Revised OM1 Monte Carlo Set based on index profile data

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CORNING
Discovering Beyond Imagination

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Summary

The MC67YY OM1 mode delay set was compared to mode delays calculated from measured index profiles from 1999-2000. These delays agree with the 1998 “MBI310” delays used in the 1GbE MBI work, including a subset presented in abbott_1_0704.pdf at the Portland meeting in July 2004.

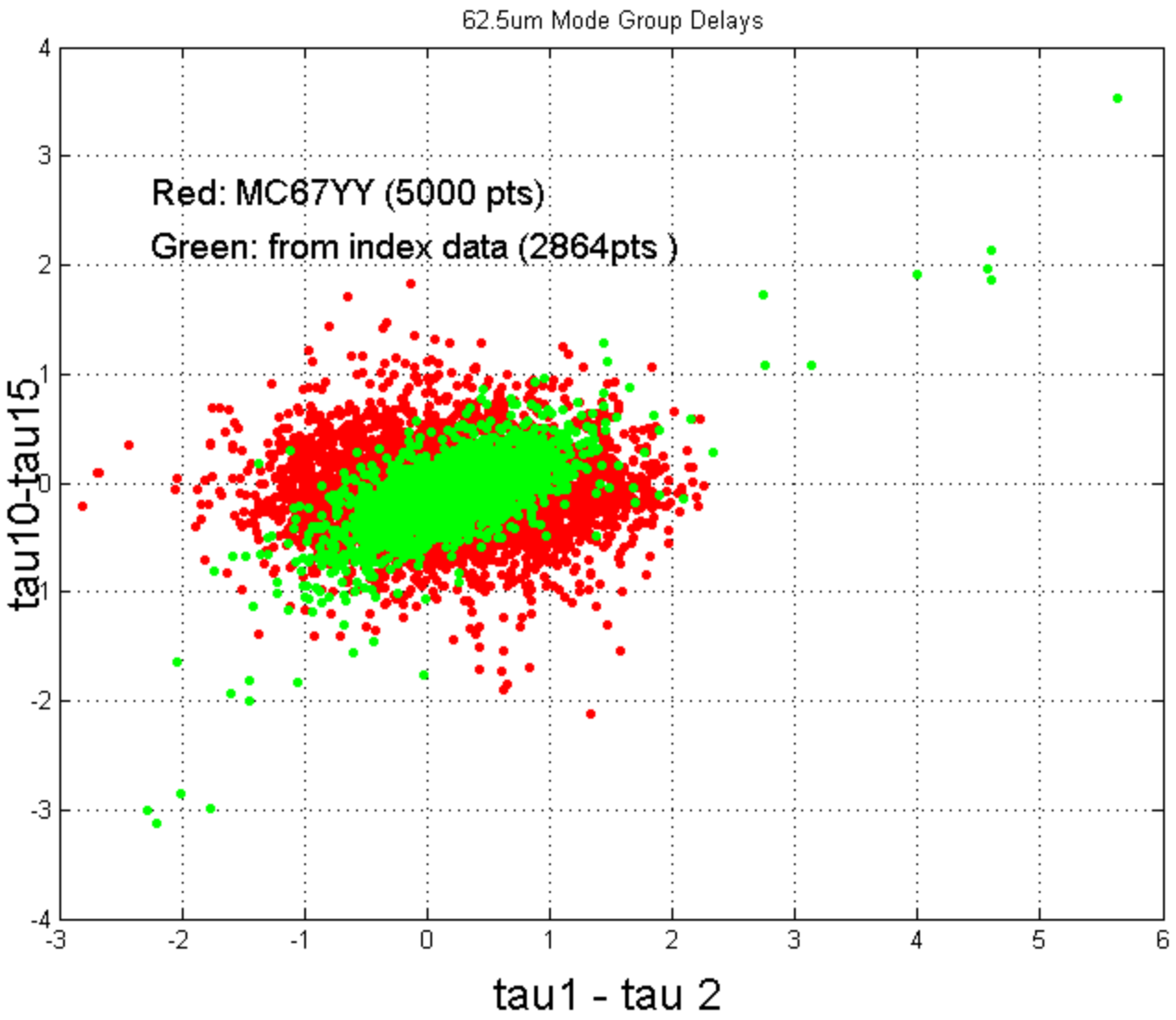
The mode delays from index data show a correlation between inner mode delays and those relevant to an offset launch. In contrast, by construction the MC67YY delays (as well as the TIA OM3 delays) show no correlation. Because the dual launch statistics are predicted upon center and offset being independent, this effect should be included in an improved data set.

