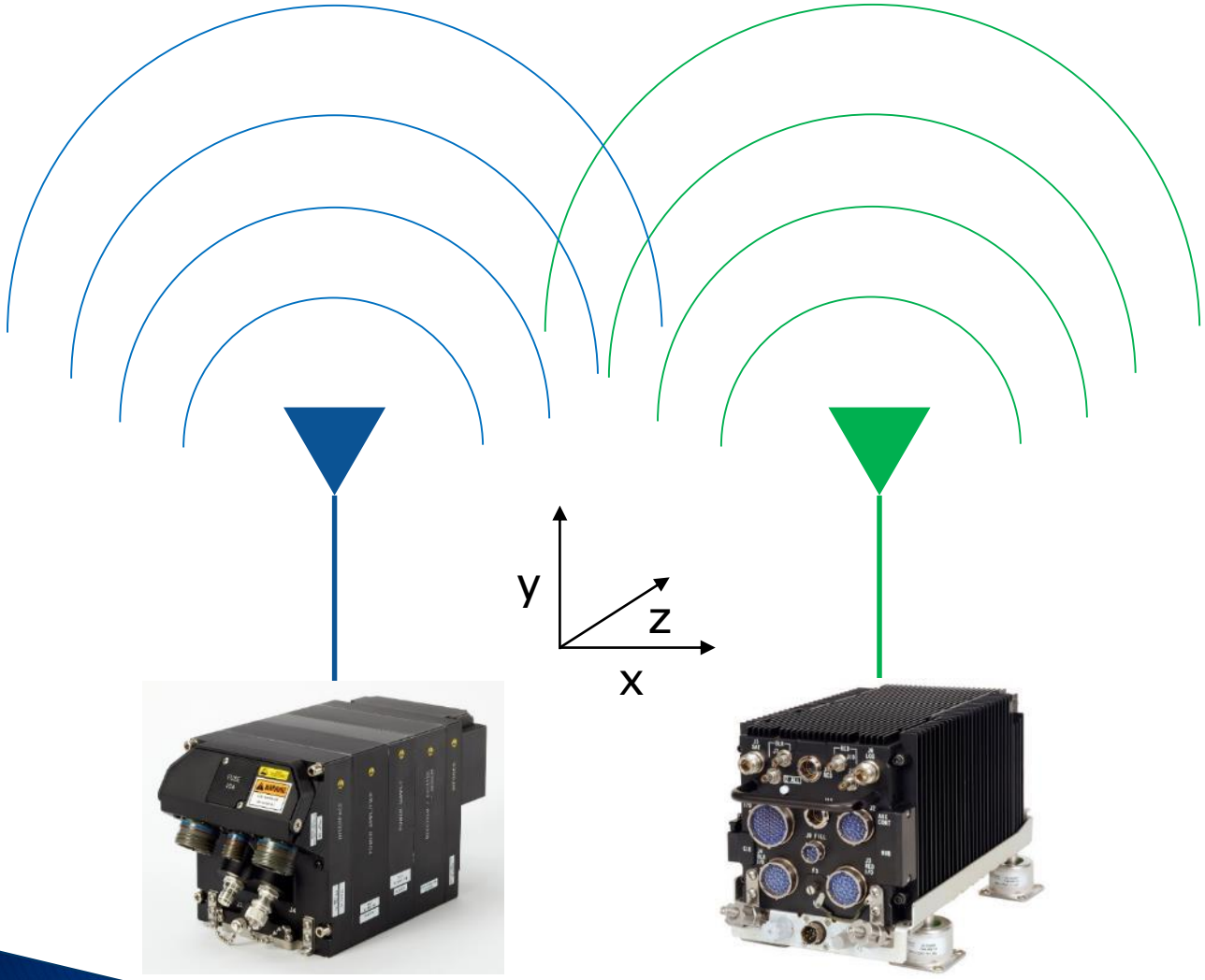
Introduction into Cosite Interference

Agenda

- What is cosite interference?
- Interference mechanisms and their effects
- How to regain communications range in the presence of interference?

