



iTrack

QUARTZ CRYSTAL MICROBALANCE

PERSONNEL TRACKING AND ROBOTIC NAVIGATION



iTrack's multi-channel Quartz Crystal Microbalance (QCM) portable acquisition instrument can be used to add low-cost bio-chem detection to robotic vehicles or first-responders. The device can also be used to monitor the air quality or water contamination in the field in less than

Features:

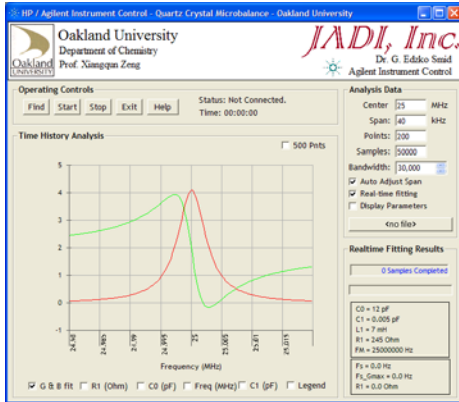
- ◆ Complete stand-alone position tracking system without the need for GPS input.
- ◆ Full self-configuration in less than 5 seconds
- ◆ Infinite scalability
- ◆ Positioning off other moving targets
- ◆ 2D and 3D tracking capability
- ◆ Minimum of 2 beacons in range for 2D tracking
- ◆ Easy-to-use graphical user interface
- ◆ Personnel tracking and autonomous robotic navigation with one single system
- ◆ Can augment existing positioning systems. E.g. which use GPS or Laser.

QUARTZ CRYSTAL

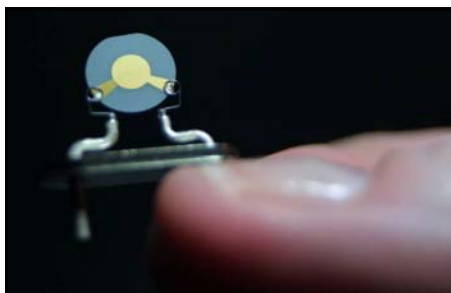
MICROBALANCE (QCM) is a piezoelectric device capable of very sensitive mass measurement with several nanograms accuracy. The quartz crystal oscillates in a mechanically resonant shear mode by application of an alternating, high frequency electric field using electrodes, which are usually deposited, on both sides of the disk. The mass sensitivity arises from a dependence of the oscillation frequency on the total mass of the crystal, its electrode and contacting materials on its surfaces. Specific coatings applied to the surface of the crystal allow only specific chemicals or analytes to bond, and cause a detectable mass change. Chemical sensors typically utilize an AT-cut quartz crystal of 9 MHz fundamental frequency which is easy to handle; thereby, a 1 nanogram adhesion of material on the crystal can be directly detected as

a 1 Hz decrease in oscillation frequency.

The QCM area of application in chemistry is very wide. For example, toxic gas sensing in chemical plants and the detection of specific biomolecules by antigen/antibody interaction on the modified metal surfaces are current popular applications using QCM sensors. The QCM measurement technique involves an electronic oscillator circuit, a frequency measurement acquisition and the calculation of the relationship between the frequency behavior and the analyte mass deposition, using the inverse equivalent impedance model of the crystal. This technique is widely practiced and knows numerous implementations depending on the application and equipment cost. The measurement should compensate for temperature variations, and the drift over time of the crystal sensor.



The implementation of the sensor and the measurement device on a portable modular interface provides the opportunity for easy configuration as an add-on item of a mission package for soldiers, first-aid responders, tactical vehicles and autonomous robotic vehicles. The addition of wireless connectivity through narrow-band or Ultra-Wide Band (UWB) RF allows for the device to be carried or positioned in various types of hazardous environments and dangerous road side vehicle checkpoints. This gives the operator the ability to monitor the presence of targeted chemical and biological agents at multiple locations simultaneously from a safe command and control center. This UWB/RF technology will be utilized for the accurate navigation and guidance of robotic vehicles equipped with chemical/biological detection sensors.



Specifications:

◆ Robotic Module weight	1.5 lbs
◆ Personnel Tracking Module weight	0.25 lbs (ex. Battery)
◆ Beacon weight	5 lbs
◆ Power consumption	1 W
◆ Robotic Module size	5" x 5" x 2.5"
◆ Personnel Tracking size	2.25" x 3.75" x 0.5"
◆ Beacon size	7.25" x 4.75" x 2.25"
◆ Update rate	20 Hz
◆ Horizontal accuracy	± 4"
◆ Vertical accuracy	± 1'
◆ Directional accuracy	± 5 deg
◆ Frequency of Operation	6.1—6.6 GHz
◆ Temperature range	-40—70 °C
◆ Operator Interface	Windows XP or Vista

Benefits:

- ◆ Ability to track first responders in a hostile environment without the need for existing infra-structure or elaborate system setup.
- ◆ Replacement of personnel by autonomous robotic systems for certain tasks that are mundane and repetitive, or that are hazardous.
- ◆ Semi-autonomous operation for tele-operated robots. For example: 1) autonomously bringing a robot to and from a stand-off vehicle checkpoint; 2) autonomously tracking a manually driven trajectory back to the operator location.
- ◆ Situational awareness within the commanding vehicles. I.e. the crew of a Striker vehicle can track precise relative location of dismounted warriors and autonomous robots to the vehicle.

iTrack, LLC

2200 North Squirrel Road
Rochester, MI 48309

<http://www.itrack-llc.com>

Contact: Jerry Atkinson
Phone: 248-648-4777
Fax: 248-648-4799
jerry.atkinson@itrack-llc.com