Compendium of Current Heavy Ion Single-Event Effects Test Results for Candidate Electronics for NASA Johnson Space Center

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Abstract: Radiation effects test results are presented as produced by NASA JSC in 2021 for candidate electronic components and devices. Devices tested include integrated circuits, MOSFETs, DC-DC converters, and various commercial solutions.

Part Number	Manufacturer	LDC	Device Function	Technology / Process	Sample Size	Test Facility (Test Date)	Test Results (Configuration, Effects Observed)
Analog / Linear / Mixed Signal							
TAS2505	Texas Instruments	-	speaker amplifier & audio processor	CMOS	1	TAMU (Oct. 2021)	No DSEE @ LET=37 (3.0E7 ions/cm^2)
Digital / Logic							
ATMEGA128L	Atmel	1838	microcontroller	CMOS	3	TAMU (Oct. 2021)	Biased and unbiased corruption of on-chip EEPROM and Flash memories. EEPROM failure @ LET=37 (6E6 ions/cm^2)
Field-Effect Transistors (FETs)							
BSS806NE	Infineon	-	150 V_{DS} n-ch	MOS	4	TAMU (Oct. 2021)	**V_{DS}=5, 10, 15, & 20V, V_{GS}=0V, normal incidence, Kr^{84} range (Si)=61.4µm:** No DSEE @ LET_{PASS}=37 (4 samples, 1.0E6 ions/cm^2)
NVBLS4D0N15MC	Onsemi	-	150 V_{DS} n-ch	MOS	5	NSRL (Nov. 2021)	**V_{DS}=120V, V_{GS}=0V, normal incidence:** No DSEE* @ LET_{surf}=9.3, 10.4, & 12.0 (5.0E5 ions/cm^2) (*OVERTEST SEGR w/ 1 sample to 5.0E6 ions/cm^2 @ LET_{surf}=9.3); SEB and SEGR @ LET_{surf}=17.0 (>=2.8E5 ions/cm^2) **V_{DS}=150V, V_{GS}=0V, normal incidence:** SEB @ LET_{surf}= 12 (8.9E4 ions/cm^2)
SFC85N9051	Solid State Devices Incorporated (SSDI)	-	900 V_{DS} n-ch	SiC	3	TAMU (Oct. 2021)	**V_{DS}=45, V_{GS}=0V, normal incidence, Kr^{84} range (Si)=61.4µm:** No DSEE @ LET_{PASS}=37.0 (3 samples to 5.0E5 ions/cm^2) **V_{DS}=90, V_{GS}=0V, normal incidence, Kr^{84} range (Si)=61.4µm:** µSEGRs @ LET_{FAIL}=28.6 before full SEGR (1 sample, 5.0E5 ions/cm^2); µSEGRs before full SEGR @ LET_{FAIL}=37.0 (1 sample to 5.0E5 ions/cm^2) **V_{DS}=12, V_{GS}=0V, normal incidence, Kr^{84} range (Si)=61.4µm:** SEGR @ LET_{FAIL}=37.0 (1 sample, 5.0E5 ions/cm^2)
SFF80N20S1	SSDI	-	200 V_{DS} n-ch	SiC	3	TAMU (Oct. 2021)	**V_{DS}=45, 75, 100, 110, & 115V, V_{GS}=0V, norm. inc., Kr^{84} range (Si)=61.4µm:** No DSEE @ LET_{PASS}=37.0 (3 samples, 5.0E5 ions/cm^2) **V_{DS}=120, 125, & 450, V_{GS}=0V, norm. inc., Kr^{84} range (Si)=61.4µm:** SEB and SEGR @ LET_{FAIL}=37.0 (3 samples, >=3.0E4 ions/cm^2)
SFF120N10S1	SSDI	-	100 V_{DS} n-ch	SiC	3	TAMU (Oct. 2021)	**V_{DS}=45, 75, & 80V, V_{GS}=0V, norm. inc., Kr^{84} range (Si)=61.4µm:** No DSEE @ LET_{PASS}=37.0 (3 samples, 5.0E5 ions/cm^2) **V_{DS}=85 & 100, V_{GS}=0V, norm. inc., Kr^{84} range (Si)=61.4µm:** SEB and SEGR @ LET_{FAIL}=37.0 (3 samples, >=1.7E4 ions/cm^2)
SQP120N06-06	Vishay	-	60 V_{DS} n-ch	MOS	7	NSRL (Nov. 2021)	**V_{DS}=28V, V_{GS}=0V, normal incidence:** No DSEE @ LET_{surf}=17.0 (2 samples, 5.0E5 ions/cm^2 each); SEGR @ LET_{surf}=27.6 (discovered during PIGS in 1 of 2 samples after 5.0E5 ions/cm^2); No DSEE @ LET_{surf}=34.9 (2 samples, 5.0E5 ions/cm^2) **V_{DS}=35V, V_{GS}=0V, normal incidence:** No DSEE @ LET_{surf}=34.9 (1 sample, 5.0E5 ions/cm^2) **V_{DS}=40V, V_{GS}=0V, normal incidence:** No DSEE @ LET_{surf}=17.0 (2 samples, 5.0E5 ions/cm^2); SEB and SEGR @ LET_{surf}=34.9 (3 samples >=1.8E5 ions/cm^2) **V_{DS}=45V, V_{GS}=0V, normal incidence:** SEB @ LET_{surf}=17.0 (2 samples >=3.9E5 ions/cm^2)
Power							
DCM2322	Vicor	-	DC-DC converter	hybrid	5	NSRL (Nov. 2021)	DSEE failures at LET_{surf}=3.3, 5.0, 9.3, 17.0. Failed open or undulating output voltage. No NDSEE data collected.
