MONARCH
Antenna. Inc.
Reshaping Wireless

A Cognitive Antenna for Wireless Applications

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Tayfun Özdemir, Ph.D.

Chief Technology Officer

Technology

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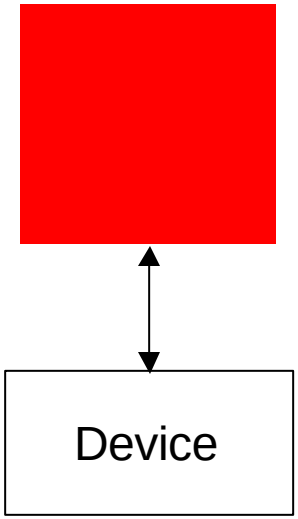
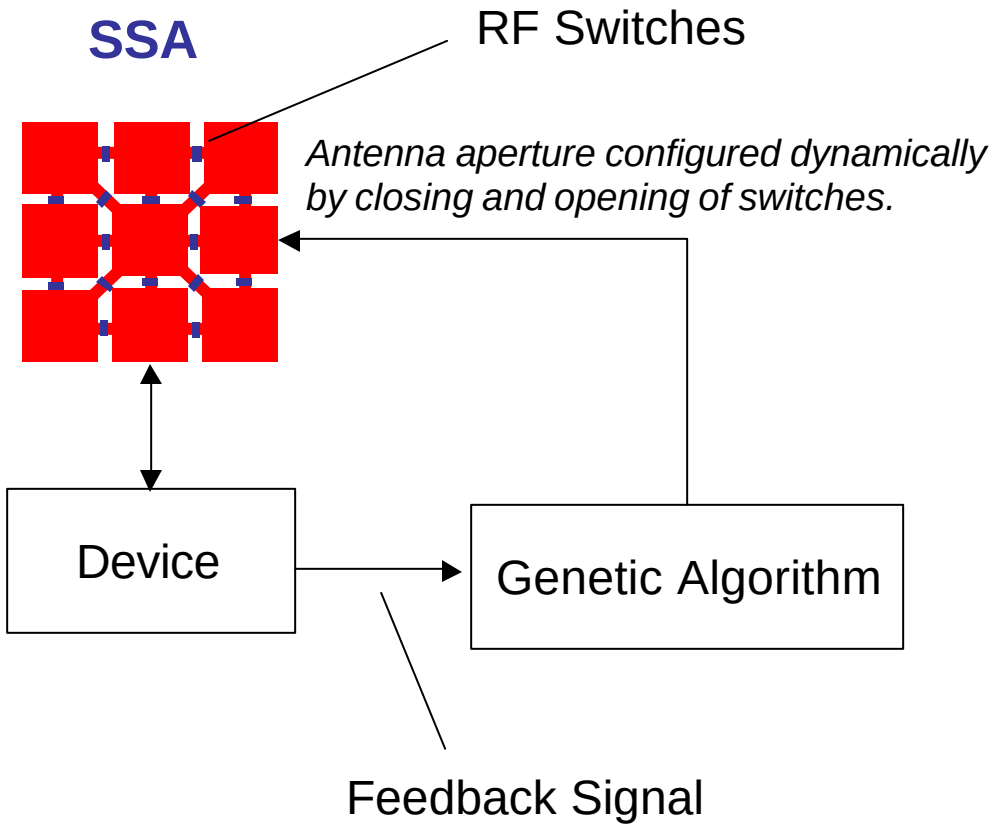
Self-Structuring Antenna (SSA)

Conventional Antenna



SSA



Technology

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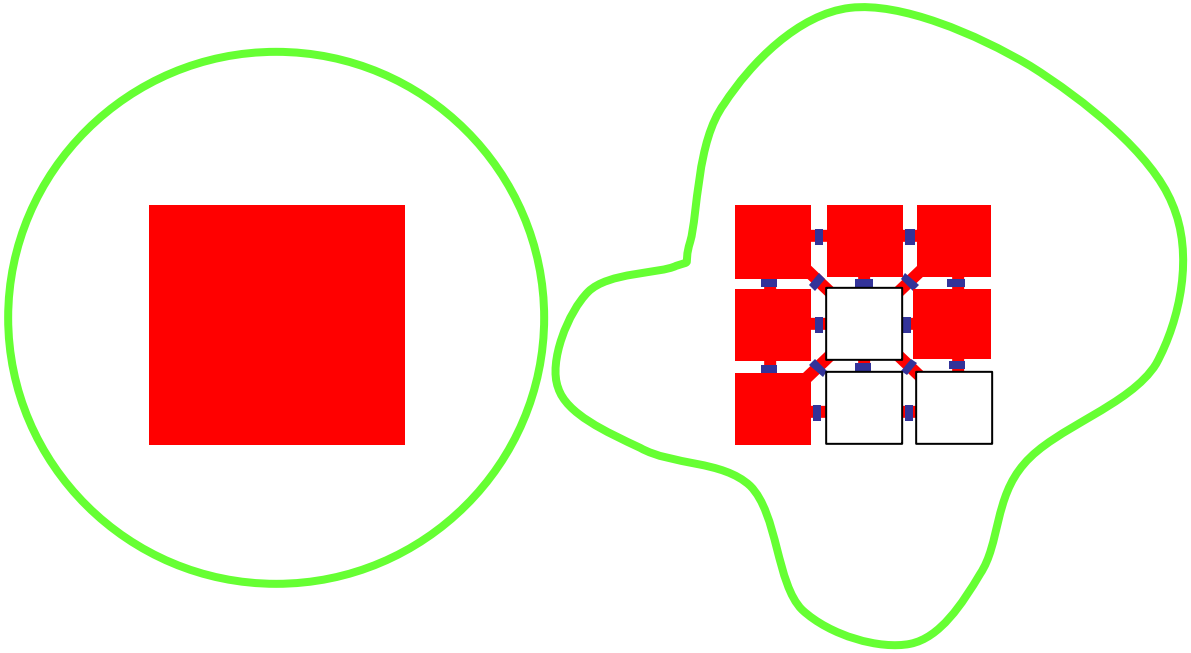
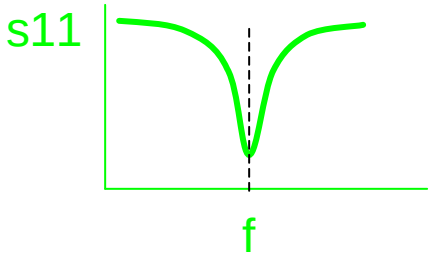
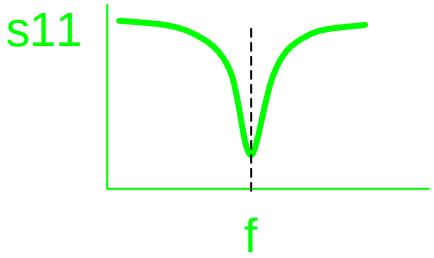
"PATTERN SHAPING"







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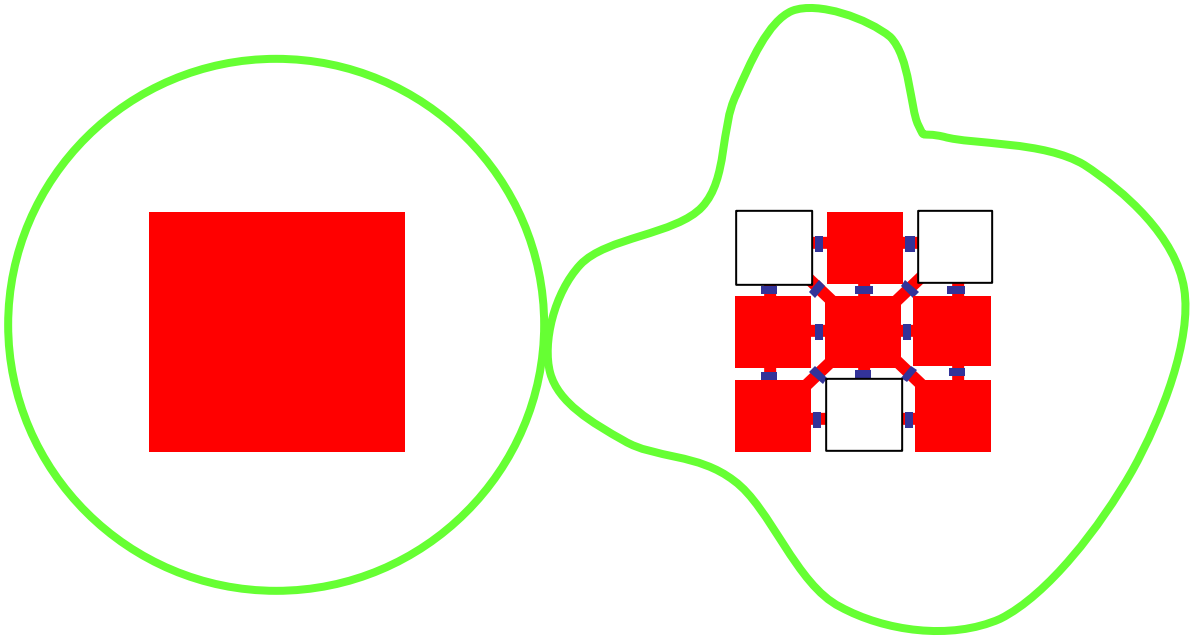

