

10GBASE-T

Cabling Baseline Proposal

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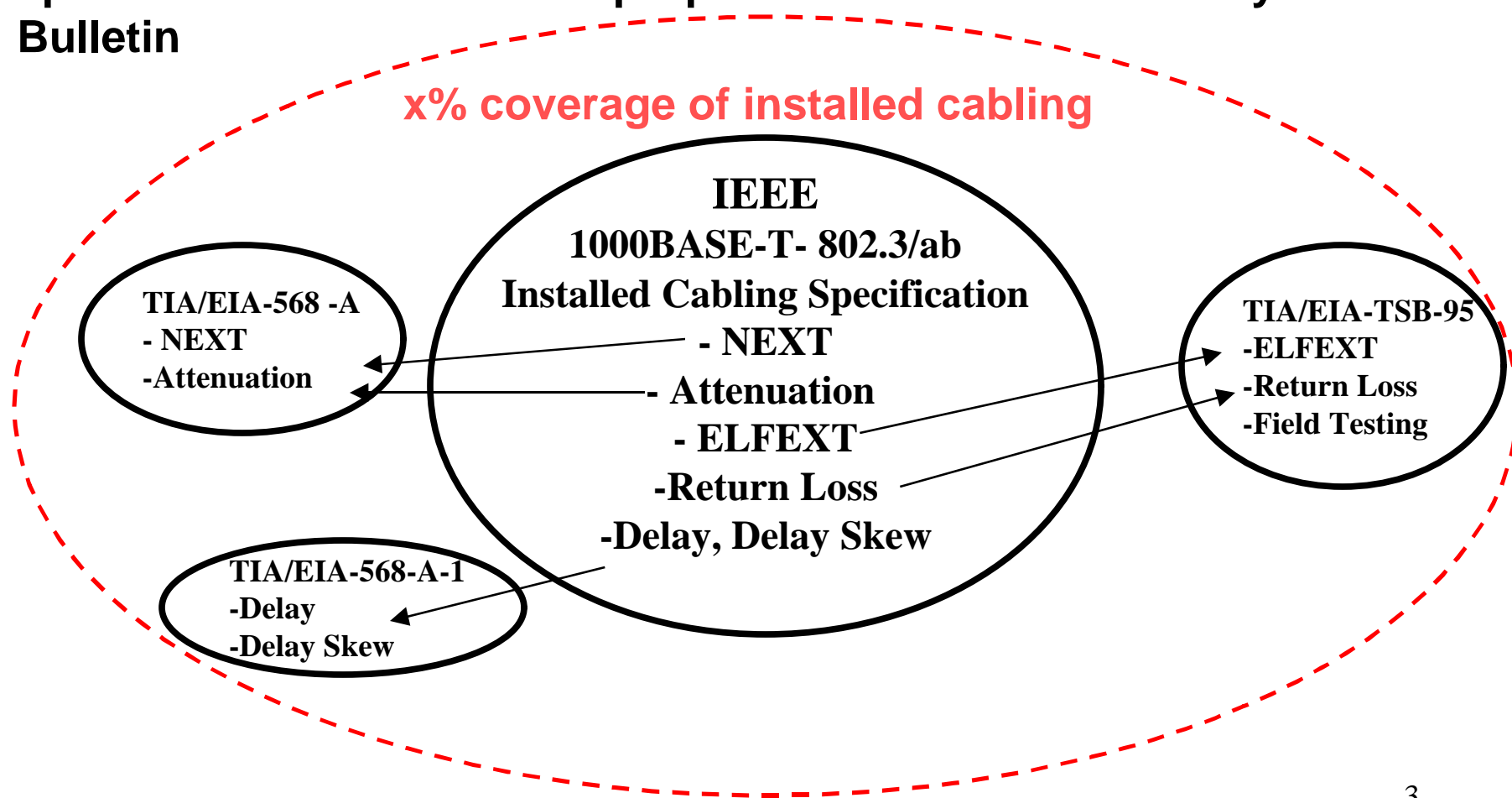
10GBASE-T Baseline Consensus Proposal

Develop objectives and specifications to:

- **maximize 10GBASE-T coverage for Class D and Class E cabling (installed cabling).**
- **establish 100% coverage for new installations.**

