Security Level:

NG-EPON Diplexer filter analysis

Zhenxing Liao, Dekun Liu

www.huawei.com

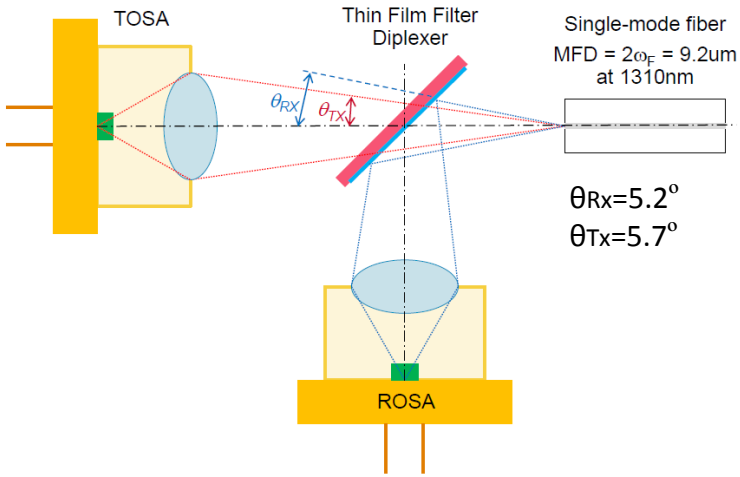
HUAWEI TECHNOLOGIES CO., LTD.

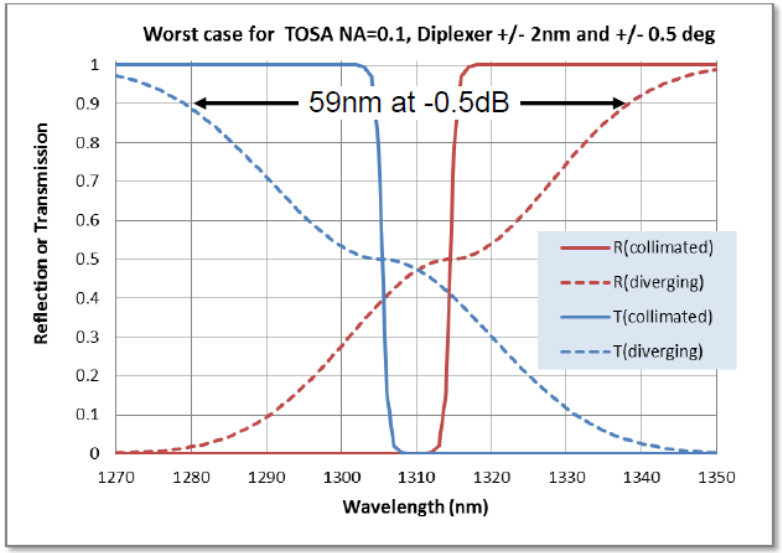
HUAWEI

Background

From johnson_3ca_1a_1116

BOSA diplexer optics





Conclusions:

- The analysis presented here for standard single-mode fiber and TOSA with NA=0.1 is more pessimistic than the previously reported cut-off of 35-40nm for use of focusing beam optics.
  - Center-to-center US-DS gap of 61nm results in up to 0.5dB excess loss.
  - Center-to-center US-DS gap of 49nm results in up to 1.0dB excess loss.

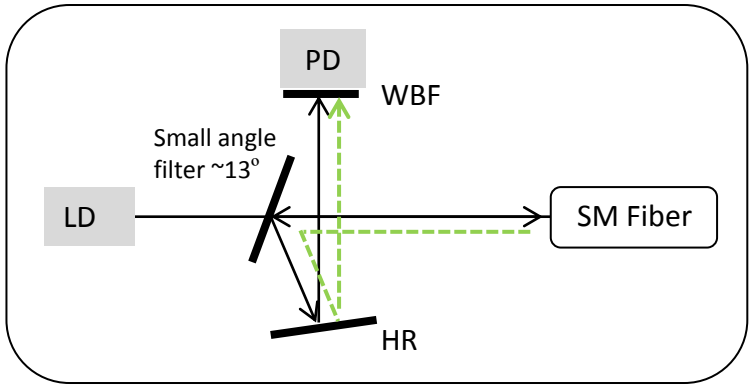
Filter vendors' feedback on the analysis :

•There will be a 10~12nm transmission curve split due to different polarization at 45 degree incident angle .