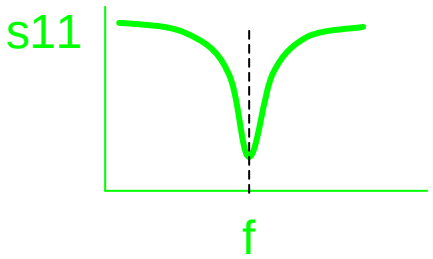

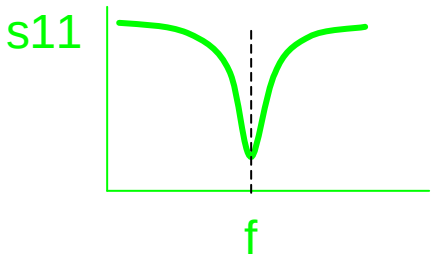

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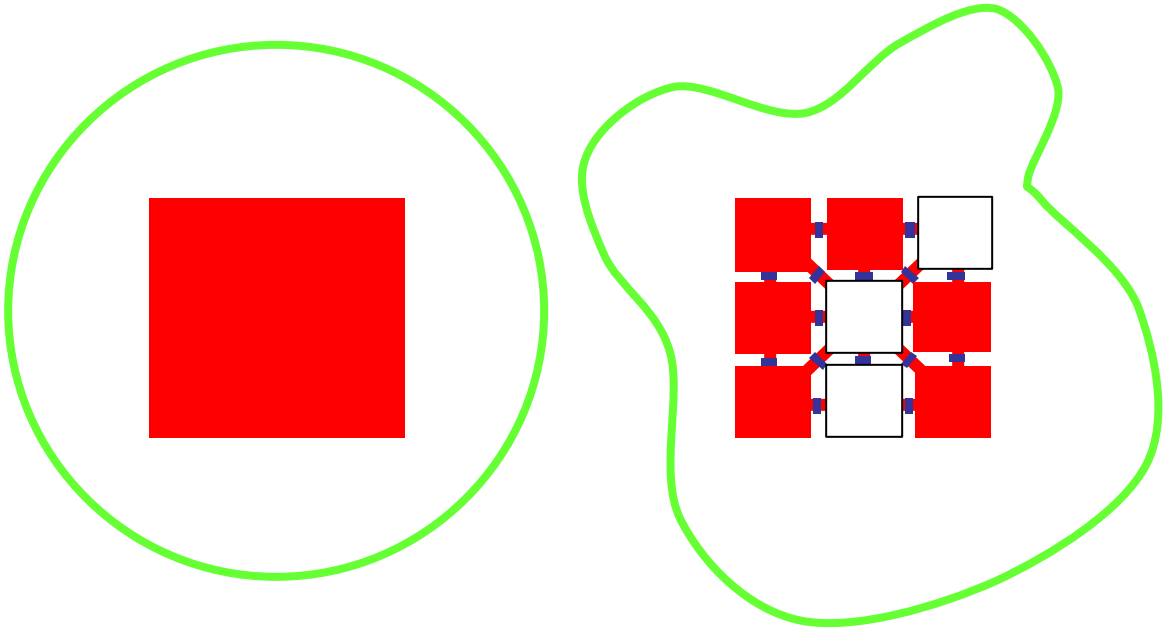

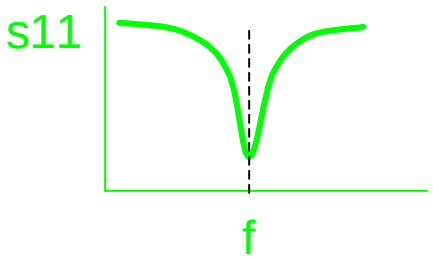

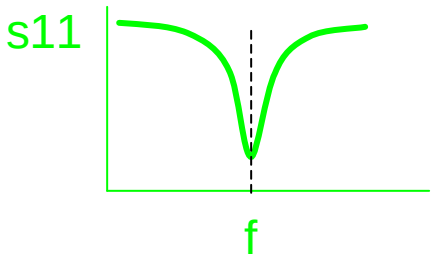

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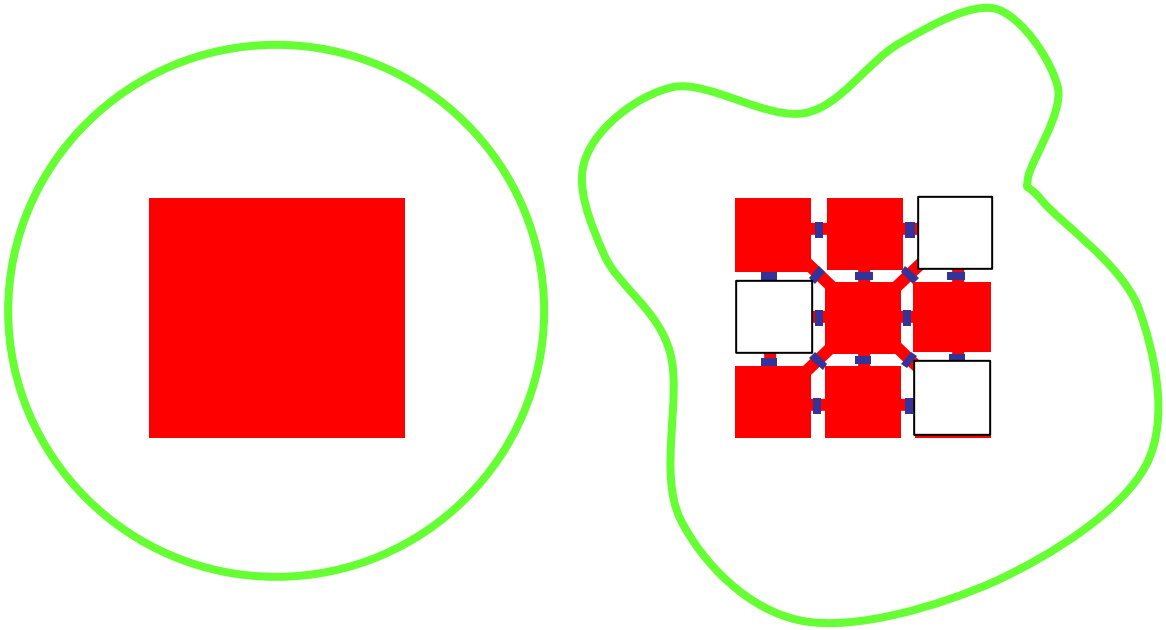
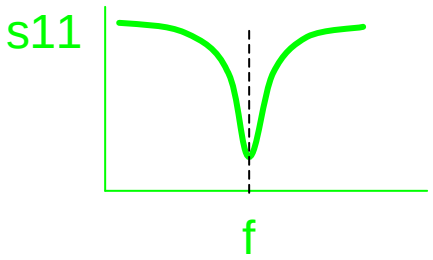
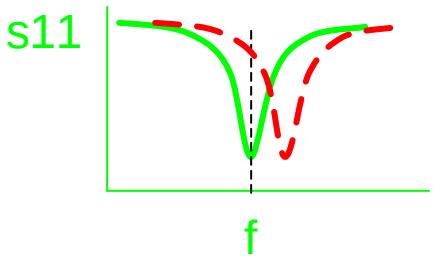
"FREQUENCY TUNING"







