WHITE PAPER

SuperCycle+

Why Signal-Blocking Bags Fail, and How We Built One That Doesn't

Durability testing, cycle ratings and a buyer's checklist for school signal-blocking bags

Generation Faraday by MOS Equipment

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Executive summary

Almost every well constructed signal-blocking bag works on day one. What sets them apart is whether it still works later in the year. In side-by-side cycle testing of 12 competitor bags from 6 brands, most competitor bags stopped blocking signals within a few hundred open-and-close cycles. Generation Faraday bags built with **SuperCycle+ construction** are rated for **2,000+ cycles**, more than 10× longer than the competitor bags tested, on average.

2,000+	150	10×
cycles of continuous signal blocking, every SuperCycle+ bag tested	cycles on average before competitor bags failed	longer life than the competitor bags tested, on average

We know this failure firsthand. Our own first-generation bag used the same TitanRF™ shielding fabric we use today, and it wore out at about the same rate as the competition. That told us the fabric was not the problem. The construction around it was. SuperCycle+ is the rebuild that came out of those tests.

This paper is written for everyone involved in a school phone-free program:

- **District and procurement teams** get a way to compare products by cycles, not by a day-one demo, and a checklist to send any vendor.
- **Principals and teachers** get a clear picture of how bags fail in a real school day, and what that means for a program.
- **Technical evaluators** get the test method, the brand-by-brand results and the shielding standards, in the appendix.

The short version: ask every vendor how many cycles their bag survived while still blocking signals, and ask them to show the data.

The problem with day-one testing

The standard evaluation (put a phone in the bag, call it, watch it go to voicemail) checks a bag at its best: new, handled with care, tested once. Schools don't use bags that way.

In a school year, a bag gets opened and closed hundreds of times. It gets stuffed into backpacks, dropped, spilled on, and passed through many hands. A bag that passes a demo in August and fails in November is not a cheaper option. It's a program failure: the phone is back online, the policy stops working, and there may be no money left to reorder.

So the real question isn't *does it block signals?* It's *how long will it keep blocking them?* Cycles answer that question.

Defining the cycle

A cycle is one full use of the bag. Every rating and result in this paper uses this definition:

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1. Bag opened
2. Phone placed inside
3. Bag sealed (and locked, if it has a lock)
4. Bag opened
5. Phone removed
6. Bag sealed again

Each cycle flexes the shielding liner, loads the closure, and works the lock. Those stresses add up, and over hundreds or thousands of cycles they decide whether the bag still blocks signals.

How fast schools add up cycles

How fast a school uses up cycles depends on its phone policy. These are the four patterns we see in deployments:

Use pattern	Typical policy	Cycles per day	Cycles per 180-day year
Low: bell-to-bell	Phones bagged all day under a district or state ban	2 (planning figure)	360
Medium: blocks or programs	Access at lunch or between blocks	3–4	540–720
High: every period	Classroom-level rules, access in hallways	5–8	900–1,440
Extreme: in-class access	Phones opened during class	9–16	1,620–2,880

In a strict bell-to-bell day, the bag is closed in the morning and opened at the final bell, which is one cycle. We plan around two cycles a day because real days add extra opens: a lunch check, a nurse visit, a parent pickup. Using two keeps the lifespan numbers conservative.

Why bags fail

A Faraday bag blocks signals with a passive conductive liner that completely surrounds the phone. Every other part of the bag (the exterior, the seams, the closure, the lock) exists to protect that liner. When the liner's enclosure is broken, the shielding stops working.

Shielding doesn't fade evenly. A healthy liner holds signals far below what a phone needs to connect. As wear builds up, a small crack or gap barely changes anything, until it opens a path big enough for the phone to reach a tower or a router. From the school's side, that looks like a sudden failure: the bag worked yesterday and doesn't today.

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In our testing, failures came from five sources:

Failure mode	What happens	Where we saw it
Flex fatigue	Repeated folding cracks the conductive layer, usually at the fold line and the seams	The most common cause of cycle failure across brands
Seam wear	Stitching that passes through the liner frays and opens gaps over time	Bags whose seams pierce the shielding
Water intrusion	Water gets through the exterior, reaches the liner, and damages it permanently	Foam, nylon and fabric exteriors in the dunk test
Closure gaps	The opening stops sealing completely without being squeezed	Single-layer magnetic and gasket-style closures
Lock wear	Thin locking pins bend, and the bag can no longer be locked	Pin-style locks in the lock test

None of these failures can be fixed in the field. Once the liner or closure goes, the bag has to be replaced.

Where SuperCycle+ came from: we tested our own bag first

Our first-generation school bag already beat most of the market where buyers usually look: two layers of military- and forensics-grade TitanRF™ on every side and complete signal blocking out of the box. Its construction, though, followed the industry standard, and on cycle life it landed where the industry does, at about 200 cycles in our tests. The fabric wasn't the limit. Standard industry construction was.

