
TP2 Encircled Flux Measurement Results

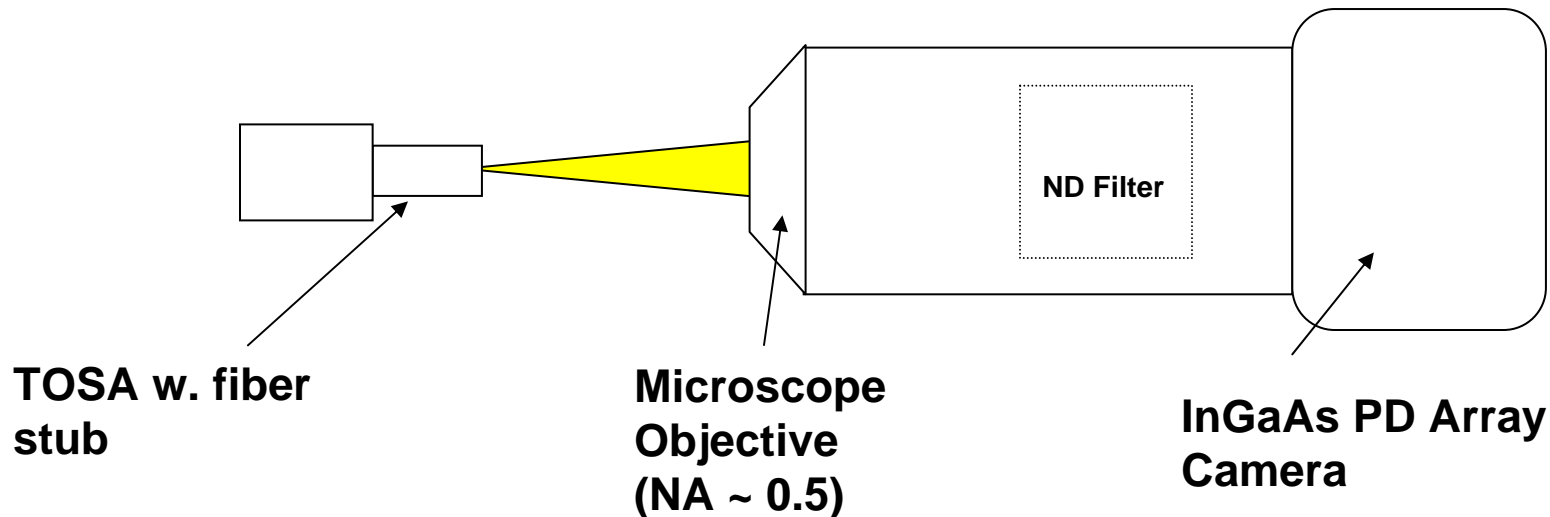
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Introduction

- D2.1 TP2 Requirements Include Encircled Flux Limits:
 - >30% within 5 μm Radius
 - >86% within 11 μm Radius
- Measurement at $\sim 1310\text{nm}$ Presents Some Practical Challenges
- We Report Experimental Measurement of the EF on 3 FP based TOSAs Intended for 10GBASE-LRM Application.
 - SC Port
 - Fiber Stub Based

Measurement Setup



- TOSA with SC nose, Limits Capture to $NA \sim 0.2$ Escaping the SC Bore
- Microscope focused on the fiber stub
- InGaAs IR PD array camera + frame grabber + PC
- Special processing routine to expand dynamic range of camera.
 - Capture Signal At Two Optical Power Levels
 - Combine Data to Capture Low Amplitude Cladding Signals

