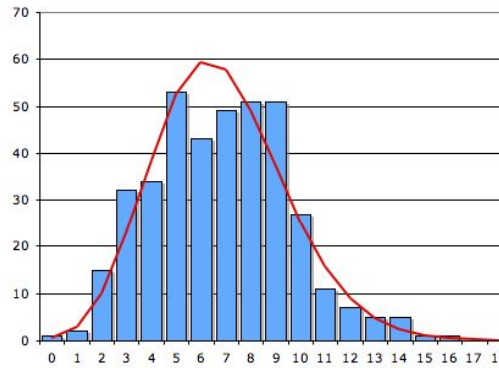


# Verifying Effectiveness of Proprietary and Standard FEC in 40G/43G Networks

**MP1595A**

40G SDH/SONET Analyzer



# Verifying Effectiveness of Proprietary and Standard FEC in 40G/43G Networks

**MP1595A Proprietary Random Error Insertion Technique Provides Unique Standards-Based Solution For All FEC Performance Testing**



## Background

- **40G/43G networks require sophisticated Forward Error Correction (FEC) to achieve acceptable performance**
  - ◆ **ITU-T G.709 specifies the standard FEC process**
  - ◆ **Many equipment vendors are also developing proprietary enhanced FEC methods**
  
- **ITU-T O.182 defines required test methods for verifying FEC performance**
  - ◆ **Based on generating an error pattern having a Poisson distribution of randomness**
  - ◆ **Must be applied to both standard and proprietary FEC solutions**

# Unique Verification of 40G/43G FEC Efficiency

## Implementing Unique FEC Verification

- **Step 1**

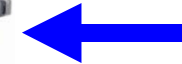
- ◆ Network equipment with vendor-unique FEC encoding transmits OTU-3 (43 Gbps) OTN frames to MP1595A



Anritsu MP1595A  
40G Analyzer



Network  
Equipment



- **Step 2**

- ◆ MP1595A loops back the OTU-3 data frames using Transparent Through Mode
- ◆ Anritsu proprietary technique inserts random frame errors in the vendor-unique FEC transmissions



# Unique Verification of 40G/43G FEC Efficiency

## Implementing Unique FEC Verification

- Step 3
  - ◆ Network equipment with unique FEC monitors frame errors received on its DUT Rx input



Anritsu MP1595A  
40G Analyzer



Network  
Equipment

- Basis of Anritsu's ideal FEC performance testing
  - ◆ Ability to insert OTU-3 frame errors using Transparent Through Mode
  - ◆ Proprietary FEC error generation technique



OTU-3

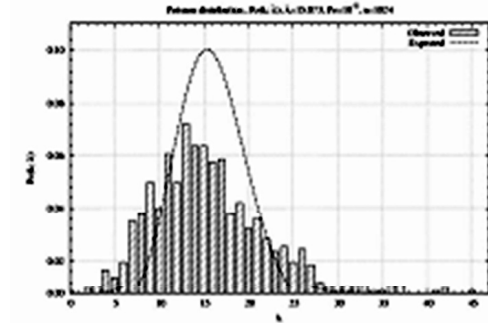


- Operates with network equipment standard or unique FEC
- Randomness complies with ITU-T O.182 requirements

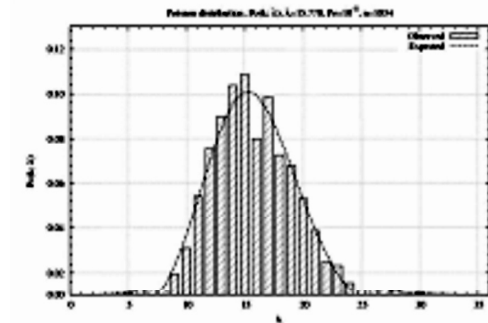
# Unique Verification of 40G/43G FEC Efficiency

## Importance of Random Error Insertion

- ITU-T O.182 requires random error insertion based on a Poisson distribution
- Improper error generation results in tests that do not correctly model actual 40G/43G network behavior
- Anritsu MP1595A uses patented process to generate errors correctly matching Poisson distribution of randomness
  - ◆ The industry's only solution for correct and accurate 40G/43G FEC performance verification



