

PERFORMANCE WORK SCOPE (PWS)

FOR

CDM-MAGIC®930 IM Filter

2014 DoN Rapid Innovation Fund (RIF)

Broad Agency Announcement (BAA) Research Opportunity

Requirement/Topic Number: FY14-DoN-RIF-SPAWAR-03



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PREPARED BY:

DEPARTMENT OF THE NAVY

PROGRAM EXECUTIVE OFFICE (PEO) C4I

PMW 120

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TABLE OF CONTENTS

| <u>Section</u> | <u>Page</u> |
|---|-------------|
| 1.0 SCOPE | 4 |
| 1.0.1 Project Objective..... | 4 |
| 1.0.2 Technical Approach..... | 4 |
| 1.0.3 Project Tasks | 4 |
| 1.0.4 Project Deliverables | 6 |
| 1.0.5 Operational Need | 6 |
| 1.0.6 Navy Multiband Terminal | 6 |
| 1.0.7 CDM-MAGIC®930 IM Filter Technology..... | 6 |
| 1.0.8 Benefits of the Comtech MAGIC®930 Technology..... | 7 |
| 1.1 BACKGROUND | 7 |
| 1.1.1 PMW/A-170 | 7 |
| 1.1.2 NMT Program..... | 7 |
| 1.1.3 Adaptive Dynamics | 8 |
| 1.1.4 Comtech EF Data Corp | 8 |
| 1.1.5 Adaptive Dynamics Contractual History with the SBIR RIF Program | 9 |
| 1.2 Definitions | 9 |
| 1.3 Security | 9 |
| 1.4 Data rights | 10 |
| 2.0 REFERENCE DOCUMENTS | 10 |
| 2.1 Government | 10 |
| 2.2 Commercial | 10 |
| 3.0 GENERAL REQUIREMENTS | 10 |
| 3.1 Program Management | 10 |
| 3.2 Data Deliverable Formats | 11 |
| 3.3 Meetings | 11 |
| 3.4 GOVERNMENT FURNISHED Information (GFi) | 12 |
| 4.0 TECHNICAL REQUIREMENTS | 12 |
| 4.1 SYSTEM Requirements | 14 |
| 5.0 INTEGRATED LOGISTICS SUPPORT | 14 |
| 5.1 Configuration Management | 14 |

- 5.2 Configuration Identification 14**
- 5.3 Deviations 14**
- 5.4 Quality Assurance 14**
 - 5.4.1 Quality Management 14
 - 5.4.2 Quality Program 14
 - 5.4.3 Best Practices 14
- 5.5 Environmental, Safety and Health (ES&H) 15**
 - 5.5.1 Safety 15
 - 5.5.2 Hazardous Materials 15
- 5.6 Warranty 15**
- 5.7 GOVERNMENT FURNISHED PROPERTY (GFP) 15**
- 6 TESTING 15**
- 6.1 Government Verification 15**
- 6.2 First Article Testing (FAT) and Production Acceptance Testing (PAT) 15**
 - 6.2.1 Production Acceptance Testing 15
- 6.3 contractor Data Requirements 15**
- 7 DELIVERY 16**
- 7.1 Technical Data Package and Supporting Data (TDP) 16**
- 8 ADDITIONAL REQUIREMENTS 16**
- 8.1 Prohibited Packing Materials 16**
- 8.2 Marking of Shipment 16**
- 8.3 Unpacking Instructions: Complex or Delicate Equipment 16**
 - (a) Location on Container 17
 - (b) Marking Containers 17
 - (c) Marking 17

1.0 SCOPE

This Performance Work Statement (PWS) defines the scope of effort required of Adaptive Dynamics Inc. (ADI) to provide development, design, documentation, and factory acceptance test for the ‘CDM-MAGIC®930’ Interference Mitigation (IM) filter.

ADI and its subcontractor Comtech EF Data Corp (‘Comtech’) are required to provide all personnel, equipment, and materials to complete requirements specified within this PWS and referenced documents.

The scope of the project is to demonstrate ADI’s MAGIC® IM technology ported to the Comtech CDM-930 to provide significant protection for DoN wideband SATCOM modems that are vulnerable to interference/jamming signals.

1.0.1 Project Objective

The main objective of the 2-year Rapid Innovation Funding (RIF) project is to develop the ‘CDM-MAGIC®930’ Interference Mitigation (IM) filter applique, initially for use with the Navy Multiband Terminal (NMT) high speed SATCOM modem, utilizing the MAGIC® IM filter technology and the Comtech CDM-930 hardware.

The CDM-MAGIC®930 IM filter design will be flexible enough to mitigate interference for many high speed SATCOM modems with standard L-band intermediate frequency (IF) analog ports or with ‘Future Advanced SATCOM Technologies, Open Standard Digital IF Interface’ (FAST OSDI) digital data ports.

The secondary project objective is to be able to use the CDM-MAGIC®930 to digitally capture 300MHz BW L-Band input signals, MAGIC® filtered signals and interference. The digital captures would be routed to an external optical storage device, for remote retrieval, analysis and post-processing.

