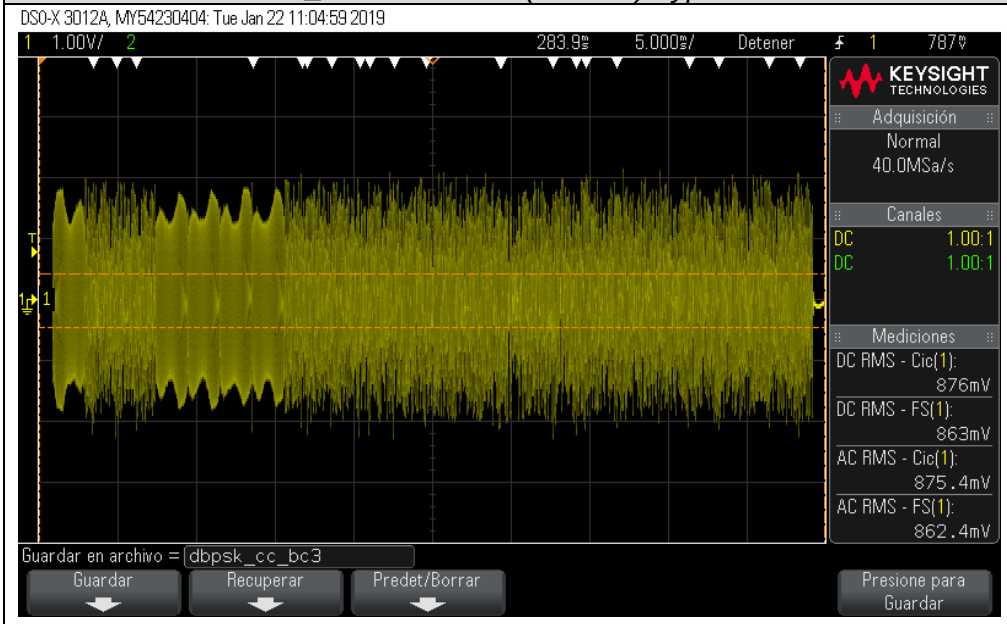
*DBPSK_CC modulation (DUT Tx) Type A CH1*