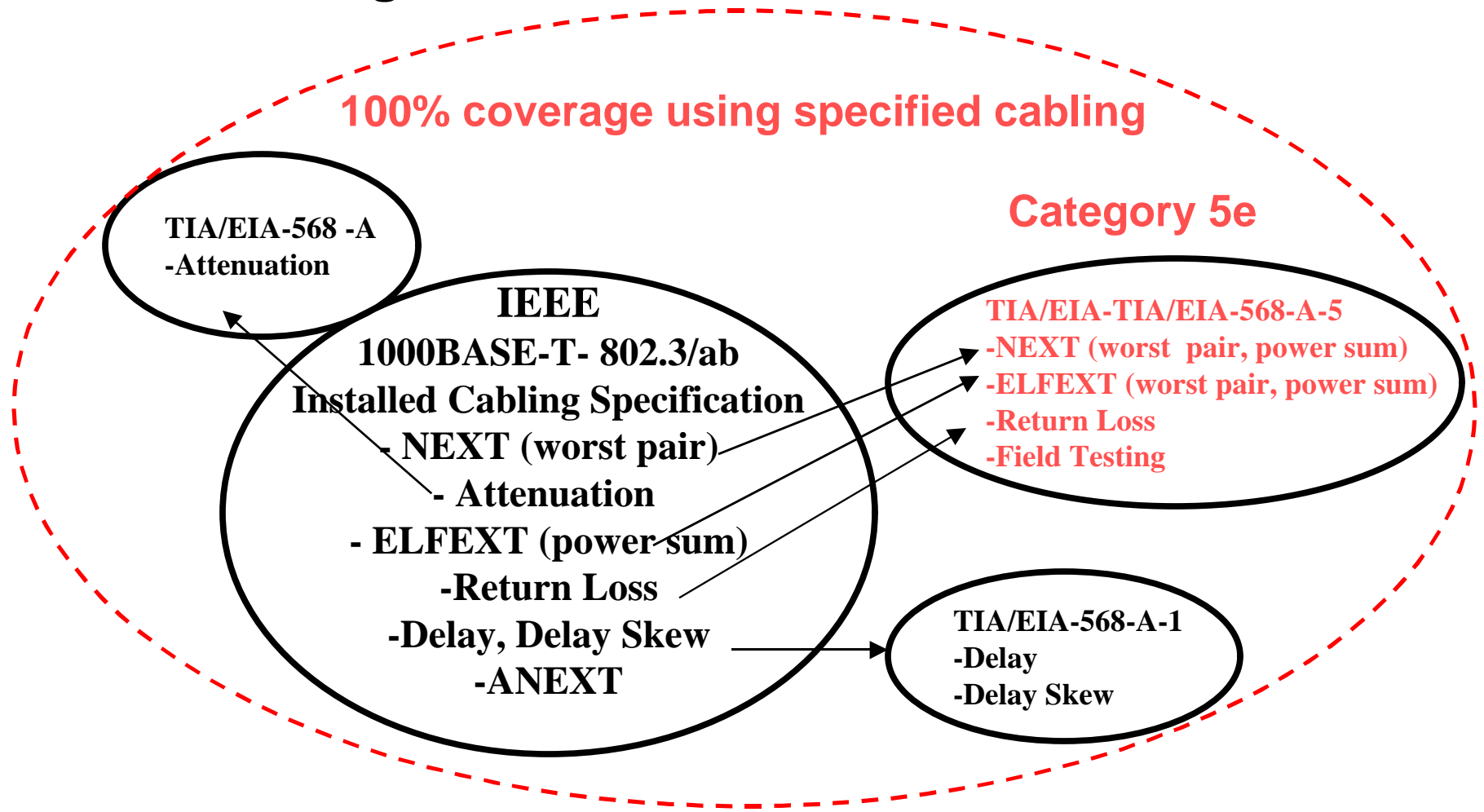
1000BASE-T Link Specifications - Minimum Requirements

Cabling Installed to TIA/EIA-568-A with additional parameters as specified in Addendum and proposed TIA/EIA-Technical System Bulletin