The CDM-MAGIC®930 should be able to provide at least 20dB of interference mitigation as a minimum with an objective to provide 60dB of protection.

1.0.2 Technical Approach

Adaptive Dynamics will follow the technical approach that it has followed in all of its recent projects, which is as follows:

- 1) Collect real-time digital I&Q captures of the data signal and the worst case interference.
- 2) Simulate the performance of the desired signal PHY layer, fading channel and interference.
- 3) Optimize the MAGIC® filter performance with the simulated signal and interference.
- 4) Implement the optimized MAGIC® filter in FPGA hardware.
- 5) Test and optimize the MAGIC® filter performance against the data captures and the real-time signal in an operationally relevant environment.

1.0.3 Project Tasks

The following section describes the project tasks assigned to Adaptive Dynamics and Comtech.

Adaptive Dynamics Tasks

- 1) ADI and Comtech define the full ICD for the CDM-MAGIC®930.
- 2) Obtain digital data captures of the WGS system signal and interference from the Land-Based Test Facility (LBTF) at SPAWAR Systems Center (SSC) – Point Loma.

- 3) Simulate the PHY layer model of the WGS system with the signal and interference captures using MATLAB. Simulate and optimize the performance of the MAGIC® filter with the interference captures and simulated signal data.
- 4) Implement the MAGIC® filter in VHDL for insertion into the FPGAs.
- 5) ADI Lab Testing of CDM-MAGIC®930 FPGA implementation with digital data captures from LBTF.
- 6) Test and optimize the performance of the MAGIC® Filter as implemented in the CDM-MAGIC®930 hardware against the interference in the digital data captures.
- 7) Validate the performance of the CDM-MAGIC®930 with live WGS signals, initially at Comtech and then at the LBTF at SSC–Point Loma.
- 8) Deliver the CDM-MAGIC®930 unit for testing in the Seminal Transition Event, i.e. Trident Warrior 2016 and 2017.

The following table shows the tasks versus the 2 year schedule.

| Tasks | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 |
|--|----|----|----|----|----|----|----|----|
| Define Interface Control Document between MAGIC® Filter Appliqué and CDM-930 | | | | | | | | |
| Obtain Digital Data Captures of WGS Signal & Interference from NMT at LBTF SSC-Pt Loma | | | | | | | | |
| MAGIC® Filter Performance Simulations with WGS PHY Layer Model and Data Captures | | | | | | | | |
| Initial FPGA Firmware Implementation for MAGIC® Filter Applique and Embedded S/W | | | | | | | | |
| ADI Lab Testing of CDM-MAGIC®930 Implementation with Digital Data Captures | | | | | | | | |
| FPGA Firmware Updates for Optimized MAGIC® Filter Applique Performance | | | | | | | | |
| Lab Testing of Optimized MAGIC® Filter at Comtech and then at LBTF at SSC-Point Loma | | | | | | | | |
| Preparation and Support of Operational Demonstration and Testing at Trident Warrior | | | | | | | | |

Comtech EF Data Tasks

Comtech has the following secondary tasks to support the overall CDM-MAGIC930 development effort :

FY15 (1st and 2nd Quarter)

Task 1 - WGS Spectrum Digital I&Q Data Capture to Local External Storage Device via 10G Optical Port.

Task 2 - Development of CDM-MAGIC®930 HW/SW ICD to support ADI MAGIC® Filter Implementation.

FY16 (3rd Quarter to 6th Quarter)

Task 3 - Development and Test of CDM-MAGIC®930 Hardware and Embedded Software Features.

FY17 (7th and 8th Quarter)

Task 4 - Final Test and Verification and CDM-MAGIC®930 Seminal Transition Event Demonstration Support.

1.0.4 Project Deliverables

ADI proposes to deliver 4 working prototypes of the CDM-MAGIC®930 IM filter for testing in mid-2017. Additionally, ADI would like to enter the CDM-MAGIC®930 for two seminal transition events, the 2016 and 2017 Trident Warrior experiments.

1.0.5 Operational Need

There are approximately 1,000 high speed SATCOM modems in service with the DoN and 5,000-10,000 throughout the DoD needing interference protection in degraded/denied areas. COCOM priorities include: CENTCOM STIPL 8 & IPL 9, PACOM IPL 3 & 19.

The initial requirement for the proposed CDM-MAGIC®930 IM filter is to protect the Navy Multiband Terminal (NMT) against intentional and unintentional radio signal interference and to ensure that high speed, high quality communications is maintained, even under adverse conditions.

1.0.6 Navy Multiband Terminal

The NMT is the primary next-generation satellite communication (SATCOM) system for the U.S. Navy and coalition partners that provides seamless assured connectivity between a ship's or submarine's computer network and the Global Information Grid. The NMT is expected to be installed in approximately 300 U.S. Navy ships, submarines and shore stations, replacing several existing SATCOM systems developed since the mid-1980s. The new NMT system will provide naval commanders and sailors with greater data throughput capacity and improved protection against enemy intercepts.