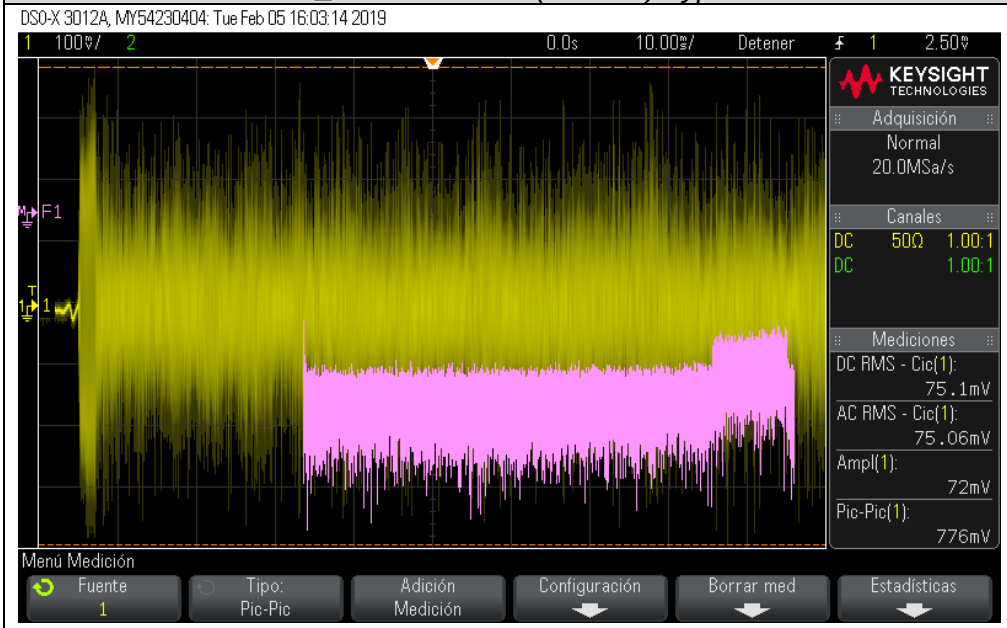

*DBPSK_CC modulation (DUT Tx) Type B CH1*



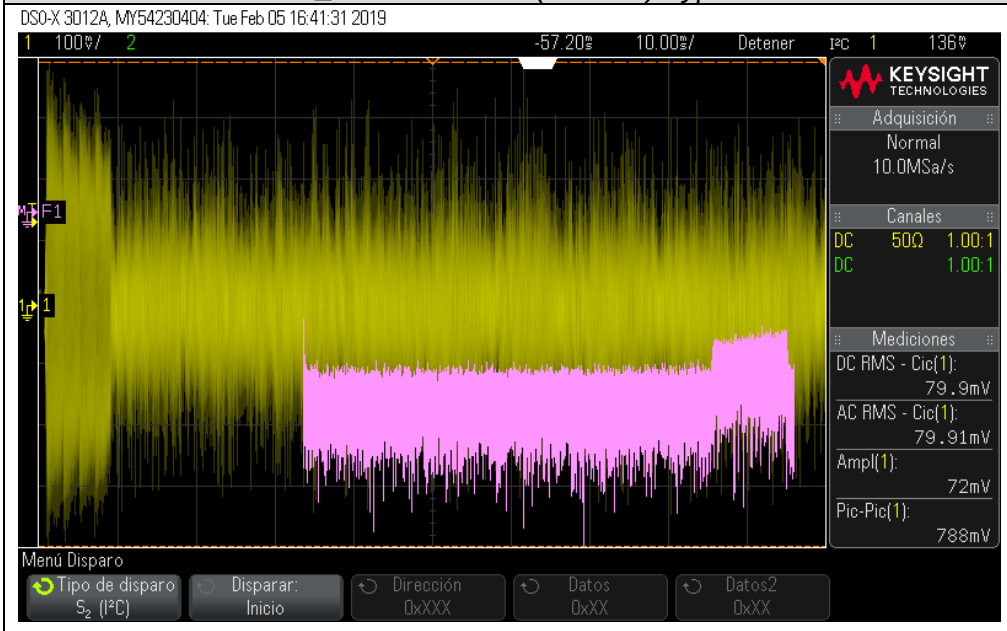
*DBPSK_CC modulation (DUT Tx) Type BC CH1*



