Radiation Database Survey 2001-2008:

Executive Summary:

The following data represents a continuing research effort to maintain a clear and concise tool for the radiation effects community. More specifically groups developing fiber optic technology operating in radiation sensitive environments. Recently, a need arose to revisit and update the original database summary work by M. Ott [1] due in part to the severe decline of the telecom industry and the present state of the technology sector as whole.

Since the decline of the telecom industry many companies in particular fiber optic companies have been bought, sold, or no longer in business and often during these times manufacturing methods and procedures change. For example, a product manufactured under one company may have performed above expectations several years ago and due to a “buy-out” or re-structuring of some kind may not perform adequate today and vice a versa. The reasons just stated imply that a watchful eye be dedicated to industry changes and technology trends not only to update this database, but discover new and possibly better performing technologies for future endeavors.

[1] M. Ott “Radiation Effects Data on Commercially Available Optical Fiber: Database Summary,” Nuclear Science and Radiation Effects Conference, Phoenix, Arizona, NSREC 2002, Data Workshop Proceedings, July, pp.24-31.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Page#	Vendor	Part#	Fiber Type	Core/Clad	Length	Lambda	Test Type	Dose Rate	Total Dose	C.O.T.S. Still? (Yes or No)	Info?	MISC Notes about fiber/Company	Website Ref	
2	01/01	Bicron	BCF-98	Polystyrene w/PMMA; MM	1-2mm Total	6-100cm	400-700	100kv X-Ray	Less than 10Gr/hr	Approx 2.2 kGy Total	No; Not Available Anymore	Yes; PDF	Subsidiary of Saint-Gobain Crystals (HQ in Paris)	http://www.bicron.com/	
3	01/01	Kuraray	SCSF-38	Polystyrene w/PMMA; MM	1-2mm Total	6-100cm	400-700	100kv X-Ray	Less than 10Gr/hr	Approx 2.2 kGy Total	Could not confirm part#	No	Sent email to company for info 11-20-2008	http://www.kurarayamerica.com/	
4	01/01	Kuraray	SCSF-81	Polystyrene w/PMMA; MM	1-2mm Total	6-100cm	400-700	100kv X-Ray	Less than 10Gr/hr	Approx 2.2 kGy Total	Could not confirm part#	No	Sent email to company for info 11-20-2008	http://www.kurarayamerica.com/	
5															
6	01/03	Mitsubishi Rayon	SH8001	Polystyrene w/PMMA; MM	2mm	10-100m	300-800	Beta, Gamma, Neutron	could not confirm	could not confirm	Yes; Part numbers may have changed	Yes; PDF	Now made by "ESKA" fiber	http://www.pofeska.com/pofeskae/pofeskae.htm	
7															
8	01/04	Lucent	HE980 (amp)	could not confirm	could not confirm	3m	wht light	Gamma; Proton	could not confirm	Proton(5.6-28MeV); Gamma(50 Krad)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/fiber/	
9	01/04	Lucent	HP980 (amp)	could not confirm	could not confirm	3m	wht light	Gamma; Proton	could not confirm	Proton(5.6-28MeV); Gamma(50 Krad)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/fiber/	
10	01/04	Lucent	MP980 (amp)	could not confirm	could not confirm	3m	wht light	Gamma; Proton	could not confirm	Proton(5.6-28MeV); Gamma(50 Krad)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/fiber/	
11	01/04	Lucent	LP980 (amp)	could not confirm	could not confirm	3m	wht light	Gamma; Proton	could not confirm	Proton(5.6-28MeV); Gamma(50 Krad)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/fiber/	
12	01/04	Lucent	HG980 (src)	could not confirm	could not confirm	3m	wht light	Gamma; Proton	could not confirm	Proton(5.6-28MeV); Gamma(50 Krad)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/fiber/	
13	01/04	Lucent	R37003 (src)	could not confirm	could not confirm	3m	wht light	Gamma; Proton	could not confirm	Proton(5.6-28MeV); Gamma(50 Krad)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/fiber/	
14															
15	02/02	USConec	MTP 12-Fiber Rib	OFS Fitel Glass Fibers	100/140	5.24m	could not confirm	Co^{60}	4 rads/min (10d 18hr)	61.9 krads	Yes; COTS	Yes; PDF	USConec buys fiber from OFS Fitel & Corning	http://www.ofsoptics.com/fiber/	
16															
17	02/06	Spectran	SMC-A0515B	SM UV 0.11na Acrylate	3/125/245	Delay Line 2Km	1064; 532	could not confirm	could not confirm	expected to see <0.16 dB/km	?; Left a voicemail w/tech support		Now called OFS (a Furukawa Company)	http://www.ofsoptics.com/index.php	
18	02/06	Spectran	SMC-A0980B	SM UV 0.11na Acrylate	6.2/125/245	Delay Line 2Km	1064; 532	could not confirm	could not confirm	expected to see <0.16 dB/km	?; Left a voicemail w/tech support		Now called OFS (a Furukawa Company)	http://www.ofsoptics.com/index.php	
19	02/06	Polymicro	FVP200220240	MM Step 0.22na Polyimide	200/220240	< 10m	1064; 532	could not confirm	0.038 rads/min	30 krads	Yes; COTS	Yes; PDF	Subsidiary of Molex (HQ in Paris)	http://www.polymicro.com/default.htm	
20	02/06	Polymicro	FVP100110125	MM Step 0.22na Polyimide	100/110/125	< 10m	1064; 532	could not confirm	0.038 rads/min	30 krads	Yes; COTS	Yes; PDF	Subsidiary of Molex (HQ in Paris)	http://www.polymicro.com/default.htm	
21															
22	02/08	Mitsubishi	STR1OOC-SY	MM Step Index	100/?	could not confirm	could not confirm	Co^{60}	could not confirm	Various Pre-Radiated and STD Doses	Yes; Part numbers may have changed	Yes; PDF	Now made by "ESKA" fiber	http://www.pofeska.com/pofeskae/pofeskae.htm	
