# 10GBASE-T
# Link Segment Baseline Proposal

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# List of supporters:

**Paul Kish - Nordx/CDT**
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**Chris DiMinico - MC Communications**
**George Zimmerman - SolarFlare Communications**
**Mike Bennett - Lawrence Berkeley National Laboratory**
**Olindo Savi – Siemon Company**

# Overview

**Purpose of presentation:**

- **To propose a baseline for the 10GBASE-T link segment based on the agreement to set the starting performance requirements for 10GBASE-T cabling to: ISO/IEC 11801-2002 Class E specifications extrapolated by using the formulas in this standard up to 625 MHz**
- **To propose a 10GBASE-T link segment table that identifies the alien crosstalk specifications that are required to meet the objective distances for each Class and cabling construction type and that identifies an alien crosstalk field test specification to address Class E UTP installed cabling.**

# 10GBASE-T Link Segment Specifications

IEEE P802.3an Meeting
January 14th and 15th, 2004, Vancouver, BC. Canada
**Motion # 2**
**Description:** Move to set the starting performance requirements for 10GBASE-T cabling to: **ISO/IEC 11801-2002 Class E specifications extrapolated by using the formulas in this standard up to 625 MHz.**

**Motion Type**: Technical 75% required
**Moved By**: Henriecus Koeman
**Seconded By**: Luc
SG Voters Y: 38 N: 0 A: 14
802.3 Voters: Y: 17 N: 0 A: 8
**Results**: **100 %** P/F: **Passed**

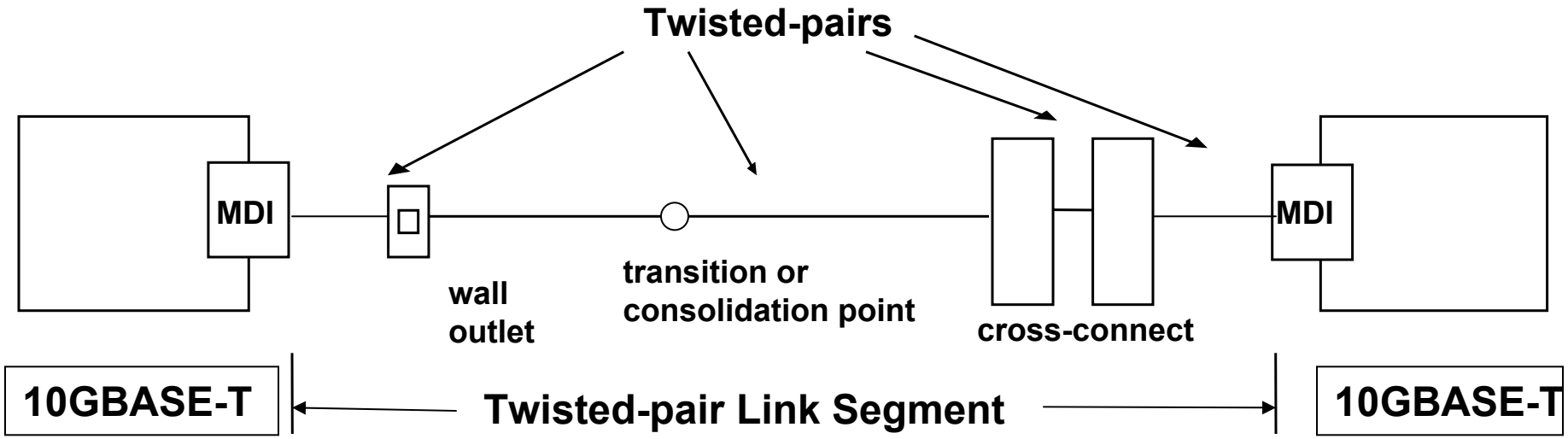
# 10GBASET Link Segment

## Cabling system characteristics

- 4-connector structured 4-pair, twisted-pair copper cabling
- at least 55m to 100 m on four-pair Class E balanced copper cabling
- at least 100m on four-pair Class F balanced copper cabling
- ISO/IEC 11801:2002, with any appropriate augmentation

- ISO/IEC 11801-2002 Class E specifications extrapolated by using the formulas in this standard up to 625 MHz

# Type 10GBASE-T – Link Segment

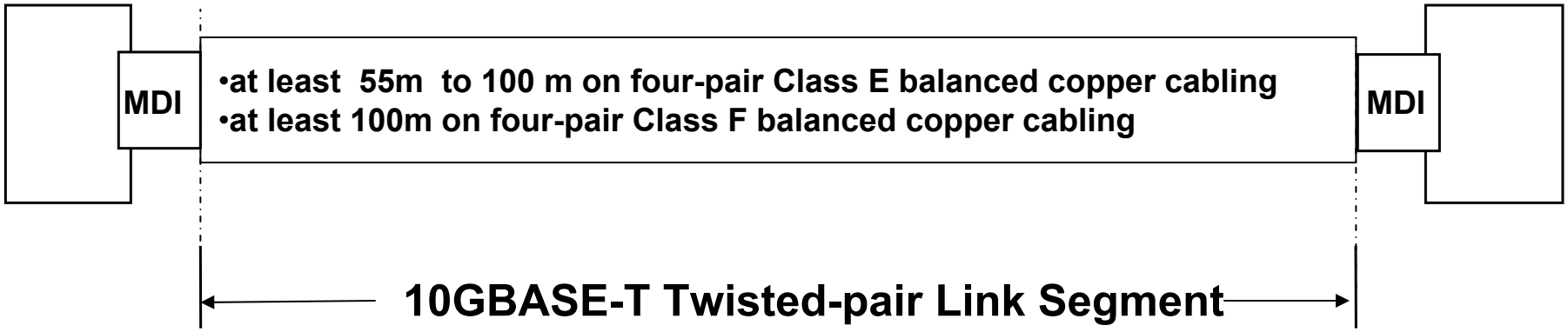



**ISO/IEC 11801-2002 Class E**
**1 ≤ *f* ≤ (250 to TBD)**

***Class E Specified: 1 ≤ f ≤ 250 MHz**
**Class E: 250 < f ≤ TBD – starting point for extrapolated frequency performance**

# Link transmission parameters

- **Link segment transmission parameters based on cabling system characteristics**



# 10GBASE-T Link Segment Types

| Construction | IL | Alien Crosstalk | AXTIR/Field Test | Minimum Distance |
|---|---|---|---|---|
| UTP | Class E* | TBD** | TBD** | at least 55 m to 100 m |
| FTP | Class E* | TBD** | NA | 100 m |
| S/FTP | Class F* | TBD** | NA | 100 m |
| | | | | |
| UTP | Class E+ | TBD** | NA | 100 m |

***extrapolated up to 625 MHz**
****to be determined in cooperatively with ISO/IEC JTC 1/SC 25/WG 3 and TIA-TR-42**

# D1.0 10GBASE-T Link Segment: Class E*

## Coupling parameters:

- **Pair-to-pair NEXT:**
  - **-20*LOG( (10^((74.3-(15*LOG(f)))/-20))+( 2*(10^((94-(20*LOG(f)))/-20))))**
- **Power sum NEXT:**
  - **-20*LOG( (10^((72.3-(15*LOG(f)))/-20))+( 2*(10^((90-(20*LOG(f)))/-20))))**
- **Pair-to-pair ELFEXT:**
  - **-20*LOG( (10^((67.8-(20*LOG(f)))/-20))+( 4*(10^((83.1-(20*LOG(f)))/-20))))**
- **Power sum ELFEXT:**
  - **-20*LOG( (10^((64.8-(20*LOG(f)))/-20))+( 4*(10^((80.1-(20*LOG(f)))/-20))))**

***Class E specified: 1 ≤ f ≤ 250 MHz**
***Class E: 250 < f ≤ TBD – starting point for extrapolated frequency performance**

# D1.0 - 10GBASE-T Link Segment: Class E*

## Transmission parameters:

- **Insertion Loss**

**10GBASE-T Link segment Insertion Loss 100 m:**
**$1.05 \times (1.82 \sqrt{f} + 0.0169 \times f + 0.25/\sqrt{f}) + 4 \times 0.02 \times \sqrt{f}$**

| Frequency | Class E Channel IL | 10GBT IL -100m |
|---|---|---|
| MHz | dB | dB |
| 1 | 4.0 | 4.0 |
| 16 | 8.3 | 8.3 |
| 100 | 21.7 | 21.7 |
| 250 | 35.9 | 35.9 |
| 500 | NA | 53.4 |
| 625 | NA | 60.9 |

*Class E Specified: $1 \leq f \leq 250$ MHz
Class E: $250 < f \leq$ TBD – starting point for extrapolated frequency performance

# D1.0 - 10GBASE-T Link Segment: Class E*

## Transmission parameters:

- **Return Loss:**
  - **1 MHz $\leq$ f $<$ 10 MHz** **19 dB**
  - **10 MHz $\leq$ f $<$ 40 MHz** **24-5*LOG(f)**
  - **40 MHz $\leq$ f $\leq$ (250 MHz to TBD)** **32-10*LOG(f)**

***Class E specified: 1 ≤ f ≤ 250 MHz**
**Class E: 250 < f ≤ TBD – starting point for extrapolated frequency performance**

# Link Transmission Parameters

## Delay parameters:

- **Maximum link delay**
  - –The propagation delay of a link segment shall not exceed 570 ns at all frequencies between 2 MHz and TBD MHz.
- **Link delay skew**
  - –The difference in propagation delay, or skew, between all duplex channel pair combinations of a link segment, under all conditions, shall not exceed 50 ns at all frequencies from 2 MHz to TBD MHz. It is a further functional requirement that, once installed, the skew between any two of the four duplex channels due to environmental conditions shall not vary more than 10 ns within the above requirement.

# Link Transmission Parameters

## Coupling parameter:(between link segments)

- Alien crosstalk (TBD)

# Clause 40: 1000BASE-T: Annex 40A (informative)

## Additional cabling design guidelines

### 40A.1 Alien crosstalk

- Bundled or hybrid cable configurations
  - –PSNEXT specified- between link segments

    35 – 15*log(*f*/100) (dB)

    At all frequencies from 1 MHz to 100 MHz.

Note: 1000BASE-T is a Class D application (11801 © ISO/IEC:2002(E))

# Motion

**Move that the Task Group approve the Link Segment Baseline Proposal (contribution number here) as the basis for the D1.0 Clause 55 link segment specifications.**

**Moved By: C. Di Minico**

**Seconded By:**

**Yes:  No:  Abstain:**