

# ISO/IEC SC25/WG3 Meeting

## Ixtapa, Mexico: 10-14 January 2005

### - Structured Cabling Systems -

report for IEEE 802.3an by Alan Flatman

#### Items

1. NWIP for *10GBASE-T* cabling approved
  - » 20 nations vote for, 2 nations vote against
  - » TR-24750 installed cabling for 10GBASE-T
  - » ISO 11801 Ed 2.1 new Class E/new Class F
2. input from IEC on cable AXT specifications
3. update on cabling EM performance analysis
  - » emission/immunity results for UTP & STP



46 Participants

19 Nations

# **ISO/IEC TR-24750**

## **Installed Class E/F to Support 10GBASE-T**

- **Technical Reports created as *industry guides***
- **TR will define channel only, not components**
- **TR will contain alien xtalk mitigation methods**
- **TR also planned to contain AXT test methods**
- **channel AFEXT characterisation still required**
- **plan to agree initial working draft by end April**
- **it is hoped to approve ISO/IEC TR by Feb 2006**
- **currently compatible with TIA/EIA TSB-155**

# **Proposed PSANEXT Mitigation Procedures for Installed Class E Cabling**

- 1. Select 6 channels in TR. Measure PSANEXT between each channel and others in same rack, and in rack panels above/below.**
- 2. Calculate PSNEXT for each channel.**
- 3. Measure IL for all channels.**
- 4. Mitigation is needed if channels do not meet PSANEXT requirement.**
- 5. If PSANEXT negative margin  $>6\text{dB}$  between 1 + 500MHz, mitigation is not feasible. Replace these channels with cabling having better PSANEXT, such as Cat 6A or Cat 7.**
- 6. Replace patch, equipment & work area cords with Cat 6A cords, keeping them unbundled and randomly organised.**
- 7. Use interconnects rather than crossconnects.**
- 8. Unbundle & randomise horizontal cabling in the TR up to its point of exit.**
- 9. Select non-adjacent channels for 10GBASE-T (skip patch panel jacks).**
- 10. Replace inter/crossconnect with Cat 6A inter/crossconnect.**
- 11. Replace CP with Cat 6A connectors.**
- 12. Repeat steps 1- 5 above to verify that mitigation has been successful, selecting a different 6 channels on which to measure PSANEXT.**
- 13. Once channels have been qualified for PSANEXT, each channel must be further qualified for internal transmission up to 500MHz. If any channel does not meet internal requirements, the mitigation steps above concerning component replacement should be followed.**

