Power Budget Calculations for GarrettCom Inc. Fiber Transceivers

Receiver Sensitivity and Transmitter Power are the primary parameters necessary to compute the power budget available. To calculate the power budget of different fiber media installations using Magnum products, the following equations should be used:

OPB (Optical Power Budget) = P_T(min) - P_R(min)

where P_T = Transmitter Output Power, and P_R = Receiver Sensitivity Power

Worst case OPB = OPB - 1dBm(for LED aging) - 1dBm(for insertion loss)

Worst case distance = {Worst case OPB, in dBm} / [Cable Loss, in dBm/Km]

where the "Cable Loss" for 62.5/125 and 50/125µm (M.m) is 2.8 dBm/km,

and the "Cable Loss" for 100/140 (Multi-mode, 850nm) is 3.3 dBm/km,

and the "Cable Loss" for 9/125 (Single-mode, 1310nm) is 0.5 dBm/km (a worst case industry number)

and the "Cable Loss" for 9/125 (Single-mode, 1310nm) is 0.4 dBm/km (LXSC25)

and the "Cable Loss" for 9/125 (Single-mode 1550nm) is 0.25 dBm/km (ZXSC40, SSCX)

and the "Cable Loss" for 9/125 (Single-mode 1550nm) is 0.2 dBm/km (ZXSC70)

and the "Cable Loss" for 9/125 (Single-mode 1550nm) is 0.22 dBm/km (ZXSC120)

The following data has been collected from component manufacturer's (Agilent, IBM, Lucent and others) web sites and catalogs to provide guidance to network designers and installers.

Fiber Port Connector Type	Speed, Std.	Mode	Std. km fdx (hdx)	Wave-length nm	Cable Size µm	X'mitr Output P_T, dBm	R'cvr Sens. P_R,dBm	Worst OPB, dBm	Worst* distance Km, fdx	typical OPB, dBm	typical* distance Km, fdx
ST	10 Mb FL	Multi-	2+ (2)	850	62.5/125 100/140 50/125	-15.0 -9.5 -19.5	-31 -31 -31	14 19.5 9.5	**5** **5.9** **3.4**	17 23.5 13.5	**6** **7** **4.8**
ST	10 Mb FL	Single-	10+ (5)	1310	9/125	-30.0	-39	7	**14**	13	**26**
ST or SC	100 Mb FX	Multi-mode	2+ (0.4)	1310	62.5/125 50/125	-20 -23.5	-31 -31	9.0 5.5	**3.0** **2.0**	14 12	**5** **4**
SST	100 Mb FX	Single-	18+ (0.4)	1310	9/125	-20	-31	9	**18**	12.5	**25**
SSC	100 Mb FX	Single-	18+ (0.4)	1310	9/125	-20	-31	9	**18**	12.5	**25**
SSCL Long Reach	100 Mb FX	Single-	40+	1310	9/125	-5	-34	27	**54**	32.5	**65**
SSCX 1550nm spcl.	100 Mb FX	Single-	100+	1550	9/125	-5	-35	28	**112**	33	**124**
MTRJ	100 Mb FX	Multi-	2+ (0.4)	1310	62.5/125 50/125	-19 -23.5	-31 -31	10 5.5	**3.5** **2.0**	15.8 12.2	**5.5** **4.0**
MLC	100 Mb FX	Multi-	2+ (0.4)	1310	62.5/125	-19	-31	10	**3.5**	18	**6.5**
SLC	100 Mb FX	Single-	18+	1310	9/125	-15	-31	14	**28**	23	**46**
SLCL Long Reach	100 Mb FX	Single-	40+	1310	9/125	-5	-34	27	**54**	32.5	**65**
SXSC GBIC	1000 Mb SX (Gigabit)	Multi -	0.55+	850	62.5/125 50/125	-9.5	-17	5.5	**2**	12.5	**4**
LXSC 10 GBIC	1000 MbLX (Gigabit)	Single-	10+	1310	9/125	-9.5	-20	8.5	**17**	10.5	**21**
LXSC 25GBIC	1000 Mb LX (Gigabit)	Single-	25+	1310	9/125	-4.0	-21	15	**38**	17.5	**43**
ZXSC 40 GBIC	1000 Mb ZX (Gigabit)	Single-	40+	1550	9/125	-4.0	-21	15	**60**	17.5	**70**
ZXSC 70 GBIC	1000 Mb ZX (Gigabit)	Single-	70+	1550	9/125	-3.0	-23	18	**90**	20.5	**102**
ZXSC 120 GBIC	1000 Mb ZX (Gigabit)	Single-	120+	1550	9/125	0.0	-32	28	**126**	29.5	**133.5**
SFP-SX	1000 Mb SX (Gigabit)	Multi-	0.55+ (0.22)	850	62.5/125 50/125	-9.5	-17	5.5	**2**	10.5	**4**
ESX	1000 Mb SX + Extn. Dist.	Multi-	2+	1310	62.5/125 50/125	-9.0	-19	8	**2.8**	12	**4**
SFP-LX10	1000 Mb LX (Gigabit)	Single-	10+	1310	9/125	-10.0	-22	10	**22**	11	**24**
SFP-LX25	1000 Mb LX (Gigabit)	Single-	25+	1310	9/125	-3.0	-21	16	**40**	18	**45**
SFP-ZX40	1000 Mb ZX (Gigabit)	Single-	40+	1550	9/125	-5.0	-22	15	**60**	17	**68**
SFP-ZX70	1000 Mb ZX (Gigabit)	Single-	70+	1550	9/125	-2.0	-22	18	**90**	20	**100**

***Note**: The use of either multi-mode or single-mode fiber to operate at 100 Mbps or Gb speed over long distances (i.e., over approx. 400 meters) can be achieved **only** if the following factors are both applied:*

- *The fiber segment must operate in full-duplex (FDX) mode*
- *The worst-case OPB of the fiber link must be greater than the fiber cable's passive Attenuation.*

(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)

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