OPEN Alliance Specification Copyright Notice and Disclaimer

A. OPEN Specification Ownership and Usage Rights
As between OPEN Alliance and OPEN Alliance Members whose contributions were incorporated in this OPEN Specification (the “Contributing Members”), the Contributing Members own the worldwide copyrights in and to their given contributions. Other than the Contributing Members’ contributions, OPEN Alliance owns the worldwide copyrights in and to compilation of those contributions forming this OPEN Specification. For OPEN Alliance Members (as that term is defined in the OPEN Alliance Bylaws), OPEN Alliance permits the use of this OPEN Specification on the terms in the OPEN Alliance Intellectual Property Rights Policy and the additional applicable terms below. For non-members of OPEN Alliance, OPEN Alliance permits the use of this OPEN Specification on the terms in the OPEN Alliance Specification License Agreement (available here: [http://www.opensig.org/Automotive-Ethernet-Specifications/](http://www.opensig.org/Automotive-Ethernet-Specifications/)) and the additional applicable terms below. The usage permissions referenced and described here relate only to this OPEN Specification and do not include or cover a right to use any specification published elsewhere and referred to in this OPEN Specification. By using this OPEN Specification, you hereby agree to the following terms and usage restrictions:

A.i. Rights and Usage Restrictions Specific to OPEN Alliance Members
FOR OPEN ALLIANCE MEMBERS ONLY: In addition to the usage terms and restrictions granted to Members in the OPEN Alliance Intellectual Property Rights Policy, Members’ use of this OPEN Specification is subject this Copyright Notice and Disclaimer. Members of OPEN Alliance have the right to use this OPEN Specification solely (i) during the term of a Member’s membership in OPEN Alliance and subject to the Member’s continued membership in good standing in OPEN Alliance; (ii) subject to the Member’s continued compliance with the OPEN Alliance governance documents, Intellectual Property Rights Policy, and the applicable OPEN Alliance Promoter or Adopter Agreement, as applicable; and (iii) for internal business purposes and solely to use the OPEN Specification for implementation of this OPEN Specification in the Member’s products and services, but only so long as Member does not distribute, publish, display, or transfer this OPEN Specification to any third party, except as expressly set forth in Section 11 of the OPEN Alliance Intellectual Property Rights Policy. Except and only to the extent required to use this OPEN Specification internally for implementation of this OPEN Specification in Member’s products and services, Member shall not modify, alter, combine, delete portions of, prepare derivative works of, or create derivative works based upon this OPEN Specification. If Member creates any modifications, alterations, or other derivative works of this OPEN Specification as permitted to use the same internally for implementation of this OPEN Specification in Member’s products and services, all such modifications, alterations, or other derivative works shall be deemed part of, and licensed to such Member under the same restrictions as, this OPEN Specification. For the avoidance of doubt, Member shall not include all or any portion of this OPEN Specification in any other technical specification or technical material, product manual, marketing material, or any other material without OPEN Alliance’s prior written consent. All rights not expressly granted to Member in the OPEN Alliance Intellectual Property Rights Policy are reserved;

A.ii. Rights and Usage Restrictions Specific to Non-members of OPEN Alliance
FOR NON-MEMBERS OF OPEN ALLIANCE ONLY: Use of this OPEN Specification by anyone who is not a Member in good standing of OPEN Alliance is subject to your agreement to the OPEN
Alliance Specification License Agreement (available here: http://www.opensig.org/Automotive-Ethernet-Specifications/) and the additional terms in this Copyright Notice and Disclaimer. Non-members have the right to use this OPEN Specification solely (i) subject to the non-member’s continued compliance with the OPEN Alliance Specification License Agreement; and (ii) for internal business purposes and solely to use the OPEN Specification for implementation of this OPEN Specification in the non-member’s products and services, but only so long as non-member does not distribute, publish, display, or transfer this OPEN Specification to any third party, unless and only to the extent expressly set forth in the OPEN Alliance Specification License Agreement. Except and only to the extent required to use this OPEN Specification internally for implementation of this OPEN Specification in non-member’s products and services, non-member shall not modify, alter, combine, delete portions of, prepare derivative works of, or create derivative works based upon this OPEN Specification. If non-member creates any modifications, alterations, or other derivative works of this OPEN Specification as permitted to use the same internally for implementation of this OPEN Specification in non-member’s products and services, all such modifications, alterations, or other derivative works shall be deemed part of, and licensed to such non-member under the same restrictions as, this OPEN Specification. For the avoidance of doubt, non-member shall not include all or any portion of this OPEN Specification in any other technical specification or technical material, product manual, marketing material, or any other material without OPEN Alliance’s prior written consent. All rights not expressly granted to non-member in the OPEN Alliance Specification License Agreement are reserved.

B. Terms Applicable to both Members and Non-members of OPEN Alliance

B.i. Patents, Trademarks, and other Rights:
OPEN Alliance has received no Patent Disclosure and Licensing Statements related to this OPEN Specification. Therefore, this OPEN Specification contains no specific disclaimer related to third parties that may require a patent license for their Essential Claims. Having said that, the receipt of this OPEN Specification shall not operate as an assignment of or license under any patent, industrial design, trademark, or other rights as may subsist in or be contained in or reproduced in this OPEN Specification; and the implementation of this OPEN Specification could require such a patent license from a third party. You may not use any OPEN Alliance trademarks or logos without OPEN Alliance’s prior written consent.

B.ii. Disclaimers and Limitations of Liability:
THIS OPEN SPECIFICATION IS PROVIDED ON AN “AS IS” BASIS, AND ALL REPRESENTATIONS, WARRANTIES, AND GUARANTEES, EITHER EXPLICIT, IMPLIED, STATUTORY, OR OTHERWISE, ARE EXCLUDED AND DISCLAIMED UNLESS (AND THEN ONLY TO THE EXTENT THEY ARE) MANDATORY UNDER LAW. ACCORDINGLY, OPEN ALLIANCE AND THE CONTRIBUTING MEMBERS MAKE NO REPRESENTATIONS OR WARRANTIES OR GUARANTEES WITH REGARD TO THIS OPEN SPECIFICATION OR THE INFORMATION (INCLUDING ANY SOFTWARE) CONTAINED HEREIN. OPEN ALLIANCE AND ALL CONTRIBUTING MEMBERS HEREBY EXPRESSLY DISCLAIM ANY AND ALL SUCH EXPRESS, IMPLIED, STATUTORY, AND ALL OTHER REPRESENTATIONS, WARRANTIES, AND GUARANTEES, INCLUDING WITHOUT LIMITATION ANY AND ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR USE, TITLE, NON-INFRINGEMENT OF OR ABSENCE OF THIRD PARTY RIGHTS, AND/OR VALIDITY OF RIGHTS IN THIS OPEN SPECIFICATION; AND OPEN ALLIANCE AND THE
CONTRIBUTING MEMBERS MAKE NO REPRESENTATIONS AS TO THE ACCURACY OR COMPLETENESS OF THIS OPEN SPECIFICATION OR ANY INFORMATION CONTAINED HEREIN. WITHOUT LIMITING THE FOREGOING, OPEN ALLIANCE AND/OR CONTRIBUTING MEMBERS HAS(VE) NO OBLIGATION WHATSOEVER TO INDEMNIFY OR DEFEND YOU AGAINST CLAIMSRELATED TO INFRINGEMENT OR MISAPPROPRIATION OF INTELLECTUAL PROPERTY RIGHTS.
OPEN ALLIANCE AND CONTRIBUTING MEMBERS ARE NOT, AND SHALL NOT BE, LIABLE FOR ANY LOSSES, COSTS, EXPENSES, OR DAMAGES OF ANY KIND WHATSOEVER (INCLUDING WITHOUT LIMITATION DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, AND/OR EXEMPLARY DAMAGES) ARISING IN ANY WAY OUT OF USE OR RELIANCE UPON THIS OPEN SPECIFICATION OR ANY INFORMATION HEREIN. NOTHING IN THIS DOCUMENT OPERATES TO LIMIT OR EXCLUDE ANY LIABILITY FOR FRAUD OR ANY OTHER LIABILITY WHICH IS NOT PERMITTED TO BE EXCLUDED OR LIMITED BY OPERATION OF LAW.