Additional comments

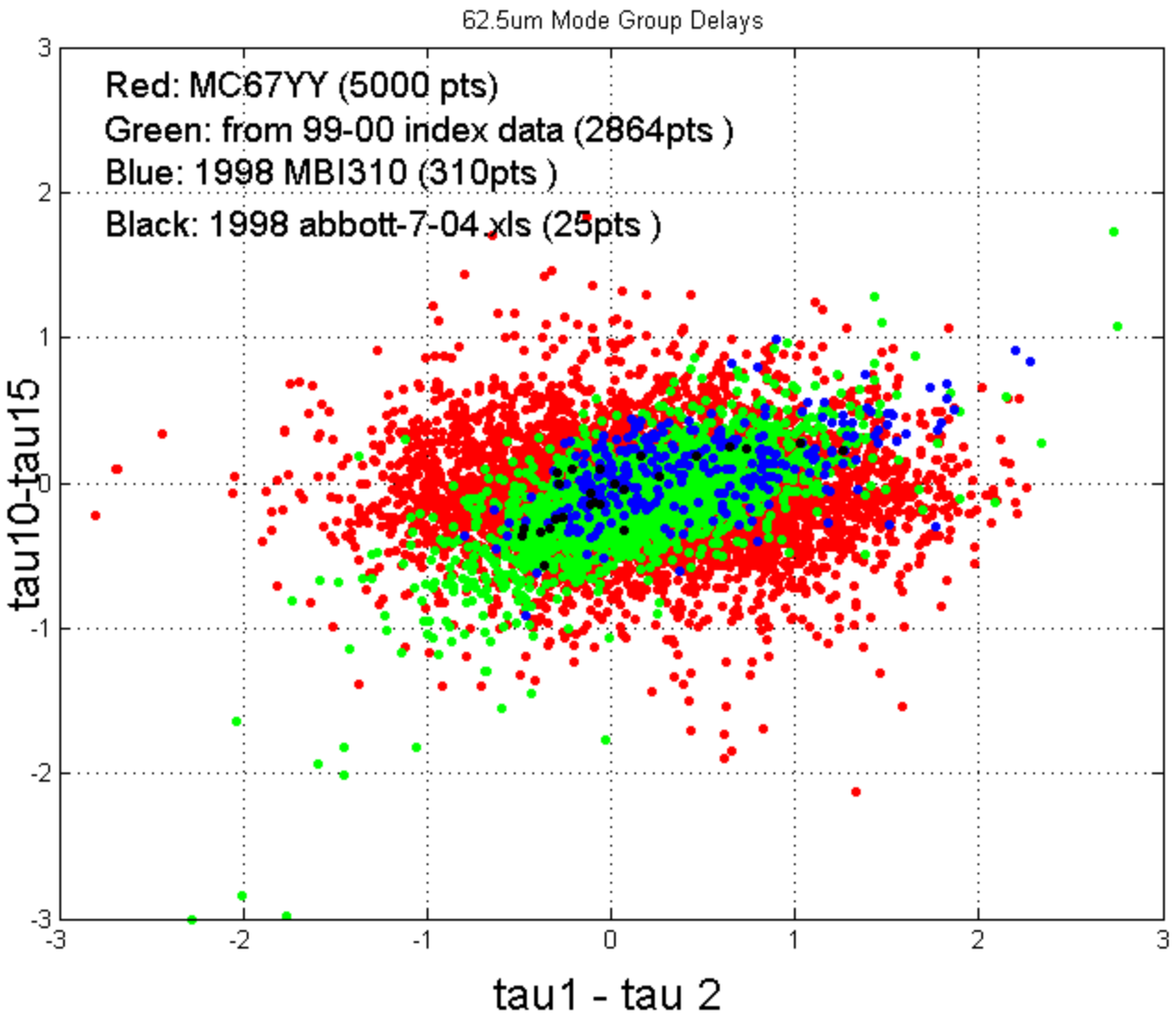
A correlation was also seen between center launch and offset launch in measured DMD data provided by both Corning and OFS. That data was questioned because it was measured on long lengths. The index profiles do not have a length dependence issue.

The mode delays from index data do not include the larger perturbations associated with the ends of the blank or the ‘start up’ of a fiber draw process as a blank is drawn. Hence they give an optimistic estimate of mode delays.

