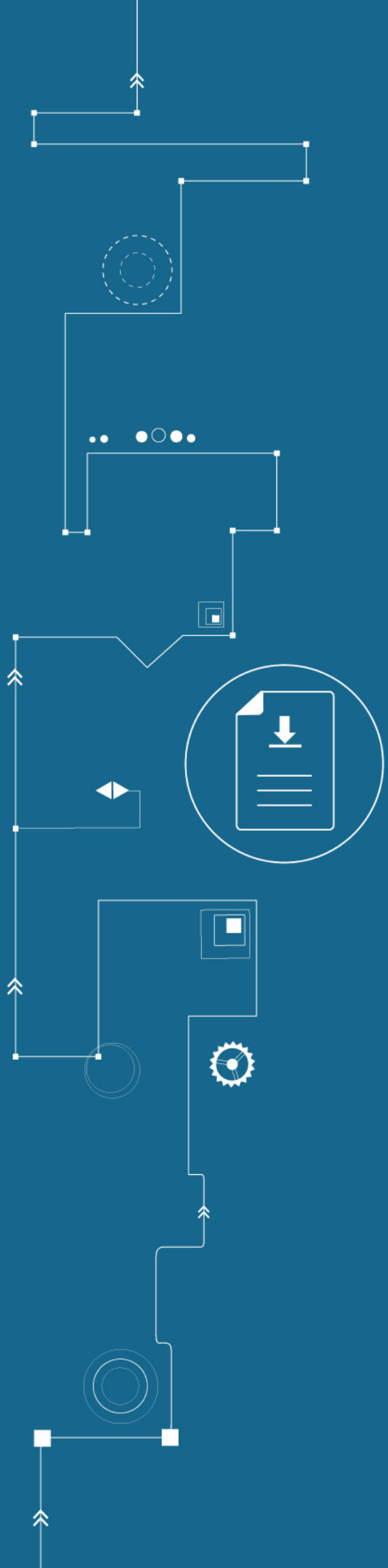
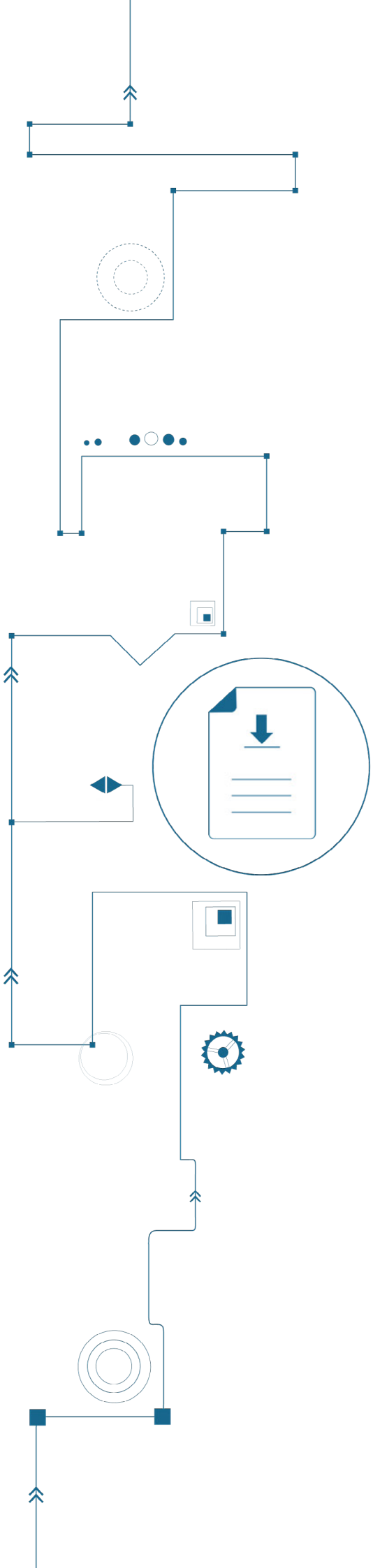


CUBRO
NETWORK VISIBILITY

TAP 100MB

WHITE PAPER

SEP 2017



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INTRODUCTION

1.1 Description TAP 100Mbit with LINKSAFE

Test-Access Ports (called TAPs throughout this document) are network elements, which loop through traffic on its network ports while the traffic is also available on an isolated monitoring port.
Thus, on the monitoring port the entire data stream of the network connection is available for further analysis. Important is that any reaction from the monitoring port to the network ports must be strictly avoided.