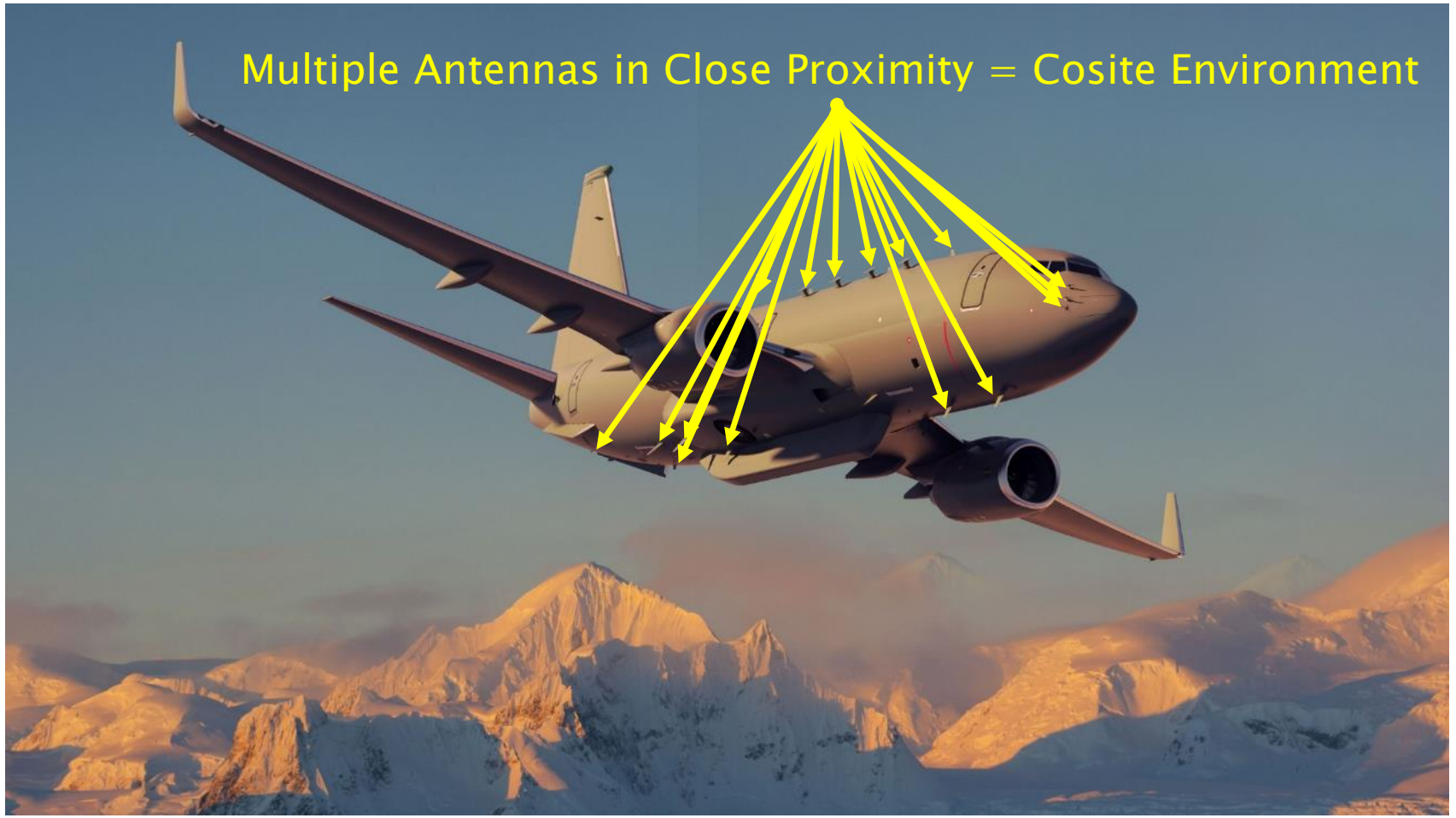
What is a Cosite Interference Environment?



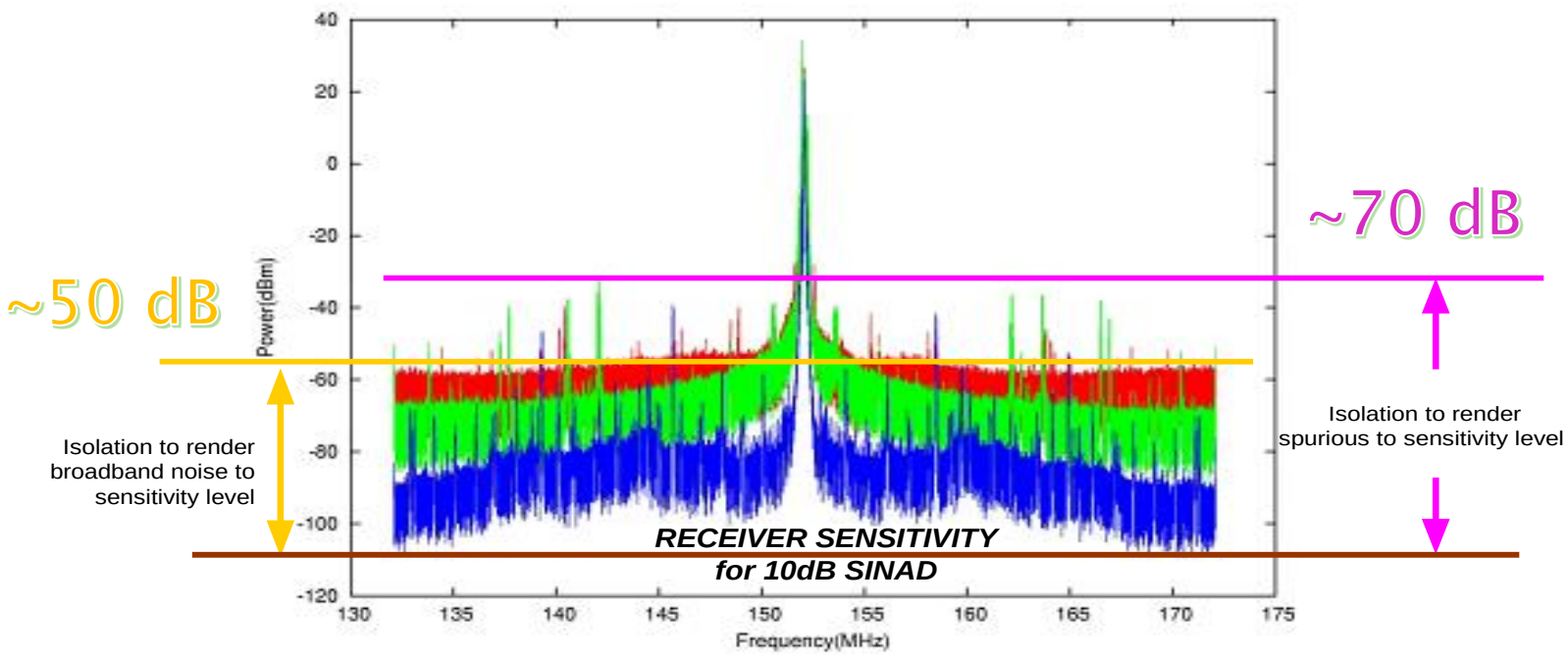
- Phenomena that occurs when multiple RF systems operate close-in <u>without sufficient antenna isolation</u>
  - Isolation is typically gained by physical separation

- **This is difficult to achieve on mobile platforms where surface area and installation locations are limited!**

Cosite Interference Environment



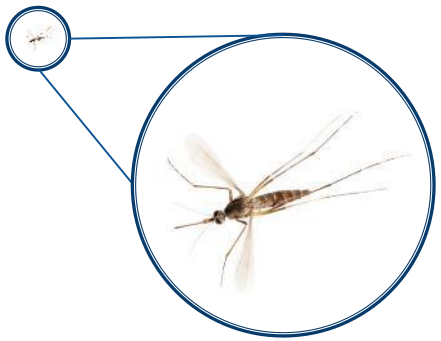
How does Cosite Interference affect a Comms System?



- **Broadband noise, intermods, spurious signals and harmonics** from the transmitter artificially raise the system noise floor for co-located receivers – even if the RF systems are on different frequencies

- The end result is system desensitization and **diminished communications range**

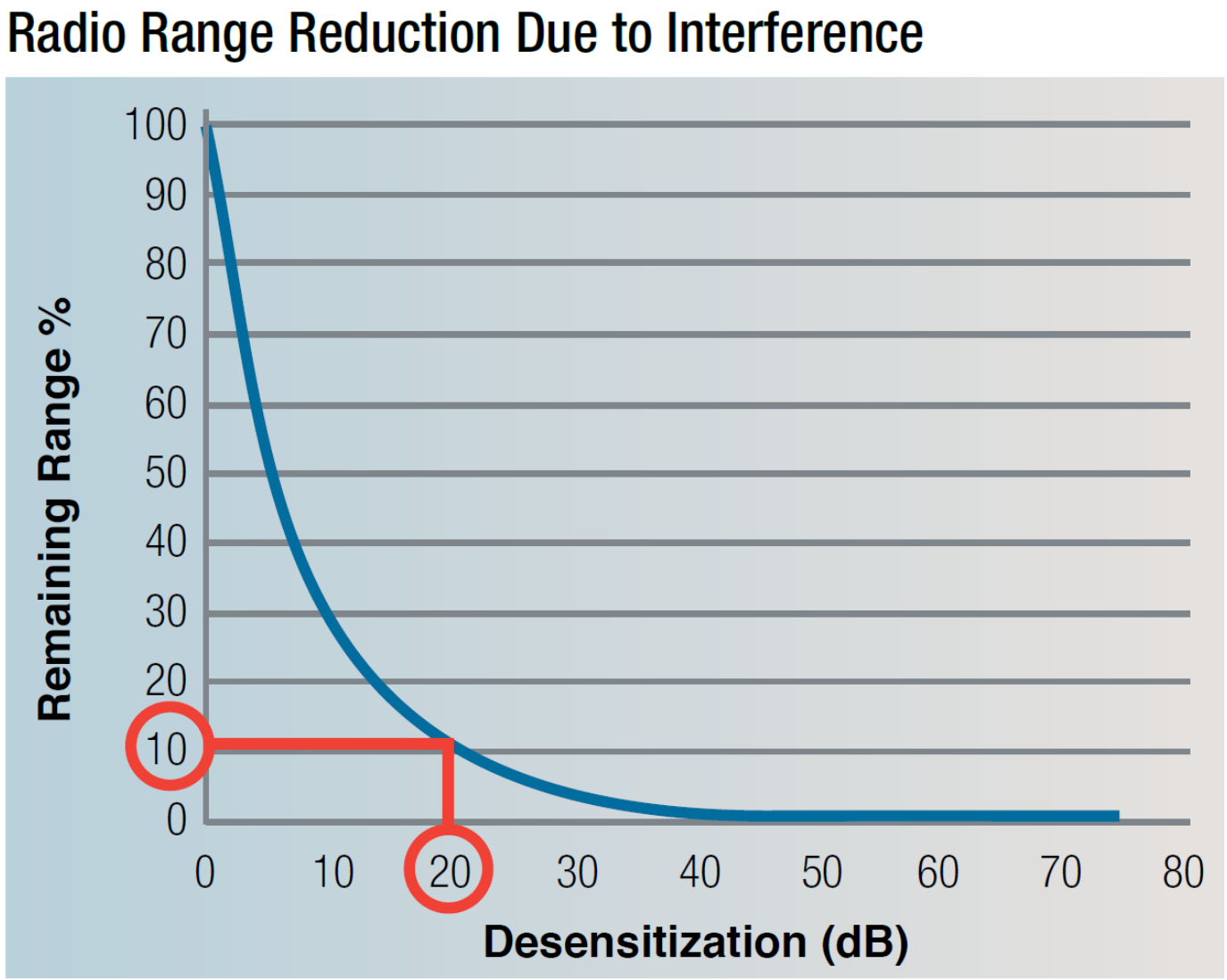
The Conundrum, illustrated



Imagine trying to hear a mosquito while you watched the final Space Shuttle launch…

That's what it's like for a receiver with -110 dBm sensitivity to operate in the presence of a 10 Watt transmitter!

Cosite Interference Impact on Range

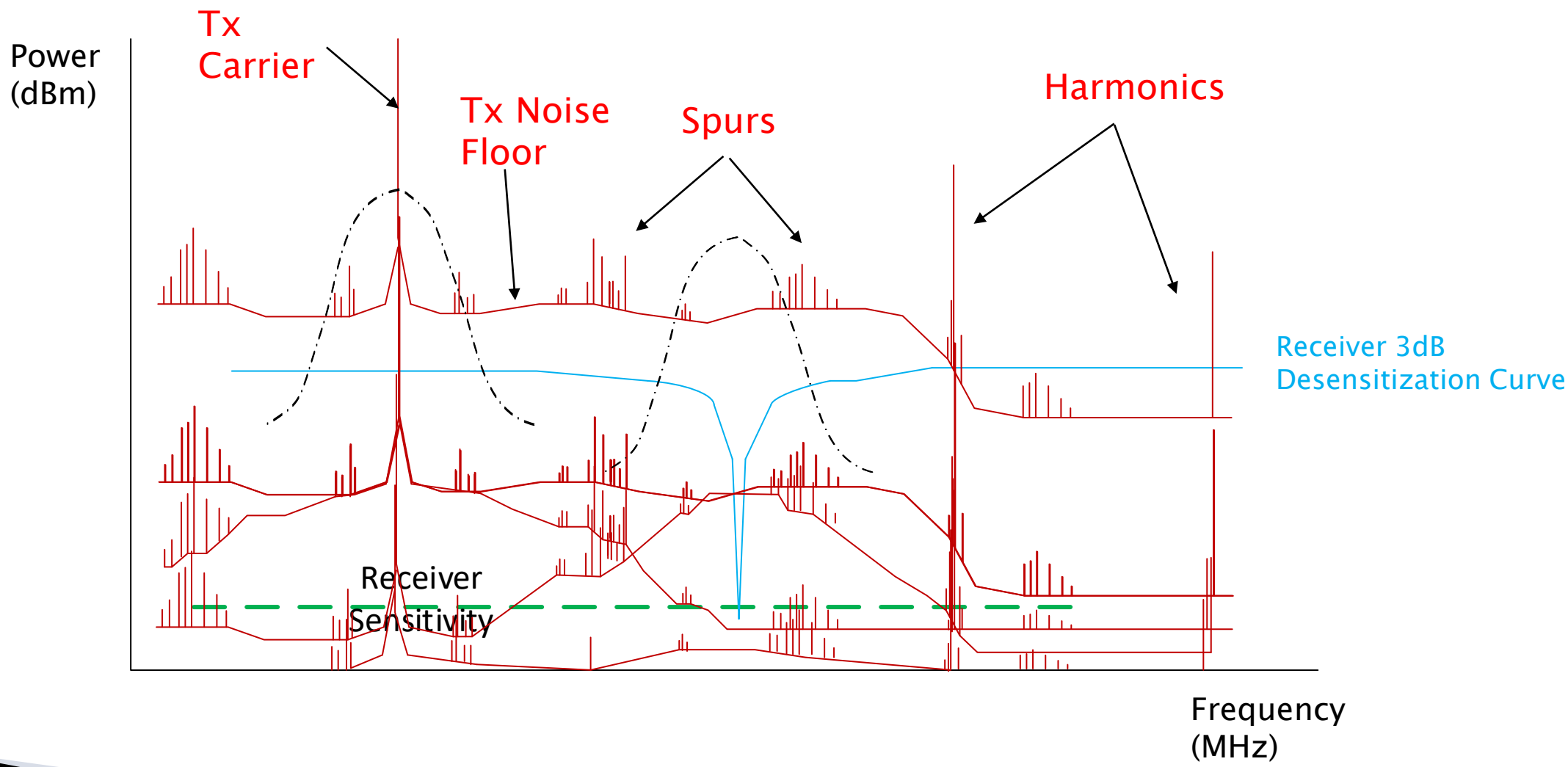


Every 6 dB loss halves the remaining range…

A 20 dB desensitization of your receiver results in the **loss of 90%** of your range!

Interference Mechanisms and their Effects

Interference Types And Mitigations

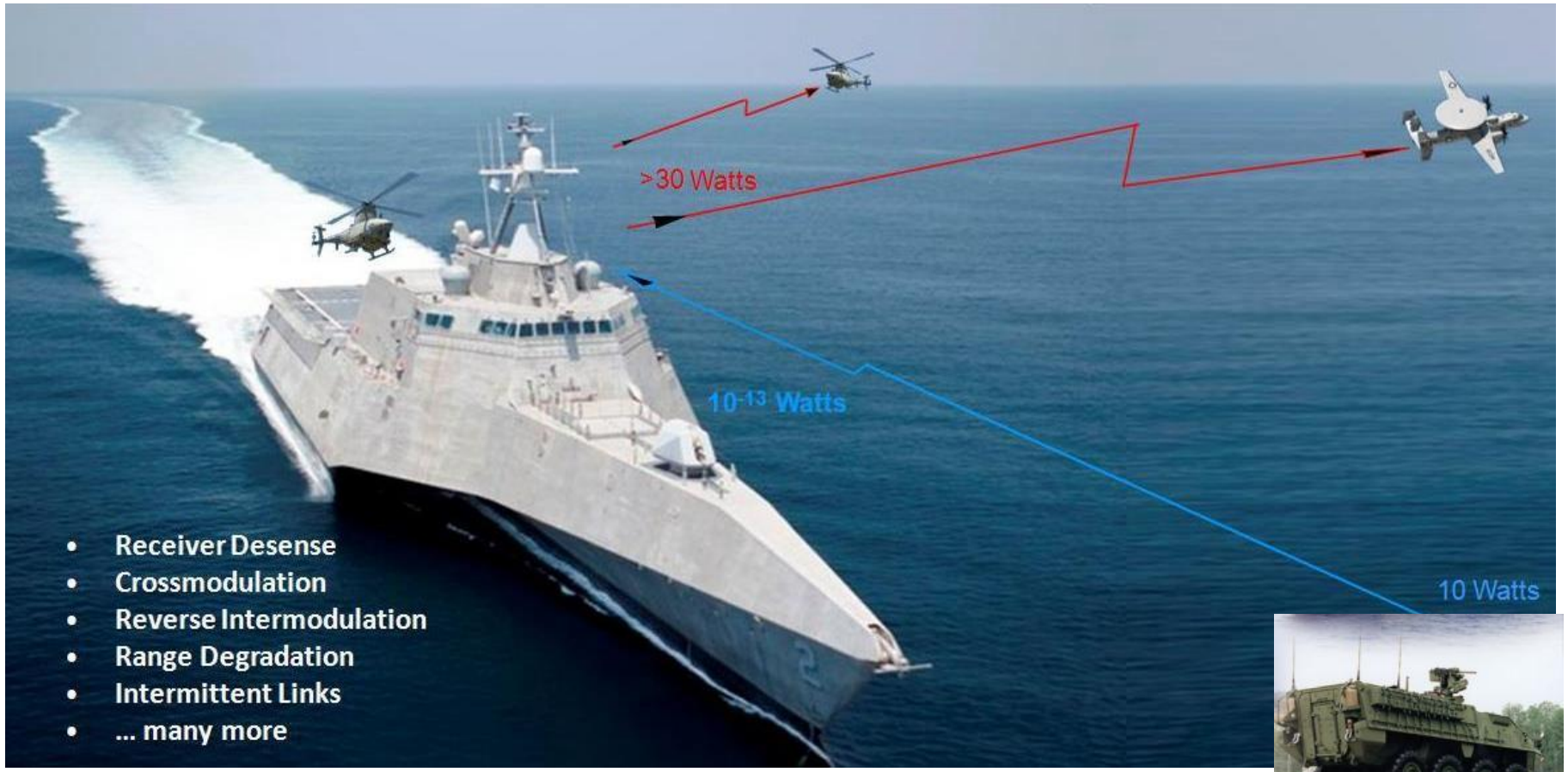


Interference Scenarios: Airborne

- Command & control and targeting aircraft carry dozens of RF systems
  - Even widebody aircraft (e.g. 747) can have cosite issues
- UAS carry comms relays with multiple antennas

Interference Scenarios: Seaborne

- Crowded antenna masts onboard ships = insufficient isolation



Interference Scenarios: Ground

- Forward-operating ground elements carry more RF systems for communications and electronic warfare than ever before

Options for a Cosite Interference Environment

- Acceptance of significantly reduced range
- Time division multiplexing all RF systems
- Factory upgrades to existing RF systems
- Implementation of auxiliary RF cosite interference mitigation solutions

Why don't the radio vendors build this in?

- There is no silver bullet – each cosite environment is unique
- The cost of incorporating advanced cosite circuitry (e.g. filtering, amplification, cancellation) inside every tactical radio is prohibitive
- Radio chassis do not have enough internal real estate to incorporate advanced cosite mitigation circuitry

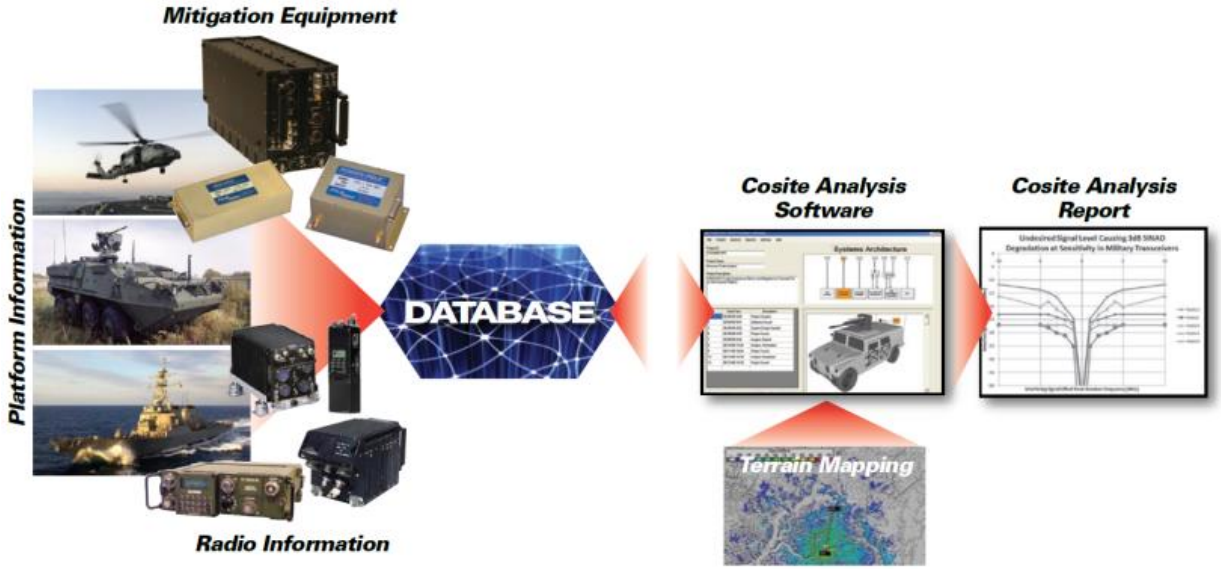
Cosite Interference Mitigation Solutions

Integrated Cosite Equipment (ICE)

- Filter/Amplifier Systems
- Canceler Systems

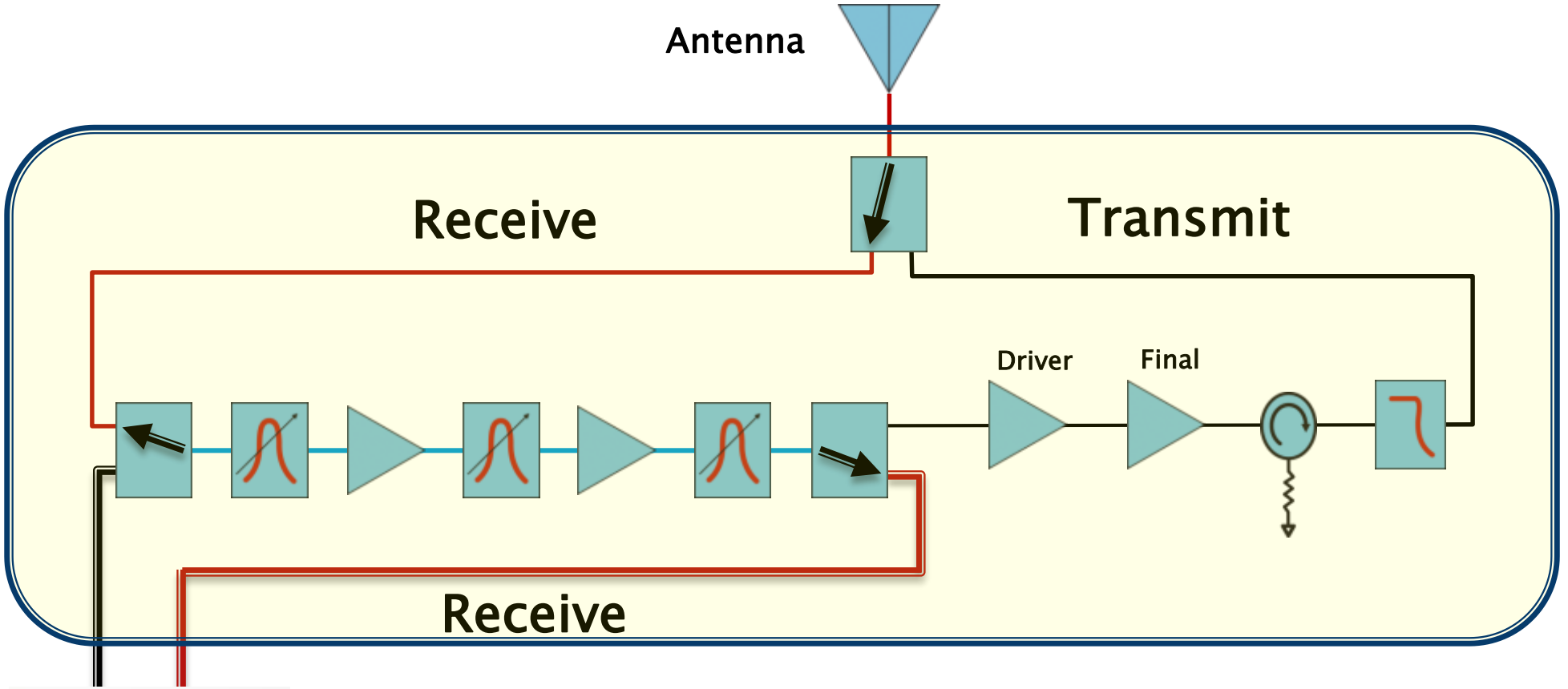
Cosite Analysis & System Integration

- Characterize unique cosite environments



ICE – Filter/Amplifier System

ICE
Filter / Amplifier

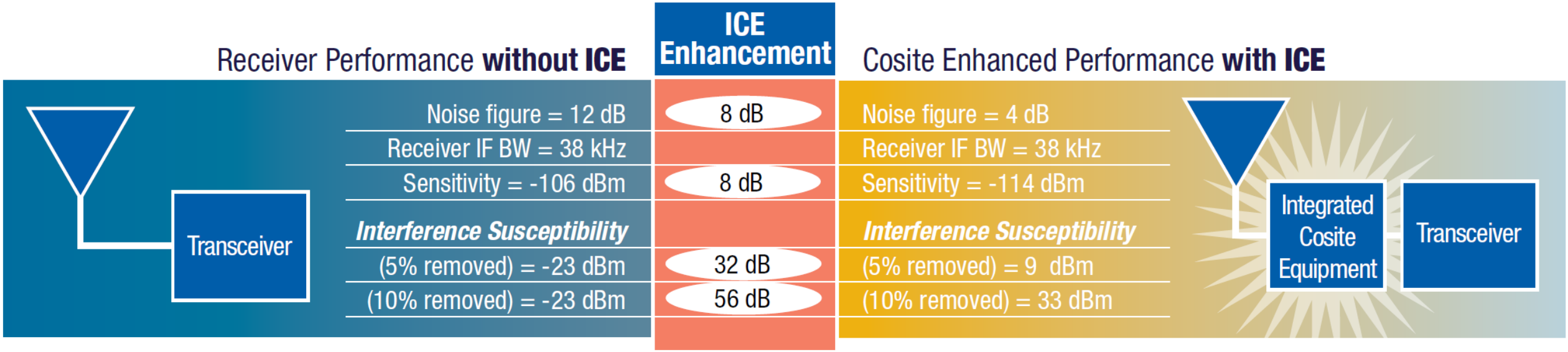


Transceiver

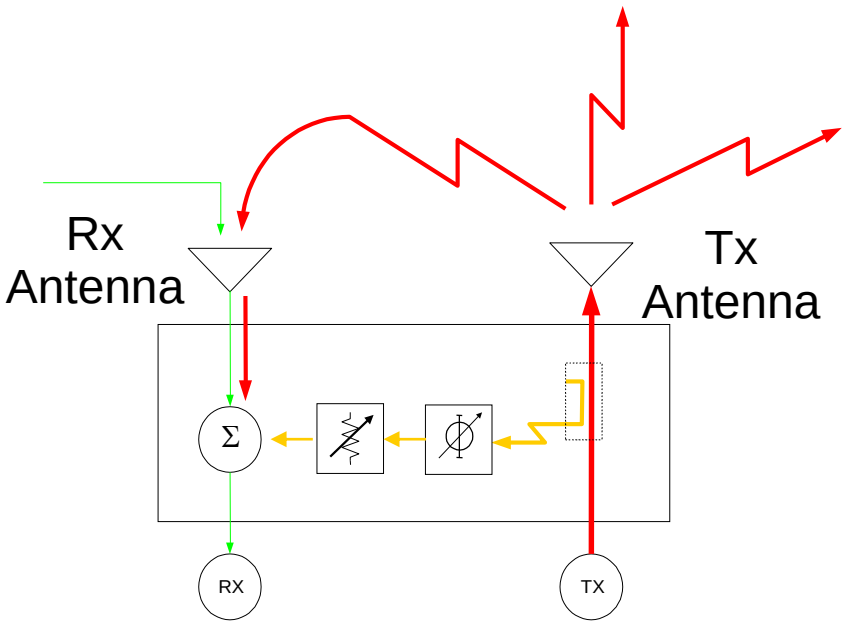
- Combines Low Noise Amplifier, Power Amplifier, Agile Filters, and ancillary functions into a single box
- Purifies transmitter output to reduce effects on collocated receivers
- Protects receivers to enhance the user's ability to communicate

Potential Impact of ICE Filter/Amplifier

An Example of Receiver Performance Improvement with ICE



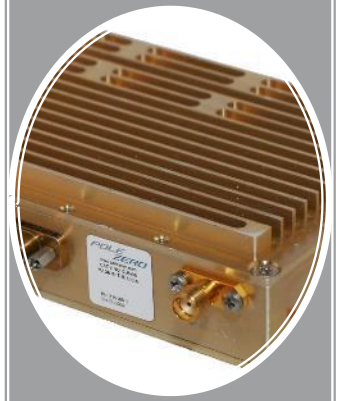
ICE – Canceler System

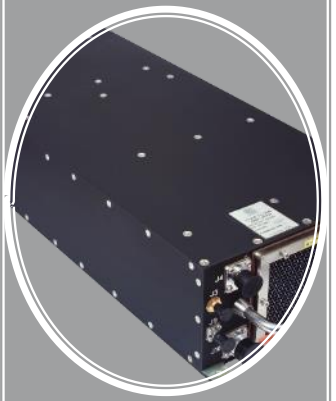


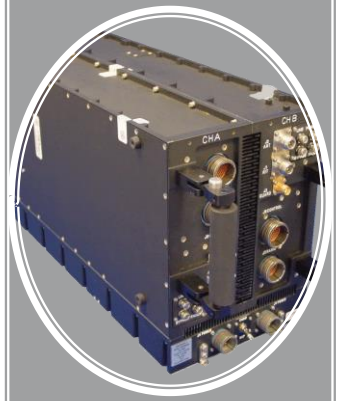
Canceler Offerings

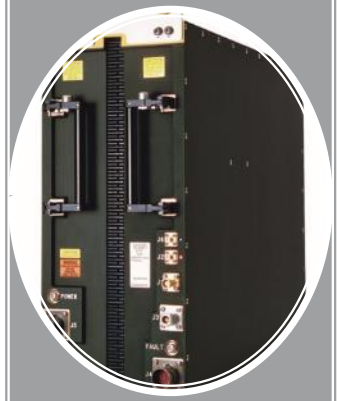
- ***Referenced*** – Counters collocated interferer(s) ("spectral fratricide")
  - Model: Multichannel Interference Canceler (MIC)
    - Interferer signal couples to receiver and is conditioned for canceling
    - 5 Channels, combination of VHF and UHF
- ***Referenceless*** – Counters off-board interferer(s)
  - Model: ICE2004
    - Intelligently identifies interfering signals and cancels up to 8 unique interferers
    - Highly configurable to meet mission needs

Spectrum of ICE Filter/Amplifier Solutions









ICE 1000 | ICE 2000 | ICE 3000 | ICE 4000 | ICE 5000

Modest ← *Filter Selectivity, RF Input Power Handling, RF Output Power* → High

Contact Details

RUPPtronik
Bernd Rupp
Breslauer Str. 14
D-83052 Bruckmuehl
GERMANY

Tel: +49 8062 80 96 96-0
Cell: +49 151 100 689 45
Fax: +49 8062 80 96 96-9
Email: info@RUPPtronik.de
Web: www.RUPPtronik.de

Bernd.Rupp@RUPPtronik.de