

tracense

nano-enhanced threat detection

“Vapor trace detection with large arrays of silicon nano-sensors”



Dr. Ricardo Osiroff, CEO
November 4, 2014

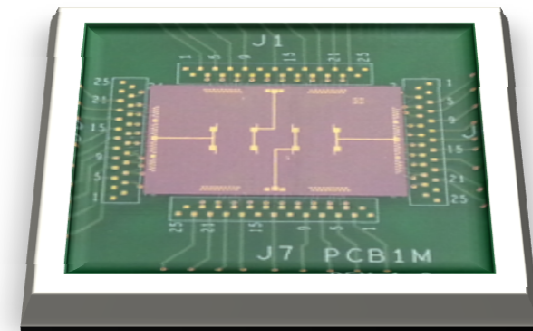


Tracense develops an extremely sensitive & generic sensing platform based on large arrays of silicon nano-wire sensors on a chip for the screening of multiple threats - such as explosives - in cargo, luggage and persons.

Taking advantage of the high sensitivity, we are able to detect the presence of explosives vapors from a small sample of air.

Security authorities shall benefit from:

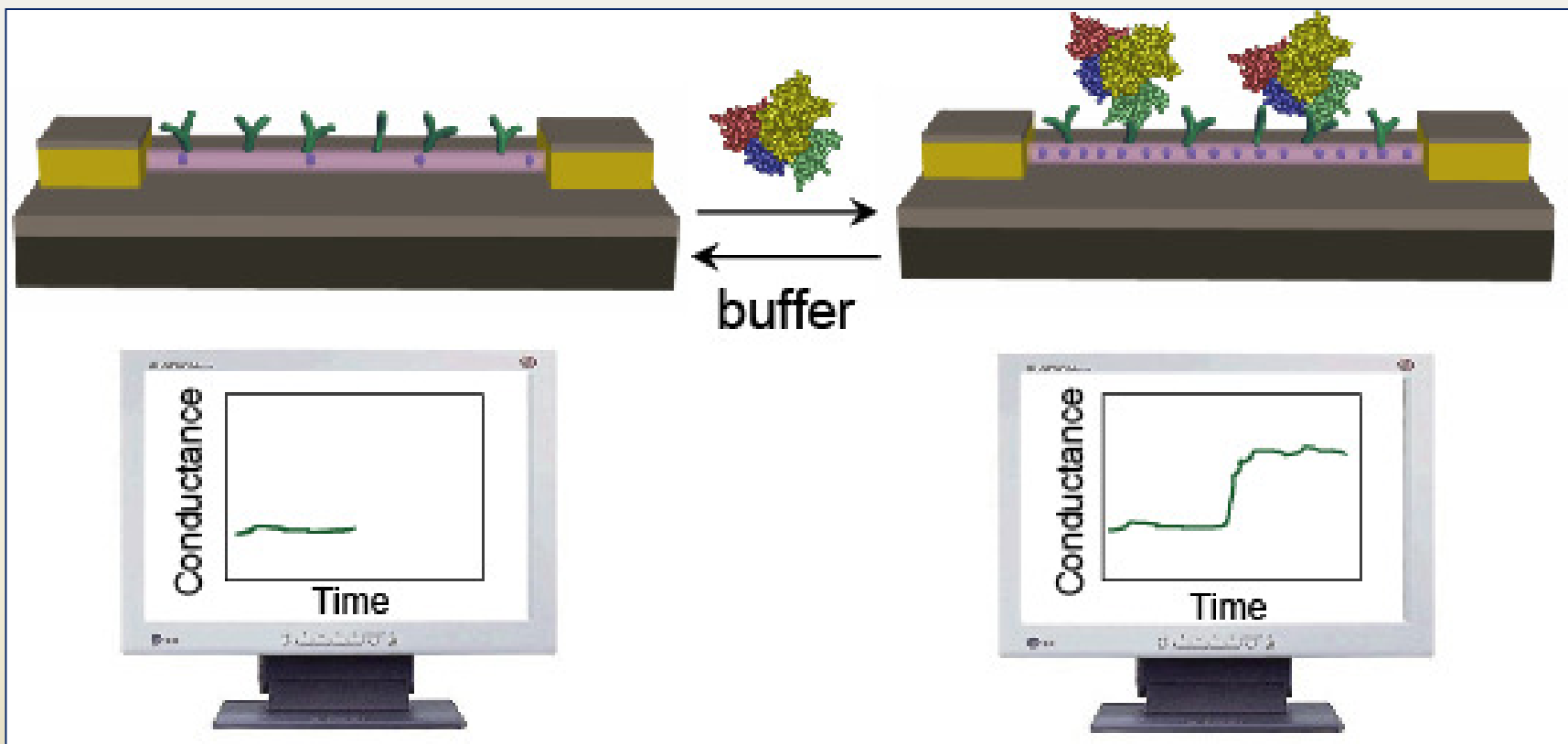
- Ultra high sensitivity
- Versatility: vapor, liquid, particles samples
- High throughput
- Specificity based on pattern recognition
- High reliability based on a redundant array of sensors
- Spiral and fast upgrade of “library” of targets via SW download
- Safe: no radioactive source, no high-V source , no lasers
- Portable, battery operated
- Low cost - system & operation (consumables, short training, high uptime)



Status: operating prototypes, extensive laboratory validation, initial field tests in collaboration with Israeli national security agencies.

Basic Technology

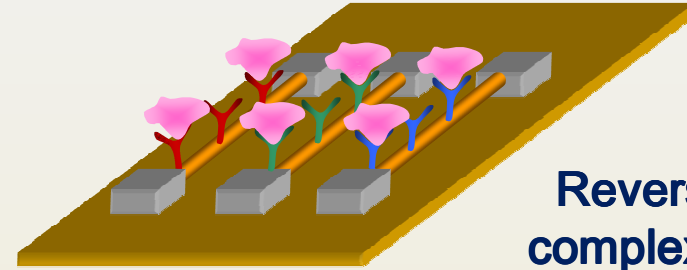
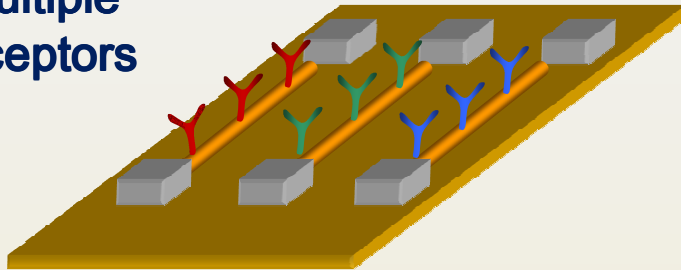
How does a FET “nano-sensor” work?



Generic sensing platform , adaptive to a wide range of chem/bio threats.