1.2 Basic characteristics of a TAP

A fundamental feature of a TAP is the guaranteed decoupling of the monitoring port from the network ports. In our case we use „the LINKSAFE "technology to ensure that.
Furthermore, Linksafe guarantees also that the network link is always looped through even if power fails. Our Linksafe function does not include any switching mechanism – the construction of our TAP is like that the main link is always connected and therefore the TAP will not lose any traffic in case of a power fail. Even if the monitoring port gets damaged/destroyed the main link will not be affected.

2 MEASUREMENTS

2.1 Basics: Eye Diagram Measurement

For the characterization of network elements the eye diagram generally serves as the most meaningful measure. In the eye diagram not only the bandwidth of a system is directly visible, but also any errors by delay impairments can be seen. A correct eye diagram secures correct decoding of the bit stream.

2.2 Measurement Setup

For the eye diagram measurement a oscilloscope from LeCroy was used. With a maximum sampling frequency of 10GS/s and an effective frequency range of >1GHz the oscilloscope is fully able to measure frequencies <100MHz. Beside an oscilloscope a bit pattern generator from Sympuls and a DC power supply from Agilent was used. In order to simulate high-dynamic power supply changes, the DC power supply to the TAP was pulsed by using a Wavetek pulse generator.

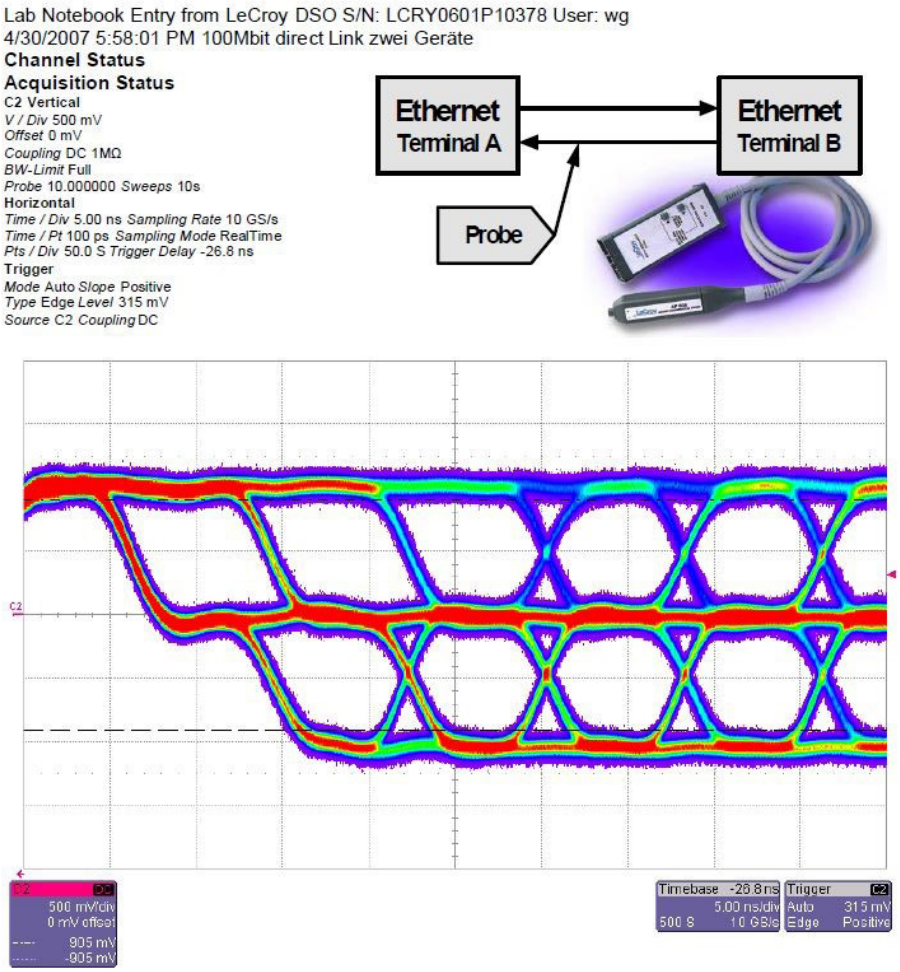
2.3 Used Measurement Equipment

LeCroy DSO WaveRunner 6199 10Gs (SN LCRY0601P10378)
Differential Probe LeCroy 1GHz AP034 (SN 3705)
Agilent Power Supply (SN MY40001829)
Bit Pattern Generator BMG 2500 (SN 21102)
Signalgenerator Wavetek FG-5000A (SN 91090971)
Ethernet-Tester Anritsu MP 1590(SN 62000453)
Network Terminal Intel PRO/1000 PM
Network Terminal Marvell 88E1111

2.4 Measurements in Detail

2.4.1 Measurement 1: Ethernet Line between two terminals without TAP

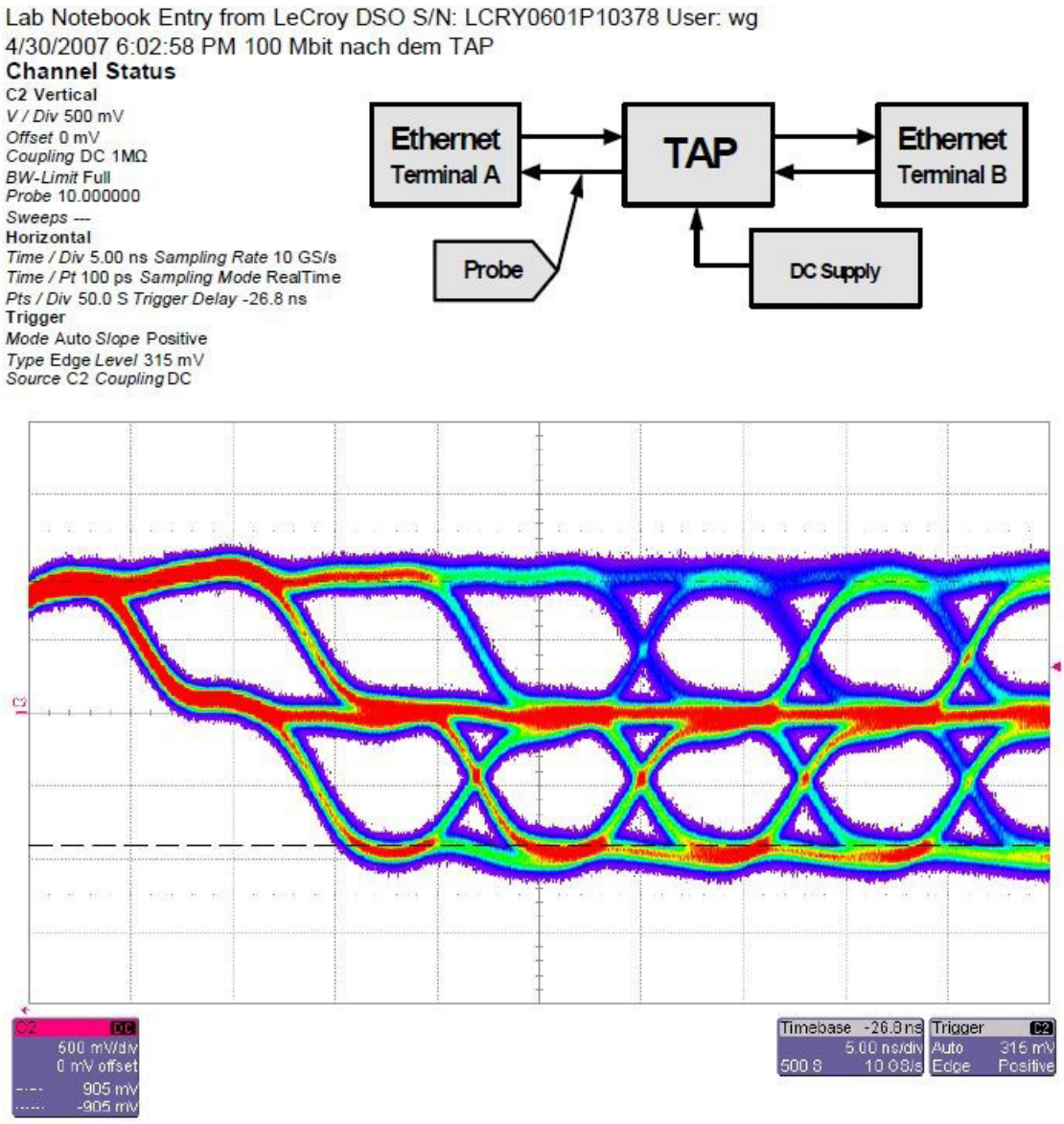
As reference for the later measurements an eye diagram measurement was done. For the connection between the terminals a 2m long commercial CAT5 cable was used. The measuring point is 50cm far away from the Receiver. The coupling to the line under test was done by a Differential Probe.



