

# **TIA FO-2.2.1**

## **July 9, 2001 Update**

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Task Group on Modal Dependence of Bandwidth

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# Next Generation 50 mm System Recommendation Complete

- Requirements have been defined
  - \* Fiber DMD (FOTP 220) and
  - \* Transceiver encircled flux (FOTP 203)
- IEEE P802.3ae/D3.1 specification correct
  - \* Swanson and Kolesar
- Final standardization in progress and on schedule

# Progress Since March

- Risk Assessment Modeling complete
  - \* Modification required to DMD mask to achieve low failure risk
  - \* Six masks allow tradeoff in fiber design
- Differential Modal Delay FOTP 220 technical issues resolved
  - \* Final approval in progress
  - \* Defines a maximum allowable broadening (ps/m) over a range of radial offsets ( $\mu\text{m}$ )
- Optimum tradeoff achieved
  - \* Intermediate modes in the fiber are easiest to tune
  - \* Typical sources using cost effective manufacturing have a limited range of launches

# Transceiver Requirement Set

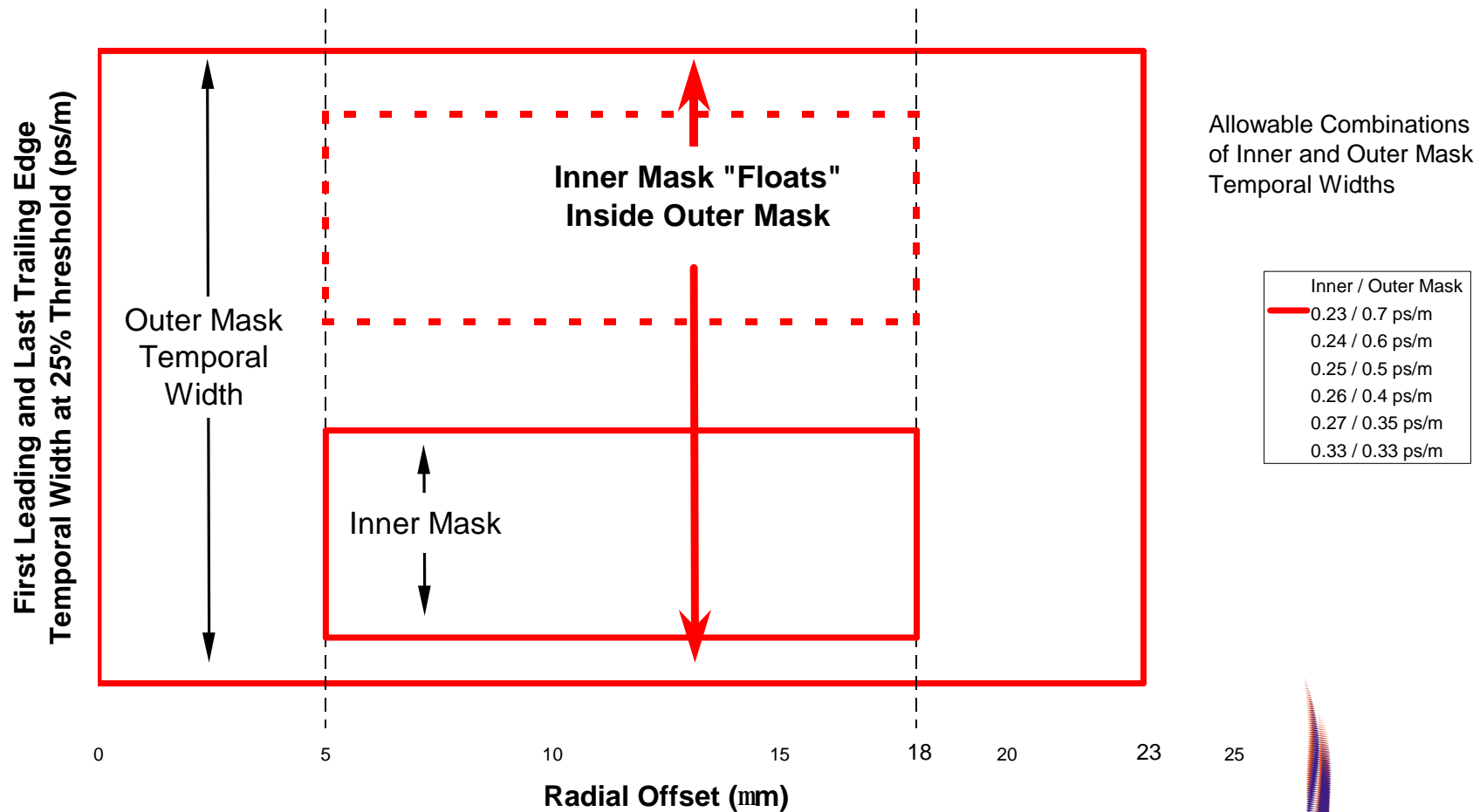
- Transceiver requirement defined in terms of Encircled Flux
  - \* TIA FOTP 203 - status approved
- Encircled flux requirement
  - \*  $\geq 86\%$  at  $19\ \mu\text{m}$  radius
    - Eliminates launches too large
  - \*  $\leq 30\%$  at  $4.5\ \mu\text{m}$  radius
    - Eliminates launches too small
- “Not too large, not too small” - Just Right