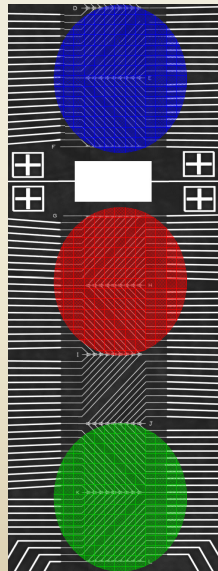
Pattern Generation

Multiple
receptors

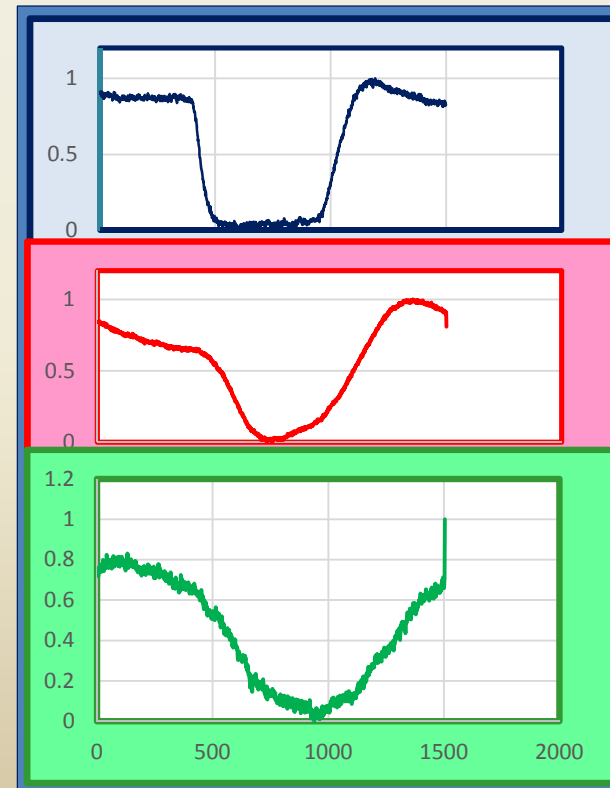


Reversible
complexation

Hundreds
of nano-
sensors in
one array

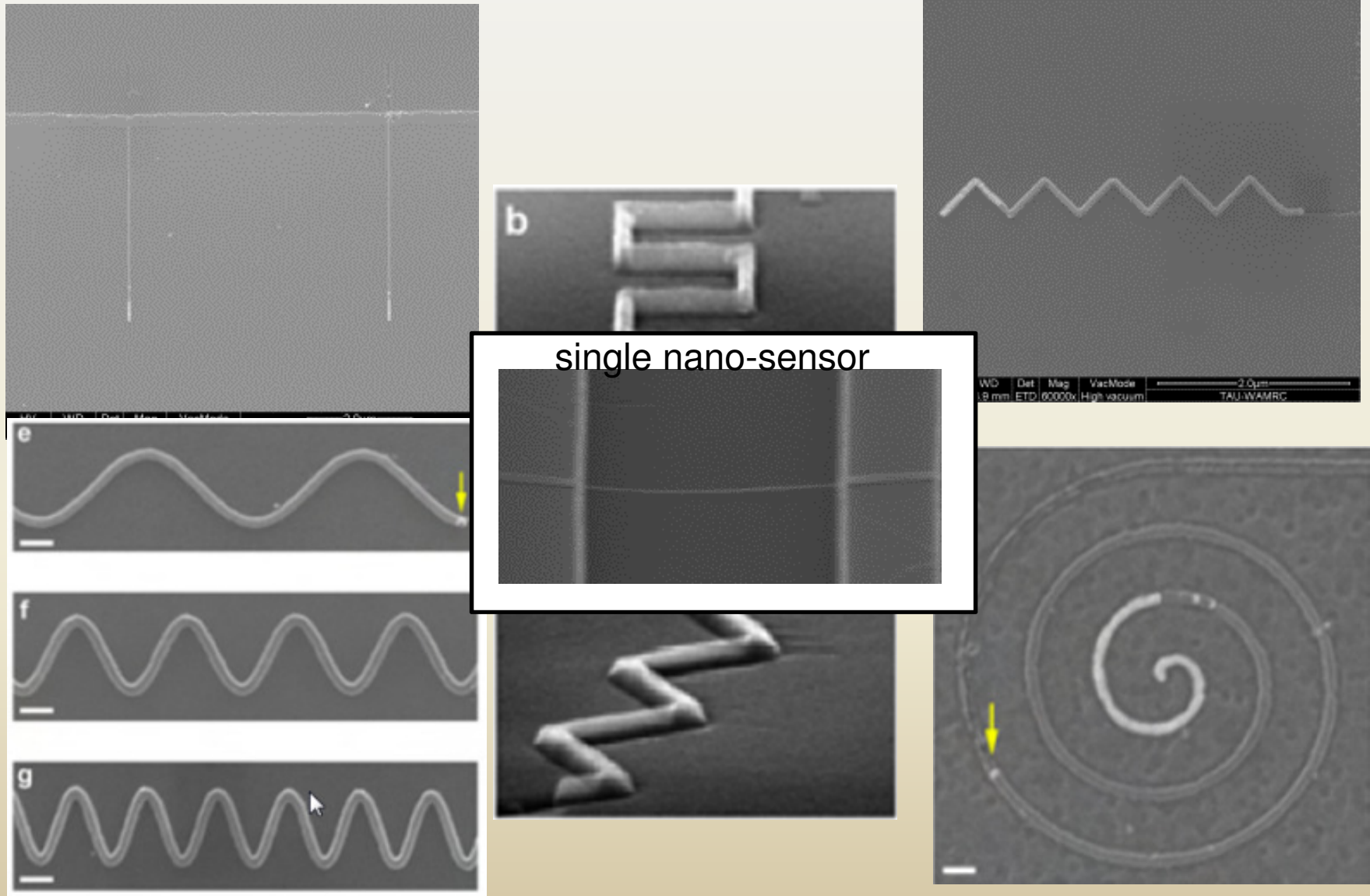


Results

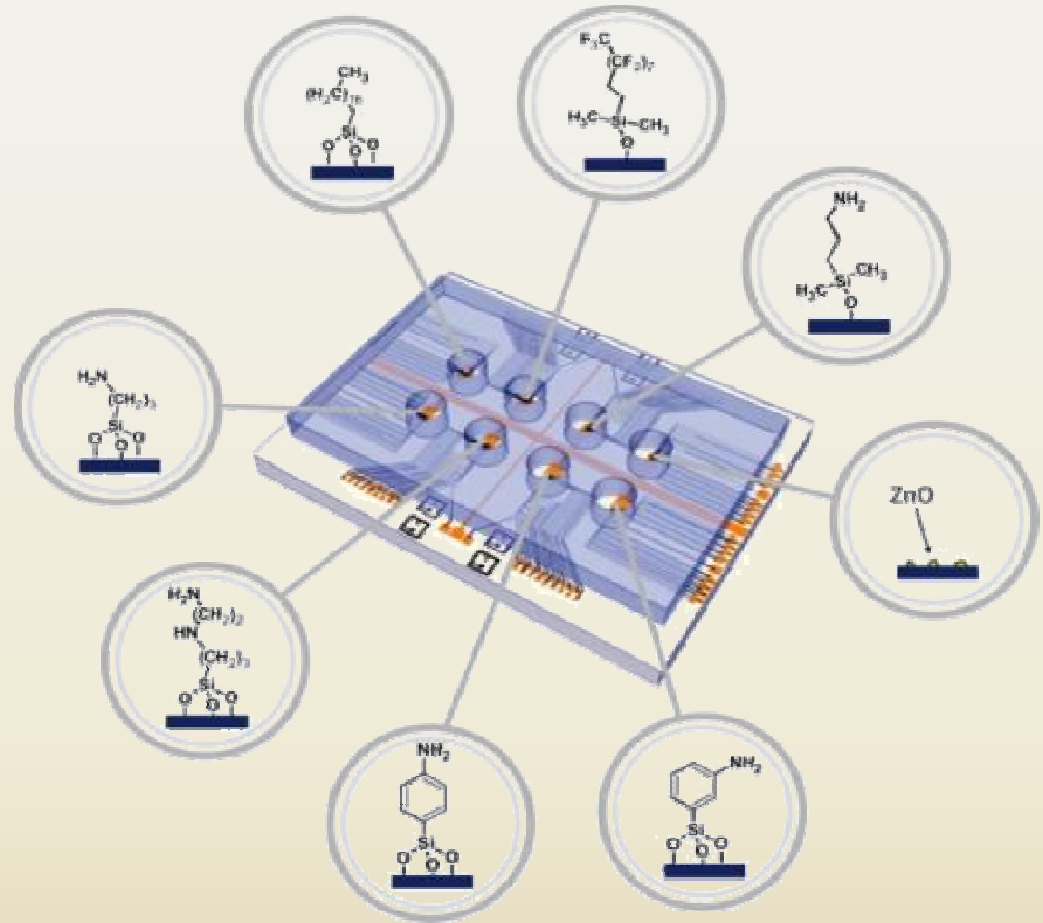
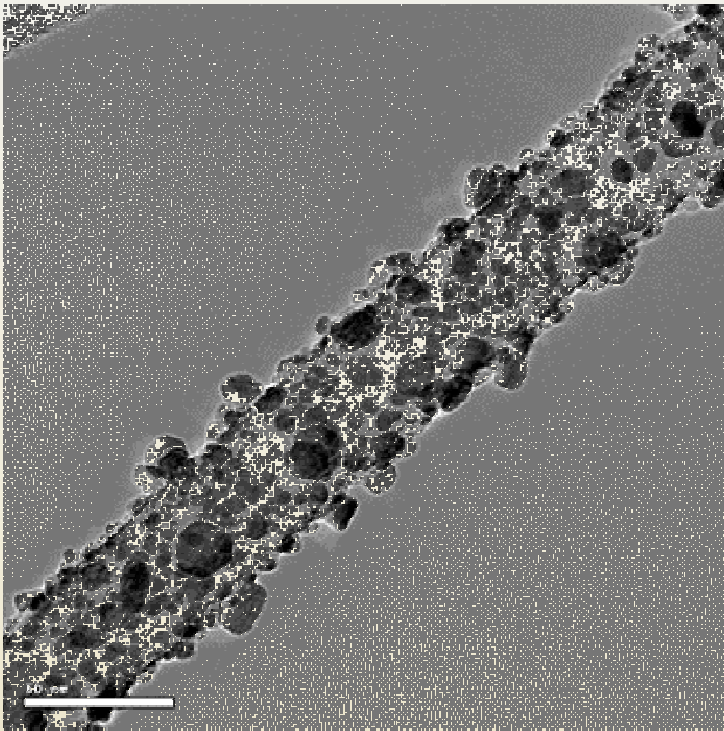