23	02/08	Heraeous	SSU1.2107/00(F100)	MM Step Index	100/?	could not confirm	could not confirm	Co^{60}	could not confirm	Various Pre-Radiated and STD Doses	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
24	02/08	Heraeous	SIWU1.2 087/200(F300)	MM Step Index	100/?	could not confirm	could not confirm	Co^{60}	could not confirm	Various Pre-Radiated and STD Doses	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
25	02/08	Heraeous	STU1.2 237/2000	MM Step Index	100/?	could not confirm	could not confirm	Co^{60}	could not confirm	Various Pre-Radiated and STD Doses	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
26															
27	02/10	FORC (Moscow)	KS-4V	MM Step Index w/F Doped Clad	110/125/280	40m & 70m	829;1310;1514	Co^{60}	could not confirm	Max of 10^5 Gy total	?; Sent email FORC (Russia) to confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
28	02/10	Heraeous	Fluosil SSU 1.2	MM Step Index w/F Doped Clad	104/125/250	40m & 70m	829;1310;1514	Co^{60}	could not confirm	Max of 10^5 Gy total	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
29	02/10	Heraeous	Fluosil STU 1.2	MM Step Index w/F Doped Clad	104/125/250	40m & 70m	829;1310;1514	Co^{60}	could not confirm	Max of 10^5 Gy total	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
30	02/10	Mitsubishi	STR1OOC-SY	MM Step Index w/F Doped Clad	100/150/300	40m & 70m	829;1310;1514	Co^{60}	could not confirm	Max of 10^5 Gy total	Yes; Part numbers may have changed	Yes; PDF	Now made by "ESKA" fiber	http://www.pofeska.com/pofeskae/pofeskae.htm	
31															
32	02/17	Spectran	TCG	could not confirm	100um Core	<1m	640	Co^{60}	could not confirm	20MGy	?; Left a voicemail w/tech support		Now called OFS (a Furukawa Company)	http://www.ofsoptics.com/index.php	
33															
34	02/20	AT&T	HE980 Er-Doped	Erbium-doped	could not confirm	10m	1550	Co^{60}	could not confirm	1Mrad (si)	?; Left a voicemail w/tech support		AT&T (Lucent) is partners w/Alcatel and OFS	http://www.ofsoptics.com/index.php	
35	02/20	Corning	Puremode 1550c	Erbium-doped	could not confirm	3m	1550	Co^{60}	could not confirm	1Mrad (si)	Found old datasheet; Part# not available on website	Yes; PDF	Corning seems to have dis-con't this part	http://www.corning.com/opticalfiber/index.aspx	
36															
37	02/22	FORC (Moscow)	KS-4V	Pure Silica OH&Cl free; Hydrogen treated	200/250	20m	wht light	Co^{60}; Fusion neutrons (d,t)	Gamma =1.2^4 Gy/hr	Neutrons flues = 2.4 x 10^{17}	?; Sent email FORC (Russia) to confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
38	02/22	FORC (Moscow)	KU-1	Pure Silica OH&Cl free; Hydrogen treated	200/250	20m	wht light	Co^{60}; Fusion neutrons (d,t)	Gamma =1.2^4 Gy/hr	Neutrons flues = 2.4 x 10^{17}	?; Sent email FORC (Russia) to confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
39	02/22	FORC (Moscow)	KU-H2G	Pure Silica OH&Cl free; Hydrogen treated	200/250	20m	wht light	Co^{60}; Fusion neutrons (d,t)	Gamma =1.2^4 Gy/hr	Neutrons flues = 2.4 x 10^{17}	?; Sent email FORC (Russia) to confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
40	02/22	Fujikura Ltd.	FF	F-doped OH free	200/250	20m	wht light	Co^{60}; Fusion neutrons (d,t)	Gamma =1.2^4 Gy/hr	Neutrons flues = 2.4 x 10^{17}	Can't confrim Pt#, but company is still in business		Company still in business; PT# not on site	http://www.fujikura.co.jp/00/index_e.html	
41	02/22	Mitsubishi	MF	F-doped OH free	200/250	20m	wht light	Co^{60}; Fusion neutrons (d,t)	Gamma =1.2^4 Gy/hr	Neutrons flues = 2.4 x 10^{17}	Yes; Part numbers may have changed	Yes; PDF	Now made by "ESKA" fiber	http://www.pofeska.com/pofeskae/pofeskae.htm	
42															
43	02/23	Corning	SMF-28	Ge-Doped	9/125/250	5-250m	700-1700	Co^{60}	could not confirm	10^2 - 10^5 Gy	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
44	02/23	Lucent	AllWave	Ge-Doped	9/125/250	5-250m	700-1700	Co^{60}	could not confirm	10^2 - 10^5 Gy	Yes; COTS	Yes; PDF	Made by OFS Fitel (a Furukawa Company)	http://www.ofsoptics.com/index.php	
45	02/23	FORC (Moscow)	SPPF 97-10-20	P-doped; MCVD Process	28/120/250	5-250m	700-1700	Co^{60}	could not confirm	2.5 - 10^5 Gy	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
46	02/23	FORC (Moscow)	SR-00-12-28	P-doped; MCVD Process	4/125/250	5-250m	700-1700	Co^{60}	could not confirm	10^2 - 10^5 Gy	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
47															
48	03/01	FORC (Moscow)	KU-1	High OH; Low Cl and F-doped	200/240/325	coiled @ 60mm	could not confirm	Co^{60}; Fission	Gamma 5.4 Gy/sec; Fission 1667 Gy/sec	Gamma = 5.0 Mgy;	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
49															
50	03/03	Sumitumo	HC-20/07	could not confirm	could not confirm	50m	could not confirm	Co^{60}	could not confirm	1.173 MeV & 1.332 MeV	Can't confrim Pt#, but company is still in business		Company still in business; PT# not on site	http://www.sumitomoelectricusa.com/	
51															
52	03/10	Corning	SMF-28	SM	could not confirm	Cavity 2.2mm	1553.9	Co^{60}	could not confirm	1 Mgy	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
53															