# Fiber Requirement

- Specification defined in terms of six “floating” masks (inner 5-18  $\mu\text{m}$  / outer 0-23  $\mu\text{m}$  at 850  $\pm$  10 nm):
  - 1)  $\leq 0.23$  /  $\leq 0.7$  ps/m or
  - 2)  $\leq 0.24$  /  $\leq 0.6$  ps/m or
  - 3)  $\leq 0.25$  /  $\leq 0.5$  ps/m or
  - 4)  $\leq 0.26$  /  $\leq 0.4$  ps/m or
  - 5)  $\leq 0.27$  /  $\leq 0.35$  ps/m or
  - 6)  $\leq 0.33$  /  $\leq 0.33$  ps/m Flat
  - \* Note: Masks 1 through 5 require OFL BW  $\geq$  1500 MHz-km)
- Meeting any one of the six is sufficient
- Six masks allow tradeoff in fiber design (inner / outer at 850  $\pm$  10 nm):

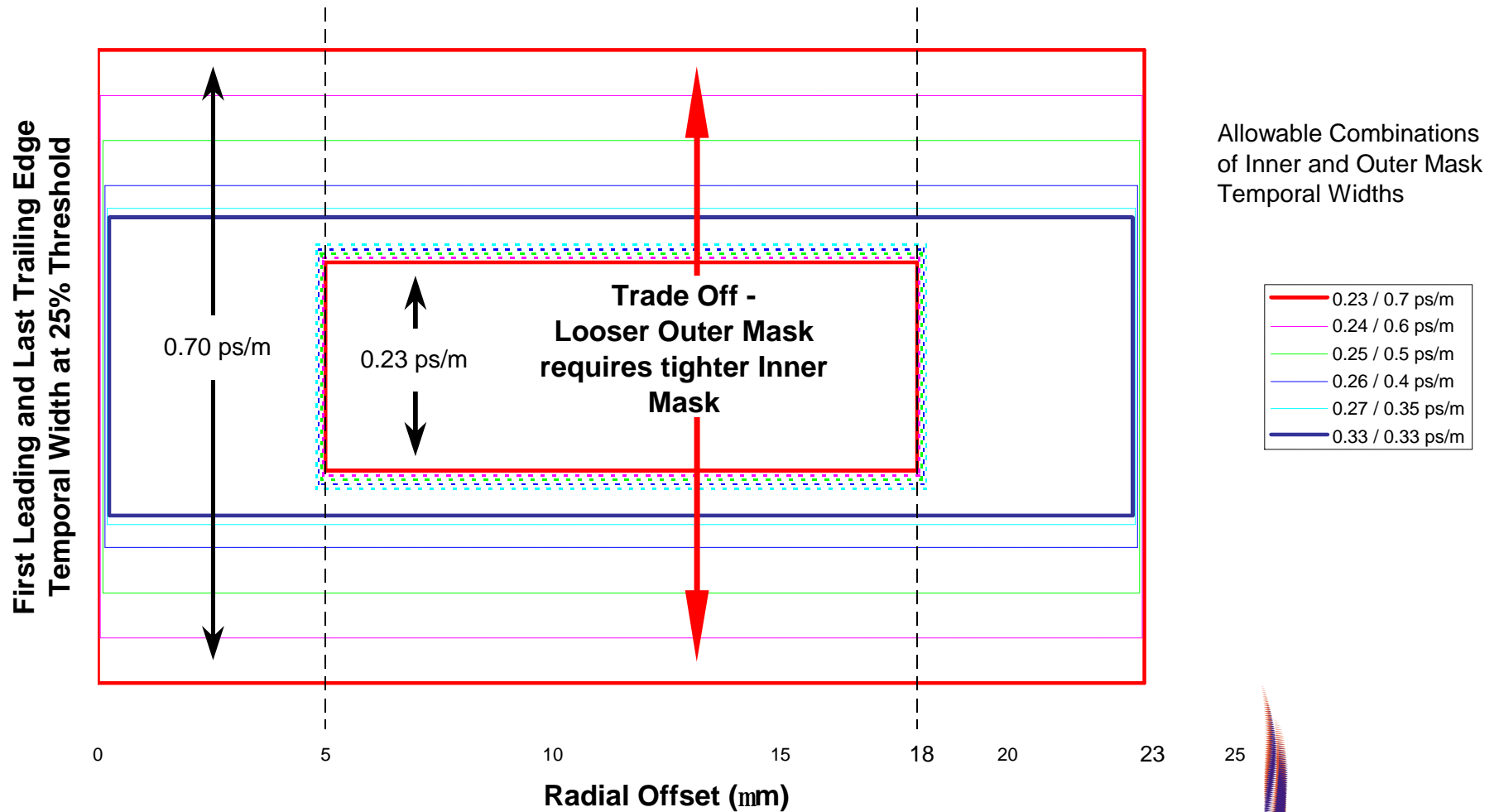
# DMD "Floating" Mask

## TIA 2.2.1 850 nm Laser Optimized



# DMD "Floating" Mask

## TIA 2.2.1 850 nm Laser Optimized



# Risk Assessment Modeling

- Modeling used to confirm risk assessment
  - \* Includes fiber and transceiver performance / interaction
  - \* Connector offset impact evaluated
- Modeling supported by
  - \* 2 fiber manufacturers  
(Steve Golowich, John Ritger - Lucent, John Abbott - Corning)
  - \* 1 transceiver manufacturer  
(Petar Pepeljugoski - IBM)
- 40,000 transceiver fiber combinations evaluated
  - \* Included a broad range of fiber profiles and transmitter launches