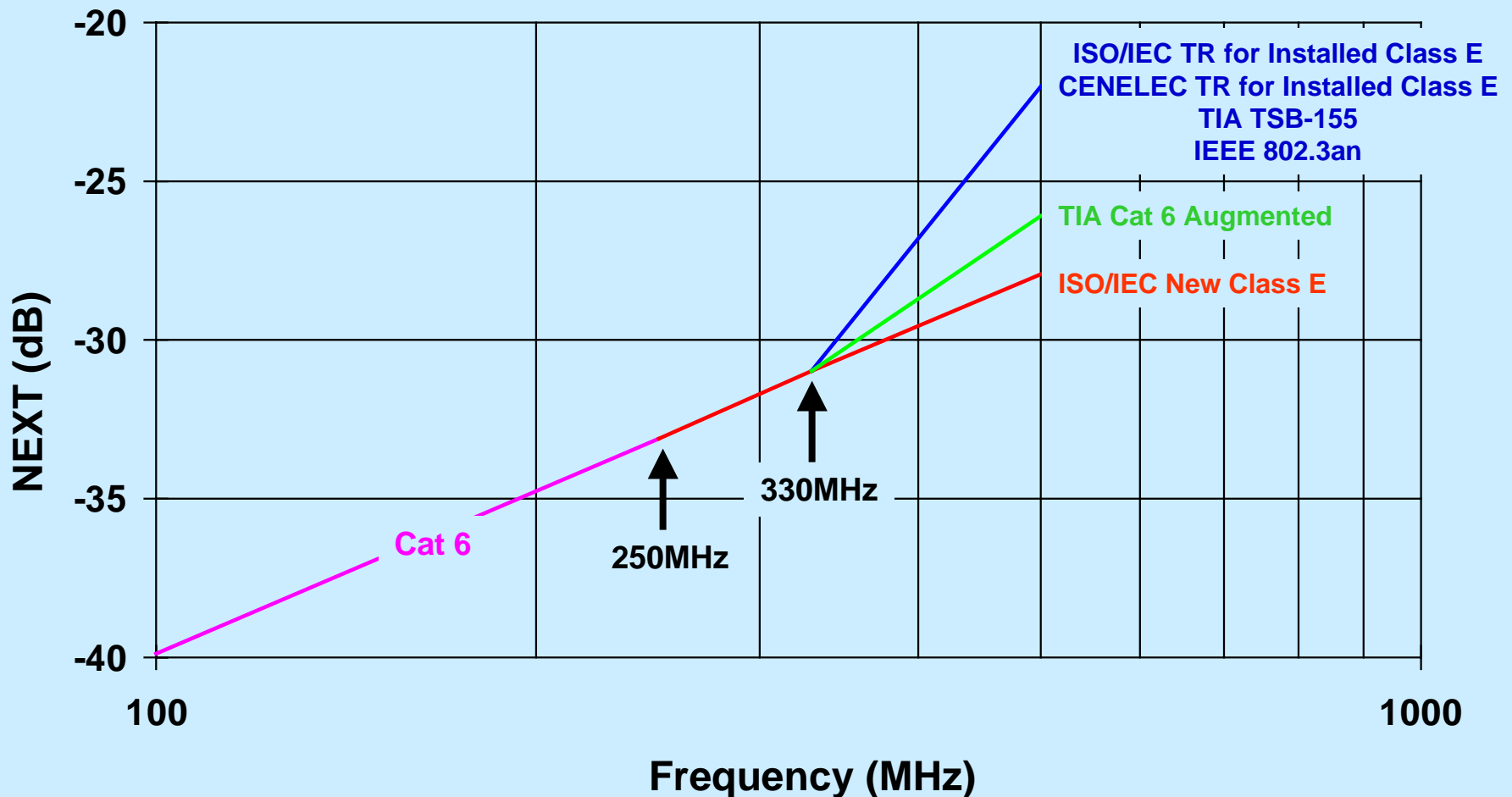
# **ISO/IEC 11801 Edition 2.1**

## **New Class E & Class F Cabling**

- **11801 Ed 2.1 will define channel + components**
- **better than existing Class E + Class F cabling**
- **expected to require totally new component set**
- **intent to meet AXT requirements “by design”**
- **channel AFEXT characterisation still required**
- **plan to agree initial working draft by end April**
- **technically different to TIA “Cat 6 Augmented”**

Channel Parameter	Installed Class E/F Strawman	Class E Ed.2.1 Strawman	Class F Ed.2.1 Strawman
<b>Return Loss</b>	Ed.2 RL extrapolated to 500 MHz + 6dB plateau	Ed.2 RL extrapolated to 500 MHz + 8dB plateau @ 250 MHz	Ed.2 RL extrapolated to 1000 MHz + 8dB plateau @ 250 MHz
<b>Insertion Loss</b>	Ed.2 Class E IL extrapolated to 500 MHz	Ed.2 Class F IL extrapolated to 500 MHz	~8% lower than Ed.2 Class F IL extrapolated to 1000 MHz
<b>NEXT</b>	Ed.2 Class E NEXT extrapolated to 330 MHz, $31-50\log(f/330)$ in range 330-500 MHz	Ed.2 Class E NEXT extrapolated to 500 MHz	Ed.2 Class F NEXT extrapolated to 1000 MHz
<b>PSNEXT</b>	Ed.2 Class E NEXT extrapolated to 330 MHz, $28-42\log(f/330)$ in range 330-500 MHz	Ed.2 Class E NEXT extrapolated to 500 MHz	Ed.2 Class F NEXT extrapolated to 1000 MHz
<b>ELFEXT</b>	Ed.2 Class E ELFEXT extrapolated to 500 MHz	Ed.2 Class E ELFEXT extrapolated to 500 MHz	Improved Ed.2 Class F ELFEXT extrapolated to 1000 MHz
<b>PSELFEXT</b>	Ed.2 Class E ELFEXT extrapolated to 500 MHz	Ed.2 Class E ELFEXT extrapolated to 500 MHz	Improved Ed.2 Class F ELFEXT extrapolated to 1000 MHz
<b>PSANEXT</b>	47-10 $\log(f/100)$ 1-100 MHz 47-15 $\log(f/100)$ 100-500 MHz	60-10 $\log(f/100)$ 1-100 MHz 60-15 $\log(f/100)$ 100-500 MHz	75-10 $\log(f/100)$ 1-100 MHz 75-15 $\log(f/100)$ 100-1000 MHz
<b>PSAFEXT</b>	<i>awaited</i>	<i>awaited</i>	<i>awaited</i>

