3M™Twin Axial Cable

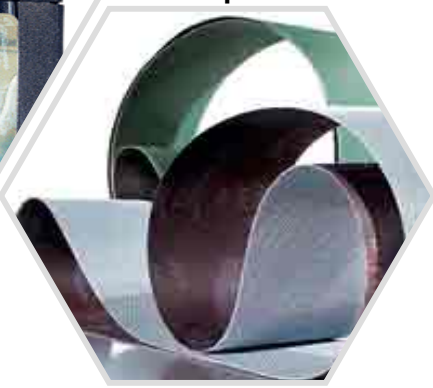
May 10, 2011

3M Company Overview

- 2010 Sales: $26.6 billion
- Net income: $4.1 billion
- 65% of sales outside the United States

Safety, Security and Protection Services

Industrial and Transportation



Health Care

Consumer and Office

Display and Graphics

Electro and Communications

- Headquartered in St. Paul, MN
- Over 80,000 employees
- 55,000+ products
- Operations in more than 60 countries
- 589 U.S. patents issued in 2010

Electro & Communications Business

Austin, Texas
Five Units — Three Markets

3M Electronics

Electrical Markets

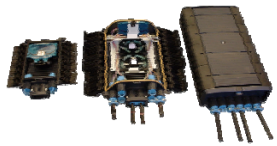
Terminals

Terminating & Splicing

Cold Shrink

Communication Markets

Fiber Optic Splices

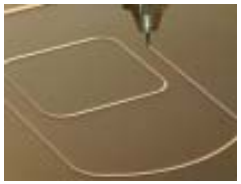


Fiber Optic Closures

Copper Splicing Modules & Connectors

Electronic Markets Materials

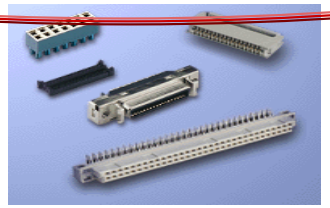
Semiconductor Materials



Adhesives

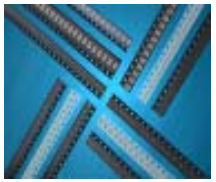
Fluids

Electronic Solutions



Interconnect

Flex Circuits

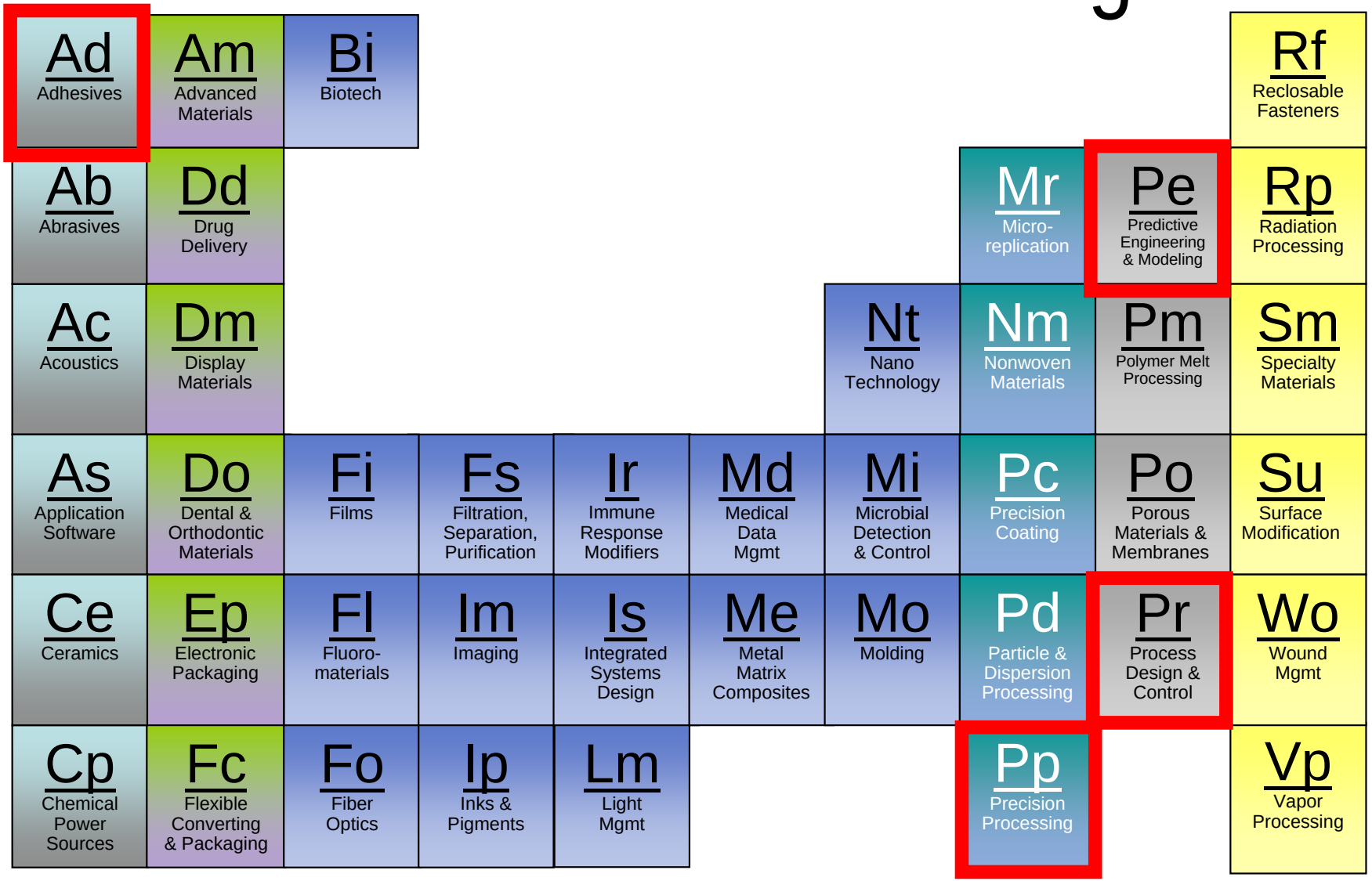


Transport

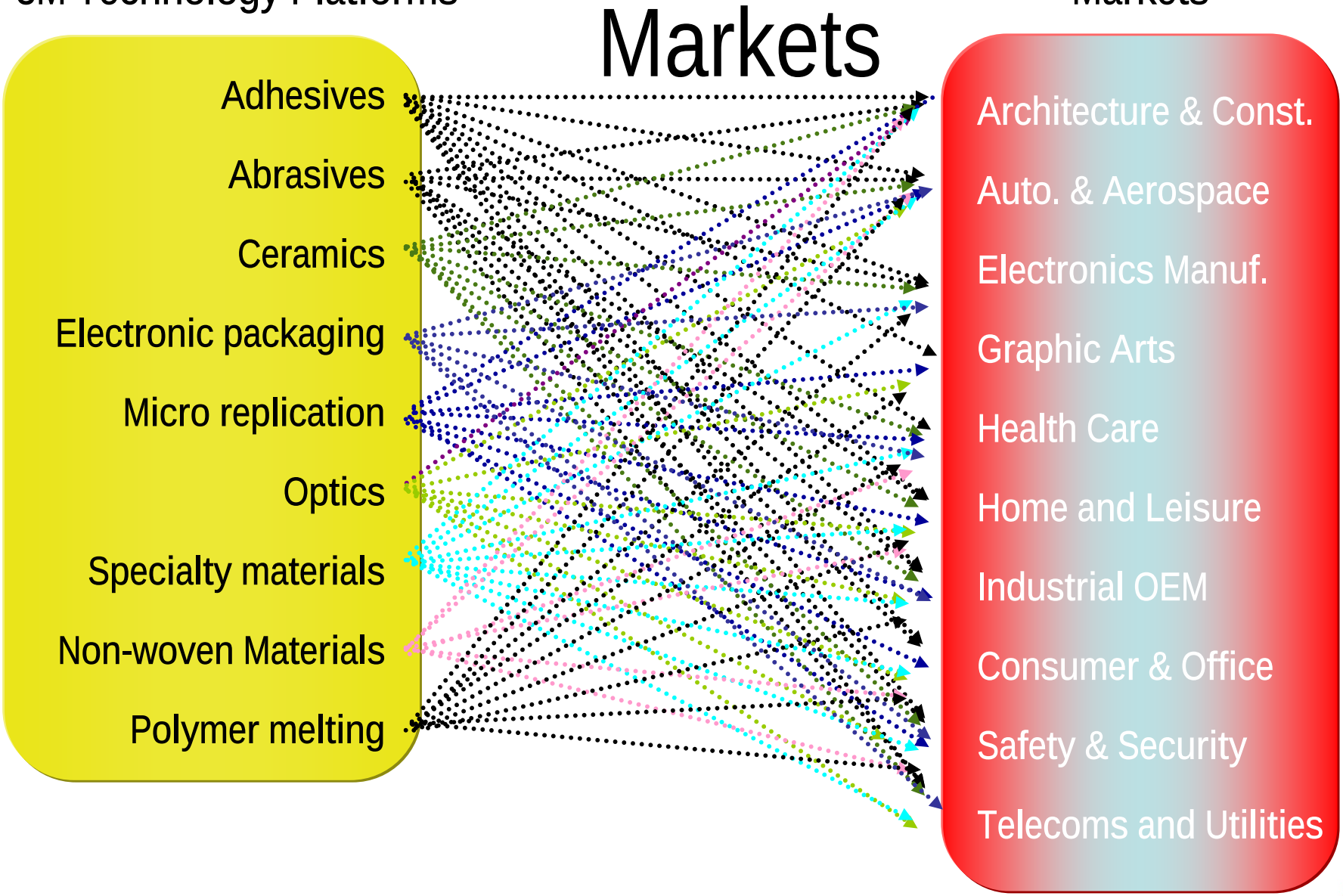
Static

Touch Systems

More than 40 Core Technologies



3M's Technologies Extend Into Multiple Markets



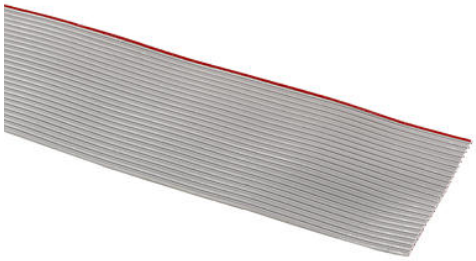
Enterprise & Netcom Market Trends

Performance Requirements

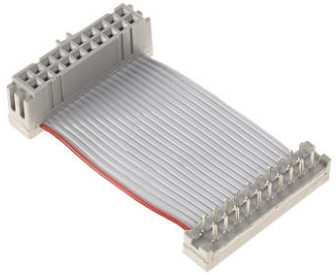
Density Constraints

Cost Controls

- Performance demands in **tightly packed enclosures** continue to increase
