

Loss Correlation Study for Contaminated Multimode Optical Connectors

Conducted by Westover Scientific
As part of iNEMI project

Presented March 6th, 2006 by Steve Lytle, Westover Scientific



Overview

- Purpose of Experiment
- Design of Experiment
- Data Analysis
- Deductions to-date
- Future Plans



Design of Experiment

- Simple link-loss test
- Currently using an overfilled launch condition to produce most sensitive arrangement. Considering running some tests in parallel using a normal fill to see the difference in loss correlation
- Start with two high quality 1 meter jumpers with SC-PC connectors
- Insert launch cable into source and meter, zero/reference meter
- Insert test cable into meter and adapter and test. De-mate, mate, test 10 times. Obtain average IL and standard deviation
- Apply Arizona Road Dust in small quantities until a “relevant” amount is on core.
- Mate and test. De-mate, mate, test, 5 times to arrive at new IL and Std Dev.
- Compare new IL value to $(3 \times \text{Original Std Dev}) + (\text{original average IL})$. If new IL is greater, FAIL

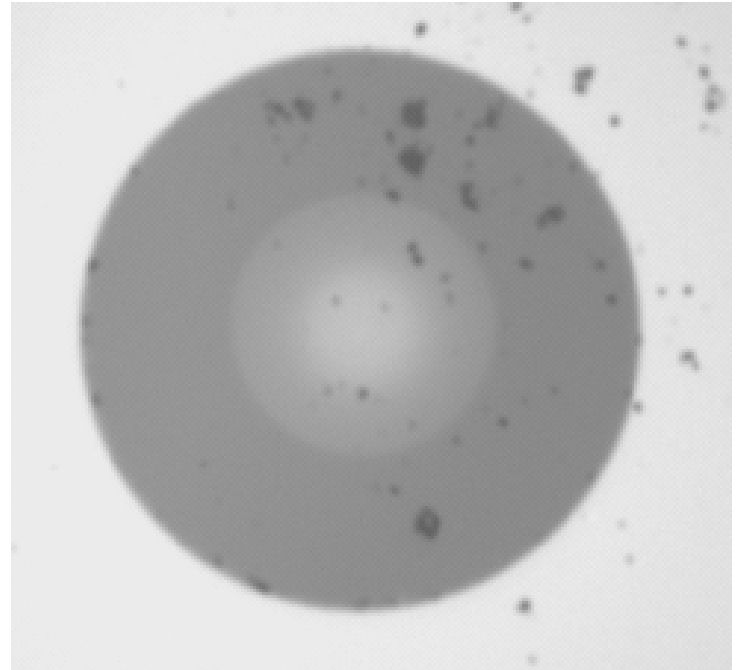
Data Analysis

- Av. IL = 0.21dB
- St Dev = 0.0042
- 3S Thresh = 0.22dB

- Contam IL = 0.25dB

Notes:

- One particle over 5um
- While over 3 sigma, still not a terrible loss value



FAIL

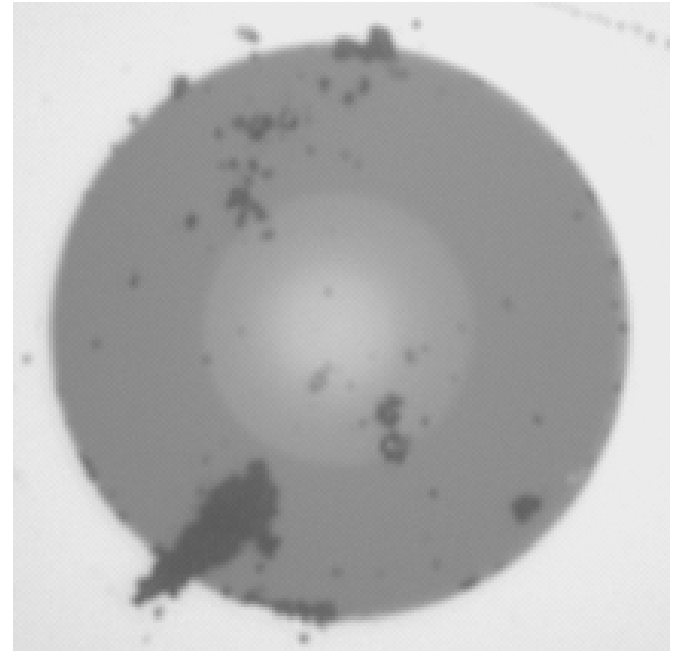
Data Analysis

- Av. IL = 0.01dB
- St Dev = 0.004 dB
- 3S Thresh = 0.02dB

- Contam IL = 0.63dB

Notes:

- Huge particle on cladding could be relevant



FAIL

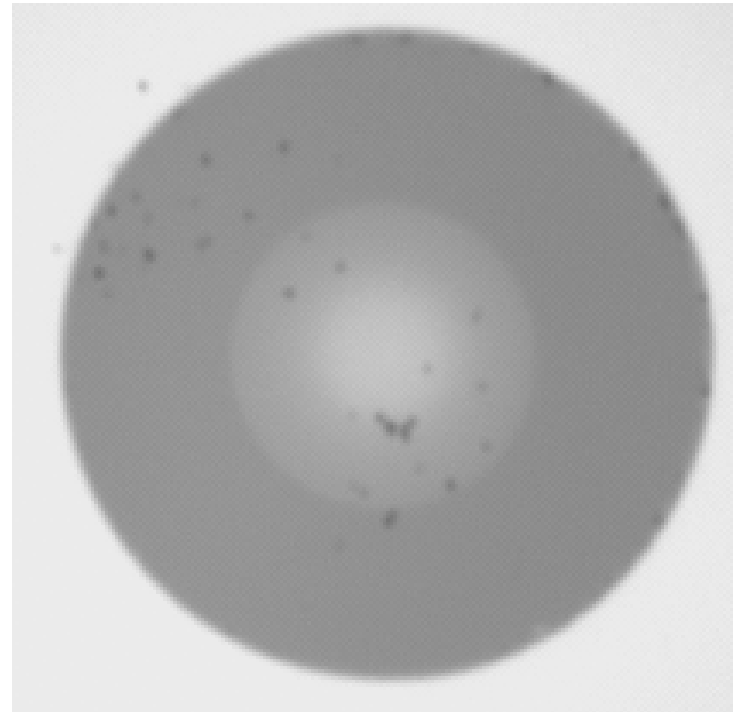
Data Analysis

- Av. IL = 0.02dB
- St Dev = 0.0048 dB
- 3S Thresh = 0.04dB

- Contam IL = 0.02dB

Notes:

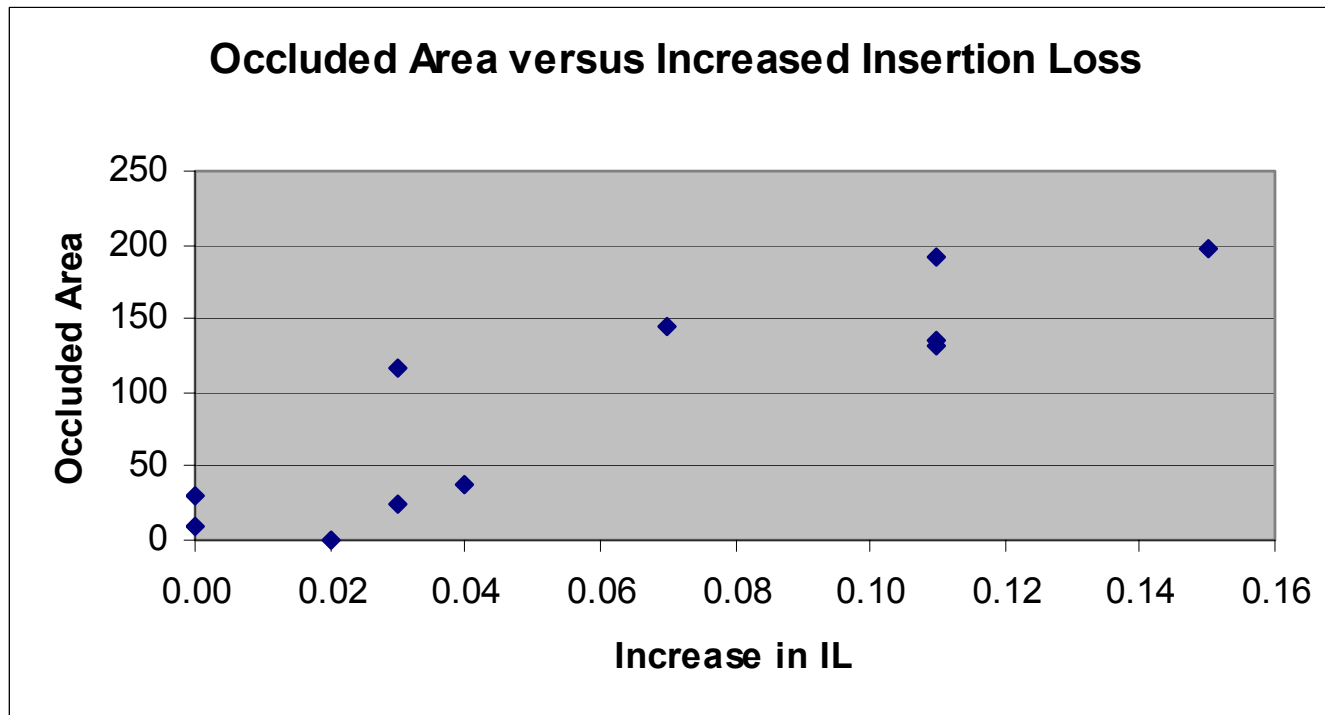
- Nothing huge on cladding
- Measurable dirt on core (11 particles, 1 over 5 microns) Still passed.



PASS

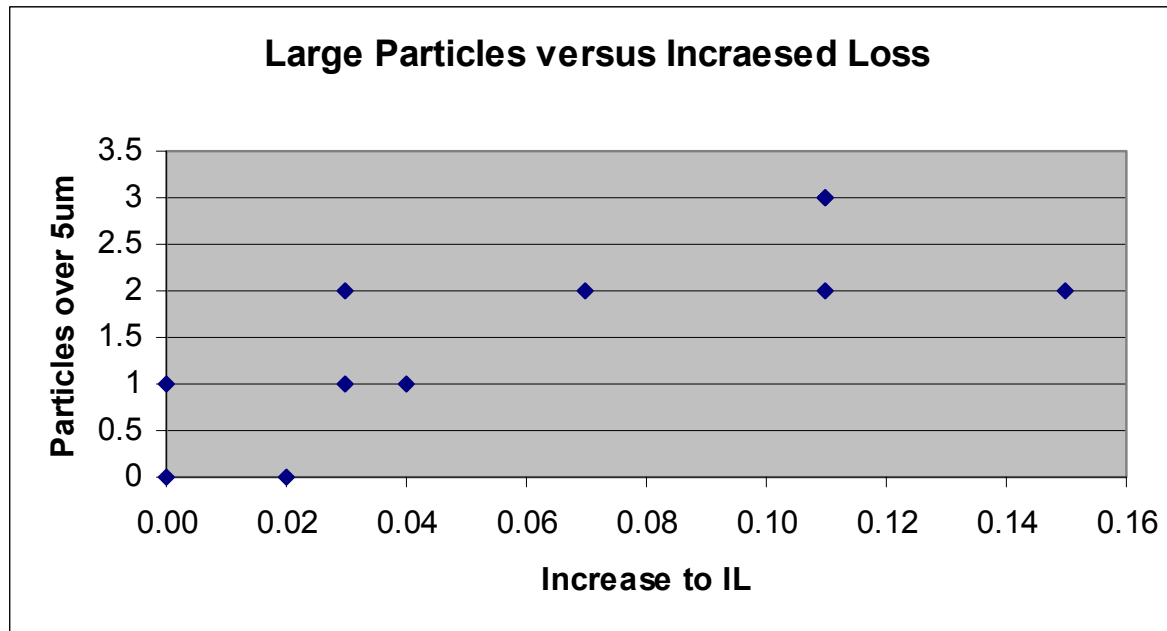
Data Analysis

- Occluded Area plotted versus increase to Insertion Loss.
- With more data points, hoping the trend will continue to show that below 50um occlusion provide relatively low loss levels. More data needed.