The NMT operates over the Q, Ka, and X frequency bands on the Advanced Extremely High Frequency (AEHF), Milstar, Ultra High Frequency Follow-on (UFO/E/EE), Interim Polar, Enhanced Polar System (EPS), Defense Satellite Communications System (DSCS) and Wideband Global SATCOM System (WGS) satellite constellations.

1.0.7 CDM-MAGIC®930 IM Filter Technology

The CDM-MAGIC®930 IM filter will utilize the ADI MAGIC® IM filter technology running on the re-tasked Comtech CDM-930 high speed modem hardware platform.

The ADI MAGIC® IM filter technology is a highly resource efficient digital signal processing (DSP) technology that provides significant interference protection from hostile wireless threats. The performance of the MAGIC® filter has been validated in independent government lab testing at SPAWAR and Aberdeen Proving Grounds, with the results being classified as SECRET.

The Comtech CDM-930 modem is a powerful software defined radio with very high speed analog-to-digital converters (ADCs) and 11 field programmable gate arrays (FPGAs), as well as a 10Gbps optical Ethernet port.

The Comtech CDM-930 hardware will enable the CDM-MAGIC®930 IM filter to mitigate interference within a 300MHz BW analog signal in the L-Band 950-2050MHz Intermediate Frequency (IF) port on the NMT. Additionally, the MAGIC®930 IM filter will be able to mitigate interference from received SATCOM signals on the high speed digital FAST OSDI input port running at 150Mps, 16-bits complex I&Q.

The CDM-MAGIC®930 IM filter will be able to output either the 'cleaned up' signal of interest or the separated interference signal at either the analog IF port or at the high speed FAST OSDI port.

In the case where multiple interferers are removed, it will be possible to select which interferer is captured.

1.0.8 Benefits of the Comtech MAGIC®930 Technology

The re-tasking of the Comtech CDM-930 modem hardware for the CDM-MAGIC®930 IM Filter allows for a low risk product development cycle, as well as a simple, rapid, and low cost deployment, compatible with a large number of existing wideband SATCOM modem assets.

The CDM-MAGIC®930 IM filter will reduce total ownership costs by extending the useful life of current equipment and postponing the need to develop and procure more advanced jam-resistant wideband SATCOM modems.

In the future, the CDM-MAGIC®930 IM filter technology could later be ported to a high speed ASIC to allow full integration within the next generation wideband SATCOM modem receiver.

1.1 BACKGROUND

1.1.1 PMW/A-170

PMW/A-170 is the Communication and Global Positioning System Navigation Program Office under the Program Executive Office Command, Control, Communications, Computers, and Intelligence (PEO C4I) at the Space and Naval Warfare Systems Command (SPAWAR).

PEO C4I PMW/A 170 is responsible for the acquisition, integration, delivery and support of interoperable C4I systems for the fleet, joint and coalition war fighter, including the Navy Multiband Terminal (NMT) Program.

1.1.2 NMT Program

The NMT is the next generation protected SATCOM system currently under development. NMT will provide deployed Naval Commanders with secure, protected, command, control and communications capabilities and will support the exchange of tactical data, imagery, real-time video, battlefield maps and targeting information.

The NMT will provide physical and electromagnetic survivability, resistance to jamming and Electromagnetic Interference (EMI), and Low Probability of Intercept (LPI)/Low Probability of Detection (LPD) capabilities against current and projected threats. NMT is an advanced software architecture that will allow the U.S. Navy to substantially increase bandwidth and data throughput of its satellite communications systems, and serve as a bridge to the next generation capabilities.

The NMT is the fourth iteration Navy EHF terminal being designed to communicate with the AEHF satellites, as well as other on-orbit EHF capable satellites. The NMT will provide an approximate fourfold increase in data rate capacity over currently fielded systems. In addition, the NMT will include wideband variants to allow the terminal to communicate with other military satellites such as Defense Satellite Communications System (DSCS) and the Wideband Global Satellite (WGS). It is anticipated that the NMT, with minor modifications, will also be able to communicate with the future Transformational Satellites (TSAT), in support of Transformational Communications (TC).

NMT will feature data rates that range between 75 kbps to 8 Mbps for voice, data or video. It will provide protected wideband communications for ships in the Q, Ka and X bands simultaneously with dual antennas,

while submarines can utilize Q and X bands simultaneously, and shore commands will utilize the Q band only. The NMT will also receive Global Broadcast Service (GBS) on ship and submarine antennas.

1.1.3 Adaptive Dynamics

Adaptive Dynamics Inc. (ADI), a San Diego based company founded in 2003, has created and demonstrated a revolutionary wireless signal processing technology, known as MAGIC® (Multiple Adaptive Generalized Interference Cancellation), which promises to effectively mitigate interference from tactical RF communication systems, even under highly dynamic, frequency agile, variable bandwidth narrowband and broadband interference conditions.

