

Test Report

No B41-18-BM-I1

PRIME Certification Tests Cases for Service Nodes

EQUIPMENT UNDER TEST	SINGLE-PHASE METER WITH INTEGRATED PRIME Power Line Communications
MODEL	ZEUS 8021
FIRMWARE VERSION	00-2744c
CERTIFICATION SCOPE	Profile 4 – Electricity Meter with PRIME PHY and PRIME MAC

Responsible for tests	Smart Data & Protocol Laboratory Manager
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. B41-18-BM-I1 summary

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INDEX

1.- EQUIPMENT UNDER TEST IDENTIFICATION.....	3
SUMMARY OF TEST RESULTS.....	4
2.- APPLICANT.....	7
3.- PLACE OF RECEPTION AND EXECUTION OF THE TESTS	7
4.- STANDARDS AND TEST PROCEDURES EMPLOYED	7
5.- CONCLUSIONS	8
ANNEX I. TEST RESULTS.....	9

1.- EQUIPMENT UNDER TEST IDENTIFICATION

Unit:	SINGLE-PHASE METER WITH INTEGRATED PRIME PLC
Model:	ZEUS 8021
Trade Mark:	HEXING
Serial Number:	M1: 2018092603 (MAC 00:80:E1:67:AB:54)
Manufacturer:	Hexing Electrical Co., Ltd.



The sample was selected and delivered by the applicant.

Equipment characteristics declared by the applicant:

Device type	ENERGY METER WITH PRIME COMMUNICATION
BaudRate	57600
Firmware version	00-2744c
Applicable Optional tests	<p>PHY layer test cases</p> <ul style="list-style-type: none"> • Signal Quality category <p>Convergence layer tests</p> <p>PRIME PLC MODEM is certified PRIME 1.3.6 tests report number No B41-17-BA-I1 of the Smart Data & Protocol Laboratory of TECNALIA</p>

SUMMARY OF TEST RESULTS

PHY LAYER		
2.2 PHY Test Cases: Functional Category		
2.2.1	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. D8PSK	NA
2.2.2	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. D8PSK+CC	NA
2.2.3	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. DBPSK	NA
2.2.4	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120dBuV, PPDU length 256 bytes. DBPSK+CC	NA
2.2.5	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. Modulation type: DQPSK	NA
2.2.6	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. QPSK+CC	NA
2.2.7	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec (20hm) and output level 120 dBuV, PPDU length 256 bytes.DBPSK	NA
2.2.8	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec (20hm) and output level 120 dBuV, PPDU length 256 bytes. D8PSK+CC	NA
2.2.9	Verify error free communication (0.2% FER) (checking the complete frame payload) when receiving input signal of 122 dBuV. (DUT is in reception state). Modulation type: D8PSK	NA
2.4 PHY Test Cases: Signal Quality category		
2.4.1	Verify that the EVM of the received signal at output level is above 17dB.	PASS
2.4.2	Verify that the EVM of the transmitted signal output level is above 17dB.	PASS
2.5 PHY Test Cases: Regulatory category		
2.5.1	PHY Test Cases: Regulatory category	PASS
MAC LAYER		
3.2 MAC Test Cases: Service Node Start-up		
3.2.1	Service node start-up (forcing the reception of beacons).	NA
3.2.2	Service node start-up (No PNPDU's are transmit when DUT receives BPDUs).	NA
3.2.3	Service node start-up (Tx rate of PNPDU's reduced by factor of received PNPDU's).	NA

