

Antenna Array Designer Pro

Full-Stack Phased Array Design and Analysis Platform

What It Is

A complete phased array antenna design platform that replaces manual iterative design workflows with a proprietary deterministic engine. Define your array geometry, beam direction, null placement, and sidelobe constraints — the engine delivers certified weight vectors that satisfy every requirement. Every solution includes an auto-generated MATLAB verification script for fully independent confirmation of all claimed performance metrics.

< 1s	6	20	10
Typical solve time	Regulatory standards auto-checked	Interactive analysis panels	Workstation tabs

Why It Matters

Traditional phased array design relies on iterative numerical optimization — methods that are slow, non-deterministic, and offer no guarantee of convergence. Engineers spend days tuning optimizer parameters, re-running failed attempts, and manually verifying results against regulatory envelopes.

This platform delivers certified results in under a second, with automatic baseline comparison against 6 established methods, built-in regulatory compliance checking, and a 20-panel interactive analysis suite — all in a single unified workstation. One solve, complete insight.

Time Savings

Task	Traditional	This Platform
Single beam + nulls	30-60 min (manual tuning)	Under 1 second
Full scan codebook	Days (per-beam optimization)	Minutes (automated sweep)
Regulatory compliance	Hours (manual envelope overlay)	Automatic — every solve
Hardware robustness check	Separate Monte Carlo campaign	Built-in — one slider
Independent verification	Write custom MATLAB script	Auto-generated, runs out of the box

Supported Configurations

- **Array Geometries:** ULA (linear), URA (rectangular), UCA (circular), Conformal (arbitrary 3D element positions)
- **Scale:** Up to 256+ elements per array
- **Weight Modes:** Complex, bounded-complex (amplitude-constrained), phase-only
- **Constraints:** Arbitrary null placement, SLL masks, phase quantization (any bit depth), amplitude bounds, failed element compensation
- **Mutual Coupling:** Load measured or simulated NxN coupling matrices — accounted for during optimization

- **Verification:** Two-layer independent certification + auto-generated MATLAB verification script
- **Export:** JSON, CSV, MATLAB — all with independent verification, no proprietary dependencies

Automatic Baseline Comparison

Every solve automatically runs the identical problem through 6 established beamforming methods. Results are displayed side-by-side — no separate setup, no manual benchmarking. You see exactly how the solution compares to industry-standard approaches.

Method	Description
Multi-Start Gradient (L-BFGS-B)	5-start numerical optimizer with random initialization
Gradient + Chebyshev Taper	Same optimizer with Dolph-Chebyshev amplitude taper seeding
DFT + Chebyshev Window	Standard 5G/NR codebook approach — DFT steering with window taper
MVDR / Capon	Minimum Variance Distortionless Response adaptive beamformer
LCMV	Linearly Constrained Minimum Variance null-steering method
SOCP (Convex Relaxation)	Second-Order Cone Program via convex optimization

Built-In Regulatory Compliance

Automatic pre-hardware regulatory verification against 6 international standards. Pass/fail with margin reported per standard. Visual envelope overlay available in the interactive analysis suite.

Standard	Application
FCC §25.209	Earth station antenna performance (co-pol, GSO arc)
FCC §25.218	Off-axis EIRP density (digital Ku-band FSS)
ITU-R S.580-6	Reference radiation pattern for FSS earth stations
ITU-R S.1428-1	Reference radiation pattern for NGSO earth stations
MIL-STD-188-164B	Military SHF SATCOM interoperability
ETSI EN 302 217	Fixed radio systems, point-to-point antennas

10-Tab Production Workstation

- **Setup:** Geometry picker, beam/null configuration, weight mode, phase bits, failed elements
- **Results:** Executive summary, certification status, ranked solutions, solve statistics
- **Pattern:** Rectangular + polar pattern plots, baseline overlay, null zoom
- **Robustness:** Phase noise analysis, dead element sweep, quantization impact
- **Sweep:** Automated scan codebook generation with transition analysis
- **Compare:** 6 baselines vs. engine — SLL, null depth, directivity charts + compliance cards
- **Export:** JSON, CSV, MATLAB verification script — no proprietary dependencies
- **Verify:** Independent verification status, MATLAB script preview, copy-paste ready
- **Batch:** Multi-problem queue processing
- **Interactive:** 20-panel real-time analysis suite (see next page)

Interactive Engineering Analysis Suite

20 real-time analysis panels. Every panel updates live on slider changes — no re-running, no separate tools, no context switching. One solve populates the entire suite.

Real-Time Pattern Sculpting Place new nulls directly on the live pattern with sliders	Angular Vulnerability Map SINR heatmap showing jammer exposure at every angle
Trade Space Explorer Pareto comparison of all certified solutions	Failure Mode Cascade Progressive element failure with live degradation tracking
Hardware Survival Simulator Phase noise, amplitude error, dead elements, quantization — all on sliders	Scan Animation Animated beam sweep through codebook positions
Operational Scenario Templates Pre-built scenarios: GPS anti-jam, SATCOM, radar, 5G, EW	Jammer Scenario Builder Custom jammer placement with per-emitter power and SINR waterfall
Mutual Coupling Sensitivity Scale coupling strength and watch null/SLL response in real time	Bandwidth Certificate Frequency sweep showing where performance exits spec
Frequency Sensitivity Element spacing scaling with grating lobe onset visualization	Element Criticality Index Ranking of which elements matter most to array performance
Baseline Shootout Pattern overlay of all 6 baselines vs. engine solution	Null Inspector 10x zoom into each null — shape, width, and depth at fine resolution
Monte Carlo Pattern Shadow Statistical envelope under phase noise (90%/99% bands)	Solution Comparison Side-by-side delta between any two certified solutions
Weight Visualizer Amplitude/phase bar charts and polar view of the weight vector	Hardware Weight Export Quantized weights at target bit depth with per-element error
Compliance Envelope Theater Toggle regulatory envelopes on pattern — visual pass/fail	Executive Dashboard Top-level KPIs always visible: SLL, nulls, directivity, health, compliance

New Leaf Tools LLC | Available for live demo | Contact for licensing and integration