Bad Error Profile

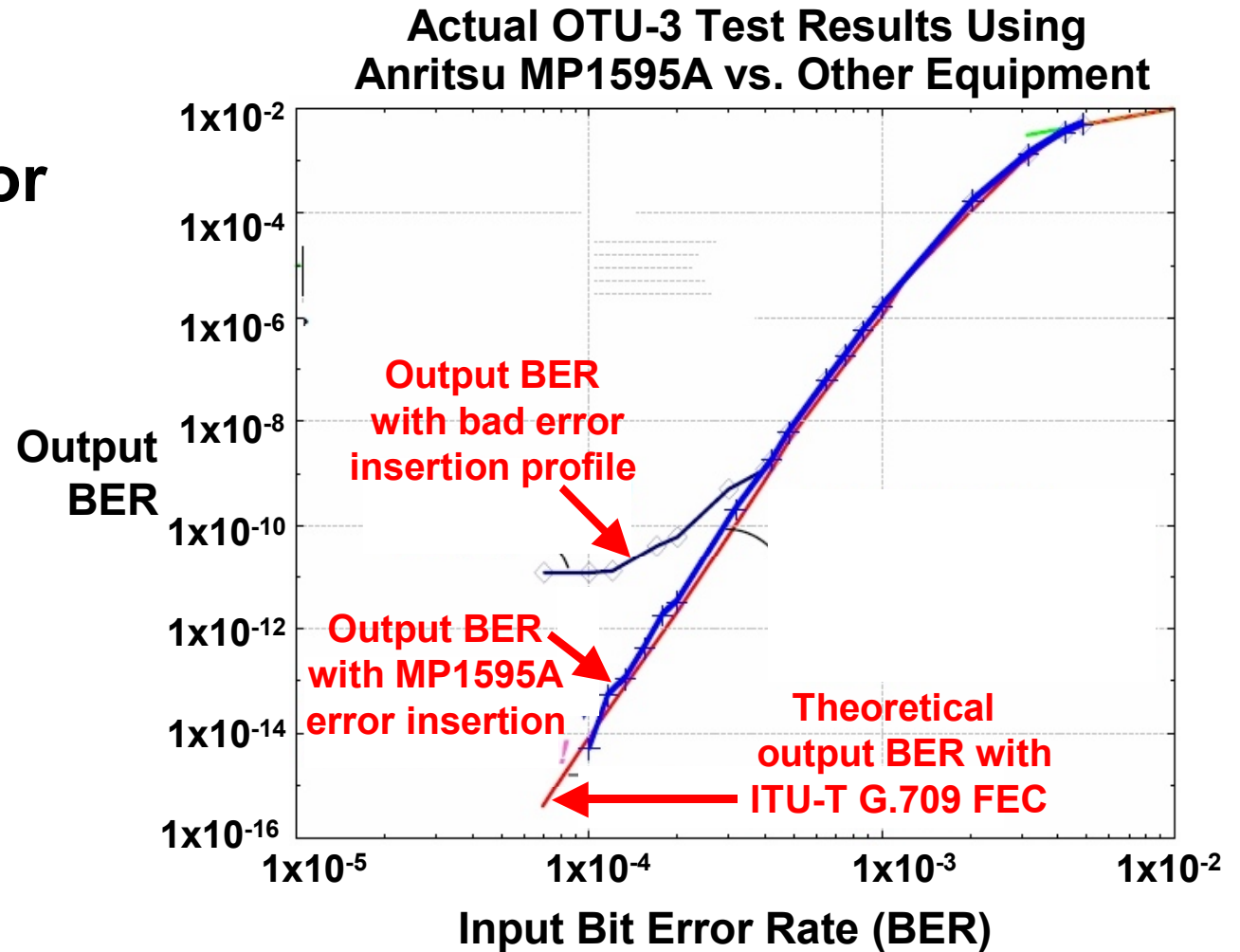


MP1595A Error Generation

# Unique Verification of 40G/43G FEC Efficiency

## Measured vs. Theoretical Bit Error Rates

- Using correctly randomized error insertion is the only way to properly evaluate an FEC decoder under test



## Next Steps

- **Download the ITU-T O.182 FEC testing standard:**
  - ◆ [www.itu.int/rec/T-REC-O.182/en](http://www.itu.int/rec/T-REC-O.182/en)
- **Review the Anritsu white papers about FEC testing and the ITU-T standards:**
  - ◆ “FEC Efficiency New Test Method”
  - ◆ “Technologies for Verifying Poisson Error Generator Performance”
- **Get MP1595A 40G SDH/SONET Analyzer literature:**
  - ◆ Data sheet
  - ◆ Product introduction
- **See an MP1595A demonstration so you can evaluate its performance and ease of use**



# Unique Verification of 40G/43G FEC Efficiency

---

Note

## Anritsu Corporation

5-1-1 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan  
Phone: +81-46-223-1111  
Fax: +81-46-296-1264

## • U.S.A.

### Anritsu Company

1155 East Collins Blvd., Suite 100, Richardson,  
TX 75081, U.S.A.  
Toll Free: 1-800-267-4878  
Phone: +1-972-644-1777  
Fax: +1-972-671-1877