The MAGIC® interference mitigation (IM) technology is revolutionary in that

- i) It does not require any prior knowledge of the interferer modes.
- ii) The desired signal does not need to have any training sequence or reference signal.
- iii) Both the interferer and the desired signal can be fast moving.
- iv) The technology works for both narrowband and wideband signals and interferers.

The potential of the MAGIC® interference mitigation technology was first demonstrated during an SBIR Phase I contract in 2007 and culminated in the MAGIC® RIF project to build a 1U rack-mounted UHF SATCOM interference mitigation filter prototype with multi-channel capable, ruggedized custom built hardware using FPGA processing with a high performance RF front end.



The 1U rack-mounted MAGIC® prototype unit has now been demonstrated to provide significant anti-jamming enhancement to radio system performance, typically exceeding 30dB ISR over a wide range of RF signal and highly dynamic interference characteristics, e.g. varying bandwidths, modulation types. There are now a broad array of applications and software and h/w implementation options either planned or already under development.

The MAGIC® technology is already being transitioned to a wide range of military waveforms including UHF SATCOM (25kHz MIL-STD-188), SRW, MUOS (WCDMA), Link-16, CMN4, TTNT, WNW, SeaLancet (WiFi/OFDM) and GPS.

1.1.4 Comtech EF Data Corp

Comtech EF Data Corporation is a subsidiary of Comtech Telecommunications Corporation (NASDAQ: CMTL) and is the recognized global leader in satellite bandwidth efficiency and link optimization. Comtech's advanced communication solutions encompass Advanced VSAT Solutions, Modems, RAN & WAN

Optimization, Network & Bandwidth Management and RF Products. The solutions enable commercial and government users to increase throughput for fixed and mobile/portable satellite-based applications.

The Comtech CDM-930 is a Very High Speed DVB-S2 / DVB-S Modem intended for transmit, receive, or duplex operation supporting new satellite deployments with very wideband transponders. The CDM-930 supports DVB-S2 QPSK, 8PSK, 16APSK and 32APSK modulations with symbol rates from 1 MSps to 300 MSps.



Comtech 930 Front Panel



Comtech 930 Rear Panel

This project proposes to utilize ADI’s MAGIC® IM signal processing algorithm to re-task the Comtech CDM-930, changing its function from a DVB-S2 high speed modem into an L-band IM filter appliqué, providing significant resistance to intentional or unintentional interference and enhanced network capacity without modification or distortion to the original L-band waveform or FAST OSDI digital signal.

1.1.5 Adaptive Dynamics Contractual History with the SBIR RIF Program

Adaptive Dynamics Inc. has been working since before 2007 with the Small Business Innovative Research (SBIR) Program and now has been awarded 3 SBIR Rapid Innovation Funding (RIF) awards, for the UHF 25kHz SATCOM, the MIME (MIDS-JTRS CMN4) and the MUOS programs.

ADI has extensive experience in the research and development of RF interference mitigation technology with the SBIR program, including the creation of the ‘Multiple Adaptive Generalized Interference Cancellation’ (MAGIC®) IM filter algorithm, as well as the development of various MAGIC® IM filter implementations.

1.2 DEFINITIONS

- | | |
|---|-----------------------------------|
| DSCS - Defense Satellite Communications System (DSCS) | IM – Interference Mitigation |
| FAST – Future Advanced SATCOM Technologies | NMT – Navy Multiband Terminal |
| OSDI – Open Standard Digital IF Interface | TSAT - Transformational Satellite |
| MAGIC – Multiple Adaptive Generalized Interference Cancellation | WGS - Wideband Global Satellite |

1.3 SECURITY

1.3.1 Classification Level:

Per the DD254 provided with the RFP, all work under this RIF contract shall be performed at the UNCLASSIFIED level. Resulting CDM-MAGIC®930 filter performance may be subject to further classification if the interference cancellation results are better than the objective level of 60 dB. Determinations will be made during the performance of the contract and any classification of performance above the UNCLASSIFIED level will be based on Navy Multi-band Terminal (NMT) Security Classification Guide (SCG).

1.3.2 Military Critical Technology:

The CDM-MAGIC®930 will contain technology and provide capabilities whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., sec. 2751, et seq.), the International Traffic in Arms Regulations (ITAR), Title 22 Code of Federal Regulations (CFR) Parts 120-130 or the Export Administration Act of 1979, as amended, Title 50, U.S.C. App. 2401 et seq. Violation of these export laws are subject to severe criminal penalties. Disseminate in accordance with the provisions of DoD Directive 5230.25.

The CDM-MAGIC®930 will provide signal interference mitigation capabilities which are critical in ensuring high speed, high quality data SATCOM capability is maintained in highly congested and contested environments. Thus, this technology can be considered ‘Military Critical Technology’.