# ISO/IEC vs CENELEC vs TIA vs IEEE 802.3an Channel NEXT values (March 2005)



## **Extending IEC Cable Specifications to Accommodate 10GBASE-T**

- **IEC 61156 Cat 6 & Cat 7 cable standards being extended**
- **Cat 6 cable upper frequency being extended to 500 MHz**
- **AXT being added to Cat 6 and Cat 7 cable standards**
- **no AXT characterisation is necessary for Cat 7 cable**
- **most Cat 6 UTP cables fail to meet proposed IEC AXT requirements but many meet current 10GBASE-T PSANEXT according to measurements by French experts**
- **AXT test methods being evaluated for accuracy and repeatability**

# Electromagnetic Performance of Balanced Cabling

- **generic specification for all cable constructions**
  - » need to define cabling for industrial applications
  - » need to manage alien crosstalk for 10GBASE-T
- **EMC analysis updated for 10M/100M/1G/10GBE**
  - » emission/immunity performance for cabling system only
  - » Cat 6 UTP compliant with Class A RF emission (4dB margin)
  - » Cat 6 UTP compliant with 3V/m radiated immunity
  - » Cat 6 UTP compliant with 1V conducted immunity
  - » Cat 6 FTP compliant with Class A RF emission (25dB margin)
  - » Cat 6 FTP compliant with 10V/m radiated immunity
  - » Cat 6 FTP compliant with 10V conducted immunity
  - » latest version of analysis made available to 802.3an

**3N740 posted in 802.3an Jan 2005 public area**



# Balanced Cabling EM Performance E<sub>1</sub>

		unscreened	screened
crosstalk parameters	alien crosstalk	$\geq$ channel PSNEXT (ffs)	$\geq$ channel PSNEXT(ffs)
unbalance attenuation	TCL	$40-10\log(1+(f^2/5))$ 1MHz to max f for Class	ffs
	ELTCTL	$30-20\log(f)$ 1-30MHz	ffs
screen parameters	screening attenuation	not applicable	not specified
	coupling attenuation	not specified	$39-20\log(f/100)$ 30-1000MHz

## Balanced Cabling EM Performance E<sub>2</sub>

		unscreened	screened
crosstalk parameters	alien crosstalk	$\geq$ channel PSNEXT (ffs)	$\geq$ channel PSNEXT(ffs)
unbalance attenuation	TCL	$50-10\log(1+(f^2/5))$ 1MHz to max f for Class	ffs
	ELTCTL	$40-20\log(f)$ 1-30MHz	ffs 1-30MHz
screen parameters	screening attenuation	not applicable	not specified
	coupling attenuation	not specified	$49-20\log(f/100)$ 30-1000MHz

# Balanced Cabling EM Performance E<sub>3</sub>

		unscreened	screened
crosstalk parameters	alien crosstalk	$\geq$ channel PSNEXT (ffs)	$\geq$ channel PSNEXT(ffs)
unbalance attenuation	TCL	$60-10\log(1+(f^2/5))$ 1MHz to max f for Class	ffs
	ELTCTL	$50-20\log(f)$ 1-30MHz	ffs 1-30MHz
screen parameters	screening attenuation	not applicable	not specified
	coupling attenuation	not specified	$59-20\log(f/100)$ 30-1000MHz

# **Future Meetings**

<b>Industrial Cabling</b>	<b>25-27 Apr 2005</b>	<b>Ottawa</b>
<b>ISO/IEC SC25 WG3</b>	<b>26-29 Sep 2005</b>	<b>Edinburgh</b>
<b>ISO/IEC SC25 Plenary</b>	<b>30 Sep 2005</b>	<b>Edinburgh</b>
<b>ISO/IEC SC25 WG3</b>	<b>06-10 Feb 2006</b>	<b>Kitzbuhel</b>