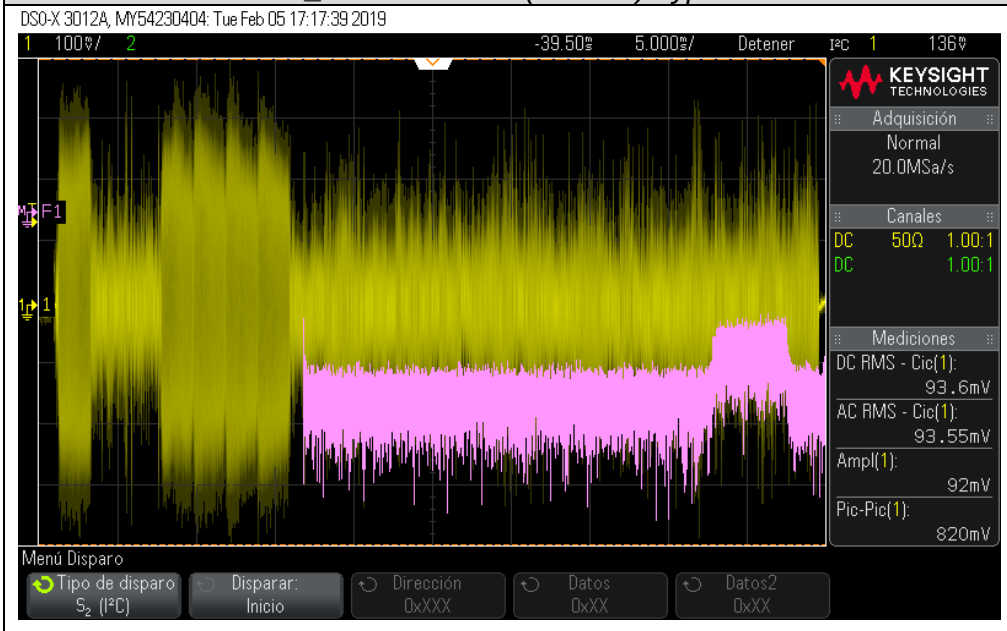

*DBPSK_CC modulation (DUT Tx) Type A CH5*



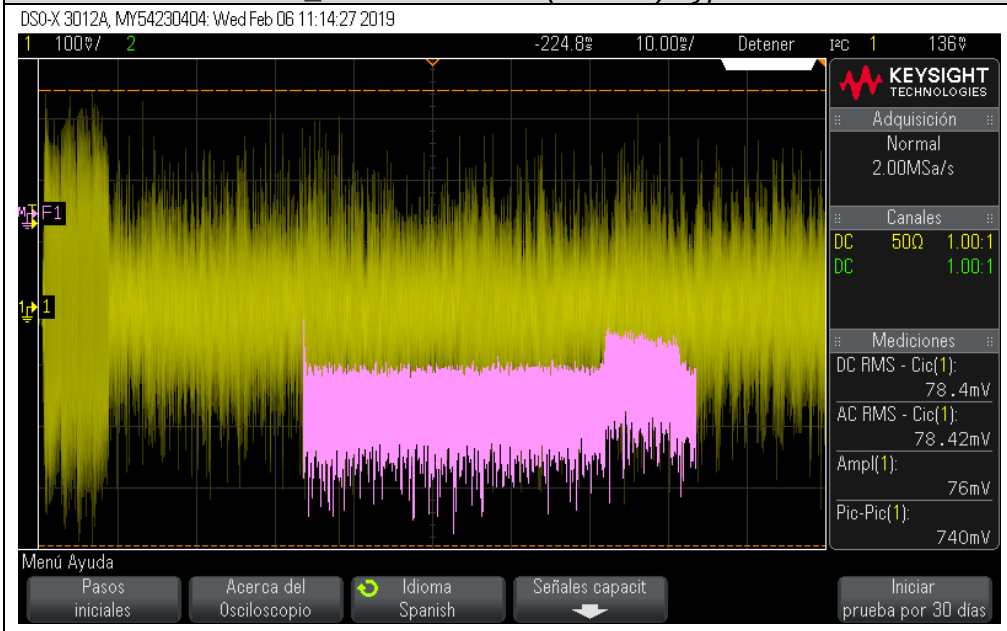
*DBPSK_CC modulation (DUT Tx) Type B CH5*