Captured Images

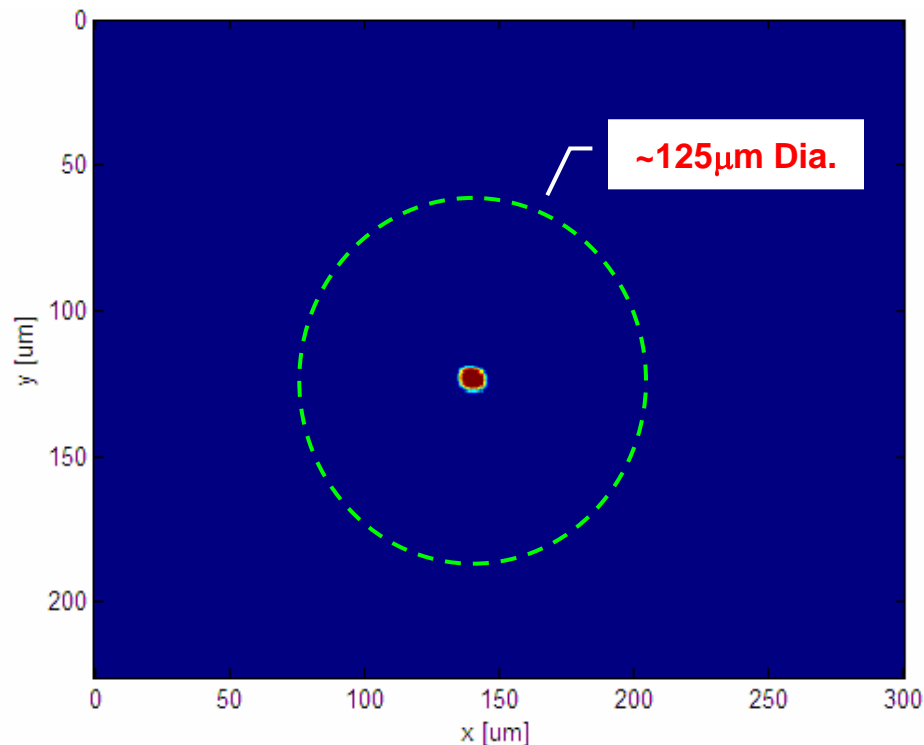


Image Capture at Low Power

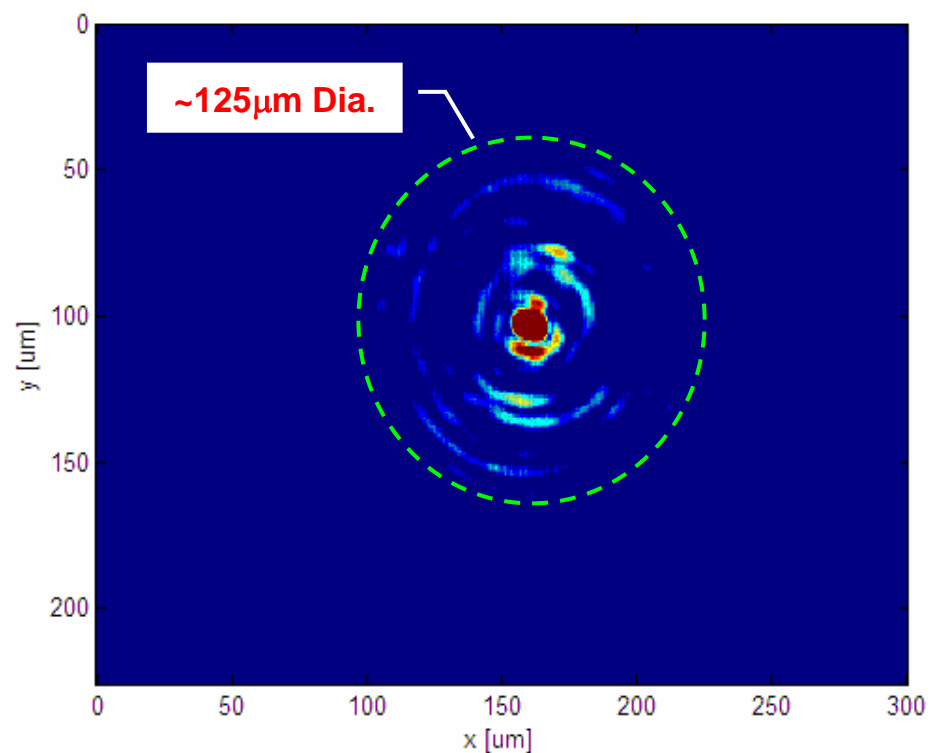
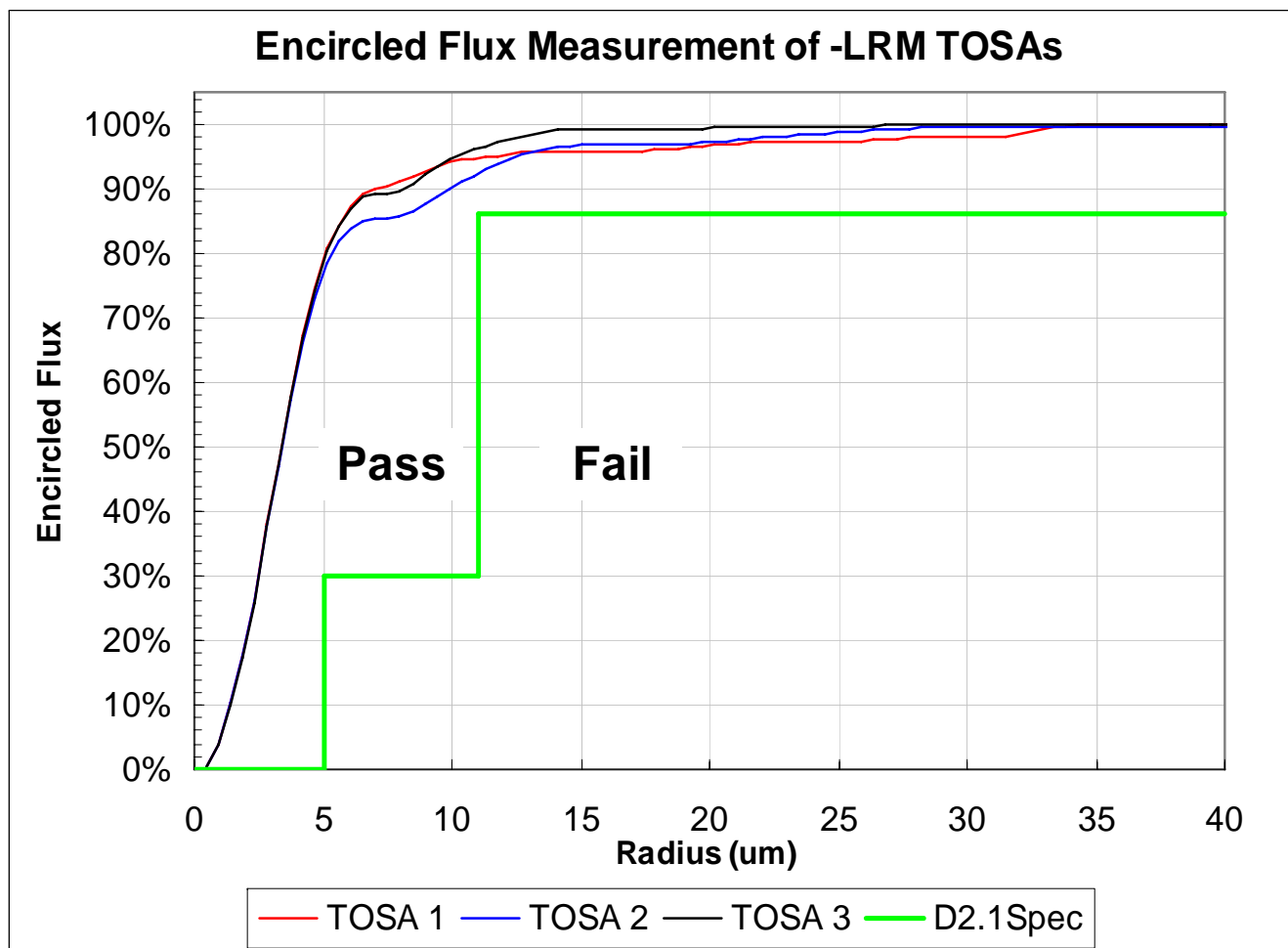


Image Capture at High Power

Test Procedure:

- Take two images at low and high laser power
- Combine two images and calculate the encircled flux

