Compendium of Single-Event Effects Test Results for Candidate Electronics at NASA Johnson Space Center from 2025

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Abstract: We present single-event effect (SEE) test results and analysis produced by NASA JSC in 2025 for candidate electronic components and devices. Test environments include heavy ions or protons, depending on the intended use case regarding mission, environment, application, and lifetime.

	Part Number	Manufacturer	LDC	Device Function	Sample Size	Test Env.	Test Facility (Test Date)	POC	Test Results (Configuration, Effects, Remarks)
Integrated Circuit	INA240A1PWR	Texas Instruments	Package Mark: 43KG4 I240A1	Current Sense Amplifier	11	HI	LBNL (08/2025)	BD	**Elevated temperature (70 °C):** V_{CM} = 33.6 V (application worst-case common-mode voltage) DSEE @ LET_{th} = 5.9 MeV-cm²/mg in 1.03E6 ions/cm², 11 samples had catastrophic failures with all LETs from 5.9 to 58.8 MeV-cm²/mg
	M2-JODY-W377	Ublox	-	Wi-Fi & Bluetooth Card	3	P	LLUMC (11/2025)	BD	**Only Wi-Fi transmission exercised for test, Chipset: NXP 88W9098:** No non-recoverable SEE in 3 samples in 4E10 p+/cm² (2 samples irradiated to 1E10 p+/cm², 1 sample irradiated to 2E10 p+/cm²) Recoverable SEE (25x) in 1.2E10 p+/cm² across 3 samples
	CMP9620-1C-T	CEL	-	Wi-Fi & Bluetooth Card	3	P	LLUMC (11/2025)	BD	**Only Wi-Fi transmission exercised for test, Chipset: NXP 88W9098:** No non-recoverable SEE in 1E10 p+/cm² each | Recoverable SEE (20x) in 8.03E9 p+/cm² across 3 samples
	AIW-170BQ	Advantech	-	Wi-Fi & Bluetooth Card	1	P	LLUMC (11/2025)	BD	**Only Wi-Fi transmission exercised for test, Chipset: Qualcomm QCA2066:** No non-recoverable SEE in 1E10 p+/cm² | Recoverable SEE (4x) in 1E10 p+/cm² for 1 sample
Memory	MTFC256GBCAQTC-IT	Micron Technology	-	eMMC, SLC	3	P	LLUMC (11/2025)	BD	No non-recoverable SEE for 3 samples in 1E10 p+/cm² each Recoverable SEE after power cycle (10x) in 6.38E8 p+/cm² across 2 samples
	SFEM256GB2ED1TB-A-VG-121-STD	Swissbit	-	eMMC, TLC	3	P	LLUMC (11/2025)	BD	No non-recoverable SEE for 3 samples in 1E10 p+/cm² each Recoverable SEE after power cycle (10x) in 9.05E8 p+/cm² across 2 samples
	SDINBDA6-256G-ZA	Sandisk	-	eMMC, SLC & TLC	3	P	LLUMC (11/2025)	BD	No non-recoverable SEE for 3 samples in 1E10 p+/cm² each | Recoverable SEE after power cycle (1x) in 2.4E10 p+/cm² across 2 samples | Self-recoverable SEE (6x) in 1.0E9 p+/cm² for 1 sample
Miscellaneous	Atlas-I-Z8	IVeia	-	Xilinx Zync UltraScale+ MPSoC Processor Board	4	HI	NSRL (06/2025)	RR	No DSEE @ LET = 12.8 MeV-cm²/mg (1E7 ions/cm² for 3 samples each) and @ LET = 17.1 MeV-cm²/mg (1E7 ions/cm² for 1 sample) NDSEE (11x) @ LET = 12.8 MeV-cm²/mg in 1.54E4 ions/cm² (combined across 3 samples)
	P48541-b21	Hewlett Packard	-	Compute Edge Server	1	P	LLUMC (05/2025)	KN	Irradiation was completed on 3 out of 7 planned beam positions. CPU, Ethernet Card (front/back), & RAM modules irradiated individually CPU: non-recoverable SEE in 1.37E8 p+/cm², recoverable SEE (3x) in 1.37E8 p+/cm² Ethernet Card (back): Non-recoverable SEE in 4.42E9 p+/cm², recoverable SEE (4x) in 8.33E9 p+/cm² Ethernet Card (front): Non-recoverable SEE @ 5.32E9 p+/cm², recoverable SEE (4x) in 1.78E9 p+/cm² RAM: recoverable SEE (5x) in 6.8E7 p+/cm²
	119384-02/52	Ametek	-	Blower	5	HI	NSRL (10/2025)	RR	DSEE in 4 samples at the following LETs (MeV-cm²/mg) / Fluences (ions/cm²): 5 / 1.7E6, 9.3 / 1E6, 17.1 / 6E4, 17.1 / 3.4E5 No DSEE for 1 sample @ LET = 1.93 MeV-cm²/mg to 1E7 ions/cm² | No recoverable SEE in 5 samples across all LETs