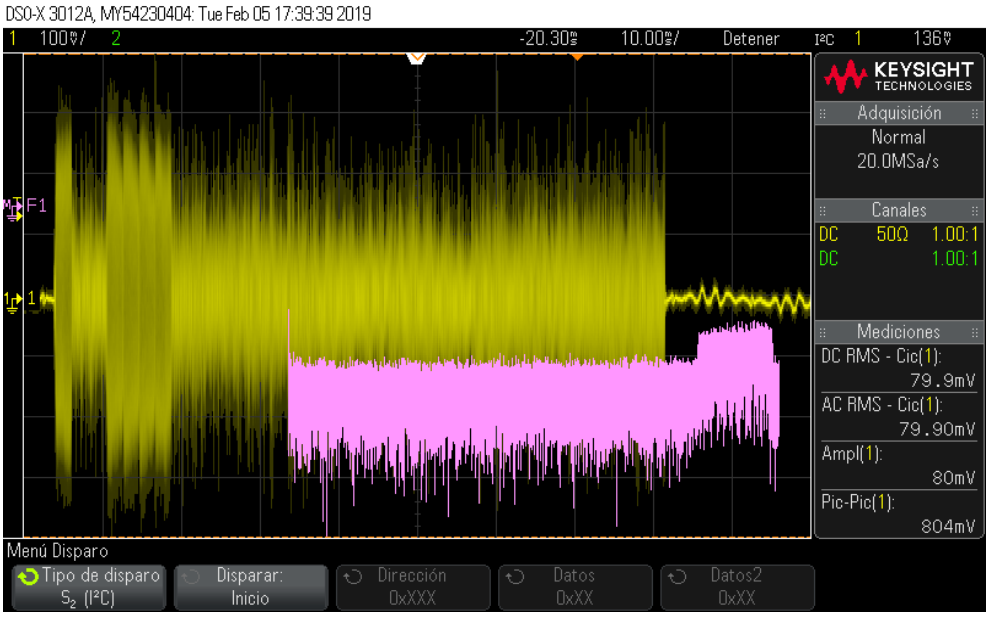

*DBPSK_CC modulation (DUT Tx) Type BC CH5*



*DBPSK_ROB modulation (DUT Tx) Type B CH5*




*DQPSK_ROB modulation (DUT Tx) Type BC CH5*



### 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<br>18,07 dB | at least 1996 frames<br>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<br>18,15 dB | at least 1996 frames<br>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 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.8.2 | Verify error free transmission of DBPSK type A frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.9.1 | Verify error free reception of D8PSK_C type A frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |

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|---|---|---|---|---|---|---|
| 2.3.9.2 | Verify error free transmission of D8PSK_C type A frames in channel ch 1 (55º) | Frames: 1999 | at least 1996 frames | PASS | Sample: M2 | 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 |

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|---|---|---|---|---|---|---|
| 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<br>18,06 dB | at least 1996 frames<br>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<br>18,13 dB | at least 1996 frames<br>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 |

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|---|---|---|---|---|---|---|
| 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 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.18.2 | Verify error free transmission of DBPSK type B frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.19.1 | Verify error free reception of D8PSK_C type B frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.19.2 | Verify error free transmission of D8PSK_C type B frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | 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 |

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|---|---|---|---|---|---|---|
| 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<br>18,10 dB | at least 1996 frames<br>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<br>18,16 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M1 | TT |

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|---|---|---|---|---|---|---|
| 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 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.28.2 | Verify error free transmission of DBPSK type BC frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |

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|---|---|---|---|---|---|---|
| 2.3.29.1 | Verify error free reception of D8PSK_C type BC frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.29.2 | Verify error free transmission of D8PSK_C type BC frames in channel ch 1 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | 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: M2 | 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: M2 | 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: M2 | TT |

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|---|---|---|---|---|---|---|
| 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | TT |
| 2.3.6.1 | Verify error free reception of D8PSK type A frames in channel ch 5 | Frames: 2000<br>18,15 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M2 | TT |
| 2.3.6.2 | Verify error free transmission of D8PSK type A frames in channel ch 5 | Frames: 2000<br>18,15 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M2 | 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: M2 | 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: M2 | TT |
| 2.3.8.1 | Verify error free reception of DBPSK type A frames in channel ch 5 (55º) | Frames: 1999 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.8.2 | Verify error free transmission of DBPSK type A frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.9.1 | Verify error free reception of D8PSK_C type A frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.9.2 | Verify error free transmission of D8PSK_C type A frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | 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: M2 | 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: M2 | TT |

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|---|---|---|---|---|---|---|
| 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | TT |
| 2.3.14.1 | Verify error free reception of D8PSK type B frames in channel ch 5 | Frames: 2000<br>18,15 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M2 | TT |
| 2.3.14.2 | Verify error free transmission of D8PSK type B frames in channel ch 5 | Frames: 2000<br>18,21 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M2 | TT |

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|---|---|---|---|---|---|---|
| 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | TT |
| 2.3.18.1 | Verify error free reception of DBPSK type B frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.18.2 | Verify error free transmission of DBPSK type B frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2.3.19.1 | Verify error free reception of D8PSK_C type B frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.19.2 | Verify error free transmission of D8PSK_C type B frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | TT |
| 2.3.24.1 | Verify error free reception of D8PSK type BC frames in channel ch 5 | Frames: 2000<br>18,18 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M2 | TT |
| 2.3.24.2 | Verify error free transmission of D8PSK type BC frames in channel ch 5 | Frames: 2000<br>18,16 dB | at least 1996 frames<br>EVM above 17dB | PASS | Sample: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | 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: M2 | TT |
| 2.3.28.1 | Verify error free reception of DBPSK type BC frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.28.2 | Verify error free transmission of DBPSK type BC frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.29.1 | Verify error free reception of D8PSK_C type BC frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | TT |
| 2.3.29.2 | Verify error free transmission of D8PSK_C type BC frames in channel ch 5 (55º) | Frames: 2000 | at least 1996 frames | PASS | Sample: M2 | 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-AW-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:** | nº 0000000018 |