- Explosive growth in technologies has created an **endless drive for increased bandwidth**
- Suppliers are stressed to provide **reliable, space-efficient & cost efficient** solutions to meet emerging opportunities



3M Innovation

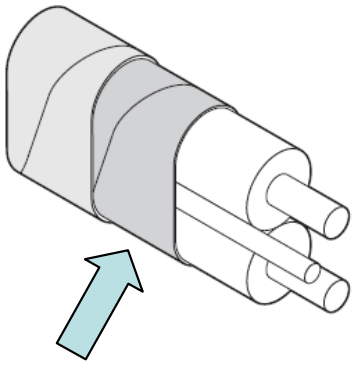


- 3M has a legacy of innovation - invented ribbon cable/IDC technology 50 years ago
- 3M is an industry leader in films, adhesives, bonding and fine pitch processing
- 3M has brought these technologies together to develop the 3M™ Twin Axial Cable, SL8800 Series
- This is only our first generation of high-speed ribbon twin axial cable

Twin Axial Cable Landscape

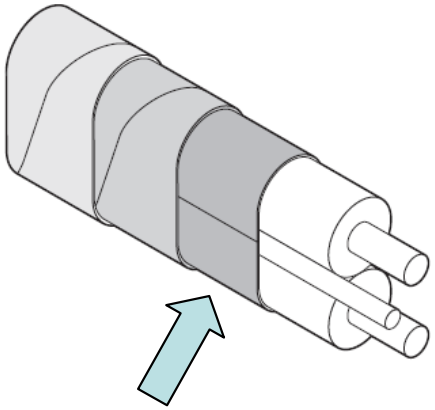
EXISTING & EMERGING SOLUTIONS

Traditional Wrap Cable
Standard Performance



Multiple layer wrap
Cable must still be bundled

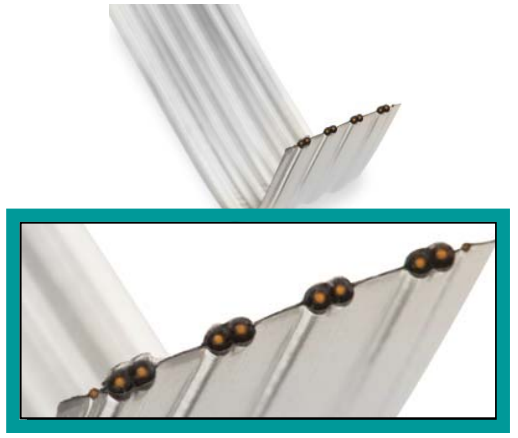
Emergent Longitudinal Cable
Premium Performance



Multiple layer wrap over longitudinal shield wrap
Cable must still be bundled

3M SOLUTION

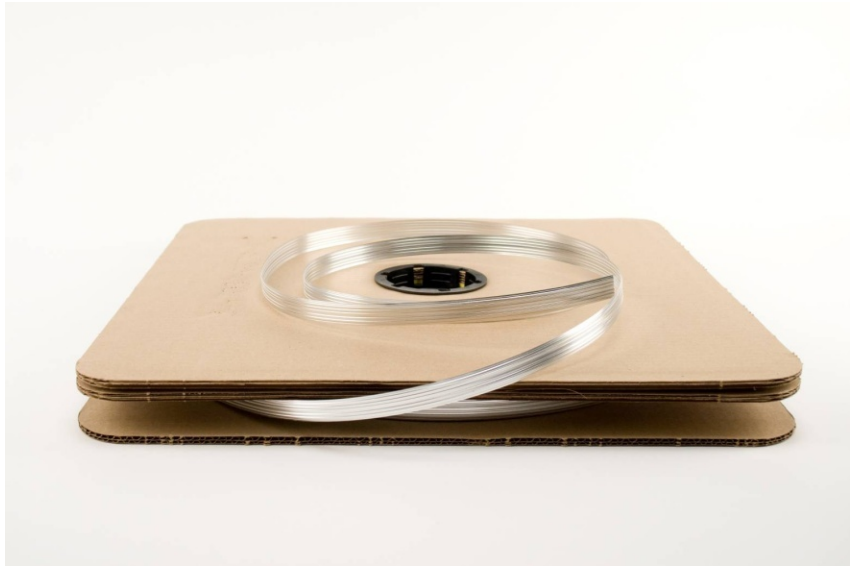
3M™ Twin Axial Cable, SL8800 Series
Premium Performance



Simultaneous 4-pair construction
Fewer layers, thinner construction
Cable in final form, no bundling required
Longitudinal shield → no resonance

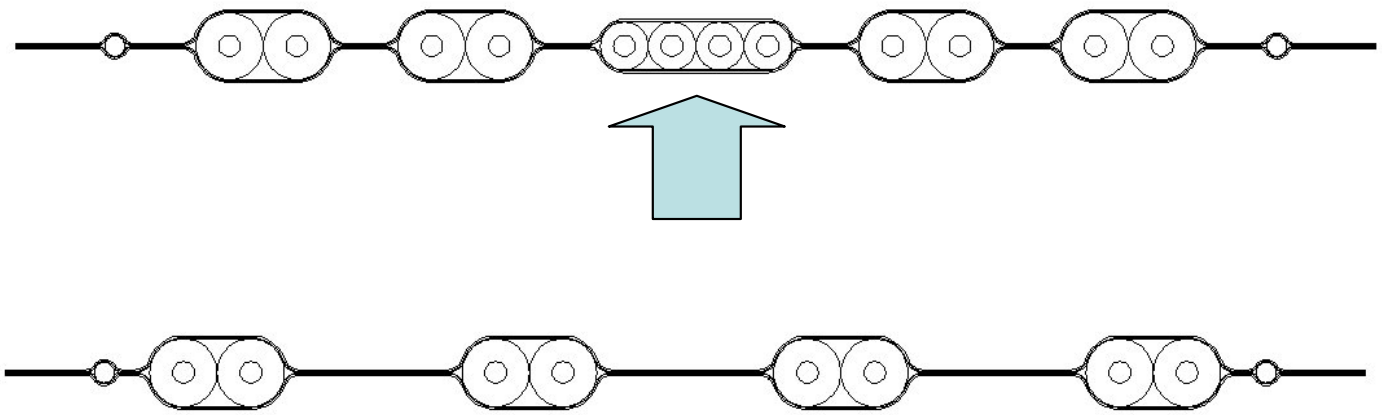
Current Offerings

- 3M™ Twin Axial Cable, SL8800 Series (sold in reels)
- 3M™ High Routability Internal Mini Serial Attached SCSI (miniSAS) Assemblies, 8F36 Series