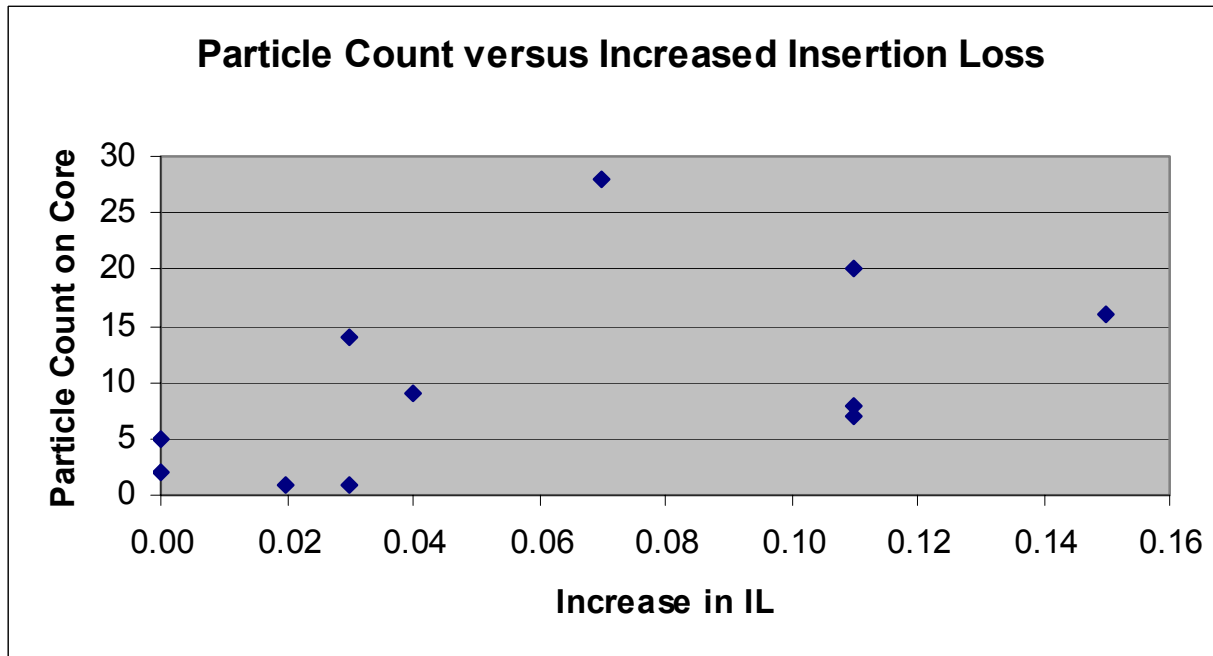
Data Analysis

- Number of particles over 5 microns plotted against increased insertion loss.
- Definitely more data points needed, but not seeing the correlation as strongly.



Data Analysis

- Particle Count (all sizes) plotted against increase to Insertion Loss.





Deduction To Date

- Similar to SM experiment, we are not seeing a perfect threshold
- Any dirt on the core seems to have some relevance, but it is not always indicative of unacceptable performance so a slightly contaminated core is likely acceptable.
- Occluded area might be the best method for specifying pass/fail, but may not be as practical for field implementation (comments?)
- More data is needed, but if the data continues on current path the proposed pass/fail thresholds to IEC WG6 must be made somewhat tighter.



Future Plans

- Collect 100 sets of data points (currently have about 16)
- Analyze again, and present to team
- Hoping to be at this point by end of March.
- Derive recommendation for IEC WG6