2.4.2 Measurement 2: Ethernet Line with TAP between two terminals

The TAP was inserted in the middle of the network line and supplied with fixed DC Voltage and measurement 1 was (Eye Diagram) was repeated.

Compared to measurement 1 the amplitude of eye diagram is slightly reduced. This is caused by the TAP and its internal components. However, the eye diagram is still well within the appropriate standards. Reflections due to an impedance mismatch cannot be determined. The eye opening is clearly visible and in comparison to measurement 1 it is more or less unchanged. Thus, the expected bit error rate will not deviate from the direct connection without TAP.



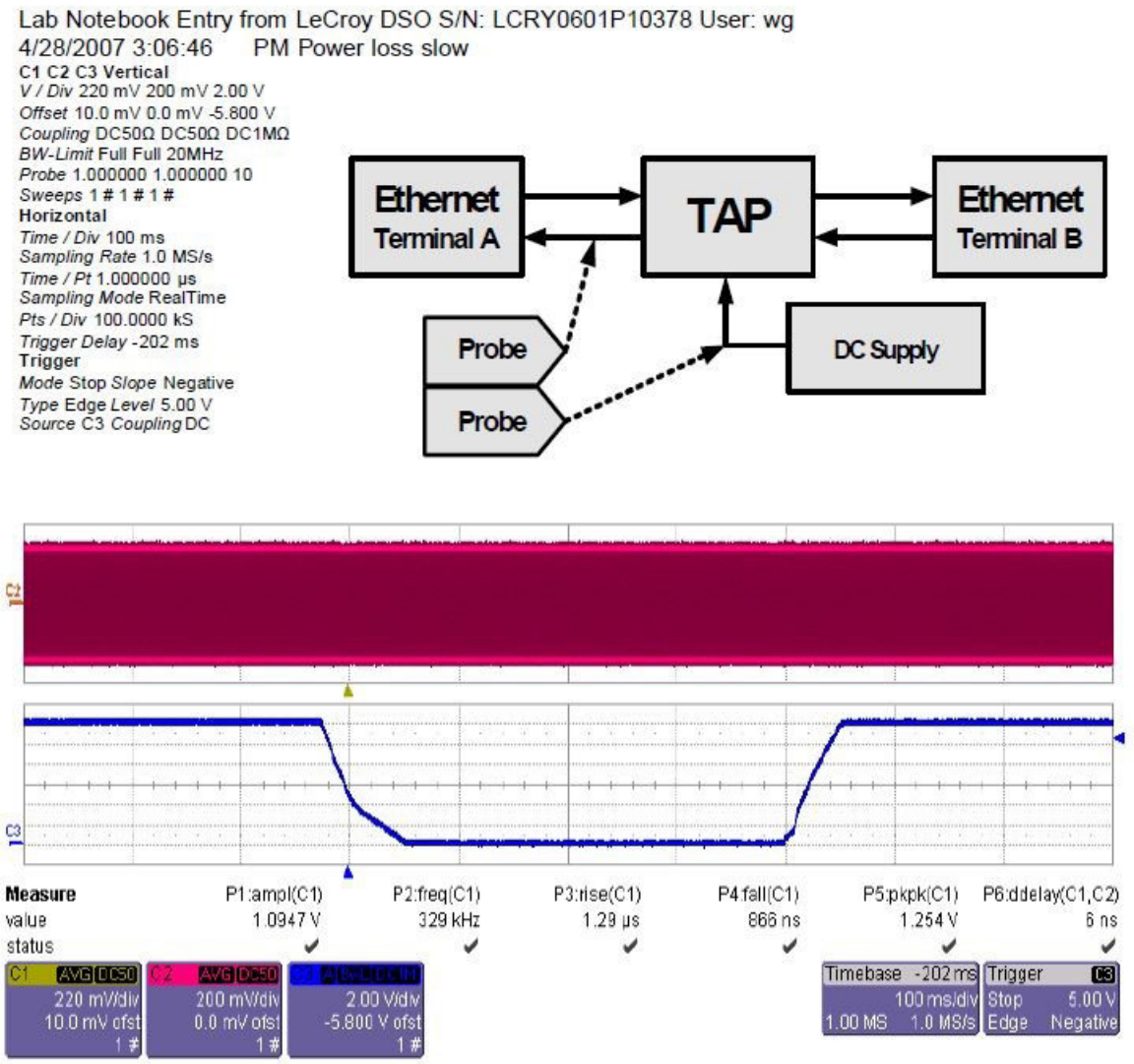
2.4.3 Measurement 3: Slow Voltage Changes

In order to prove the Linksafe function (i.e. the integrity of the data path is not impaired by voltage failure at the TAP), two possible incidents were simulated:

> Slow up and down of the power supply. The TAP goes slowly through all supplying levels down to zero (similarly the Brownout tests).