## • Canada

### Anritsu Electronics Ltd.

700 Silver Seven Road, Suite 120, Kanata,  
Ontario K2V 1C3, Canada  
Phone: +1-613-591-2003  
Fax: +1-613-591-1006

## • Brazil

### Anritsu Eletrônica Ltda.

Praca Amadeu Amaral, 27 - 1 Andar  
01327-010-Paraiso-São Paulo-Brazil  
Phone: +55-11-3283-2511  
Fax: +55-11-3288-6940

## • Mexico

### Anritsu Company, S.A. de C.V.

Av. Ejército Nacional No. 579 Piso 9, Col. Granada  
11520 México, D.F., México  
Phone: +52-55-1101-2370  
Fax: +52-55-5254-3147

## • U.K.

### Anritsu EMEA Ltd.

200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.  
Phone: +44-1582-433200  
Fax: +44-1582-731303

## • France

### Anritsu S.A.

16/18 avenue du Québec-SILIC 720  
91961 COURTABOEUF CEDEX, France  
Phone: +33-1-60-92-15-50  
Fax: +33-1-64-46-10-65

## • Germany

### Anritsu GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1  
81829 München, Germany  
Phone: +49-89-442308-0  
Fax: +49-89-442308-55

## • Italy

### Anritsu S.p.A.

Via Elio Vittorini 129, 00144 Roma, Italy  
Phone: +39-6-509-9711  
Fax: +39-6-502-2425

## • Sweden

### Anritsu AB

Borgafjordsgatan 13, 164 40 KISTA, Sweden  
Phone: +46-8-534-707-00  
Fax: +46-8-534-707-30

## • Finland

### Anritsu AB

Teknobulevardi 3-5, FI-01530 VANTAA, Finland  
Phone: +358-20-741-8100  
Fax: +358-20-741-8111

## • Denmark

### Anritsu A/S

Kirkebjerg Allé 90, DK-2605 Brøndby, Denmark  
Phone: +45-72112200  
Fax: +45-72112210

## • Spain

### Anritsu EMEA Ltd.

**Oficina de Representación en España**  
Edificio Veganova  
Avda de la Vega, n° 1 (edf 8, pl 1, of 8)  
28108 ALCOBENDAS - Madrid, Spain  
Phone: +34-914905761  
Fax: +34-914905762

## • Russia

### Anritsu EMEA Ltd.

**Representation Office in Russia**  
Tverskaya str. 16/2, bld. 1, 7th floor.  
Russia, 125009, Moscow  
Phone: +7-495-363-1694  
Fax: +7-495-935-8962

## • United Arab Emirates

### Anritsu EMEA Ltd.

#### Dubai Liaison Office

P O Box 500413 - Dubai Internet City  
Al Thuraya Building, Tower 1, Suit 701, 7th Floor  
Dubai, United Arab Emirates  
Phone: +971-4-3670352  
Fax: +971-4-3688460

## • Singapore

### Anritsu Pte. Ltd.

60 Alexandra Terrace, #02-08, The Comtech (Lobby A)  
Singapore 118502  
Phone: +65-6282-2400  
Fax: +65-6282-2533

## • India

### Anritsu Pte. Ltd.

#### India Branch Office

Unit No. S-3, Second Floor, Esteem Red Cross Bhavan,  
No. 26, Race Course Road, Bangalore 560 001, India  
Phone: +91-80-32944707  
Fax: +91-80-22356648

## • P.R. China (Hong Kong)

### Anritsu Company Ltd.

Units 4 & 5, 28th Floor, Greenfield Tower, Concordia Plaza,  
No. 1 Science Museum Road, Tsim Sha Tsui East,  
Kowloon, Hong Kong  
Phone: +852-2301-4980  
Fax: +852-2301-3545

## • P.R. China (Beijing)

### Anritsu Company Ltd.

#### Beijing Representative Office

Room 1515, Beijing Fortune Building,  
No. 5, Dong-San-Huan Bei Road,  
Chao-Yang District, Beijing 10004, P.R. China  
Phone: +86-10-6590-9230  
Fax: +86-10-6590-9235

## • Korea

### Anritsu Corporation, Ltd.

8F Hyunju Building, 832-41, Yeoksam Dong,  
Kangnam-ku, Seoul, 135-080, Korea  
Phone: +82-2-553-6603  
Fax: +82-2-553-6604

## • Australia

### Anritsu Pty. Ltd.

Unit 21/270 Ferntree Gully Road, Notting Hill,  
Victoria 3168, Australia  
Phone: +61-3-9558-8177  
Fax: +61-3-9558-8255

## • Taiwan

### Anritsu Company Inc.

7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan  
Phone: +886-2-8751-1816  
Fax: +886-2-8751-1817

Please Contact:

