# Monte Carlo FDDI test set

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IEEE P802.3aq 10GBASE-LRM Task Force

Task 1Teleconference

# Summary/Outline

1. Notes on Purpose of Monte Carlo set for FDDI EDC testing.
2. Criteria for generating the set.
3. GEN54YY test set (5000 delays)
4. Comparison with criteria data from fiber manufacturers
5. Discussion; future work; areas for improvement

# 1. Purpose of FDDI Monte Carlo set

The purpose of a large ‘Monte Carlo’ set of mode delays is to provide a large base of mode delays in approximately the proportion found in manufacturing, for purposes of modeling with a variety of ‘sources’.

The procedure was using in the TIA FO4.1.2 working group on modal bandwidth to develop for OM3 fiber for 300m 10GbE applications.

The IEEE 802.3aq application is slightly different, because the distribution is intended to approximate the ‘installed base’ of FDDI.

# 2a. Criteria for generating the set

The initial approach for generating the set is to follow the same procedure as Ritger/Golowich/Abbott for the TIA OM3 development: the mode delays follow line segments whose slopes vary randomly like local alpha shifts. In addition, the inner modes are given additional random variation.

Upon review of initial modeling of a FDDI Monte Carlo set by this procedure and further review of the TIA Monte Carlo set, it was seen that the BW distribution produced is too broad, including BWs implausibly if not unphysically high. Adjusting the distribution to reduce the very high BWs tends to result in too many low BW fibers.

# 2b. Criteria for generating the set

The solution followed was to include more variation in the mode delays, comparing to the example Corning "MBI310" data presented at the July 2004 Portland meeting.

Variations were tested and included which moved the OFL BW distribution closer to what was estimated from index profiles from 1998-99. In addition, aspects of the DMD centroid curve and offset bandwidth were checked for consistency.

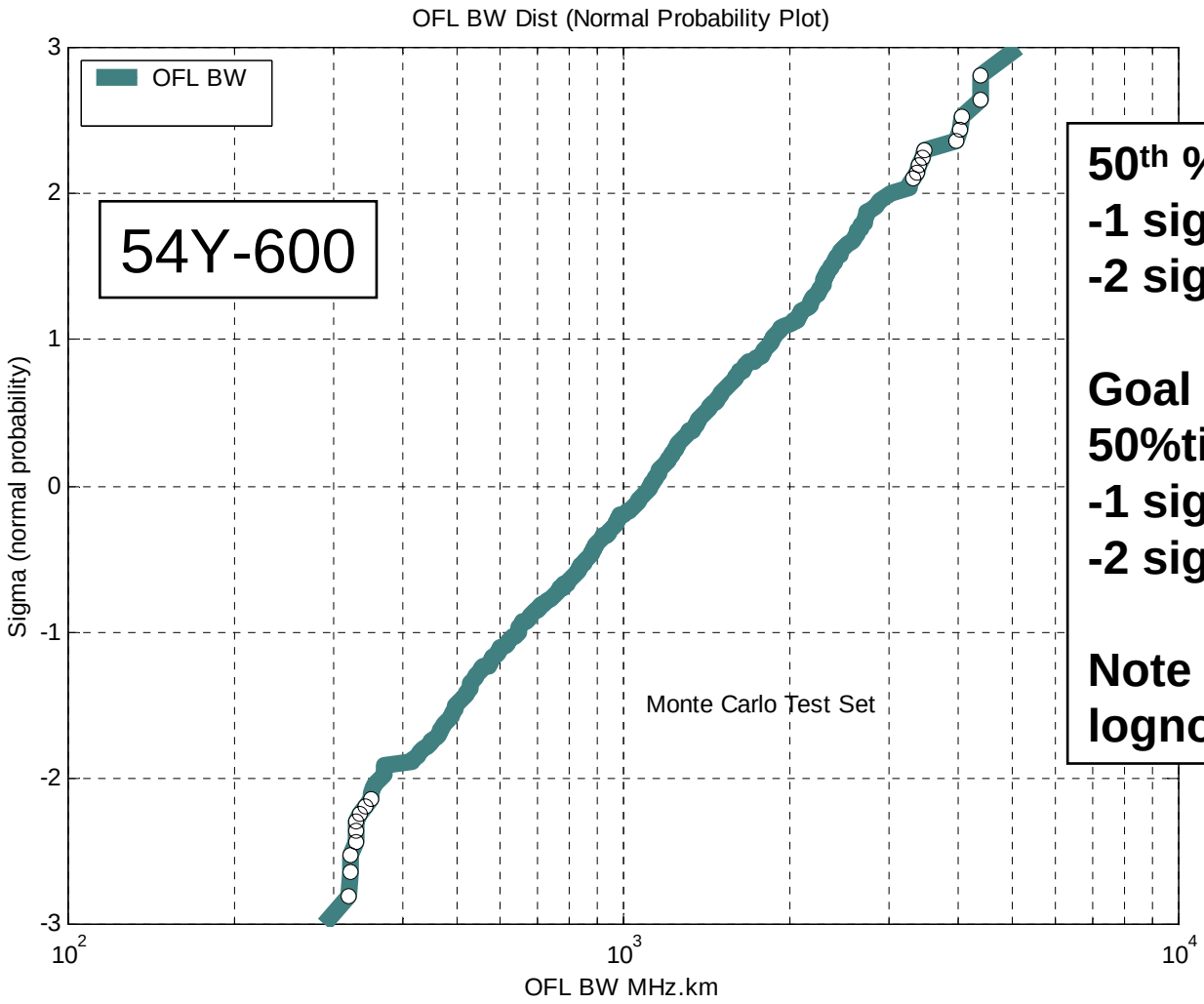
OFL BW distribution data was shared by fiber manufacturers and is compared to the test set data. DMD data will also be compared to the test set data.

# 3. Gen54YY test set data

After more than 50 iterations a test set of 1000 mode delays Gen32a was shared with Jonathan Ingham and the Cambridge group. The main observations were that approximately 5% of the fibers had centroid DMD ranges of about 1.5-2.5nsec/km, more or less as ‘expected’, but that a higher percentage of fibers had BWs below 600/500/400MHz.km than ‘expected’.

After approximately 20 additional iterations a set Gen54YY of 5000 mode delays was generated for additional testing and review. This test set data (or subsets) is presented here.

# Gen5P54Y: OFL norm prob plot




**50th %tile ~ 1000+MHz.km**
**-1 sigma ~650MHz.km**
**-2 sigma~350-400MHz.km**

**Goal was**
**50%tile ~ 900-950**
**-1 sigma~600**
**-2 sigma~400**

**Note curve retains lognormal form.**

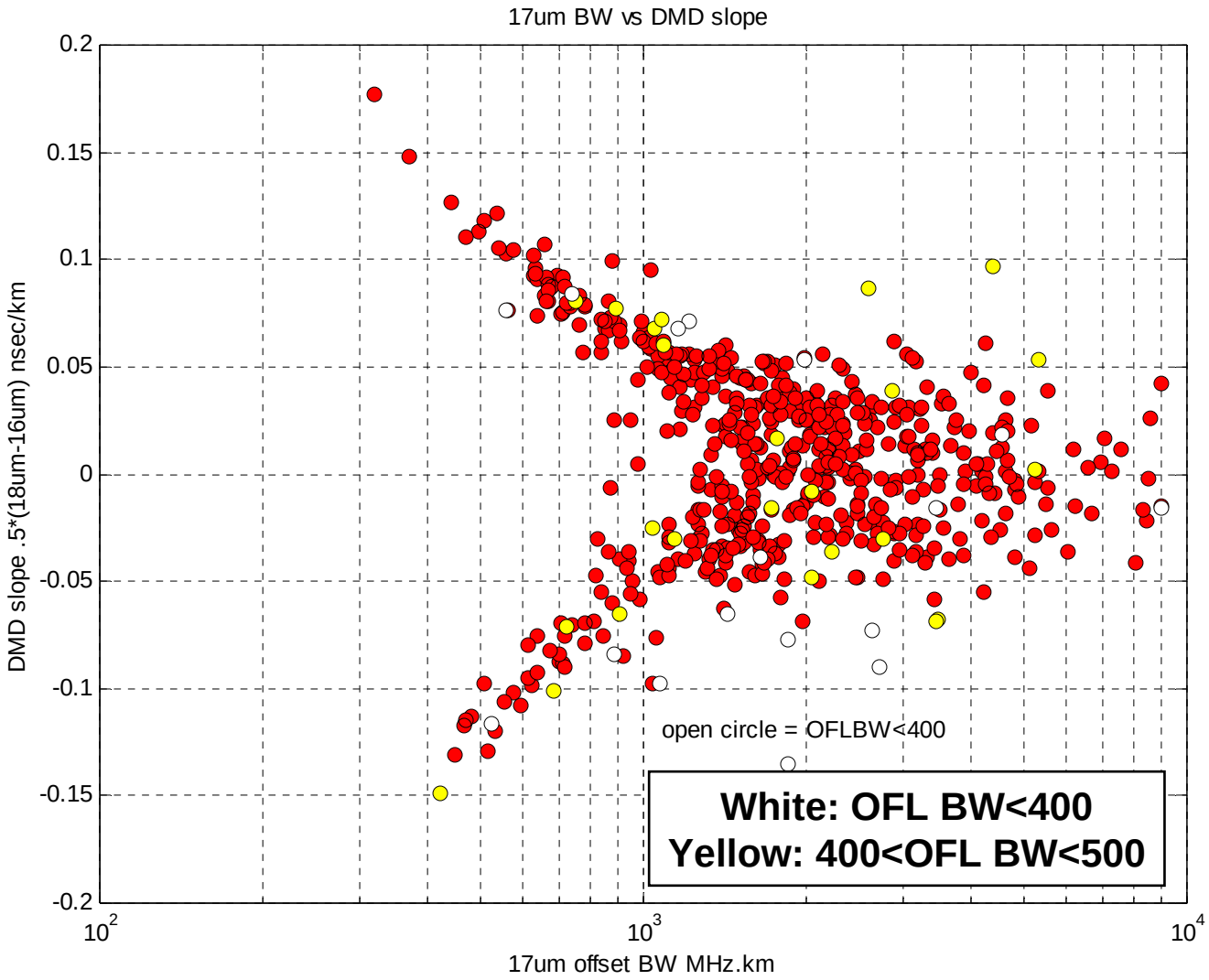
**600 fibers in this subset**

# Gen5P54-54Y: DMD range vs. offset BW

54Y-600

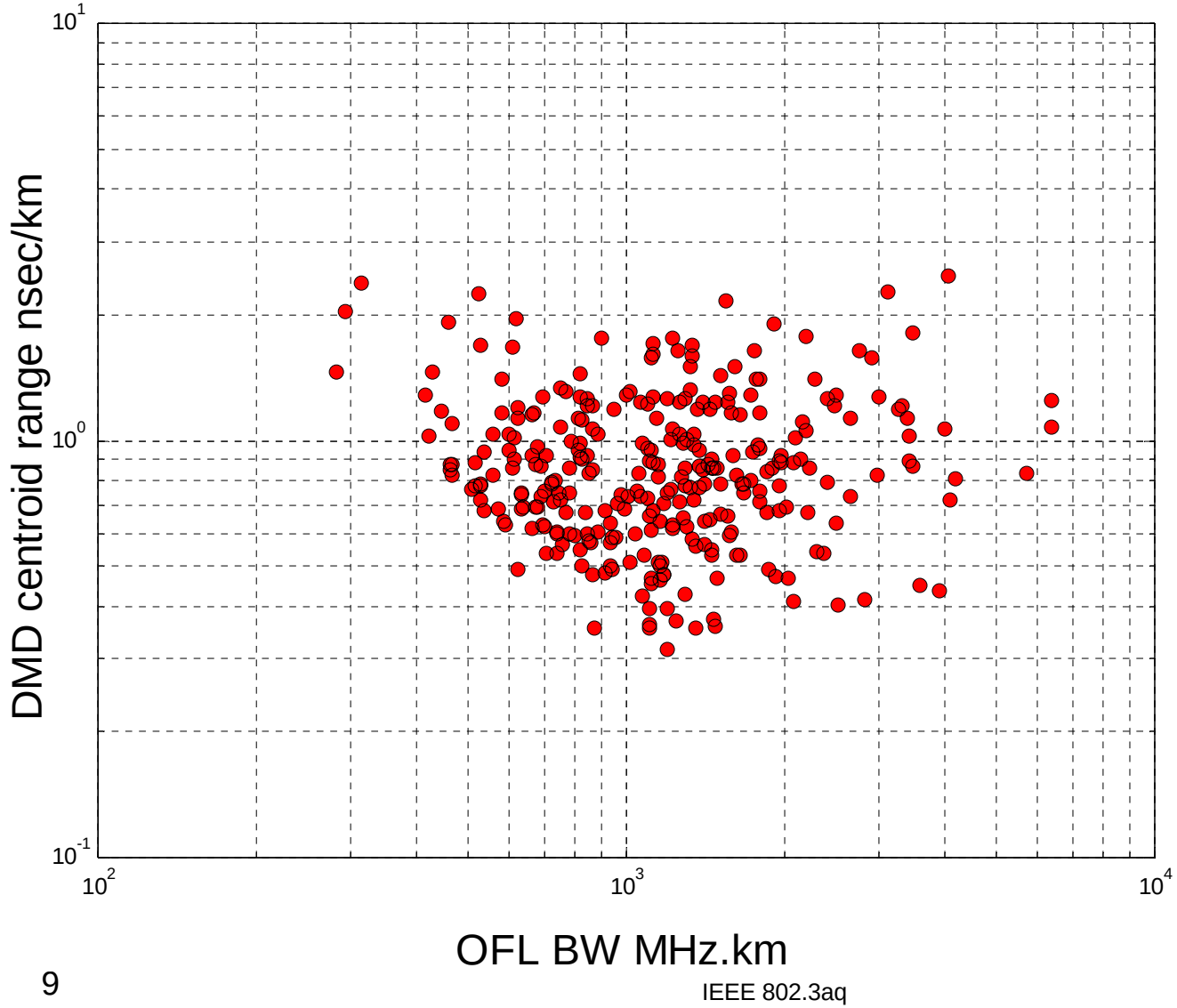
**The plot of DMD slope vs offset BW at 17um has this characteristic shape in both MBI310data and the Cambridge Rev2 65 fibers.**