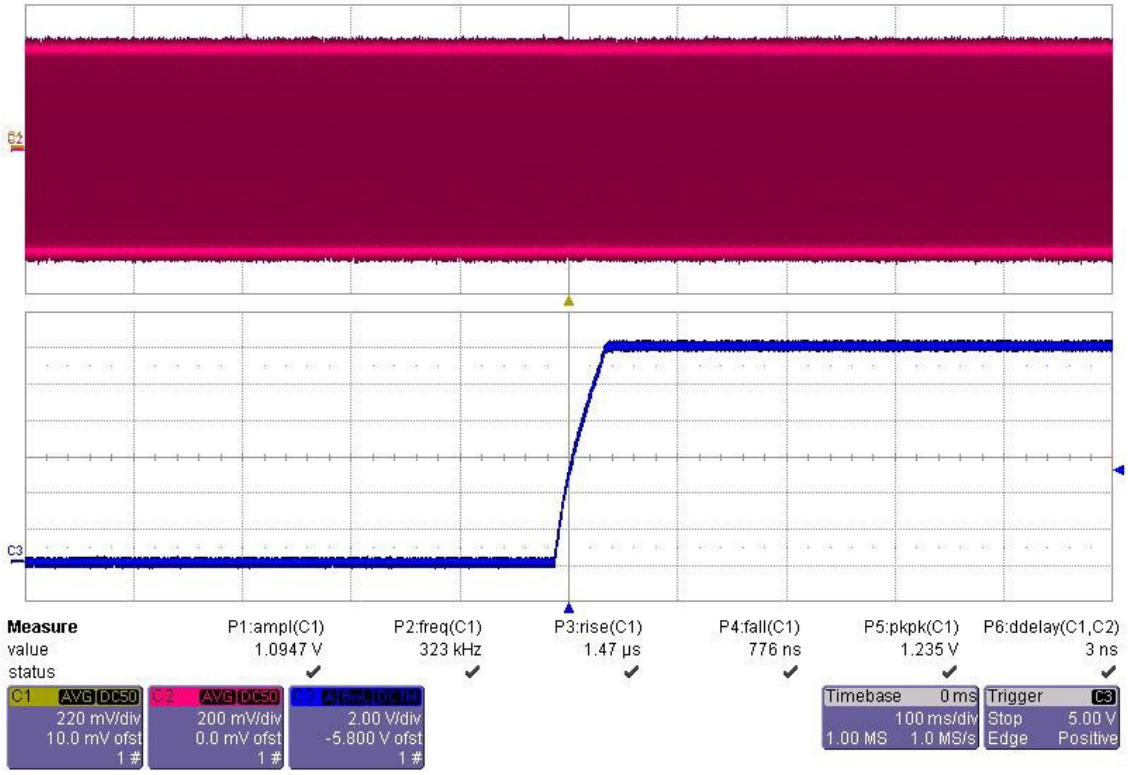
> On the other hand also high-dynamic measurements of the supply were accomplished.