- **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). | Succesful start-up of Service Node | Succesful start-up of Service Node | PASS | Sample: M1 | NT |
| 3.2.2 | Service node start-up (No PNPDUs are transmitted when DUT receives BPDUs). | Succesful start-up of Service Node | Succesful start-up of Service Node | PASS | Sample: M1 | NT |
| 3.2.3 | Service node start-up (PNPDUsgeneration latency, transmission parameters and transmission rate of PNPDUs reduced by factor of received PNPDUs). | Correct PNPDU generation latency | Correct PNPDU generation latency | PASS | Sample: M1 | NT |
| 3.2.4 | Service node start-up (Seeking promotion of DUT after an unsuccessful registration process). | Succesful promotion of DUT | Succesful promotion of DUT | PASS | Sample: M1 | NT |
| 3.2.5 | Service Node start-up (Time condition in the transmission of PNPDUs) | Correct Time condition in TX of PNPDUs | Correct randomness in TX of PNPDUs | PASS | Sample: M1 | NT |
| 3.2.6 | Robust mode of Service Node start-up (PNPDU transmission modulation change). | Succesful PNPDU modulation change | Succesful PNPDU modulation change | PASS | Sample: M1 | NT |
| **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: M1 | NT, VT to Trigger TX_DATA Burst |
| 3.3.2 | Channel access-Shared Contention Period. Channel is occupied. | MacCSMACHBusyCount > MacCSMAFailCount | MacCSMACHBusyCount > MacCSMAFailCount | PASS | Sample: M1 | NT, VT to Trigger sn_tx_data |
| 3.3.3 | Channel access-Contention Free Period. | DUT does not transmit during CFP | DUT does not transmit during CFP | PASS | Sample: M1 | NT, VT to Trigger TX_DATA Burst |
| 3.3.4 | Channel access-Contention Free Period. | Succesful beacon modulation change | Succesful beacon modulation change | PASS | Sample: M1 | NT, LT Test-case edited by Tecnalia |
| 3.3.5 | Channel access-Adaptation to frame structure change (FRA) | Succesful modification of frame structure | Succesful modification of frame structure | PASS | Sample: M1 | NT, VT to Trigger sn_tx_data |
| 3.3.6 | Channel access-Adaptation to frame length change (FRA) | Succesful modification of frame length | Succesful modification of frame length | PASS | Sample: M1 | NT, LT confirm manually |
| 3.3.7 | Switch's beacon transmission time tolerance with respect to frame's beginning time. | Correct beacon transmission time tolerance | Correct beacon transmission time tolerance | PASS | Sample: M1 | NT |
| **3.4 MAC Test Cases: Registration** | | | | | | |
| 3.4.1 | Registration accepted (Base Node available when DUT powers up). | Succesful registration to Base Node | Succesful registration to Base Node | PASS | Sample: M1 | NT |
| 3.4.2 | Registration accepted (Base Node not available when DUT powers up). | Succesful registration to Base Node | Succesful registration to Base Node | PASS | Sample: M1 | NT |
| 3.4.3 | Registration accepted (DUT connected to a Switch node and the Switch node is connected to the | Succesful registration through switch | Succesful registration through switch | PASS | Sample: M1 | NT *Attenuators needed |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Base Node). | | | | | |
| 3.4.4 | Tracking available Switches | MACListAvailableSwitches contains both available switches | MACListAvailableSwitches contains both available switches | PASS | Sample: M1 | NT, VT to Trigger unregistration and to confirm manually |
| 3.4.5 | Unregistering process initiated by a terminal node. | Succesful unregistration | Succesful unregistration | PASS | Sample: M1 | NT, VT to trigger unreg |
| 3.4.6 | Unregistering process initiated by the Base node. | Succesful unregistration | Succesful unregistration | PASS | Sample: M1 | NT |
| **3.5 MAC Test Cases: Promotion** | | | | | | |
| 3.5.1 | Promotion process initiated by the base node. | Succesful promotion process | Succesful promotion process | PASS | Sample: M1 | NT |
| 3.5.2 | Promotion process initiated by the service node DUT when receiving PNPDUs from another device. | Succesful promotion process | Succesful promotion process | PASS | Sample: M1 | NT |
| 3.5.3 | Switching process: 2 levels of switching (DUT1 as a level 1 switch). | Succesful switching proces | Succesful switching proces | PASS | Sample: M1 | NT |
| 3.5.4 | Tracking Switches under one node | Succesful switching proces | Succesful switching proces | PASS | Sample: M1 | NT |