Current Offerings

- 100 ohm differential impedance
- 30 AWG 4-pair ribbon
- Ag or Sn plated signal wires
- With or without sideband wires

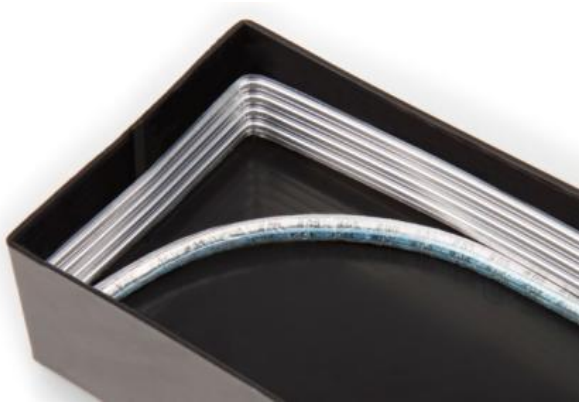


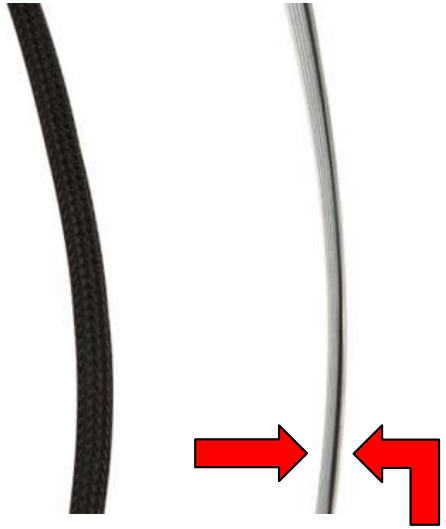
A Unique Combination of Benefits

- Thin, foldable
  - Tight radius folds while maintaining signaling integrity
- Electrical Performance
  - Resonance-free to 20 GHz
  - Excellent EMI performance
- Assembly process benefits
  - Simultaneous foil-stripping of 4-pair
  - Consistent wire position

3M™ Twin Axial Cable, SL8800 Series

Conventional Twin Axial Cable vs. 3M Twin Axial Cable





Two strands of 3M SL8800 Series next to over-braid bundle

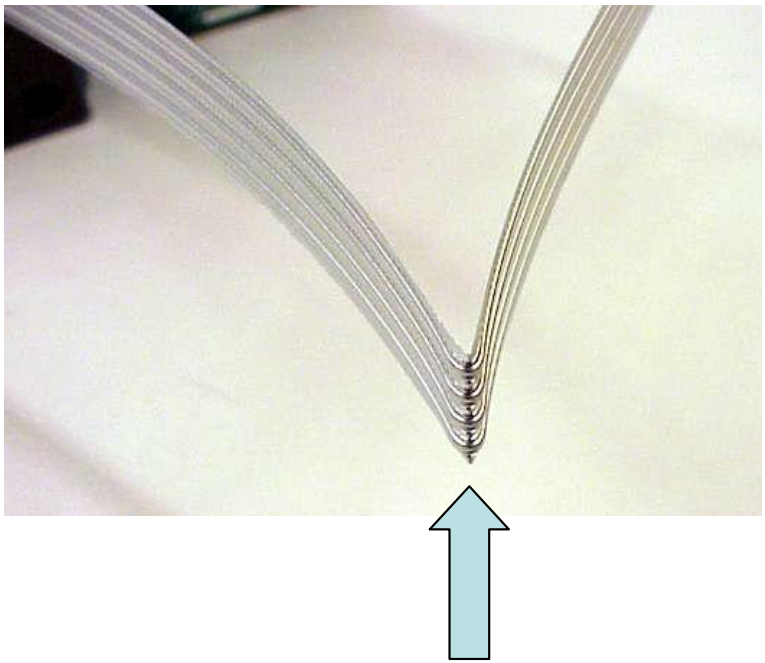
Each version is 30 AWG, 8 pairs

Ribbons less than 0.9 mm thick each

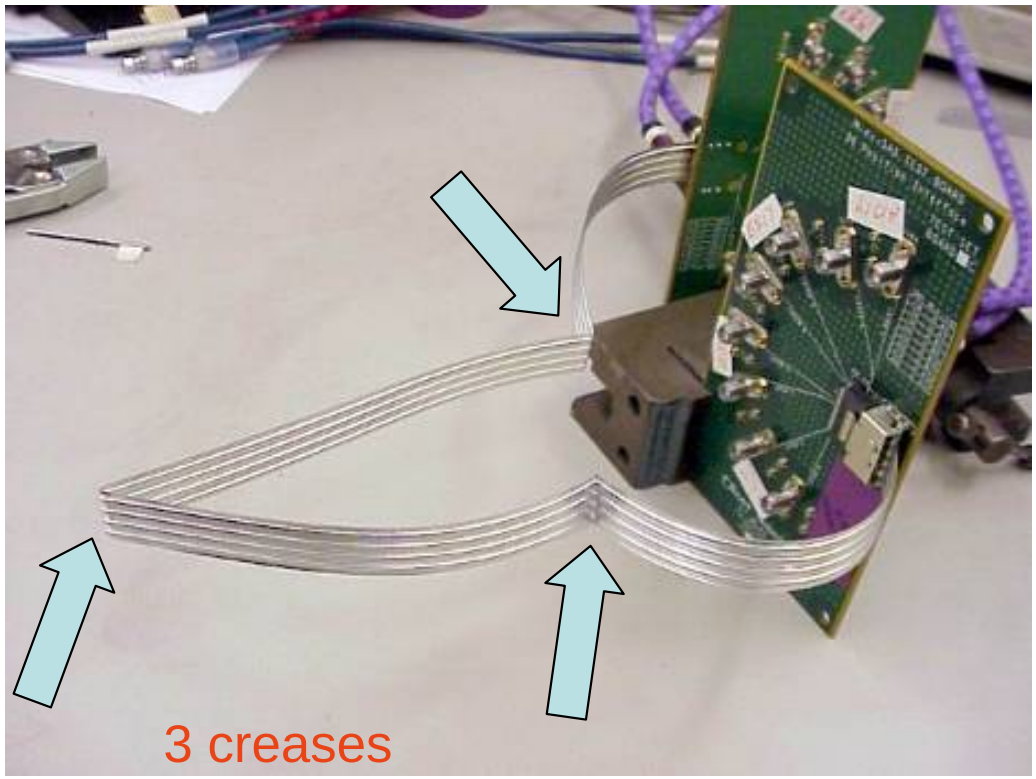
Thin and Foldable

- Two layers of 3M SL8800 Series cable are **less than ¼ the thickness** of a typical over-braided cable
- 3M SL8800 Series cable can be folded with minimal performance impact, opening up new routing options