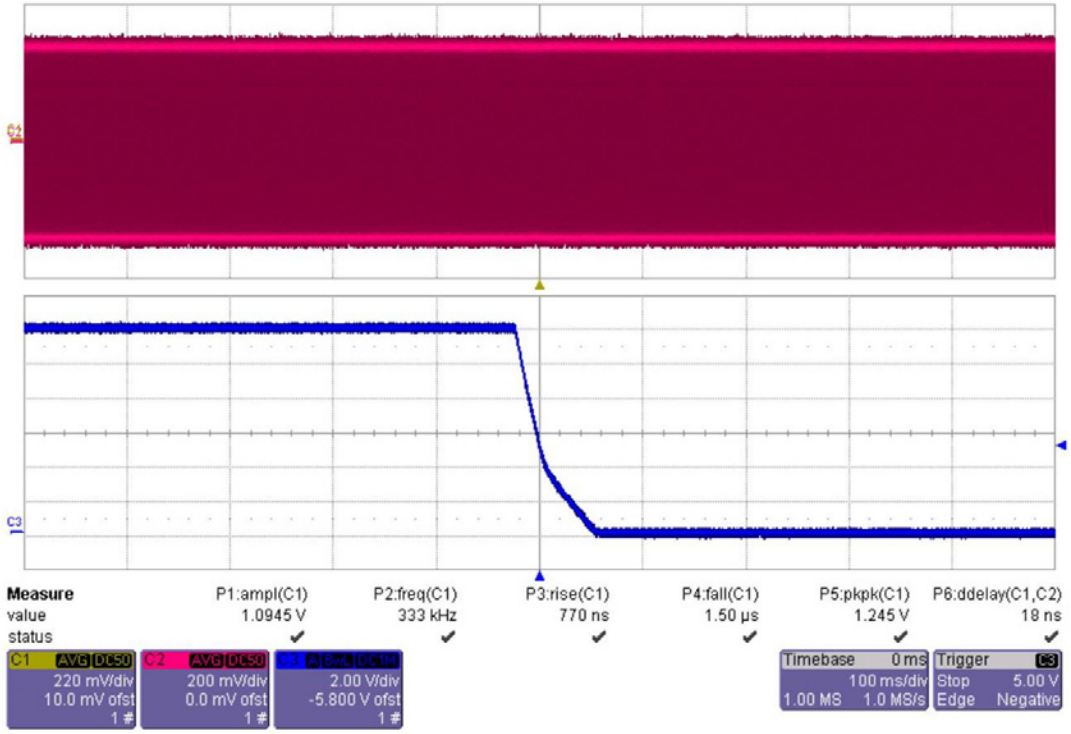
The results show clearly that the network link is not affected by any means.