3.2.4	Service node start-up (PNPDU generation latency and transmission parameters).	NA
3.2.5	Service Node start-up (RANDOMness in the transmission of PNPDU)	NA
3.2.6	Service Node start-up (seeking promotion of DUT).	NA
3.3 MAC Test Cases: Channel Access		
3.3.1	Channel access- Shared Contention Period. Channel is idle	NA
3.3.2	Channel access- Shared Contention Period. Channel is occupied.	NA
3.3.3	Channel access- Contention Free Period.	NA
3.3.4	Channel access-Adaptation to frame structure change (FRA)	NA
3.4 MAC Test Cases: Service Node MAC specific procedures		
3.4.1	Registration accepted (Base Node available when DUT powers up).	NA
3.4.2	Registration accepted (Base Node not available when DUT powers up).	NA
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node).	NA
3.4.4	Unregistering process initiated by a terminal node.	NA
3.4.5	Unregistering process initiated by the Base node.	NA
3.4.6	Promotion process initiated by the base node.	NA
3.4.7	Promotion process initiated by the service node DUT.	NA
3.4.8	Switching process: 2 levels of switching (DUT1 as a level 1 switch).	NA
3.4.9	Switching process: 2 levels of switching (DUT as a level 2 switch).	NA
3.4.10	Switching functions: BPDU transmisión	NA
3.4.11	Switching functions: BPDU updates from FRA control packet	NA
3.4.12	Promotion rejected by the base node.	NA
3.4.13	Demotion process initiated by the base node.	NA
3.4.14	Keep-Alive process (response from DUT).	NA
3.4.15	Keep-Alive process (timeout and disconnect).	NA
3.4.16	Keep-Alive process (changes in Keep Alive timeout).	NA
3.4.17	Connection establishment initiated by the Base node.	NA
3.4.18	Connection establishment initiated by the Service node.	NA
3.4.19	Connection establishment rejected by the Base node.	NA

3.4.20	Connection closing initiated by the Base node.	NA
3.4.21	Connection closing initiated by the Service node.	NA
3.4.22	File transfer process (unicast).	NA
3.4.23	File transfer process (multicast).	NA
3.4.24	Error in the firmware upgrade process.	NA
CONVERGENCE LAYER		
4.2 CL Test Cases: 4-32 Connection establishment		
4.2.1	Correct establishment and disconnection of 4-32 link	PASS
4.3 CL Test Cases: DLMS traffic over 4-32 connection		
4.3.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	PASS
4.3 CL Test Cases: 4-32 parameter integrity		
4.4.1	Test that CS4-32 integrity parameter is verified at the DUT.	NA

For more detailed information about the test results see Annex I

2.- APPLICANT

Lingqin Xu

Hexing Electrical Co., Ltd.

1418-5 Moganshan Road, Shangcheng Industrial Zone, 310011, Hangzhou
City, CHINA

3.- 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).

4.- STANDARDS AND TEST PROCEDURES EMPLOYED

Standards:

- Draft Specification for PowerLine Intelligent Metering Evolution. PRIME-Specification v.1.3.6.
- 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:

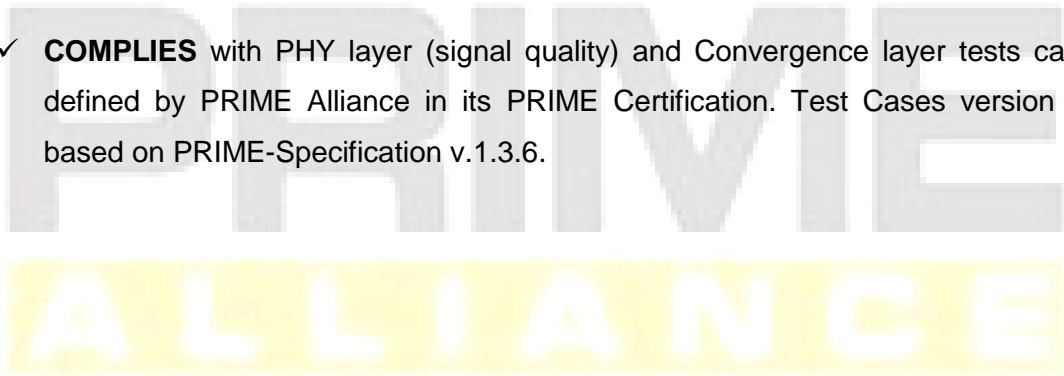
- PRIME Certification. Test Cases version 1.2

5.- CONCLUSIONS

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

Unit:	SINGLE-PHASE METER WITH INTEGRATED PRIME PLC
Model:	ZEUS 8021
Trade Mark:	HEXING
Serial Number:	M1: 2018092603 (MAC 00:80:E1:67:AB:54)
Manufacturer:	Hexing Electrical Co., Ltd.

- ✓ **COMPLIES** with PHY layer (signal quality) and Convergence layer tests cases defined by PRIME Alliance in its PRIME Certification. Test Cases version 1.2 based on PRIME-Specification v.1.3.6.