**Low BW is due to a slope in the DMD.**




**600 fibers in this set**

# 4. Gen54YY DMD range vs. OFL BW



# 4. Comparison to data

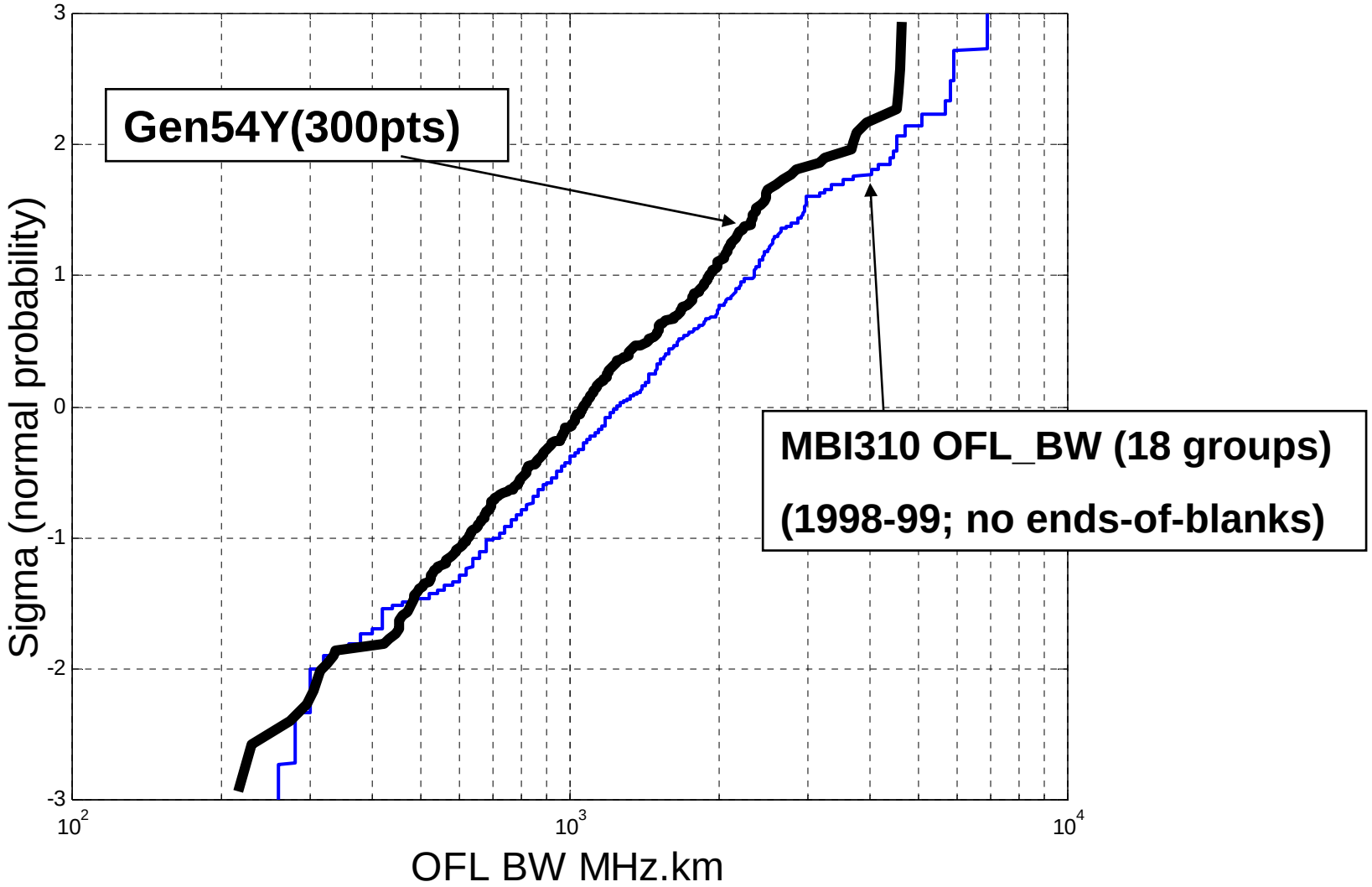
a. Optical Fiber Communications (ed. T Li) volume 1: Fiber Fabrication. p. 266. “Production was started in 1982 on this design [62.5um fiber] with outstanding performance. For a recent production sample of 10,000km, mean values of 710MHz.km were obtained for the enhanced fiber design.”