2.4.4 Measurement 4: DC Supply On/Off

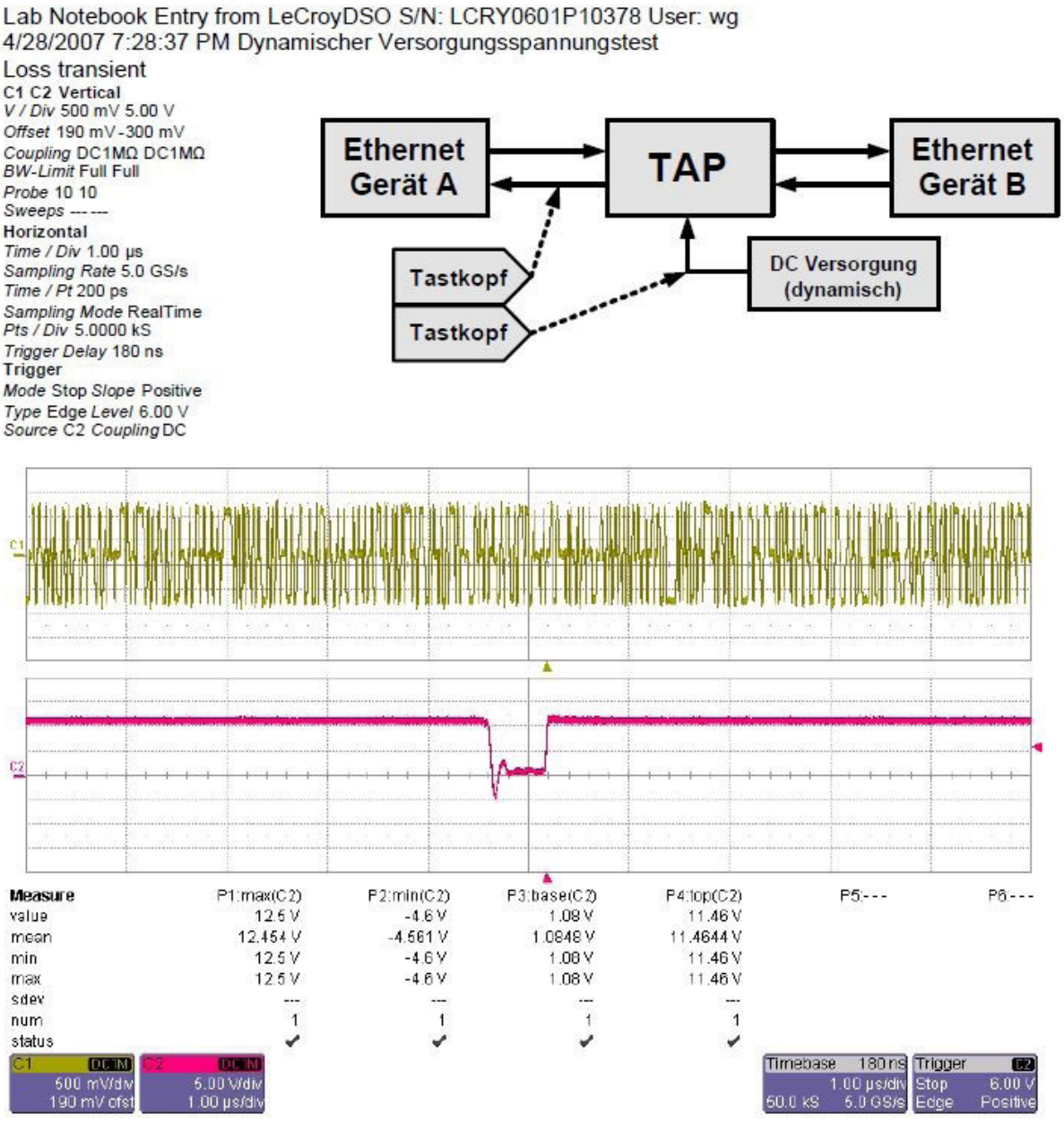
Also with individual in and/or turn-off processes the result remains the same – no influence to the link and the data. In the data stream no influence is recognized by the supply voltage change.





