





### SPECTRUM PROCESSING FOR TOTAL DOMINANCE



As threats become more agile, deceptive and diverse, our mandate becomes more focussed on delivering EW solutions that drastically cut deployment risk, time and cost.



# **Mission Statement**

### **10 Gigabit Sensor Processing**

# **Company Background**

Founded in 2007, D-TA designs, develops and manufactures sensor systems for demanding EW/ISR applications. D-TA products cover a wide range of applications, including, signal intelligence, radar, EW simulation, electronic attack, sonar and sonobuoy processing. All D-TA's state-of-the-art sensor-interface products include one or more 10 gigabit optical network(s) for high-speed data transfer to and from a server class computer which is used for real-time multi-core software application development. The combination offers a truly

reconfigurable solution which also cuts deployment risk, time and cost.

D-TA's technical team has unparalleled expertise, in RF, IF & network systems design and also multi-core software application development. D-TA enjoys a growing list of customers who have used either standard COTS or tailored products from D-TA. DTA backs all its products ensuring unmatched customized support, resulting in 100% success in fielding solutions in record times & lower costs.



### Fast, Scalable and Synchronized

D-TA has pioneered sensor processing fiber (approximately 1 Gbytes/s per solutions that use the 10 Gigabit Ethernetwork) with no loss of data. D-TA's net as data back-bone, instead of comdesign also ensures virtually limitless puter bus, for high speed data transfer scalability and fully synchronous opbetween signal acquisition and proeration irrespective of the number of cessing units. Appropriately termed, 10 fibers (networks) used. Furthermore, Gigabit Sensor Processing, the approach D-TA's 10 Gigabit sensor processing is can handle demanding high-bandwidth OS agnostic, facilitating greater softand high channel-count requirements ware portability. The use of optical fiof today's military sensor systems. bers also allows signal digitization and processing functions to be far apart D-TA's 10 Gigabit sensor processing thus permitting digitization close to the scheme sustains data throughput rate sensors.

close to the line rate of the 10 Gigabit



# **Spectrum Processing** For Total Dominance

In today's complex threat environment, spectrum superiority is paramount. One who controls the spectrum wins the battle! D-TA Systems provides the tools necessary to acquire deep insight of the spectrum in order to use it for maximum effectiveness.

D-TA's line of highly advanced spectrum processing solutions provide the flexibility and power to capture, process & create spectrum to gain the

**Open-Architecture EW Solutions** 

advantages needed to control the outcome. These products provide end-toend spectrum coverage for single- or multi-sensor applications.

D-TA's website (www.d-ta.com) provides detailed information on various D-TA products which are deployed in a multitude of demanding EW applications as highlighted below. This brochure provides a brief overview of some of the major products and their applications.



D-TA offers open-architecture solutions for demanding COMINT applications: including, Electronic Surveillance (ES); Direction Finding (DF); Communications (*COMMS*); and, Electronic Attack (*EA*).



### **RFvision1-Supermini**

D-TA's RFvision1-Supermini portable RF transceiver product with integrated record and playback offers a highly powerful tool for spectrum monitoring, spectrum collection, recorded data file transfer to the user computer and RF playback.

### **CSM-1000**

A fully integrated portable Search Receiver (CSM-1000) which includes signal detection, narrowband channelization, automatic modulation/transmission mode recognition and demodulation/decoding is offered by D-TA. This system is based on the Supermini.

### **RFvision-Broadview**

RFvision-Broadview is an integrated multi-antenna transceiver platform for all-in-one COMINT solution, including ES, DF, COMS and EA. The system is configured for the required number of receive and /or transmit channels for each of these functions. D-TA offers fully-integrated COMINT software suite for a complete solution. D-TA also supports user development with algorithms, application examples and hands-on training. This configuration supports up to 16 channels per system.





COMINT



Sonar & Sonobuoy



**HF** Processing

ELINT



Radar



Spectrum Fusion



**RF / IF Recording** & Playback



**EW** Simulation







D-TA's website offers a wealth of information, click the icon of interest to learn more. www.d-ta.com

# COMINT

### Dual Channel RFvision1-Supermini **Portability Without Compromise**

### Capture, Process & Create Spectrum Anywhere

D-TA's RFvision1-Supermini series products are designed to operate in dense electromagnetic environments. They include high-performance super-heterodyne RF stages with pre-, post- and IF-filters, 16-bit data converters and FPGA based

DDCs & DUCs to offer high-dynamic range performances. They also include 10 Gigabit data network(s) for high-speed I/Q data transfer to and from recorder/player. The products are available in both rack-mount & portable enclosures.