| 3.5.5 | Switching process: 2 levels of switching (DUT as a level 2 switch). | Succesful switching proces | Succesful switching proces | PASS | Sample: M1 | NT*Attenuators needed |
| 3.5.6 | Switching process: Multicast switching | Succesful multicast switching proces | Succesful multicast switching proces | PASS | Sample: M1 | NT |
| 3.5.7 | Switching functions: BPDU transmission | Correct BPDU transmission | Correct BPDU transmission | PASS | Sample: M1 | NT, LT testcase edited by Tecnalia |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.5.8 | Switching functions: BPDU modulation change initiated by the Base Node | Correct BPDU modulation change | Correct BPDU modulation change | PASS | Sample: M1 | NT |
| 3.5.9 | Switching functions: BPDU modulation change initiated by the DUT | Correct BPDU modulation change | Correct BPDU modulation change | PASS | Sample: M1 | NT, VT to trigger mod.change |
| 3.5.10 | Promotion rejected by the base node. | Correct behaviour for promotion rejection | Correct behaviour for promotion rejection | PASS | Sample: M1 | NT |
| 3.5.11 | Demotion process initiated by the base node. | Succesful demotion process | Succesful demotion process | PASS | Sample: M1 | NT |
| 3.5.12 | Double Switching process initiated by the DUT. | Succesful Double Switching process | Succesful Double Switching process | PASS | Sample: M1 | NT, LT for external BN, confirm manually, testcase edited by Tecnalia |
| 3.5.13 | DS-enabling promotion rejection from the base node. | Succesful DS-rejection process | Succesful DS-rejection process | PASS | Sample: M1 | NT |
| 3.5.14 | Full demotion process initiated by the base node. | Succesful DS-demotion process | Succesful DS-demotion process | PASS | Sample: M1 | LT, confirm manually |
| 3.5.15 | Double Switching process initiated by the base node. | Succesful Double Switching process | Succesful Double Switching process | PASS | Sample: M1 | NT |
| 3.5.16 | DS-enabling promotion rejection by the DUT. | Succesful DS-rejection process | Succesful DS-rejection process | PASS | Sample: M1 | NT |
| **3.6 MAC Test Cases: Connection** | | | | | | |
| 3.6.1 | Connection establishment initiated by the Base node. | Sucessful connection establishment | Sucessful connection establishment | PASS | Sample: M1 | NT |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.6.2 | Connection establishment initiated by the Service node. | Sucessful connection establishme nt | Sucessful connection establishme nt | PASS | Sample: M1 | NT, VT to trigger 4_32 conn |
| 3.6.3 | Connection establishment rejected by the Base node. | Correct behaviour after rejection of connection | Correct behaviour after rejection of connection | PASS | Sample: M1 | NT |
| 3.6.4 | Connection closing initiated by the Base node. | Succesful connection closing | Succesful connection closing | PASS | Sample: M1 | NT |
| 3.6.5 | Connection closing initiated by the Service node. | Succesful connection closing | Succesful connection closing | PASS | Sample: M1 | NT, VT to trigger conn_close |
| **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. | CON messages transmitted with CON.ARQ = 0 | CON messages transmitted with CON.ARQ = 0 | PASS | Sample: M1 | NT, VT to establish 4_32 conn |
| 3.7.2 | Verify correct behaviour of the DUT in a setup where the Base Node does support ARQ. | CON messages transmitted with CON.ARQ = 1 | CON messages transmitted with CON.ARQ = 1 | PASS | Sample: M1 | NT |
| 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). | ARQ mechanism implemented in the DUT according to clause 4.7.3 | ARQ mechanism implemented in the DUT according to clause 4.7.3 | PASS | Sample: M1 | NT |
| 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). | DUT resends PPDUs that it does not receive ACK for | DUT resends PPDUs that it does not receive ACK for | PASS | Sample: M1 | NT, VT to trigger TX DUT, LT to confirm manually, testcase edited by Tecnalia |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.7.5 | Verify that the DUT is able to effectively respond against congestion situation. | DUT does not send any data for the next ARQCongClrTime seconds | DUT does not send any data for the next ARQCongClrTime seconds | PASS | Sample: M1 | NT, LT to confirm manually |
