

CORNING

Relative cost of 100GbE
point-to-point links

John Abbott, Doug Coleman,
Jabulani Dhiwayo, Peter Ronco,
Steve Swanson

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Optical Fiber

Summary

The relative cost of 4 approaches were estimated:

1. MM OM3 fiber full parallel (1x10x10 SDM) (850nm)
2. MM OM3 fiber using 2 wavelength cWDM (2 x 5 x10 cWDM) (~850nm)
- 3a. SMF OS2 fiber using 10 wavelength cWDM (10x1x10 cWDM); 12 fiber ribbon
- 3b. SMF OS2 fiber using 10 wavelength cWDM (10x1x10 cWDM); 24 fiber ribbon

Approach

Point to Point topology considered here.

- Use standard cable at estimated 2010 price. Use 144 fiber ribbon for MM to spread out some of the costs (Corning estimate); same with 12 fiber and 24 fiber SMF ribbons.
- Use standard connector hardware at estimated 2010 price (Corning estimate)
- Use lasers at estimated 2010 price (using input from laser manufacturers)
- Combine (1),(2),(3); divide appropriately to get cost of single 100Gb “circuit”. Then normalize to compare to 10x10 MM SDM over OM3

Comments

- 1. Estimates for cable & cable hardware pretty solid; MM cWDM results sensitive to assumption of 2010 price – we will vary the price by 50% and show the effect.**

1. Cable

We are using 144 fiber ribbons (MM) or 12/24 fiber ribbons (SMF). These will enable different numbers of “links” or “circuits”. The final plots of cost will normalize to a “cost per circuit”

OM3 MMF	10x10 SDM	OM3	144F Plenum Ribbon
OM3 MMF	2x5x10 cWDM	OM3	144F Plenum Ribbon
OS2 SMF	cWDM 10x10	OS2	12F Plenum tight buffer
OS2 SMF	cWDM 10x10	OS2	24F Plenum tight buffer

2. Cable Hardware: MM

We are using 144 fiber ribbons (MM)

	<u>Number</u>
OM3 Fiber 144F Plenum Ribbon	
19 inch frame	1
Inter Bay Unit	1
Fiber Management Spools	4
IBS Cover	1
Closet Jumper Management Panel	2
MTP/MPO connector	12
MTP Riser Jumpers	12
Closet Connector Housing 1U	1
Connector Panel 6 MTP	2

2. Cable Hardware: SMF

SMF 12F Plenum MIC	<u>Number</u>
19 inch frame	1
Inter Bay Unit	1
Fiber Management Spools	4
IBS Cover	1
Closet Jumper Management Panel	2
LC Connector	12
Duplex LC Riser Jumper	6
Closet Connector Housing 1U	1
Connector Panel 12 LC	1

**We are
comparing 12
fiber and 24
fiber ribbons**

SMF 24F Plenum MIC	<u>Number</u>
19 inch frame	1
Inter Bay Unit	1
Fiber Management Spools	4
IBS Cover	1
Closet Jumper Management Panel	2
LC Connector	24
Duplex LC Riser Jumper	12
Closet Connector Housing 1U	1
Connector Panel 12 LC	2