- 1) Measuring 7.64"x 7.5"x 12.76", & weighing only 8.1 kg.
- 2) RFvision1-Supermini only requires a tablet for control and operation.

4) RF playback of pre-recorded or computer generated data.





#### **Block Diagram**

#### **SigInspector**<sup>™</sup> **Software Offers:**

- System Status
- Spectral Scan based on user defined scan parameters (scan table);
- Wideband (40/80 MHz) energy detect:
- Waterfall display of signal activities over the entire spectrum;
- Wideband spectral analysis (FFT) of selected spectrum (40/80 MHz);
- Recording of selected spectrum for user defined duration;
- Transfer of recorded data details to host (user) computer; and,
- RF playback of pre-recorded data or host (user) computer generated data.

Scans (Max-Hold)

COMINT

### **Dual Channel RFvision1-Supermini Features**

• 1 Rx & 1 Tx channels, or 2 Rx or 2 Tx channels

• Standard Supermini S offers frequency tuning range from 20 MHz to 6 GHz (Supermini W offers 1 MHz – 8 GHz & Supermini W/E offers 1 MHz – 18 GHz frequency tuning range)

• 40 MHz IBW (Supermini W offers 80 MHz IBW)

• 8 dB noise figure, 93 dB gain control, > 30 dBm OIP3 & 70 dB

• DDC & DUC based operating BW selectable from 5 KHz to 40 MHz

· Real-time recording of 2 channels with 40 MHz BW each for over 1.3 hours

• 2 TB SSD storage (expandable to 6 TB)

AC/Battery operation

GPS time & location option

### FFT of Selected Spectrum Signal Activity **Occupancy Chart** 20 MHz – 6 GHz Waterfall Display Signal Power Current & Previous Record

SigInspector<sup>™</sup> Software is offered free with **RFvision1-Supermini** 

COMINT

# **Portable Search** Receiver

D-TA offers a complete search receiver with real-time channelization, automatic modulation recognition, and demodulation. The Supermini with 2 receive channels can support signal analysis without interrupting scanning. One receive channel (scan) outputs FFT data for signal detection and frequency, and bandwidth estimation. This data is then used to program the DDCs of the monitoring (stare) channel for narrowband signal analysis.

The portable search receiver is based on the RFvision1-Supermini and a laptop pre-installed with a very powerful communication signal monitoring and analysis software









Supermini Configuration for Search Receiver



### All-In-One Multi-Antenna COMINT Platform For ES, DF, COMMS & EA

### **RFvision Broadview** Multi-Antenna Transceiver

DTA-3380 transceiver system can be configured to user specified number of receive and / or transmit channels [e.g, 1 independently tuned Rx channel for Electronic Surveillance; 5 phase-coherently tuned Rx channels for Direction Finding; 1 Rx & Tx (both independently tuned) for Communications; and, 3 phase-coherently tuned Tx channels for Electronic Attack].

Up to 16 receive and/or transmit channels can be housed in a compact enclosure. For each channel the tunable frequency range is from 1 MHz to 8 GHz and the IBW is 80 MHz. The number of 10 GbE networks for I & Q data transfer is a function of the channel count.





- 1 MHz 8 GHz frequency tuning range & 80 MHz IBW
- Up to 16 RF input and/or output channels in any combination
- Phase-Coherent and/or independent tuning
- 16 Bit Data Converters
- DDC programmed Operating BW selection from 5 kHz to 80 MHz
- K-7 FPGAs (User Programmable)
- · Multiple 10 GbE optical networks for fast data transfer for server (DTA-5000) based recording, playback and processing

### **Rugged Packaging Options** of RFvision Broadview



# ELINT

D-TA's ultra-wideband RFvision-2 record/playback solution forms the backbone for a powerful ELINT implementation (MFEL-5000) which includes advanced pulse processing, data collection and data management. The pulse processing involves entropy-based signal detection in low SNR environment, accurate frequency and bandwidth estimations,

System-95 ultra-wideband IF recorder has been widely used as an ELINT recorder. It offers simultaneous recording of multiple IF signals, each of different frequency and bandwidth. The maximum signal bandwidth is 1 GHz.

### Example COMINT Configuration of RFvision Broadview



# RFvision-Broadview configured for 1 ESM, 5 DF and EA channels

All processing for ES, DF and EA are multi-core software based. D-TA offers full custom solution based on D-TA's unique recorder-centric processing concept which allows multiple algorithms (e.g, Phase-Correlative Interferom-

eter and MUSIC for DF estimation) to run on the same data set to improve the bearing estimate. D-TA also supports user development with algorithms, example application cores and hands-on training.



For more information on D-TA's open-architecture COMINT solutions, click the *COMINT* button on the home page: *www.d-ta.com* 



modulation-on-pulse recognition, de-interleaving and emitter identification. The baseband I/Q data recording at full bandwidth continues unabated while processing is going on. An SQL database of pulse descriptor words allows query based search for accessing only relevant (I/Q) data for further scrutiny and/or archiving, a portable version of the system.

# **RFvision-2**

The RFvision-2 system includes DTA-9590 tunable ultra-wideband transceiver and DTA-1000R RAID server with 8 TB SSDs to support over 1 hour continuous record/playback. It is also offered with DTA-5000 RAID server with 24 TB SSDs.

- 500 MHz 18 GHz Frequency Coverage
- 500 MHz, 250 MHz or 100 MHz Stare BW (DDC selectable)
- 12 Bit Data Converters & FPGA Based DDC & DUC
- · Real-Time IQ Data Recording, Processing & RF Playback
- Supports simultaneous receive & transmit from the hard drives
- Signalview software for analysis of recorded data
- SDK & FDK support for user development





**RFvision-2 system includes independently tuned** receive & transmit channels, & real-time record & playback at full 500 MHz BW

# **Multi-Function ELINT**

With Advanced Pulse Processing, Wideband **Data Recording and Data Management** 



**Rack-mount ELINT** 



#### Portable ELINT

The recorded baseband (I/Q) data is indexed by base. Each pulse data is processed using multiple a file index and a packet offset from the file or multi-core processing threads for estimation of frequency, BW, Modulation on Pulse (MOP), etc. in other words, the time elapsed from the beginning of the recording session. The threshold The SQL database allows query based search of analysis module (Noise Riding Threshold or Enonly the relevant pulse data for further analysis tropy based pulse detection) then scans through or archiving. A optional trim back feature retains the data while the data is being recorded. Pulse only the pulse data and erases irrelevant data, tag (time of arrival & time of departure, or pulse thereby increasing storage capacity. width) information is placed in the SOL data-

14

D-TA's MFEL-1000 (portable) and MFEL-5000 (rackmount) ELINT solution is based on the RFvision-2 platform and multi-core software processing. It is compact, low-cost and addresses all the issues faced by today's ELINT system, including pulse processing with MOPs recognition, real-time long-duration data collection and data reduction to address the 'big data' problem associated with ELINT collection.

The key difference in the design of the MFEL system over other ELINT systems in the market is that it is based on processing recorded (wideband I/Q) data and as a result every sample is scrutinized for the highest probability of intercept and more accurate analysis. Processing happens concurrently as data is being recorded in multi-core software environment.

ELINT



### Major Features:

	Frequency range:	0.5 – 18 GHz
	Frequency Scanning resolution:	1 MHz
ELINT	Instantaneous bandwidth:	500 MHz
	Noise Figure:	14 dB
	Gain Control:	31 dB in steps of 1 dB
	Dynamic range:	63dB (500 MHz BW)
	Pulse Detection Option:	Manual Threshold, Entropy, Noise Riding Threshold
16	Rise Time, Fall Time, PW resolution:	1.875 ns
	MOPs Recognition :	FMOP - Linear and non-line PMOP - Bi-phase, multi-pha Barker
	Basic Pulse Descriptor Word (PDW):	TOA, Rise & Fall Times, PW, Frequency, BW MOP, PRI & Emitter Isolation
	Search Option:	Query based search on PDN items for accessing relevant pulse data
	Storage Options:	6TB, 12 TB, 24 TB or 48 TB
	Data Reduction Option:	Trim back to retain PDW an I/Q data for each pulse
	Additional RF Assets:	One or more 500 MHz and 80 MHz IBW channels





