

Tag Measurement Approaches

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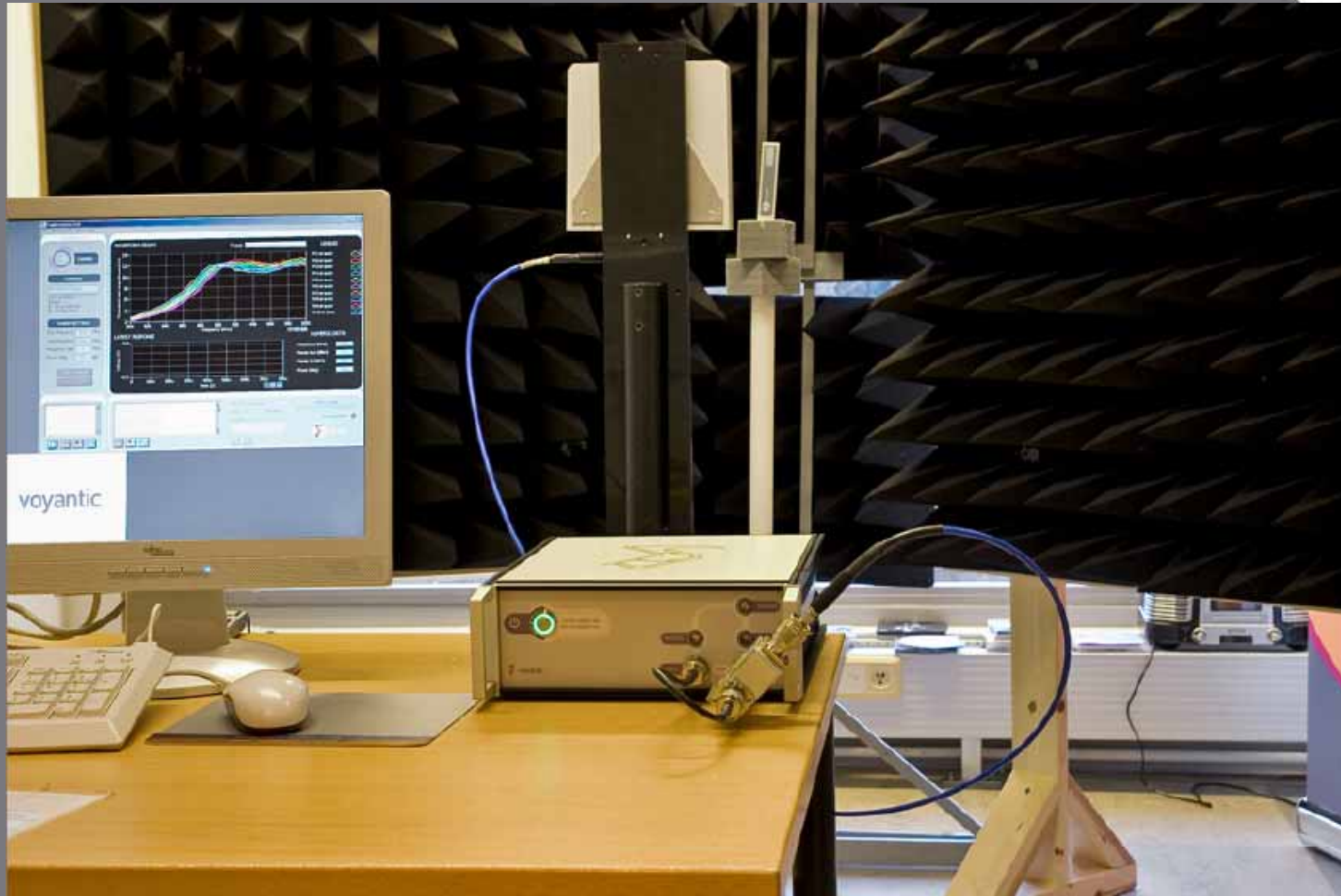


