



Testing Radar Transmitter Amplitude and Timing Stability



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Anticipate — Accelerate — Achieve

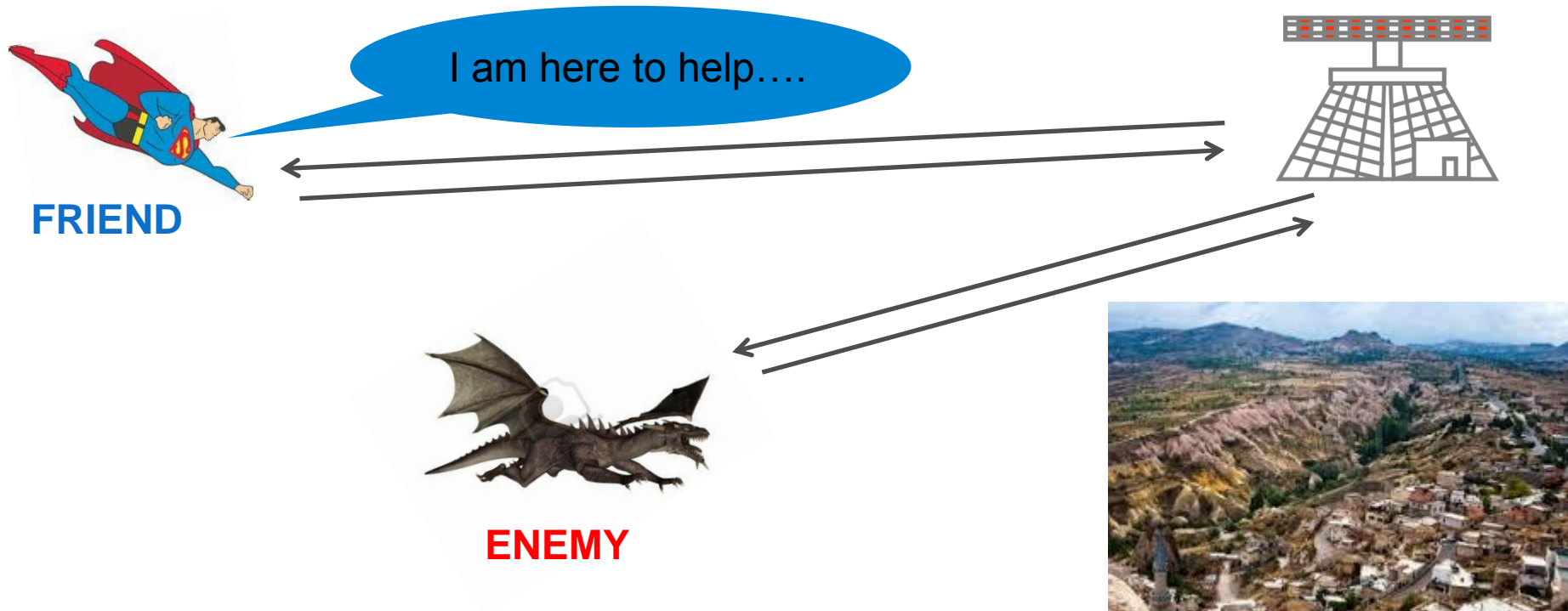
Agenda:

- Problem Statement: Radar Pulse Amplitude and Timing
- Existing solutions to Radar Pulse Amplitude and Timing analysis
- New solution: 8990B PPA Multipulse, it's value and benefit
- Use Cases illustration
 - Transmitter with long PRI pulses
 - Transmitter with multiple pulse burst
- Future enhancement to help you more



Why the need to test Radar transmitter Stability?

- Transmit enough energy to detect target
- Able to detect the target at the specified maximum range
- To provide the required bandwidth for the Radar communication
- Able to identify and differentiate the object



Pain Points:

What/How should I test on my transmitter for stability?

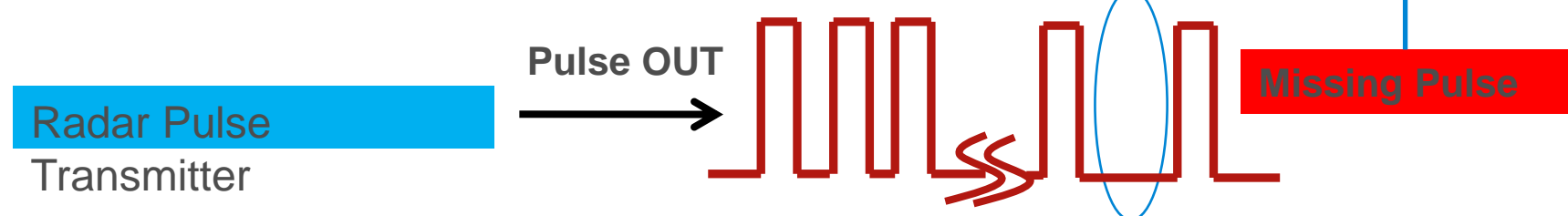
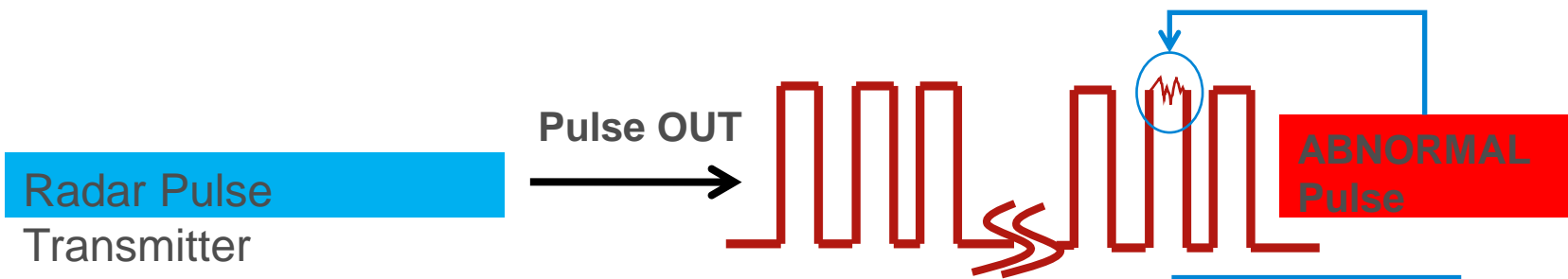
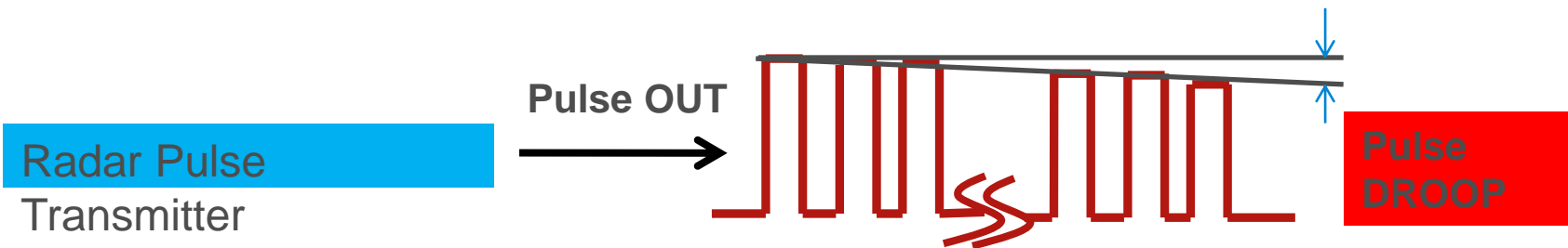
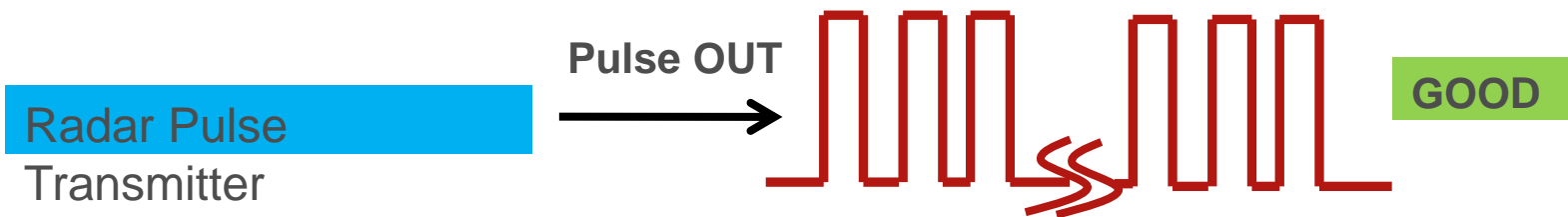


How do I **test** the transmitter is stability, **EASILY**?



I don't want to invest **too much and too many** test instruments!!!

Common Pulsed Radar Transmitter Faults



Current Solutions for testing Transmitter Stability

What are the common solutions currently available?

Digital Oscilloscope + power meter

Digital Oscilloscope + diode detector

Spectrum Analyzer

Network Analyzer

What are the trade off/limitation of these solutions?

Scope + power meter → 2 instruments, need external trigger connection

Scope + diode detector → lack of RF power measurement accuracy

Spectrum Analyzer

→ May be the most popular solutions, can analyze amplitude, timing, phase and frequency.