**Intuitive & Ergonomic** Software GUI & Display

**Requiring Minimum Operator training** 

# **Ultra-Wideband IF Recorder & Player For ELINT**

(1 GHz Spectrum Processing)

The System-95 ultra-wideband spectrum processing solution includes DTA-9500 digital IF transceiver & DTA-5000 (2U) or DTA-1000 (1U) RAID server. The System-95 is available in rackmount or ATR enclosures. The major features are:

- Simultaneous (I/Q) data recording of two IF inputs with bandwidths up to 500 MHz (IF=160 MHz or 1 GHz or 1.2 GHz), OR
- (I/Q) data recording of one IF input with bandwidths up to 1 GHz (IF = 1 - 3 GHz)
- Analog IF playback of pre-recorded or computer generated (I/Q) data
- Powerful PulseView software for post processing for ELINT







#### System-95 can handle: One (1) 1 GHz BW or Two(2) 500 MHz BW IF Inputs

### PulseView Software For Post-Analysis of Recorded Data

The PulseView software upon selection of a particular recorded session extracts PDW table and can display any user selected PDW parameters.



# D-TA SYSTEMS INT

D-TA's MRSE-5000 multi-channel radar signal emulator is considered one of the most powerful in the world. Based on the concept of streaming waveform (I/Q) data from computer hard drives to a tunable RF transmit unit, the system can generate any waveform at any frequency for virtually any duration. The powerful RSE software supplied with the system simplifies complex radar signal generation.

Portable RFvision1-Supermini which includes 1 or 2 tunable RF transmit channels can also be used to generate communications and test signals using the same concept. A large number of a rack-mount version of the same unit has been simultaneously used to generate a dense electromagnetic environment for simulating a synthetic battlefield environment.



**Inter-Pulse Display** 

For more information on D-TA's open-architecture ELINT solutions, click the *ELINT* button on the home page: *www.d-ta.com* 

Histogram

# **Communications Signal Emulation**

# I/Q Data Streaming For **RF Scenario Generation**

D-TA's concept of streaming waveform data files (I/Q data) from computer hard drives to a tunable RF transmit unit has revolutionized RF scenario generation. Any waveform at any frequency can be generated for any duration (as hard drive capacity is virtually unlimited).

**EW SIMULATION** 20

Baseband waveform (I/Q) data corresponding to a signal scenario to be generated can be pre-computed and stored in the RAID server's hard drives. During operation I/Q data is streamed via 10 Gigabit networks to one of D-TA's tunable transmit solutions for generating RF scenario.



D-TA has developed a Communications and Radar Signal Generation Software that runs inside the server to generate the waveform (I/Q) data files and store them in the hard drives for RF playback.



in storage (2 TB) can provide two simultane- data for RF playback. User can also use 3<sup>rd</sup> parous RF outputs for generating communication ty software (MATLAB, Octave, etc.) to create signals. The RF tuning can be phase-coherent arbitrary waveform data files for storage in the or independent. D-TA offers signal builder GUI Supermini hard drives.

### **Examples of Complex Signal Generation**



Weighted OFDM signal



- The portable RFvision1-Supermini with built- software to create and store baseband (I/Q)

**Sonobuoy Receiver Signal** (32 FM channels)

EW SIMULATION 21

# Creating a Dense Electromagnetic Environment

Multiple RFvision1-Supermini can be used to create a dense electromagnetic environment for testing EW receivers and operator training. Each Supermini (or a rack-mount equivalent) can provide 2 RF outputs simultaneously. The waveform data files reside inside the Supermini hard drives. A networked computer can be made to control the operation of each Supermini.