B.iii. Compliance with Laws and Regulations:
NOTHING IN THIS DOCUMENT OBLIGATES OPEN ALLIANCE OR CONTRIBUTING MEMBERS TO PROVIDE YOU WITH SUPPORT FOR, OR RELATED TO, THIS OPEN SPECIFICATION OR ANY IMPLEMENTED PRODUCTS OR SERVICES. NOTHING IN THIS OPEN SPECIFICATION CREATES ANY WARRANTIES OR GUARANTEES, EITHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, REGARDING ANY LAW OR REGULATION. OPEN ALLIANCE AND CONTRIBUTING MEMBERS EXPRESSLY DISCLAIM ALL LIABILITY, INCLUDING WITHOUT LIMITATION, LIABILITY FOR NONCOMPLIANCE WITH LAWS, RELATING TO USE OF THE OPEN SPECIFICATION OR INFORMATION CONTAINED HEREIN. YOU ARE SOLELY RESPONSIBLE FOR THE COMPLIANCE OF IMPLEMENTED PRODUCTS AND SERVICES WITH ANY SUCH LAWS AND REGULATIONS, AND FOR OBTAINING ANY AND ALL REQUIRED AUTHORIZATIONS, PERMITS, AND/OR LICENSES FOR IMPLEMENTED PRODUCTS AND SERVICES RELATED TO SUCH LAWS AND REGULATIONS WITHIN THE APPLICABLE JURISDICTIONS.
IF YOU INTEND TO USE THIS OPEN SPECIFICATION, YOU SHOULD CONSULT ALL APPLICABLE LAWS AND REGULATIONS. COMPLIANCE WITH THE PROVISIONS OF THIS OPEN SPECIFICATION DOES NOT CONSTITUTE COMPLIANCE TO ANY APPLICABLE LEGAL OR REGULATORY REQUIREMENTS. IMPLEMENTERS OF THIS OPEN SPECIFICATION ARE SOLELY RESPONSIBLE FOR OBSERVING AND COMPLYING WITH THE APPLICABLE LEGAL AND REGULATORY REQUIREMENTS. WITHOUT LIMITING THE FOREGOING, YOU SHALL NOT USE, RELEASE, TRANSFER, IMPORT, EXPORT, AND/OR RE-EXPORT THIS OPEN SPECIFICATION OR ANY INFORMATION CONTAINED HEREIN IN ANY MANNER PROHIBITED UNDER ANY APPLICABLE LAWS AND/OR REGULATIONS, INCLUDING WITHOUT LIMITATION U.S. EXPORT CONTROL LAWS.

B.iv. Automotive Applications Only: Without limiting the foregoing disclaimers or limitations of liability in any way, this OPEN Specification was developed for automotive applications only. This OPEN Specification has neither been developed, nor tested for, non-automotive applications.

B.v. Right to Withdraw or Modify:
OPEN Alliance reserves the right to (but is not obligated to) withdraw, modify, or replace this OPEN Specification at any time, without notice.

© 2022 OPEN Alliance. This document also contains contents, the copyrights of which are owned by third parties who are OPEN Alliance Contributing Members. Unauthorized Use Strictly Prohibited. All Rights Reserved.
**Version Control of Document**

<table>
<thead>
<tr>
<th>Version</th>
<th>Author</th>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>C&amp;S</td>
<td>Initial version</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td>C&amp;S</td>
<td>Implemented Feedback from April 4, 2023</td>
<td>April 20, 2023</td>
</tr>
<tr>
<td>0.3</td>
<td>C&amp;S</td>
<td>Implemented Feedback from CanovaTech discussed on May 11, 2023</td>
<td>May 11, 2023</td>
</tr>
<tr>
<td>0.4</td>
<td>C&amp;S</td>
<td>Following the consensus achieved in the ballot held at the TC14 main regular call on June 20, 2023, the PLCA Recovery section has been defined as informative and the respective pass criteria were updated accordingly</td>
<td>June 22, 2023</td>
</tr>
<tr>
<td>0.5</td>
<td>C&amp;S</td>
<td>Last editorial feedback from Canovatech and Onsemi of typos and copy/paste errors were corrected</td>
<td>August 28, 2023</td>
</tr>
<tr>
<td>1.0</td>
<td>C&amp;S</td>
<td>Public</td>
<td>November 8, 2023</td>
</tr>
</tbody>
</table>

**Contributing Members**

Piergiorgio Beruto [OnSemi]
Viliam Vozar [OnSemi]
Content
1 Introduction ........................................................................................................................................9
  1.1 Overview.....................................................................................................................................9
2 Normative references .....................................................................................................................10
3 Terms and definitions .....................................................................................................................11
  3.1 Node term definition .................................................................................................................11
  3.2 PLCA location within different 10BASE-T1S PHYs implementations .......................................12
4 Abbreviations ................................................................................................................................13
5 Glossary terms ..............................................................................................................................15
6 Organization of tests ......................................................................................................................17
  6.1 Elementary test structure ..........................................................................................................17
  6.2 Test case instance structure ......................................................................................................17
  6.3 DUT requirements ....................................................................................................................18
7 PLCA conformance test definitions ..............................................................................................19
  7.1 Channels definition ....................................................................................................................19
    7.1.1 Channel type 1 (2 node mixing segment) [H1] ..................................................................19
    7.1.2 Channel type 2 (3 node mixing segment) [H2] ..................................................................19
  7.2 PLCA configuration ....................................................................................................................19
    7.2.1 PLCA configuration in 2 node mixing segment [H1] ..........................................................19
    7.2.2 PLCA configuration in 3 node mixing segment [H2] ..........................................................20
  7.3 Message transfer .........................................................................................................................20
  7.4 Power conditions .........................................................................................................................20
    7.4.1 Nominal Battery Voltage ....................................................................................................20
8 Group 1 – PLCA test cases ..............................................................................................................21
  8.1 [T] PLCA Timing requirements ..................................................................................................21
    8.1.1 Group T1 – Coordinator node ..............................................................................................21
    8.1.2 Group T2 – Follower node BEACON .................................................................................23
    8.1.3 Group T3 – Follower node packet .....................................................................................25
  8.2 [D] PLCA Decoding of BEACON and message reception ..........................................................27
    8.2.1 Group D1 – Decoding of BEACON ....................................................................................27
    8.2.2 Group D2 – Message Reception after different preambles ..................................................28
  8.3 [R] PLCA Recovery ....................................................................................................................30
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3.1</td>
<td>Group R1 – Recovery of a Coordinator node</td>
</tr>
<tr>
<td>8.3.2</td>
<td>Group R2 – Recovery of a Follower node</td>
</tr>
<tr>
<td>8.4</td>
<td>[B] PLCA Burst</td>
</tr>
<tr>
<td>8.4.1</td>
<td>Group B1 – PLCA burst count &gt; TX buffer</td>
</tr>
<tr>
<td>8.4.2</td>
<td>Group B2 – PLCA burst count &lt; TX buffer</td>
</tr>
<tr>
<td>8.5</td>
<td>[C] PLCA Corner cases</td>
</tr>
<tr>
<td>8.5.1</td>
<td>Group C1 – Decoding of COMMIT near to_timer_done</td>
</tr>
<tr>
<td>8.5.2</td>
<td>Group C2 – Recovery of coordinator node near to_timer_done</td>
</tr>
<tr>
<td>8.5.3</td>
<td>Group C3 – Recovery of follower node near to_timer_done</td>
</tr>
<tr>
<td>9</td>
<td>Appendix</td>
</tr>
<tr>
<td>9.1</td>
<td>Test station setup</td>
</tr>
<tr>
<td>9.1.1</td>
<td>Transmit Station</td>
</tr>
<tr>
<td>9.1.2</td>
<td>DUT</td>
</tr>
<tr>
<td>9.1.3</td>
<td>Link partner</td>
</tr>
<tr>
<td>9.2</td>
<td>List of Tables</td>
</tr>
<tr>
<td>9.3</td>
<td>List of Figures</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Overview
This particular suite of tests has been developed to help implementers evaluate the functionality of
the PLCA reconciliation sublayer of their 10BASE-T1S device.