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

ANNEX I. TEST RESULTS

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

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

Responsible: Ibone García-Borreguero Melero

Used instruments:

Measurement instruments	
X	SW CURRENT CURRENT PRIME audition v1.2.3ct ✓ PRIME AUDITION TOOL
X	HW CURRENT ✓ BASE NODE (MAC 00:80:E1:00:00:57) ✓ AUX1 (MAC 00:80:E1:00:00:5D) ✓ AUX1 (MAC 00:80:E1:00:00:63) ✓ AUX2 (MAC 00:80:E1:00:00:5F) ✓ SNIFFER
X	EL092142 – LISN
X	EL092017 – LISN PRIME
X	FILTERS WITH VARIABLE ATENUATION
X	EL052008 - CLIMATIC CHAMBER
X	EL022011 - DIGITAL OSCILLOSCOPE
X	EL082055 – AISOLATING TRANSFORM
Data registers storage place	
PRIME laptop /home/conftester/Resultados/CLIENTES/HXE_1phSN/	

Results:

A1. 1. PHY layer

A1. 1.1. Test setup

DUT connections:

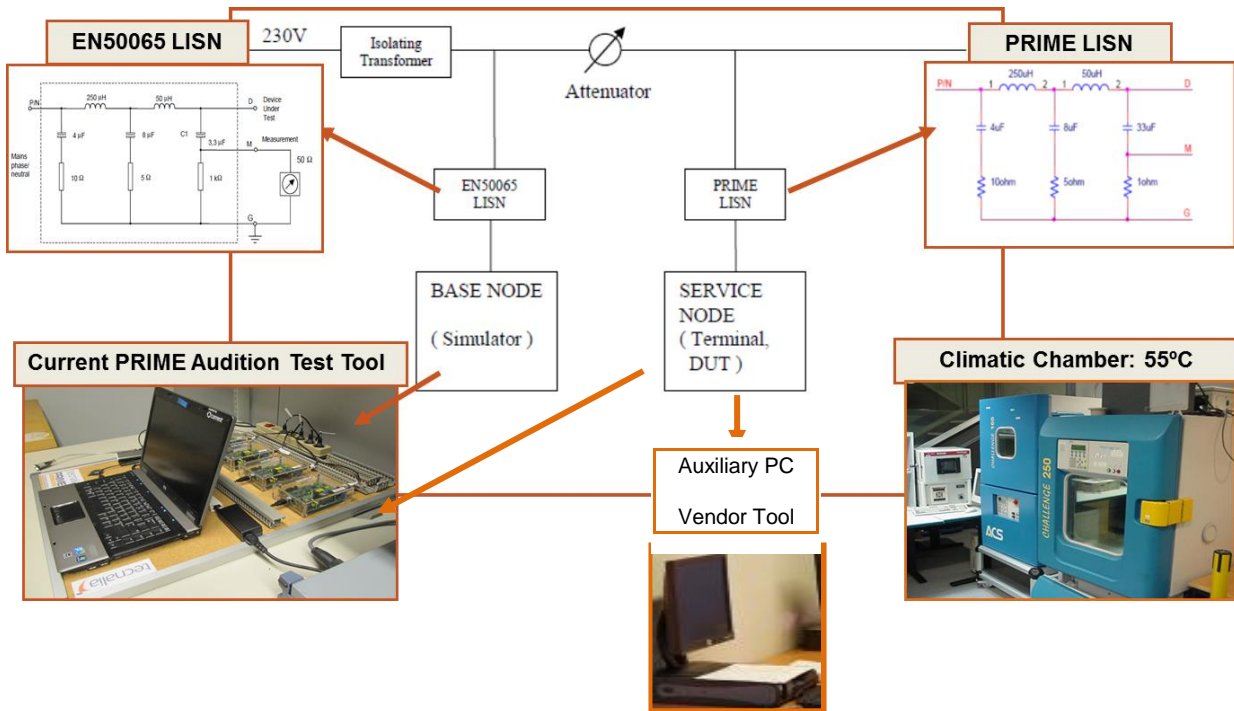
- Serial Port-Optical port:
 - to manage the DUT
 - connected to auxiliary PC to configure the DUT in different modes (PHY tx, PHY rx)
 - to access to PIB values with Current PRIME Testing Tool
 - connected to Current PRIME Audition Test Tool

Auxiliary PC with the following Software:

- Controlling software called STMicroelectronics “PrimeGUI 1.3.6” (Rev 2269): to manage and configure the DUT through the optical port in PHY mode.