2.4.5 Measurement 5: Highly Dynamic Voltage Changes

In this case pulses with few 100ns and full 12V were put on to 0V supplying stroke. Again it is clearly shown that voltage changes do not have any influence to the link and no data on the link are lost.



2.4.6 Measurement 6: RFC2544 Test

Finally, a RFC2544 measurement was made. During the RFC2544 Test the power supply to the TAP was interrupted to show that the TAP does not lose any packets nor introduces bit errors.

Setup
==== General Setting
Traffic Distribution : One to one Traffic Orientation : Unidirectional Selected Ports :
Port --------> Port
No.001 Unit1:3:3 No.002 Unit1:3:4
Frame Size : 64,128,256,512,1024,1280,1518 byte Protocol : MAC
Device Type : Bit Forwarding
==== Throughput Test Start (at 17:05:44 Apr 27, 2007) Duration : 10 s
Number of Trials : 1 Burst Size : 1
Initial Rate : 100.00 %
Minimum Rate : 0.50 % (User setting: 0.10 %) Maximum Rate : 100.00 %
Resolution : 0.50 %
Loss Tolerance : 0.0000 %

The measured throughput was always 100% - for all frame lengths. No frames got lost. Following is a short summary of the test for 64Bytes and 1280Bytes frames.

Result

Frame Size : 64

Trial No. : 01 / 01

Address Learning:----------

Learning Mode : Once Learning Retries : 1 Address Learning ..Finished Binary Search

Trial : No.1 Duration : 10 s

Tx Rate : 100.00 %

Tx Setting(3 s)

Transmit Test Frame START
.....

Transmitted Test Frame END

Tx Frames
Unit1:3:3 = 1488096
Total Frames = 1488096

Rx Frames
Unit1:3:4 = 1488096
Total Frames = 1488096

****

Result

Throughput Rate : 100.00 %
Total frame/s : 148809 fps
Total bytes/s : 9523776 byte/s

==== Frame Size : 1280
==== Trial No. : 01 / 01
Binary Search Trial : No.1
Duration : 10 s
Tx Rate : 100.00 %

Tx Setting(3 s)
Transmit Test Frame START
.....

Transmitted Test Frame END

Tx Frames
Unit1:3:3 = 96154
Total Frames = 96154

Rx Frames
Unit1:3:4 = 96154
Total Frames = 96154

****

Result

Throughput Rate : 100.00 %
Total frame/s : 9615 fps
Total bytes/s : 12307200 byte/s

3 CONSTRUCTION

3.1 Mechanical and electrical

The mechanical structure of the TAP is oriented to latest industry standards. The housing is completely composed of metal. The equipment does not need louvers and no mechanical cooling components. As there are no active mechanical components inside the equipment is maintenance free.

By the electrical point of view the housing is leading connected with the RJ45 sockets coat. The housings are thus on signal mass (as usual with Ethernet). The TAP features two DC inputs, thus it features redundant power supply. Correct Power Supply is show on the front panel via LED.

Environmental Conditions

> Power Supply: 12VDC, max. current 150mA

> Operating Conditions:

> Temperature : 0°C to 55°C

> Humidity: 5 to 95% (non cons.)

> Storage Conditions:

> Temperature : -15°C to 90°C

3.2 Mechanical Dimensions (reduced A4 drawing)