These tests are designed to determine if a product conforms to specifications defined in
IEEE802.3cg Clause 148. Successful completion of all tests contained in this suite does not
guarantee that the tested device will operate with other devices. However, combined with
satisfactory operation when tested in accordance with the OPEN Alliance 10BASE-T1S
Interoperability Test Suite, these tests provide a reasonable level of confidence that the Device
Under Test (DUT) will function properly in many 10BASE-T1S automotive environments.
2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[2] OPEN ALLIANCE: 10BASE-T1S Physical Media Attachment Test Suite – Revision 1.2 (draft)
[3] OPEN ALLIANCE: 10BASE-T1S Physical Coding Sublayer Test Suite – Revision 0.3 (draft)
[4] OPEN ALLIANCE: Channel and Components Requirements for 10BASE-T1S Link Segment – Revision 0.2 (draft)
[6] OPEN ALLIANCE: 10BASE-T1S PLCA Management Registers – Revision 1.2
[8] OPEN ALLIANCE: 10BASE-T1x MAC-PHY Serial Interface – Revision 1.1
3 Terms and definitions

For the purposes of this document, the terms and definitions given in [1] - [10] apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Node term definition

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Node</td>
<td>A node that is at either end of a mixing segment. There are no other nodes between the End Node and the 100Ω end termination. The End Node may contain the 100Ω end termination.</td>
</tr>
<tr>
<td>Drop Node</td>
<td>Any node that is located between the two end nodes</td>
</tr>
<tr>
<td>Coordinator</td>
<td>This is the node configured as aPLCALocalNodeID=0 that is responsible for the periodic transmission of the BEACON and configuring the number of transmit opportunities between each BEACON.</td>
</tr>
<tr>
<td>Follower</td>
<td>Followers are any nodes configured as aPLCALocalNodeID=1..254. They synchronize their transmit opportunity counter with the reception of the periodic BEACON transmitted by the coordinator</td>
</tr>
<tr>
<td>Head Node</td>
<td>This is the highest-level application node on the mixing segment. It typically implements a Switch or gateway access to the core network beyond the bus segment.</td>
</tr>
</tbody>
</table>

Note: It is expected that each mixing segment includes one Coordinator Node, one Head Node and two End Nodes. The Coordinator and Head Node functions may be implemented in any physical node (including End Nodes) and may be combined into a single physical node or separate physical nodes.
### 3.2 PLCA location within different 10BASE-T1S PHYs implementations

Following table describes an overview of the different possible 10BASE-T1S PHYs implementations that are covered by this test specification.

<table>
<thead>
<tr>
<th>PHY with MII</th>
<th>SW+Eth.driver</th>
<th>MAC</th>
<th>MII or RMII</th>
<th>PLCA</th>
<th>MII PHY</th>
<th>PCS</th>
<th>PMA</th>
<th>MDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>µC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **PLCA integrated in PHY: transparent for every uC**
- **Compatible with every MAC controller supporting Half-duplex**

<table>
<thead>
<tr>
<th>PHY with SPI (MACPHY)</th>
<th>SW+Eth.driver</th>
<th>SPI driver TC6</th>
<th>OA SPI</th>
<th>MACPHY</th>
<th>MAC</th>
<th>PLCA</th>
<th>PCS</th>
<th>PMA</th>
<th>MDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>µC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Low-cost ECU without MAC and smaller interface**
- **Requires Ethernet frame processing over SPI interface as defined in [8].**

<table>
<thead>
<tr>
<th>DigPHY/PMD Transceiver</th>
<th>SW+Eth.driver</th>
<th>MAC</th>
<th>PLCA</th>
<th>PCS</th>
<th>PMA Dig.</th>
<th>PMA Dig.</th>
<th>PMA Analog</th>
<th>MDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>µC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **The 10BASE-T1S PMD Transceiver is a simple and cost effective solution with 3-pin clock-less interface between the host controller and the PMD transceiver chip suited for embedded systems where the digital portion of the PHY is fully integrated into an MCU, an Ethernet switch core, or any other suitable host where only the analog portion is left into a separate chip (i.e., the PMD transceiver).**
# 4 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Glossary term</th>
<th>Glossary definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI_DA-</td>
<td>Negative MDI pin or cable connected to a PHY’s negative MDI pin.</td>
<td></td>
</tr>
<tr>
<td>BI_DA+</td>
<td>Positive MDI pin or cable connected to a PHY’s positive MDI pin.</td>
<td></td>
</tr>
<tr>
<td>BIN</td>
<td>Bus Interface Network</td>
<td></td>
</tr>
<tr>
<td>CIDM</td>
<td>Characteristic Impedance Differential mode</td>
<td></td>
</tr>
<tr>
<td>CRC</td>
<td>Cyclic Redundancy Check</td>
<td></td>
</tr>
<tr>
<td>dPLCA</td>
<td>Dynamic Physical Layer Collision Avoidance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is an optional PLCA Node ID allocation method. This should allow all node IDs (including node 0) to be assigned dynamically and to change during operation. The coordinator node shall also be able to vary the node count depending on how many active nodes are detected. dPLCA is fully backward compatible to the normal PLCA defined in 802.3cg, so that dPLCA enabled nodes can join a network with normal PLCA nodes without disturbing the operation.</td>
<td></td>
</tr>
<tr>
<td>DUT</td>
<td>Device under test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combination of uC, PHY/Switch component, PHY/Switch configuration and filter that is being tested.</td>
<td></td>
</tr>
<tr>
<td>ET</td>
<td>End Termination</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>Ground connection in electrical circuits</td>
<td></td>
</tr>
<tr>
<td>IL</td>
<td>Insertion Loss</td>
<td></td>
</tr>
<tr>
<td>ISO/OSI</td>
<td>Layer model of communication systems</td>
<td></td>
</tr>
<tr>
<td>IUT</td>
<td>Implementation under test</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The PHYs entirety in a network environment are considered as the IUT</td>
<td></td>
</tr>
<tr>
<td>LP</td>
<td>Link partner</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device that is connected to a DUT to perform the interoperability tests. A link partner must use a well-known PHY, PHY configuration and external PHY filter (if necessary).</td>
<td></td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Glossary term</td>
<td>Glossary definition</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LT</td>
<td>Lower Tester</td>
<td>According to [7], the control and observation of the lower service boundary of the IUT is provided by the LT via the underlying service provider</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control</td>
<td>Abbreviation for the sub layer of the data link layer (layer 2) of the OSI model or for the physical device that implements the Media Access Control functions.</td>
</tr>
<tr>
<td>MCU</td>
<td>Micro Controller Unit</td>
<td></td>
</tr>
<tr>
<td>MDI</td>
<td>Media dependent interface</td>
<td></td>
</tr>
<tr>
<td>MDIO</td>
<td>Management Data Input / Output</td>
<td></td>
</tr>
<tr>
<td>MII</td>
<td>Medium Independent Interface</td>
<td></td>
</tr>
<tr>
<td>P2P</td>
<td>Point-to-point</td>
<td></td>
</tr>
<tr>
<td>PCS</td>
<td>Physical Coding Sublayer</td>
<td></td>
</tr>
<tr>
<td>PHY</td>
<td>Interface semiconductor circuit for implementation of the functions of the Ethernet physical layer</td>
<td>Abbreviation for the physical layer (layer 1) of the OSI model or for the device that implements layer 1 of the OSI model.</td>
</tr>
<tr>
<td>PLCA</td>
<td>Physical Layer Collision Avoidance</td>
<td>A method for generating transmit opportunities for 10BASE-T1S operating on mixing segments. (See[1], Clause 148,)</td>
</tr>
<tr>
<td>PMA</td>
<td>Physical Medium Attachment</td>
<td></td>
</tr>
<tr>
<td>RL</td>
<td>Return Loss</td>
<td></td>
</tr>
<tr>
<td>SCC</td>
<td>Standalone Communication Channel</td>
<td></td>
</tr>
<tr>
<td>SPI</td>
<td>Serial Peripheral Interface</td>
<td></td>
</tr>
<tr>
<td>SV</td>
<td>Supervisor</td>
<td>According to [7], the Supervisor controls the test procedures.</td>
</tr>
<tr>
<td>TO</td>
<td>Transmit opportunity</td>
<td>Each node on the network get assigned at least one transmit opportunity in each transmission cycle.</td>
</tr>
<tr>
<td>UT</td>
<td>Upper Tester</td>
<td>According to [7], the control and observation of the upper service boundary of the IUT is provided by the UT</td>
</tr>
<tr>
<td>n.a.</td>
<td>Not applicable</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 1: List of Abbreviations.
### 5 Glossary terms