b. MBI310 profile data and calculated mode delays

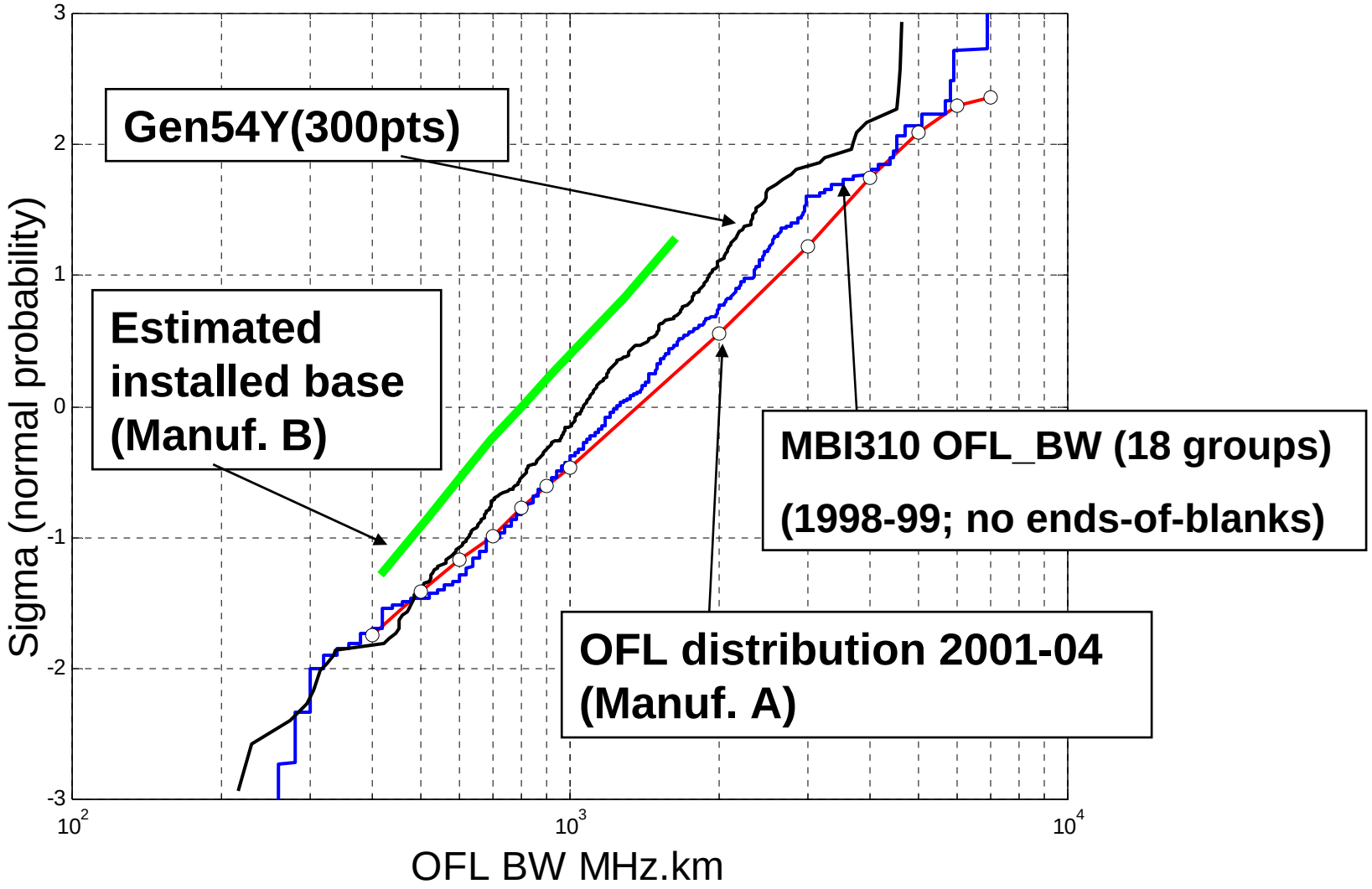
c. OFL BW distribution data being shared by fiber manufacturers.

d. Some older DMD data may also be available.