The setup of the PHY layer tests is the following one:



DUT has to be configured in PHY reception and PHY transmission mode.

PHY reception mode:

- Connect optical port to the auxiliary PC: configure the DUT with vendor specific attribute named phyStartRxTest (PIB ID: 0x8002) in PHY reception mode
- Disconnect the optical port from auxiliary PC
- Connect the optical port to Current PRIME Audition Test Tool
- Start the test with “Current PRIME Audition Test Tool”

PHY transmission mode:

- Connect optical port to the auxiliary PC: configure the DUT with vendor specific attribute named phyStartTxTest (PIB ID: 0x8001) in PHY transmission mode
- Start the test with “Current PRIME Audition Test Tool”

A1. 1.2. Test results

CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS
2.4 PHY Test Cases: Signal Quality category					
2.4.1	Verify that the EVM of the received signal at output level of 120 dBuV is above 17dB.	18.00 dB	>17 dB	OK	Sample: M1
2.4.2	Verify that the EVM of the transmitted signal output level of 120 dBuV is above 17dB.	17.95 dB	>17 dB	OK	Sample: M1

A1. 1.3. PHY Test Cases: Regulatory category

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

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

And the tested sample of:

Unit: Single-phase energy METER with integrated PRIME Power Line Communication

Brand: HEXING

Model: ZEUS 8021

Manufacturer: Hexing Electrical Co., Ltd.

PRIME version: 00-2744c

Serial number: MAC:00:80:E1:67:AB:2E, MAC: 00:80:E1:67:AB:4D

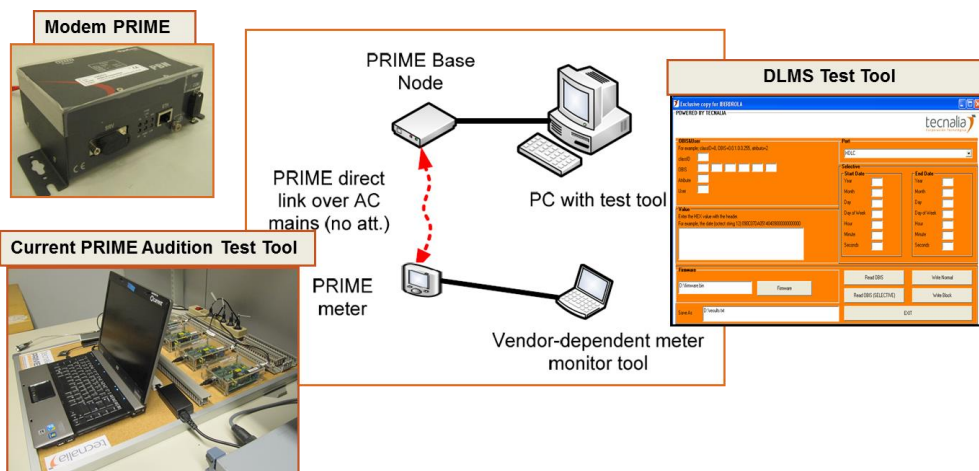
- **COMPLIES** with EN 50065-1:2011.
- **COMPLIES** with EN 50065-2-3:2003+A1:2005.
- **COMPLIES** with EN 50065-7:2001.

A1. 2. Convergence layer

A1. 2.1. Test setup - DUT Connections:

- Serial port – Optical port:
 - to access to PIB values with Current PRIME Testing Tool
 - connected to Current PRIME Audition Test Tool
- Start the test with “DLMS Tool” from Tecnia and read/write several DLMS OBIS code

The setup of the Convergence layer tests is the following one:



A1. 2.2. Test results

CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS
4.2 CS Test Cases: 4-32 Connection establishment					
4.2.1	Correct establishment and disconnection of 4-32 link	Successful 4-32 connection establishment	Successful 4-32 connection establishment	PASS	Sample: M2
4.3 CS Test Cases: DLMS traffic over 4-32 connection					
4.3.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	Valid DLMS payload	Valid DLMS payload	PASS	Sample: M2
4.4 CS Test Cases: 4-32 parameter integrity					
4.4.1	Test that CS4-32 integrity parameter is verified at the DUT.		Successful 4-32 parameter integrity	N/A	Skipping this test from the certification.