# Receiver electrical reference filter for testing (serial)

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## Background

- Reference receiver filters are common
- Used to look at transmitted eye “from a receiver’s point of view”
- Usually 4th order Bessel-Thompson, bandwidth = 0.75 * Baud rate
- Does not represent “product” receivers but is similar
- Filter may be:
  - in the test instrument or external
  - bought or home made
  - hardware or software
- Tolerance is specified

## Need to specify a bandwidth

- Options are:
  - A higher value
  - 0.75 * 10.3125 = 7.7 GHz
  - 0.75 * 9.95328 = 7.5 GHz
  - A lower value
- Note tolerances +/-0.85 dB representing approx. +/- 0.5 GHz (ITU-T G.691 in draft)

  G.691 says “the optical reference receiver function is defined as the total frequency response of any combination of photodetector, low-pass filter and oscilloscope functional elements, together with any interconnection of those elements”



## Higher value?

- Advantages
  - May help with “slow” lasers (take “balance of pain” off the transmitter)
  - May reveal some laser resonance problems?
- Disadvantages
  - Not already in a standard
    - Unknown effects, more standards-engineering work, delays?
    - Costs, complexity in testing department, long lead times for test equipment
  - May mask problems with slower production receivers built using OC-192 like parts

# 7.7 GHz?

- Advantages
  - It's 0.75 * LAN line rate, will probably work
    - Similar to likely production receivers
  - Near enough to 7.5 GHz
- Disadvantages
  - Not already in a standard
    - Costs, complexity in testing department, long lead times for test equipment

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*Is anyone sure how to spell Thompson/Thomson? IEEE and ITU-T differ.*



# 7.5 GHz?

- Advantages
  - It's already in other standards
  - Test equipment exists - most of us have already bought this
  - Simplifies testing activity
  - It's 0.75 * WAN line rate, will probably work
    - Similar to likely production receivers
  - Near enough to 7.7 GHz
- Disadvantages
  - Might be leaving a little more pain with the Tx
    - Revising eye specification as proposed should counter this

# Lower value?

- Advantages
  - May help “ringy” lasers pass
- Disadvantages
  - Not already in a standard
    - Unknown effects, more standards-engineering work, delays?
    - Costs, complexity in testing department, long lead times for test equipment
  - May demand excessive Tx bandwidth (move “balance of pain” to the transmitter)
  - May hide some laser resonance problems (ringy lasers as above?



# Conclusions

- No sure advantage in deviating from other standards and existing test hardware
- Tolerances mean that 7.5 and 7.7 GHz are indistinguishable
- Possible delay, uncertainty and costs by deviating from other standards and existing test hardware
- We should consider total frequency response of the optical reference receiver
- We should accept the ITU-T STM-64 reference receiver (specified in G.691)