	119384-02/52	Ametek	-	Blower	2	P	LLUMC (04/2025)	RR	No non-recoverable SEE or recoverable SEE in 2 samples in 1E10 p+/cm² and 4.95E10 p+/cm²
	BCB0812UHN	Delta	-	Blower	3	P	LLUMC (04/2025)	RR	No non-recoverable or recoverable SEE in 3 samples in 1.00E10 p+/cm², 1.00E10 p+/cm², and 1.01E10 p+/cm².
	BFB1224H	Delta	-	Blower	2	P	LLUMC (04/2025)	RR	No non-recoverable or recoverable SEE in 2 samples in 1.03E10 p+/cm², 1.10E10 p+/cm².
	BFB1012VH	Delta	-	Blower	5	HI	NSRL (10/2025)	RR	No DSEE @ LET = 12.8 MeV-cm²/mg (3E7 ions/cm² across 3 samples) | No DSEE @ LET = 17.1 MeV-cm²/mg (1E7 ions/cm² on 1 sample) DSEE @ LET = 17.1 MeV-cm²/mg (6.4E6 ions/cm² on 1 sample) NDSEE (33x) @ LET = 12.8 MeV-cm²/mg in 3E7 ions/cm² and (23x) @ LET = 17.1 MeV-cm²/mg in 1.67E7 ions/cm²
	BFB1012VH	Delta	-	Blower	3	P	LLUMC (04/2025)	RR	No non-recoverable or recoverable SEE in 3 samples in 1.02E10 p+/cm², 9.98E10 p+/cm², and 4.91E10 p+/cm².
	GRIMM	Durag	-	Dust Monitor	2	P	LLUMC (06/2025)	KN	2 beam positions required to irradiate whole part: Beam A: No non-recoverable SEE in 2E10 p+/cm² | Beam B: No non-recoverable SEE in 7.21E9 p+/cm² Beam A: recoverable SEE (9x) in 2E10 p+/cm² | Beam B: recoverable SEE (14x) in 7.21E9 p+/cm² No failure due to Total Dose in 1 Sample to ~3.6 krad(Si) (max tested)
	Model 3444	Kanomax	-	Dust Monitor	2	P	LLUMC (06/2025)	KN	No non-recoverable SEE in 2E10 p+/cm² || Recoverable SEE (7x) in 2E10 p+/cm² | No failure due to Total Dose in 1 Sample to ~1.8 krad(Si) (max tested)
	N/A	NASA JSC	-	Camera & Interface Board	3	HI	NSRL (06/2025)	RR	No DSEE @ LET = 12.8 MeV-cm²/mg (3E7 ions/cm² across 3 samples) | NDSEE (9x) @ LET = 12.76 MeV-cm²/mg in 1.04E4 ions/cm² Camera: Maximum hot pixels observed = 0.06% of total pixel count
	FG-70F	Fortinet	-	Firewall (SD-WAN Security)	1	P	LLUMC (08/2025)	KN	No non-recoverable SEE in 1 sample in 1.12E10 p+/cm² | Recoverable SEE (11x) in 2.56E9 p+/cm²
	FG-60F	Fortinet	-	Firewall (SD-WAN Security)	1	P	LLUMC (08/2025)	KN	2 beam positions required to irradiate whole part: Beam A: No non-recoverable SEE in 1 sample in 1.09E10 p+/cm², recoverable SEE (15x) in 2.07E9 p+/cm² Beam B: No non-recoverable SEE in 1 sample in 1.09E10 p+/cm², recoverable SEE (1x) in 1.09E10 p+/cm²
	IP Power 9855	AVIOSYS	-	Ethernet Power Interrupter	1	P	LLUMC (08/2025)	RR	No non-recoverable SEE in 1 sample in 1.74E10 p+/cm² | Recoverable SEE (17x) in 9.55E9 p+/cm²
	Multiple Medical Kit Devices:	Multiple Mfrs.	-	ECG, Auscultation, Pulse Oximeter, Otoscope, Auscultation	4 (each part)	P	LLUMC (08/2025)	KN	Results provided in REDW Paper due to limited space. Part type, manufacturer, and part number for each tested device is as follows: Portable ECG: AliveCor Kardia Mobile 12L, AliveCor Kardia Mobile 6L, Bittium Faros 360 | Auscultation: Eko COR200 Pulse Oximeter: Masimo MAS-9909, Nonin Onyx Vantage 9590 | Otoscope: Welch Allyn 2280-WHT, Welch Allyn WEL22821 Thermometer: ADC Adtemp 419, Tempagenix Temp-N-Toss (no active electronics), NexTemp Ultra 8000 (no active electronics)
	Multiple Personal Computing Devices	Multiple Mfrs.	-	Personal Computing Device (4x)	2 (each part)	P	ProNova (10/2025, 01/2026)	BD	Results provided in REDW Paper due to limited space. Part mfr. & number for each is as follows: Durabook U11I w/ i5 (2x) & w/ i7 (2x) CPU, Getac K120G3 w/ i5 (2x) & w/ i7 (2x) CPU, Microsoft Surface Pro (MSP) w/ Intel Core™ Ultra 7 processor 268V (2x) & w/ Snapdragon® X Elite (2x) CPU

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