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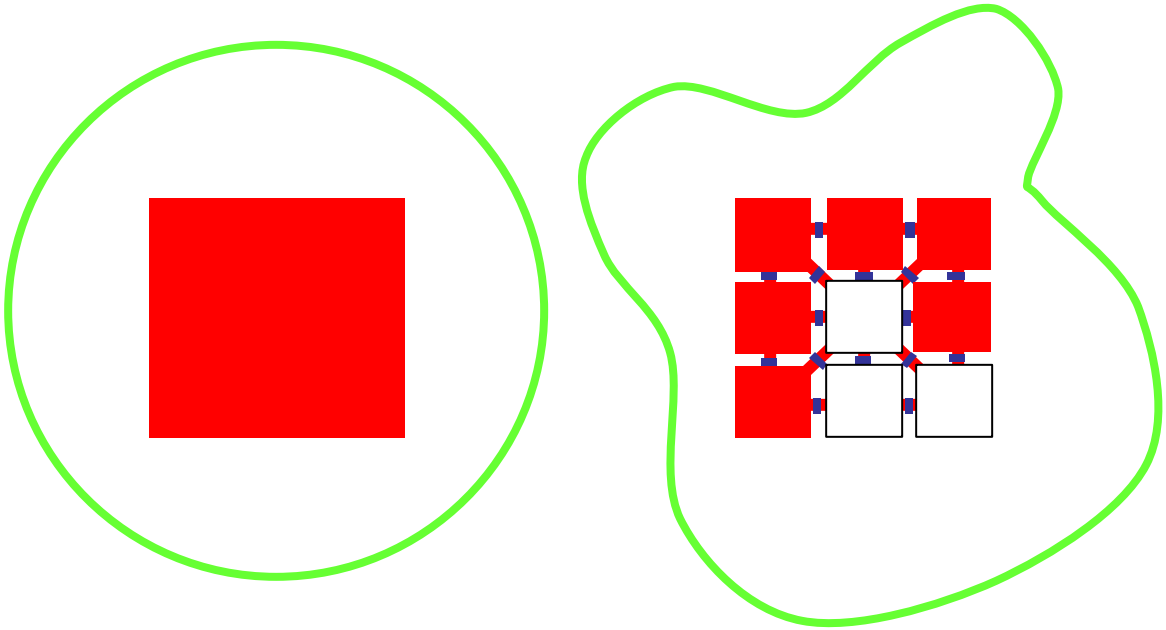

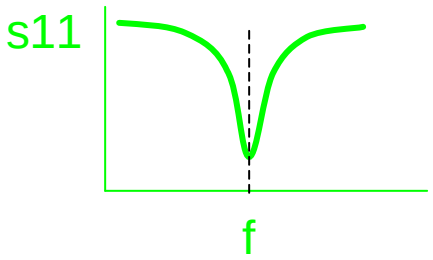

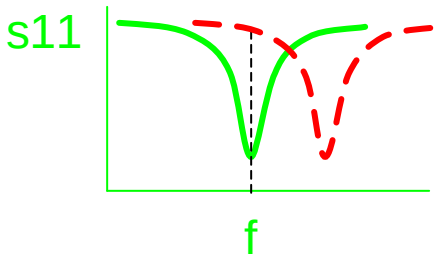

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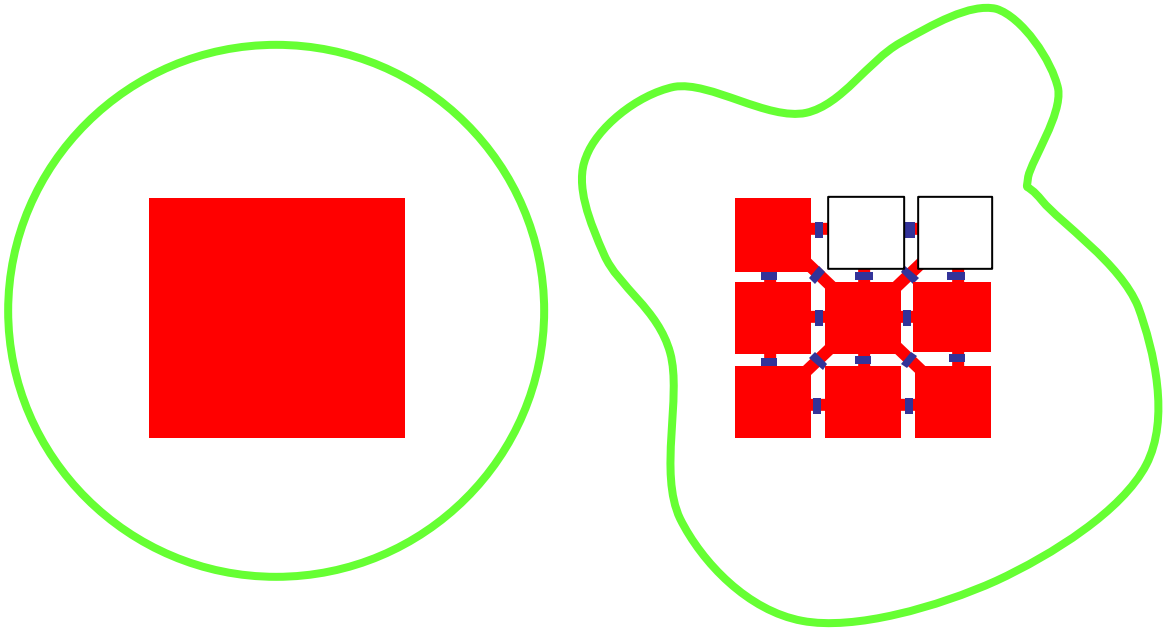

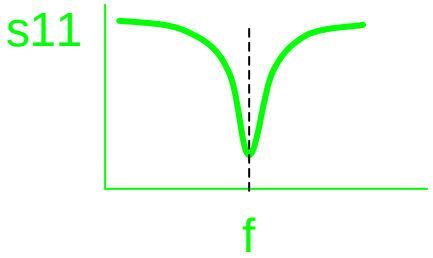

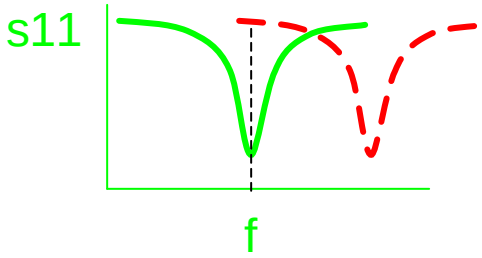

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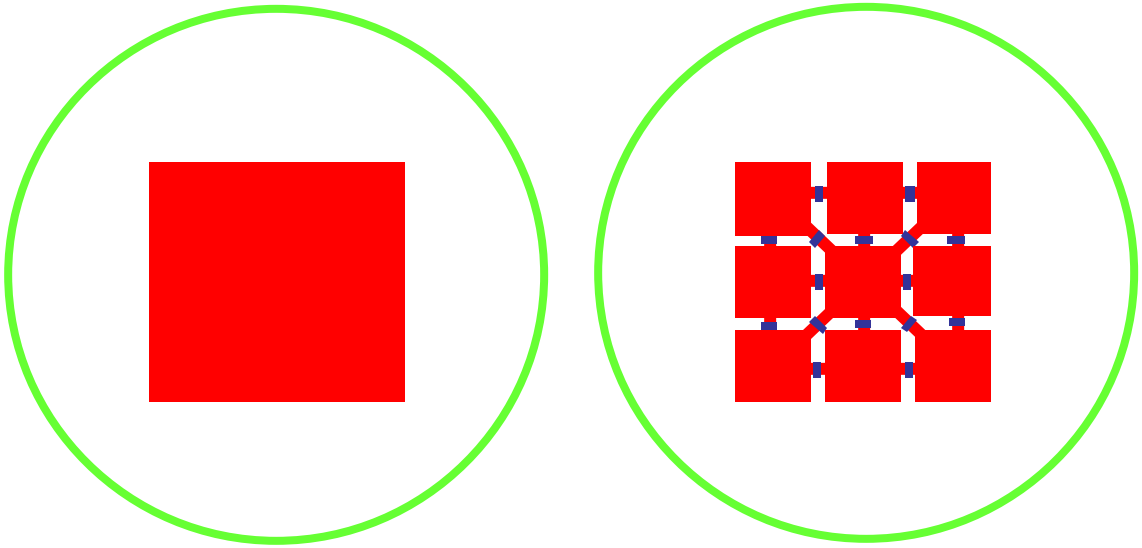
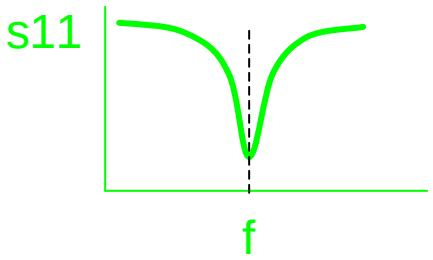
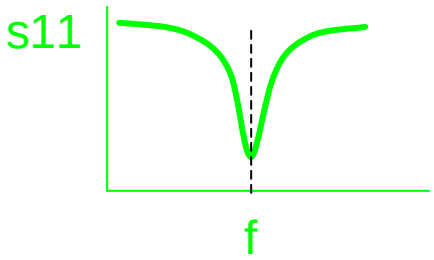
"SELF-HEALING"