More Sample and Test Images

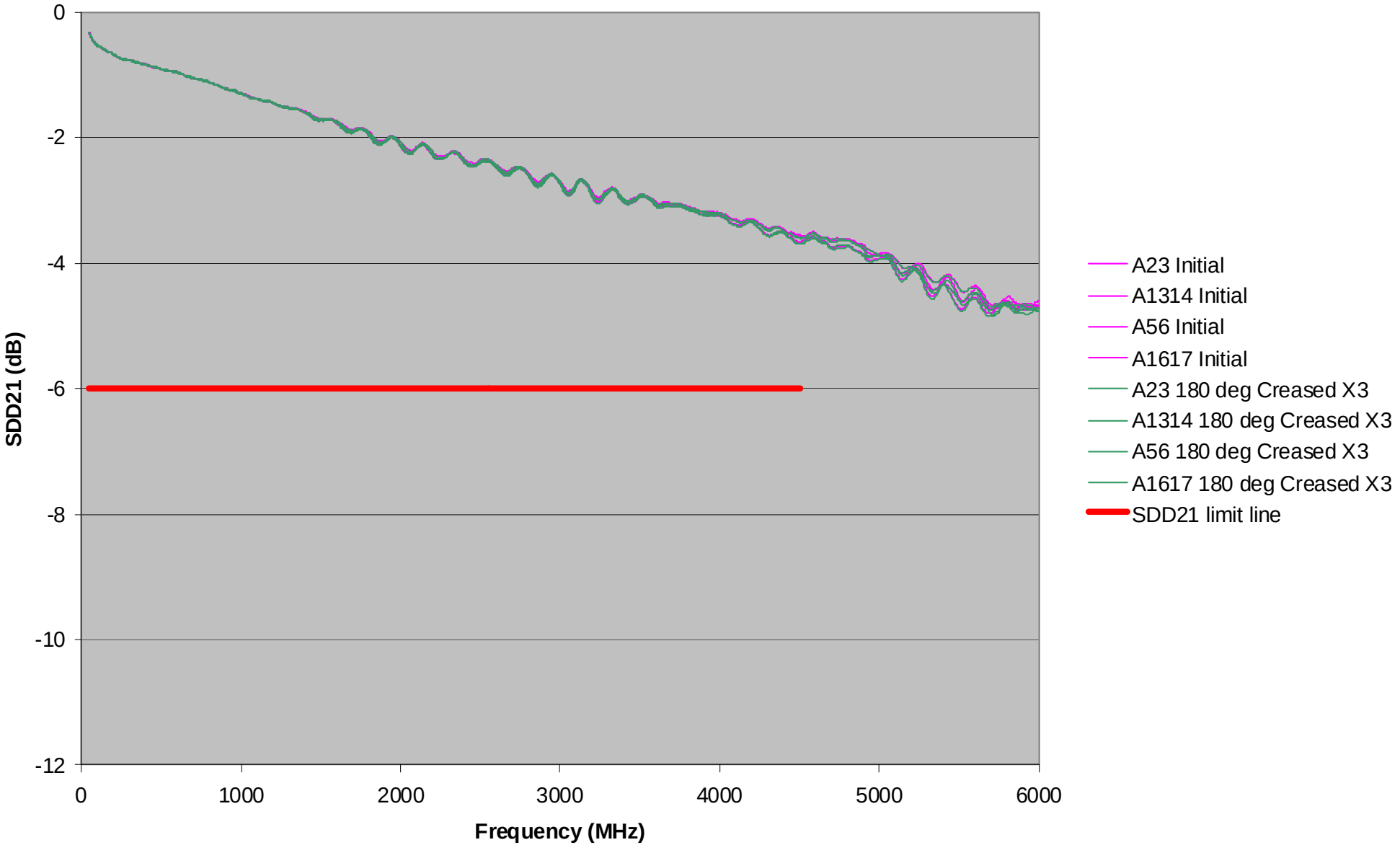


180 degree *crease*

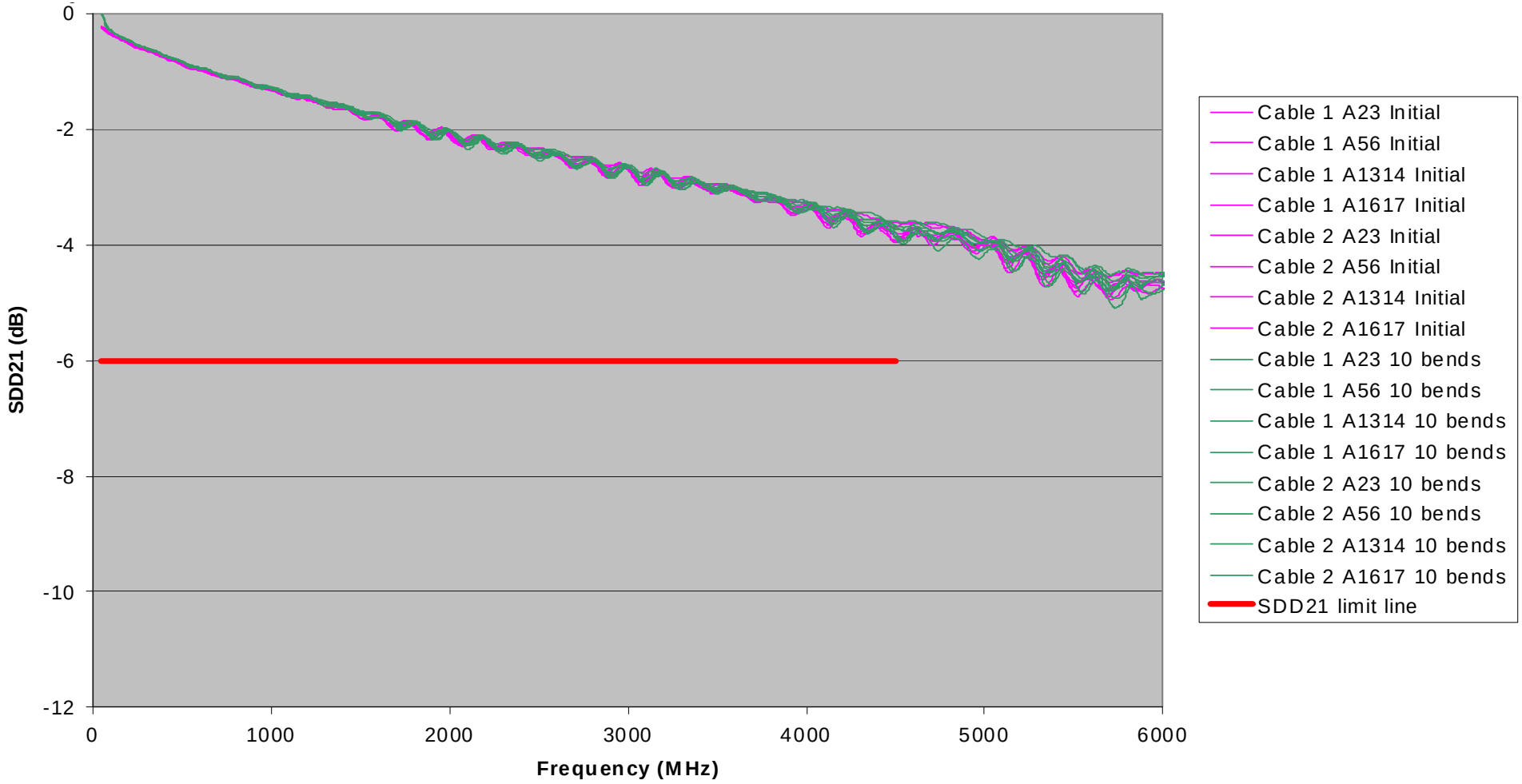


- Samples had previously been subjected to 85ºC/1000 hrs heat aging
- Creases done with fingers, without any mandrel to limit inside radius of fold
- S-parameters & TDR measured before and after folding

Differential Insertion Loss (SDD21) before and after Folding



Differential Insertion Loss (SDD21) from repeated folds in same location

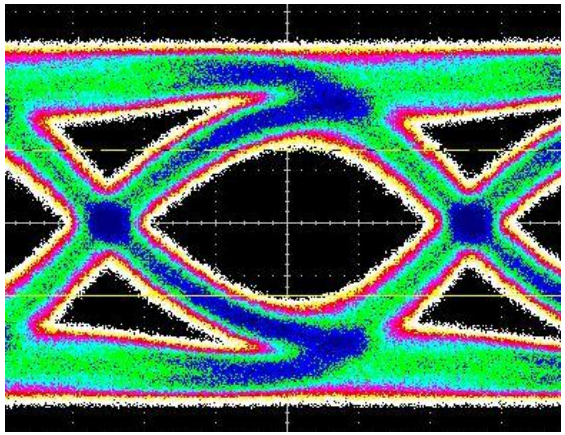


- 180 degree bend about a 1 mm radius pin gauge
- 10 bend sample was folded and unfolded 10 times (same bend location)
- SDD21 shown, but we examined all 5 SAS2.1 S-parameter requirements, and there was similar minimal impact on each