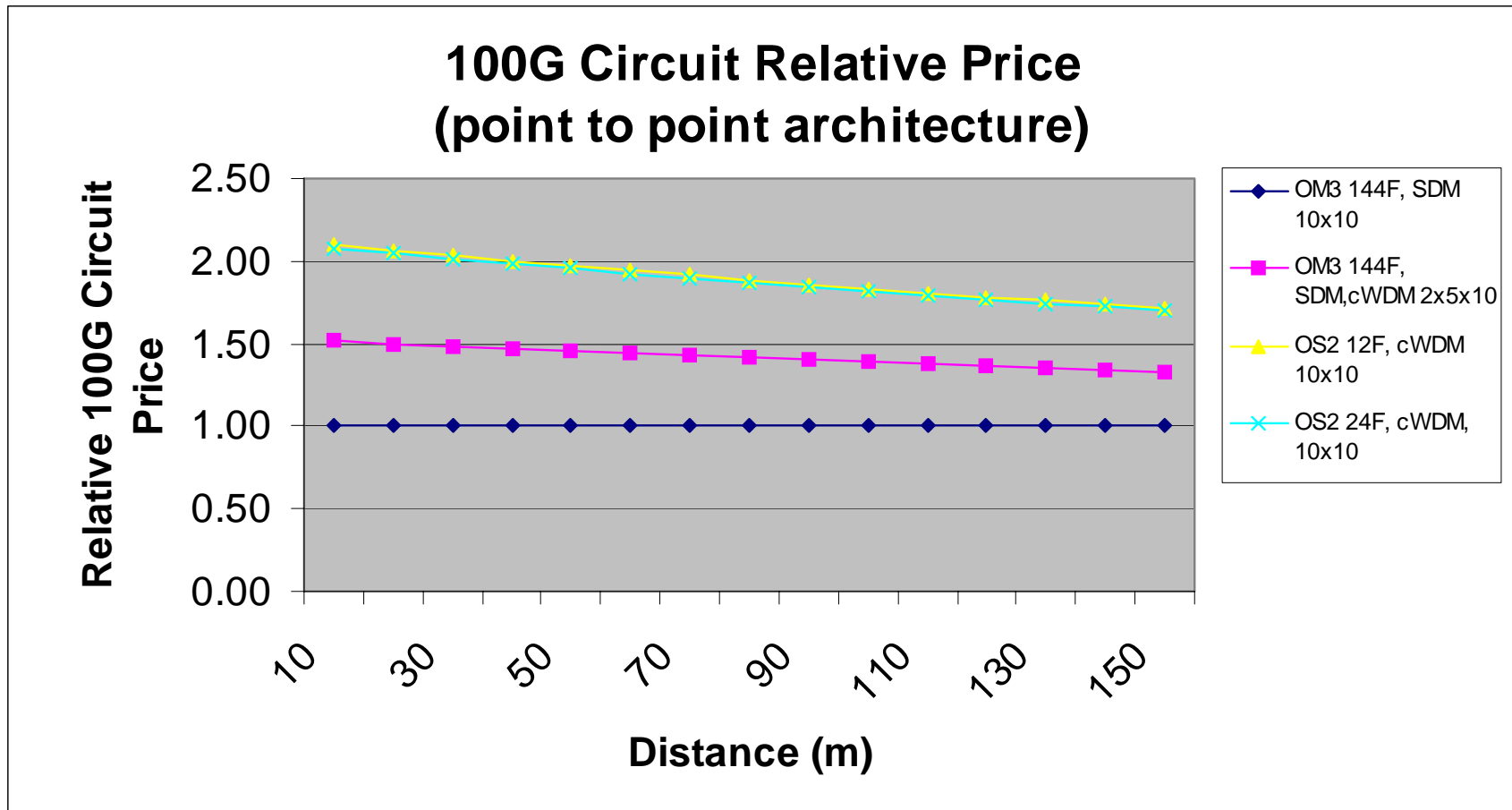
3. End-user Electronics

End User Electronics		
OM3	10x10 SDM 2x5x10 cWDM/SDM	850nm array VCSEL ~850nm array VCSEL
SMF	10x10 cWDM	~1300nm array