| 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). | DUT ACKs at least one PPDU in the reception window size | DUT ACKs at least one PPDU in the reception window size | | Sample: M1 | NT, LT to confirm manually |
| 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). | ARQ mechanism implemented in the DUT is according to the clause 4.7.3 [1] | ARQ mechanism implemented in the DUT is according to the clause 4.7.3 [1] | | Sample: M1 | VT, LT for external BN, confirm manually |
| 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). | DUT sends PPDUs, according to the clause 4.7.3 [1]. | DUT sends PPDUs, according to the clause 4.7.3 [1]. | | Sample: M1 | NT, LT to confirm manually, testcase edited by Tecnalia |
| 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). | DUT sends PPDUs, according to the clause 4.7.3 [1]. | DUT sends PPDUs, according to the clause 4.7.3 [1]. | | Sample: M1 | NT, LT to confirm manually, testcase edited by Tecnalia |
| **3.8 MAC Test Cases: Alive** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.8.1 | Keep-Alive process (response from DUT as Terminal). | ALV control packets are transacted with its correct priority | ALV control packets are transacted with its correct priority | PASS | Sample: M1 | NT |
| 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: M1 | NT |
| 3.8.3 | Keep-Alive process (timeout and disconnect). | DUT considers itself unregistered and behaves properly | DUT considers itself unregistered and behaves properly | PASS | Sample: M1 | NT |
| 3.8.4 | Keep-Alive process (timeout refresh of DUT as a Terminal) | After REG.TIME confirm that the DUT considers itself unregistered | After REG.TIME confirm that the DUT considers itself unregistered | PASS | Sample: M1 | NT |
| 3.8.5 | Keep-Alive process (timeout refresh of DUT as a Switch). | DUT considers itself unregistered and behaves properly | DUT considers itself unregistered and behaves properly | PASS | Sample: M1 | NT |
| 3.8.6 | Keep-Alive process (changes in Keep Alive timeout). | DUT considers itself unregistered and behaves properly | DUT considers itself unregistered and behaves properly | PASS | Sample: M1 | NT |
| 3.8.7 | Keep-Alive process (three levels hierarchy with the DUT as the first level Switch). | ALV control packets are transacted with the correct priority | ALV control packets are transacted with the correct priority | PASS | Sample: M1 | NT, LT to confirm manually |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3.8.8 | Keep-Alive process (1.3.6 mechanism). | ALV control packet is conformant to specifications | ALV control packet is conformant to specifications | PASS | Sample: M1 | NT |
| **3.9 MAC Test Cases: Management** | | | | | | |
| 3.9.1 | Forced modulation scheme | Modulation scheme of the DUT matches the one indicated by the B.N. | Modulation scheme of the DUT matches the one indicated by the B.N. | PASS | Sample: M2 | NT, VT to send 4_32 data |
| 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 | Response is in the most robust mode | Response is in the most robust mode | PASS | Sample: M2 | NT, LT to confirm manually |
| 3.9.4 | Modulation scheme updated with ALIVE mechanism: lost response | Messages from the DUT are of the same robutsness than the request message | Messages from the DUT are at least of the same robutsness than the request message | PASS | Sample: M2 | NT, LT to confirm manually |
| **3.10 MAC Test Cases: Backwards Compatibility** | | | | | | |
| 3.10.1 | Service node start-up (No PNPDUs 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. | DUT ignores TREF subheader of any of the received packets | DUT is able to ignore TREF subheader of any of the received packets | PASS | Sample: M2 | NT, LT to confirm manually |
| 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. | DUT relays one of the packets transmitted to the Servie Node with TREF.TIME field set to 0x80000000. | DUT relays at least one of the packets transmitted to the Servie Node with TREF.TIME field set to 0x80000000. | PASS | Sample: M2 | NT, LT to confirm manually, testcase edited by Tecnalia |
| 3.11.3 | Check each zero cross detection circuits available in the DUT. | Time Reference subheader of the response of the DUT and Base Node is less than ± 1.5 milliseconds | Time Reference subheader of the response of the DUT and Base Node is less than ± 1.5 milliseconds | PASS | Sample: M1 | NT, VT, LT to confirm manually |