→ Instrumentation cost is high

New Solution, Make Your Life Easy



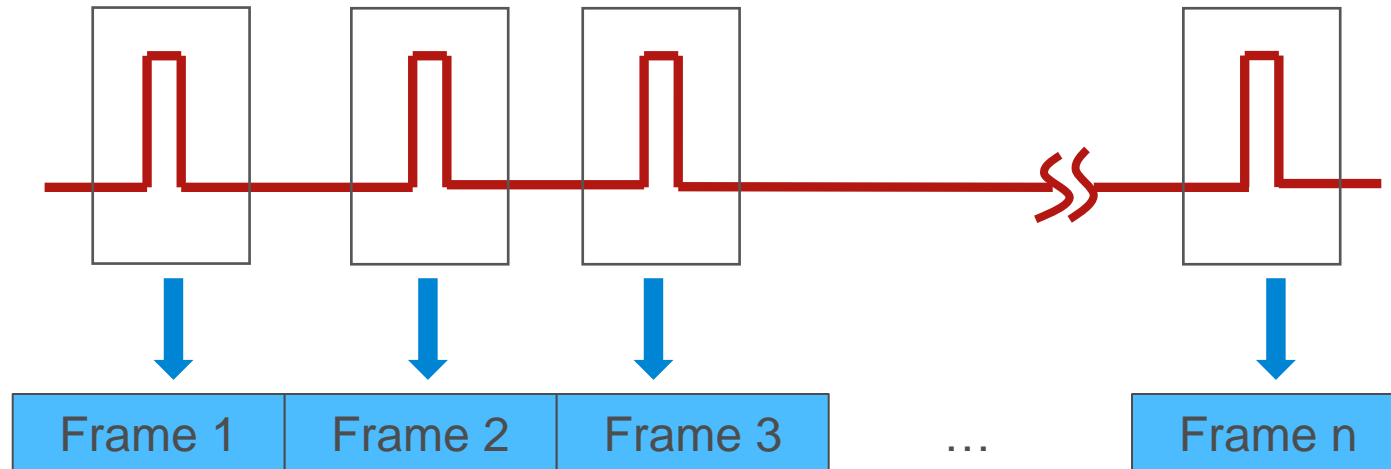
Agilent 8990B PPA
(with **Multipulse** Option)

Benefits:

- 1) One box solution: Power Meter with “segmented memory” feature
- 2) Able to analysis 512 pulses continuously
- 3) Power Meter measurement accuracy (0.2dB)
- 4) Capturing down to 1usec pulse-to-pulse duration
- 5) Compare pulse to pulse measurement

Multipulse Feature Explained

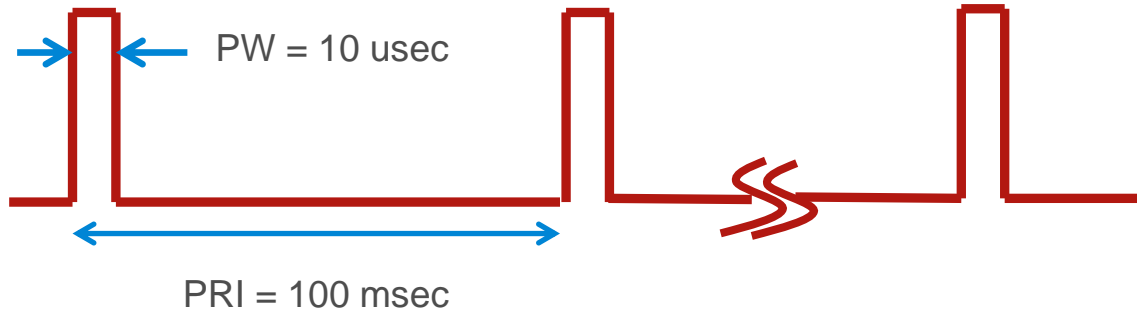
Optimize the pulse(s) into the frame window by adjusting the timescale, trigger settings and trigger delay



Maximum 512 frames. There will be timestamp on each trigger point on each frame

- 1) Only capture and analysis the “useful” part of the burst
- 2) Optimizing the memory usage