1.4 DATA RIGHTS

The CDM-MAGIC®930 will be developed under a Small Business Innovative Research (SBIR) Rapid Innovation Funding (RIF) contract. The key technology utilized in the CDM-MAGIC®930 IM filter is the MAGIC® IM filtering algorithm which was developed under an SBIR funded technology program and which is fully protected by SBIR Data Rights. Thus, the CDM-MAGIC®930 will also protected by SBIR Data Rights for a period of not less than 5 years from the end of the RIF contract. The Government's rights to use, modify, reproduce, release, perform, display, or disclose technical data or computer software marked with this legend are restricted during the period shown as provided in paragraph (b)(4) of the Rights in Noncommercial Technical Data and Computer Software - Small Business Innovation Research (SBIR) Program. No restrictions apply after the expiration date of the SBIR Data Rights Period. Any reproductions of technical data, computer software or portions thereof marked with this legend must also reproduce the markings.

The government will receive such RIF deliverables as specified in the RIF contract, e.g. Monthly Status Reports, PDR, CDR and TIM Reports, Final Technical Reports, Test Reports, CDM-MAGIC®930 User Manuals, 4 (four) CDM-MAGIC®930 units, etc. Purchase of additional CDM-MAGIC®930 units at the end of the RIF contract period of performance (PoP) will be subject to further license negotiation.

2.0 REFERENCE DOCUMENTS

The following specifications and standards form a part of this PWS to the extent specified herein. Unless otherwise stipulated, the applicable versions shall be the versions identified in the following lists.

2.1 GOVERNMENT

| Document | Title |
|----------|--|
| Doc001 | Future Advanced SATCOM Technologies (FAST), Open Standard-IF Interface (OSDI) for SATCOM Systems, June 5, 2013, Version 1.00 |
| Doc002 | NMT L-Band ICD |
| Doc003 | NMT FAST OSDI ICD |
| Doc004 | Physical Description of Wideband Fading Model for WGS |
| Doc005 | Protected Tactical System Field Demonstration (PTSFD) document |

2.2 COMMERCIAL

| Document | Title |
|----------|--|
| Doc006 | ViaSat MD1366 EBEM Modem Specification |

3.0 GENERAL REQUIREMENTS

3.1 PROGRAM MANAGEMENT

Adaptive Dynamics shall maintain an Integrated Master Schedule (IMS) for performance of analyses, software integration, and test and evaluation performed for development efforts under this contract. The IMS shall provide the framework for assigning development work responsibilities and summarizing planned versus actual accomplishments. Adaptive Dynamics shall present the IMS in the monthly contractor's Progress Status Management Reports, CDRL A001.

Adaptive Dynamics shall appoint a Program Manager (PM) responsible for carrying out the work as set forth in this PWS. The PM shall be the focal point for all program communications between the Government and Adaptive Dynamics. The Program Manager for the CDM-MAGIC@930 project will be Dr. Will Cooper.

3.2 DATA DELIVERABLE FORMATS

Adaptive Dynamics shall deliver all contract, technical, and engineering information in digital form. Adaptive Dynamics shall reference the table below, Applications for Document Deliverables, for the requested applications for each document type. All applications must be compatible with the latest Navy Marine Corps Intranet (NMCI) approved revisions or as coordinated with the Government.

All required data and documentation will be delivered in electronic media format via email, CD or DVD. All data shall be in Microsoft Word and Microsoft Excel with the exception of presentation material, which shall be delivered in Microsoft PowerPoint. Any changes to the documents will also be rendered in PDF format. Any electronic submittals, including attachments, submitted via e-mail shall be readable on a standard Personal Computer (PC) using Windows 7; OSX or later, Microsoft Office Suite 2007 or later, Microsoft Project 2007 or later.

Applications for Document Deliverables

| Document Category | Application |
|--------------------------|-----------------------------|
| Word Processing | MS Word 2007 or later |
| Spreadsheets | MS Excel 2007 or later |
| Project Planning | MS Project 2007 or later |
| Presentation Software | MS PowerPoint 2007 or later |
| Engineering Drawings | Solid Works and PDF format |

3.3 MEETINGS

Adaptive Dynamics shall conduct quarterly program reviews. These reviews shall be no more than one day in duration, unless authorized by the Government, and shall take place at SPAWAR Old Town or Adaptive Dynamics' offices unless specifically approved by the Government to occur elsewhere. These reviews shall address the status of all ongoing tasks, including development, software changes, integration, and test and evaluation. Adaptive Dynamics shall develop agendas for each program review. The Government reserves the right to modify the agenda prior to the review. The review content shall contain all aspects of the contract addressing schedule and performance.

The program reviews shall emphasize progress and changes since the previous review. Adaptive Dynamics shall specifically address known or anticipated impacts to systems and terminal performance. The meetings may be conducted in person or as video teleconferences if mutually agreed upon by both Adaptive Dynamics and the Government. Action items resulting from contractor/Government reviews and meetings are to be considered complete upon approval by the Government at the next quarterly review. The Post Award Conference shall be conducted at Adaptive Dynamics's facility no later than 30 days after contract award.

The Government shall be allowed participation in the Preliminary Design Review (PDR) and the Critical Design Review (CDR). Any material provided during these meetings marked proprietary shall be handled

appropriately. The Government shall refrain from disclosing any proprietary information gathered at these meetings. Adaptive Dynamics shall provide a copy of the meeting minutes and brief to the Government, CDRLs A004 and A005.