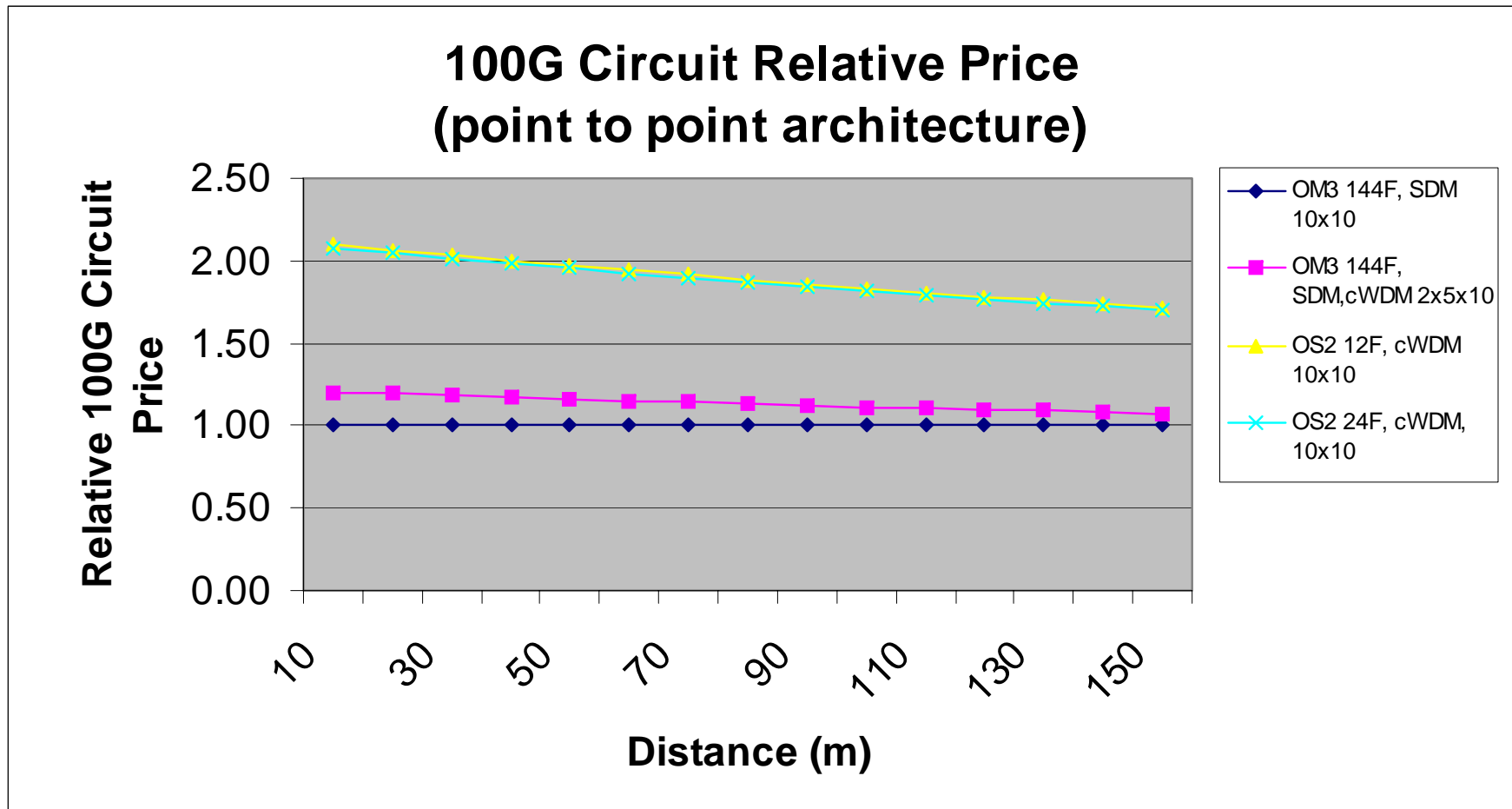
4. Combining to make circuits

1. **OM3 10x10 SDM uses 24 fibers for 1 circuit, hence 144F ribbon makes 6 circuits.**
2. **OM3 2x5x10 cWDM uses 12 fibers for 1 circuit, hence 144F ribbon makes 12 circuits.**
3. **OS2 10x10 cWDM uses 2 fibers for 1 circuit, hence 12F ribbon makes 6 circuits.**
4. **OS2 10x10 cWDM uses 2 fibers for 1 circuit, hence 24F ribbon makes 12 circuits.**

