

A full-page background image showing a surfer in silhouette riding a large, powerful wave. The wave is curling over, creating a massive wall of water and spray. A faint rainbow is visible in the mist created by the wave's crest. The surfer is positioned near the base of the wave, looking up towards the crest.

Proposal for Ingress Calibration in CMNR Test

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Overview

- **Purpose:** Propose a modification to the existing CMNR test procedure in Annex 113A to add an ingress level calibration phase for the purpose of ensuring the test level common-mode ingress matches a pre-defined target value for every test set up.
 - Eliminate variations in common-mode ingress test levels from differences in test setup parameters (e.g. clamp coupling)
- Basic description of CMNR test procedure in Annex 113A
- Proposed modified CMNR test procedure
- Next steps and discussion points

Description of CMNR Test Procedure in Annex 113A

- For all test setups, the test procedure is a two step process: validation and test
- Validation of injection device electrical parameters (insertion loss and return loss of source signal injection ports as per Annex 113A.3)
- Validation of injection device coupling phase (measure coupling of injection device to test channel, Annex 113A.3)
 - Set up test desired test channel without any additional impairment sources (e.g. alien crosstalk)
 - Substitute a 4-pair RJ45-to-SMA breakout/balun test fixture for the MDI port of the EUT
 - Set the source signal generator output to a specified level (e.g. +13 dBm); source signal is not modulated
 - With the available measurement system and signal sensor (e.g. fixed-level swept sine wave signal source and power meter), measure the CM and differential coupled power from the injection apparatus into the each of 4 pairs at the MDI port breakout test fixture
 - For all four pairs, verify that coupled power levels do not exceed the limits in Table 113A-2
- Test phase: Inject test signal into test cable channel and monitor performance (Annex 113A.4)
 - Replace the port under test breakout fixture with the actual PHY port under test
 - Initialize data link between the PHY under test and the far-end link partner
 - Perform test; sweep the signal source (at the above validation level) and monitor data link performance metrics; add additional impairments (e.g. 6-around-1 alien crosstalk) as necessary
- **This procedure allows significant variation of the common-mode ingress test level between different test setups**

Proposed Description of Modified CMNR Test Procedure

- For all test setups, the test procedure is a three step process: validation, calibration, and test
- Validation of injection device electrical parameters (insertion loss and return loss of source signal injection ports as per Annex 113A.3)
- Calibration phase: Compute required signal generator output power to match target common-mode ingress level at each frequency (Annex 113A.4 -- new)
 - Set up test desired test channel without any additional impairment sources (e.g. alien crosstalk)
 - Substitute a 4-pair RJ45-to-SMA breakout/balun test fixture for the MDI port of the EUT
 - Set the source signal generator output to a specified level (e.g. +10 dBm); source signal is not modulated
 - With the available measurement system and signal sensor (e.g. fixed-level swept sine wave signal source and power meter), measure the CM and differential coupled power from the injection apparatus into the each of 4 pairs at the MDI port breakout test fixture
 - Upon completion of the four measurement sweeps, select the data from a single pair and compute the difference between the measured common-mode power level and the common-mode target test level defined in Table 113A-2 to create a correction table that adjusts the signal generator output level to provide target the CM ingress level at each frequency
 - If the corrected signal generator output level exceeds the maximum output level of the signal generator (e.g. +20 dBm), the correction factor shall be limited such that the signal generator output will remain at maximum output level.
 - Apply the correction factor at each frequency to the measured differential (calibration) levels of all four pairs; the resulting corrected differential mode levels should meet the limit defined in Table 113A-2 over the sweep frequency range for each cable pair.
 - Using the corrected signal source values, verify the CM ingress level, signal generator harmonic distortion, and signal generator envelope rise/fall time
- Test phase: Inject corrected source signal into test cable channel and monitor performance(Annex 113A.5 -- new)
 - Replace the port under test breakout fixture with the actual PHY port under test
 - Initialize data link between the PHY under test and the far-end link partner
 - Perform test; sweep the corrected signal source and monitor data link performance metrics; add additional impairments (e.g. 6-around-1 alien crosstalk) as necessary

Next Steps and Discussion Points

- Should we modify the CMNR test by adding a calibration step?
 - Eliminate test variation from differences in test setup parameters (e.g. clamp coupling)
- Need to determine the proper CMNR CM target level and differential mode limits for Table 113A-2
 - Initial proposals for CM target level (for 802.3bz) in contribution from last week's CMNR ad hoc meeting: "Cable_RF_ingress_measurement_in_an_anechoic_chamber"
 - Need to define differential mode limits
- Common-mode termination impedance of unused pairs on the RJ45 breakout fixture may need modification for 802.3bz (but not for 802.3bq)
 - Current value is 25 Ohms: All wires in unused pairs terminated with 50 Ohms to ground
 - The 25 Ohms termination may be okay for 802.3bq as it uses shielded cable
- May need to modify proposed calibration and EUT test setup by inserting a directional coupler between the signal generator and clamp input
 - Directional coupler provides 50 Ohms monitoring port for measuring signal level, harmonic distortion, and RF envelope rise/fall time
 - Significant clamp source path insertion loss when a cable is inserted inside the clamp inner conductor
- Write text for proposed modification
 - Initial draft already on paper
- Write text for other proposed additions (e.g. signal generator harmonic distortion, envelope rise/fall time)
 - Initial draft already on paper
- **Goal is to have working text by September interim meeting!**
 - Additional time may be required to determine final numbers in Table 113A-2