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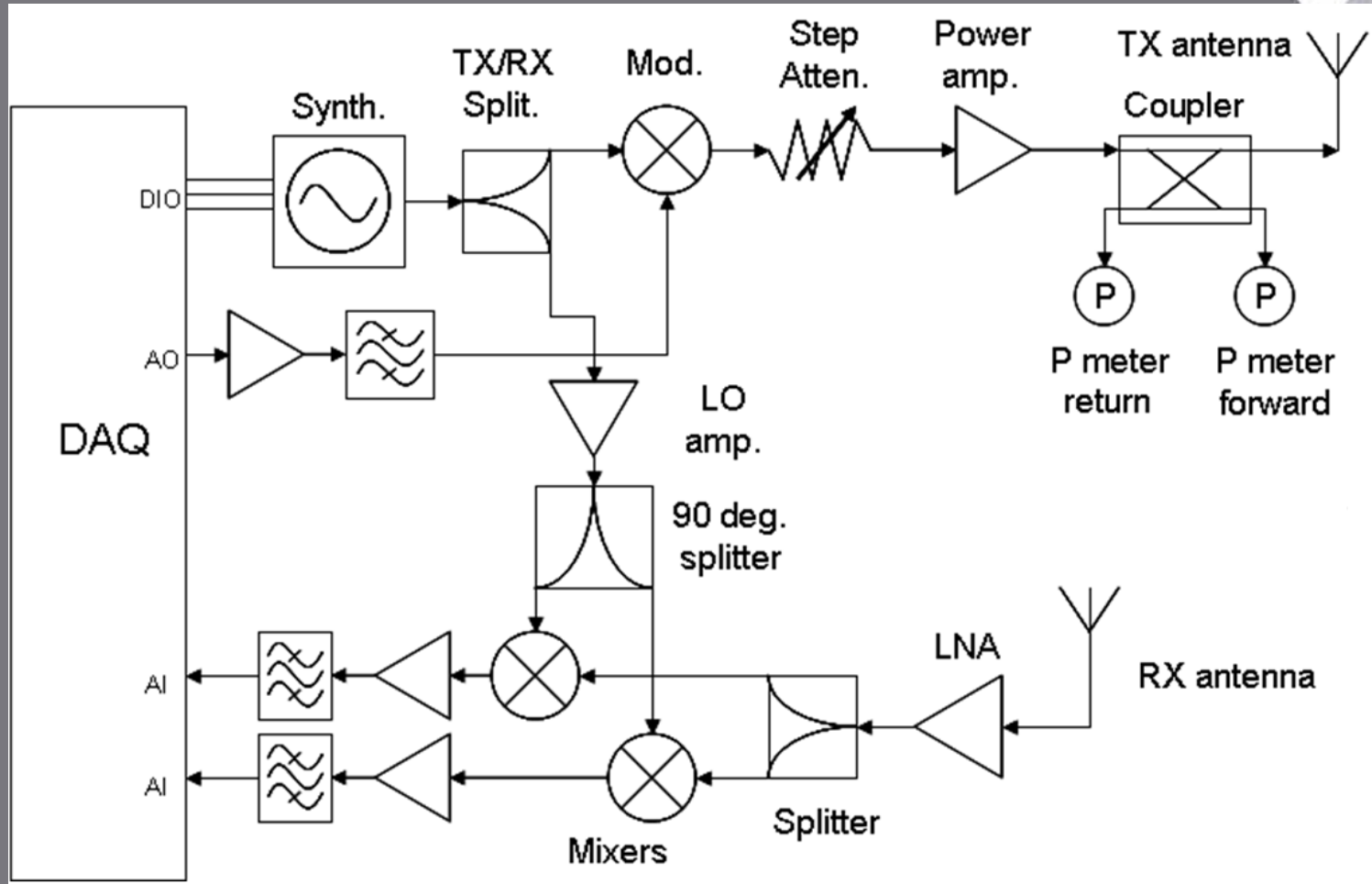
Agenda

- System description
(A different measurement setup)
- More about tag performance
 - Case: Write range
- Protocol level tag testing
 - Case: Randomness of RN16
- Tag production testing
 - Case: Inline testing

System description



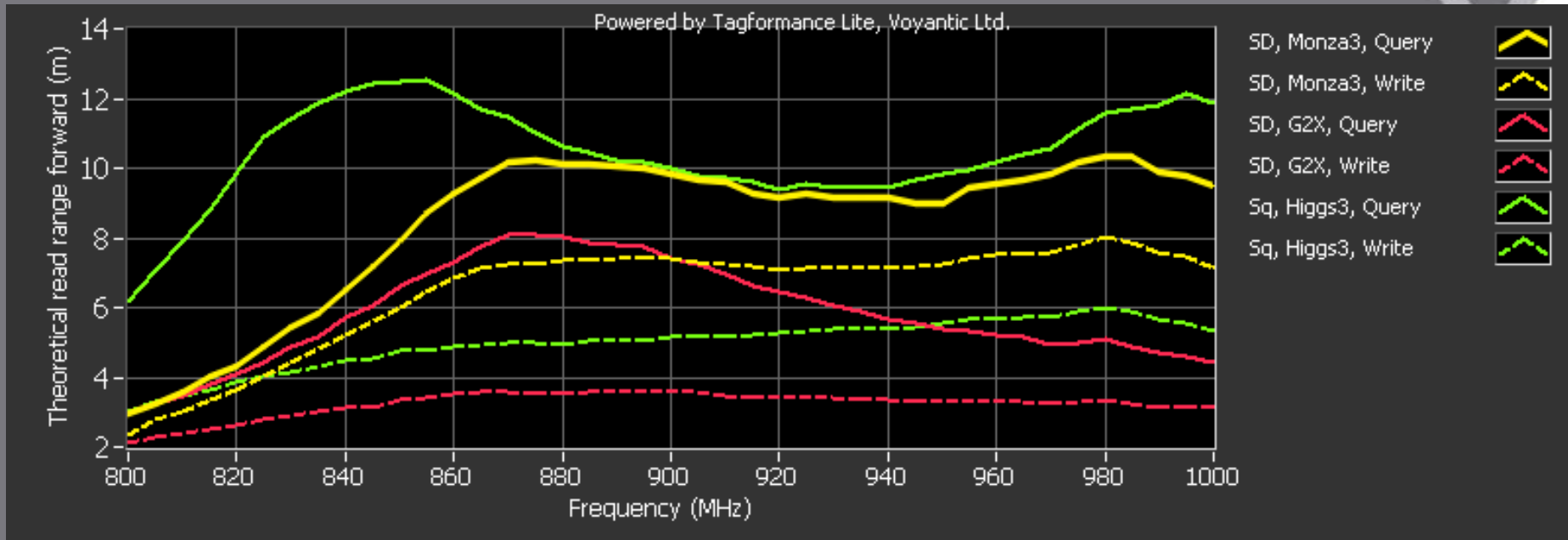
Measurement electronics



More about tag performance

- Read sensitivity and backscatter efficiency are the most important metrics
 - Not just on free air but on different materials
- Many others are relevant as well
 - Write sensitivity
 - Orientation sensitivity (radiation pattern)
 - Performance near other tags
 - Interference rejection
 - Write time
- There are performance measurement standards, but adoption is still quite low
 - ISO 18046-3 and EPC Global Tag Performance Specification

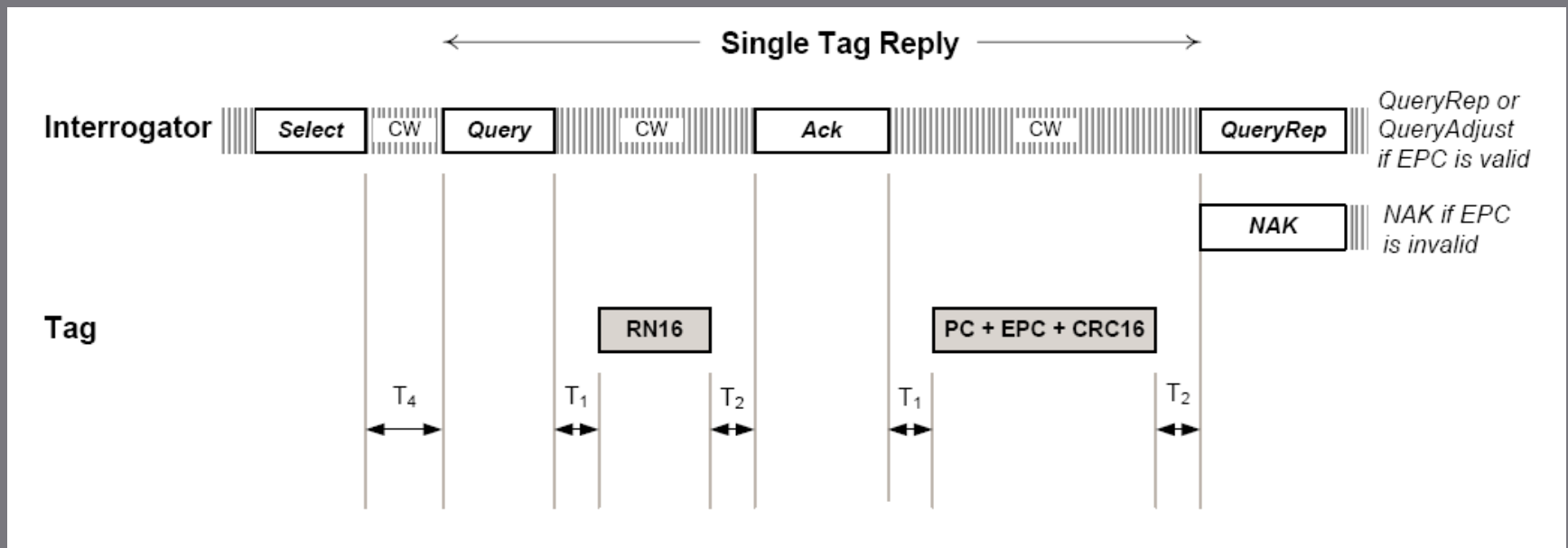
Case: Range with Write vs. Query



Close to a constant difference with some ICs,
entirely different shapes with some others

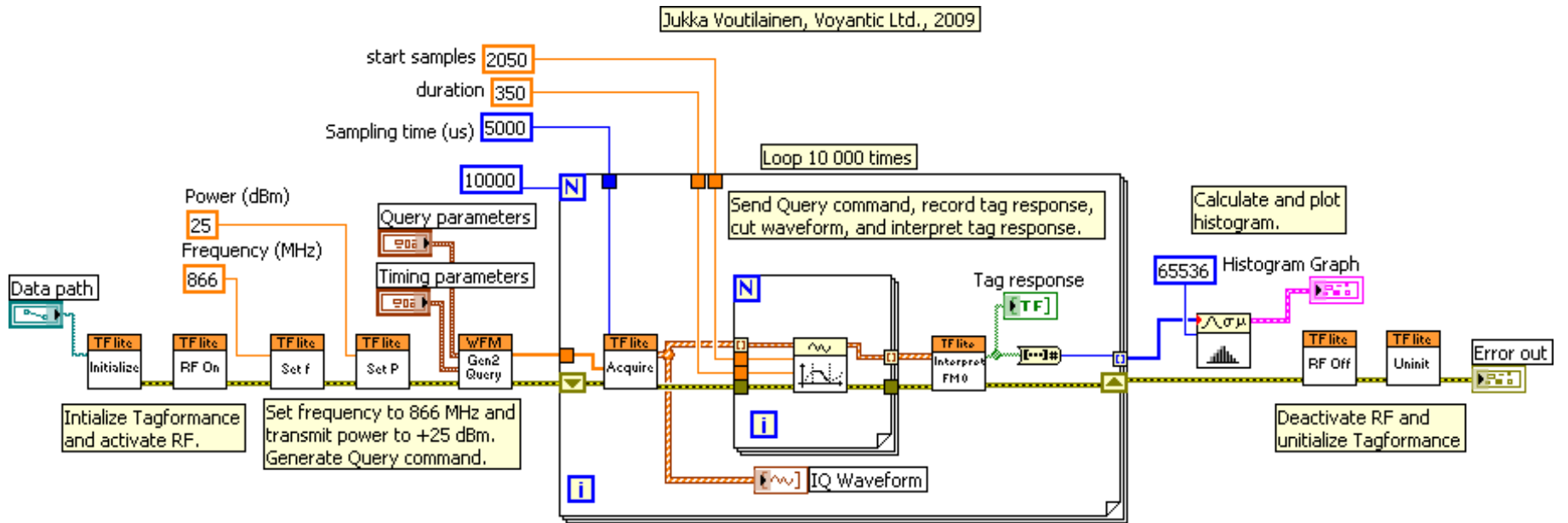
Protocol level tag testing

- Testing the functionality of the IC
 - Timings, state machine, correct responses to commands etc.



