



## Corporate Objective

As a Small Business working in leading-edge technology, we are committed to putting the superior benefits of **Superconductive Electronics** as applied to Radio Frequency (RF) applications into the hands of the Warfighter.

## Mission Statement

Out of the Fog Research is focused on the development of advanced RF technology for the military and intelligence customers, based on Superconducting (HTS) Electronics and Cryogenic technology.

## Core Advantage

Superconductivity has unique electronic properties that make it significantly superior to conventional electronics. Out of the Fog Research is the only company to be contracted to permanently fielded Cryogenic RF systems for the military.

## Core Competencies

Out of the Fog Research LLC has staff that is accomplished in Superconducting and Cryogenic **Advanced RF Development**

- RF Chain Analysis,
- Design, testing and manufacture of RF components and systems.

## The Benefits of Cryogenics Translates Directly to Warfighter Benefits

Areas Improved	Sensitivity	Selectivity	Accuracy	Linearity
Warfighter Benefits	Area of Coverage Increases because	# Signals Detected Increases because	Time to Search and Target Decreases because	Probability of Detection Increases because
SIGINT Sys	Min det signal Increased	Prob of Detection Increased	Error ellipse Reduced	PI(False targets) Decreased
RF System	Tsys, sensitivity Increased	Available Clean Spectrum Increased	Angle of Arrival More Accurate	SFDR and Distortion Improved
Component	NF decreased	Q Increased	Phase coherence/ stability Increased	IP3 Decreased
Physics	Thermal Noise Decreased	Conductivity Increased	Phase Noise Reduced	Flux Quantization

## Benefits Apply to All RF Equipment

- ▼ SIGINT, COMINT, ELINT
- ▼ Radar Warning Receivers
- ▼ Radar: air search, fire control, space tracking
- ▼ IFF
- ▼ Common Data Links (CDL)
- ▼ SATCOM
- ▼ Navigation: TACAN, GPS, Radar Altimeter
- ▼ Sonobuoy receiver

## Customers

Cryogenic RF Technology has been developed for the following agencies: SPAWAR, ONR, NRL, PEO C4I PMW 120, Air Force, DARPA, and NIST. Each can attest to the effectiveness of the company to develop state-of-the-art technology with a focus on transition.

## Products:

Our current product line includes:

- Radio Frequency Distribution Systems (RFDS)
- SINCGARS Comb Limiter Combiners (CLIC)
- Cryogenic Fixed Filters Systems

Technology under development:

- Cryogenic Fast Tuning Filters
- Cryogenic RF Excision Systems (CRES)

## OFR3000 HF/VUHF RFDS



- Increased frequency range
- Improved Noise Figure (3-4 dB)
- Improved power handling capability (+43 dBm in HF)
- Channelized to improve spectrum utility
- Modular, upgradeable design

**Transition to a Navy POR CCOP (Cryptologic Carry-On Program) 100+ unit multi-year order/ Phase III**

## SINGARS Comb Limiter Combiners

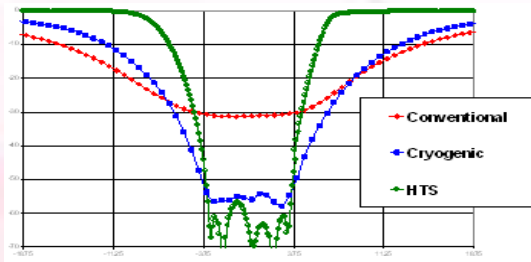


CLIC uses channelization with limiters to eliminate intermodulation products caused by multiple frequency hopping interferers. CLIC has been demonstrated to successfully eliminate the EMI caused by SINGARS.

- 2-U 19-inch rack-mounted 16-channel VHF CLIC
- Resulting in a 5x size reduction

## Cryogenic Fixed Filters Systems

Cryogenic/HTS filters are better at detecting SOIs and better at rejecting interference.



Deeper Notches, Sharper Filters, Low-loss

## Cryogenic Fast Tunable Filters

Cryogenic tunable filters prototypes have demonstrated superior performance in recent real-world at-sea Shipboard operations.

These filters combine low-loss, excellent rejection and fast tuning response to meet demanding EMI protection needs. These prototypes have combined automated EMI detection and filter tuning, which eliminates the need for an operator.

## Cryogenic RF Excision Systems

CRES is an analog approach to interference cancellation. With this approach, EMI is cancelled before the non-linear RF front-end components. This eliminates intermodulation products.

CRES combines the outputs of multiple intercept antennas to synthesize and subtract the interferer waveform at the receiver. It uses a power diverter component (patented by Lincoln Laboratory, our partners in this development project).

## Corporate Profile

We have 10 employees with annual revenues ranging from \$4-6 million over the past 3 years. We own lab/office space in Silicon Valley. We have spent over \$500k building up modeling, design, and test capabilities. Out of the Fog Research was founded in 2004 by Stuart Berkowitz, Ph.D.



*The **Cooler Technology** to solve  
your toughest **EMI problems.***

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