1000BASE-T Link Specifications

When Installing 1000BASE-T Links



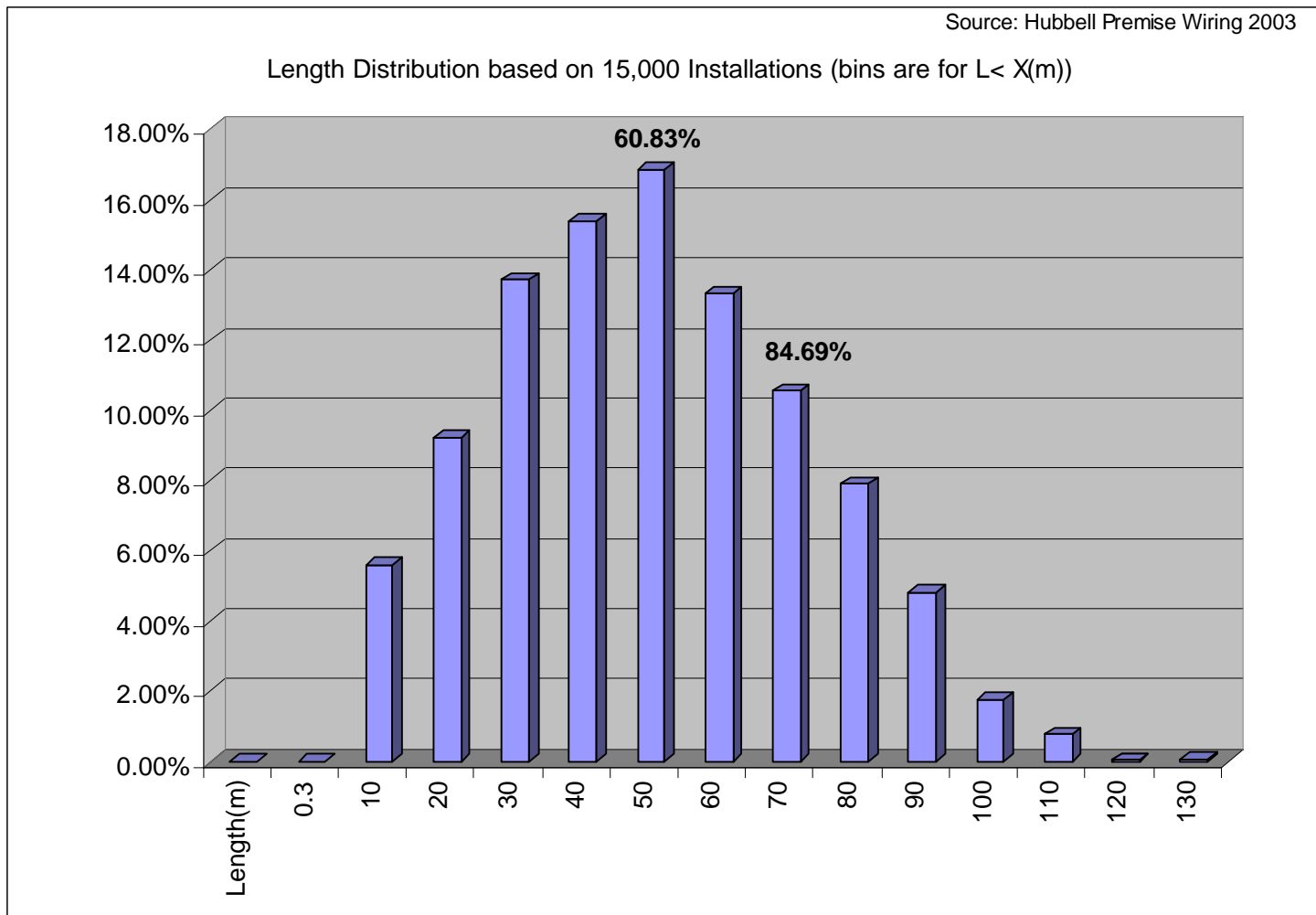
10GBASE-T coverage dependencies

- **Capacity analysis assumptions**
 - worst case measurements
 - worst case measurements scaled
 - assumption that all worst case impairments occur simultaneously
- **Number and Category of connectors**
- **Distances**
- **ANEXT and mitigation**

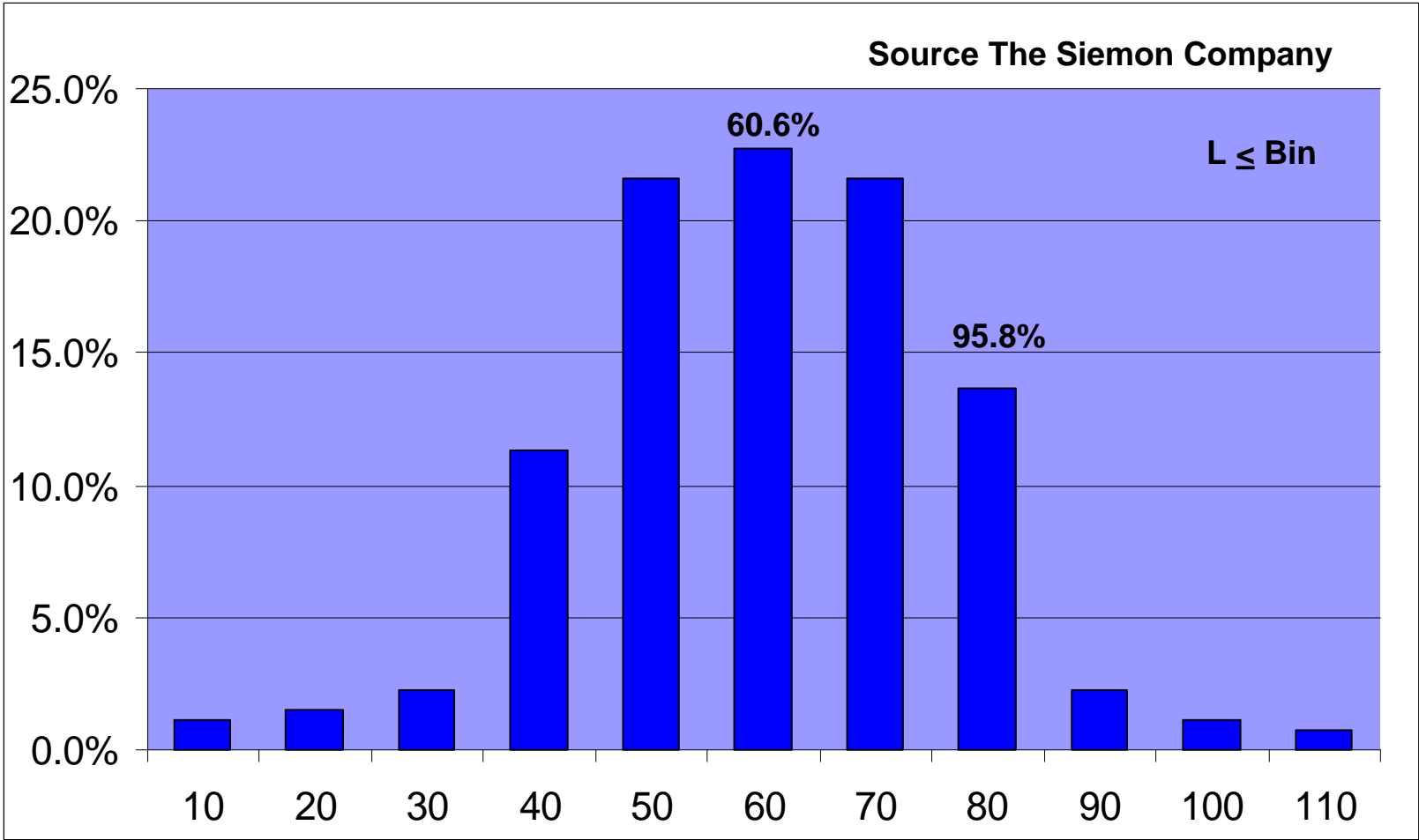
10GBASE-T Cabling Topologies and Distances

Cable Element	Customer Premises ISO/IEC 11801-TIA	Data Center	Central Office	Equipment Room
Horizontal Cabling	≤100 meters	≤100 meters	≤100 meters	NA
Equipment-to-Equipment		≤100 meters	≤100 meters	30 meter