Case: Randomness of RN16

”Set frequency to 866 MHz and power to +25 dBm, send Query command to the tag 10 000 times, interpret RN16 responses, calculate histogram”

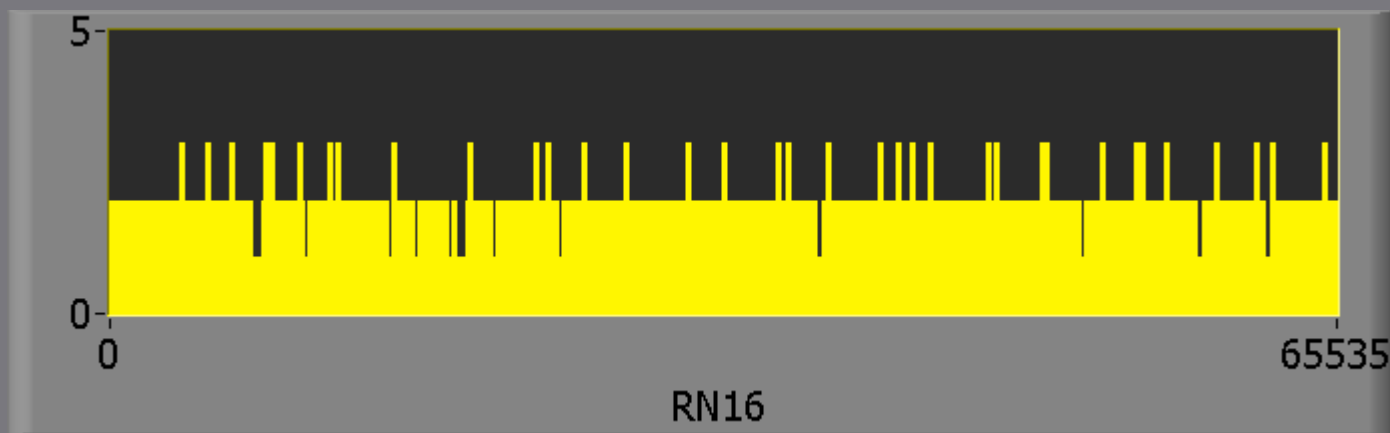


RN16 histograms - normal

Higgs2

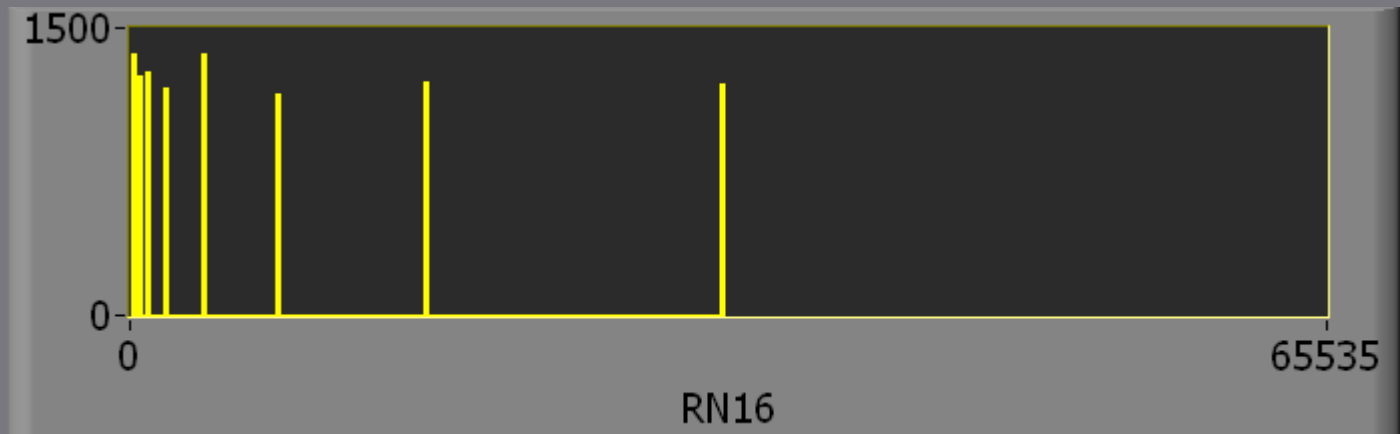


G2X



RN16 histograms - suspicious

Historic
chip X

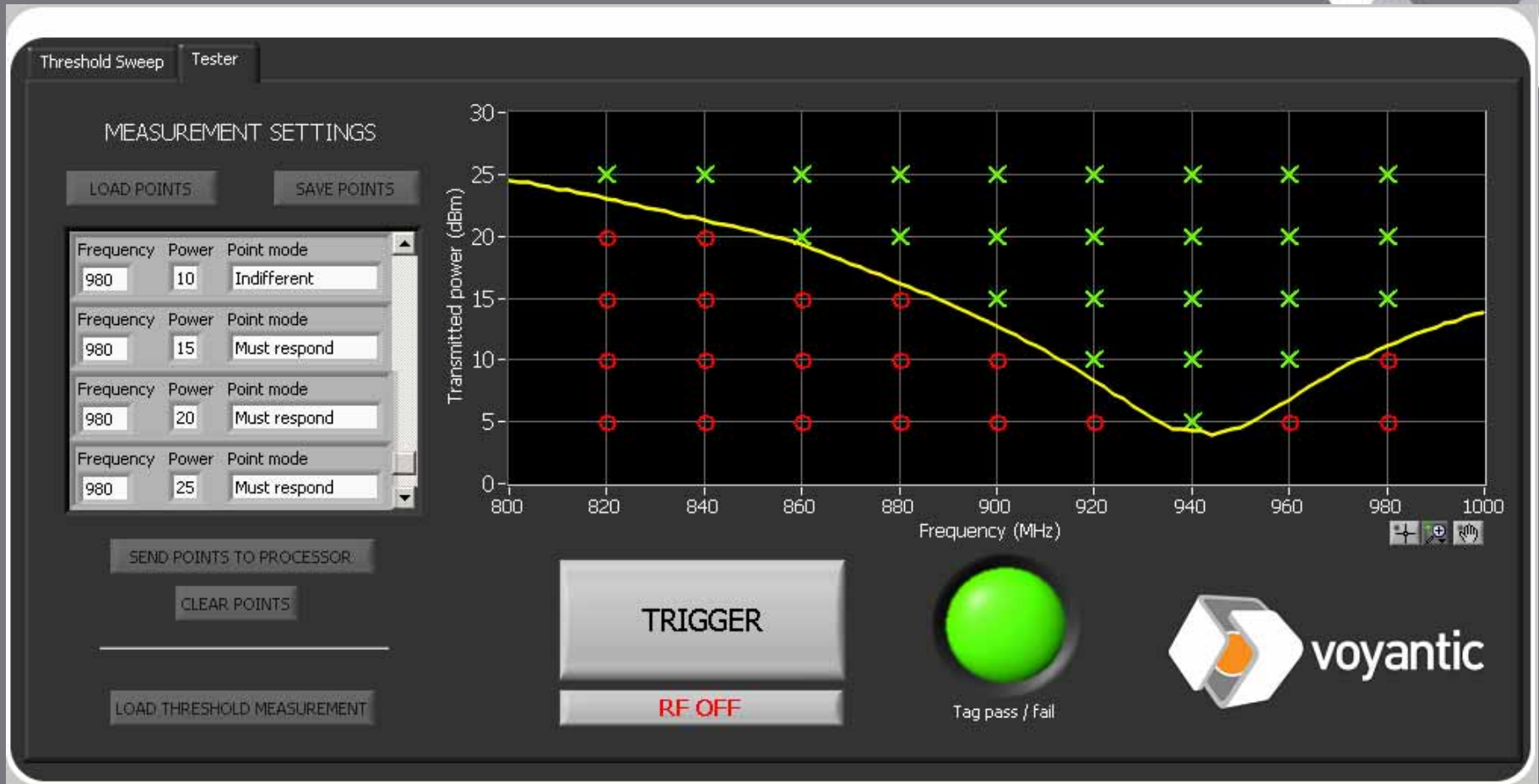


What is going on here? Only 8 different random numbers?
RN3?

Tag manufacturing testing

- End users expect 100% tested tags
- If quality is tested only post-production, a lot of scrap is potentially made
 - To achieve high yield, production quality needs to be monitored real-time
- Typically manufacturers perform a reader-based GO / NO GO test for each tag
 - But tag functionality is not the same as performance
- **PROBLEM:** How to measure tag performance in less than 100 ms?

Case: Inline testing



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