DCM3623	Vicor	-	DC-DC converter	hybrid	5	NSRL (Nov. 2021)	DSEE failures at LET_{surf}=3.3, 5.0, 9.3, 17.0. Failed open or undulating output voltage. No NDSEE data collected.
Power (continued)							
RS12-2412SZ	RECOM	-	DC-DC converter	hybrid	10	NSRL (Nov. 2021)	**V_{IN}=36V:** No DSEE @ LET_{surf}=17.0,17.6,18.3 (1e+6 ions/cm^2), DSEE @ LET_{surf}=19.1, σ=8.5E-6 & L_{ent} =21.9, σ=1.0E-5. **V_{IN}=28V:** No DSEE @ LET_{surf} =17.0,17.6,18.3,19.1, (1.0E+6 ions/cm^2); DSEE for LET_{surf} =20.3, σ=2.3E-6 & L_{ent} =21.9, σ=1.0E-5. **V_{IN}=36&28V:** SET LET_{th}=3.0, σ_{sat}=2.4E-4, W=9.8, S=3.00 $\Delta t_{self\text{-}recovery}$ = 20-25 milliseconds, -ΔV_{out} = 1.2-2.7 volts **V_{IN}=36&28V:** SET LET_{th}=7.1, σ_{sat}=2.6E-5, W=8.0, S=2.30 $\Delta t_{self\text{-}recovery}$ unknown but >100 milliseconds, -ΔV_{out} = 7-11 volts
Miscellaneous							
A660	Aitech	-	Network Switch	COTS	1	NSRL (Nov. 2021)	No DSEE to LET=12.7, 3 SEFI modes
ACM-DB-3M	Doodle Labs	-	Wi-Fi Radio	COTS	2	NSRL (Nov. 2021)	No DSEE @ LET_{surf}=17.6 (1 sample, 1.0E7 ions/cm^2); No DSEE @ LET>=37 (2 samples,10 steps of 1.0E6 ions/cm^2, "blind" Bragg peak scanning / degraders) SEFI starting @ LET_{surf}=3.3, σ= 2.9E-3 @ LET_{surf}=17.6
AP650X	Aerohive	-	Wireless Access Point	COTS	1	NSRL (Nov. 2021)	No DSEE to LET_{surf}= 9.3; DSEE @ LET_{surf} = 17.6 SEFI: σ=2.85E-4 @ LET_{surf}=3.3, σ=1.34E-4 @ LET_{surf}=5.0, σ=6.85E-5 @ LET_{surf}=9.3
AWK-4131	MOXA	-	Wireless Access Point	COTS	1	NSRL (Nov. 2021)	DSEE @ LET_{surf}=9.3
MC031CG-SY-FV	Ximea	-	4K HD camera	COTS	2	NSRL (Nov. 2021)	No DSEE w/ 1 sample @ LET_{surf}=9.3 (6.0E6 ions/cm^2) Nonrecoverable SEE (NVROM corruption) observed after >1.0E6 ions/cm^2 @ LET_{surf}=17.6 SEFI starting @ LET_{surf}=3.3, σ= 3.5E-3 @ LET_{surf}=17.6
Xirrus XH-2-240	Cambium Networks		Wireless Access Point	COTS	3	NSRL (Nov. 2021)	DSEE @ LET_{surf}=12.7+