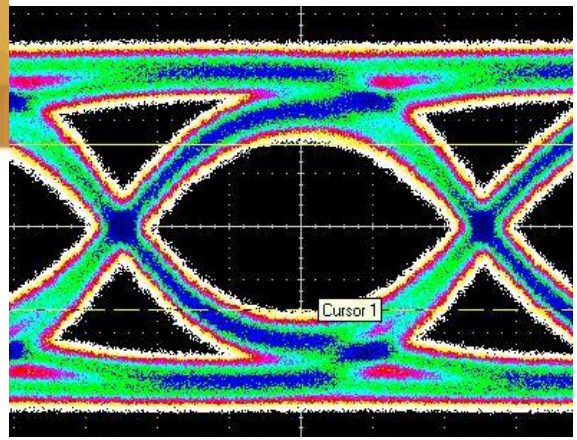
Data from 3M test request IR8175

Improved High-Speed Electrical Performance

Conventional twin axial cable

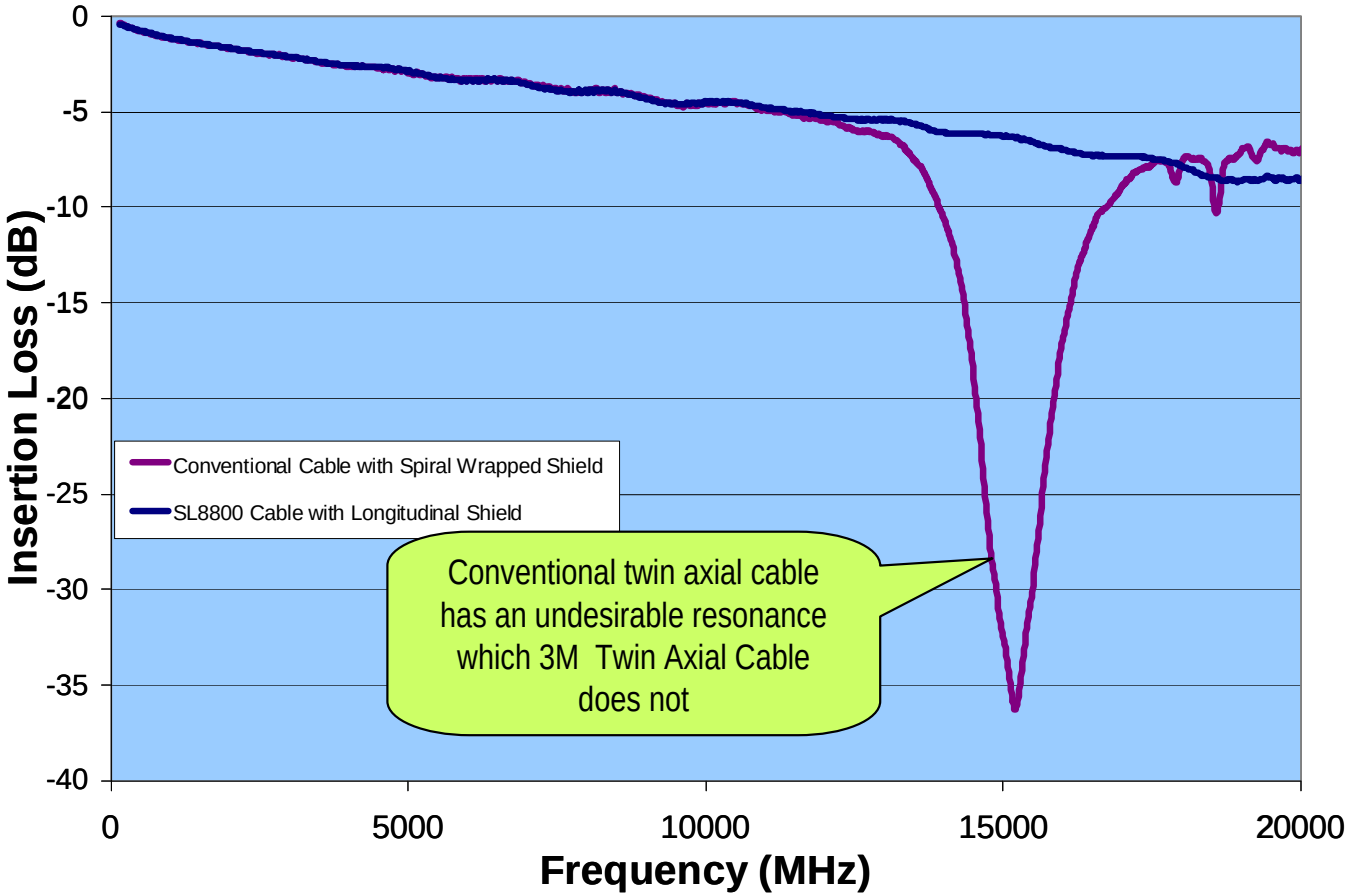


3M™ Twin Axial Cable, SL8800 Series

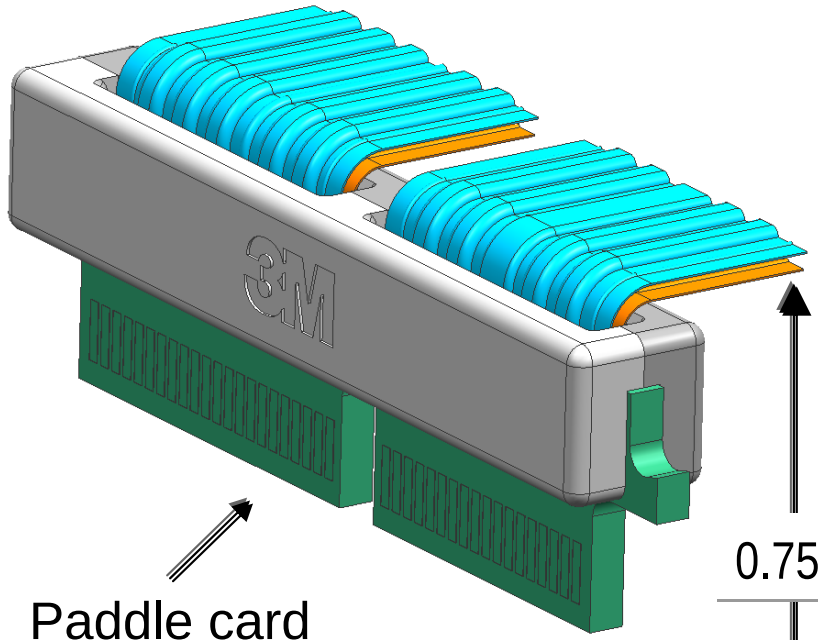


9 Gbps 1 meter

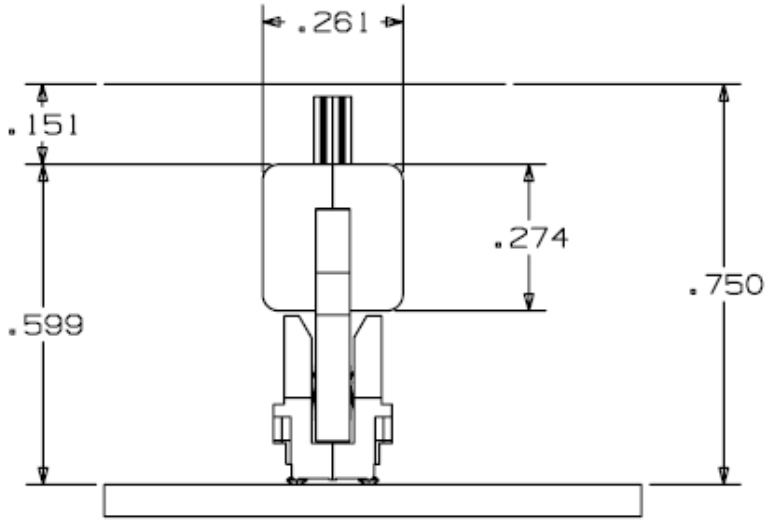
15% greater eye opening



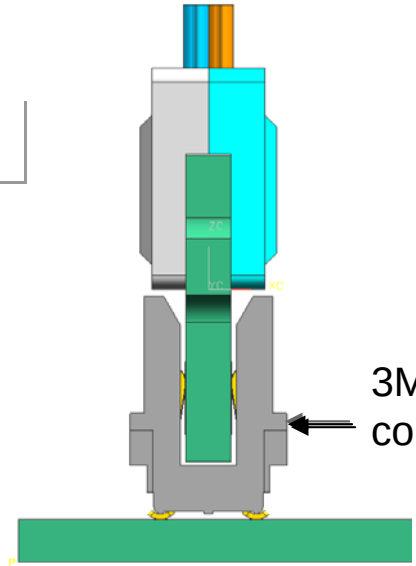
3M™ Twinax + SPEED Connector Design…



Paddle card design



0.750 max height



3M™ SPEED connector