Multiple
reactions
create a
unique
pattern

In-Plane Nanowire Growth

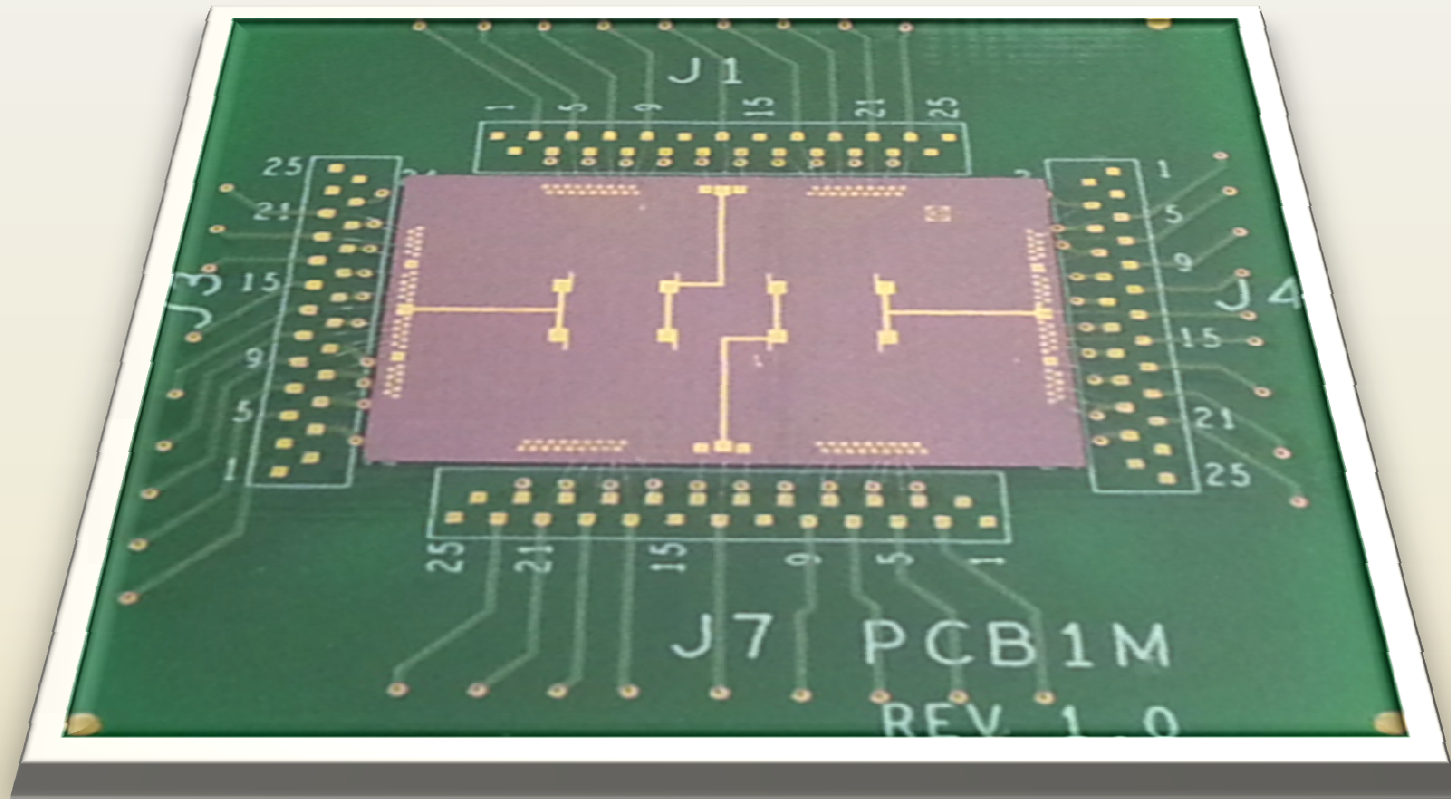


Multiple Receptors



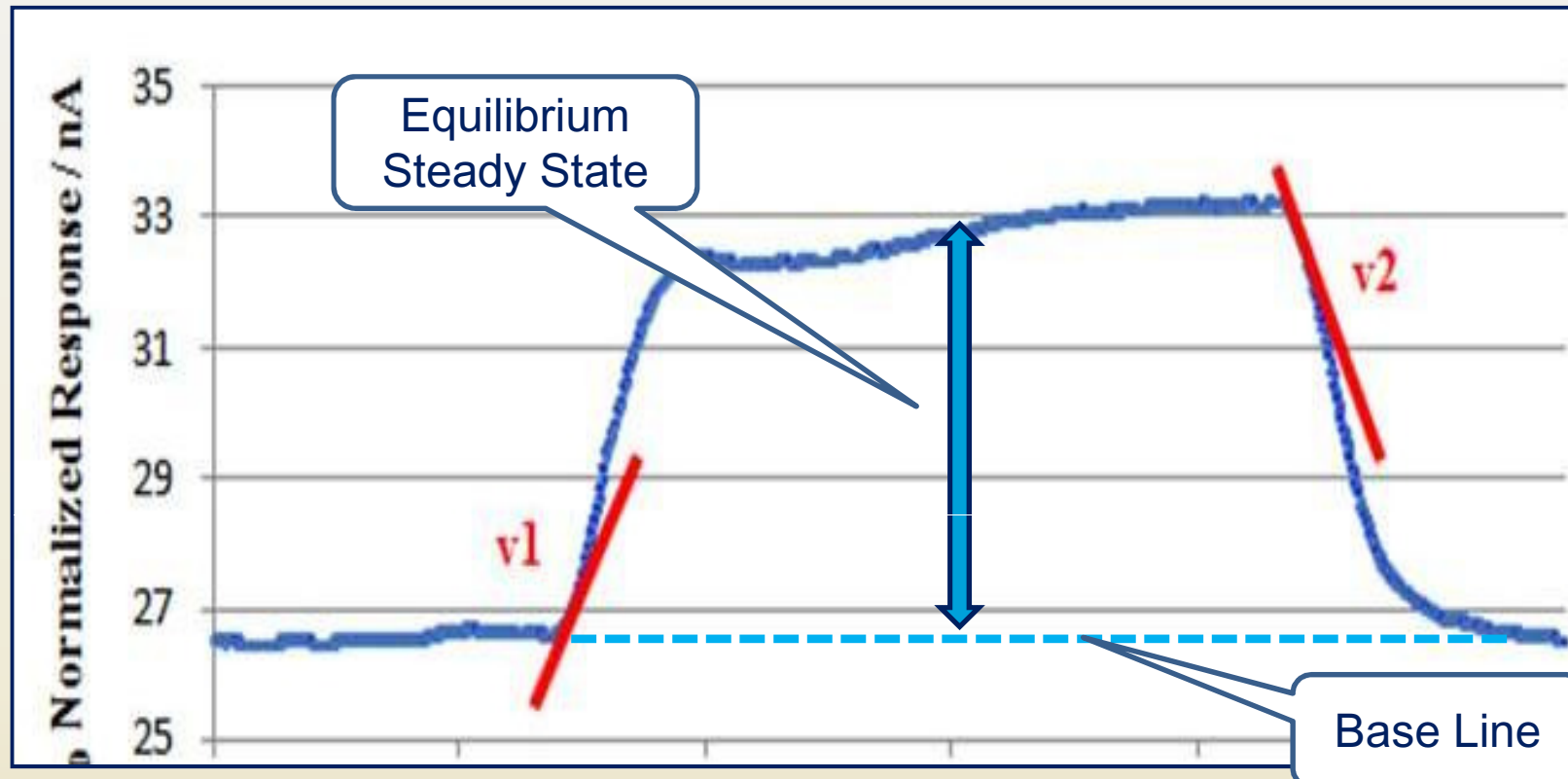
Match & optimize receptor set to application