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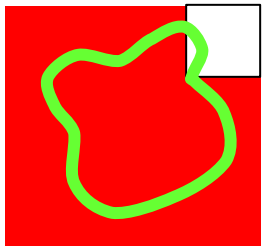
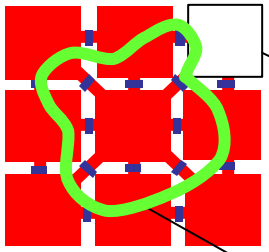
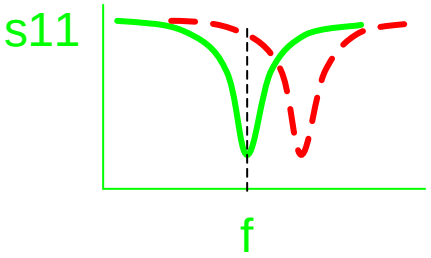
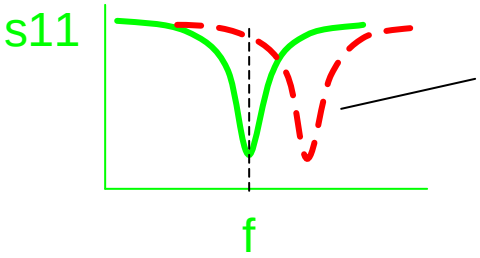




Part of the antenna structure is damaged

Gain drops drastically





Antenna detunes

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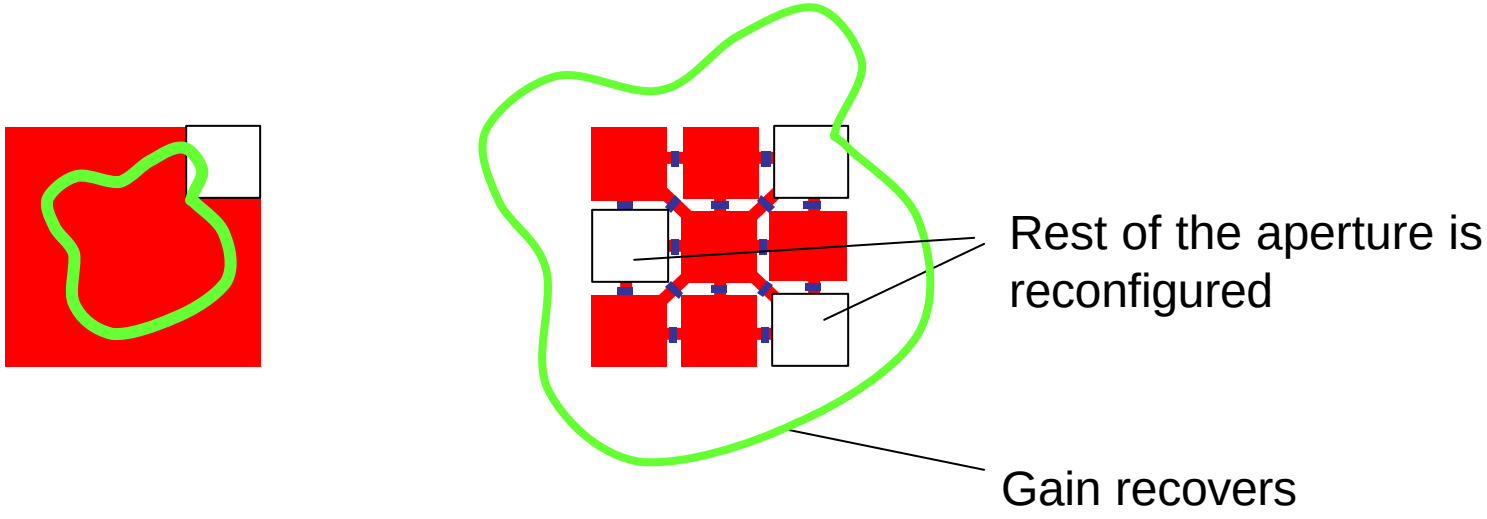
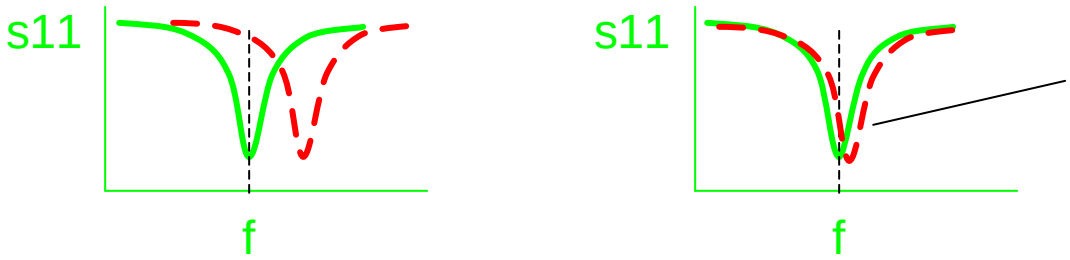
"SELF-HEALING"





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FEATURES		BENEFITS
Pattern shaping	→	Adaptive Beam and Null Steering

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FEATURES		BENEFITS
Pattern shaping	→	Adaptive Beam and Null Steering
Frequency Tuning	→	Dynamic Compensation for Frequency Detuning & Packaging Effects

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FEATURES		BENEFITS
Pattern shaping	→	Adaptive Beam and Null Steering
Frequency Tuning	→	Dynamic Compensation for Frequency Detuning & Packaging Effects
Self-Healing	→	Graceful Degradation

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Market

Market

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Wide-Band:

- Quad-band Phones (multiple frequencies)
- Media-capable Phone (high data rate)

Narrow Band:

- 802.11 (WLAN)
  - Wi-Fi
- 802.15 (PAN)
  - Bluetooth
  - Zigbee
- 802.16 (WMAN)
  - Wi-Max
- Cellular Broadband
  - 3G / EDGE / GPRS / EVDO / UMTS / IDEN
- Cellular Voice
  - GSM, CDMA, TDMA

Technology Solutions

Handset Antenna

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Consumer Demands	Range	Capacity	Cross-Platform Compatibility

Handset Antenna

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Consumer Demands	Range	Capacity	Cross-Platform Compatibility
OEM's Solution	MIMO		

Handset Antenna

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Consumer Demands	Range	Capacity	Cross-Platform Compatibility
OEM's Solution	MIMO		Multi-Band