54	03/11	INFOS (Russia)	Silica-Silica	MM	300/325	1.68m	250-700	Co^{60}	80 rad/s & 10 rad/s	could not confirm	Can't confirm campany is still in business				
55	03/11	Polymicro	Silica-Silica	MM	310/320	1.68m	250-700	Co^{60}	80 rad/s & 10 rad/s	could not confirm	Yes; COTS & Custom	Yes; PDF	Subsidiary of Molex (HQ in Paris)	http://www.polymicro.com/default.htm	
56	03/11	Polymicro	Poly-Silica	MM	300/315	1.68m	250-700	Co^{60}	80 rad/s & 10 rad/s	could not confirm	Yes; COTS & Custom	Yes; PDF	Subsidiary of Molex (HQ in Paris)	http://www.polymicro.com/default.htm	
57	03/11	Hestibel	Silica-Silica	MM	300/315	1.38m	250-700	Co^{60}	80 rad/s & 10 rad/s	could not confirm	Can't confrim Pt#, but company is still in business	Yes; PDF	Company is based in Turkey	http://www.hestibel.com/	
58															
59	04/01	FORC (Russia)	KS-4V	MM	100/120 na=0.16	could not confirm	could not confirm	Co^{60}	could not confirm	11.0 Mgy	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
60	04/01	FORC (Russia)	KU-1	MM	400/440 na=0.16	could not confirm	could not confirm	Co^{60}	could not confirm	11.0 Mgy	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
61	04/01	Heraeous	F-100	MM	200/240 na=0.16	could not confirm	could not confirm	Co^{60}	could not confirm	11.0 Mgy	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
62	04/01	Corning	HPFS-7980 Supersail F-300	MM	200/220 na=0.16	could not confirm	could not confirm	Co^{60}	could not confirm	11.0 Mgy	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
63															
64	04/11	Sumitumo	Z-Fiber	SM	could not confirm	could not confirm	1510	10^5 rads/mission	could not confirm	Approx 1.3dB/km	Yes; COTS	No	No changes to the product line noticed	http://www.sumitomoelectricusa.com/	
65	04/11	Corning	SMF-28	SM	could not confirm	could not confirm	1510	10^5 rads/mission	could not confirm	7.2dB/km	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
66	04/11	Corning	PRSM	PM	could not confirm	could not confirm	1300	10^5 rads/mission	could not confirm	4.3dB/km	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
67	04/11	3M	PM	PM	could not confirm	could not confirm	1530	10^5 rads/mission	could not confirm	4.5dB/km	Can't confrim Pt#, Fiber division sold to Verrillon Optics	Yes; PDF	Fiber line sold to Verrillon in 2005	http://www.verrillon.com/	
68															
69	04/12	Fujikura Ltd.	KS-4V	MM	200/250	10m	wht Light	Co^{60} Fast Neutrons	Gamma = 7.2^3 Gy/s	Fast Neutrons 14.1 MeV	This Pt# sounds like a Russian Pt# from FORC			http://www.fujikura.co.jp/00/index_e.html	
70															
71	05/03	Suhner	FO03220	PCS MM	200 core w/ 90 Clad	200m	800; 600; 570	Co^{60}	Gamma = 47.69 Gy/h (Si)	could not confirm	Can't confrim Pt#, but company is still in business			http://www.hubersuhnerinc.com	
72															
73	05/07	Corning	SMF-28	SM	could not confirm	could not confirm	could not confirm	could not confirm	could not confirm	could not confirm	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
74	05/07	FiberCore	1250/1500	MM	could not confirm	could not confirm	could not confirm	could not confirm	could not confirm	could not confirm	Available as custom Pt#	Yes; PDF		http://www.j-fiber.de/index.php	
75															
76	05/08	Bicorn	BCF-20	Core = PBD PMMA	0.25mm Diameter	0.5 - 12cm	could not confirm	could not confirm	could not confirm	could not confirm	No; Not Available Anymore	Yes; PDF	Subsidiary of Saint-Gobain Crystals (HQ in Paris)	http://www.bicron.com/	
77															
78	05/10	Prime Optical Fiber Corp	Year made 2001	MM	62.5/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.pofc.com/	
79	05/10	Prime Optical Fiber Corp	Year made 2001	MM	50/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.pofc.com/	
80	05/10	Corning	Year made 2000	MM	50/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.corning.com/opticalfiber/index.aspx	
81	05/10	Corning	Year made 2004	MM	62.5/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.corning.com/opticalfiber/index.aspx	
82	05/10	Optical Cable Corp	Year made 2002	MM	50/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.occfiber.com/main/	
83	05/10	Optical Cable Corp	Year made 2002	MM	62.5/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.occfiber.com/main/	
84	05/10	FiberCore Jena	Year made 2002	MM	62.5/125/250	could not confirm	244	UV Laser Rad 40um Spot	could not confirm	5 eV	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.j-fiber.de/index.php	
85															
86	05/12	Optical Fiber Solutions (OFS)	GeoSD50-P3	MM; Graded; Polyimide	50/125/155	20m	700-1700	Co^{60}	could not confirm	326.8 kGy	Can't confrim Pt#, but company is still in business			http://www.ofsoptics.com/index.php	
87															
88	06/02	Nufern	S1550-HTA	SM	could not confirm	Total = ?; Coiled @ 150mm	1570	Proton; Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads; Proton = 55MeV	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
89	06/02	Nufern	R1310-HTA	SM	could not confirm	Total = ?; Coiled @ 150mm	1550	Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
90	06/02	Nufern	GR50/125-23-HTA	MM	50/125	Total = ?; Coiled @ 150mm	850; 1300	Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
