

Paul D Turner, TSS TSI



The Kestrel TSCM<sup>®</sup> Professional Software is developed as a TSCM specific, operator centric application and our business model focuses on dispelling the misleading, often by design sales tactics by a number of test and measurement equipment manufacturers within the TSCM industry.

One of the most common sales tactics involves exceptional Probability of Intercept (POI) claims made using theoretical and IF BW windowing as a basis for published POI calculations. There is little dispute when the technical operator is working within a narrow Range of Interest (ROI) or focusing on a particular narrow real-time IFBW mode, however this an exception in TSCM work.

The problem is that many sales people quote the hardware IF calculated POI, as the definitive POI, for TSCM purposes.

As noted in the October 2019 newsletter.

*“The technical operator who understands the basic workings of a fiber-optic network will clearly see a tremendous advantage over competitive interests. Technical operators are encouraged to download and review the October issue of the TSCM | SIGINT newsletter to learn more about the Photonic capability within the Kestrel TSCM<sup>®</sup> Professional Software”.*

Once again I have had a spirited discussion with a potential customer looking to purchase the so-called best SDR hardware on the market for TSCM and he quickly explained his choice in hardware under consideration.

He had approached various vendors and manufacturer representatives and asked them about their products POI and in all cases was provided with exceptional specifications or simply that the particular product had a 100% POI with no technical explanation given.

His mission at this point was to confirm whether or not our software supported his hardware choice.

I proceeded to ask about his choice in hardware to better understand his rationale.

It was explained to me that it had the best POI numbers as indicated by the sales representative. Having now fully peaked by professional curiosity, I asked him if he had told the sales representative that the application was TSCM.

He indicated that he had a lengthy discussion about the hardware suitability for TSCM and the sales representative told him the hardware was widely used for TSCM because of the excellent POI specifications.

This is the point that the discussion took on a different tone. I asked him to drop by the RDTC lab in Alberta and bring his demo hardware to confirm his POI expectations and to demonstrate a number of other hardware options.

A few days later, I had the opportunity to demonstrate the misleading POI claims and set the record straight as to why the POI numbers were nothing more than a misleading sales tactic in this instance.

### Real-World POI Considerations

First, lets consider for a moment that the technical operator positively knew the frequency of the Signal of Interest (SOI) (not likely in the real-world) and was able to set a narrow search range centered on the SOI within the real-time IF BW.

This might actually result in a 100% POI. The problem is that in TSCM and SIGINT applications we have no idea where in the ambient RF spectrum the so-called SOI is located or when it might make an appearance.

We have no idea as to the signal type, amplitude, or other characteristics. This is where the POI specifications issue becomes suspect. First, we are not generally operating in the IFBW mode when we need to sweep 18 GHz, 20 GHz, or another wide ROI up to say 50 GHz of spectrum bandwidth.

There are a number of important factors to consider aside from the ROI, such as the Resolution Bandwidth (RBW), and also the search speed capability of the receiver.

If you are sweeping 18 GHz and this takes 6.3 seconds to sweep, the receiver will generally be sweeping someplace else in the spectrum when an extremely short duration (uSec) signal event occurs in the spectrum.

# Kestrel TSCM<sup>®</sup> Professional Software

## TSCM Probability of Intercept (POI)

### Real-World Deployment Testing Protocol

Professional Development TSCM Group Inc.

Technical Security Branch (TSB)

In many cases the odds of actually hitting the signal event, even periodically are similar to winning a lottery!

The Kestrel TSCM<sup>®</sup> Professional Software has implemented a real-time POI calculator that calculates the actual POI by taking into account the ROI, RBW, SWEEP SPEED, DSP TIME and other factors affecting runtime.

The runtime POI value will be a shock to many technical operators who have been misled as to the POI specification values, relative to typical deployment conditions.

#### Quick POI Test Protocol

The following test protocol will not provide a total picture as it fails to account for a number of factors noted above, however, it will provide a means to confirm that the POI values provided by the manufacturer of any particular product are simply not achievable under real-world runtime sweep mode deployment.

To initiate this test process you will require a Vector Signal Generator (VSG), such as the Signal Hound VSG25A or the VSG60A and a search receiver (radio) as the Device Under Test (DUT).

Once the search receiver is configured and running in a typical operational mode consistent with TSCM deployment, a periodic burst signal can be enabled with a variety of values to confirm the result across various types of signals.

The PERIOD is the actual time it takes for a Signal of Interest (SOI) event to complete its ON and OFF cycle. The PULSE WIDTH is the total PERIOD of the SOI and is often referred to as duty cycle. For example, if the specification states that 100% POI requires a signal of 25 uSec, be sporting and set the VSG for 25 mSec (1000 x longer duration) and confirm that the spectrum and waterfall displays every pulse produced. Just for the record, it generally will not!

Now that you have a test process, you can change the value of the WIDTH and PERIOD accordingly to determine the actual POI value for the deployment parameters.

As an experienced technical operator, I have tested many manufacturers products and frankly, unless the hardware is being deployed for signal level analytics, the published specifications relating to POI are meaningless from a TSCM perspective.

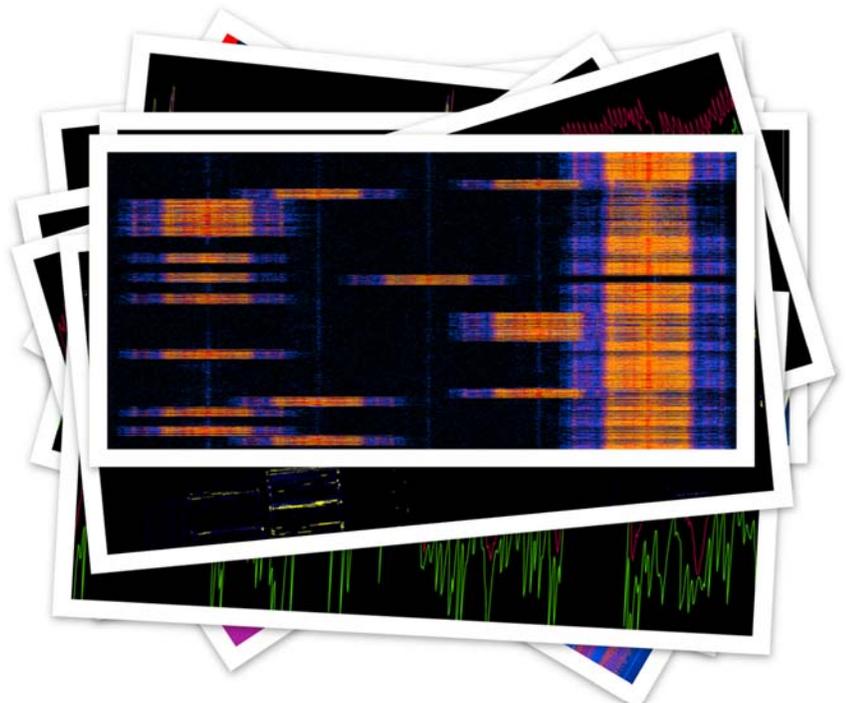
If the threat level encountered is satisfied with a longer signal event requirement to achieve a given POI, this will be an informed trade-off or limitation and it is only a problem if the operator believes that they are getting the published POI during real-world deployment.

#### Improve Probability of Intercept (POI)

To increase the POI the technical operator can narrow the search ROI, divide the spectrum across multiple radios, adjust the RBW, lower the apparent noise floor, increase the apparent sweep speed, increase the runtime collection time, to improve the ability to capture more burst events.

**Innovation is Simply the Beginning!**

| [www.pdtg.ca](http://www.pdtg.ca) | [www.kestreltscm.com](http://www.kestreltscm.com) | [pdtturner@pdtg.ca](mailto:pdtturner@pdtg.ca) |



*Kestrel TSCM<sup>®</sup> Professional Software is innovative industry leading, disruptive technology, sold in 44 countries worldwide.*