Handset Antenna

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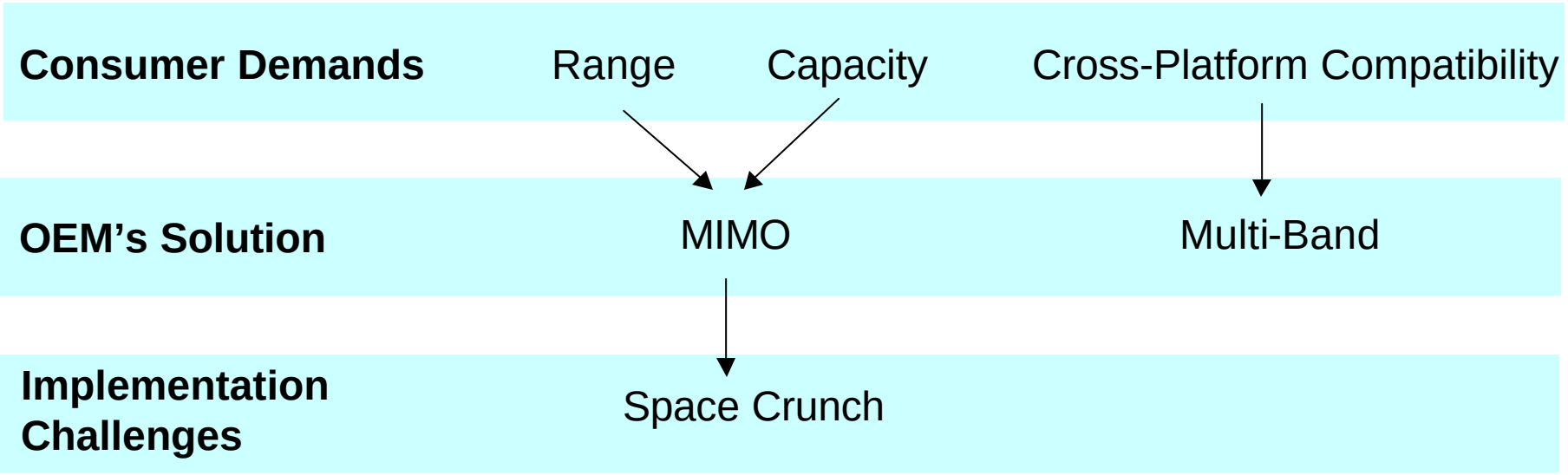

Handset Antenna

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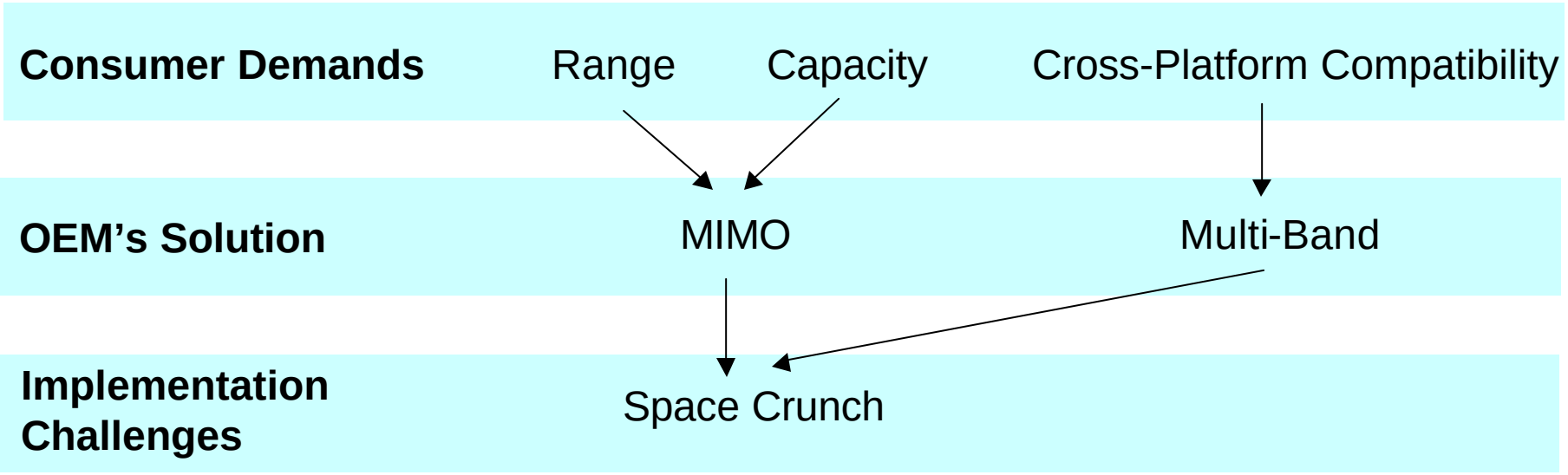

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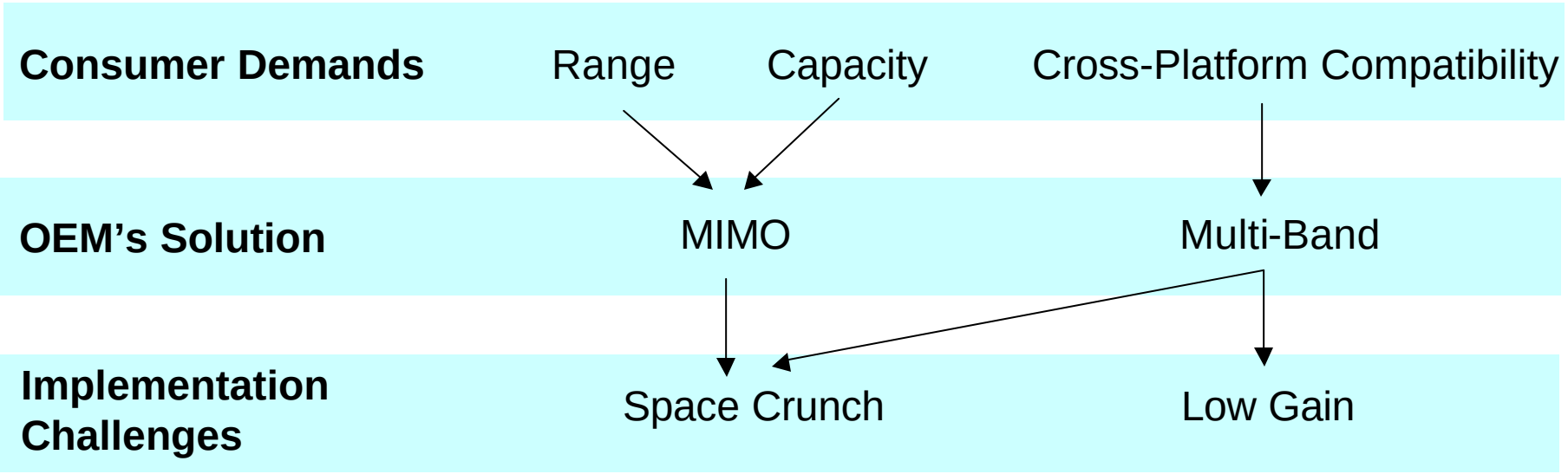

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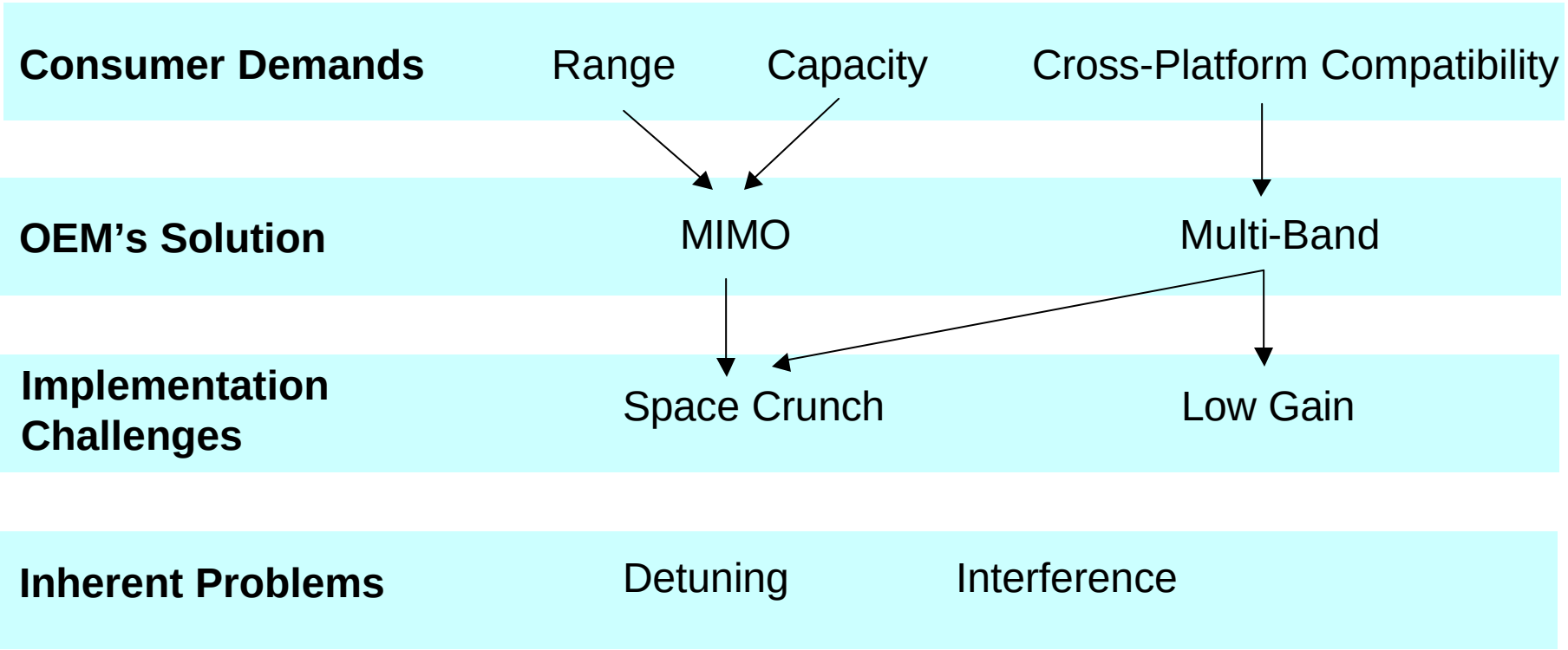