  - \* 5000 fiber DMD profiles included realistic profiles
  - \* 2000 transmitter launch distributions spanned allowable range of encircled flux



# Conclusion

- TIA FO-2.2.1 recommendation complete
  - \* Recommendation submitted in comments by Swanson and Kolesar
  - \* Achieves optimum balance between fiber and transceiver properties
  - \* Includes fiber DMD and transceiver encircled flux requirement
  - \* Final modeling demonstrated acceptably low risk
- TIA FO-2.2.1 wrap up actions in progress
  - \* Complete the standards process
  - \* Complete documentation
  - \* Prepare for the next Ethernet standard (100 Gb over MMF!)

# Next Generation 50 mm Fiber Standardization Timing

- TIA
  - \* Technical cutoff - June 2001 Plenary **(DONE)**
  - \* FOTP 220 30 day PN ballot - March 2001 **(DONE)**
  - \* 492 fiber specification - draft June 2001 **(DONE)**
    - Publication anticipated by February 2002
  - \* FOTP 220 publish by January 2002
    - Publication anticipated in August 2001
- IEC
  - \* 793-2 international fiber specification includes IEEE requirement
  - \* IEC 60793-1-41 and 49 test method
    - Introduced in March 2001, review and ballot in October
- IEEE
  - \* Final reference required by publication **(March 2002)**