Multiplex Chip



Multiple simultaneous reactions on a chip

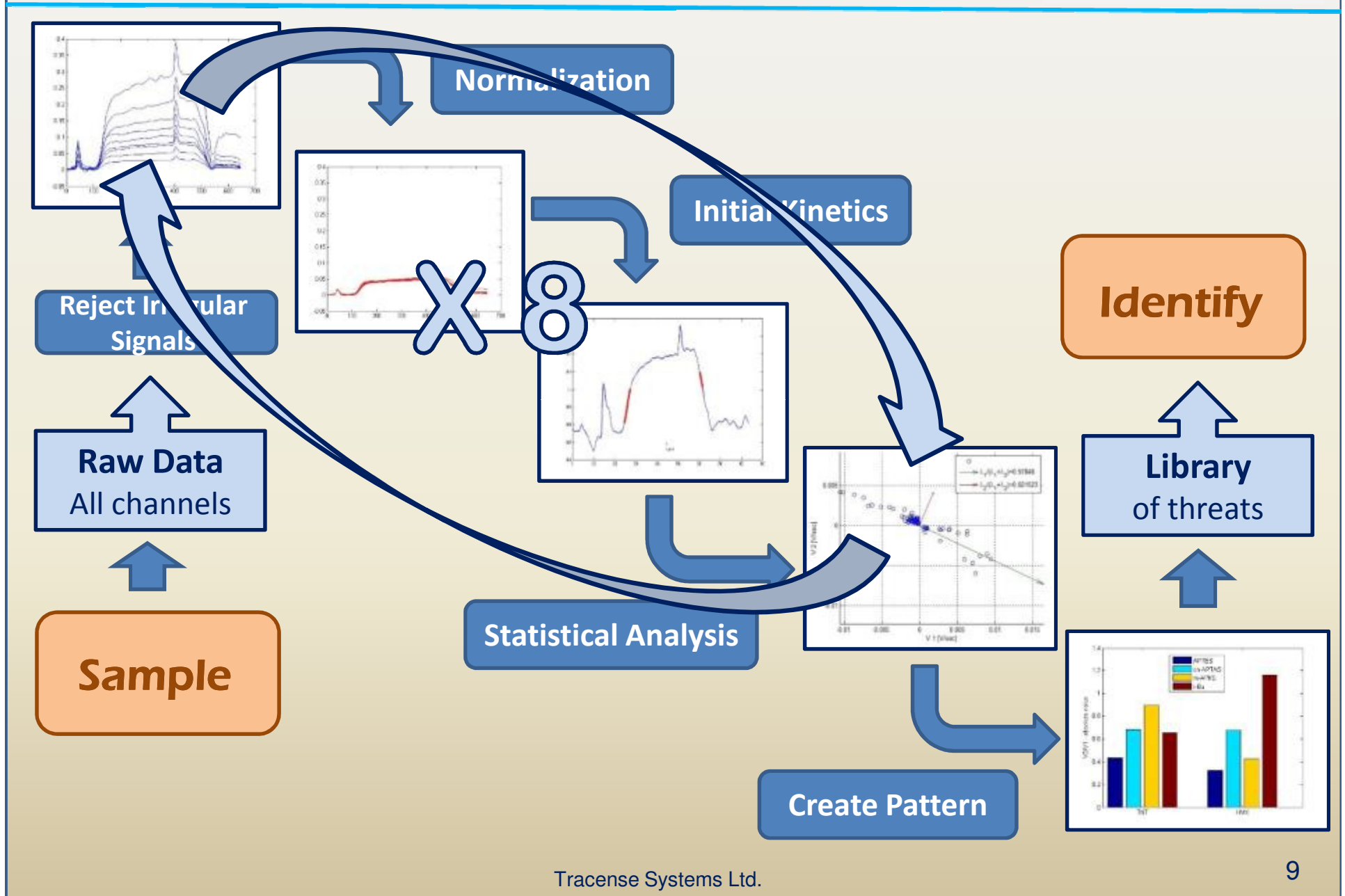
ID Principles



Onset Kinetic Ratio Independent of Concentration

**Complimentary identification methods:
thermodynamics & kinetics**

5-Tier ID Algorithm

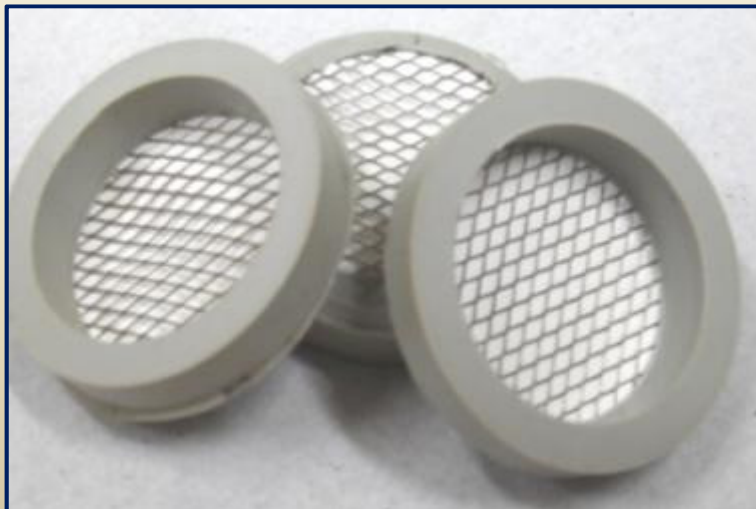


Vapor Collection

Collection of calibrated volume

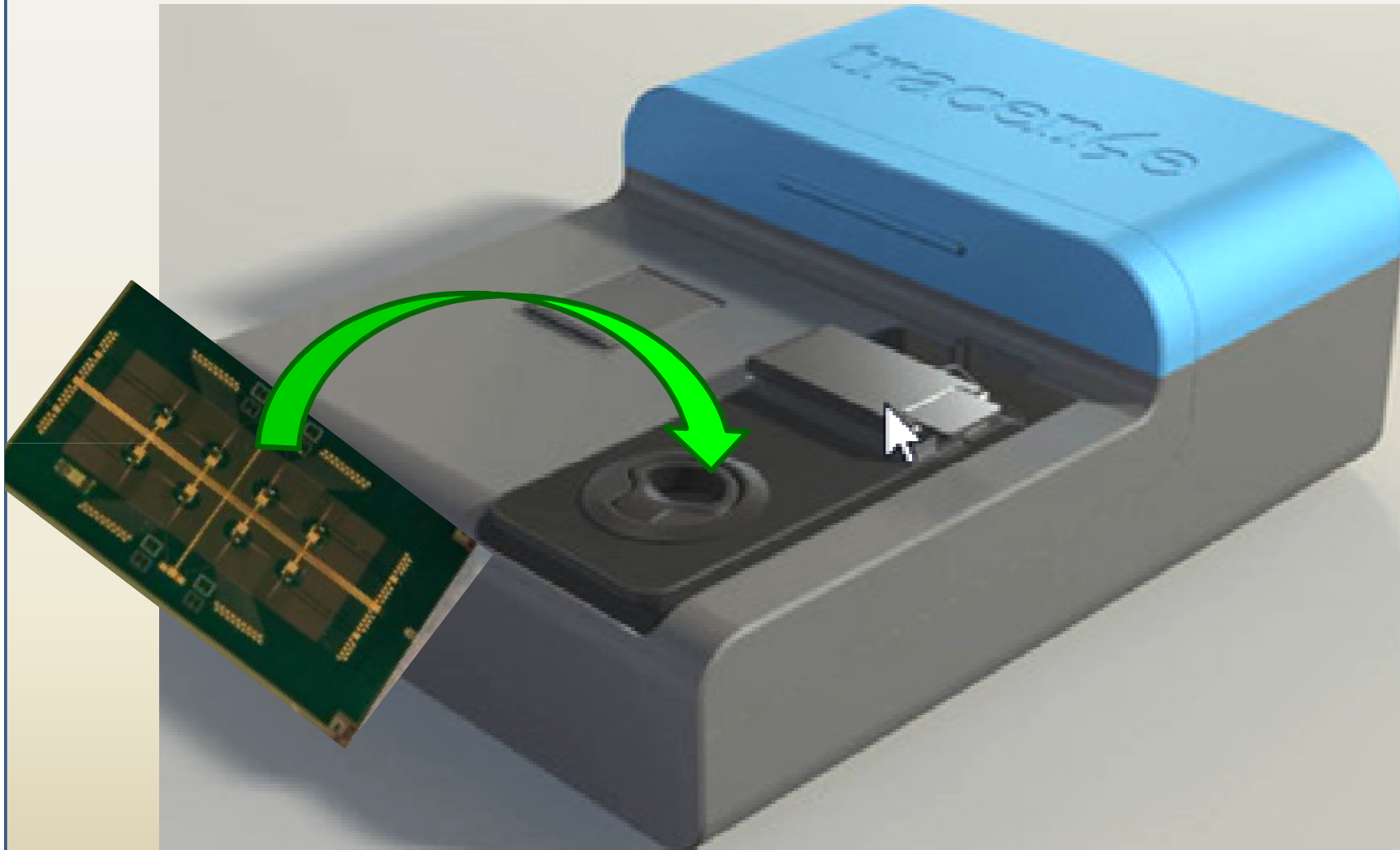


Collection of larger volumes



Explosives Detector

tracense
nano-enhanced threat detection



All samples are measured in liquid solution

Experimental Results

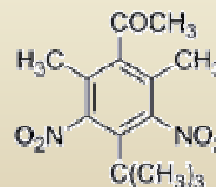
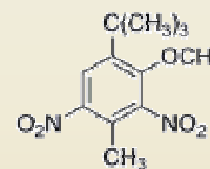
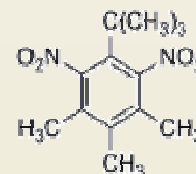
Tested Explosives