Synthetic Battlefield Emitter System

**The Radar Signal Emulator (RSE)** software runs inside the server and it can create receiver I/Q waveform data files for multiple emitters, including jammers with or without a target. The software can model path loss, target radar cross-section with motion dynamics for each platform



Desk-Top Multi-Channel Radar Signal Emulator *MRSE-5000*  The MRSE-5000 base system is available in 1,2,3 and 4 channels with BW up to 250 MHz or up to 2 Channels with BW up to 500 MHz. Optionally, MRSE-5000 can have more than 4 transmit channels. The open-architecture MRSE-5000 can also be configured with one or more receive channels for "hardware-in-the-loop" simulation

# The Radar Signal Emulator (RSE)

The RSE software offers incredible capability to generate any radar waveform for each transmitter for each channel, including: linear and non-linear FM, phase-coded and CW waveforms; variable PWs, BWs, Frequency hopping, pulse-on-pulse & pulse pair designs, PRI staggering, etc.

It also offers the flexibility to configure antenna element type, phase array type, antenna orientation in azimuth and elevation and scan sector definitions for both receive and transmit antennas. The RSE can also model transmitter, target and receiver location, velocity and acceleration in three dimensions.





RAID Server with 24 TB Storage

User PC





# Hardware-In-The-**Loop Simulation**

(Jammer)

The open-architecture MRSE-5000 system can be configured to analyze the performance of a device (System Under Test, e.g, a Jammer) by stimulating its RF input(s) and analyzing its response (RF output).

The DTA-5000 can store various waveform data files to stimulate the SUT and record its responses in real-time for post-analysis of the SUT performance. All performance evaluation software resides in the server.



For more information on D-TA's open-architecture EW Simulation solutions, click the *EW Simulation* button on the home page: www.d-ta.com

D-TA's tunable RF transceiver products coupled with multicore server based software processing offer a highly cost-effective approach for implementing any complex radar solution. Frequency tunability across multiple radar frequency bands (L, S, C, X, K.) implies that a common platform can be developed for multiple radar applications. Spectrally smart cognitive radars requiring adaptive operation are well suited for multi-core software based implementation



# RADAR

which is at the heart of all D-TA's sensor solutions.

Data transmission over optical 10GbE links allows users to deploy the front-end signal acquisition hardware near the antenna, thereby improving sensitivity. This is particularly useful for phased array HF radar and other radars where the signal acquisition is done close to the antennas and the data processing is done in remote sheltered location.

# A Portable Radar Solution For L, S, C, X, or K Band

#### **Real-Time Pulse Compression & Doppler Processing in Software**



A single channel radar system can be readily implemented using D-TA's RFvision1-Supermini portable transceiver system. The frequency tuning range is 1 MHz to 8 GHz (extendable to 18 GHz) and the IBW is 80 MHz.

Real-time multi-core software based pulse-doppler processing in the computer inside the Supermini provides a fully portable battery operated solution that can be taken anywhere

The fact that both receive and transmit channels are tunable over a wide frequency range, it is possible to search for 'white space' in the spectrum for optimum radar performance.

### Multi-Channel / Phased-Array Radar

A complete multi-channel radar solution with all control I/Os (ACP, ARP, T/R Gate, etc) can be readily implemented using the RFvision-Broadview multi-channel transceiver product. The frequency range is from 1 MHz to 8 GHz (18 GHz with frequency extenders) and the bandwidth is up to 80 MHz. As many as 16 RF channels (in any combination of Rx and Tx channels) can be accommodated in a compact enclosure. Precise phase-coherency between channels is maintained using a common frequency synthesiser.

#### **RFvision-Broadview**



DTA-5000 RAID Server for Processing, Record & Playback

**RFvision-Broadview multi-antenna** transceiver system can be configured for handling bandwidths up to 80 MHz.

## 128-channel Over the Horizon Radar (OTHR) System



D-TA has delivered a 128 channel HF phased array radar with full receive and transmit capabilities using DTA-3380 transceiver solution. The product (DTA-3380H) was configured for operation in the HF band (1 MHz to 30 MHz). It included second harmonic compensated front-end design with 31 dB gain and 90 dB SFDR. The transmit section provides 0 dBm output for directly connecting to power amplifiers.

Each DTA-3380H includes 16 receive or 16 transmit channels, ADCs or DACs and FPGA resources for digitization, channelization and data transfer over 10 GbE optical networks. All processing is done in DTA-5000 RAID server, typically placed in a sheltered location far away. The system is now being expanded to include 1024 channels.