Use Case Illustration 1: Long PRI Pulses Analysis



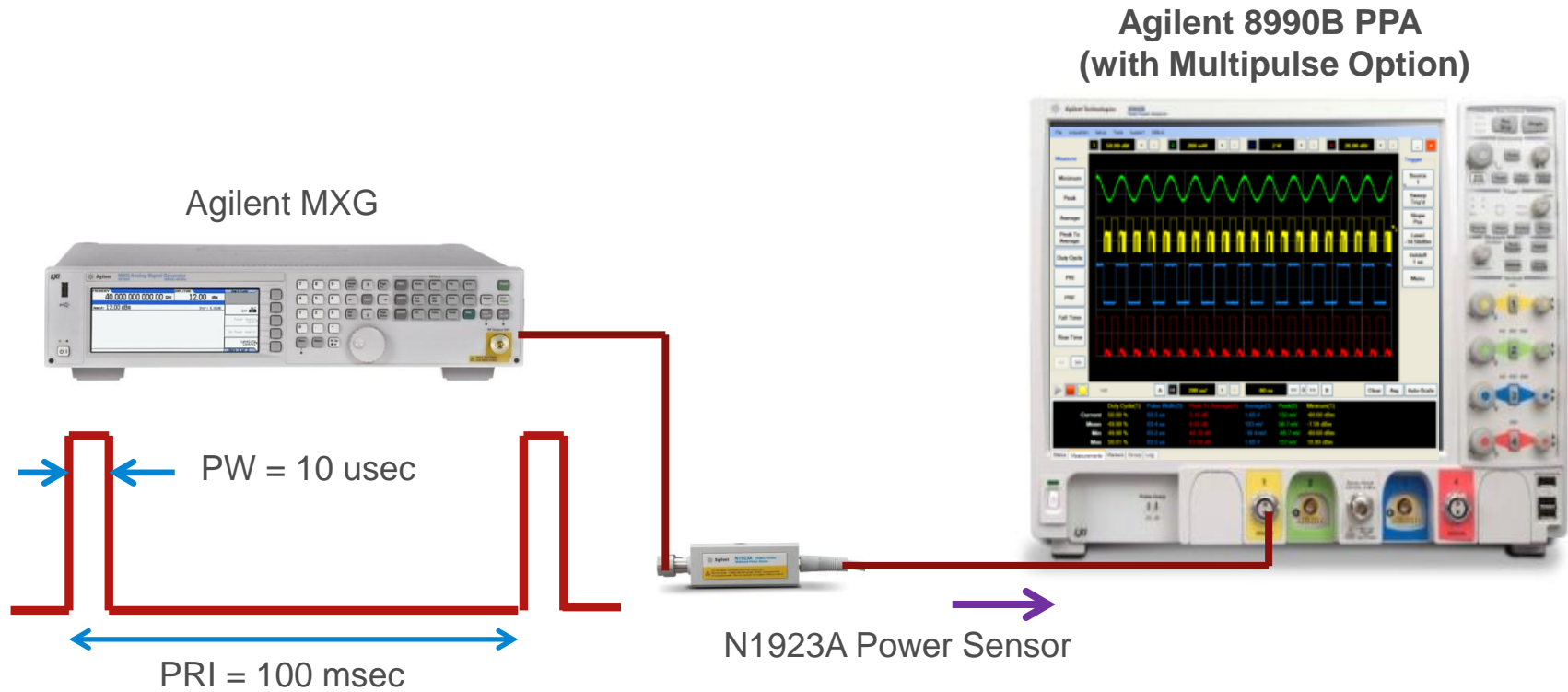
Narrow pulses
with long off time
or PRI

0.01% duty cycle

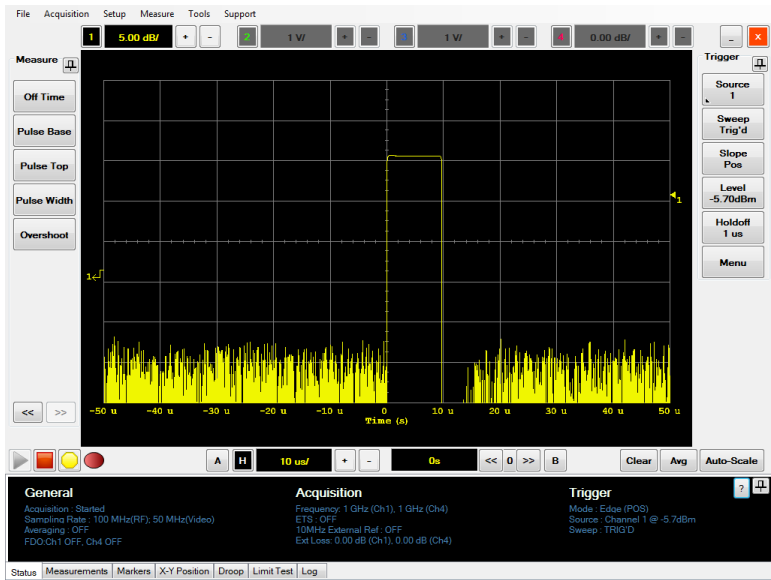
Testing requirements:

- 1) Analysis 100 pulses continuously
- 2) Measure the pulse top, rise time, fall time and pulse width of each pulse
- 3) Measure the pulse droop (amplitude drop) from 1st to the 100th pulse

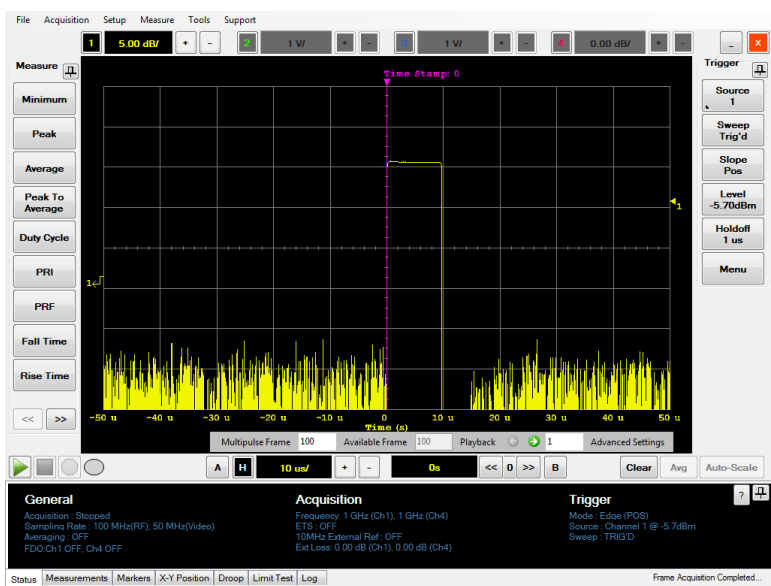
Use Case Illustration 1: Long PRI Pulses Analysis (continued)



