Test Org.*	Device	Function	Technology	Mfr.	Effective SEU LET* Threshold	Device Xsection (cm^2)	Bits Tested	Bit Xsection (cm^2)	Test Date	LUth	LU Xsection (cm^2)	Fac.	Remarks 31-Aug-99
		Other Linears											
	Note: Entries in **RED** indicate data added since the 1997 Compendium.												
LMM	**3261**	**Frequency Synthesizer**		**QLG**	**10**	**2.0E-03**			**1998**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Permanent frequency change. CMD required to recover.**
JPL	**37-97**	**Autocorrelator**	**CMOS (3.3 V)**	**ORB?**	**3.5**	**1.8E-06**			**Sep-98**			**TAM**	**Cross section saturation = 3.0E-04 @ LET = 80.**
JPL	54HC4046	Phase Lock Loop	HCMOS/bulk (3.5 µm).	NSC					Apr-95	>120			
GSFC	**AD630**	**Balanced Modulator**	**Bipolar**	**ADI**	**3.38**				**1996**		**>65**	**BNL TAM**	**LaBel, et al, 97IEEE Wrkshp Rec., pg 14. Short (<20 µs) errors.**
GSFC	**AD630**	**Balanced Modulator**	**Bipolar**	**ADI**	**17 7.4**				**1996**		**>65**	**BNL TAM**	**LaBel, et al, 97IEEE Wrkshp Rec., pg 14. Medium (20 - 100 µs) errors.**
GSFC	**AD630**	**Balanced Modulator**	**Bipolar**	**ADI**	**7.4**				**1996**		**>65**	**TAM**	**LaBel, et al, 97IEEE Wrkshp Rec., pg 14. Long (>100 µs) errors.**
MMS	AD630	Balanced Modulator		ADI	<7.4				Mar-97				LaBel, EEE Links
GSFC	**AD652**	**Voltage-to-Frequency Convert.**	**Bipolar**	**ADI**	**7.4**	**3.0E-03**			**1996**		**>64.7**	**BNL**	**LaBel, et al, 97IEEE Wrkshp Rec., pg 14. Single-bit SEUs.**
GSFC	**AD652**	**Voltage-to-Frequency Convert.**	**Bipolar**	**ADI**	**7.4**	**6.0E-05**			**1996**		**>64.7**	**BNL**	**LaBel, et al, 97IEEE Wrkshp Rec., pg 14. Double-bit SEUs.**
GSFC	**AD652**	**Voltage-to-Frequency Convert.**	**Bipolar**	**ADI**	**7.4**	**1.0E-04**			**1996**		**>64.7**	**BNL**	**LaBel, et al, 97IEEE Wrkshp Rec., pg 14. Multiple-bit SEUs.**
MMS	AD652	Voltage-to-Frequency Convert.	Bipolar	ADI	~7.4				Mar-97	>15			LaBel, EEE Links
MMS	AD783	Sample & Hold Amplifier	ABCMOS	ADI					Aug-95	>120		BNL	Up to 125 °C. ABCMOS technology = merged bipolar and CMOS.
JPL	CD54HC4046	Phase Lock Loop	HCMOS/bulk (3.0 µm).	HAR					Apr-95	>120		BNL	JPL Internal Report
GSFC	EMXO	Precision Oscillator	Hybrid Circuit	BAL	>85				Jul-93	>85		BNL	LaBel, et al, 93IEEE Wrkshp Rec., pg 27.
GSFC	**FUGA 15**	**Image Driver**	**CMOS**	**CCT**					**1997**	**11.4 to 12**		**BNL**	**O'Bryan, et al, 98IEEE Wrkshp Rec., pg 39.**
JPL	IMP 50E10	EPAC	CMOS/epi(15-20 µm.)	IMP	11	>5.0E-05			Aug-95	15	~1E-4	BNL	EPAC [Elec. Prog. Analog Circuit] is a configurable group of analog elements. SEU cross section obscured by LU.
GSFC	IMP 50E10	EPAC		IMP	<1.5					15 to 27		BNL	LaBel, et al, 96IEEE Wrkshp Rec., pg 19. See preceding entry.
LMM	**LM2315**	**1.2 GHz Frequency Synthesizer**	**BiCMOS**	**NSC**	**23**	**4.3E-05**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Permanent frequency change. CMD required to recover.**
ARSP	LTC1064	Low Pass Filter	CMOS	LTN					Dec-92	15	3.0E-04	UCB	W. Will (WP-01).
BREL	LTC1064	Low Pass Filter	CMOS	LTN					May-93	11	1.0E-02		W. Will (WP-01).
BREL	MC145158P2	PLL Freq. Synthesizer	Unknown. See DC's.	MOT	17+/-3	3.0E-04			May-93	>38			W. Will (WP-01). D/Cs QY9141 and QQST9217.
LMM	**PE3282A**	**1.1.GHzFrequency Synthesizer**	**UTSi(r)CMOS**	**PRG**	**34**	**5.0E-07**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Permanent frequency change. CMD required to recover.**
HAC	Q3216	PWM	BiCMOS [no CMOS devices]	QAL	1	2.0E-03			1996	>62		UCB	Jobe, et al, 96IEEE TNS, No. 6, pg 2868. Serial & Parallel modes approx. same.
HAC	Q3236	PWM	BiCMOS [with CMOS devices]	QAL	1	2.0E-03			1996	>62		UCB	Jobe, et al, 96IEEE TNS, No. 6, pg 2868. Serial & Parallel modes approx. same.
GSFC	**QS3384DM**	**Quickswitch**	**CMOS**	**QSI**					**1995**	**15 to 18**		**BNL**	**LaBel, et al, 96IEEE Wrkshp Rec., pg 19.**
GSFC	SE5521F	Signal conditioner	Bipolar	SGN					Jul-94	>100		BNL	LaBel. D/C 012BD19-9401RD. .
LMM	**SG1525**	**PWM**	**Bipolar**	**SLG**	**18**	**1.2E-05**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. No double, but missing pulses.**

Heavy Ion SEE

Test Org.*	Device	Function	Technology	Mfr.	Effective SEU LET* Threshold	Device Xsection (cm^2)	Bits Tested	Bit Xsection (cm^2)	Test Date	LUth	LU Xsection (cm^2)	Fac.	Remarks 31-Aug-99
JPL	SG1526	PWM	Bipolar (+1 JFET)	SLG	10	2.0E-03			Sep-91	>110			
ARSP	**SG1549**	**Current Sense Latch**	**Bipolar**	**SLG**	**5**	**~3.0E-04**			**1997**	**>60**		**UCB**	**Koga, et al, 97IEEE TNS, No. 6, pg. 2325. D/C 9627**
LMM	**SG1825**	**PWM**	**Bipolar**	**SLG**	**11**	**7.5E-06**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. X-section for all 2 µS transients > 4.0 V. Double and missing pulses.**
LMM	**SP8855**	**2.8 GHz Parallel Load Frequency Synthesizer**		**PLS**	**6**	**1.1E-05**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Permanent frequency change. CMD required to recover.**
LMM	**SP8858**	**1.5 GHz Frequency Synthesizer**		**PLS**	**7**	**3.7E-03**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Permanent frequency change. CMD required to recover.**
ARSP	SP8908	PLL Divide by eight	Bipolar-ECL HE process	PLS	3	1.0E-04			1994			UCB	Shoga, et al, 94IEEE TNS, No. 6, pg 2252. Sophisticated phase & amplitude measurements.
GSFC	SSP-21110-025	Solid State Power Controller	Hybrid [ASICs, power FETs)	DDC					Feb-94	>80		BNL	LaBel. No transients, SEB or SEGR @ LET = 80.
LMM	**UC1705**	**PWM**	**Bipolar**	**UTR**	**18**	**1.5E-05**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Transient duration = ±2.5/150 nS.**
ARSP	UC1802	PWM [low-P current mode]	BiCMOS	UTR	~1	5 E-4			Dec-96	>63		UCB	Penzin et al, 96IEEE TNS, No. 6, pg 2968. Several SEU modes.
LMM	**UC1803**	**PWM**	**Bipolar**	**UTR**	**18**	**1.6E-03**			**97-98**			**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Damage observed @ LET = 11.1. Double and missing pulses.**
ALC	UC1806	PWM [1846 equivalent]	BiCMOS	UTR						>119		BNL	DC/DC reset errors "Not acceptable for any space application."
LMM	**UC1825**	**PWM**	**Bipolar**	**UTR**	**11**	**4.1E-06**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. X-section for all 2 µS transients > 4.0 V. Double and missing pulses.**
ARSP	UC1825A	PWM [high frequency]	Bipolar	UTR	~1	1.0E-02			Dec-96	>63		UCB	Penzin et al, 96IEEE TNS, No. 6, pg 2968. Several SEU modes.
ARSP	UC1845A	PWM [current mode]	Bipolar	UTR	~1	2.0E-04			Dec-96	>63		UCB	Penzin et al, 96IEEE TNS, No. 6, pg 2968. Several SEU modes.
LMM	**UC1864**	**PWM**	**Bipolar**	**UTR**	**6.25**	**4.1E-04**			**97-98**	**>84**		**BNL**	**Bogorad, et al, 99NSREC Poster Paper PD-1 Preprint. Double and missing pulses.**

Legend

Manufacturers: ADI - Analog Devices, Inc; BAL - Ball Efatrom; CCT - C-Cam Technology; DDC - Data Devices Corp; HAR - Harris Corp; LTN Linear Technology; MOT - Motorola Semiconductor; NSC - National Semiconductor;
OBT - Orbit Semiconductors; ONI - Optical Networks, Inc; PLS - GEC-Plessey Semiconductors; QLG - Qualcomm; QSI - Quality Semi Inc; PRG - Peregine; SGN - Signetics;
SLG - Silicon General Corp; UTR - United Technologies Microelectronic Center

Test Organizations
ALC - Alcatel Espace, France
ARSP - Aerospace Corp., El Segundo, CA
BREL - Boeing Radiation Effects Laboratory, Seattle, WA
GSFC - Goddard Space Flight Center, Greenbelt, MD
HAC - Hughes Aircraft Co, El Segundo, CA
JPL - Jet Propulsion Laboratory, Pasadena, CA
LMM - Lockheed Martin Missiles and Space, Newtown, PA

Radiation Test Facilities
BNL - Tandem Van de Graaff, Brookhaven National Laboratories, Long Island, NY
TAM - Texas A&M University Cyclotron Institute, College Station, TX
UCB - 88-inch Cyclotron, University of California, Berkeley, CA