91	06/02	Nufern	GR62.5/125-27-HTA	MM	62.5/125	Total = ?; Coiled @ 150mm	850; 1300	Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
92	06/02	Nufern	GR100/140-24-HTA	MM	100/140	Total = ?; Coiled @ 150mm	850; 1300	Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
93	06/02	Nufern	PM1550G-80	SM	could not confirm	Total = ?; Coiled @ 150mm	1570	Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
94	06/02	Nufern	PM850G-80	Sum	could not confirm	Total = ?; Coiled @ 150mm	830	Co^{60}	Gamma avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
95	06/02	Nufern	PM1300G-80	Sm	could not confirm	Total = ?; Coiled @ 150mm	1310	Proton	could not confirm	Proton = 55MeV	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
96	06/02	Nufern	EDFL-980-HP	Rare Earth Doped (RED Fiber)	could not confirm	Total = ?; Coiled @ 150mm	980; 1300; 1510	Proton	could not confirm	Proton = 55MeV	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.nufern.com/	
97	06/02	Corning	SMF-28	SM	could not confirm	Total = ?; Coiled @ 150mm	1310	Proton; Co^{60}	Avg = 2 rads/sec	Gamma = 50krads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
98	06/02	Sumitomo	Z-Fiber	SM	could not confirm	Total = ?; Coiled @ 150mm	1570	Proton	could not confirm	Proton = 55MeV	Yes; COTS	No	No changes to the product line noticed	http://www.sumitomoelectricusa.com/	
99															
100	06/14	FORC (Russia)	KU-1	MM	Core = 100um	20m	400-800	Fission Reactor	Pulse = 80us; Neutron Flux = 7 x 10^{14} cm^{-2}s^{-2}	could not confirm	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
101	06/14	Fujikura Ltd.	K-3	MM	Core = 200um	20m	400-800	Fission Reactor	Pulse = 80us; Neutron Flux = 7 x 10^{14} cm^{-2}s^{-2}	could not confirm	This Pt# sounds like a Russian Pt# from FORC			http://www.fujikura.co.jp/00/index_e.html	
102															
103	06/15	Heraeous	SSU (High OH)	MM; Step	100/120	Pulsed = 10m; Constant = 30, 39, 53m	660; 403; 1310	Pulsed & Constant Co^{60}	Pulsed = 10^4 rad/sec; Constant = 42 rad/sec	could not confirm	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
104	06/15	Heraeous	STU (Low OH)	MM; Step	100/120	Pulsed = 10m; Constant = 30, 39, 53m	660; 403; 1310	Pulsed & Constant Co^{60}	Pulsed = 10^4 rad/sec; Constant = 42 rad/sec	could not confirm	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
105	06/15	FORC (Russia)	KU-1 (High OH)	MM; Step	100/120	Pulsed = 10m; Constant = 30, 39, 53m	660; 403; 1310	Pulsed & Constant Co^{60}	Pulsed = 10^4 rad/sec; Constant = 42 rad/sec	could not confirm	?; Sent Email (Russia) to Confirm		Company still in business; PT# not on site	http://www.forc-photonics.ru/E-we.htm	
106	06/15	Corning	Ge-Doped	MM; Graded	62.5/125	Pulsed = 4, 40, 100m	660; 403; 1310	Pulsed & Constant Co^{60}	Pulsed = 10^4 rad/sec; Constant = 42 rad/sec	could not confirm	Can't confrim Pt#, but company is still in business	Yes; PDF		http://www.corning.com/opticalfiber/index.aspx	
107															
108	07/01	Lieki	Yb1200-10/125DC	Yb-doped; Double Clad	10/125	3m	75W Xeon	Co^{60}	14 & 40 rad/sec	2 - 5 krads	Yes; COTS	Yes; PDF	Now owned by nLight	http://www.nlight.net/	
109	07/01	Lieki	Yb1200-20/400DC	Yb-doped; Double Clad	20/400	3m	75W Xeon	Co^{60}	14 & 40 rad/sec	2 - 5 krads	Yes; COTS	Yes; PDF	Now owned by nLight	http://www.nlight.net/	
110	07/01	Lieki	Yb1200-30/250DC	Yb-doped; Double Clad	30/250	3m	75W Xeon	Co^{60}	14 & 40 rad/sec	2 - 5 krads	Yes; COTS	Yes; PDF	Now owned by nLight	http://www.nlight.net/	
111	07/01	Lieki	Yb1200-4/125	Yb-doped	4/125	3m	75W Xeon	Co^{60}	14 & 40 rad/sec	2 - 5 krads	Yes; COTS	Yes; PDF	Now owned by nLight	http://www.nlight.net/	
112	07/01	Lieki	Yb2000-6/125DC	Yb-doped; Double Clad	6/125	3m	75W Xeon	Co^{60}	14 & 40 rad/sec	2 - 5 krads	Yes; COTS	Yes; PDF	Now owned by nLight	http://www.nlight.net/	
113															
114	07/11	ThorLabs	BFL37-200	Low OH	200/230	50m	Deuterium	Co^{60}	could not confirm	100 Mrads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.thorlabs.com/	
115	07/11	ThorLabs	BFH37-200	High OH	200/230	50m	Deuterium	Co^{60}	could not confirm	100 Mrads	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.thorlabs.com/	
116	07/11	Heraeous	SSU	Low OH	100/120	10m	Deuterium	Co^{60}	could not confirm	650 Mrads	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
117	07/11	Heraeous	STU	High OH	100/120	10m	Deuterium	Co^{60}	could not confirm	600 Mrads	YES; COTS PREFORM	Yes; PDF	No changes to the product line noticed	http://www.heraeus-quarzglas.com/en/home/Home.aspx	
118															
119	07/14	Polymicro	FSHA-800	High OH	600/660	5m	UV; Vis	Bremsstrahl Gamma	could not confirm	5 kGy	Yes; Custom Order	Yes; PDF	Subsidiary of Molex (HQ in Paris)	http://www.polymicro.com/default.htm	
120															
121	07/19	Mitsubishi	PMMA POF	MM	240/250	5m	wht Light	Co^{60}	2.3 Gy/sec	could not confirm	Yes; Part numbers may have changed	Yes; PDF	Now made by "ESKA" fiber	http://www.pofeska.com/pofeskae/pofeskae.htm	
122															
123	08/01	Corning	SMF-28	SM	could not confirm	30m	1550	X-Ray	10 - 50krads/pulse	could not confirm	Yes; COTS	Yes; PDF	No changes to the product line noticed	http://www.corning.com/opticalfiber/index.aspx	
124															
125															
126															
127															
128															