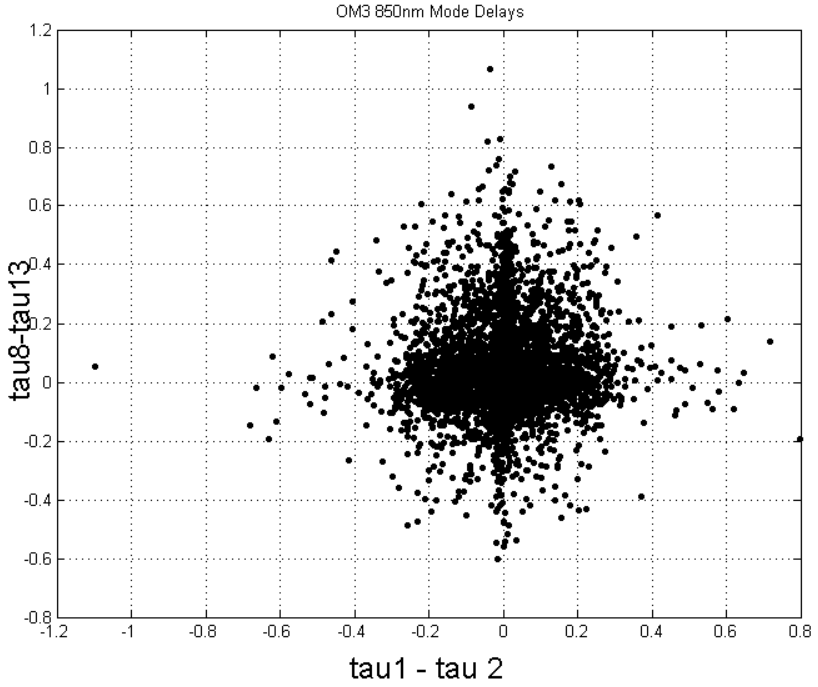
Comparison of MC67YY & delays from index data

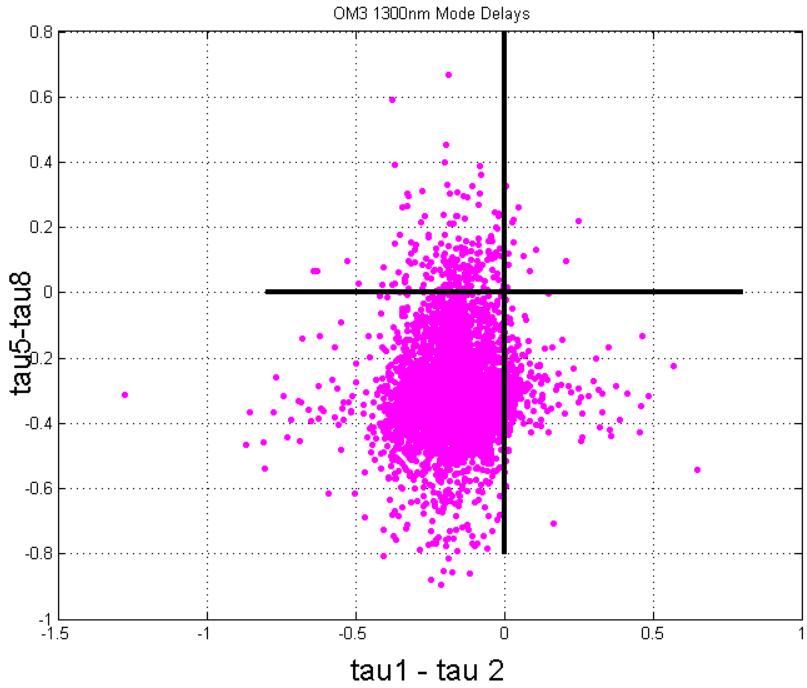


Comparison of MC67YY & delays from index data



TIA OM3 data set at 850nm & 1300nm





850nm

1300nm

OM3 data set also has no correlation between center & offset, like MC67YY. LRM is only using center launch so no effect…