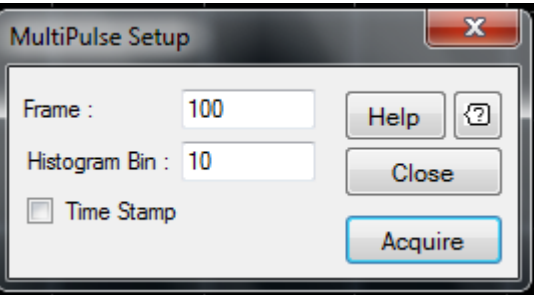
8990B Multipulse Results on long PRI Radar Pulses



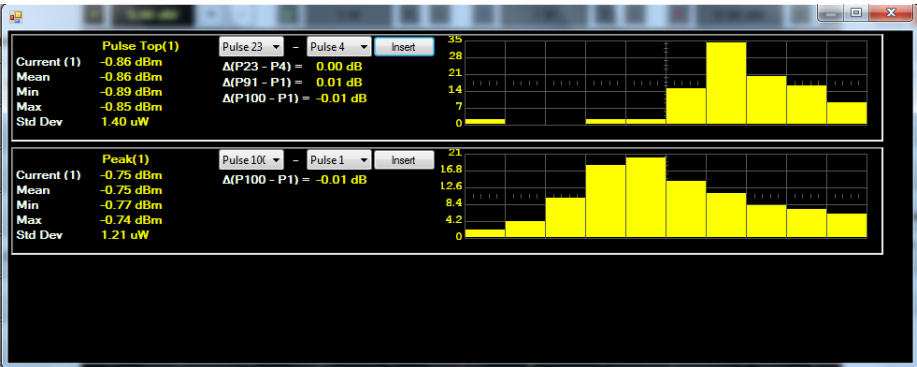
a) 10usec pulse



c) Multipulse acquisition completed

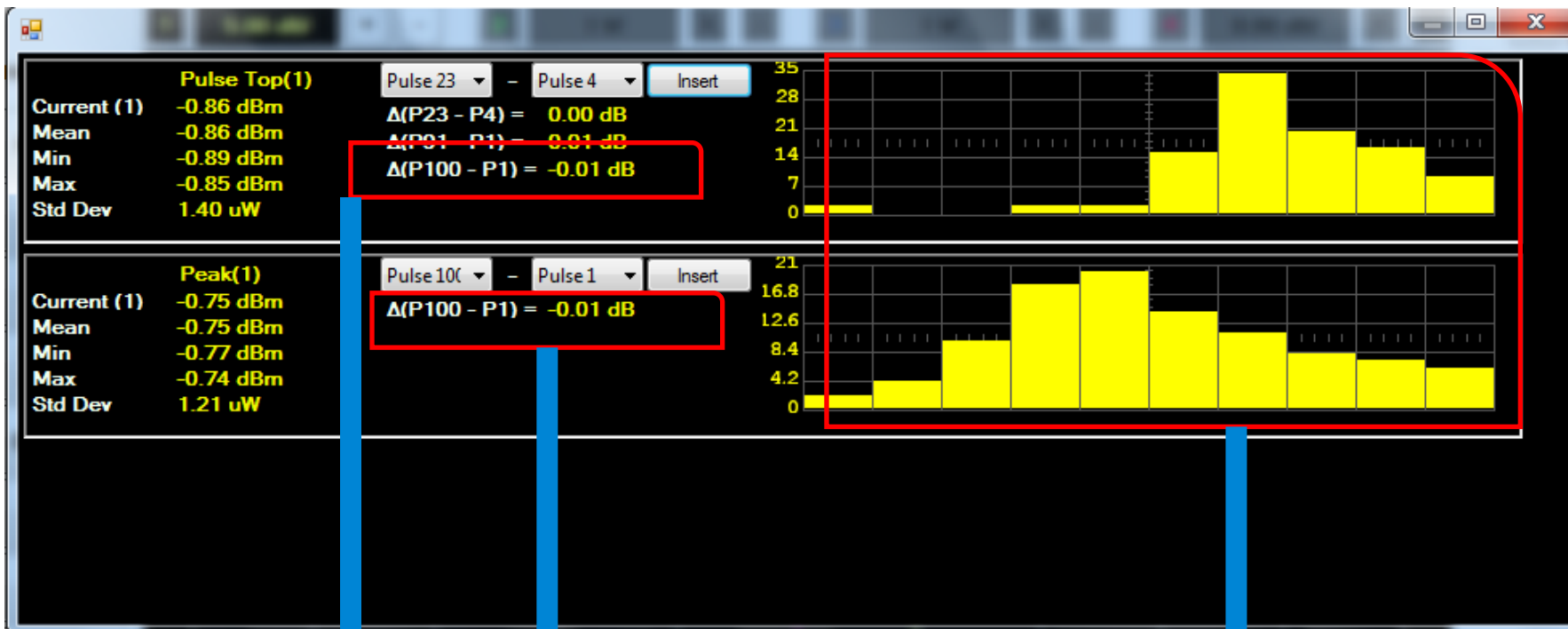


b) Multipulse Setup



d) Pulse to pulse comparison and Histogram