2001-2008 Radiation Database Survey Papers:

Paper 01/01 notes:

- **BCF-98 (Bicron) had perm damage that rose linear w/ dose. SCSF-38 & 81 rises non-linear and perm damage showed more at lower dose**

Paper 01/03 notes:

- **The purpose of this paper is using an optical fiber for radiation detection around reactors**
- **The fiber is made sensitive or "tuned" specifically to BETA, GAMMA, and first Neutrons**
- **The fiber will show the location or position of where radiation leakage is occurring**
- **Four different sources were used:**
    1. **A^{90} Sr – 90Y BETA Source**
    2. **A^{137} Cs GAMMA-Ray source & Co^{60}**
    3. **Fission Neutron Beam**
    4. **D-T Neutron Beam Fusion**

Paper 01/04 notes:

- **Moderate spacecraft shielding of 200-300 mils of AL in a GEO orbit make RAD levels benign mainly due to short paths**
- **BUT! Er-doped fibers even at low doses cause significant problem because of the long-lengths need for amplification (10-30m)**
- **One vendor (LUCENT) was selected, but 6 types were used**
- **SMF lead IN/OUT cables were used**
- **Only HE980 & HF980 were Proton tested**

Paper 02/01 notes:

- **This paper is about COMM WDM products**
- **This paper also mentions about Intra-Satellite multi-gigabit optical networks**

Paper 02/02 notes (Mel's Paper from 2002 on MTPs):

- **MTPs connectors and cables will pass everything, BUT not vacuum**
- **OFS Fitel Fiber**
- **The first paper Mel refers to was a test on the off-the-shelf version. Then suggestions were made and this paper focuses on those improvements.**
- **This paper shows testing for the SFODB**
- **Low dose was 4/rads per min 10 days and 18hr (total dose 62 krads)**
- **High dose was 27/rads per min 10 days and 18hr (total dose 403 krads)**
- **Total loss @ low dose rates was 6.18dB and recovered to 6dB w/ 3 days of annealing**
- **Total loss @ high dose rates was 15.18dB and recovered to 14.16dB w/ 4.6 days of annealing**

Paper 02/04 notes:

- **Good paper on how they did the testing, but no mention of what type of fiber they used.**

Paper 02/05 notes:

- **This paper talks about using fiber as an Image Guide inside a Co^{60} chamber and correcting for the radiation induced image using color correction algorithms.**
- **No mention of the type of fiber that was used.**

Paper 02/06 notes (Mark Flanegan's paper on GLAS fiber optics)

- **Good paper on what was done with the GLAS fiber Optics**
- **He mentions you should always use MM fiber over SM due to alignment issues, but SM fiber can be used if MM cannot reach the particular spot size need i.e. for the 2km delay line used for calibration aboard GLAS.**
- **Polymicro Fiber was used for MM apps**
- **Spectran Fiber was used for SM apps**
- **GLAS is supposed to see 30Krads w 0.038 rads/min**
- **The fibers are expected to see 0.16 dB/km overall, but the fibers are less the 10m and will really only see at 0.0016 dB for given channel.**

Paper 02/07 notes:

- **This paper talks about using Fabry-Perot Fiber Optic Sensors for harsh environments. i.e. nuclear facilities.**
- **But they do talk about using two different types of multi-mode fibers for lead in/out cables. CeramOptec and Spectran. 50/125 polyimide coated step index 0.22na ultra-low OH.**
- **They do not mention where the lead in/out cables were during the test of the sensors. Therefore data for the fiber alone is inconclusive.**

Paper 02/08 notes (Pre-Rad effects)

- **This paper talks about *pre-radiating* the fiber with a high-pressure hydrogen treatment to supposedly increase radiation hardening overall. Pre-rad was = 10^4 Gy**
- **The authors claim a series of H_2 "loading" and radiation further increase the rad hardness of the fibers.**
- **Five samples were chosen Sumitomo SM; Mitsubishi MM Step-index; 3 different Heraeous Quartz glass MM Step-Index fibers.**

Paper 02/10 notes:

- **The authors say they did the experiment in two separate dose steps with a significant annealing period between the steps.**

Paper 02/12 notes:

- **This paper talks about aircraft testing of optical tx/rx units at 39,000ft.**

Paper 02/13 notes:

- **This paper talks about testing quantum-welled lasers. No mention of fiber.**

Paper 02/14 notes:

- **This paper talks about the effect of gamma-neutron radiation with Bragg gratings with custom AT&T Ge-doped fiber called "Accutether". No specs given for the fiber itself.**

Paper 02/15 notes:

- **The paper mentions two different fibers used for the test. The KS4V glass produced by Fiber Optic Research Center in Moscow (FORC). The other is an F-doped core fiber developed by Mitsubishi Cable (no particular part number given).**

