

QCA Presentation Day – ESA/ESTEC Wednesday 26th of January 2000.

Radiation SEE Characterisation and Comparison of Analog Devices ADSP21020, LMFS RH21020 and TEMIC TSC21020F.

by

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Abstract

Radiation SEE data will be presented for three different 21020 DSP's tested - using the same tester, using the same test conditions and using the same accelerator. Testing was performed in September 1999.



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21020 DSP SEE Tested by ESTEC:

Analog Devices

- Lot "A" ADSP-21020 TG-80/883B d/c 9211/9528
- Lot "B" ADSP-21020 TG-120/883B d/c 9426
- Lot "B1" ADSP-21020 TG-120/883B d/c 9211/9502
- Lot "C" ADSP-21020 KG-133 d/c 9623 (Rev.3)
- Lot "D" ADSP-21020 KG-133 d/c 9820 (Rev.3)

Lockheed Martin

- Lot "I" LMFS RH21020 52088 d/c 9824 s/n I104/6

TEMIC

- Lot "T" TEMIC TSC21020E Rev.C s/n T14/T15

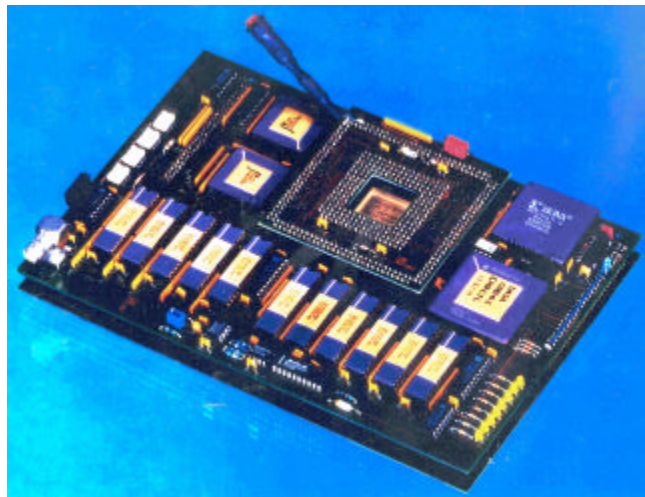


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21020 DSP SEE Test System:



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21020 Test Parameters:

“Register Test”-

Test	+	VDD	- +5.0 V
Parameters	+	Clock speed	- 8.25/16MHz
	+	RT cycle time	- 1000 ms
	+	Latch-up triggering	- 260 mA
	+	Latch-up timing	- 1ms
	+	Watch-dog timing	- 1ms
	+	Test Pattern	- AA or 55



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21020 Error Grouping:

“Register Test”- cont.

Error Grouping

- + SEU - Register Errors (4608 bits)
 - 0-1 - bit changed from 0 to 1
 - 1-0 - bit changed from 1 to 0
- + SEL - Latch-up, high I
- + Wd - Watch-Dog time out errors
- + CC - Corrupted Control Flow
- + AE - Address Errors
- + DS - Failed DSP response
- + MU - Multiple bit flips

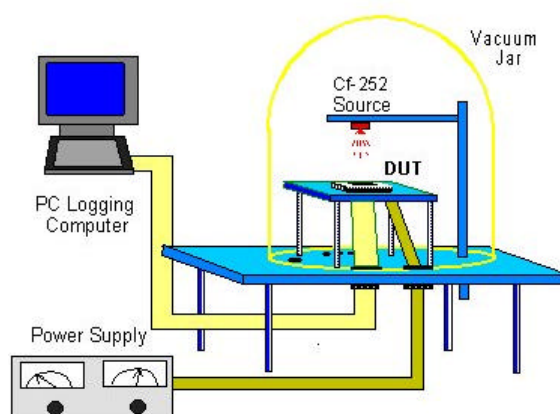


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ESTEC “CASE” System:



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21020 DSP - Initial Comparison Californium-252 Results

Register SEE testing performed Sep. '99 on Analog Devices D05 & D06 at 8.25 MHz.

File	Fluence	SEU	0-1	1-0	Per Bit	SEL	Device	CC	Wd	AE	DS	MU
"D"	5206032	5217	831	4386	2.2E-7	3	5.8E-7	105	69	64	61	0

Register SEE testing performed Sep. '99 on Lockheed Martin I104 & I106 at 8.25 MHz.

File	Fluence	SEU	0-1	1-0	Per Bit	SEL	Device	CC	Wd	AE	DS	MU
"I"	8616156	8316	40	8276	2.1E-7	0	<2E-7	133	61	76	43	0

Register SEE testing performed Sep. '99 on TEMIC T14 & T15 at 8.25 MHz.

File	Fluence	SEU	0-1	1-0	Per Bit	SEL	Device	CC	Wd	AE	DS	MU
"T"	7029132	0			<3E-11	0	<2E-7	0	0	0	0	0

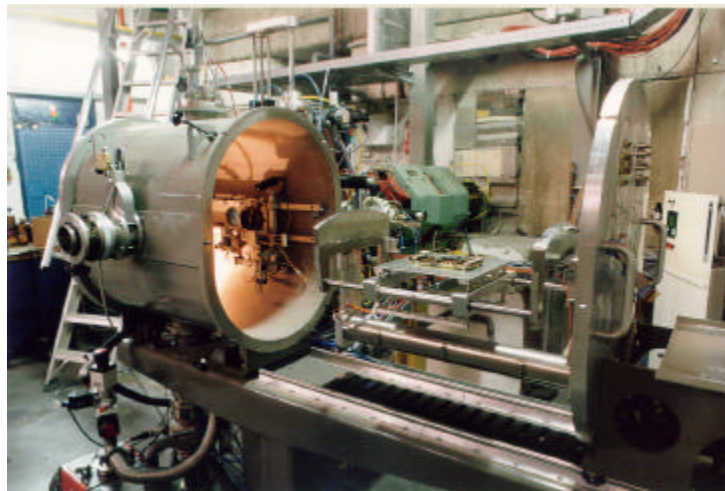


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Heavy Ion Facility - UCL

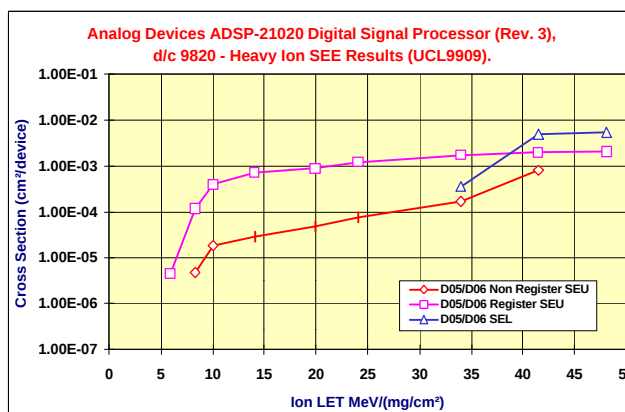


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Analog Devices 21020 - Heavy Ion SEE Results I.

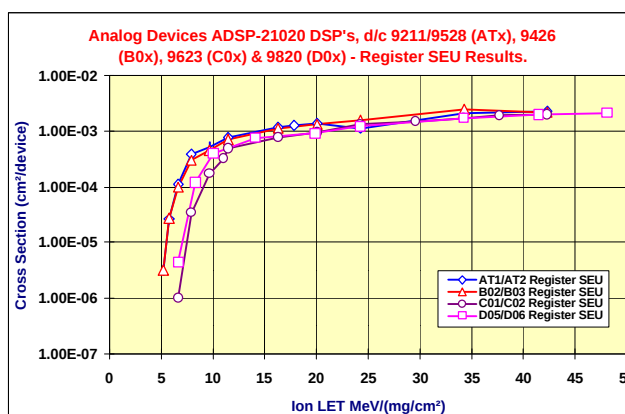


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Analog Devices 21020 - Heavy Ion SEE Results II.

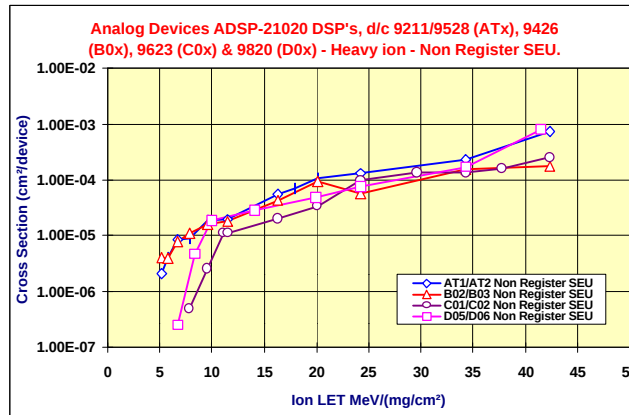


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Analog Devices 21020 - Heavy Ion SEE Results III.

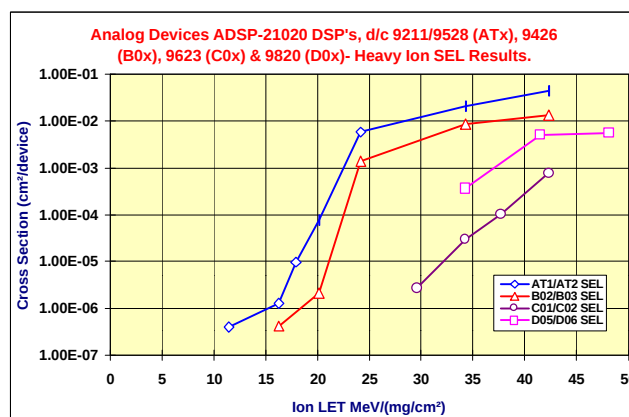


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Analog Devices 21020 - Heavy Ion SEE Results IV.

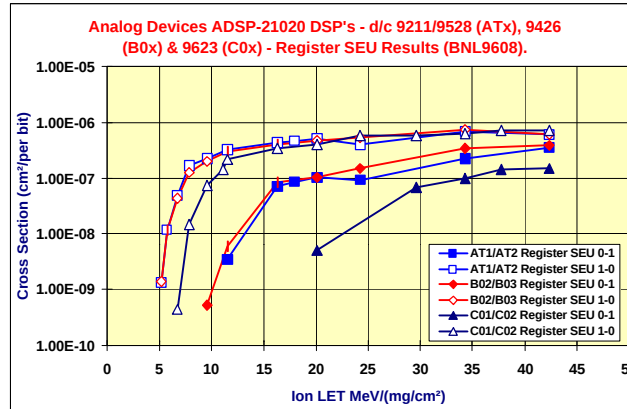


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Analog Devices 21020 - Heavy Ion SEE Results V.

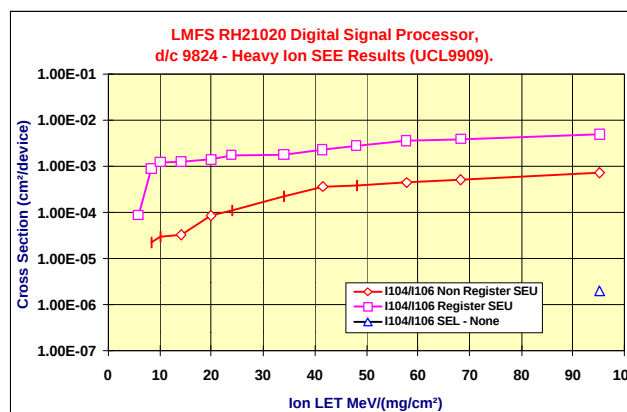


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LMFS 21020 - Heavy Ion SEE Results I.

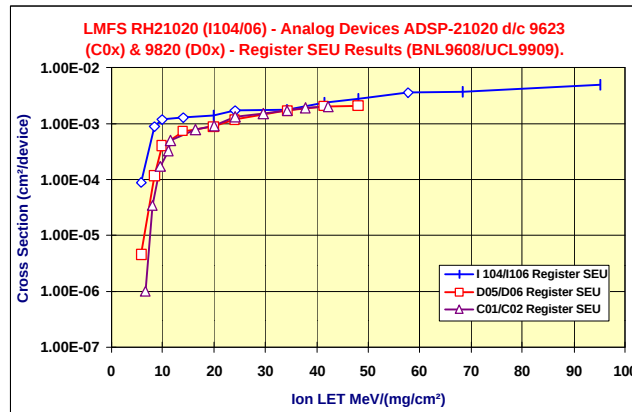


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LMFS 21020 - Heavy Ion SEE Results II.

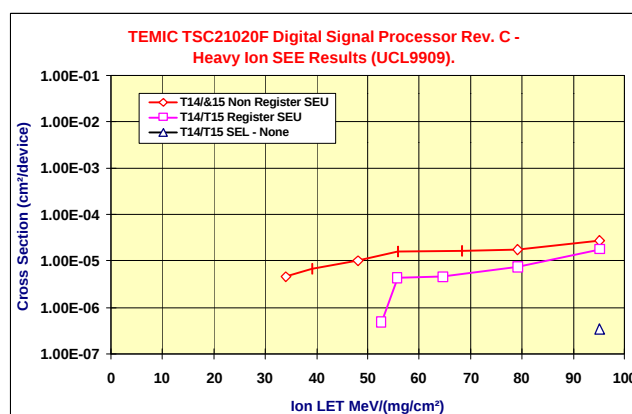


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TEMIC 21020 - Heavy Ion SEE Results I.

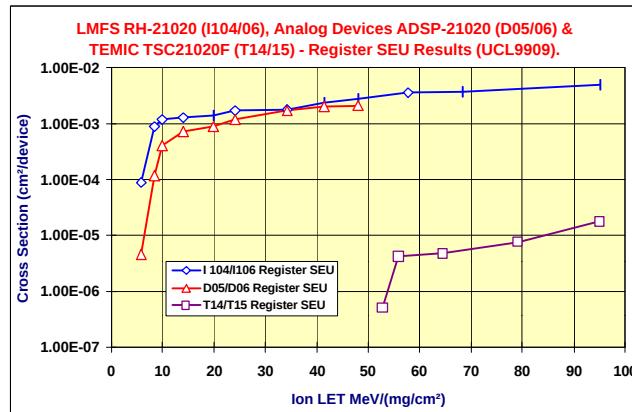


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TEMIC 21020 - Heavy Ion SEE Results II.



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21020 Main Radiation Characteristics - Conclusions

SEE values based on Register Test.

Test	AD	LMFS	TEMIC	Unit
SEU Th.	~6	~5	~30*/50	MeV/(mg/cm²)
SEL Th.	~30	>95	>95	MeV/(mg/cm²)
TID#	<50	>1000	>100	Krad(Si)

* Non Register SEU # Not measured by ESTEC



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