- TNT
- RDX
- HMX
- PETN
- DNT
- NG
- Tetryl
- TATP
- HMTD
- AN

Tested Interferents

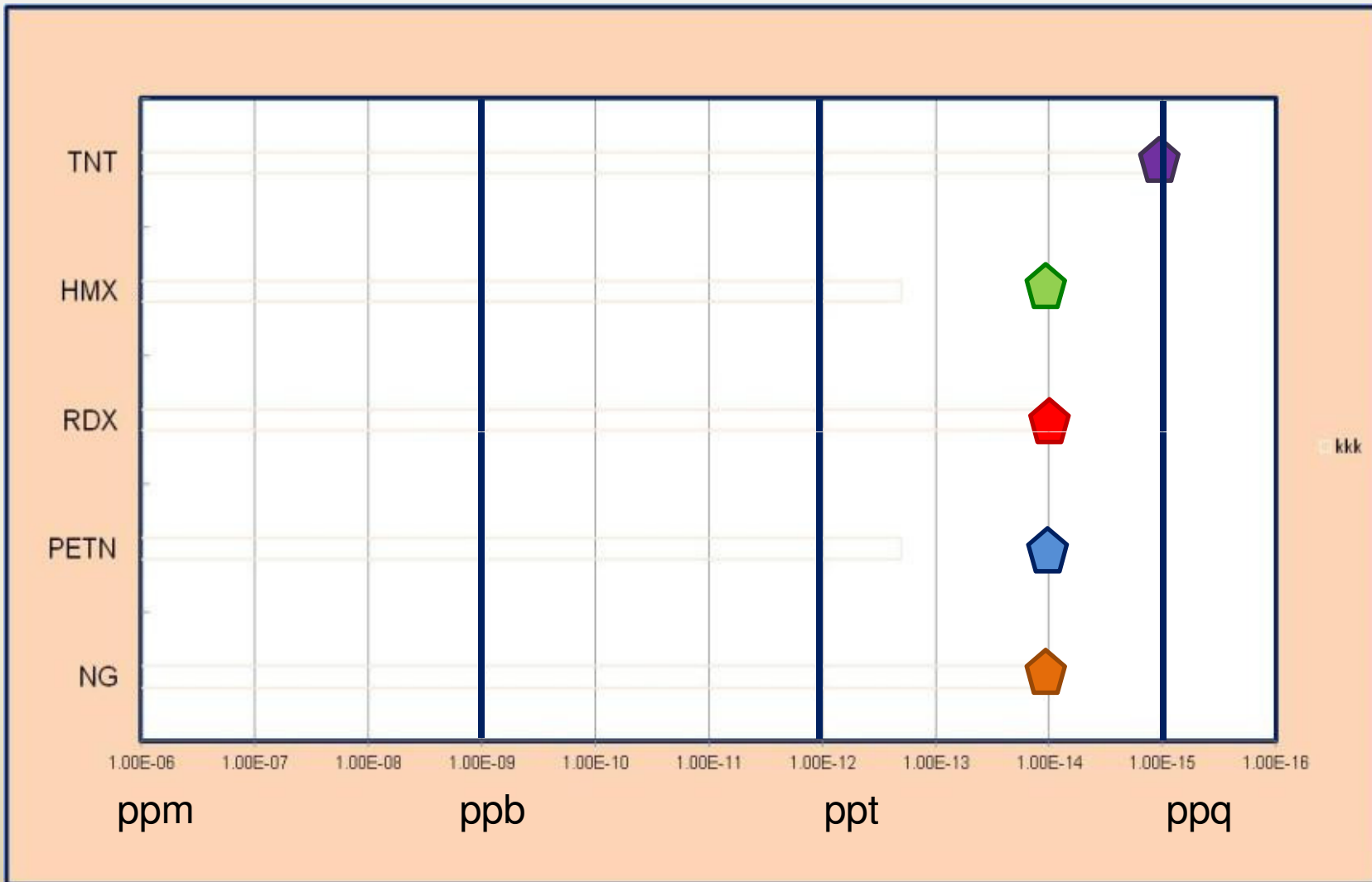
- 2,4 DNP
- p-nitrophenol
- Aniline
-
-

Musk matl's in cosmetics
and fragrances



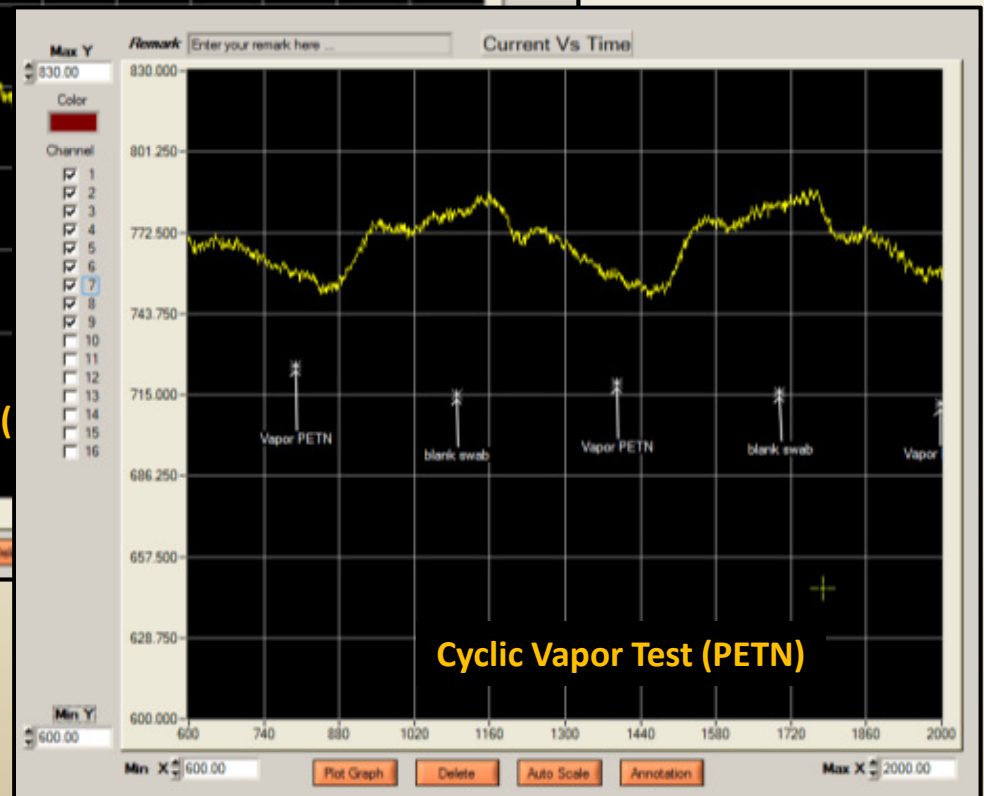
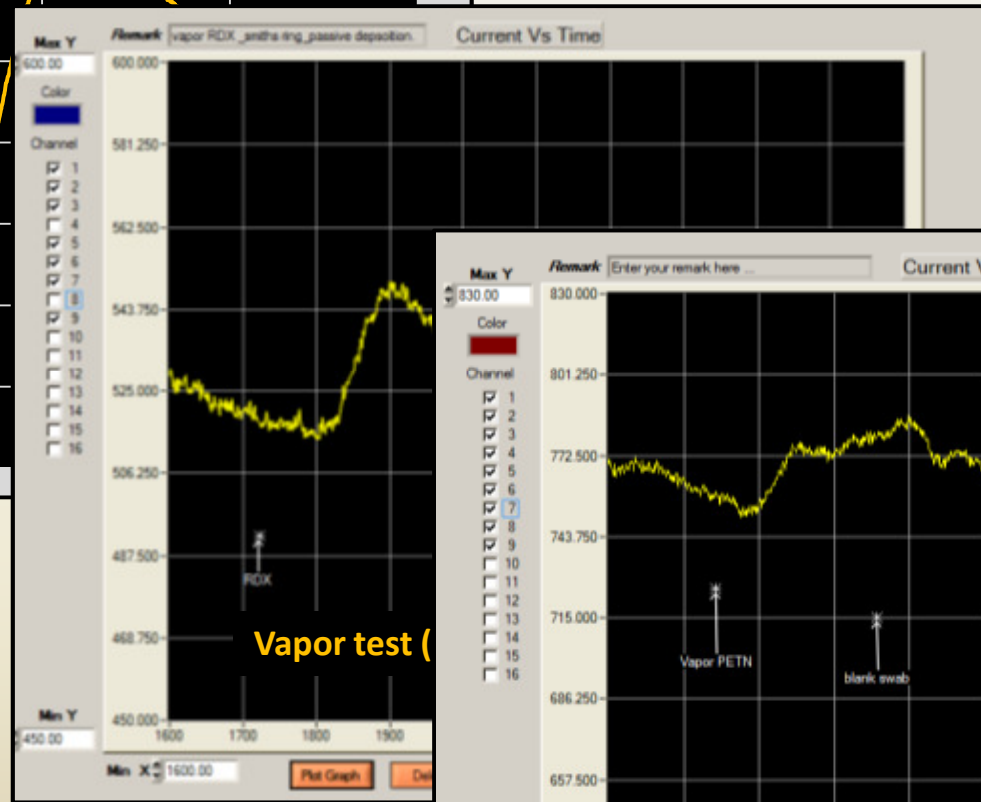
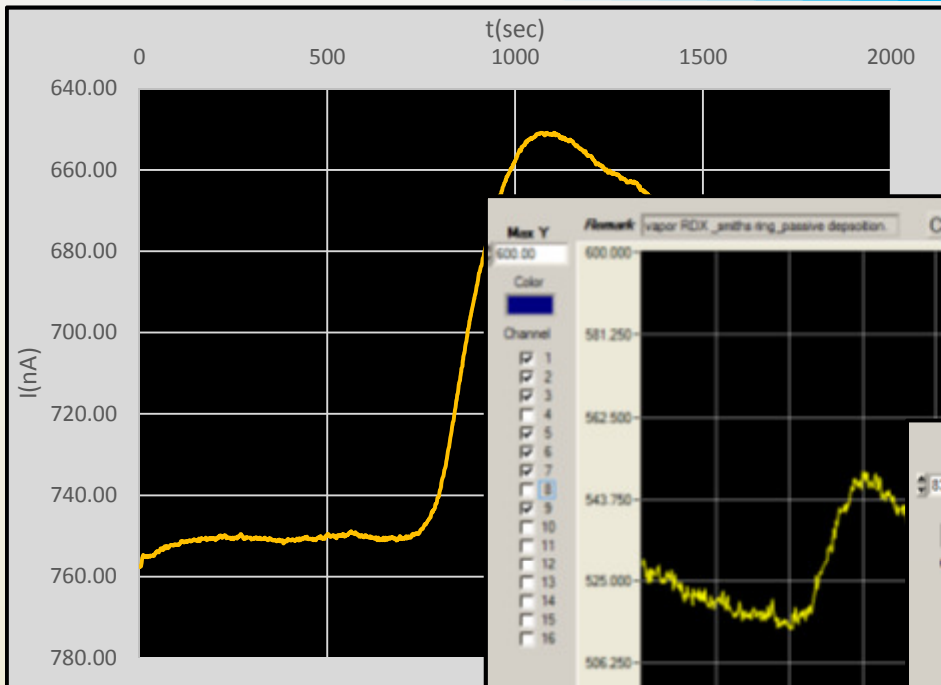
Samples: vapor, particles & solutions: 1 ng/ml (1ppb) to 1 fg/ml (1ppq)