4. Results (2x5 MM laser between 1x10 and 10x1)

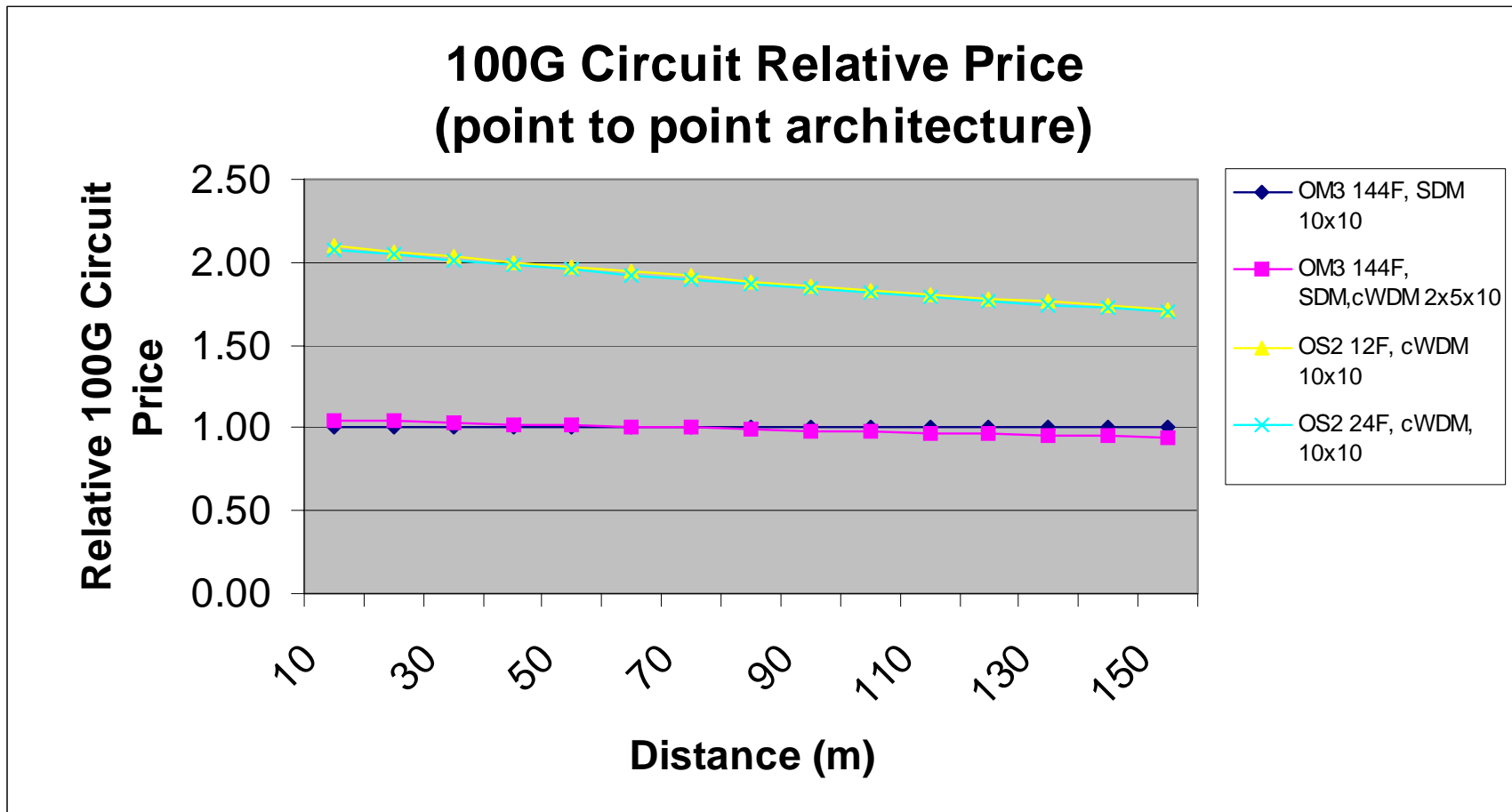


4. Results: MM 2x5 laser = 40% more than 1x10 laser

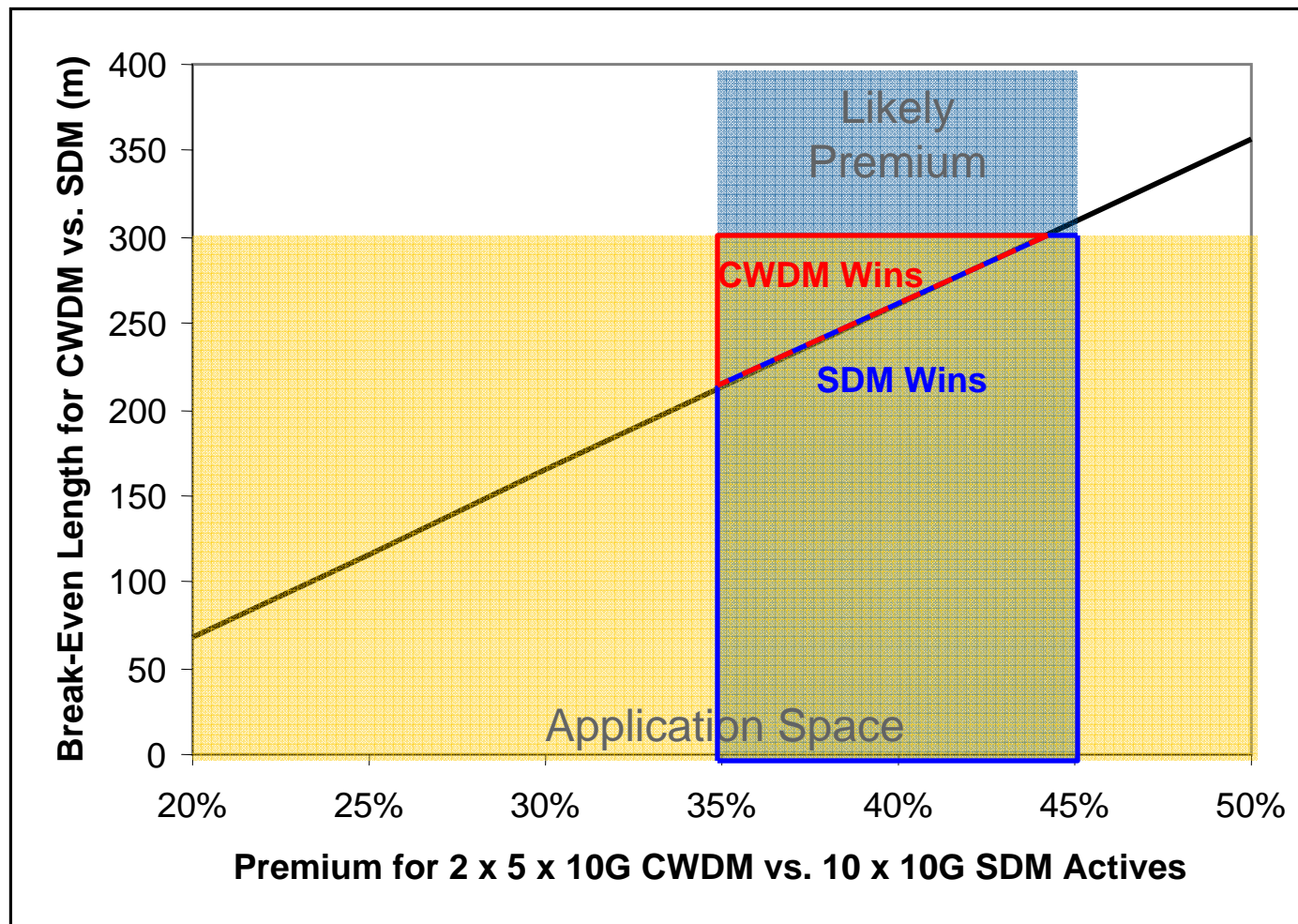


4. Results: MM 2x5 laser = 20% more than 1x10 laser

Crossover point increases from 70m to 100m as price increases from 20% to 23%



SDM OM3 design provides most cost effective, lowest risk solution for the link lengths of interest



Conclusions

SMF solutions are close together (12F vs 24F ribbons)

MM solutions appear to be the cost-effective solution for short length point-to-point connections.

Relative cost of SDM vs cWDM MM solutions depends on assumptions of laser costs. We have talked to multiple laser manufacturers and our plots reflect the spread of opinion. No manufacturer suggested a price premium below 20% for 850nm 2x5 array VCELS, and multiple manufacturers considered the 1x10 array a much more viable product.