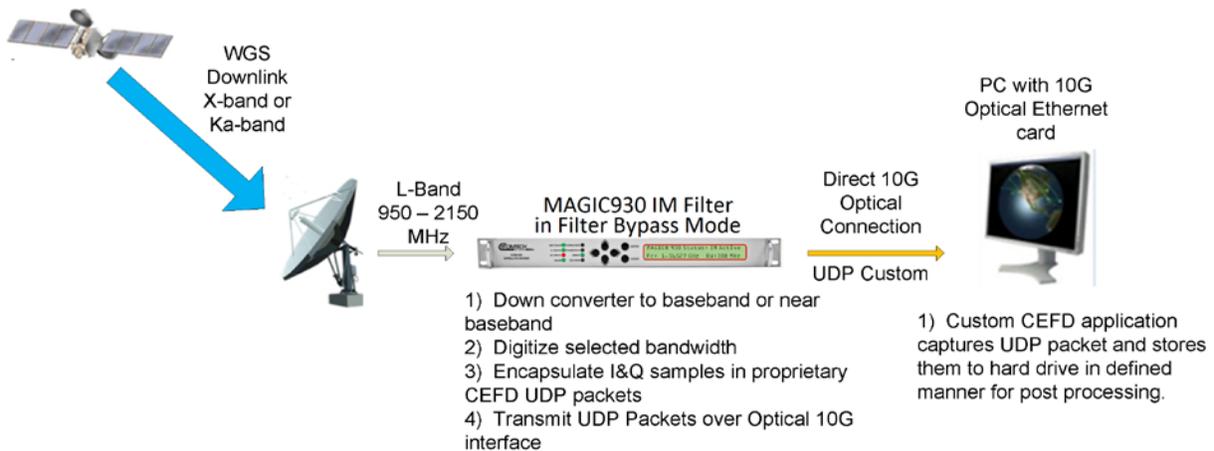
3.4 GOVERNMENT FURNISHED INFORMATION (GFI)

- a) Periodically and with 14 days written notice from ADI, the government will enable up to 24 hours of access to the NMT shore station at Navy Base Point Loma under this contract. The purpose of this access will be to 1) to collect signal and interference captures from the NMT terminal at L-Band and the FAST OSDI interface and 2) to test the live performance of the CDM-MAGIC®930 under adverse signal conditions.
- b) The government will provide ADI with a PHY Layer MATLAB model for the WGS system for the specific high speed data channels that the government wants the CDM-MAGIC®930 to protect.

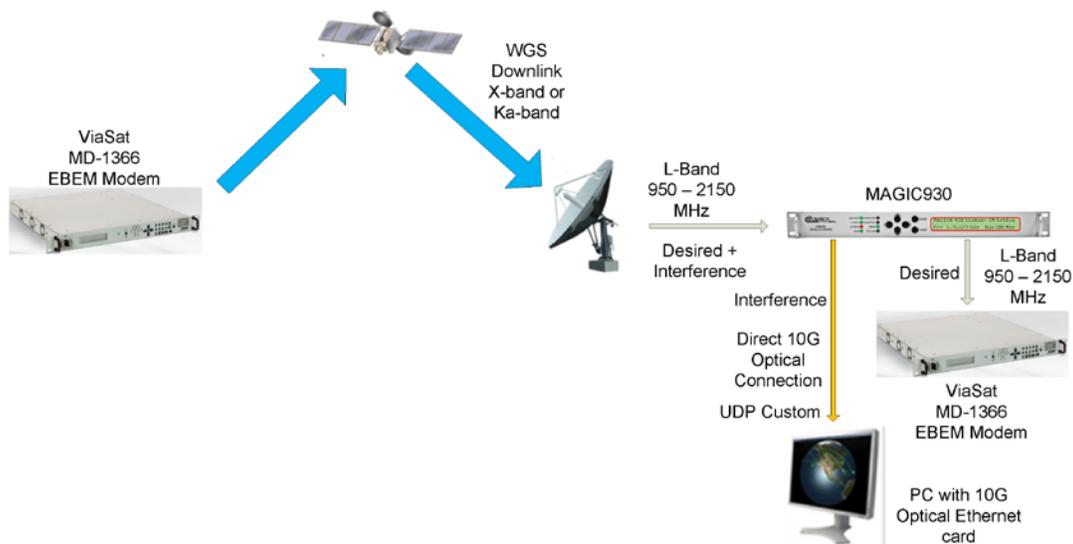
4.0 TECHNICAL REQUIREMENTS

The CDM-MAGIC®930 as proposed is a 1U interference mitigation appliqué, which will have the main following modes:

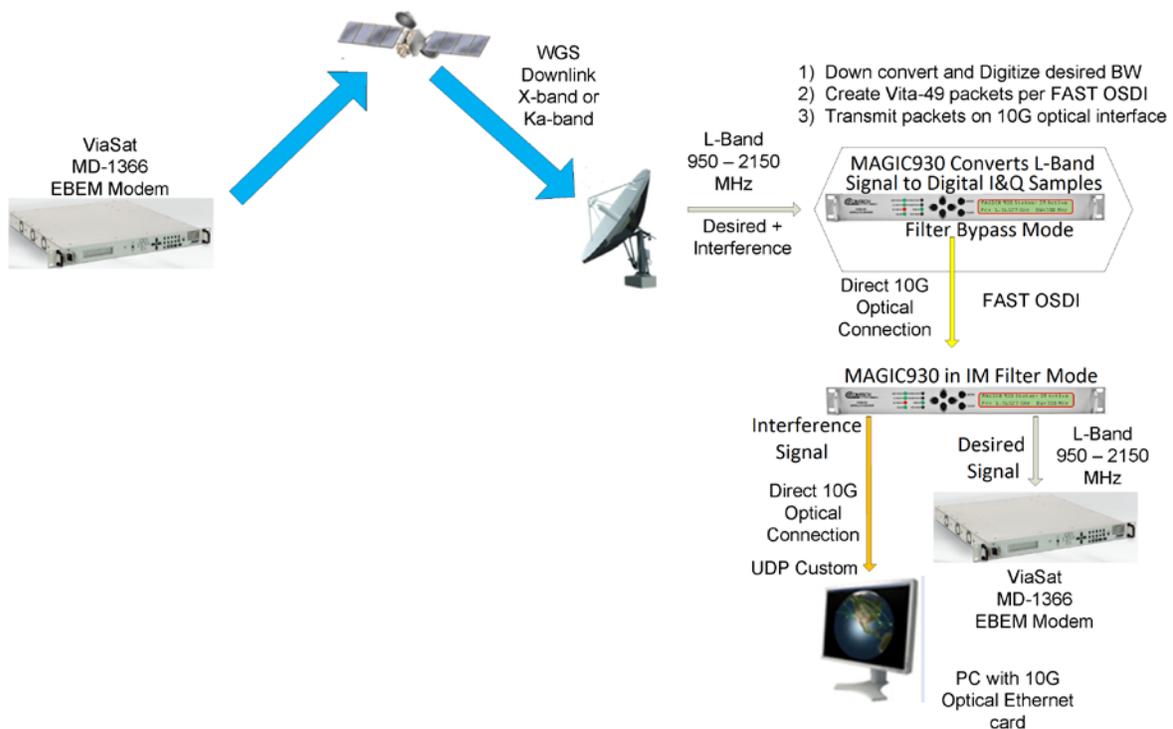
- 1) 300MHz L-Band WGS signal digital I&Q data capture on external drive (MAGIC® IM filter in bypass mode).



- 2) 300MHz L-Band interference mitigation (125MHz single WGS analog carrier in - MAGIC filtered analog out, interference signal sent as digital I&Q output on optical port to external data capture device).



3) FAST OSDI interference mitigation (WGS 16-bit digital I&Q @ 150mSps input, MAGIC filtered digital I&Q output via FAST OSDI port OR MAGIC filtered digital I&Q output to optical drive).



The CDM-MAGIC®930 will have the following features:

- 1) Ability to use either the 300MHz BW L-Band input or the FAST OSDI port (based on a single 125MHz BW WGS transponder, 16-bits complex I&Q @ 150MSps) as the input stream to the CDM-MAGIC®930.
- 2) Ability to output any signals (e.g. pre-filtered signal, post-filtered signal, any separated interference signal, etc.) to the L-Band output or the FAST OSDI port or to a local UDP optical storage device.
- 3) Custom front panel user interface for simple control and monitoring of all the basic functions of the CDM-MAGIC®930.

- 4) Web-based remote interface for full control and monitoring of all user settings and measured signal/interference parameters of the CDM-MAGIC®930.
- 5) Ability to log interference center frequencies, BW's, power levels, etc. and automatic identify known interference threats (both intentional and unintentional) from a lookup table and remotely access the interference log via the Ethernet.
- 6) Ability to send interference and other status alerts via the Internet to predefined users via SNMP traps.
- 7) Ability to remotely route any signal or interference in a custom I&Q format to a local optical storage device via the FAST OSDI port for remote retrieval and post-analysis.
- 8) Ability to save, upload or download the CDM-MAGIC®930 settings parameters to a file via the Ethernet.

4.1 SYSTEM REQUIREMENTS

| Requirement | Specification |
|----------------------------------|---|
| Interference Cancellation | 20 dB [Threshold], +60 dB [Objective] |
| Frequency bands | Military X and Ka |
| Protected Bandwidth | 300 MHz Max, Typical 125MHz Channel BW |
| Comtech CDM-930 FPGA utilization | Up to 90% with no modification to CDM-930 |

5.0 INTEGRATED LOGISTICS SUPPORT

5.1 CONFIGURATION MANAGEMENT

Adaptive Dynamics shall implement an internal configuration management system for control of all configuration documentation and physical media representing or comprising CDM-MAGIC®930.