Measuring Pulse Droop on the long PRI Radar pulses

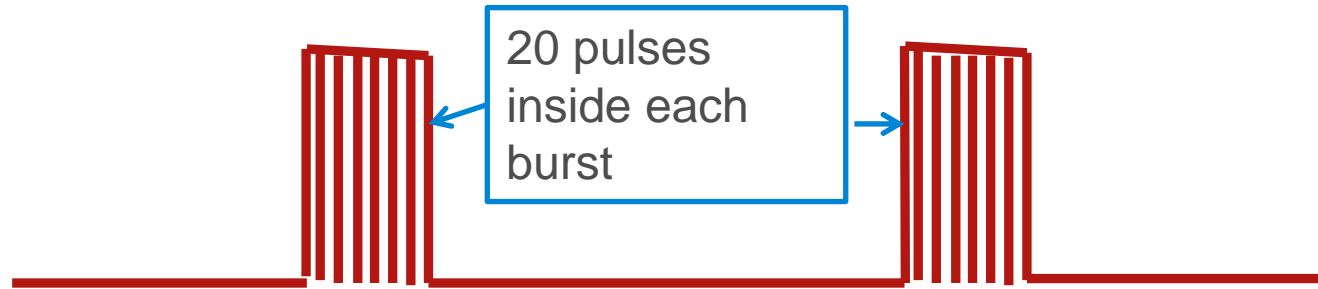


Pulse amplitude droop across the 100 pulses



Histogram representation of each pulse profile (rise time, fall time, pulse width, etc.) measurements

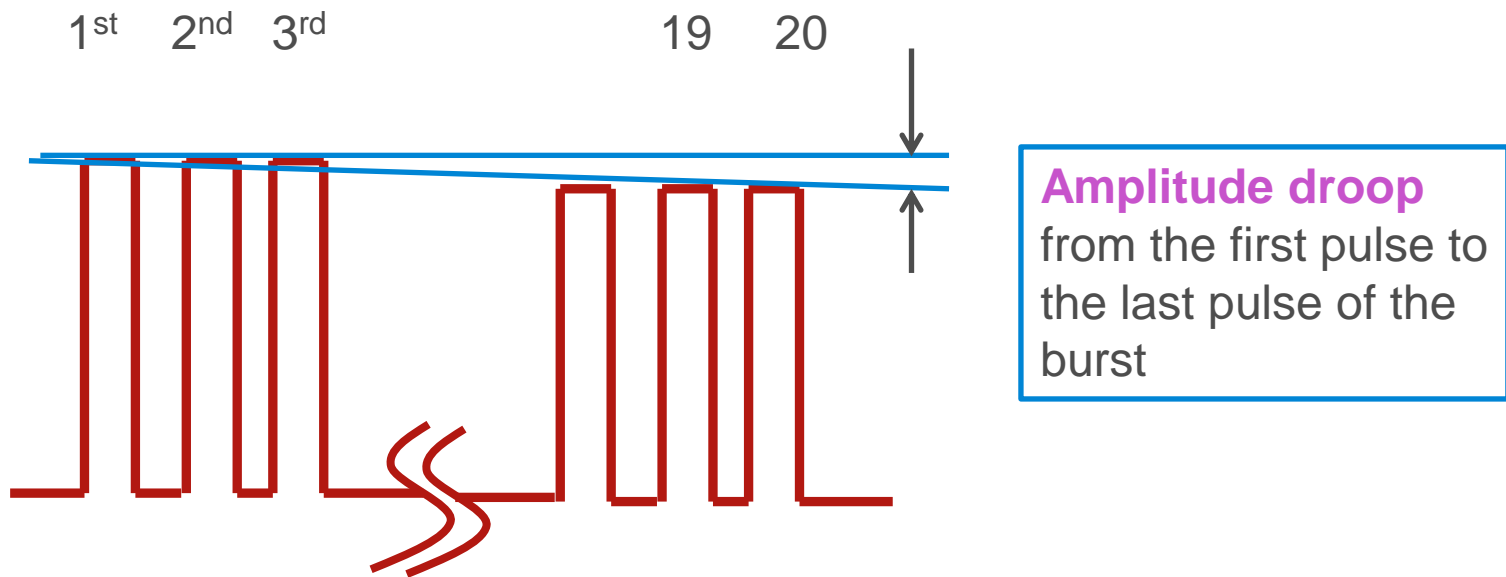
Use Case Illustration 2: Radar Pulse Burst Analysis



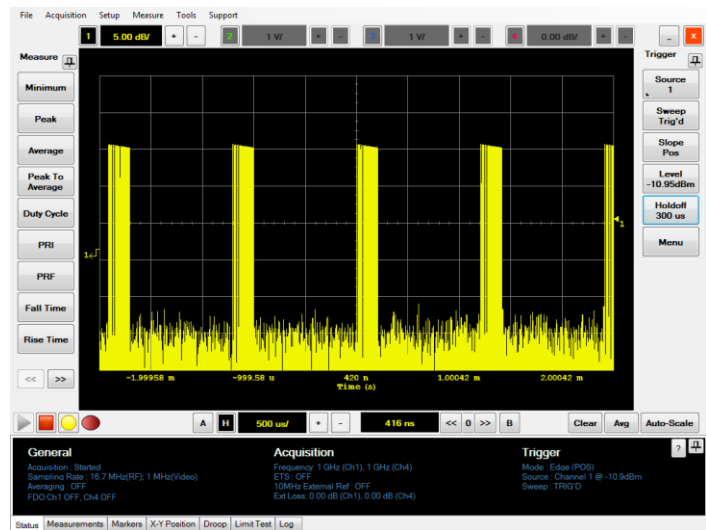
Testing requirements:

- 1) Analysis all 20 pulses inside the burst
- 2) Identify the first pulse and the last pulse
- 3) Measure the pulse top, rise time, fall time and pulse width of each pulse
- 4) Measure the pulse droop (amplitude drop) from 1st to the 20th pulse

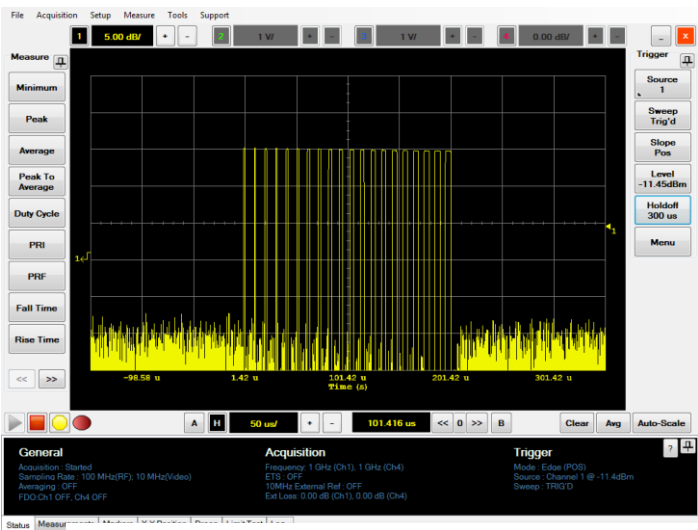
Use Case Illustration 2: Radar Pulse Burst Analysis (continued)



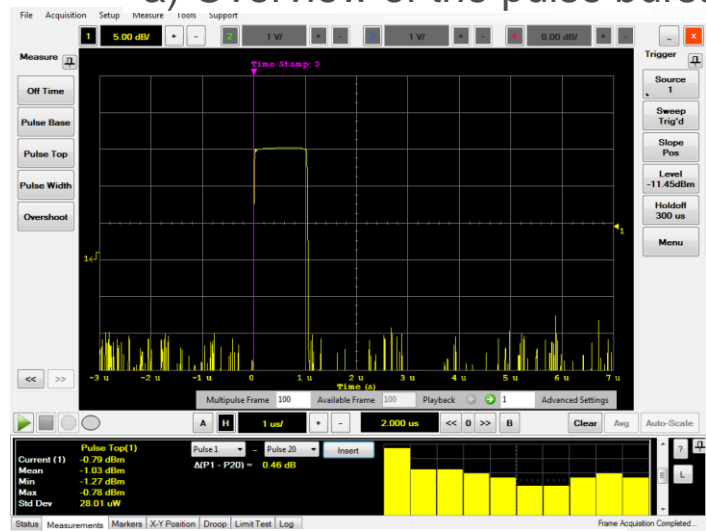
8990B Multipulse Measurement Result for Radar Burst



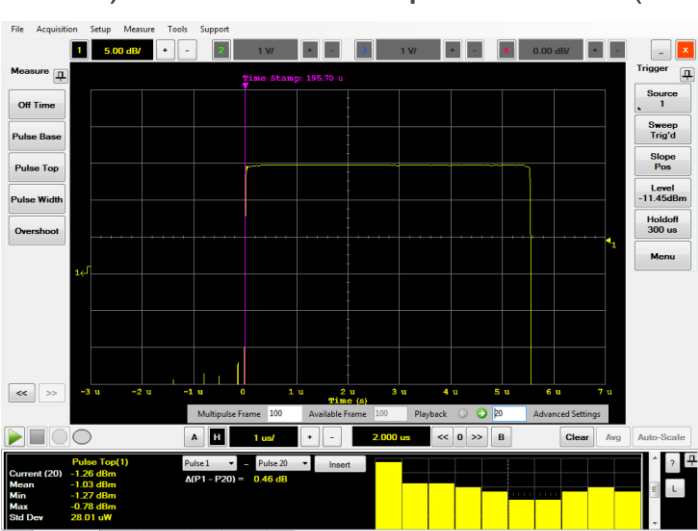
a) Overview of the pulse burst



b) Zoom into the pulse burst (20 pulses)