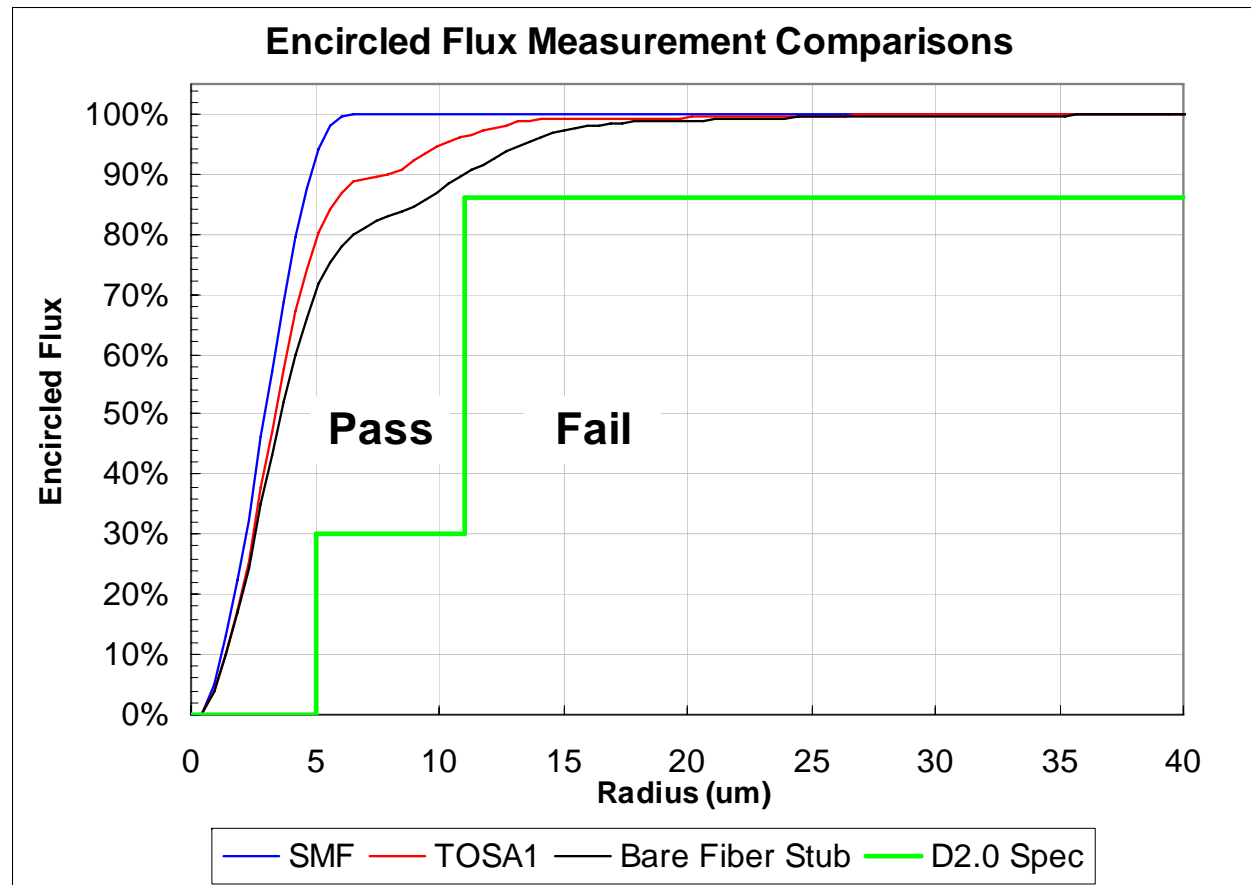
Measured Encircled Flux vs Radius – 3 TOSAs



	R=5um	R=11um
TOSA 1	75 %	95 %
TOSA 2	73 %	92 %
TOSA 3	80 %	96 %

Further Investigation and Verification

- Measure Mode at End of Long SMF
 - Should give Best EF, and Match Calculations (Calculation not done yet)
- Measurements of Bare Fiber Stub to TOSA Header
 - Easy Access to Front Face of Stub, i.e. Capture Rays > 0.2 NA
 - Unclear if Representative of TOSA Alignment



Summary

- Encircled Flux Measured at 1310nm Are Practical
 - Limited to Capture of 0.2 NA Rays in SC TOSA and Less in LC TOSA
 - Experiments to Verify with Higher NA Capture Possible, But Probably Difficult on Final Parts
- Reasonable TOSA designs Are Possible Which Meet the D2.1 Encircled Flux Spec
 - Good Margin Demonstrated in 3 Parts with 0.2 NA Capture.
 - Worst Case of 3 TOSAs 92% @ 11 μ m
 - Experiment with Larger NA Capture Also Showed Passing Performance.
 - 90% @ 11 μ m