Paper 02/16 notes:

- **Another paper on the use of Fiber Bragg components.**

Paper 02/17 notes:

- **This paper talks about using VCSEL for data communication links in high dose rate environments. There is mention of the pigtails called Spectran TCG 100um core fiber.**
- **The paper does not give much mention to the fiber because the authors assume since most data from MM fiber optic rad testing shows less than 5 dB/m at 850nm and the pigtails they were using were significantly smaller there was no need really to include this data.**

Paper 02/18 notes:

- **This paper is very similar in nature to paper 02/17. They are using VCSEL with the same 100um core Spectran TCG pigtails.**
- **Two of the authors are on both papers.**

Paper 02/20 notes (Ed Taylor's paper on EDFLs)

- **EDFL1's fiber laser cavity consisted of approx 10m of AT&T (Lucent) HE980 erbium-doped fiber.**

- **EDFL2"s fiber laser cavity consisted of approx 3m of Corning PureMode 1550C erbium-doped fiber.**

Paper 02/21 notes:

- **This paper really is a paper on radiation modeling of optical fibers. Not much on actual experimentation, but more so on math models.**

Paper 02/22 notes:

- **Good paper. Well laid out results.**

Paper 03/01 notes (Space Photonics paper on their FireFiber system)

- **The authors mention that Ken LaBel did some testing at UC Davis with their parts, but they don't really get into the specifics of the testing and what, if any, fiber they were using during the testing.**

Paper 03/02 notes:

- **This paper is another paper discussing the benefits of Hydrogen-loading fibers before they are radiated. A process that is thought to improve the effectiveness of not absorbing color centers.**
- **The FORC (Fiber Optic Research Center – Moscow) manufactured their fibers for this experiment.**
- **The paper "raves" about Hydrogen-loading as a tool for radiation hardening optical fibers for the visible spectrum.**

Paper 03/03 notes:

- **The paper is talking about optical communication circuits.**
- **The authors use two methods of trying to detect radiation signals that are intrinsically analog by 1. Simple direct conversion using a comparator and 2. Linear pulse conversion w/ a comparator and a constant current circuit. In short they tried to convert Pulse-Height signals to Pulse-Width signals**
- **A very quick mention about the fiber used for the circuits was 50m of Sumitomo HC-20/07.**

Paper 03/06 notes:

- **This paper focuses on gamma radiation changes in German silicate bulk optics.**
- **The authors exposed PINC WDM couplers to gamma radiation can help understand the radiation-induced refractive index change in single-mode optical fibers.**

Paper 03/07 notes:

- **This paper looks like it has some good data. Most of the fibers were manufactured from the FORC in Moscow.**
- **The actual fibers they chose for the testing were "custom made" so the data is irrelevant**

Paper 03/09 notes:

- **This paper again presents good insitu data for fibers in nuclear environments, but the part numbers are not given.**
- **3 different compositions are given (SM German silicate using the same MCVD process)**
- **The test used the two common communications wavelengths of 1550 and 1310nm.**

Paper 03/10 notes:

- **This paper is about using fiber based Fabry-Perot Interference Sensors in a nuclear environment.**

Paper 03/11 notes:

- **This paper talks about using fiber for the Large Hadron Collider (LHC)**
- **The LHC receives up to 100 Mrad/year**

Paper 04/01 notes:

- **This paper appeared to have good data, but the paper was not completely clear on if they were using 5mm sheets of optical material or off-the-shelf fiber from the companies listed.**
- **The Russian fibers were classified in one of two ways……. I think. The first way was the type of glass used which I think was KS-4V. The other way was I believe the part number which was KU-1. I listed both numbers on the chart just in case.**

Paper 04/02 notes:

- **This paper basically talks about BER numbers in photodetectors.**
- **The paper does not show any use of fiber.**

Paper 04/04 notes:

- **Pretty good paper on polymer chemistry and the types silicone polymers, but no real mention of fiber optic use in radiation environments.**
- **One thing I thought was interesting is that you can use a fluid or a nanoparticle powder with a comparable refractive index to fill a lens or micro-channel waveguide to act as an attenuator or optical type switch.**

Paper 04/05 notes:

- **This paper discusses custom fiber-optic probes in nuclear medicine and radiotherapy.**
- **No mention of fiber vendors or part numbers.**

Paper 04/06 notes:

- **This paper talks about using a variety of different fiber optic technologies to remotely monitor "weapons" storage (i.e. nuclear warheads).**
- **The paper specifically talks about mounting optical sensors onto embedded fiber Bragg gratings to monitor temperature, atmospheric change, shape, and vibration.**
- **Future work will be in the development of gaseous materials and surface condition (i.e. presence of rust, corrosion, and crack formation)**

Paper 04/07 notes:

- **Lockheed Martin paper on why we need to get rid of the standard 1553 communications bus and go totally optical communications.**
- **His reasons are what everyone has always said. Number one = 1553 is too old and outdated. Number two = 1553 is to complicated cabling wise. Number three = 1553 is way too damn heavy. Last but not least optical based comm. Can hold and transfer way more data without taking up any additional space. It only makes sense.**

Paper 04/08 notes:

- **The authors give credit to Friebele in their introduction for his work on Radiation-Induced Attenuation. 50% of the papers in the ref section are Friebele and Ed Taylor.**
- **Therefore the object of this study is to compare 3 PM fibers to 3 SM fibers that have similar composition.**
- **All fibers were manufactured using the MCVD process**
- **No real mention of the vendors of the fibers, but the data is pretty good.**
- **The end result is the PM fibers don't perform any better or worse than the SM fibers with one exception on the one of the PM designs. It showed slightly better radiation effects then its SM counterpart.**

Paper 04/09 notes:

- **This paper really is a call for a patent on new optical based radiation sensors.**
- **Most of the work is theoretical in nature.**
- **Any testing that appeared to be done was on "bulk" glass samples of fused-quartz.**

Paper 04/10 notes:

- **The authors are claiming that fibers that are P-doped are good in the short-term, but do not perform well in the overall Radiation Induced Attenuation (RIA).**
- **The authors say chemical alterations in the doping process will make or break you.**
- **Six different off-the-shelf SMF fibers were tested.**
- **All samples were made via the MCVD process**
- **Two different dose rates were monitored; 60m lengths; 6cm diameter coils; Room temp test**
- **Two 100uW sources; 1550nm Er-Doped fiber and 1310nm Laser Diode**
- **The authors conclude that the choice of the dopant in the fiber will greatly affect the radiation sensitivity of the fiber itself.**

Paper 04/11 notes:

- **Mentions Ken LaBel et al for their work on SAMPEX, XTE, TRMM, and HST**
- **This paper is written about using fiber for strain measurements on spacecraft, but there is some mention about different fiber configurations and dose rates.**
- **Friebele mentions that using the 0.6 rad/min worst case scenario to an mission lifetime exposure of 10^5 rad is unacceptable for SMF-28, 3M PM, and Corning PRSM. Their loss would be 7.2, 4.3, and 4.5 dB/km respectively.**
- **Friebele mentions the Sumitomo Z-fiber is the most radiation resistant pure-silica SM fiber on the market with a typical 10^5 mission lifetime exposure is only approx 1.3dB/km.**

Paper 04/12 notes:

- **The authors stress in this paper that during the irradiation process color centers are unavoidable, but if a strict regiment of pre-annealing process (heating the fiber) can significantly reduce the formation of the color centers.**
- **The fibers were coiled in 10m long samples and were heated at 140, 160, 180, 200, 220, and 300C for three hours and then allowed to cool down to room temp.**

Paper 05/01 notes:

- **This is another paper on using optical probes and fiber cables inside a nuclear facility, but I thought it interesting that one of the two chosen samples of fiber was a sapphire based core.**

Paper 05/02 notes:

- **This paper talks really about electronic components (FPGAs) in an optical comm link with the ATLAS project at CERN.**
- **There is mention of an optical cable, but no specifics were given on it.**

Paper 05/03 notes:

- **This paper has some good data, but the fiber that it mentions is PCS which is plastic core.**

Paper 05/04: Ed Taylor's Paper 2005 on Er-doped fiber (2 different dopants)

- **Ed has a good amount of data in this paper, but he uses his own designator for the two fibers he tested.**

Paper 05/06 notes:

- **This paper uses optical glass samples inside of actual drawn fibers.**

Paper 05/07 notes:

- **The authors talk in detail about sensitivity of two different types of fiber Bragg grating in ionizing radiation up to 0.54MGy.**
- **Type I and IIA gratings in two different types of reflectivity in two different types of optical fiber (SMF-28 and B/Ge).**

Paper 05/08 notes:

- **This paper is just an explanation about the benefits of using Plastic-scintillating-fibers (PSF) in a radiation sensing environment.**

Paper 05/10 notes:

- **This paper presents some good information of COTS fibers, but actual part numbers are not listed.**
- **Several different manufacturers are mentioned and the year the fiber was manufactured, but no part numbers. I still think some of the information is worth noting.**
- **The COTS fiber is for an experimental system called the Laser Megajoule Facility in France.**
- ***One thing that does not seem revellent to our needs is that this may be the first of several papers the authors are planning on publishing and this first paper mainly talks about exposing bare fiber to UV radiation on the order of 5eV to detect phosphors in the fibers.***

Paper 05/11 notes:

- **This paper is in reference to an optical comm. system in development for CERN hat is 80Mbit/s with 7200 fiber channels that will be exposed to the "radiation zone" of the facility.**
- **The type of optical system is a token-ring based between the Front-End Controller (EC) and Control Unit Modules (CCUMs).**
- **Fiber type is SMF-28 at 1310nm.**

- **The main data portion of the paper is based on what the photodiode samples did during testing.**

Paper 05/12 notes:

- **The authors propose using optical fiber for temperature sensing in radiation environments.**

Paper 05/13 notes:

- **This paper investigates a new type of fiber called "air-guiding" photonic crystal fibers (Air-PCF).**

Paper 05/14 notes:

- **One of the interesting points the author points out in this paper is that silica optical fiber exhibit very poor transmission in the spectral range 200-450nm (UV)**

Paper 06/02 notes:

- **His paper is written more on the concept that satellite and satellite payload makers are beginning to ask more and more about having their parts radiation tested before they are purchased.**
- **Reason for this is because it is too costly and time consuming for the vendors of the satellites themselves to do.**
- **Mansoor tested roughly 6 different fibers from their own shops at Nufern with 2 other types of fiber for reference.**
- **Two types of tests were completed. Both Gamma and Proton.**

Paper 06/03 notes:

- **This paper is more geared towards to mechanically reliability of fiber optics under certain high dose rates over extended periods of time.**
- **The author claimed to see something on the order of 50% strength reduction a high dose levels.**
- **Strength reduction relies heavily on material selection (acrylate and polyimide) and test conditions.**

Paper 06/05 notes:

- **Another paper on using fiber optic sensors for safely measuring items in a nuclear facility. In particular Fiber Braggs.**
- **The particular Fiber Braggs used in this experiment were chemically composition sensitive.**

Paper 06/06 notes:

- **This paper mentions collaborative work with Goddard (Ken LaBel).**
- **This paper is similar to a paper that Mel did a while ago on a "Roadmap for Qualification on Fiber Optics"**
- **They mention hoe there is a need to merge NASA Internal Documentation with Telcordia Standards.**

Paper 06/07 notes: (ESA Initiated Qualification for Space Flight Fiber)