So we stopped asking which fabric blocks best and started asking which *construction* keeps a fabric blocking. Over many months we built and cycled dozens of variations of liner, layering, seam, thread and exterior, and re-tested signal every 100 cycles. Three results shaped what came next:

- **More shielding alone didn't solve it.** Doubling the shielding layers on its own still failed in the hundreds of cycles. Durability came from how the layers are put together, not how many there are.
- **Seams and fold lines are where bags die.** Failures clustered where the liner flexes hardest and where stitching meets the shielding.
- **The exterior is part of the shielding system.** Exteriors that let water through led to liner failures that more layers couldn't prevent.

SuperCycle+ construction

SuperCycle+ is Generation Faraday's proprietary bag construction, rated for **2,000+ cycles** of continuous signal blocking. It's built into every Generation Faraday signal-blocking bag. The flagship is the **Max-Lock**, the bag most schools deploy.

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What it does

- **Takes the flex load off the liner.** The way the layers are put together keeps the fold-line and seam fatigue described above away from the shielding.
- **Keeps redundant shielding on every side.** Two layers of TitanRF™ plus one layer of our proprietary SuperCycle Faraday fabric surround the phone, so wear on one layer doesn't open a path for signal.
- **Keeps stitching from breaking the enclosure.** Seams are designed so stitching doesn't create a continuous path through the shielding.
- **Seals without anyone squeezing it.** The double-roll closure, held by a neodymium magnetic seal, closes the opening completely while the bag lies flat on a desk.

The parts around it (Max-Lock)

Component	Max-Lock
Exterior	Waterproof 600D/420D TPU
Shielding	Two layers of TitanRF™ + one layer of proprietary SuperCycle Faraday fabric, on all sides
Closure	Patented double-roll closure with neodymium magnetic seal
Lock	All-metal clasp-and-ring lock with no thin pin; opened with the Unlock Dock or handheld key
Capacity	Two phones plus earbuds
Tracking	Unique serial number and ID card slot

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The shielding fabric: TitanRF™

TitanRF™ is Mission Darkness's woven nickel-copper shielding fabric, used by military, law enforcement and digital-forensics teams. Its specifications are published:

Property	TitanRF™
Construction	Woven nickel-copper conductive fabric
Composition	66% polyester, 25% copper, 9% nickel
Surface resistance	≈ 0.5 Ω/sq
Thickness	80 ± 5 µm
Attenuation, single layer	>65 dB
Lab-tested attenuation	80–120 dB average, 10 MHz to 40 GHz (Keystone Compliance)
Frequency coverage	Low MHz to 40 GHz
Test standards	IEEE 299-2006; MIL-STD-188-125

Source: Mission Darkness TitanRF™ Faraday Fabric

The fabric sets the shielding performance. SuperCycle+ decides how long a bag stays at that performance.

Comparative testing

We cycled 12 competitor bags from 6 brands side by side with SuperCycle+ Max-Lock bags, using the same procedure and signal check for every bag. The competitor bags failed after 150 cycles on average. Every SuperCycle+ bag was still blocking past 2,000 cycles, more than 10× longer.

How we tested

1. **Baseline.** Each bag was sealed with a phone inside and checked for cellular, Wi-Fi and Bluetooth at a controlled distance from the signal source.
2. **Cycling.** Bags were cycled with a phone, using the six-step definition above.
3. **Re-check.** Every 100 cycles, each bag was re-tested with the same baseline procedure. A bag "failed" at the first check where the phone kept or regained a connection.
4. **Abuse tests.** Separately, bags were water tested and their locks were worked repeatedly (below).