Length vs % Distribution of 15,000 Cabling Links

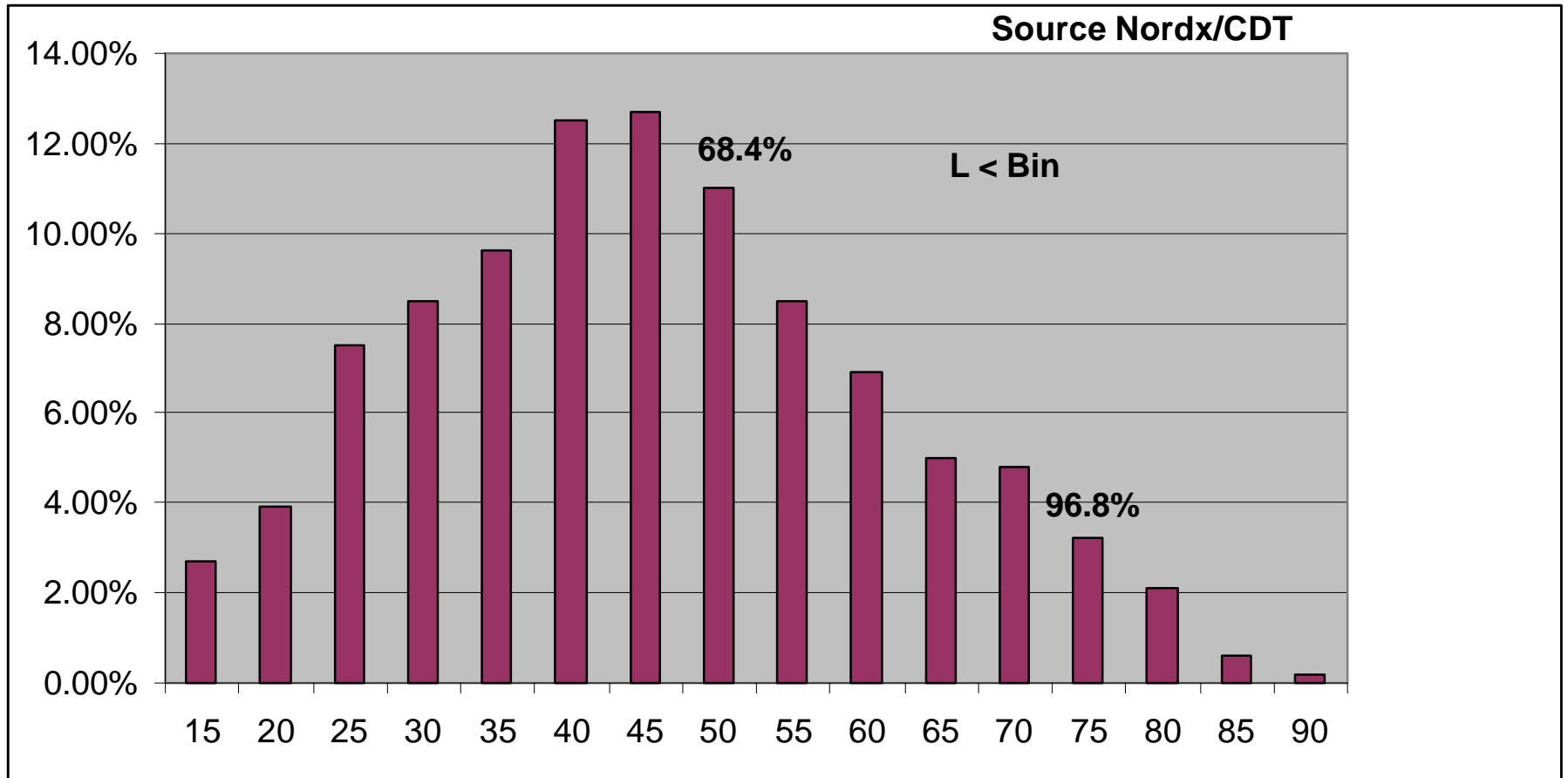


Length vs. % Distribution of >20,000 Cabling Links



Data based on a AQL level of .1

Length vs % Distribution of 18,750 Cabling Links

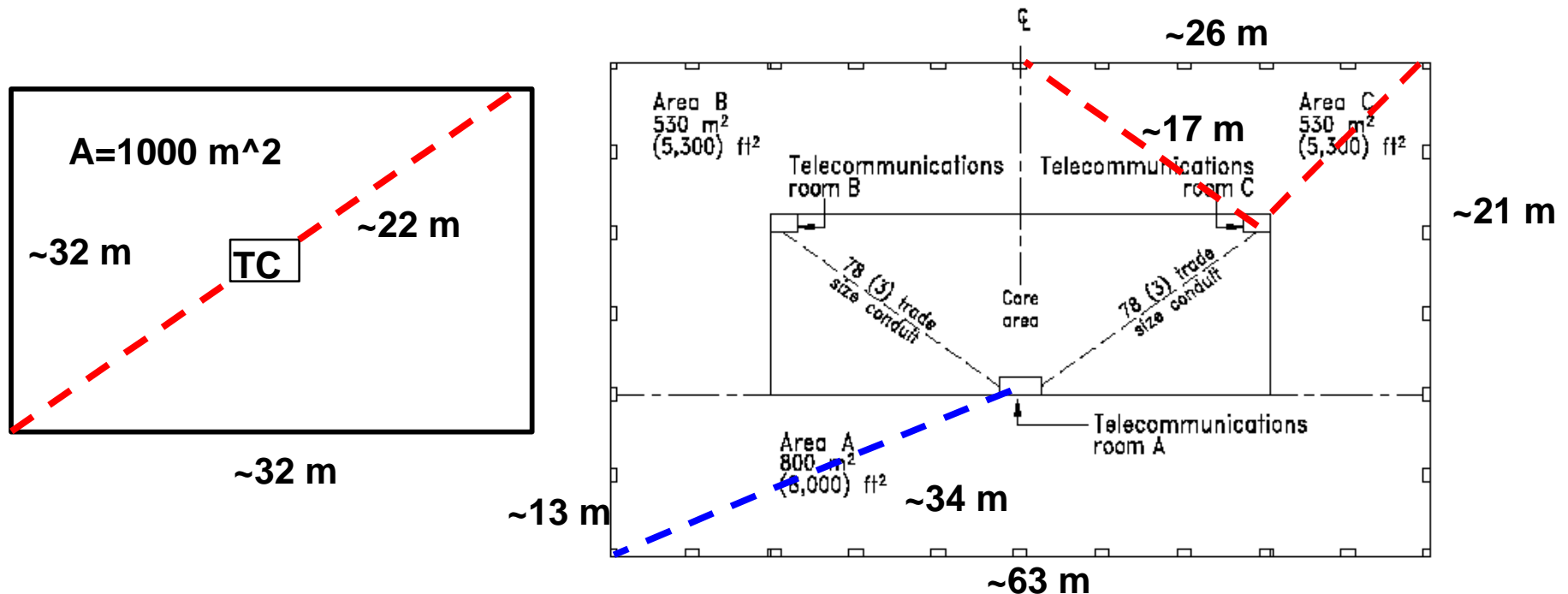


TIA/EIA-569-B COMMERCIAL BUILDING STANDARD FOR TELECOMMUNICATIONS PATHWAYS AND SPACES

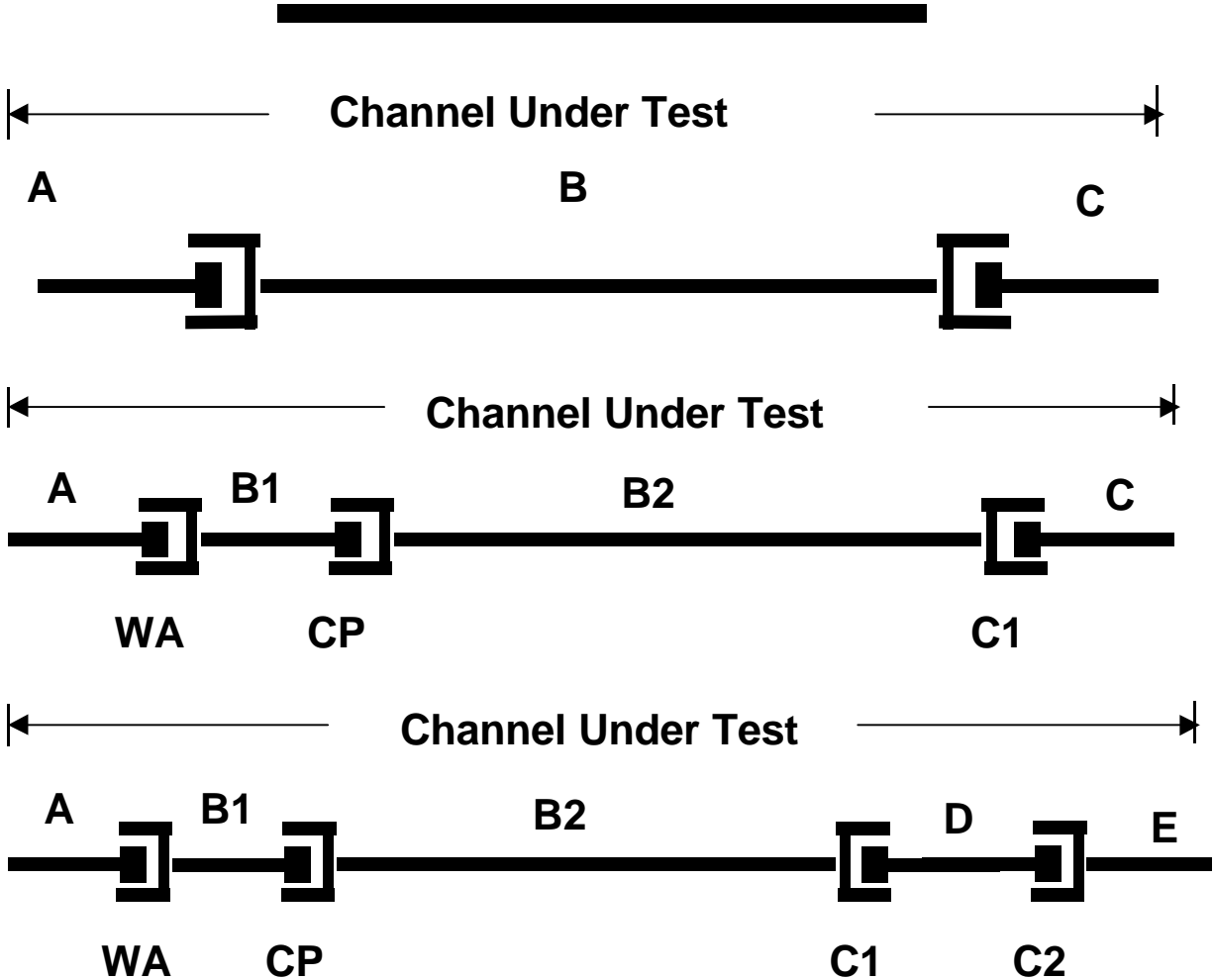
Telecommunications room:

There shall be a minimum of one telecommunications room per floor. Additional rooms (one for each area up to 1000 m² (10000 ft²), as in the figure below should be provided when:

- a) the floor area to be served exceeds 1000 m² (10000 ft²); or
- b) the horizontal distribution distance to the work area exceeds 90 m (295 ft).



Cabling Channel Topologies - Class D and Class E



Capacity versus 10GBASE-T cabling topology

Model Assumptions:

-150 dBm/Hz background noise

55 dB RL Cancellation

40 dB NEXT cancellation

25 dB FEXT cancellation

500 MHz flat TX spectrum

Capacity versus 10GBASE-T cabling topology

Cabling Topology	Connectors	Class D	Class E
Horizontal Cabling Distance		100 meters	100 meters
Interconnect-TO	2	18.3	24.0
Interconnect-CP-TO	3		
Crossconnect-CP-TO	4	17.1	21.5

Cabling Topology	Connectors	Class D	Class E
Horizontal Cabling Distance		75 meters	75 meters
Interconnect-TO	2	24.5	28.6
Interconnect-CP-TO	3		
Crossconnect-CP-TO	4	21.7	26.1

Cabling Topology	Connectors	Class D	Class E
Horizontal Cabling Distance		50 meters	50 meters
Interconnect-TO	2	26.6	32.7
Interconnect-CP-TO	3		
Crossconnect-CP-TO	4	25.7	30.1

Capacity versus 10GBASE-T cabling topology- ANEXT

Cabling Topology	Connectors	Class D	Class E
Horizontal Cabling Distance		100 meters	100 meters
Interconnect-TO	2	9.4 / 11.7	9.8 / 12.6
Interconnect-CP-TO	3		
Crossconnect-CP-TO	4	8.8 / 10.9	9.7 / 12.4

Cabling Topology	Connectors	Class D	Class E
Horizontal Cabling Distance		75 meters	75 meters
Interconnect-TO	2	13.3 / 16.3	14.3 / 17.5
Interconnect-CP-TO	3		
Crossconnect-CP-TO	4	12.6 / 15.3	14.2 / 17.3

Cabling Topology	Connectors	Class D	Class E
Horizontal Cabling Distance		50 meters	50 meters
Interconnect-TO	2	18.3 / 21.2	19.6 / 22.8
Interconnect-CP-TO	3		
Crossconnect-CP-TO	4	17.7 / 20.6	19.4 / 22.6

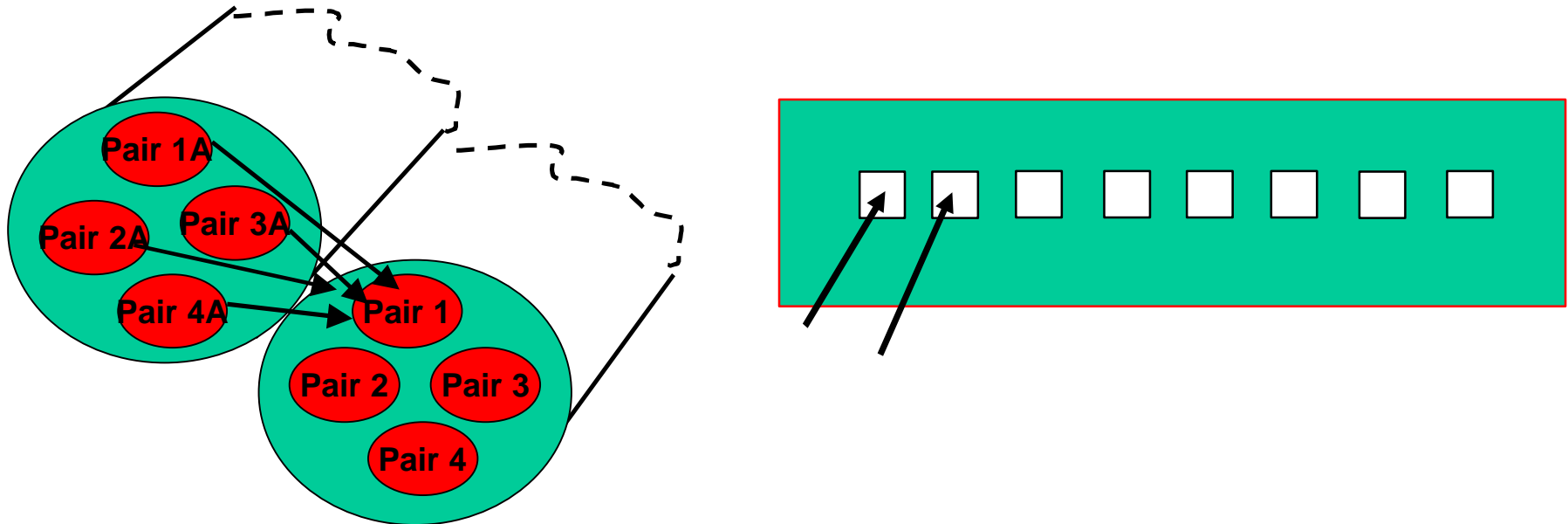
* 0 dB / 5dB alien mitigation

Alien Crosstalk Mitigation

- **Placement of horizontal cables and patch cords**
- **10GBASE-T channel placement**
- **Patch cable length (equipment cable)**
- **Patch panel - ANEXT performance**
 - **connectivity replacement**