<table>
<thead>
<tr>
<th>Glossary term</th>
<th>Glossary definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAY</td>
<td>This word or the adjective &quot;OPTIONAL&quot;, mean that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same way an implementation which does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.)</td>
</tr>
<tr>
<td>MUST</td>
<td>This word, or the terms &quot;REQUIRED&quot; or &quot;SHALL&quot;, mean that the definition is an absolute requirement of the specification.</td>
</tr>
<tr>
<td>MUST NOT</td>
<td>This phrase or the phrase &quot;SHALL NOT&quot;, mean that the definition is an absolute prohibition of the specification.</td>
</tr>
<tr>
<td>SHOULD</td>
<td>This word, or the adjective &quot;RECOMMENDED&quot;, mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.</td>
</tr>
<tr>
<td>SHOULD NOT</td>
<td>This phrase, or the phrase &quot;NOT RECOMMENDED&quot; mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood, and the case carefully weighed before implementing any behavior described with this label.</td>
</tr>
<tr>
<td>External PHY filter or external filter</td>
<td>Additional circuit that is connected directly to the PHY and filters the in- and outgoing physical layer signaling. The PHY vendor typically provides a reference filter design.</td>
</tr>
<tr>
<td>PHY configuration</td>
<td>Variable settings that affect the PHY’s behavior (e.g., sensitivity of internal equalizers, or shaping of outgoing physical layer signaling). The PHY configuration could be set by an upper layer (e.g., by software) or could be hardcoded, e.g., via dedicated PHY configuration pins.</td>
</tr>
<tr>
<td>Test case</td>
<td>Description of one or more test steps and a set of conditions that define whether the observed behavior when executing the test steps matches the expected results.</td>
</tr>
<tr>
<td>Test iteration</td>
<td>The execution of all test steps of a given test case.</td>
</tr>
<tr>
<td>Glossary term</td>
<td>Glossary definition</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Test instance</td>
<td>A test instance defines different test parameters for a given test case, such as the DUT’s PHY Coordinator/Follower configuration, or used cable to connect the link partner. The test case itself is not altered.</td>
</tr>
<tr>
<td>Soft reset</td>
<td>Reset of a PHY by software, usually triggered by writing to a control register.</td>
</tr>
<tr>
<td>Hard reset</td>
<td>Reset of a PHY via a dedicated reset-pin, or by toggling the PHY’s power supply.</td>
</tr>
<tr>
<td>Channel</td>
<td>Synonym for physical layer communication channel (cf. [4]).</td>
</tr>
</tbody>
</table>

Table 2: List of Definitions.
6 Organization of tests
In this chapter the main structure of the test cases as well as the elementary test case structure will be introduced.

6.1 Elementary test structure
The main structure description of a test case is shown in Table 3. A brief description about the meaning of each field is provided.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>A short description of the purpose of the test case is given here.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Prerequisites</td>
<td>A list of requirements and capabilities needed for a proper test conduction</td>
</tr>
<tr>
<td>DUT set-up</td>
<td>The respective test environment setup is specified (e.g. if different test case sequences will require different test system configuration)</td>
</tr>
</tbody>
</table>
| Test description | The first note here describes the total sum of test case executions due to setup variations to give the test implementer a first impression of the specific test case.
As the second part of the test case execution, the test steps are described dealing with the setup being applied and what is observed and measured at each execution etc.
All actions of the test environment shall be described explicitly in this item. |
| Pass criteria | In this response cell, a description is given about what is expected as the result.
The Pass criteria are also specified in this point. |
| Test iterations | Amount of test repetitions. |
| Notes | When necessary, a note will be added complementing the information of the test case. |

Table 3 - Main test structure

6.2 Test case instance structure
Together with the test definition and all its parameters, it will also be defined the test case instances that are part of each test case. A test case instance can be defined as a repetition of the same test case modifying certain configurations of the DUT and the test environment without losing focus on the test purpose.

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX.XX</td>
<td>Description of the test cases belonging to this subgroup</td>
<td>$\alpha$</td>
<td>conditions under which the variables are applied either in different configurations or stress conditions.</td>
</tr>
<tr>
<td>AX.XX</td>
<td>$\beta$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4 - Test case instance definition

6.3 DUT requirements

For the purposes of this test suite, it is assumed that the DUT can manipulate PLCA-related signals and ID numbers via registers. In addition, at least one or more nodes are required for PLCA testing. This node must be able to set the ID to any number from 0, 255, 1-254.
7 PLCA conformance test definitions

7.1 Channels definition

This definition shall be used for defining a test wiring harness that simulates various communication channels according to the channel definitions of IEEE Std. 802.3cg, [4] and [5].

7.1.1 Channel type 1 (2 node mixing segment) [H1]

![Diagram of Channel type 1](image)

7.1.2 Channel type 2 (3 node mixing segment) [H2]

![Diagram of Channel type 2](image)

7.2 PLCA configuration

PLCA parameters not mentioned here shall be set to “default” according to [6] and [1]. dPLCA is outside the scope of this document.

7.2.1 PLCA configuration in 2 node mixing segment [H1]

The nodes are numbered from 0 to 1. Node 0 is configured to be the coordinator. The maximum slot number (TO) is 1, so that the beacon follows immediately after the message send from node 1.
The amount of data per message and the data itself that is to be sent in each message is defined in the section 7.3.

<table>
<thead>
<tr>
<th>PLCA slot</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Burst</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 7-1: PLCA cycle in 2 node mixing segment [H1]

### 7.2.2 PLCA configuration in 3 node mixing segment [H2]

The nodes are numbered from 0 to 2. Node 0 is configured to be the coordinator. The maximum slot number (TO) is 2, so that the beacon follows immediately after the message send from node 2.

The amount of data per message and the data itself that is to be sent in each message is defined in the section 7.3.

<table>
<thead>
<tr>
<th>PLCA slot</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Burst</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 7-2: PLCA cycle in 3 node mixing segment [H2]

### 7.3 Message transfer

When messages are sent, then PLCA is active on all nodes.

All frames have **maximum length** (1500 bytes in the data field) with random data in the payload.

### 7.4 Power conditions

#### 7.4.1 Nominal Battery Voltage

Unless differently indicated the nominal battery voltage used in this specification is 14V ± 0.1V.
8 Group 1 – PLCA test cases

8.1 [T] PLCA Timing requirements

The test cases defined in this section shall ensure that the PLCA is able to communicate within the required timing parameters.