Sensitivity Limits

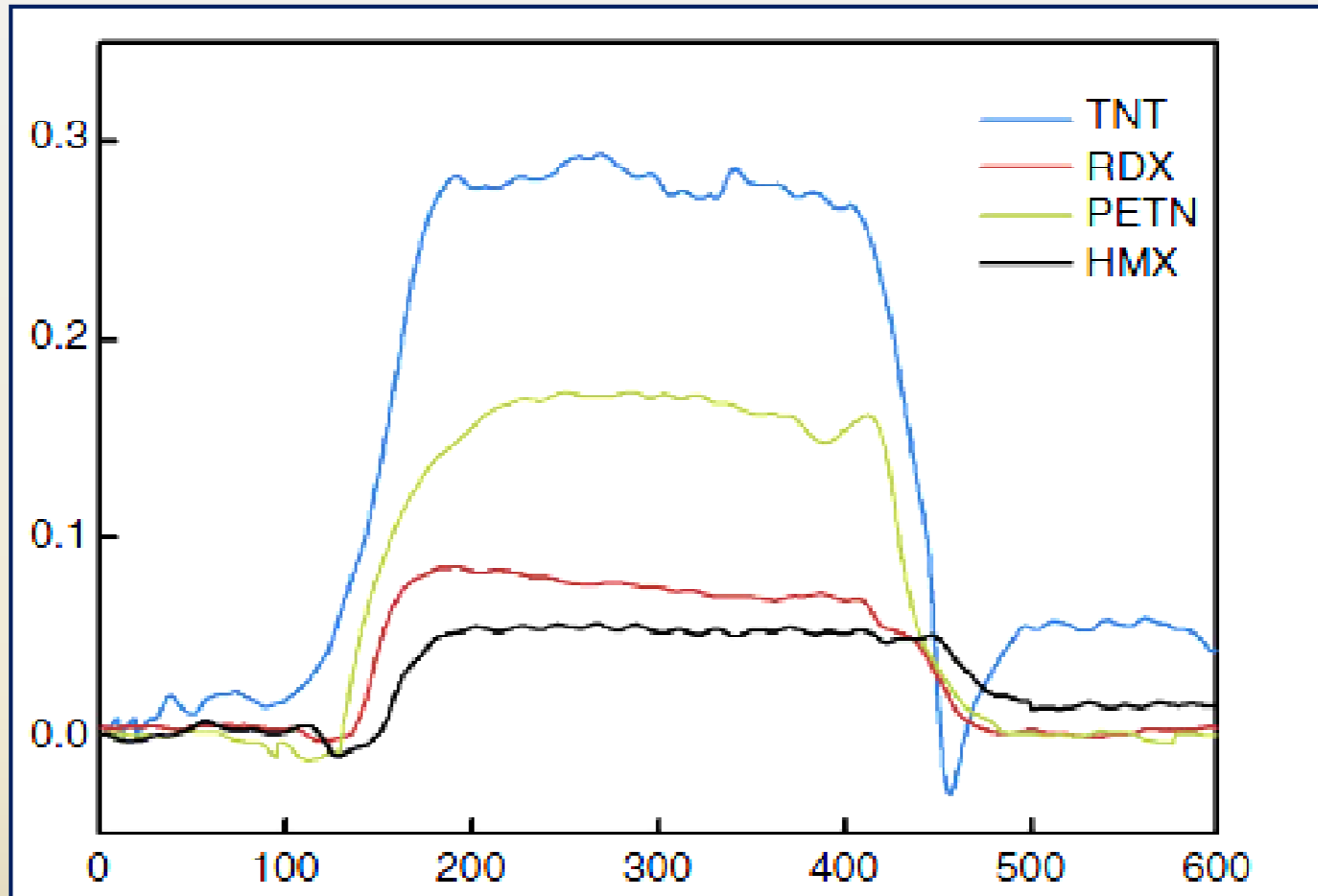


Measured from standard solutions: 1ppb = 1 ng/ml, 1 ppq = 1 fg/ml

Vapor – Head Space

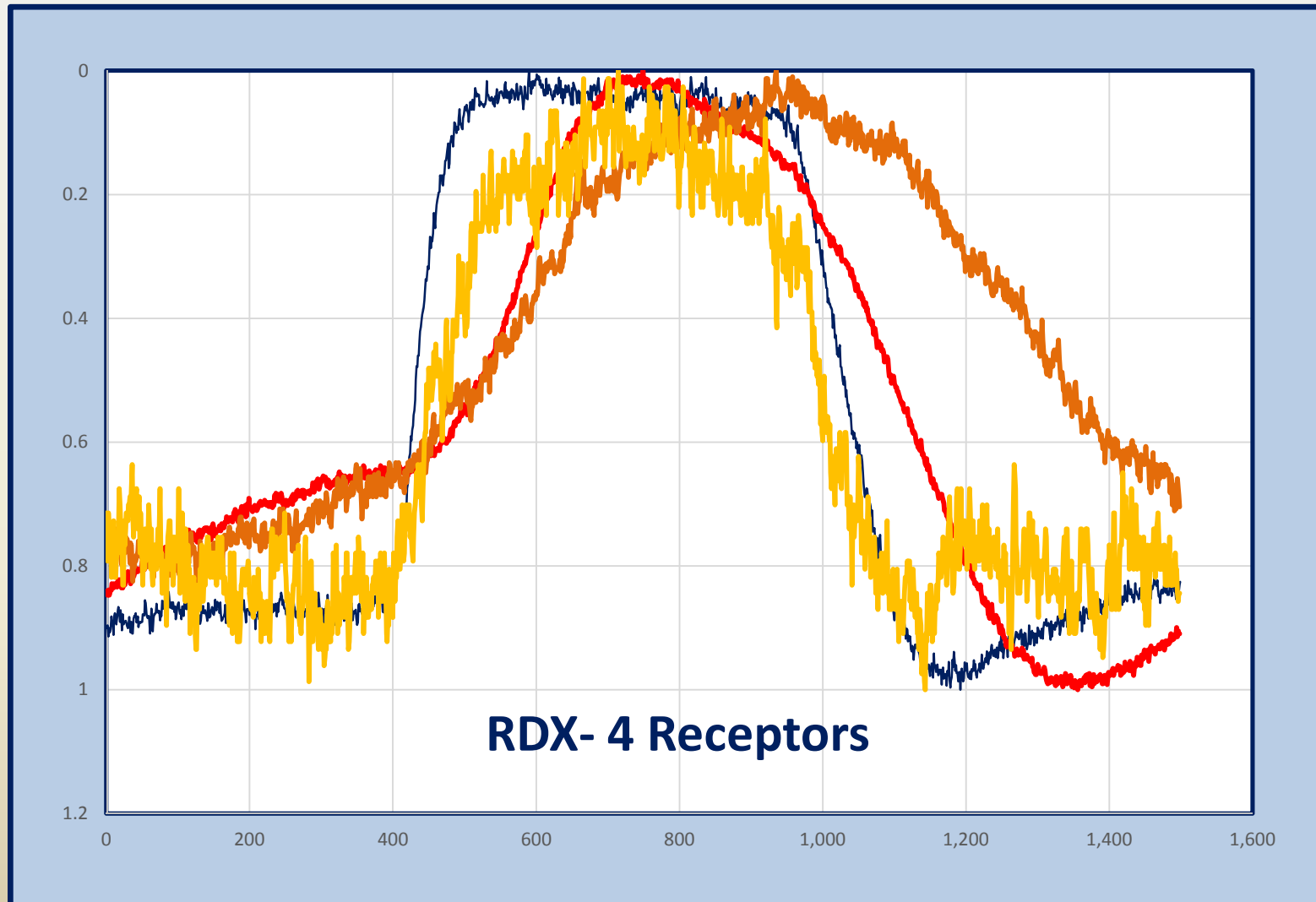


4 Explosives - 1 Receptor

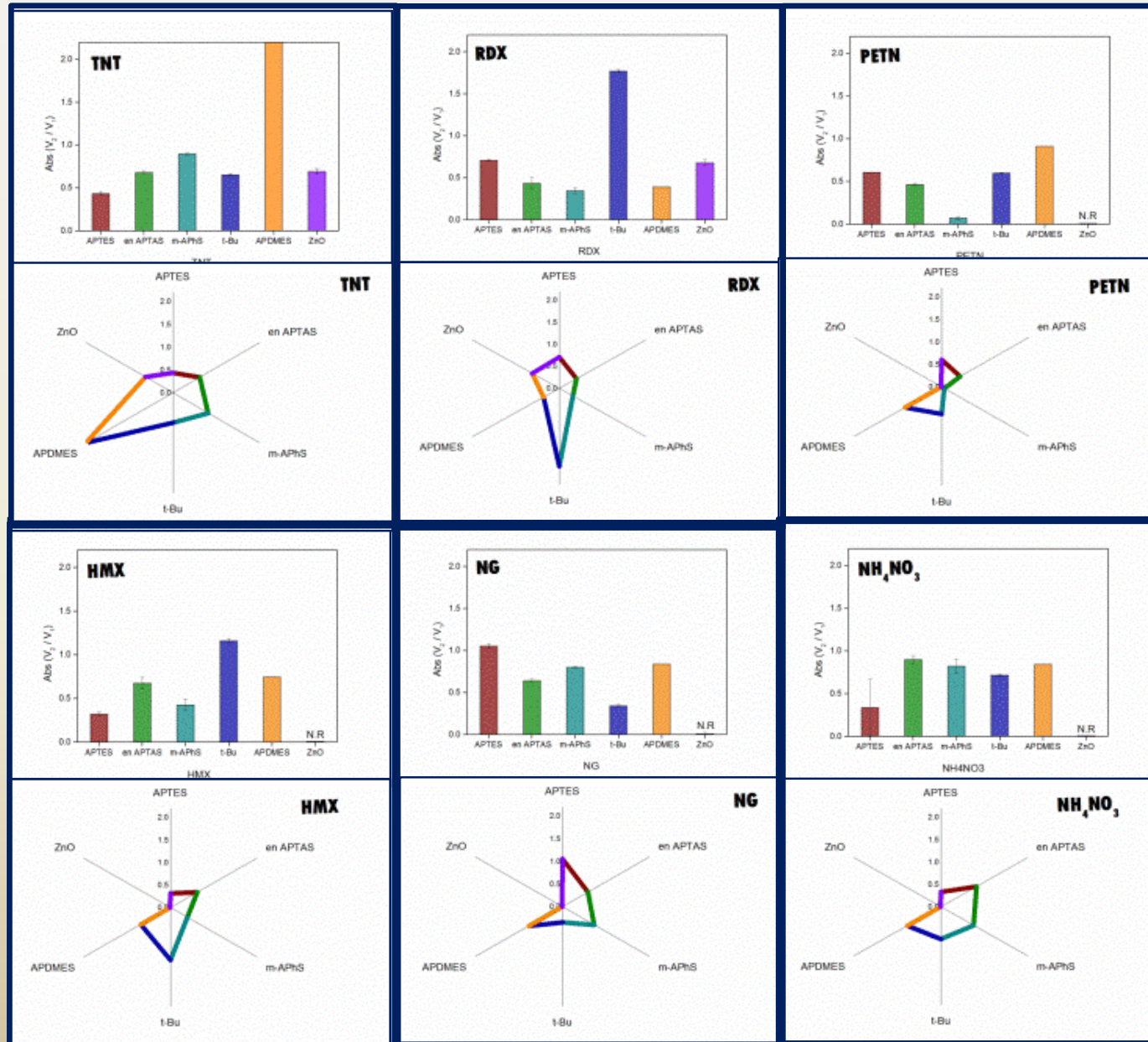


Calibrated responses of a modified nano-device to 4 different explosives at 10 ppt concentration

1 Explosive - 4 Receptors



Pattern Library



Preliminary Field Test

We received close to 70 samples collected in different sites by the IPMO. They included a variety of merchandise, regular baggage and objects contaminated by the IPMO using a variety of explosive materials.

The samples were collected via:

- (1) swiping with our filters
- (2) vapor collection.

After reviewing the results with the IPMO, we reached these conclusions:

- There were no false positive alarms. All non-contaminated samples showed no alarm of explosives.
- 14 out of 15 contaminated objects were detected*
Note: we learned later that the missed object was a commercial box of medical drugs contaminated intentionally with 1 ng of AN.
- Detection via swipe and air collection were equally successful.

Next Steps

- Install calibrated air/explosive vapor mixtures generator and determine the actual limits of effective vapor sampling (volume/conc.) in simulated and “dirty” environments
- Expand library of threats
- Automate, optimize and accelerate* data analysis
- Extensive field testing and validation in realistic environments with existing and new prototypes
- Industrialize all manufacturing methods
- Design, build and test first commercial systems (α)
- Submit α to IPMO for independent qualification
- Submit α to TSL/TSIF for US qualification



Questions?



Thank You!

Ricardo Osiroff, CEO

ricardo@tracense.com

+972-525390424

www.tracense.com