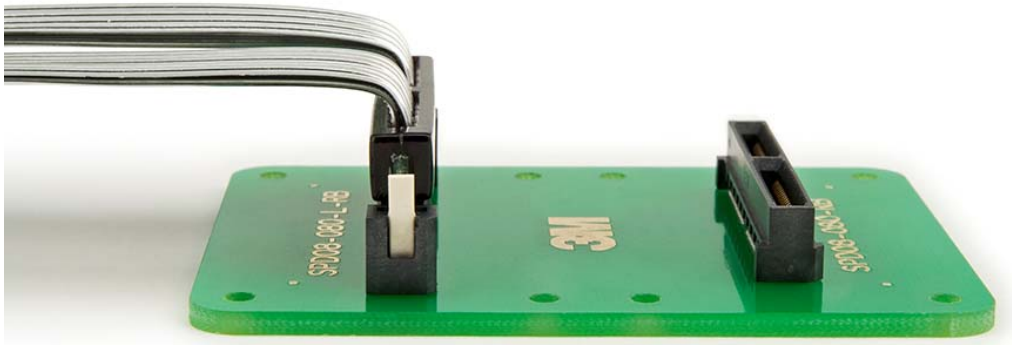
Length 2.1” with latches open

80 total contacts

17

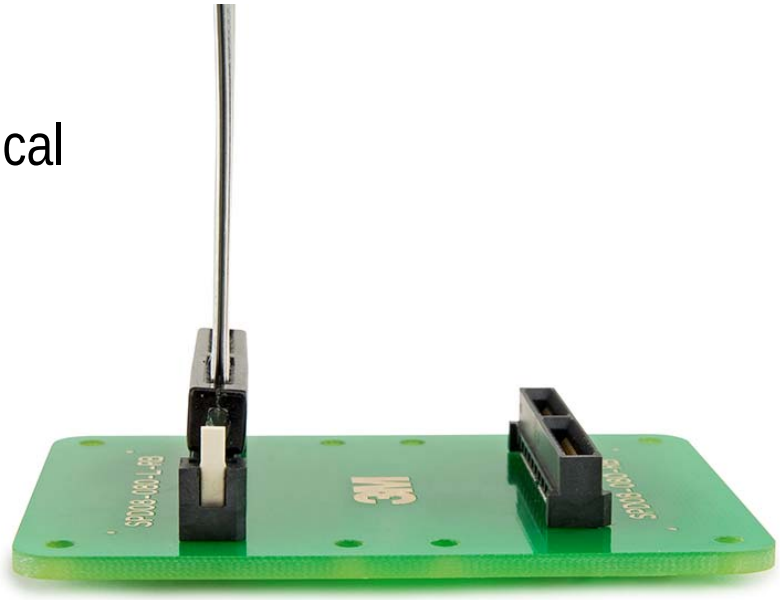
3M™ Twinax + SPEED Connector Prototype…

Right Angle



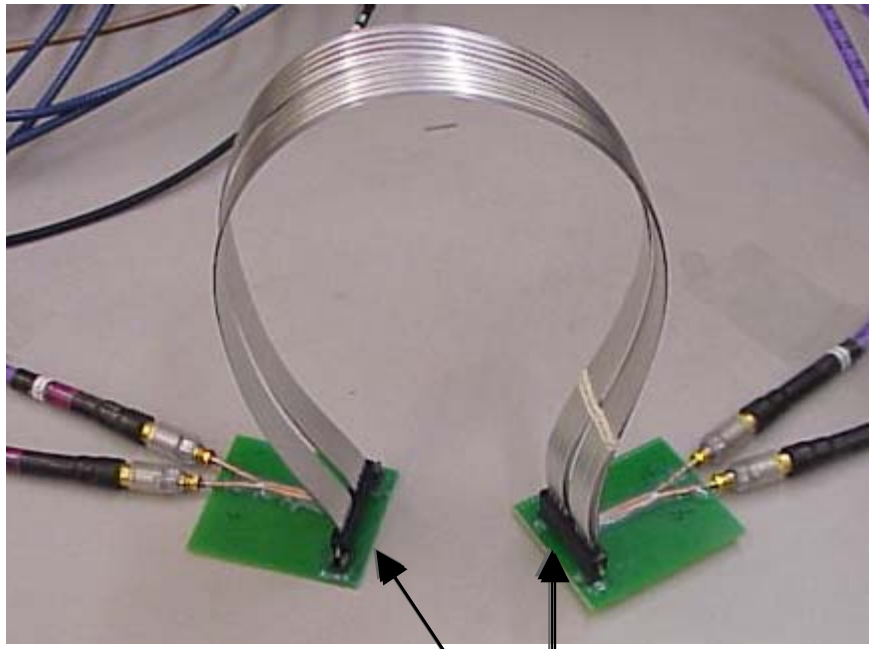
Paddle Card design

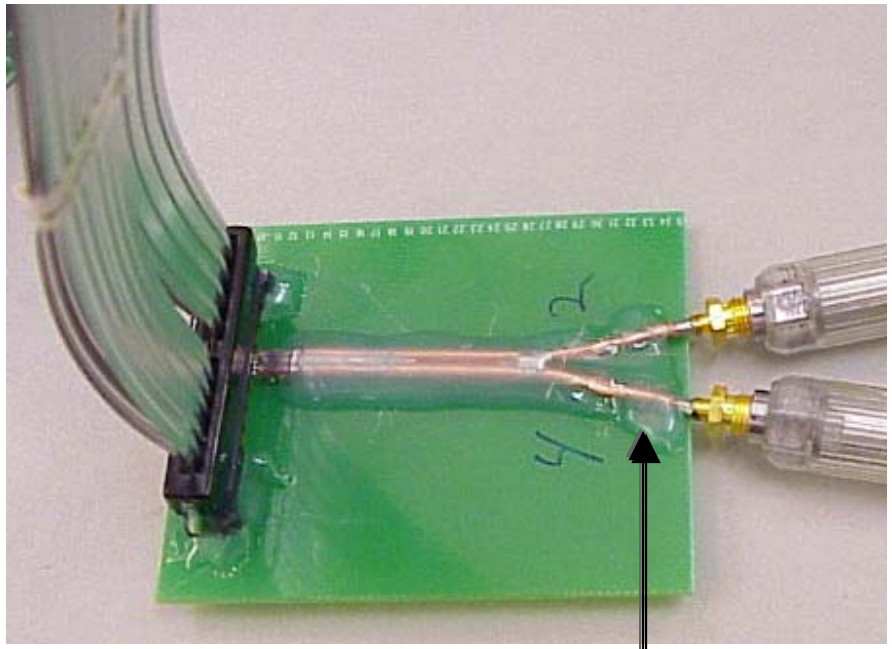
Vertical



18

3M™ Twinax + SPEED connector DUT…

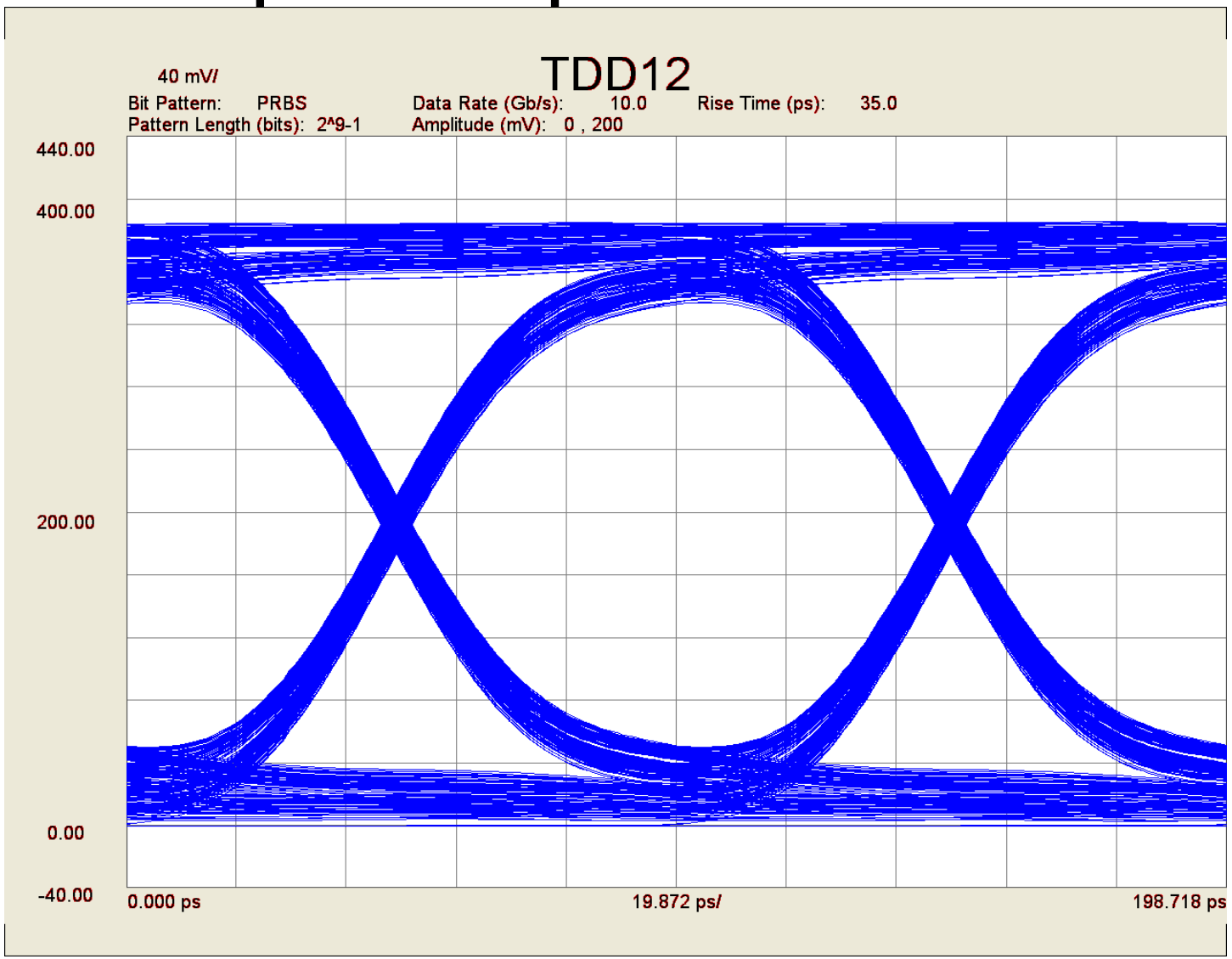




Two SPEED boardmount connectors and two paddle card connectors interconnected by 0.5 meter 30(1) SPC twin-ax cable with semi-rigid launches