8.1.1 Group T1 – Coordinator node

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test is to verify important timing parameters for interoperability of nodes in PLCA mode. Under any circumstance, a packet sent by a node during its own TO shall be received by any other node within the corresponding TO boundaries.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Table 147-6 10BASE-T1S delay constraints</td>
</tr>
</tbody>
</table>
| Prerequisites                                                          | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up                                                             | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with nodes in a mixing-segment multi drop.  
   - aPLCANodeCount = 2  
   - aPLCATransmitOpportunityTimer = 32  
3. DUT should be configured as Coordinator node with aPLCALocalNodeID = 0.  
4. DUT shall be ready to transmit before BEACON. |

**Figure 8-1: Topology for test group T1**

| Test description                                                                 | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node and subsequently at the coordinator node (Node #0) to start communication.  
2. Test should wait for PLCA on all nodes to be activated before continuing with next step.  
3. Initiate data transmission following the respective PLCA Cycle and Message transfer configurations.  
4. Measure the time between BEACON expiration and node’s transmission with an oscilloscope, as shown as $\tau_{\text{measure}}$ in the figure below: |

![Figure 8-1: Topology for test group T1](image-url)
Figure 8-2: Time between BEACON expiration and node’s transmission – Coordinator node

Pass criteria
The measured interval shall be between following values:
- Min = (TX_EN to MDI\textsubscript{min}) + (CRS\_deasserted\textsubscript{min}) + (MII\_propagation\_time\textsubscript{min}) = 760 ns
- Max = (TX_EN to MDI\textsubscript{max}) + (CRS\_deasserted\textsubscript{max}) + (MII\_propagation\_time\textsubscript{max}) = 2360 ns

Test iterations
Amount of test repetitions: n.a.

Notes

Table 5: Main test structure of Group T1

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1.1</td>
<td>Normal communication undisturbed</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 6 - Test case instances definition for Group T1 - Tests case T1.1
8.1.2 Group T2 – Follower node BEACON

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test is to verify important timing parameters for interoperability of nodes in PLCA mode. Under any circumstance, a packet sent by a node during its own TO shall be received by any other node within the corresponding TO boundaries.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Table 147-6 10BASE-T1S delay constraints</td>
</tr>
</tbody>
</table>
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with either nodes mixing-segment multi drop topology or with an arbitrary waveform generator capable to emulate a BEACON pattern (Node#3).  
   • aPLCANodeCount = 2  
   • aPLCATransmitOpportunityTimer = 32  
3. DUT should be configured as Follower node with aPLCALocalNodeID = 1.  
4. DUT shall be ready to transmit before BEACON.  
5. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test.  
6. Expiration of TO timer needs to be taken into account. |

![Figure 8-3: Topology for test group T2](image)

| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node and subsequently at the coordinator node (Node #0) to start communication.  
2. Test should wait for PLCA on all nodes to be activated before continuing with next step.  
3. Initiate data transmission with the respective PLCA Cycle and Message transfer.  
4. Measure the time between BEACON expiration and node’s transmission with an oscilloscope, as shown as $t_{\text{measure}}$ in the figure below: |
Figure 8-4: Time between BEACON expiration and node’s transmission – Follower node (aPLCALocalNodeID = 1)

Pass criteria

The test case shall be considered as passed if all the following condition(s) are fulfilled:

The measured interval shall be between following values:

- Min = (TX_EN to MDI\text{\_min}) + (CRS\_deasserted\text{\_min}) + (MII\_propagation\_time\text{\_min}) + (to\_timer) \times Node\_ID = 760 \text{ ns} + (to\_timer) \times Node\_ID
- Max = (TX_EN to MDI\text{\_max}) + (CRS\_deasserted\text{\_max}) + (MII\_propagation\_time\text{\_max}) + (to\_timer) \times Node\_ID = 2360 \text{ ns} + (to\_timer) \times Node\_ID

Test iterations

Amount of test repetitions: n.a.

Notes

Table 7: Main test structure of Group T2

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2.1</td>
<td>PLCA Timing requirements – Follower Node - BEACON</td>
<td>\text{Node_ID} = \text{from 1 to 16} \text{ The aPLCANodeCount should be incremented accordingly when Node_ID &gt;1}</td>
<td>\text{repeat the test with different values of TO_TIMER and different values of the node ID/aPLCANodeCount.}</td>
</tr>
</tbody>
</table>
8.1.3 Group T3 – Follower node packet

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test is to verify important timing parameters for interoperability of nodes in PLCA mode. Under any circumstance, a packet sent by a node during its own TO shall be received by any other node within the corresponding TO boundaries.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Table 147-6 10BASE-T1S delay constraints</td>
</tr>
</tbody>
</table>
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with either nodes mixing-segment multi drop topology or with an arbitrary waveform generator capable to emulate a BEACON pattern (Node#1).  
   • aPLCNNodeCount = 2  
   • aPLCATransmitOpportunityTimer = 32  
3. DUT should be configured as Follower node with aPLCALocalNodeID = 1.  
4. DUT shall be ready to transmit before BEACON.  
5. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test.  
6. Expiration of TO timer needs to be taken into account. |

Figure 8-5: Topology for test group T3

| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node and subsequently at the coordinator node (Node #0) to start communication.  
2. Test should wait for PLCA on all nodes to be activated before continuing with next step.  
3. Initiate data transmission with the respective PLCA Cycle and Message transfer.  
4. Measure the time between the expiration of one packet to the beginning of the next packet sent from the DUT with an oscilloscope, as shown as $t_{\text{measure}}$ in the figure below: |
Beacon 
Transmission of Node 0 
Beacon 
Transmission of Node 1 
Cycle 
n 
n + 1 

Figure 8-6: Time between node’s transmission expiration and beginning of next node’s transmission – Follower node (aPLCALocalNodeID = 1)

**Pass criteria**
The test case shall be considered as passed if all the following condition(s) are fulfilled. The measured interval shall be between following values:
- Min = (TX_EN to MDI\textsubscript{min}) + (CRS\textsubscript{deasserted\textsubscript{min}}) + (MII\textsubscript{propagation\_time\textsubscript{min}}) + (to\_timer) x (aPLCANodeCount-1) = 760 ns + (to\_timer) x Node\_ID
- Max = (TX_EN to MDI\textsubscript{max}) + (CRS\textsubscript{deasserted\textsubscript{max}}) + (MII\textsubscript{propagation\_time\textsubscript{max}}) + (to\_timer) x (aPLCANodeCount-1) = 2360 ns + (to\_timer) x Node\_ID

**Test iterations**
Amount of test repetitions: n.a.

**Notes**
Table 9: Main test structure of Group T3

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR3.1</td>
<td>PLCA Timing requirements – Follower Node - PACKET</td>
<td>TO_TIMER = minimum value declared by the PHY manufacturer, 32, 36 and 40. Node_IDs = from 1 to 16</td>
<td>- repeat the test with different values of the TO_TIMER and different values of the node ID/aPLCANodeCount. - The aPLCANodeCount should be incremented accordingly when Node_ID &gt;1</td>
</tr>
</tbody>
</table>

Table 10 - Test case instances definition for Group T3 - Tests case T3.1
8.2 [D] PLCA Decoding of BEACON and message reception

8.2.1 Group D1 – Decoding of BEACON

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT to correctly decode the BEACON sent by the coordinator node.</th>
</tr>
</thead>
</table>
| Reference | • [1], chapter 22.2.2.8 RXD (receive data)  
• [1], Figure 148–3—PLCA Control state diagram, Transition from state RESYNC to EARLY_RECEIVE and back |
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as coordinator node or as follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with an arbitrary waveform generator capable to emulate a BEACON pattern (Node#0).
   • aPLCANodeCount = 2  
   • aPLCA TransmitOpportunityTimer = 32  
3. DUT should be configured as Follower node with aPLCALocalNodeID = 1.  
4. DUT shall be ready to transmit before BEACON.  
5. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test. |

![Figure 8-7: Topology for test group D1](image_url)

| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node  
2. Test should wait for PLCA on all nodes to be activated before continuing with next step.  
3. Initiate the transmission of BEACON following the criteria of the different test case instances.  
4. Observe the transmission of the DUT with an oscilloscope. |
| Pass criteria | The test case shall be considered as passed if all the following condition(s) are fulfilled.  
• D1.1, D1.2: DUT transmits in its transmit opportunity, as BEACON command is decoded correctly.  
• D1.3, D1.4: DUT does not transmit, as corrupted BEACON commands shall not be decoded as such. |
| Test iterations | Amount of test repetitions: n.a. |
| Notes | |
Table 11: Main test structure of Group D1

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.1</td>
<td>Nominal length BEACON (5 full N symbols)</td>
<td>n.a.</td>
<td>25 DME encoded bit times.</td>
</tr>
<tr>
<td>D1.2</td>
<td>Short length BEACON (4 full N symbols)</td>
<td>n.a.</td>
<td>20 DME encoded bit times.</td>
</tr>
<tr>
<td>D1.3</td>
<td>Short length BEACON (1 full N symbols)</td>
<td>n.a.</td>
<td>5 DME encoded bit times.</td>
</tr>
<tr>
<td>D1.4</td>
<td>Nominal length BEACON (5 full N symbols), but every second N symbol is inverted</td>
<td>n.a.</td>
<td>25 DME encoded bit times, with incorrect symbols</td>
</tr>
</tbody>
</table>

Table 12 - Test case instances definition for Group D1 - Tests cases D1.1 to D1.4

8.2.2 Group D2 – Message Reception after different preambles

<table>
<thead>
<tr>
<th>Purpose</th>
<th>1. The purpose of this test case is to test the ability of the DUT to correctly receive a message even if the preamble has been corrupted.</th>
</tr>
</thead>
</table>
| Reference | • [1], chapter 22.2.2.8 RXD (receive data)  
• [1], Figure 148–3—PLCA Control state diagram, Transition between states RESYNC and RECEIVE |
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with an arbitrary waveform generator capable to emulate a COMMIT pattern (Node#0).  
• aPLCANodeCount = 2  
• aPLCATransmitOpportunityTimer = 32  
3. DUT should be configured as Follower node with aPLCALocalNodeID = 1.  
4. DUT shall be ready to receive before BEACON.  
5. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test. |

Figure 8-8: Topology for test group D2
1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node.
2. Test should wait for PLCA on all nodes to be activated before continuing with next step.
3. Initiate the transmission of preamble following the criteria of the different test case instances.
4. Observe the reception buffer of the DUT.

Pass criteria:
The test case shall be considered as passed if all the following condition(s) are fulfilled.
- D2.1: DUT receives the message correctly.

Test iterations:
Amount of test repetitions: n.a.

Table 13: Main test structure of Group D2

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2.1</td>
<td>Non-corrupted preamble</td>
<td>n.a.</td>
<td>2<em>SYNC symbol + 2</em>SSD symbol</td>
</tr>
</tbody>
</table>

Table 14 - Test case instances definition for Group D2 - Tests cases D2.1
8.3 [R] PLCA Recovery

The test cases defined in this section have an informational nature and their results should not influence the final test outcome. These test cases provide information about the functionality of the PLCA, whether or not the DUT detects or overlooks invalid patterns and whether or not it goes into the respective recovery states. Invalid patterns capable to assert CRS cannot necessarily be distinguished from noise in high noise environments.

8.3.1 Group R1 – Recovery of a Coordinator node

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT as coordinator node to correctly recover from a distorted ethernet channel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Figure 148–3—PLCA Control state diagram, RESYNC/RECOVER states.</td>
</tr>
</tbody>
</table>
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H2 topology (3 node mixing segment)  
2. This test case is conducted with an arbitrary waveform generator capable to emulate a sent package (Node#1).  
   • aPLCANodeCount = 3  
   • aPLCATransmitOpportunityTimer = 32  
3. DUT should be configured as Coordinator node with aPLCalocalNodeID = 0.  
4. DUT shall be ready to transmit before BEACON. |

![Topo1.png](/figures/Topo1.png)

**Figure 10 1: Topology for test group R1**

| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at all Nodes  
2. Initiate the transmission of the disturbance invalid pattern composed by two 1111 symbols, from Node #1 at the transmit opportunity of the Node #1.  
3. Observe the transmission of the DUT with an oscilloscope for the next PLCA cycle. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass criteria</td>
<td>A new beacon shall get sent from the DUT after the time &quot;(plca_node_count – 1) * to_timer&quot;.</td>
</tr>
<tr>
<td>Test iterations</td>
<td>Amount of test repetitions: n.a.</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
</tr>
</tbody>
</table>

### Table 15: Main test structure of Group R1

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1.1</td>
<td>Recovery of a Coordinator node</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

### Table 16 - Test case instances definition for Group R1 - Tests cases R1.1

#### 8.3.2 Group R2 – Recovery of a Follower node

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT as follower node to correctly recover from a distorted ethernet channel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Figure 148–3—PLCA Control state diagram, RESYNC/RECOVER states.</td>
</tr>
</tbody>
</table>
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 2. This test case is conducted with H2 topology (3 node mixing segment)  
3. This test case is conducted with an arbitrary waveform generator capable to emulate a sent package (Node#1).  
4. DUT should be configured as Follower node with  
   - aPLCALocalNodeID = 2.  
   - aPLCANodeCount = 3  
   - aPLCATransmitOpportunityTimer = 32  
5. DUT shall be ready to transmit before BEACON.  
6. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test. |

**Figure 8-9: Topology for test group R2**

- Node 2 (DUT)  
  - Node 0 Link partner  
  - 0.1m  
  - 1m  
- 10BASE-T1S channel  
- Node 1 Transmit Station  
- Termination  

| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at all nodes.  
2. Initiate the transmission of the disturbance invalid pattern composed by five 1111 symbols, from Node #1 at the transmit opportunity of the Node #1.  
3. Observe the transmission of the DUT with an oscilloscope. |
|------------------|---------------------------------------------------------------|

Restriction Level: Public  
10BASE-T1S PLCA Conformance Test Suite  
Nov-23
4. Wait for the next PLCA cycle, identified by the next BEACON
5. Observe the transmission of the DUT with an oscilloscope.

| Pass criteria | The DUT shall never transmit in a misaligned transmit opportunity.
|               | − If the DUT sends its message in the current PLCA cycle, it means that the invalid pattern was filtered out as it could not be distinguished from noise.
|               | − If the DUT does not send its message in the disturbed PLCA cycle (test step 3), but resynchronizes and sends its message in the next undisturbed PLCA cycle (test step 5) starting "2 * to_timer" after the BEACON ends, it means that the DUT was able to detect the invalid pattern.

| Test iterations | Amount of test repetitions: n.a.

| Notes |

Table 17: Main test structure of Group R2

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2.1</td>
<td>Recovery of a Follower node</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 18 - Test case instances definition for Group R2 - Tests case R2.1
### 8.4 [B] PLCA Burst

#### 8.4.1 Group B1 – PLCA burst count > TX buffer

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT to correctly abort the burst sequence when the TX buffer is empty before the max burst count is reached.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Figure 148–3—PLCA Control state diagram, Transition between states TRANSMIT and BURST</td>
</tr>
</tbody>
</table>
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with an arbitrary waveform generator capable to emulate a COMMIT pattern (Node#0).  
3. DUT should be configured as Follower node with  
   - aPLCALocalNodeID = 1.  
   - aPLCANodeCount = 2  
   - aPLCATransmitOpportunityTimer = 32  
   - aPLCMaxBurstCount = 5  
   - aPLCBurstTimer = 128  
4. DUT shall be ready to transmit before BEACON. |

**Figure 8-10: Topology for test group B1**

| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node  
2. Initiate the transmission of 4 frames on the DUT.  
3. Observe the transmission of the DUT for at least 2 PLCA cycles with an oscilloscope |
| Pass criteria | The test case shall be considered as passed if the DUT does send all 4 frames in the respective burst sequence, as the burst sequence shall be aborted if the TX buffer is empty before the max burst count is reached. |
| Test iterations | Amount of test repetitions: n.a. |
| Notes | |

Restriction Level: Public

10BASE-T1S PLCA Conformance Test Suite

Nov-23
Table 19: Main test structure of Group B1

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1.1</td>
<td>Normal communication undisturbed</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 20 - Test case instances definition for Group B1 - Tests cases B1.1

8.4.2 Group B2 – PLCA burst count < TX buffer

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT to correctly handle the burst sequence when the TX buffer still contains packets after the max burst count is reached.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Figure 148–3—PLCA Control state diagram, Transition between states TRANSMIT and BURST</td>
</tr>
</tbody>
</table>
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with an arbitrary waveform generator capable to emulate a COMMIT pattern (Node#0).  
5. DUT should be configured as Follower node with  
   - aPLCALocalNodeID = 1  
   - aPLCANodeCount = 2  
   - aPLCATransmitOpportunityTimer = 32  
   - aPLCAMaxBurstCount = 5  
   - aPLCABurstTimer = 128  
3. DUT shall be ready to transmit before BEACON.  
4. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test. |

![Figure 8-11: Topology for test group B2](image_url)

Test | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node |
2. Initiate the transmission of 7 frames on the DUT.
3. Observe the transmission of the DUT for at least 2 PLCA cycles with an oscilloscope

Pass criteria: The test case shall be considered as passed if the DUT does correctly send 6 frames in a burst in the first PLCA cycle and another (1) frame in a burst in the following PLCA cycle.

Test iterations: Amount of test repetitions: n.a.

Notes:

Table 21: Main test structure of Group B2

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2.1</td>
<td>Normal communication undisturbed</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Table 22 - Test case instances definition for Group B2 - Tests case B2.1
### 8.5 [C] PLCA Corner cases

#### 8.5.1 Group C1 – Decoding of COMMIT near to_timer_done

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT to correctly decode the COMMIT sent by the coordinator node under normal conditions near the expiration of to_timer. PLCA timings are calculated such that each node shall start to transmit at the beginning of its TO, or do not transmit in that TO. This because the propagation time for CRS assertion, deassertion and MDI transmission causes the TO counters not to be in sync between all the nodes.</th>
</tr>
</thead>
</table>
| Reference | • [1], chapter 22.2.2.8 RXD (receive data)  
• [1], Figure 148–3—PLCA Control state diagram, Transition between states RESYNC and RECEIVE |
| Prerequisites | 1. DUT with the capability to reset and configure its PHY.  
2. DUT shall be able to be configured either as Coordinator node or as Follower node.  
3. DUT must be able to indicate PLCA status via its status registers.  
4. DUT must be able to send frames in the respective transmit opportunity. |
| DUT set-up | 1. This test case is conducted with H1 topology (P2P link segment)  
2. This test case is conducted with an arbitrary waveform generator capable to emulate a COMMIT pattern (Node#0).  
3. DUT should be configured as Follower node with  
   • aPLCALocalNodeID = 1  
   • aPLCANodeCount = 2  
   • aPLCATransmitOpportunityTimer = 32  
4. DUT shall be ready to receive before BEACON.  
5. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test. |
| Test description | 1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node  
2. Initiate the transmission of BEACON followed by delayed COMMIT and initiate the transmission of a message from Node #0 following the criteria of the different test case instances.  
3. Observe the reception buffer of the DUT |
| Pass criteria | The test case shall be considered as passed if all the following condition(s) are fulfilled.  
• C1.1:  
  • The DUT shall not violate Node #0's transmit opportunity interpreting that Node #0 has yielded its transmit opportunity.  
  • DUT receives the message, because it detects the COMMIT correctly. |

---

**Figure 8-12: Topology for test group C1**

[Diagram showing the topology with Node 0 Transmit Station, Node 1 DUT, 10BASE-T1S channel, and Termination points.]
Table 23: Main test structure of Group C1

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1.1</td>
<td>COMMIT before “to_timer_done”-condition of Transmit Opportunity of Node #0</td>
<td>Delayed COMMIT from (to_timer-20) to (to_timer-13) bit times before “to_timer_done”</td>
<td>COMMIT gets sent delayed cyclically in step of 1 bit time per PLCA Cycle. The maximum delayed time should be to_timer + CRS deassert min - CRS assert max - MII propagation time max – P\text{DELAY} = to_timer - 1210ns. Starting from the end of BEACON transmission.</td>
</tr>
</tbody>
</table>

Table 24 - Test case instances definition for Group C1 - Tests case C1.1

8.5.2 Group C2 – Recovery of coordinator node near `to_timer_done`

This test case has an informational nature, and its result should not influence the final test outcome. This test case provides information about the functionality of the PLCA, whether or not the DUT detects or overlooks invalid patterns and whether or not it goes into the respective recovery states. Invalid patterns capable to assert CRS cannot necessarily be distinguished from noise in high noise environments.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>The purpose of this test case is to test the ability of the DUT to correctly recover from a collision in the DUT’s transmit opportunity near the expiration of <code>to_timer</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>[1], Figure 148–3—PLCA Control state diagram, Transition between states RESYNC and EARLY_RECEIVE</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>1. DUT with the capability to reset and configure its PHY. 2. DUT shall be able to be configured either as Coordinator node or as Follower node. 3. DUT must be able to indicate PLCA status via its status registers. 4. DUT must be able to send frames in the respective transmit opportunity.</td>
</tr>
<tr>
<td>DUT set-up</td>
<td>1. This test case is conducted with H2 topology (3 node mixing segment) 2. This test case is conducted with an arbitrary waveform generator capable to emulate a sent package (Node#1). 3. DUT should be configured as Coordinator node with</td>
</tr>
</tbody>
</table>

\[ P_{\text{DELAY}} \text{ is the propagation delay on the transmission line between the testbench node to the DUT. Assumed to be aprox. 5ns/m; i.e. } \sim 10\text{ns.} \]
4. DUT shall be ready to transmit before BEACON.

Figure 10.1: Topology for test group C2.1

Table 25: Main test structure of Group C2

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2.1</td>
<td>Disturbance close to “to_timer_done”-condition of DUT</td>
<td></td>
<td>- The disturbance in test step 3 gets sent delayed cyclically in step of 1 bit time</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Repeat test case until the delayed disturbance is sent at (to_timer-12) bit times before “to_timer_done”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- The maximum delayed time should be to_timer + CRS deassert min - CRS assert max - MII propagation time max – $P_{\text{delay}} = \text{to}_\text{timer} - 1205\text{ns}$². Starting from the end of BEACON transmission.</td>
</tr>
</tbody>
</table>

Table 26 - Test case instances definition for Group C2 - Tests case C2.1

² For 1 meter cable, $P_{\text{delay}}$ is approx. 5 ns.
8.5.3 Group C3 – Recovery of follower node near to_timer_done
This test case has an informational nature, and its result should not influence the final test outcome. This test case provides information about the functionality of the PLCA, whether or not the DUT detects or overlooks invalid patterns and whether or not it goes into the respective recovery states. Invalid patterns capable to assert CRS cannot necessarily be distinguished from noise in high noise environments.

### Purpose
The purpose of this test case is to test the ability of the DUT to correctly recover from a collision in the DUTs transmit opportunity near the expiration of to_timer.

### Reference
[1], Figure 148—PLCA Control state diagram, Transition between states RESYNC and EARLY_RECEIVE

### Prerequisites
1. DUT with the capability to reset and configure its PHY.
2. DUT shall be able to be configured either as Coordinator node or as Follower node.
3. DUT must be able to indicate PLCA status via its status registers.
4. DUT must be able to send frames in the respective transmit opportunity.

