739 for VHF/UHF Maritime and Coastal Surveillance Radio Direction Finding (RDF) System

The TCI Model 739 is a high-performance radio direction finder that can be integrated into maritime Vessel Traffic Management (VTM) solutions or interference detection systems for search and rescue operations and radio band protection applications. Model 739 systems can also be used individually or networked together on land or on a vessel to identify the LOB or source location of distress signals or other RF transmissions. A compact member of TCI's 700 series of field-proven Spectrum Monitoring Systems (SMS), the 739 provides an accurate, real-time solution for unattended monitoring and instantaneous identification of the source of radio transmissions for applications such as:

- Vessel Traffic Management (VTM) solutions
- Port management information systems
- Coastal Surveillance System

- Search and rescue (SAR) for aeronautical and maritime services (121.5 MHz, 156.8 MHz, optional 243.0 MHz & 406.25 MHz)
- Interference detection from other radio services
- Unauthorized usage
- Homeland Security
- Border protection
- Advanced real-time spectrum monitoring

The 739 exclusively offers users a multi-channel architecture to provide fast and accurate signal measurements for critical safety-related applications. The system consists of a spectrum processor, computer/monitor, TCI's SCORPIO client-server software and a choice of VHF/UHF direction finding (DF) antennas. The 739 achieves high-accuracy DF performance by using its spectrum processor for simultaneous DSP analysis of wideband receivers connected to an external, multi-element DF antenna array.

Each processor channel is composed of a fully synthesized, high dynamic range receiver, high-speed digitizer, and custom digital signal processor.

The digital processing provides a wide selection of measurement bandwidths, including 6.25 kHz, 8.33 kHz, 12.5 kHz, 25 kHz, 50 kHz and 100 kHz. This allows the system to be tailored to current and future channel-spacing requirements and to simultaneously measure and analyze more than 40 frequency band channels.

TCI

Make fast and accurate signal measurements **for critical safety-related applications.**

KEY FEATURES

- Field-proven spectrum monitoring and geolocation solutions used by over 50 regulatory authorities worldwide.

- Simultaneous radio direction finding on more than 40 user-defined frequency channels.

- Exceptional direction finding speed and measurement accuracy.

- 30 to1,000 MHz coverage with the TCI Model 641 or 645 antenna.

- Optional HF monitoring coverage from 9 kHz to 30 MHz.

- Instantaneous bandwidth of 10 MHz.

- Application Programming Interface (API) for control and output of the measured lines of bearing to Vessel Traffic Management (VTM) solutions.

- Client-server architecture with full networking capability over TCP/IP.

- SCORPIO client software for local or networked setup, control and display.

- Selectable measurement bandwidths include 6.25 kHz, 8.33 kHz, 12.5 kHz, 25 kHz, 50 kHz and 100 kHz.

- Compact antenna and spectrum processor units.

- Automated emergency and high-priority channel monitoring and interference detection with alarm capability.

- Built-in self-test and calibration.

- Interoperable with all TCI 700 series spectrum monitoring systems.

Intercept and Location of RF Signals

TCI's SCORPIO client is a powerful, real-time software application that monitors and locates the position of RF transmissions. SCORPIO automatically detects changes in signal activity, provides alarm notifications, records and replays measurement results. It provides location information in the form of a Line of Bearing (LOB) if a single system is used, or triangulation if more than one system is used. It can identify and locate interference signals, unauthorized transmitters or emergency transmissions.

The SCORPIO client provides an operator with a complete interface and all control functions necessary to set up direction finding (DF) measurements and receive, display and analyze DF results in real time or for post-processing. Windows®-based SCORPIO client software has a graphical user interface that operates over a TCP/IP network.

Lower Life-Cycle Cost

TCI's more than 45 years of experience in designing, installing, and maintaining spectrum monitoring equipment makes the 739 a true best value solution that offers the highest performance and reliability.