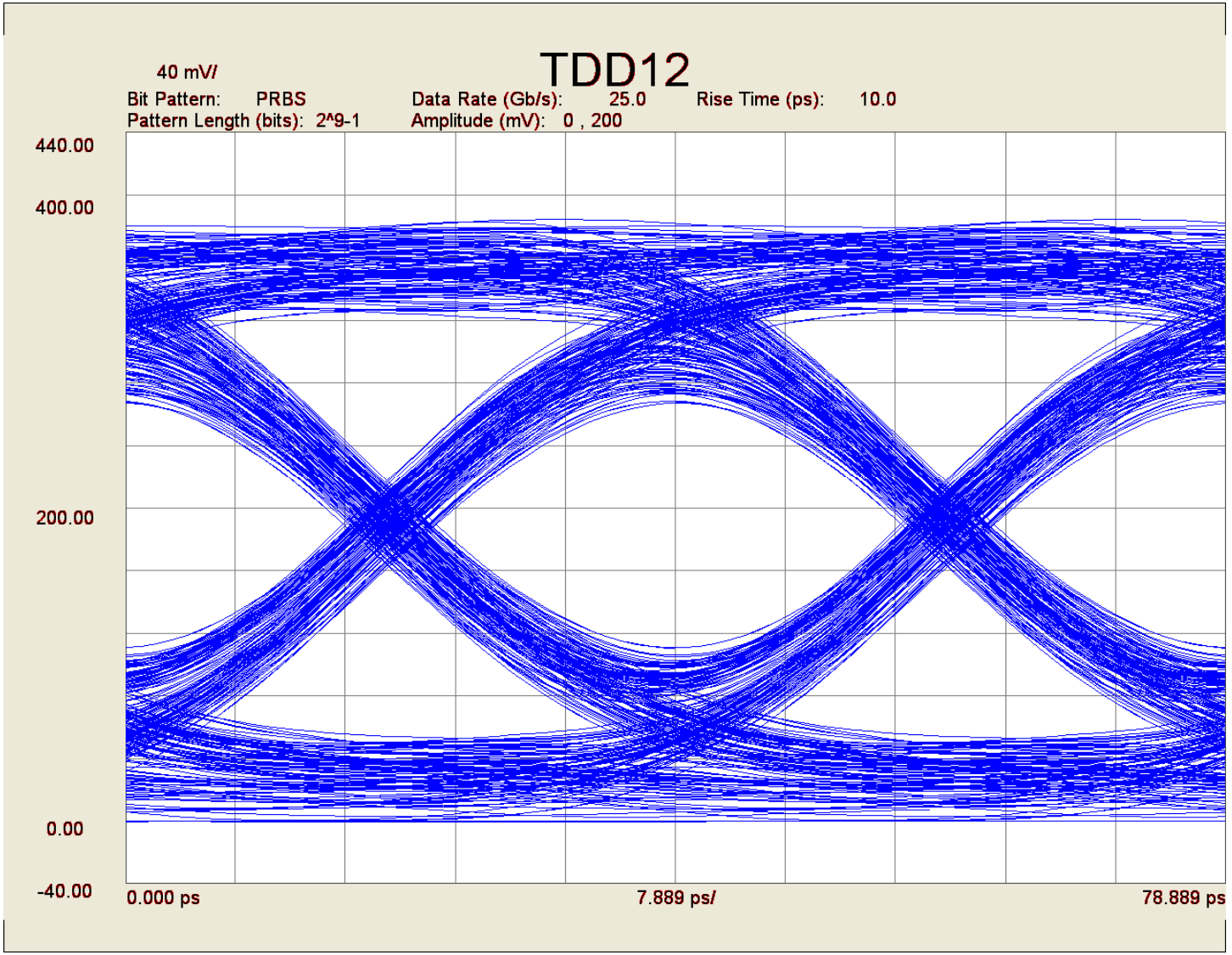
19

10 Gbps / 35 ps rise time > 80%



20

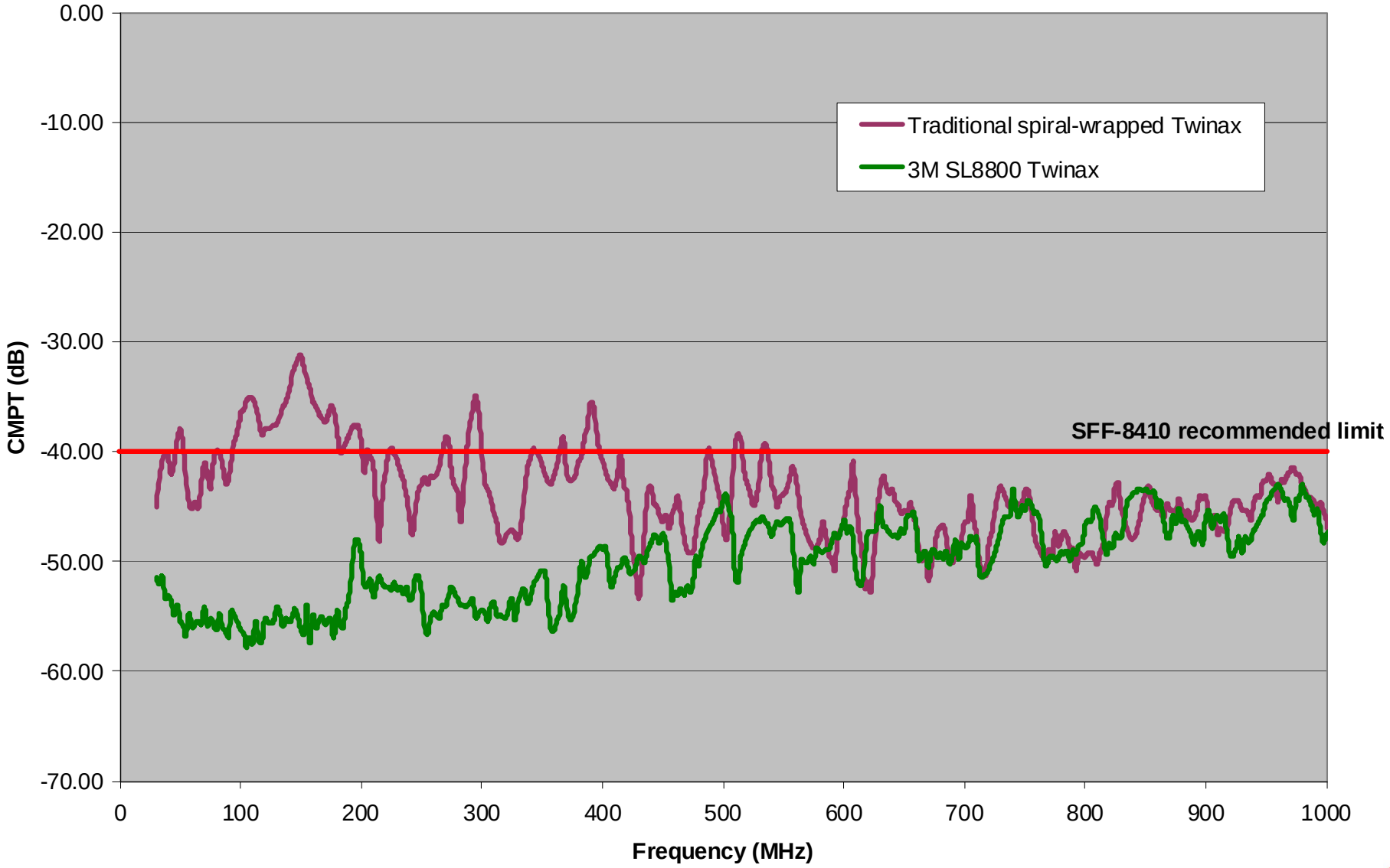
25 Gbps / 10 ps rise time > 57%



21

Reduced EMI

Common Mode Power Transfer

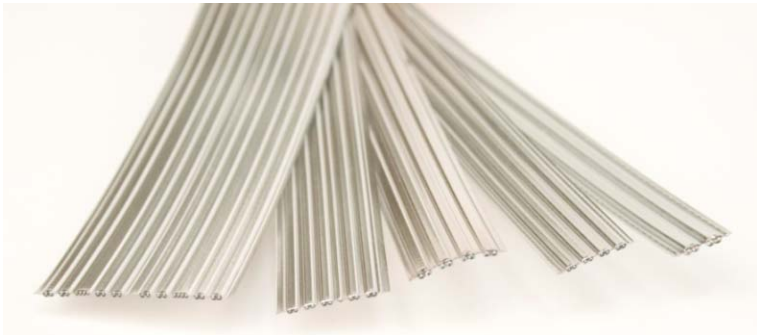


Termination Steps and Benefits

- No wire management fixtures required
- Simultaneous stripping of four pairs
- Simultaneous registration of the 4 pairs to the PCB
- Consistent wire presentation conducive to automating termination process

What's Next for 3M™ Twin Axial Cable?

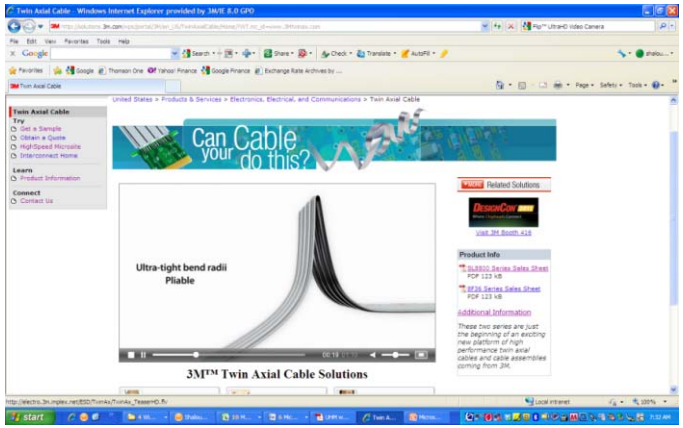
- Various configurations and customizations of the Internal 3M Twin Axial Cable are in development, some are available today
  - *Narrow pair spacing*
  - *Different pair counts, additional sidebands*
  - *Other wire gauges*
  - *Fan-outs*
  - *Others – contact 3M to discuss*



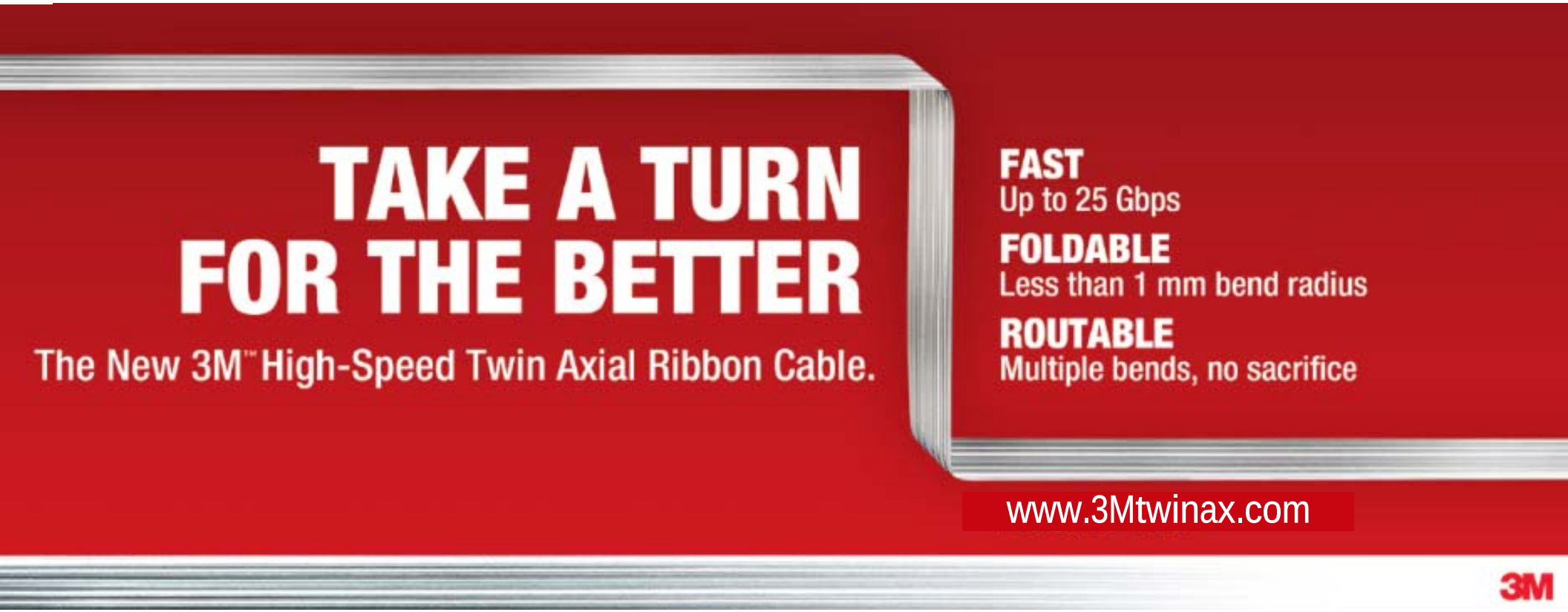
- External Jacketed Cable is in development and will achieve a unique combination of performance benefits → Launching soon in 2011
  - *4-pair: 28 and 30 AWG → QSFP+, miniSAS External*
  - *2-pair: 32 and 30 AWG → SFP+*

Learn More about 3M™ Twin Axial Cable

- Get more information at 3Mtwinax.com:
  - Tech Datasheets, Drawings, Product Specs
  - Product Video
  - Order Samples
  - Product News
- Contact your local 3M Sales Rep
- Contact a Technical or Business Team Member – email 3Mtwinax@3M.com OR Click on “Contact Us” at 3Mtwinax.com



Thank you


TAKE A TURN
FOR THE BETTER
The New 3M™ High-Speed Twin Axial Ribbon Cable.
FAST
Up to 25 Gbps
FOLDABLE
Less than 1 mm bend radius
ROUTABLE
Multiple bends, no sacrifice
www.3Mtwinax.com
3M