### DUT set-up
1. This test case is conducted with H2 topology (3 node mixing segment)
2. This test case is conducted with an arbitrary waveform generator capable to emulate a sent package (Node#1).
3. DUT should be configured as Follower node with
   - aPLCALocalNodeID = 1
   - aPLCANodeCount = 2
   - aPLCATransmitOpportunityTimer = 32
4. DUT shall be ready to transmit before BEACON.
5. To avoid having the test being affected by the MAC inter-packet gap, allow at least 10us of line idle (no transmissions) before starting the test.

### Test description
1. Once the configuration in all nodes is completed, enable the PLCA reconciliation sublayer functionality at Follower Node
2. Initiate the transmission of a BEACON from Node #0
3. Initiate the transmission of the disturbance pattern 1111 from Node #1 following the criteria of the different test case instances.
4. Observe the transmission of the DUT with an oscilloscope.

### Pass criteria
The DUT shall never transmit in a misaligned transmit opportunity.
- If the DUT sends its message in the current PLCA cycle, it means that the invalid pattern was filtered out as it could not be distinguished from noise.
- If the DUT does not send its message in the disturbed PLCA cycle (test step 3), but resynchronizes and sends its message in the next undisturbed PLCA cycle starting "2 * to_timer" after the BEACON ends, it means that the DUT was able to detect the invalid pattern.
### Table 27: Main test structure of Group C3

<table>
<thead>
<tr>
<th>Instance Test Case #</th>
<th>Description</th>
<th>Parameter</th>
<th>Condition</th>
</tr>
</thead>
</table>
| C3.1                 | Disturbance close to “to_timer_done”-condition of DUT                        | Delayed disturbance violating the TO before DUT’s transmit opportunity from (to_timer-20) to (to_timer-13) bit times before “to_timer_done” | – The disturbance in test step 3 gets sent delayed cyclically in step of 1 bit time  
– Repeat test case until the delayed disturbance is sent at (to_timer-12) bit times before “to_timer_done”.  
– The maximum delayed time should be to_timer + CRS deassert min - CRS assert max - MII propagation time max = $P_{\text{delay}} = \text{to_timer} - 1205\text{ns}^3$. Starting from the end of BEACON transmission. |

### Table 28 - Test case instances definition for Group C3 - Tests case C3.1

3 For 1 meter cable, $P_{\text{delay}}$ is approx. 5 ns.
9 Appendix

9.1 Test station setup

The test station for 10BASE-T1S PLCA tests consists of 3 types of nodes and can perform all tests that are specified in this document:

- Transmit Station.
- DUT
- Link partner

Additionally, there is an oscilloscope connected to the 10BASE-T1S channel to observe the communication as needed in the respective test cases.

![Diagram of test station setup](image)

Figure 9-1: Test station setup for 10BASE-T1S PLCA tests

The actual test station configuration is described in the test case setup of each test case.

9.1.1 Transmit Station

The 10BASE-T1S Transmit Station node consists of software and hardware that is capable of transmitting precisely timed and formatted packets or dedicated patterns on to the 10BASE-T1S network.

It consists of a FPGA board/Pattern Generator with attached PMD-transceiver which is running the lower tester software. It gets controlled by the test system according to the executed test case requirements. The Transmit Station is denoted with a resolution of at least 20 ns per data point.

9.1.2 DUT

The 10BASE-T1S DUT node will consist of software and hardware that is capable of controlling and supervising the DUT.
The DUT node setup is shown in Figure 9-2 and Figure 9-3. It consists of a host board with attached DUT which is running the upper tester software. It gets controlled by the test system according to the executed test case requirements.

**Figure 9-2: DUT setup for MII or MACPHY 10BASE-T1S Implementation**

**Figure 9-3: DUT setup for DigPHY 10BASE-T1S Implementation**

9.1.3 Link partner

The 10BASE-T1S Link partner will consist of software and hardware that is capable of controlling and supervising a 10BASE-T1S PHY to participate on the 10BASE-T1S network.

The link partner node setup is shown in Figure A.1. It consists of a host board with attached DUT which is running the lower tester software. It gets controlled by the test system according to the executed test case requirements.

**Figure 9-4: 10BASE-T1S Link partner setup**
9.2 List of Tables
Table 1: List of Abbreviations ..................................................................................................... 14
Table 2: List of Definitions ......................................................................................................... 16
Table 3: Main test structure ........................................................................................................ 17
Table 4: Test case instance definition ......................................................................................... 18
Table 5: Main test structure of Group T1 ................................................................................... 22
Table 6: Test case instances definition for Group T1 - Tests case T1.1 ....................................... 22
Table 7: Main test structure of Group T2 ................................................................................... 24
Table 8: Test case instances definition for Group T2 - Tests case T2.1 ....................................... 24
Table 9: Main test structure of Group T3 ................................................................................... 26
Table 10: Test case instances definition for Group T3 - Tests case T3.1 ...................................... 26
Table 11: Main test structure of Group D1 ................................................................................ 28
Table 12: Test case instances definition for Group D1 - Tests cases D1.1 to D1.4 ..................... 28
Table 13: Main test structure of Group D2 ................................................................................ 29
Table 14: Test case instances definition for Group D2 - Tests cases D2.1 ................................. 29
Table 15: Main test structure of Group R1 ................................................................................ 31
Table 16: Test case instances definition for Group R1 - Tests cases R1.1 ................................. 31
Table 17: Main test structure of Group R2 ................................................................................ 32
Table 18: Test case instances definition for Group R2 - Tests case R2.1 .................................... 32
Table 19: Main test structure of Group B1 ................................................................................ 34
Table 20: Test case instances definition for Group B1 - Tests cases B1.1 ................................. 34
Table 21: Main test structure of Group B2 ................................................................................ 35
Table 22: Test case instances definition for Group B2 - Tests case B2.1 ................................. 35
Table 23: Main test structure of Group C1 ................................................................................ 37
Table 24: Test case instances definition for Group C1 - Tests case C1.1 ................................. 37
Table 25: Main test structure of Group C2 ................................................................................ 38
Table 26: Test case instances definition for Group C2 - Tests case C2.1 ................................. 38
Table 27: Main test structure of Group C3 ................................................................................ 40
Table 28: Test case instances definition for Group C3 - Tests case C3.1 ................................. 40
9.3 List of Figures

Figure 7-1: PLCA cycle in 2 node mixing segment [H1] ................................................................. 20
Figure 7-2: PLCA cycle in 3 node mixing segment [H2] ................................................................. 20
Figure 8-1: Topology for test group T1 .......................................................................................... 21
Figure 8-2: Time between BEACON expiration and node’s transmission – Coordinator node .......... 22
Figure 8-3: Topology for test group T2 .......................................................................................... 23
Figure 8-4: Time between BEACON expiration and node’s transmission – Follower node
(aPLCALocalNodeID = 1) .............................................................................................................. 24
Figure 8-5: Topology for test group T3 .......................................................................................... 25
Figure 8-6: Time between node’s transmission expiration and beginning of next node’s transmission –
Follower node (aPLCALocalNodeID = 1) .................................................................................. 26
Figure 8-7: Topology for test group D1 ......................................................................................... 27
Figure 8-8: Topology for test group D2 ......................................................................................... 28
Figure 8-9: Topology for test group R2 ......................................................................................... 31
Figure 8-10: Topology for test group B1 ...................................................................................... 33
Figure 8-11: Topology for test group B2 ...................................................................................... 34
Figure 8-12: Topology for test group C1 ...................................................................................... 36
Figure 8-13: Topology for test group C3 ...................................................................................... 39
Figure 9-1: Test station setup for 10BASE-T1S PLCA tests ........................................................... 41
Figure 9-2: DUT setup for MII or MACPHY 10BASE-T1S Implementation ..................................... 42
Figure 9-3: DUT setup for DigPHY 10BASE-T1S Implementation .................................................. 42
Figure 9-4: 10BASE-T1S Link partner setup .............................................................................. 42