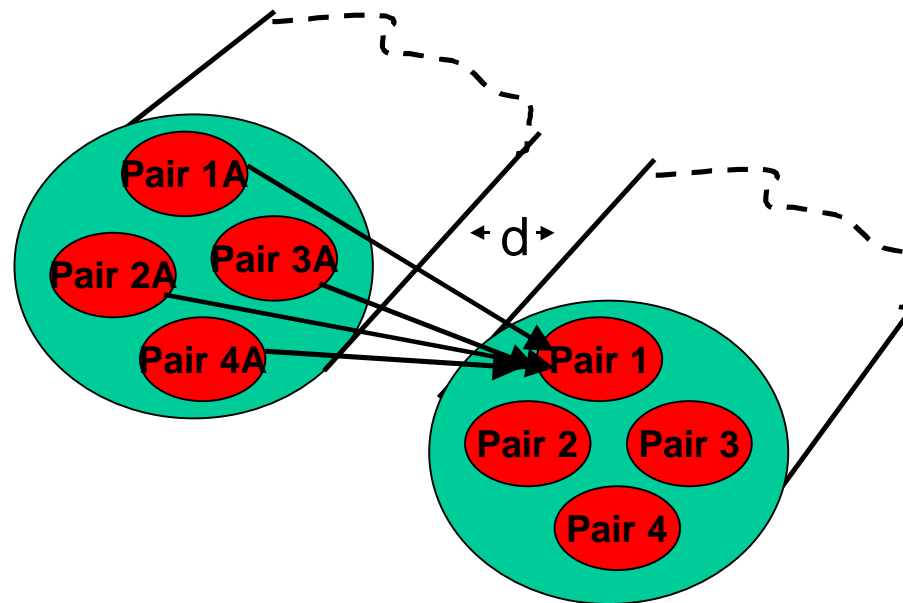
Alien Crosstalk

- Crosstalk between tightly bound adjacent 4-Pair cables and patch cords
- Crosstalk between adjacent patch panel ports



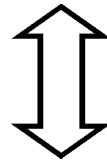
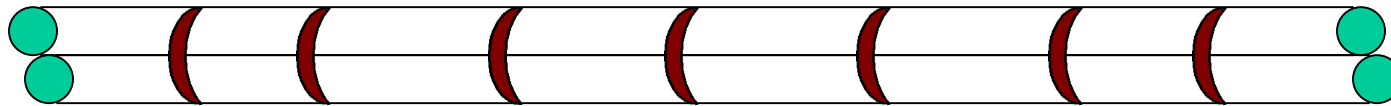
Alien Crosstalk Mitigation

Separation of 4-Pair cables and/or patch cords

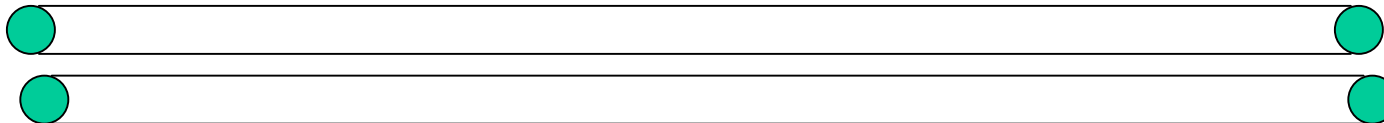


Alien NEXT Mitigation

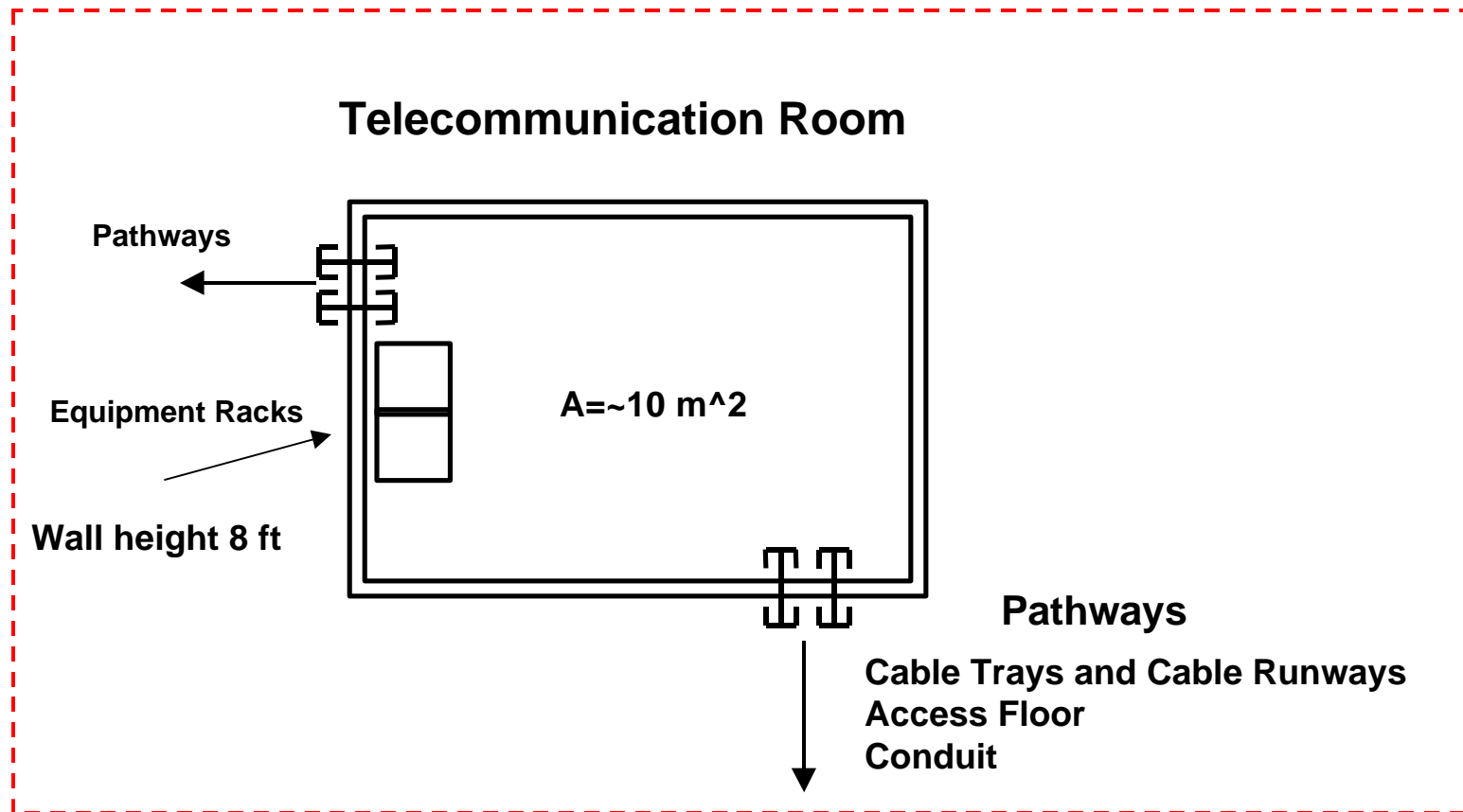
4-Pair cables and patch cords with tie-wraps



remove tie-wraps, loosely separate (< 20 meters from termination)



Area Of Accessibility



Overhead Cable Trays



10GBASE-T

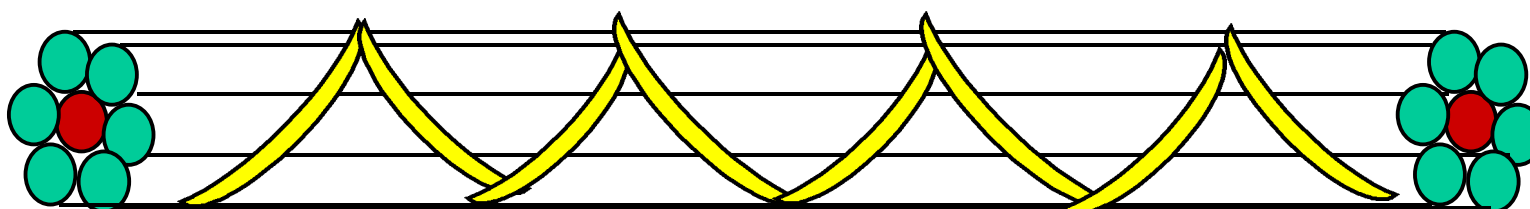
Alien NEXT Mitigation - Channel Placement



- One (or possibly more) 10GBASE-T Channel per conduit - fill TBD%
- 10BASE-T, 100BASE-T,1000BASE-T supported

Alien Crosstalk Mitigation - Channel Placement

- **Bundled cable:** An assembly of two or more cables continuously bound together to form a single unit.



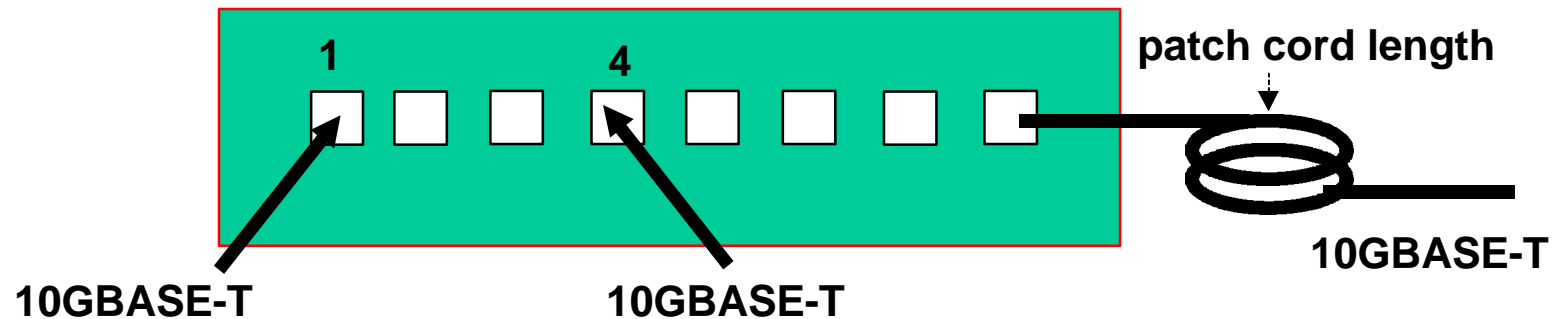
Six- 4 Pair Cables - Around One - 4 Pair Cable

- One (or possibly more) 10GBASE-T Channel per 6x1 bundled cable
- 10BASE-T, 100BASE-T, 1000BASE-T supported

- (n) 10GBASE-T Channel per (n)x1 bundled cable
- 10BASE-T, 100BASE-T, 1000BASE-T supported

Alien Crosstalk Mitigation

1. 10GBASE-T channel patch panel separation
2. 10GBASE-T channel patch cord length (5m(TBD))
3. Connector replacement



10GBASE-T Baseline Consensus Proposal

Develop objectives and specifications to:

- maximize 10GBASE-T coverage for Class D and Class E cabling (installed cabling).
 - Develop minimum requirements based on coverage of a large percentage of the installed Class D (Category 5e) and Class E (Category 6) cabling
 - Category 5e up to 100 meters if possible
 - Category 6 up to 100 meters if possible
- establish 100% coverage for new installations.
 - Use minimum requirement specification to establish baseline specification for 100% coverage
 - 100 m over 4-conductor structured 4-pair, twisted-pair copper

10GBASE-T Technical Feasibility

Establish technical feasibility of the objective solutions:

Technical Feasibility:

- **Demonstrate technical feasibility of a large percentage of the installed Class D (Category 5e) and Class E (Category 6) cabling**

- **Category 5e up to 100 meters if possible**

- **Category 6 up to 100 meters if possible**

Technical Feasibility:

- **Apply baseline specification for 100% coverage**

- **100 m over 4-connector structured 4-pair, twisted-pair copper**

- **Technical feasibility demonstrated on better cabling**
+ **cabling option selection not required for PAR**