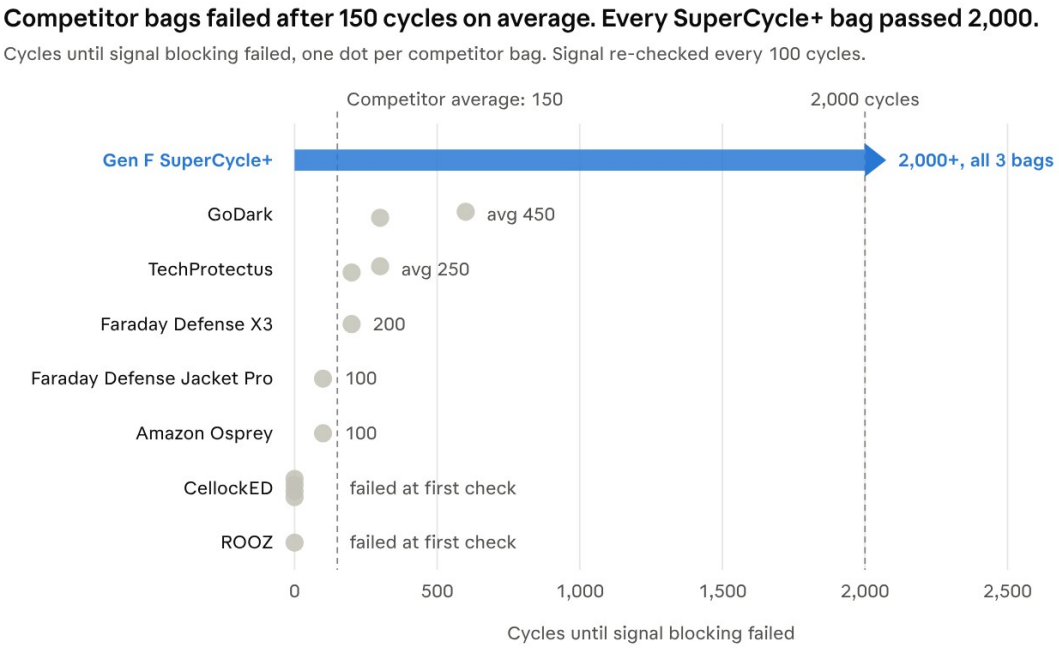
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Baseline: blocking on day one

Bag	Cellular	Wi-Fi
Gen F Max-Lock (SuperCycle+)	Blocked	Blocked
Faraday Defense X3	Blocked	Blocked
Faraday Defense Jacket Pro	Blocked	Blocked
TechProtectus	Blocked	Blocked
CellockED	Not blocked	Not blocked

CellockED's maker describes it as reducing EMF exposure, not fully blocking signals. Its single liner layer and single-layer magnetic opening are consistent with that.

Cycle results



Generation Faraday cycle-testing workbook · 12 competitor bags from 6 brands, 3 SuperCycle+ Max-Lock bags

The longest-lasting competitor bag reached 600 cycles. Two brands failed at the first check: CellockED never fully blocked signals, and ROOZ failed before 100 cycles.

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Water test

Each bag was dunked in dyed water for one minute, then cut open to see whether water had reached the shielding. Once water reaches the liner, signal blocking is permanently compromised.

Bag	Liner stayed dry
Gen F Max-Lock (SuperCycle+, TPU exterior)	Yes
Faraday Defense X3	No
Faraday Defense Jacket Pro	No
CellockED	No

Lock test

Of the bags tested, only CellockED and the Max-Lock have locks. The Faraday Defense X3 and Jacket Pro don't. CellockED uses a thin metal pin, which bent with normal use and deliberate mishandling, leaving the bag unable to lock. The Max-Lock's all-metal clasp-and-ring lock has no pin and kept its shape through the same handling.

What 2,000+ cycles means for a school

At bell-to-bell use, a 2,000-cycle bag lasts longer than a student's four years of high school. At medium use, a bag that fails at 150 cycles is done in about seven weeks of school.

Lifespan in school years

Cycles until failure	Low: 2/day	Medium: 4/day	High: 8/day
150 (competitor average)	0.4	0.2	0.1
500	1.4	0.7	0.3
1,000	2.8	1.4	0.7
2,000 (SuperCycle+ rating)	**5.6**	**2.8**	**1.4**

180-day school years. Assumes the shielding is the only thing that limits the bag's life.

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Bags needed per student over four years

A bag's price only matters when you multiply it by how many bags you'll buy. Over a four-year enrollment:

Cycles until failure	Low: 2/day (1,440 cycles)	Medium: 4/day (2,880)	High: 8/day (5,760)
150	10	20	39
500	3	6	12
1,000	2	3	6
2,000 (SuperCycle+)	**1**	**2**	**3**

Whole bags, rounded up. Every replacement also means a reorder, a gap in the program, and a teacher handling a failed bag. To compare vendors, multiply each one's unit price by its row in this table.

Signal performance and standards, in plain English

A bag for a school has to block every wireless path a phone uses, not just cellular. Generation Faraday bags block:

Signal	Frequency	Why it matters in school
Cellular, incl. 5G	~600 MHz to 40 GHz (mmWave)	Calls, texts, data, notifications
Wi-Fi	2.4 and 5 GHz	Stops the "cellular is off but Wi-Fi works" workaround
Bluetooth	2.4 GHz	Earbuds and smartwatches drop off
GPS	~1.2–1.6 GHz	Location can't be tracked while the phone is bagged
NFC	13.56 MHz	Tap-to-pay and short-range transfers
RFID	Low MHz	Access-card and tag signals

Attenuation. Shielding is measured in decibels (dB). Every 10 dB cuts signal power by a factor of 10, so 80 dB is a 100,000,000× reduction. A single layer of TitanRF™ is rated above 65 dB. In accredited lab testing by Keystone Compliance, it averaged 80–120 dB from 10 MHz to 40 GHz. SuperCycle+ puts two layers of TitanRF™ and a layer of SuperCycle Faraday fabric on every side.

IEEE 299-2006 is the IEEE's standard *method* for measuring how well an enclosure shields. Results reported against it were measured in a consistent, repeatable way that can be compared across labs.

MIL-STD-188-125 is the U.S. Department of Defense standard for shielding facilities against high-altitude electromagnetic pulse (HEMP). TitanRF™ has been tested against its shielding requirements.

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Schools aren't buying for battlefield conditions, but material tested to this bar has a lot of margin for a classroom.

What to ask any vendor: dB figures across a stated frequency range, the test method, and whether shielding was re-tested *after* cycling, not just on a new bag.

Buyer's checklist

Use these questions with any vendor, including us. A good answer comes with data.

Durability

- ☐ What is the bag's cycle rating, and how does the vendor define a cycle?
- ☐ How many bags were cycled, and what was the lowest result, not just the best?
- ☐ Was signal re-tested during cycling? How often, and with a phone inside?
- ☐ What counted as a failure, and where did failed bags break?

Signal blocking

- ☐ Does it block cellular (including 5G), Wi-Fi on 2.4 and 5 GHz, Bluetooth, GPS and NFC?
- ☐ Are attenuation figures given in dB across a stated frequency range, with a test method such as IEEE 299-2006?
- ☐ Was the bag tested lying flat with no one squeezing it, the way it sits on a desk?

Construction

- ☐ How many shielding layers surround the phone on every side?
- ☐ Does any stitching pass through the shielding layers?
- ☐ Is the exterior waterproof (not just water-resistant), and has the liner been checked after water exposure?
- ☐ Does the closure seal on its own, without anyone pressing on it?

Locking (if required)

- ☐ What is the lock made of? Does it rely on a thin pin?
- ☐ Has the lock been tested through repeated use and deliberate mishandling?

Program support

- ☐ Serial numbers and student assignment tracking?
- ☐ Replacement policy if bags fail before their rated cycles?
- ☐ Rollout support and realistic lead times?

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Appendix

A. Test scope and limitations

- **Samples.** Competitor bags tested: CellockED (4), GoDark (2), TechProtectus (2), Faraday Defense X3 (1), Faraday Defense Jacket Pro (1), Amazon Osprey (1), ROOZ (1). Some models had only one sample, so treat their results as indicative.
- **Resolution.** Signal was checked every 100 cycles, so each failure is recorded to the nearest 100. "0 cycles" means the bag failed at the first check.
- **Conditions.** Testing was conducted in-house in January 2026, under controlled, repeatable handling. Real school conditions (drops, backpacks, heat) add stress the test doesn't, so field life may be shorter than test life.
- **Scope of claims.** Results apply to the models and samples tested. They are not a claim about every product a brand makes. The water and lock tests covered only the bags listed in those sections.
- **Ratings.** A cycle rating is a tested performance standard, not a guaranteed service life for every unit.
- **Video.** See the cycle, water and lock testing on video: Generation Faraday cycle testing, part 1 · part 2.

B. Glossary

- **Attenuation:** How much a material weakens a signal, measured in dB. Each 10 dB is a 10× reduction in power.
- **Cycle:** One full use of a bag: open, phone in, seal, open, phone out, seal.
- **Cycle rating:** The number of cycles a bag is tested to survive while still blocking signals.
- **Delamination:** Bonded layers separating inside the bag, which can open gaps in the shielding.
- **Faraday enclosure:** A conductive shell that keeps radio signals from passing through it.
- **Liner:** The internal shielding layer that does the actual signal blocking.
- **mmWave:** High-frequency 5G (24 GHz and above), used in dense urban networks.
- **SuperCycle+:** Generation Faraday's proprietary bag construction, rated for 2,000+ cycles: two layers of TitanRF™ plus one layer of SuperCycle Faraday fabric.
    - **SuperCycle Faraday fabric:** Generation Faraday's proprietary shielding fabric, used as the third shielding layer in SuperCycle+ construction.
- **TitanRF™:** Mission Darkness's woven nickel-copper shielding fabric.
- **TPU:** Thermoplastic polyurethane, a waterproof, abrasion-resistant exterior material.

Sources

- Generation Faraday internal cycle-testing workbook and test video scripts (2026)
- Generation Faraday Max-Lock product page
- Durable Phone Bags for Schools: Why Max Lock Lasted 10× Longer in Testing
- Mission Darkness Generation Faraday Max-Lock (MOS Equipment)

For test data, procurement inquiries or technical documentation, contact info@generationfaraday.com or +1-805-764-4346. © MOS Equipment 2026.

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