- **This paper refers to Mel's papers in the references three out of the six totals references.**
- **This paper is a project initiated by ESA to qualify a new fiber optic cable replacement for their heritage fiber called SpaceWire ECSS-E-50-12A.**
- **The project is comprised of these main players:**
    - **Patria (Finland) Electronics, Protocol, and Interface Design**
    - **VTT (Finland) Fiber Optic TX/RX**
    - **INO (Canada) Optical Fiber**
    - **FiberPulse (Ireland) Fiber Connectors, Assembly**
    - **Gore Electronics (Germany) Fiber Jacket**
    - **University of Dundee (UK) SpaceWire Protocol**

Paper 06/08 notes:

- **The authors fabricate a custom Sapphire fiber-based pyrometer. They pyrometer utilizes black-body radiation from Ceramic paste to form temperature measurements in harsh environments.**

Paper 06/09 notes:

- **This paper is an intensive math-based paper for predicting Cerenkov radiation in multimode fibers.**

Paper 06/10 notes:

- **Another paper using fiber in the Laser Module Project (LMJ) in France.**
- **No mention of pat numbers.**

Paper 06/11 notes:

- **This paper appears to have some good data and a good explanation of how the test was conducted, but there is no mention of the part numbers used in the experiment.**

Paper 06/12 notes:

- **Good paper and well laid out.**
- **One problem with this paper was the fact that they used 25mm glass samples as opposed to COTS fiber optics.**

Paper 06/14 notes:

- **This paper is a basic paper on the non-linear effects of quartz glass fibers.**
- **Two fibers (uncommon to our group here at NASA) were chosen: 1. KU-1 (Russian FORC) 2. K-3 (Fujikura Japan)**

Paper 06/15 notes:

Interesting! Looks at the difference between gamma pulsed to constant Gamma effects on fibers.

- **The author mentions the most radiation resistant fibers are those fibers with PSC (Pure-Silica Cores) and Fluorine (F) doped Claddings.**
- **High OH doped fibers are good for UV and VIS**
- **Low OH doped fibers are good for Near-IR**
- **The 62.5/125 Corning sample mentioned in the paper does not appear to be used in the constant Gamma test. Only used in the pulsed test.**

Paper 07/01 notes:

- **The paper is on radiation responses of doped-fiber.**
- **Good layout of the paper itself. Part numbers were called out as well as dose rates and total doses.**

Paper 07/04 notes:

- **This paper really needed an English reviewer before the published it in an English speaking journal.**
- **This paper talks about experiments using polymer based fiber or POF (Polymer Optical Fiber)**
- **The authors appear to compare this cheaply made easily accessible fiber to more conventional traditional glass fibers.**
- **No part #'s given.**

Paper 07/08 notes:

- **This paper talks about the process of Random Hole Optical fibers. The core of the fiber stays the same, but the cladding that surrounds the core is filled with 1000's of little air cavities.**
- **This may be interesting information for fiber with extreme thermal requirements.**
- **There is not mention of vendor, but the data is interesting.**

Paper 07/09 notes:

- **This paper had good data about fibers being used in the ITER (International Thermonuclear Experimental Reactor), but all the optical fiber vendors were generically labeled.**

Paper 07/10 notes:

- **This paper deals more on the medical side of radiation with fibers.**

Paper 07/14 – 16 notes:

- **All three papers have excellent data on erbium and co-doped fibers, but all three papers either don't mention the vendor or generically label the vendors as F1, F2, F3, etc…**
- **I think writing papers without giving specifics on what was used are pretty much useless papers for the reader.**

Paper 07/17 notes:

- **This paper is a good comparison of different dopant materials on fibers. Ge and P doped fibers.**
- ***The authors conclude the fibers with P-Doped or Phosphorus dopant material perform much better in radiation then German silicate fibers.***
- **NO VENDORS MENTIONED!! Bummer!!**

Paper 07/18 notes:

- **This paper deals on the effects of Cerenkov radiation in optical fibers. Very math based.**
- **The authors mention core size varying has a lot to do with overall transmission of Cerenkov radiation down the fiber and the shape of angular distribution does not have any effect on its intensity.**

Paper 08/01 notes:

- **Another paper on work being conducted at the LMJ facility.**
- **This particular work focuses on singlemode fiber and active Mach Zehender modulator parts for optical systems within the confines of the facility.**

Paper 08/02 notes:

- **Some of the activities going on right now include:**
  1. **Power scaling of diffraction-limited fiber amps by bend-loss-induced mode filtering**
  2. **Widely tunable rates while maintaining constant pulse durations and pulse energies.**
  3. **Development of microseed lasers sources optimized for efficient energy extraction.**

- **Good overall paper by Brian Fox, but I think some of this data I have already written down on the chart.**

Paper 08/04 notes:

- **This paper takes an interesting look at using a fiber as a sort of optical dosimeter for harsh radiation environments.**
- **The application also mentions the pros of this application in the effect that the data can be retrieved remotely.**
- **Sensitivity of their said device is about 0.1 -100 Gy**
- **Although the paper is very interesting it really focuses more on the dopants of the fibers as opposed to the fibers themselves.**

Paper 08/06 notes:

- **This paper talks about a mission called the JEM-EF (Japanese Experiment Module Exposed Facility).**
- **This mission is currently being developed by the Japanese space agency for use on the ISS.**
- **The purpose is to search for nearby cosmic rays, gamma bursts, and dark matter.**
- **Several people for GSFC are listed on the paper itself.**

Paper 08/08 notes:

- **This paper was an article stuck in with the rest of the papers I thought was pretty interesting.**
- **The article talks about Fluorophosphates glass fiber developed at the AFO research center.**
- **The author says the fiber is highly radiation resistant with TIDs of 1.29×10^9 rads.**
- **The glass contains no hydrogen or oxygen and darkens only because of the acrylate coating.**