#### For more information on D-TA's open-architecture Radar solutions, click the *Radar* button on the home page: www.d-ta.com

# **SONAR & SONOBUOY**

For ASW, Mine, Dipping and other sonar applications, the DTA-4100 series products are hard to match. They include 24 bit ADCs that offer 108 dB spur-free dynamic range and signal bandwidths over 1 MHz. Any number of DTA-4100 products can be operated synchronously for large channel-count applications. As with all D-TA products 10 GbE optical fibers are used to move data to and from one or more DTA-1000R RAID servers for receive and transmit processing. The use of optical fibers to move data allows signal acquisition to be done close to the sensors, thereby improving sensitivity. This is of particular relevance in designing hull sonar systems

The portable RFvision1-Supermini is an attractive choice for implementing sonobuoy receivers. A Sonobuoy receiver is essentially a channelized VHF receiver, where each channel (32, 64 or 96 channels) is assigned to a buoy. Following ADC conversion, channelization and demodulations are done in FPGA and the data is sent to a processor for further processing and display.

### Multi-Channel Sonar / Acoustic Processing



#### DTA-4100

(19" rack-mount 1U) can be configured for up to 72 receive or transmit channels or up to 36 receive & 36 transmit channels

#### DTA-4100 Receive Sub-System:

- 36 Differential Inputs with Signal Conditioning
- 24-Bit, 2.5 MHz Sigma-Delta ADCs that offer over 108 dB SFDR
- Two DAC outputs that can be used for test/transmit
- Multiple DTA-4100 receive subsystems can be stacked to increase channel count
- 10 GbE Optical Link allows full bandwidth operation





10 GbE Fiber capable of moving data over long distances



#### DTA-1000R (1U) Server for Processing, Recording & Playback and Display

#### DTA-4100 Transmit Sub-System:

- 36 Differential Outputs with Signal Conditioning
- 16-Bit, 50 MHz DACs that offer over 88 dB SFDR
- Two ADC inputs that can be used for test
- Multiple DTA-4100 transmit subsystems can be stacked to increase channel count
- 10 GbE Optical Link allows full bandwidth operation





# Large Channel Count Sonar Processing

### Scaling Up to Handle a Large Number of Channels

Many acoustic applications require processing a large number of sensors (e.g, sonar), virtually any number of DTA-4100 units can be operated synchronously to increase channel count.



### **Sonobuoy Receive Processing**

Each buoy is assigned a frequency channel (typically few hundred kHz) for transmitting acoustic signals. A frequency band of approximately 40 MHz is allocated in the mid-VHF region for 32, 64 or 96 buoys. The receiver operation essentially involves channelization and demodulation.

**RFvision1-Supermini** is ideal as a sonobuoy receiver as it includes both receive and transmit functions and on-board FPGA resources for channelization, demodulation and transmit command processing.





For more information on D-TA's open-architecture Sonar and Sonobuoy receiver solutions, click the *Sonar & Sonobuoy* button on the home page: *www.d-ta.com* 



# SPECTRUM FUSION

D-TA's unique sensor interface solutions coupled with 10 GbE networks for fast data transfer to and from a multi-core server makes senor fusion possible for *DC to Daylight* spectrum processing

**RFvision-360** 





home page: www.d-ta.com



For more information on Spectrum Fusion (RFvision-360) click the **Spectrum Fusion** button on the home page: *www.d-ta.com* 

# **RECORDING** @ RECORD **BREAKING SPEED**

Recording and playing back sensor signals are fundamental requirements in most demanding sensor processing applications. D-TA has created a complete software based record/playback engine for record & playback via the 10 GbE UDP/IP data network using off-the shelf RAID servers.

D-TA's innovative 10 GbE network attached sensor interface solutions provide end-to-end solutions for record/playback of RF & IF signals for complex radio, radar and acoustic applications.

For multi-antenna applications D-TA's 10 Gigabit sensor processing technology can deliver synchronized operation over multiple fibers and a record / playback rate of 1 Gbyte/s per fiber (network).

D-TA routinely delivers record/playback solutions that sustain recording rate of 8 Gbytes/s using 8 fibers. It can be further increased using more fibers.

For more information on D-TA's open-architecture Record & Playback solutions, click the RF/IF Recording & Playback button on the



# **Spectrum Processing for Total Dominance**

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