5.2 CONFIGURATION IDENTIFICATION

The CDM-MAGIC®930 will be labeled as such, unless instructed otherwise by the PMW/A-170.

5.3 DEVIATIONS

Adaptive Dynamics shall not develop items for acceptance by the Government that incorporate a known departure from requirements, unless a Request for Deviation (RFD) is approved by the Government. Adaptive Dynamics shall submit to the PCO, in writing, their request for an RFD. RFDs may only be authorized or incorporated into the contract by the signature of the PCO. The PCO is not obligated to accept RFDs.

5.4 QUALITY ASSURANCE

5.4.1 Quality Management

Adaptive Dynamics shall have an established quality management program.

5.4.2 Quality Program

Adaptive Dynamics shall follow its established quality program to ensure the CDM-MAGIC®930 meets all inspection and test requirements of the contract. The Government reserves the right to observe all inspections or tests.

5.4.3 Best Practices

Adaptive Dynamics shall manage CDM-MAGIC®930 development in accordance with best industry practices. These practices shall include quality assurance, configuration management, and testing documentation. Evidence that the best commercial practices are followed shall be made available at Adaptive Dynamics's facility, on a noninterference basis, for review by representatives of the procuring activity. This documentation shall be available for U. S. Government representative inspection.

5.5 ENVIRONMENTAL, SAFETY AND HEALTH (ES&H)

5.5.1 Safety

The CDM-MAGIC®930 design shall not expose systems (including personnel, equipment, and interfaces) to safety hazards during installation, operation, or administration.

5.5.2 Hazardous Materials

Adaptive Dynamics shall maintain regulatory compliance with Federal and State Occupational Safety and Health Administration (OSHA) regulations while performing work under this subcontract.

5.6 WARRANTY

Adaptive Dynamics shall warranty all CDM-MAGIC®930 from defects in the delivered product. The warranty shall cover CDM-MAGIC®930 for 1 year from date of Government acceptance. Adaptive Dynamics shall maintain record system to track warranty and out-of-warranty CDM-MAGIC®930 on all software procured under this contract. Adaptive Dynamics shall allow designated Government personnel access to view these records.

5.7 GOVERNMENT FURNISHED PROPERTY (GFP)

GFP is not to be anticipated to be provided to Adaptive Dynamics under this contract.

6 TESTING

6.1 GOVERNMENT VERIFICATION

The quality assurance operations, including inspections and tests, performed by Adaptive Dynamics and Comtech shall be subject to Government witness, on a noninterference basis at any time. The Government reserves the right to witness each inspection, examination, and test required to be conducted under this contract.

6.2 FIRST ARTICLE TESTING (FAT) AND PRODUCTION ACCEPTANCE TESTING (PAT)

A contractor FAT will be satisfactorily completed before final acceptance of the CDM-MAGIC®930 system. This test will be in accordance with CDRL A008. Adaptive Dynamics shall notify the Government Technical Representatives a minimum of one week prior to the FAT testing. The Government reserves the right to witness, on a noninterference basis, each final inspection, examination, and test required to be conducted under this contract. Adaptive Dynamics shall provide proof of completion during the monthly Program Management Review.

6.2.1 Production Acceptance Testing

Prior to delivery of additional CDM-MAGIC®930 (if option is exercised) PAT shall be conducted on each CDM-MAGIC®930 version. This testing shall be a subset of the FAT approved by the contracting officer CDRL A008.

6.3 CONTRACTOR DATA REQUIREMENTS

Contractor Data Requirements List (CDRL):

| CDRL | Title | Format | Remarks |
|-------------|--|---------------|---|
| A001 | Contractor's Progress, Status, and Management Report – Monthly Progress Report | DI-MGMT-80227 | 1 Month After Contract Award (MACA) and every month, thereafter; 1 month for Govt review and resubmit as required |
| A002 | Scientific and Technical Reports – Presentation Material: Kickoff Meeting | DI-ADMN-81373 | 1 MACA; 1 month for Govt review and resubmit as required |

(a) Location on Container

When practical, one set of the unpacking instructions will be placed in a heavy water-proof envelope prominently marked "UNPACKING INFORMATION" and firmly affixed to the outside of the shipping container in a protected location, preferably between the cleats on the end of the container adjacent to the identification marking. If the instructions cover a set of equipment packed in multiple containers, the instructions will be affixed to the number one container of the set. When the unpacking instructions are too voluminous to be affixed to the exterior of the container, they will be placed inside and directions for locating them will be provided in the envelope marked "UNPACKING INFORMATION."

(b) Marking Containers

When unpacking instructions are provided shipping containers will be stenciled "CAUTION--THIS EQUIPMENT MAY BE SERIOUSLY DAMAGED UNLESS UNPACKING INSTRUCTIONS ARE CAREFULLY FOLLOWED. UNPACKING INSTRUCTIONS ARE LOCATED (Contractor shall state where instructions are located)." When practical, this marking will be applied adjacent to the identification marking on the side of the container.

(c) Marking

All shipping containers will be marked in accordance with MIL-STD-129 "Military Standard Marking for Shipment and Storage."