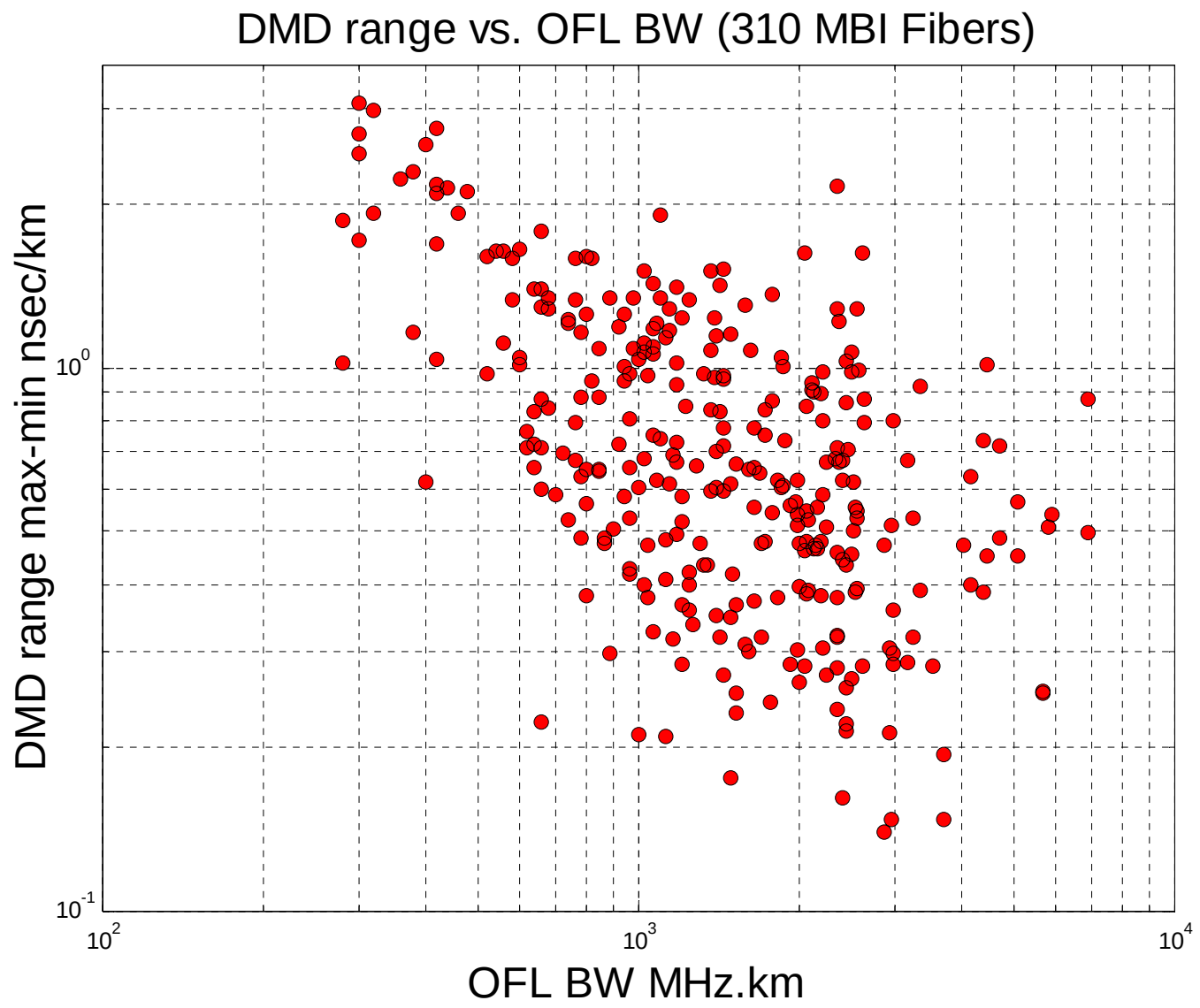
# 4. Comparison to MBI310 OFL BW



# 4. Comparison to available data



# 4. MBI310 DMD range vs. OFL BW



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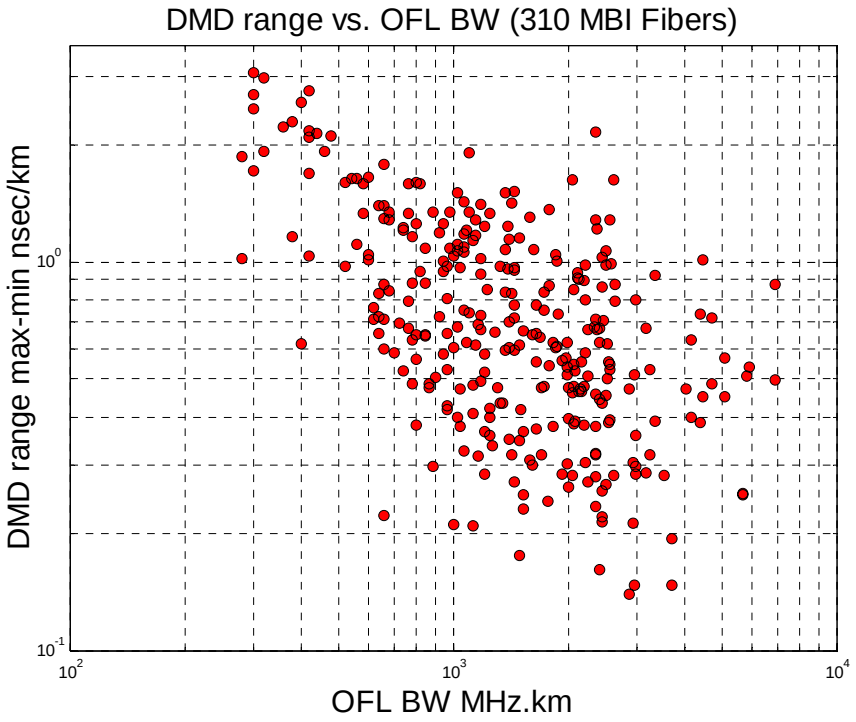
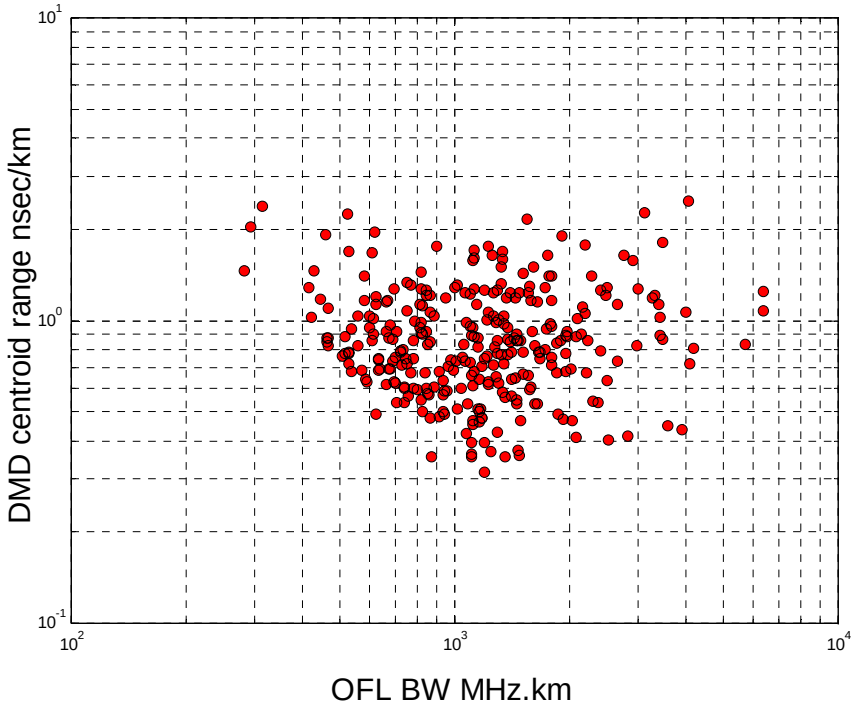
# 4. DMD range vs. OFL BW




MBI310




GEN54YY

# 5. Discussion

a. Continue looking for better “knobs” to adjust data set to match details of OFL & DMD distributions.

b. Data is optimistic compared to installed base.

c. Different purpose than TIA OM3 set (did not use tail of distribution for TIA OM3 data set).