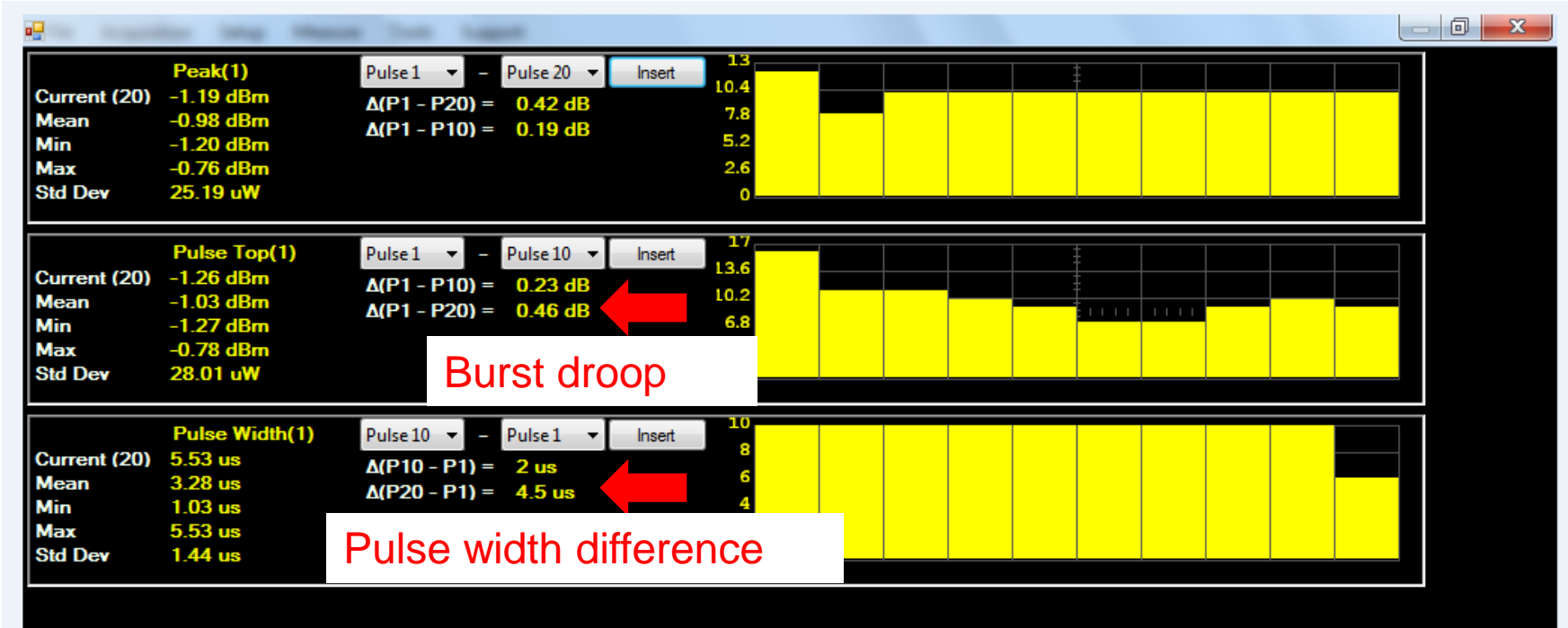


c) Multipulse capture: 1st pulse



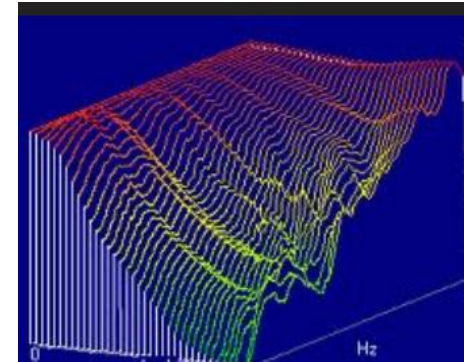
c) Multipulse capture: 20th pulse

8990B Multipulse Measurement Result for Radar Burst - continued



Future Enhancements:

- **Future enhancement for analyzing staggered PRI pulses**
- **Waterfall representation for the pulse measurements**
- **Others**



Conclusion

Testing Radar Transmitter Output Stability

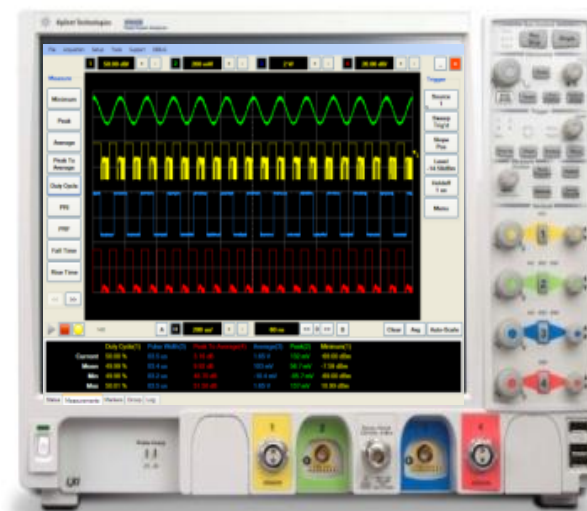
Amplitude
Analysis

Timing
Analysis

One box
solution

Easy Use

Agilent 8990B PPA
(with Multipulse Option)



Thank You