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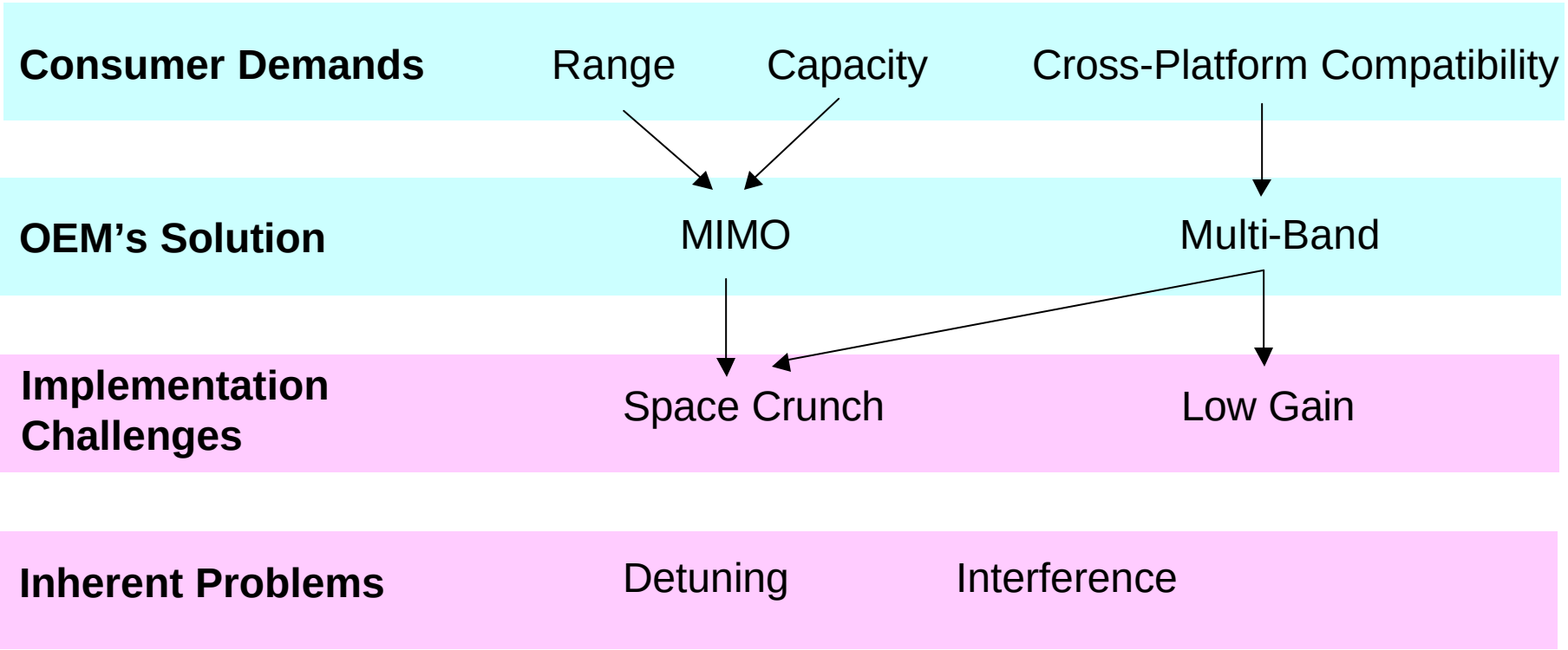

Handset Antenna

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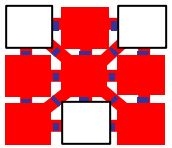
Consumer Demands	Range	Capacity	Cross-Platform Compatibility
OEM's Solution	MIMO		Multi-Band
Implementation Challenges	Space Crunch		Low Gain
Inherent Problems	Detuning	Interference	

Solution:  "Self-Structuring Antenna (SSA)"

Multi-Band

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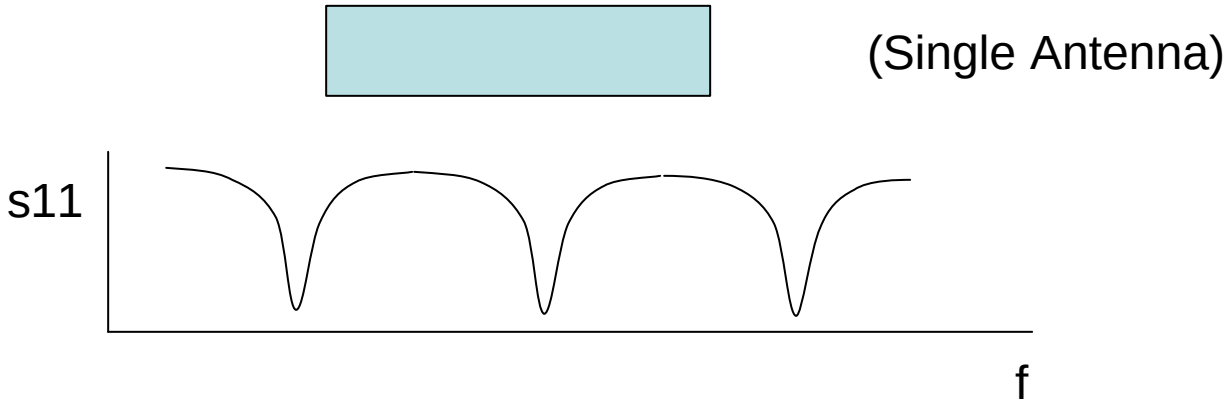
- Voice/Data (850, 900, 1800, 1900)
- Bluetooth, WiFi (2400)
- GPS (1300,1600)

Simultaneous Multi-Band



ANTENNA EFFICIENCY LOW FOR EACH BAND.

Hence Low Gain.

Multi-Band

MONARCH Antenna. Inc.
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- Voice/Data (850, 900, 1800, 1900)
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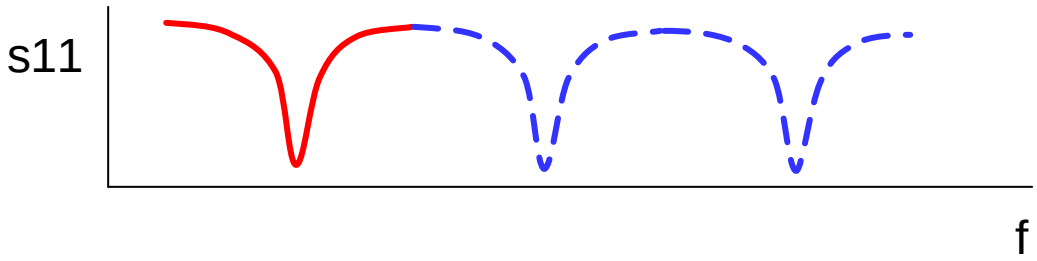
- GPS (1300,1600)

“Instantaneous” Multi-Band
(Frequency Tunable)



ANTENNA EFFICIENCY HIGH FOR EACH BAND.

Hence High Gain.

Multi-Band

MONARCH Antenna. Inc.
Reshaping Wireless

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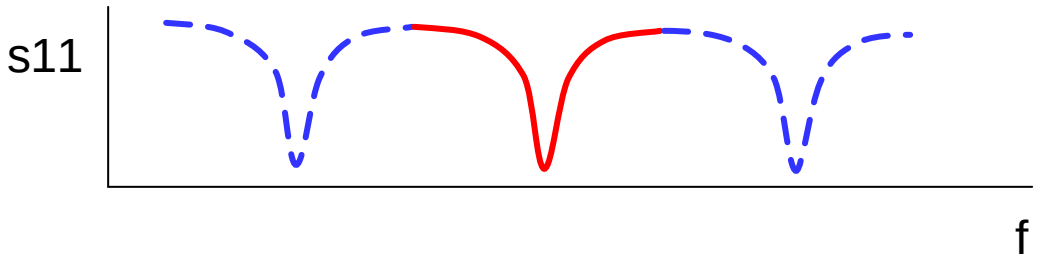

ANTENNA EFFICIENCY HIGH FOR EACH BAND.

Hence High Gain.

Multi-Band

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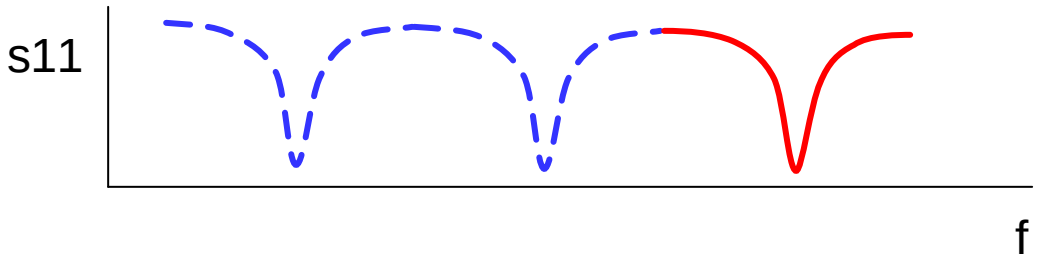

ANTENNA EFFICIENCY HIGH FOR EACH BAND.

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Multi-Band

MONARCH Antenna, Inc.
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- Voice/Data (850, 900, 1800, 1900)
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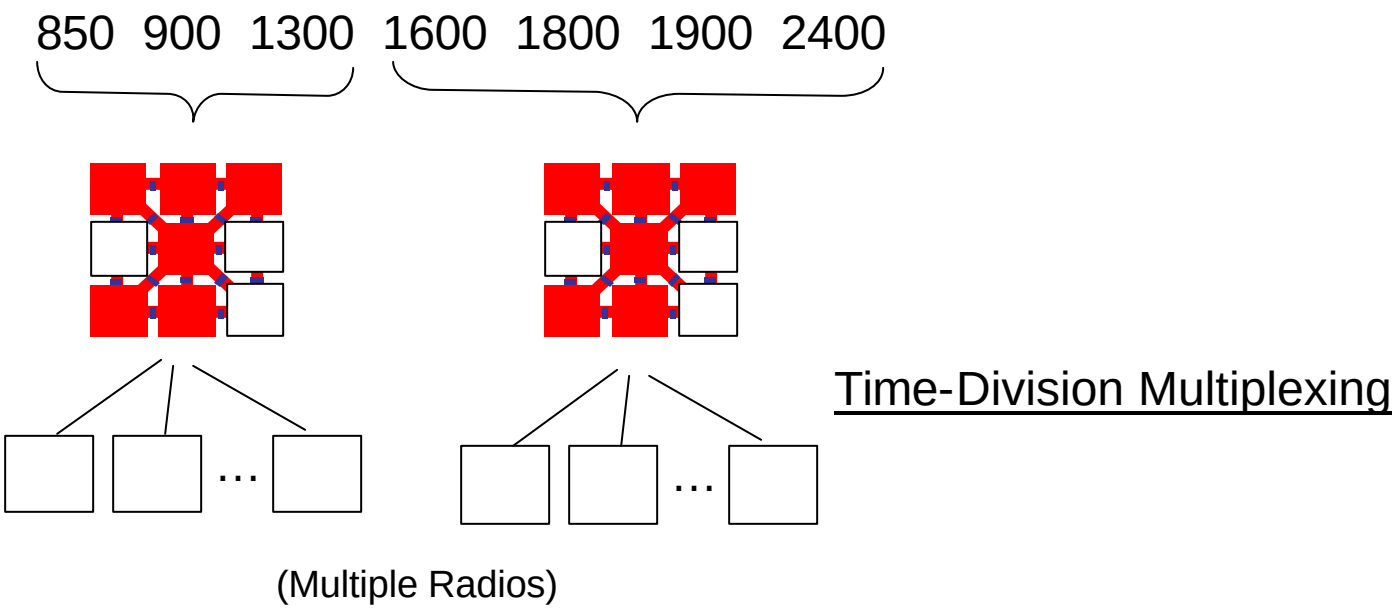
"Instantaneous" Multi-Band by SSA

(Frequency Tunable)



Multi-Band

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- Voice/Data (850, 900, 1800, 1900)
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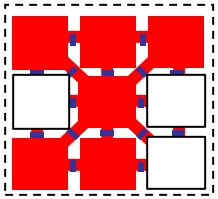
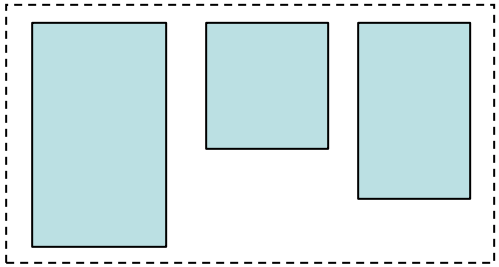
Why does SSA take less space?



Common aperture serving multiple radios



Dedicated antenna for each radio.

Prototypes

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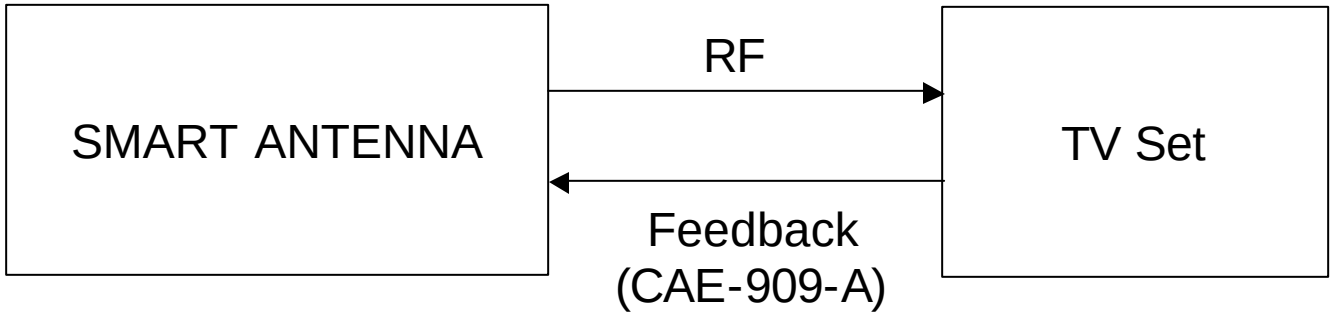
Smart Antenna Standards are finally here!

CEA-909-A *(Design, 12/07)*
CEA-774-A *(Measurement, 4/08)*



Why Smart Antenna?
Move to Digital Broadcast in 2009
Rabbit Ears won't cut it for Over the Air Broadcast

First Movers

- Sony and Hitachi made their proprietary I/O designs available w.r.t. CEA-909-A.
- Antennas Direct, outdoor "electronically steered" antenna
- RCA ANT2000 (Oct’08)
- GE Smart Digital Antenna (Dec’08).