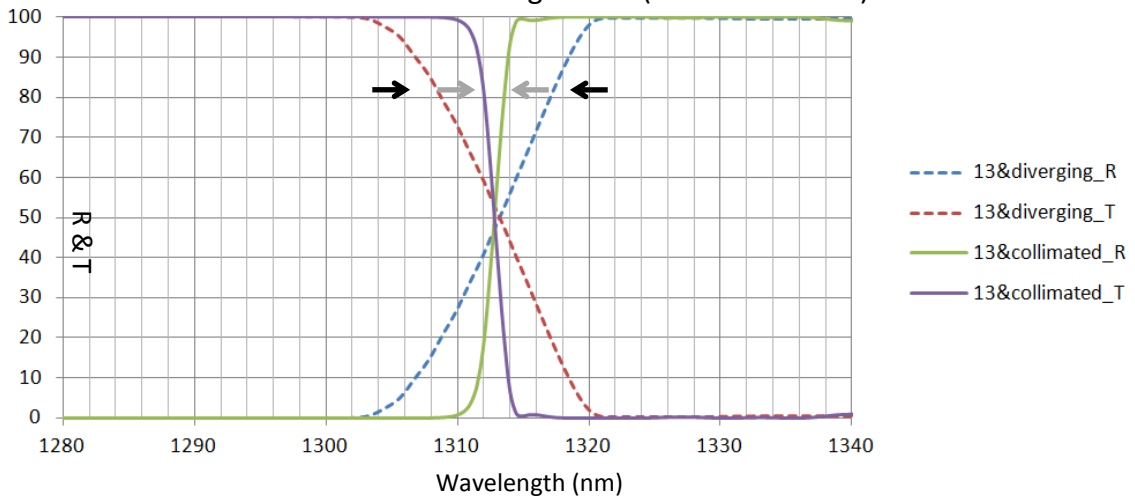
•40nm transition band will be easily run out due to the divergence angle and assembly error.

Other solutions(1)--Small angle filter

Block diagram



Simulation results based on small angle filter (at $\theta_{Tx}=\theta_{Rx}=5.7^{o}$)



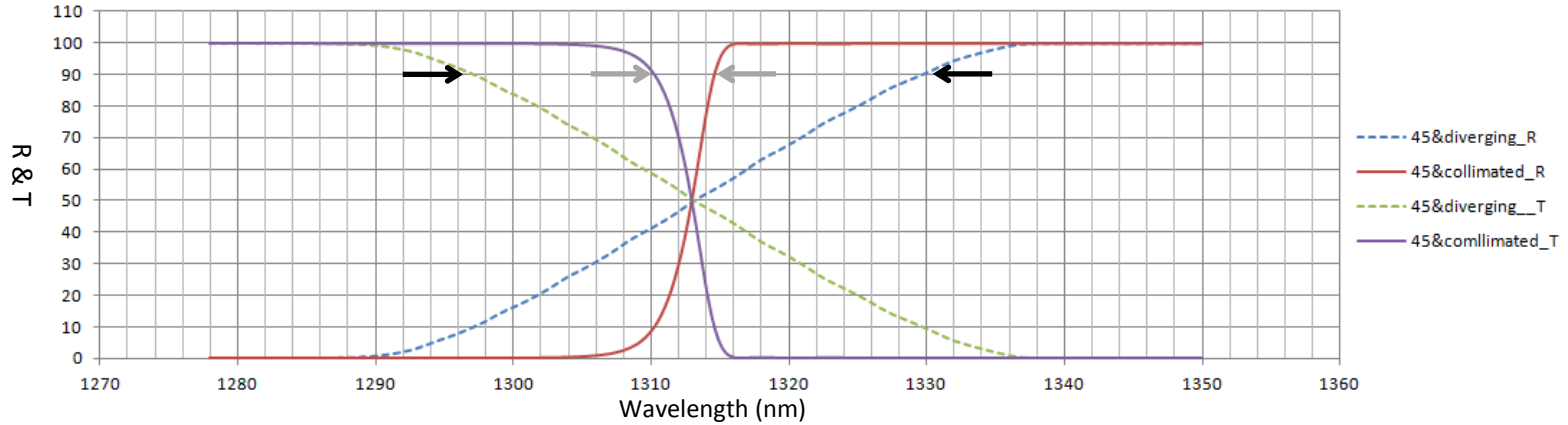
•Using a smaller angle filter, such as 13 degree filter, the required DS/US gap can be decreased to 20nm for diverging beam(extra loss<0.5dB):

- ➢12nm 10% to 90% transition band
- ➢8nm tolerance for polarization shifting , assembly error, filter wavelength error
- ➢ Another 8nm gap (28nm in total) can make the extra insertion loss negligible

• Some extra assembling cost and small extra insertion loss will be brought in inevitably compared with traditional 45 degree filter.

Other solutions(2) --New Thin Film design for depolarization

Simulation results based on New thin film filter (at $\theta_{Tx}=\theta_{Rx}=5.7^{o}$)



•By special filter design for depolarization , the required DS/US gap can be decreased to 43nm for diverging beam(extra loss<0.5dB):

- ➢33nm 10% to 90% transition band
- ➢10nm tolerance for polarization shifting , assembly error, filter wavelength error
- ➢ Another 10nm more can make the extra insertion loss negligible (<0.1dB)

• This special filter is much more difficult to fabricate : survey from 4 vendors, only one vendors suggested it.

Summary

- 40nm is DS/US gap is not enough for traditional 45 degree filter BOSA design and will inevitably bring some noticeable insertion loss on both Tx and Rx optical path.
- Small angle filter can distinctly decrease the required DS/US gap, but the impact on assembling technology and the consequent extra cost need further evaluation.
- New 45 degree thin film design for depolarization can decrease the DS/US gap by some extent, while the technical maturity and volume availability need further study.

Thank you

www.huawei.com