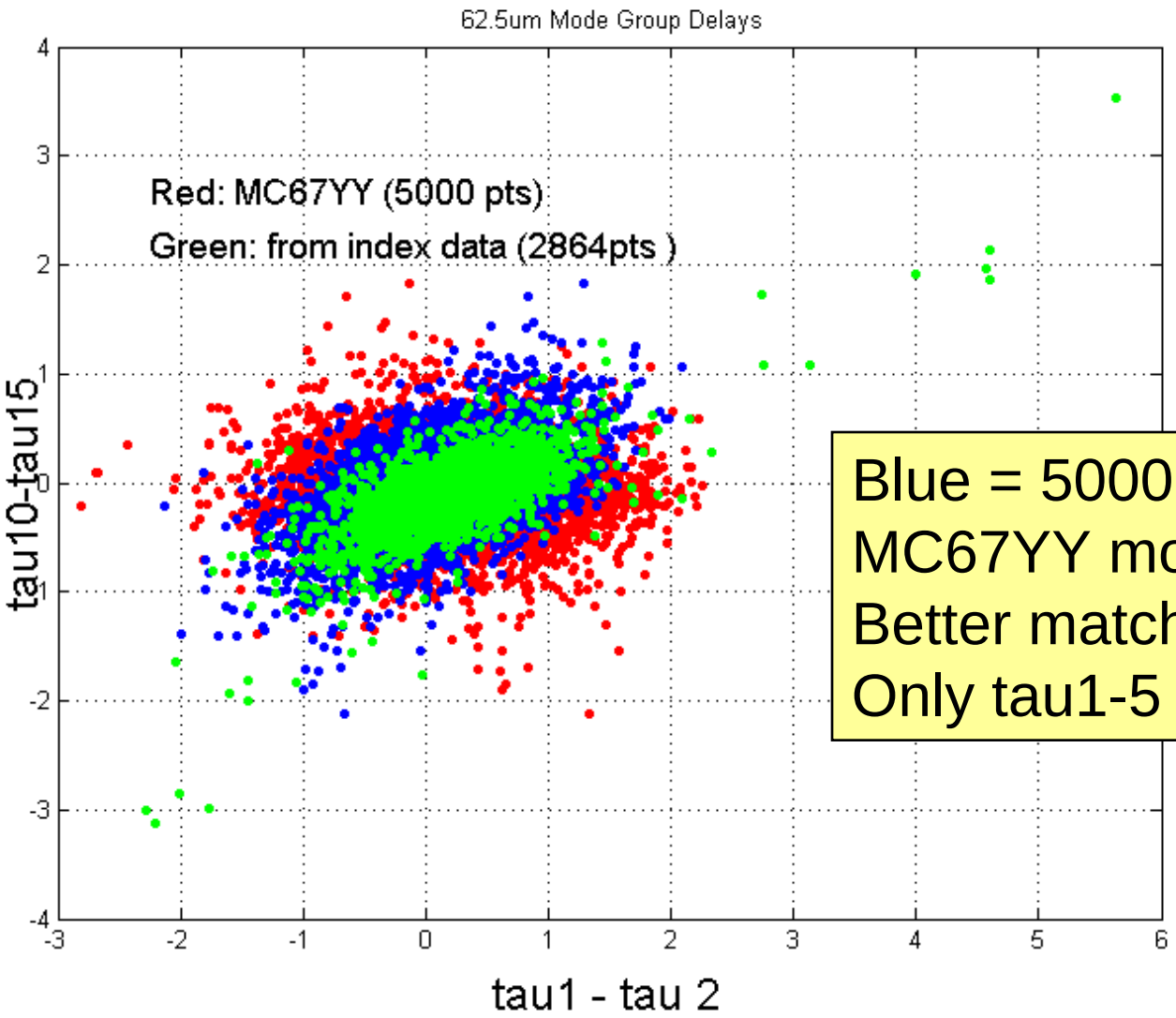
Alternatives to correcting MC67YY data set

a. Shift inner modes by partly merging with an “alpha error” which agrees with the mode delay trend of the outer modes

b. “Swap” inner mode structure of MC67YY fibers to better match measurement data.

May only have small effect on dual launch, need to make calculations.

Example corrected MC67YY mode delay set



Blue = 5000 corrected MC67YY mode delays; Better match to green data. Only tau1-5 changed.

Understanding & Required Action

Action: The statistical independence of the center and offset launch has not been verified; the OM1 modeling needs to reflect the correlation between inner and outer mode delays to make robust estimates of requirements for the standard.

Understanding: The index perturbations and the resulting mode delays are affected by overall “alpha” perturbations and local index perturbations; the balance between these determines the correlation between center launch BW etc. and that with offset launch.