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Pursuing OEMs (Sony, Hitachi, etc…)

Automotive FM

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Prototype successfully demonstrated at Delphi in 2005

***** Currently not pursued *****

GEN 1 and GEN 2 Antennas

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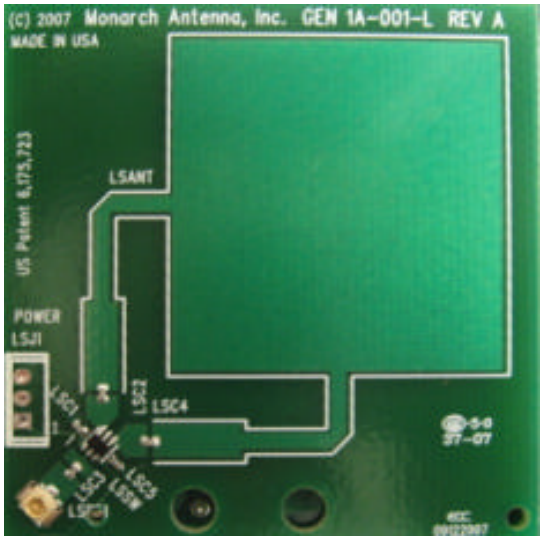
GEN 1



Polarization Diversity
(Sep'07)

GEN 1 and GEN 2 Antennas

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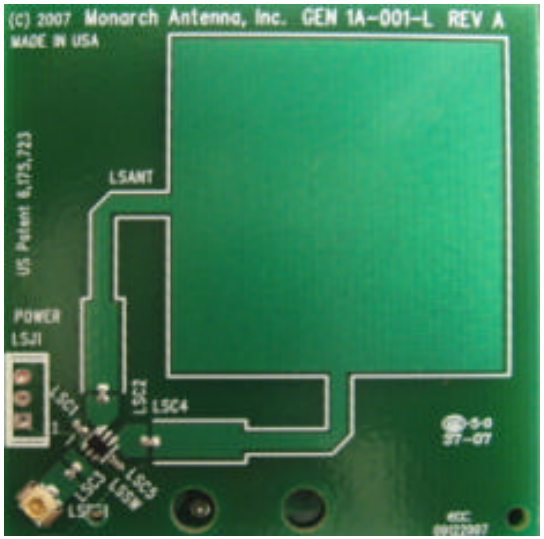
GEN 1



Polarization Diversity
(Apr'07)

Laptop WiFi Demo

GEN 1 and GEN 2 Antennas

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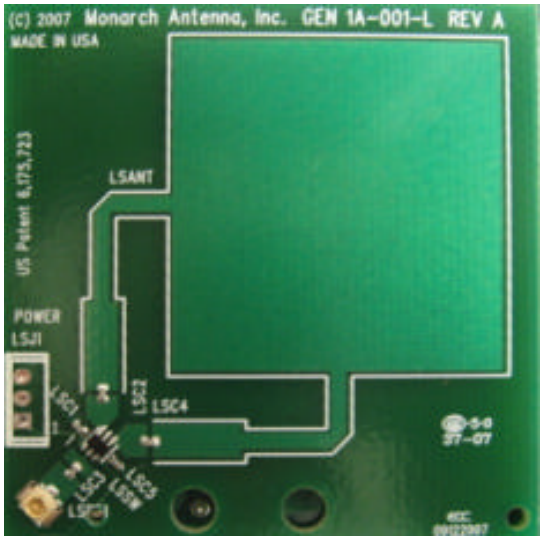

Polarization Diversity
(Apr'07)

Laptop WiFi Demo

ZigBee Customer #1
(Aug'08)

GEN 1 and GEN 2 Antennas

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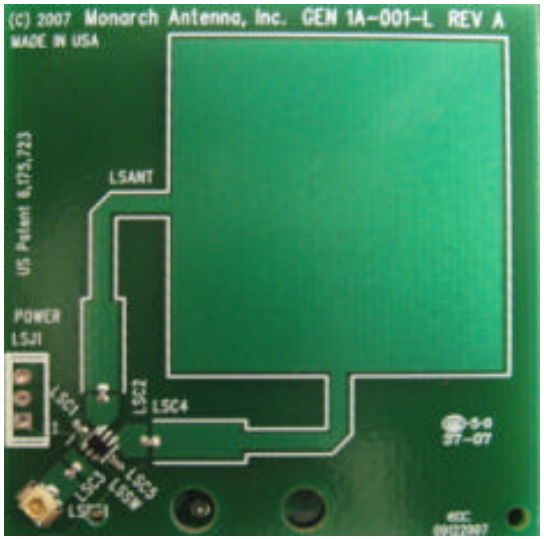
Reshaping Wireless

GEN 1



Polarization Diversity
(Apr'07)

Laptop WiFi Demo

ZigBee Customer #1
(Aug'08)

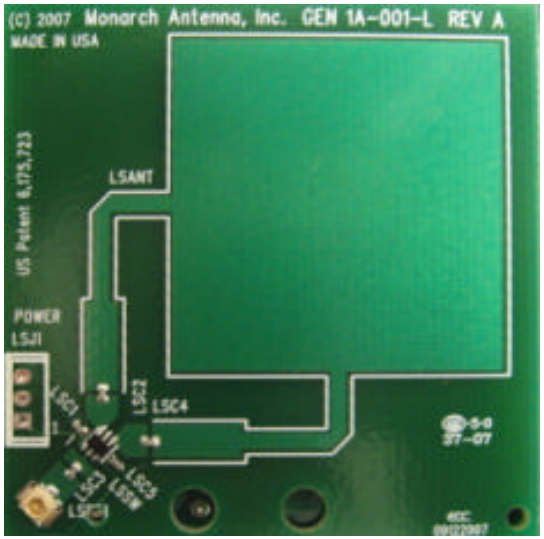
GEN 2

Beam Switching
(Sep'08)

GEN 1 and GEN 2 Antennas

MONARCH Antenna, Inc.
Reshaping Wireless

GEN 1



Polarization Diversity
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Laptop WiFi Demo

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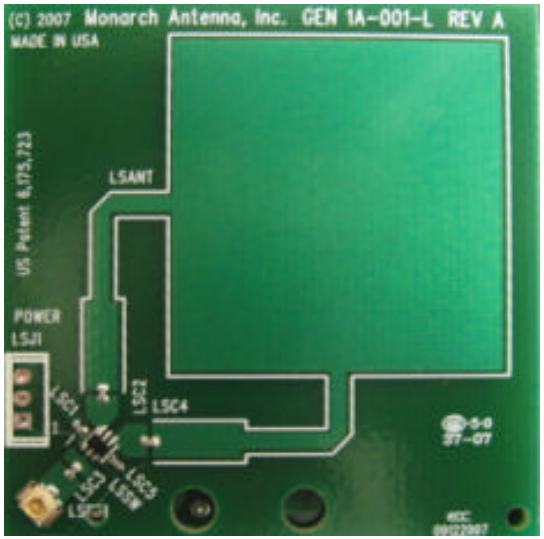
Beam Switching
(Sep'08)

Laptop WiFi Demo

GEN 1 and GEN 2 Antennas

MONARCH Antenna, Inc.
Reshaping Wireless

GEN 1



Polarization Diversity
(Apr'07)

Laptop WiFi Demo

ZigBee Customer
(Aug'08)

GEN 2

Beam Switching
(Sep'08)

Laptop WiFi Demo

ZigBee Prospect
(Jun'08)

WiFi (GEN 2)

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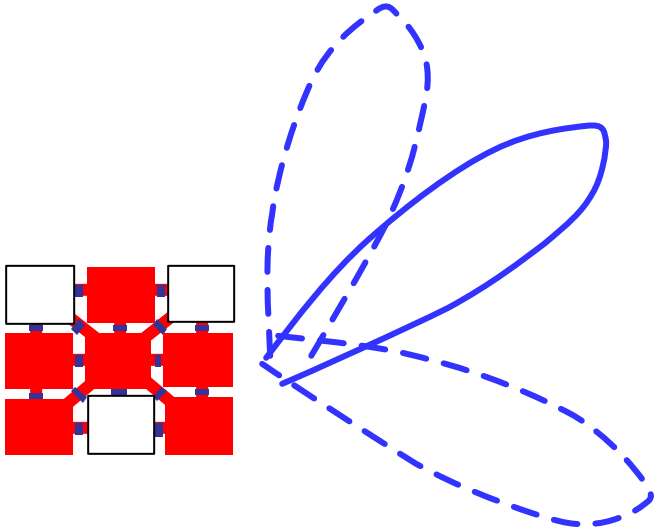
Reshaping Wireless

Laptop Wi-Fi
(2.4 GHz)



Please visit Monarch booth for a demo.

Company

MONARCH Antenna, Inc.
Reshaping Wireless

Equity Partners

1. Delphi Technologies, Inc.
2. Michigan State University
3. Automation Alley

DELPHI

MICHIGAN STATE UNIVERSITY

AUTOMATION ALLEY

HQ: SPARK

Ann Arbor, Michigan

Company - Strategy

MONARCH Antenna. Inc.
Reshaping Wireless

- **Fabless technology company**
- **Strong IP**
- **Dual-use (from Military to Consumer)**
- **Product Differentiation for OEM: *"Monarch Enabled"***

Contact

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