The 739 is self-calibrating and does not require field or factory calibration after extended use. Like all 700 series systems, its Built-in Self Test (BIST) capabilities and self-calibrating antenna technology reduce maintenance costs and achieve the lowest lifecycle ownership cost.
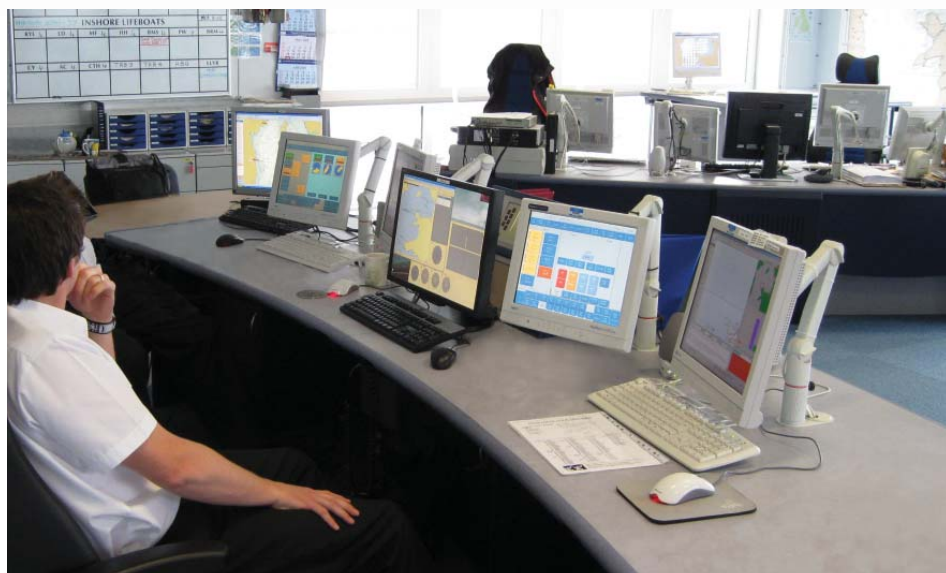
Continuous Monitoring of High Priority Channels

SCORPIO software lets the operator define over 40 high priority channels to monitor for emergency transmissions or unauthorized use. If any signal activity is detected on any of the high priority channels, the software can automatically alert the operator on the screen and issue an audible alarm at the workstation.

Interference Detection and Alarm

SCORPIO client software lets the operator detect interference and receive alarm notifications in a monitored spectrum band, as is commonly required when monitoring aeronautical bands. To enable this capability, the operator selects a Protected Area of the frequency spectrum and defines a mask of the spectrum. Typically, the mask represents the existing signals plus 5 or 10 dB. Once the operator enables the alarm, the software continuously monitors signal activity in the Protected Area and alerts the Operator when a new signal breaks through the established mask. This results in an audible alarm, a visual alarm on the spectrum display, and recording of the corresponding frequency in the Alarm Frequency List.

After the occurrence, the operator can retrieve and play back any portion of the recorded spectrum corresponding to the time of the reported interference.
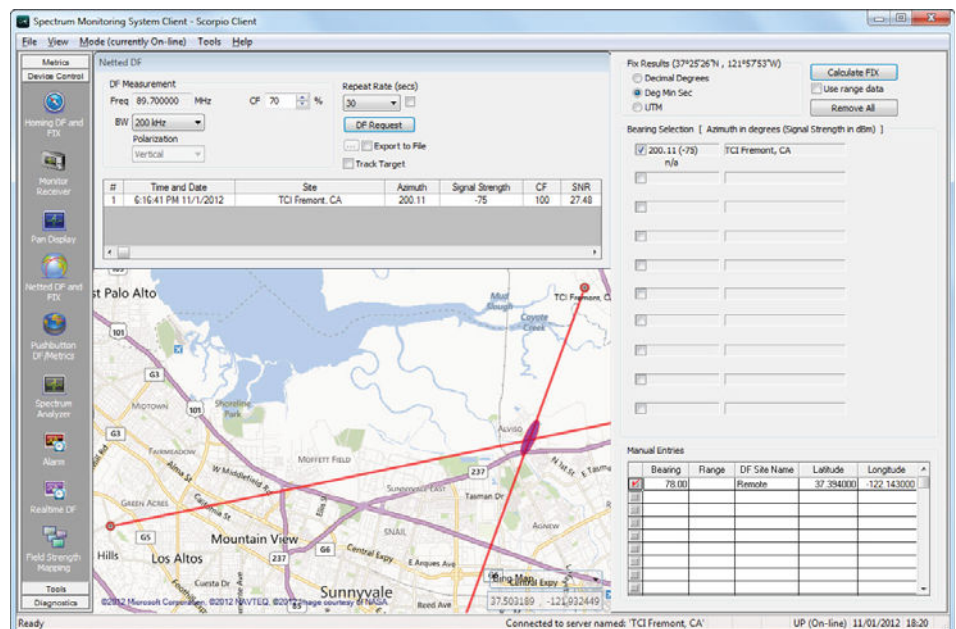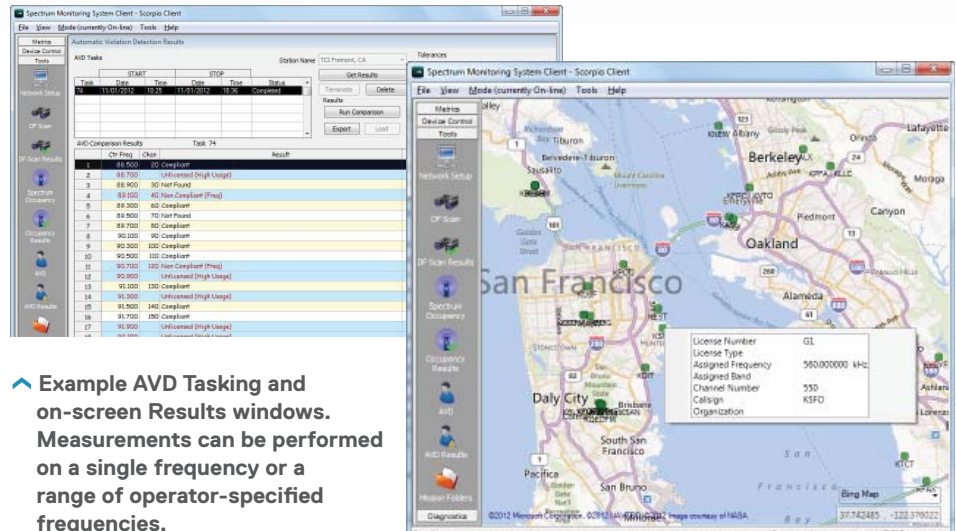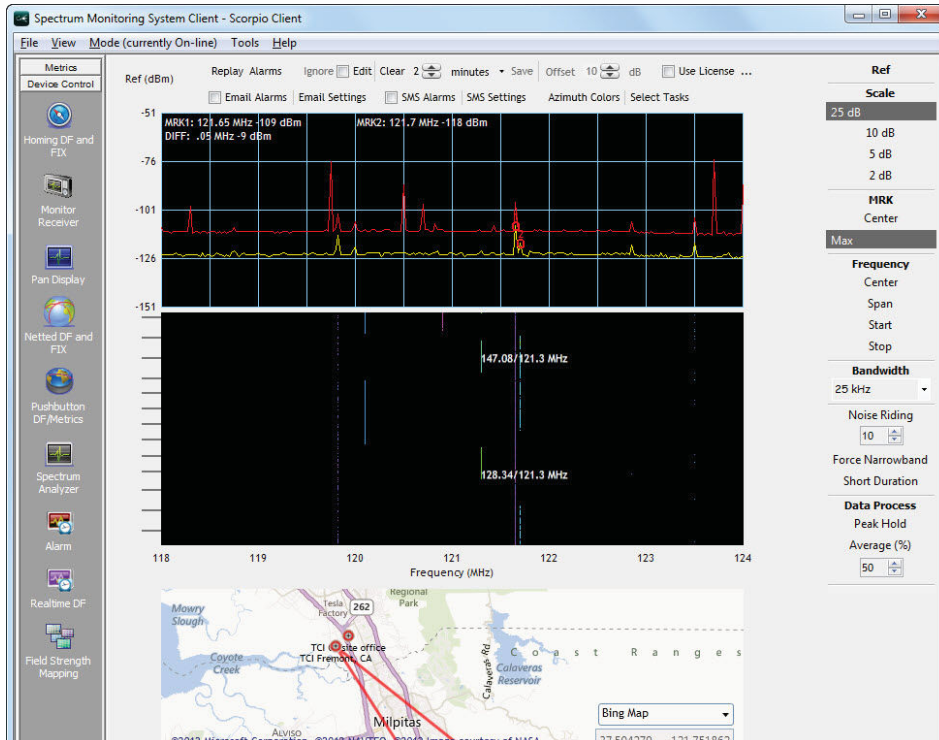
Information Management

SCORPIO displays are configured for real-time monitoring, but the software also provides administrative screens to display continuous activity status information. In addition, all real-time information is logged to disk and the operator or administrator can then query, filter, sort, export or print the stored data or generate statistical reports after the fact, at the end of the day or the end of the shift.

Single Station or Networked Operation

SCORPIO can operate in various configurations ranging from a single site, mobile or fixed, to a nationwide network with multiple operators tasking multiple fixed and/or mobile systems. Through the SCORPIO client, all functions of the DF equipment can be controlled either locally at a monitoring/DF station, or remotely from the DF operator workstation located at a control center. DF operators can perform the following functions from any SCORPIO workstation:

- Fully control all DF stations assigned to them.

- Continuously monitor signal activity, Lines of Bearings, and Fixes in all operator-assigned channels, including High Priority channels with audible alarms.

- Store all DF measurements automatically in a local database on their computer.

^ **Example AVD Tasking and on-screen Results windows. Measurements can be performed on a single frequency or a range of operator-specified frequencies.**

^ **Netted DF screen showing FIX for two-sight bearing measurement.**

Automated Spectrum Monitoring for Unattended Operation

SCORPIO software was designed for unattended operation, and automatically initializes and starts operation when power is applied. If the signal is measured by more than one monitoring/DF station, the system automatically calculates the Fix and displays the results on the map in real time.

⌃ **Real Time DF/Alarm Window**   ⌄ **Replay Window for an Alarm**
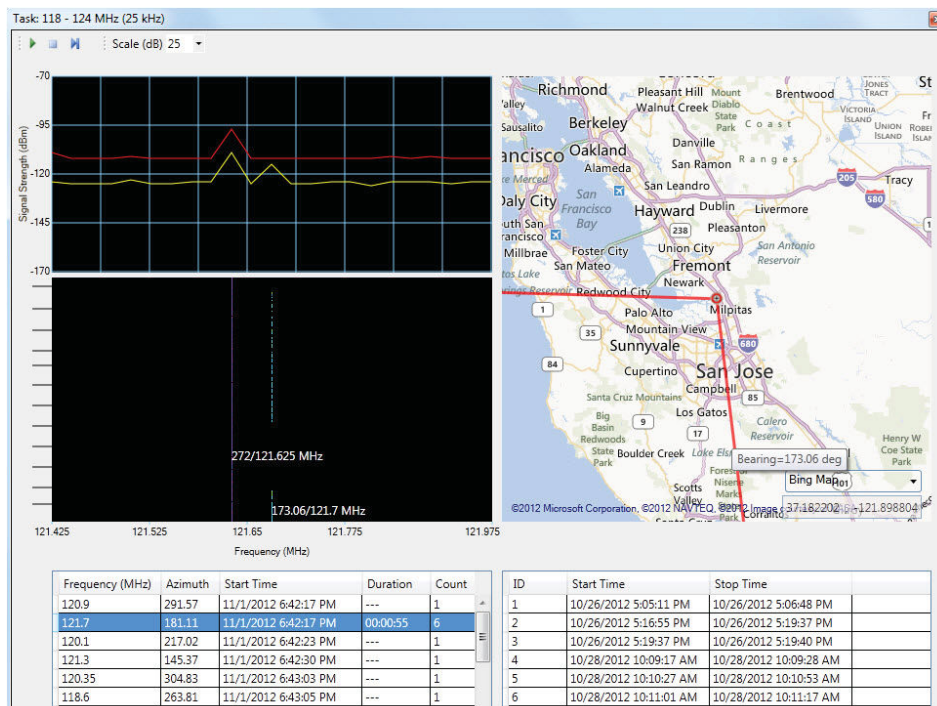
TCI 641 Antenna

This special-purpose receiving antenna is designed specifically to support signal detection and RDF applications. To provide good DF accuracy and sensitivity over a wide frequency range in a compact package, the 641 combines specially designed DF elements into an array that is electronically commutated by solid-state switching circuits for DF measurements.

To enhance accuracy and sensitivity, the DF switch includes built-in calibration circuits and RF preamps. The addition of these active electronics into the antenna array greatly improves DF performance compared to a passive array. The antenna array consists of nine fan dipole elements and one bicone reference antenna.

⌄ **TCI 641 Antenna with radome removed**

⌃ **TCI 641 antenna in radome**

⌃ **Typical customer antenna installation**

Model 739
Specifications

› DF System Specifications	
Measurable minimum signal duration:	1 ms
Channel bandwidths:	Selectable, including 6.25 kHz, 8.33 kHz, 12.5 kHz, 25 kHz, 50 kHz and 100 kHz.
DF accuracy:	1° RMS (in reflection free environment)
Bearing resolution:	0.1°
Instrument accuracy:	0.1° RMS
DF technique	Dual-channel method, multielement, TCI-proprietary Correlative Interferometry DF algorithm
DF receiver	Two-Channel DF Receiver
Modulations mode for DF	All signal modulations
DF measurements:	Line of bearing (single) DF location fix (multiple stations networked together for triangulation)

› GPS Time and Frequency Standard	
GPS receiver type	12 channel L1 with time and location data output
Timing output	1 PPS with ± 0.2 µs accuracy relative to UTC
Position determination	Latitude, longitude and altitude. Error < 10 meters.
Position update rate	Once per second
Frequency standard	10 MHz, low-noise, digitally controlled crystal oscillator, disciplined to GPS
Frequency and time reference	5×10^{-10}

Specialized Expertise in a Global Family

TCI International, Inc., a leading supplier of end-to-end, ITU-compliant RF spectrum monitoring and management products, is a wholly-owned subsidiary of SPX Corporation. Based in Charlotte, North Carolina, SPX Corporation (NYSE: SPXC) is a global, multi-industry manufacturing leader. SPX team members collaborate across business segments and borders to deliver greater efficiencies and better ideas for helping customers succeed.

At TCI, this commitment to innovation supports an array of customers whose missions depend on having a clear picture of their electromagnetic environment. For over 45 years, TCI's technical developments and advanced production capabilities have earned it a reputation for excellence in high-performance communications, spectrum monitoring and signals intelligence systems.

TCI's diverse hardware and software engineering capabilities provide proven solutions for regulatory compliance, monitoring and security, and communications intelligence applications. With advanced spectrum mapping and analytics, data recording and precision geolocation technology, TCI systems provide vital data for government and military agencies in over 100 countries worldwide.

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