| **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 PNPDUs are transmitted when DUT receives BPDUs). | N.A. | N.A. | N.A. | N.A. | N.A. |
| 3.2.3 | Service node start-up (PNPDUsgeneration latency, transmission parameters and transmission rate of PNPDUs reduced by factor of received PNPDUs). | 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 PNPDUs) | Correct Time condition in TX of PNPDUs | Correct randomness in TX of PNPDUs | 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). | Succesful registration to Base Node | Succesful 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 PNPDUs from another device. | Succesful promotion process | Succesful 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. | Sucessful connection establishment | Sucessful 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 PNPDUs 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.2.5. 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 | Succesful 4-32 communication | Succesful 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 lenght of the data being transmitted to 16 bytes at the DUT. | Succesful segmentation process | Succesful segmentation process | PASS | Sample: M2 | NT, VT to trigger 4_32 conn |
| 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. | Succesful reassembly process | Succesful reassembly process | PASS | Sample: M2 | VT&LT to TX data and confirm manually |
| 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. | Correct implementation of reassembly process with incorrect CRC | Correct implementation of reassembly process with incorrect CRC | PASS | Sample: M2 | VT&LT for external BN and confirm manually |
| **4.3 CL Test Cases: Firmware Upgrade** | | | | | | |
| 4.3.1 | Firmware upgrade process (unicast). | Succesful unicast FW Upgrade | Succesful unicast FW Upgrade | PASS | Sample: M2 | NT, LT to force ideal setup, VT to check manually |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4.3.2 | Firmware upgrade process (multicast). | Succesful multicast FW Upgrade | Succesful multicast FW Upgrade | PASS | Sample: M2 | NT, LT&VT to check manually |
| 4.3.3 | Firmware upgrade page retransmission | Succesful FW upgrade with page retransmission | Succesful FW upgrade with page retransmission | PASS | Sample: M2 | NT, LT&VT to check manually |
| 4.3.4 | Firmware upgrade process (unicast). EXCEPTION State. Bit error in the signature of the image | Succesful handling of bit error in image signature | Succesful handling of bit error in image signature | PASS | Sample: M2 | NT, LT&VT to check manually |
| 4.3.5 | Firmware upgrade process (unicast). EXCEPTION State. Bit error in the image | Succesful handling of bit error in image | Succesful handling of bit error in image | PASS | Sample: M2 | NT, LT&VT to check manually |
| **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 | Succesful reading of PIB attribute | Succesful reading of PIB attribute | PASS | Sample: M2 | NT |
| 4.5.2 | Set PIB attribute query | Succesful setting of PIB attribute | Succesful setting of PIB attribute | PASS | Sample: M2 | NT |
| 4.5.3 | Reboot device | Succesful rebooting of device | Succesful 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 | Succesful 4-32 communication | Succesful 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 lenght 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 lenght 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 lenght 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). | Succesful unicast FW Upgrade | Succesful 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 | Succesful reading of PIB attribute | Succesful reading of PIB attribute | PASS | Sample: M2 | NT |
| 4.5.2 | Set PIB attribute query | Succesful setting of PIB attribute | Succesful setting of PIB attribute | PASS | Sample: M2 | NT |
| 4.5.3 | Reboot device | Succesful rebooting of device | Succesful rebooting of device | PASS | Sample: M2 | NT |

# ANNEX II. MODIFICATIONS FROM PRIME 1.3.6 CERTIFIED MODEL AM170 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 Komenskeho 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.

ZPA ZPA Smart Energy a.s.
Komenského 821, 541 01 Trutnov
IČ: 27445976 DIČ: CZ27445976
tel. +420 499 907 111

Aleš Mikula, MBA

ZPA Smart Energy CTO
Member of the Board