How Voyantic assists DOP, Direct On Paper RFID inlay from Prototyping to Mass Production.

Smooth & Sharp Corporation

April 15, 2021

www.dop.asia

Agenda

- The Origin & Challenges
- DOP Introduction
- DOP Prototyping Keys
- RD Optimization Examples
- Mass Production Control Examples
- Summary

The Origin

”To be or not to be GREEN,
that is the question.”

Problem:

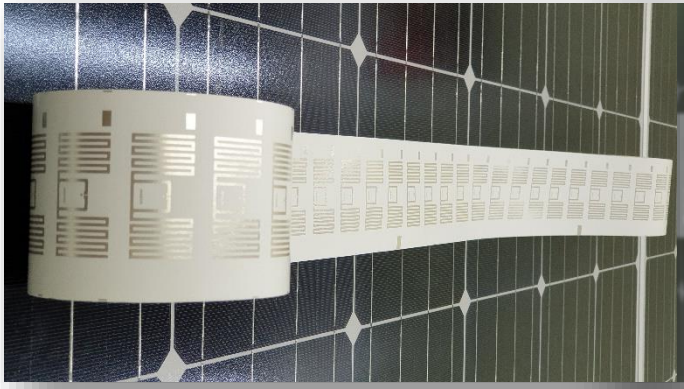
Ten Billions of disposable RFID tags are made with etched antenna on plastic, they left over plastic waste and polluted chemical plant residuals after just one-time-use.

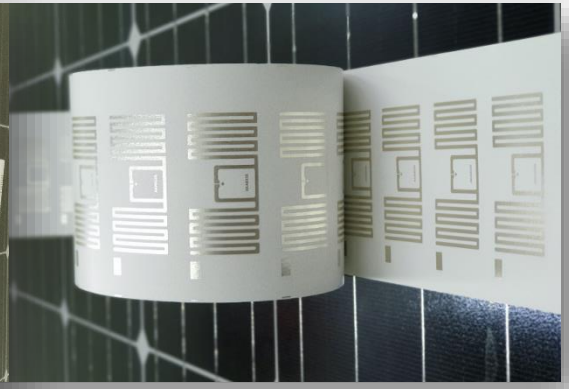
Any Alternative Solutions?

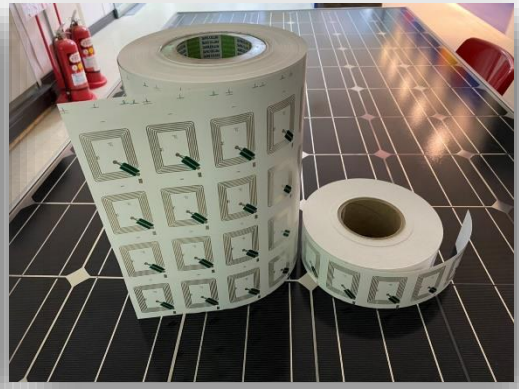
The Challenges

- Additive Manufacturing
- No Chemical Process during Production
- No Plastic after Use
- Decent Performance

Brand New BOM and Process for DOP, Direct On Paper RFID Antenna.

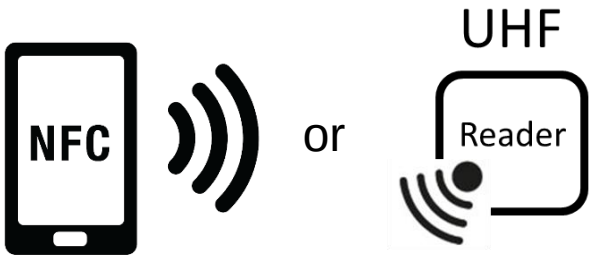


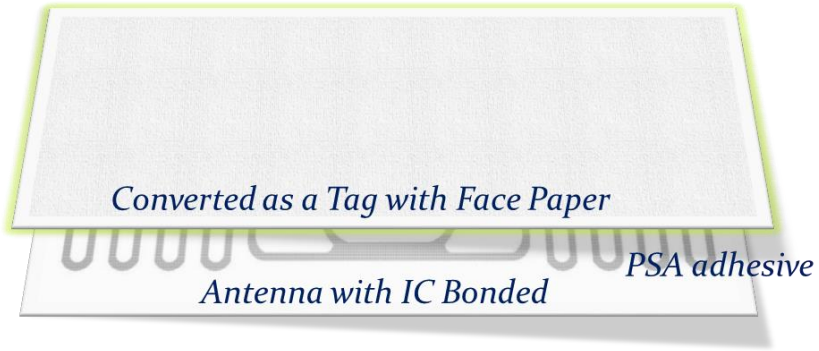




DOP Introduction

Label Structure

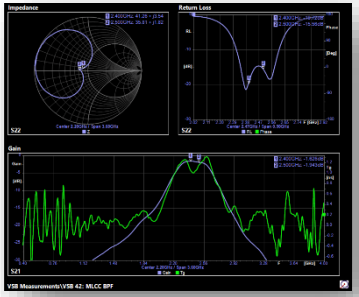




Production flow

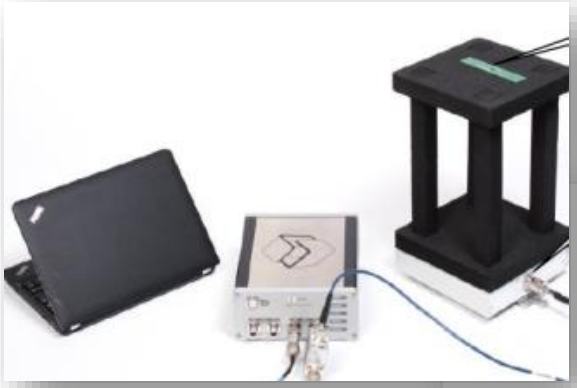
DOP speaks the same language

Use VNA to get this result
or

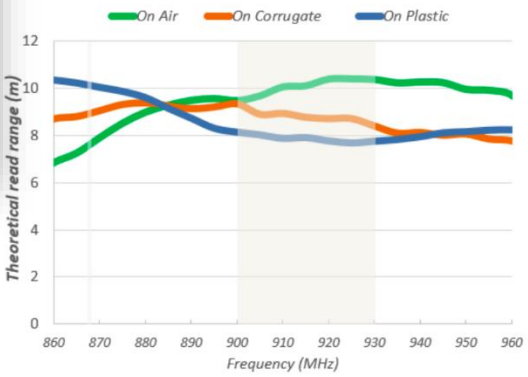


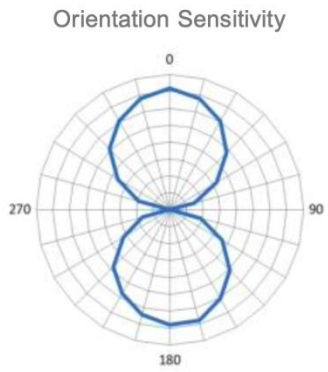
Source: https://www.rohde-schwarz.com/tw/product/zvl13-productstartpage_63493-10575.html

Source: https://www.megiq.com/images/Content/MegiQ-VNA-SandBox-42B-min.PNG



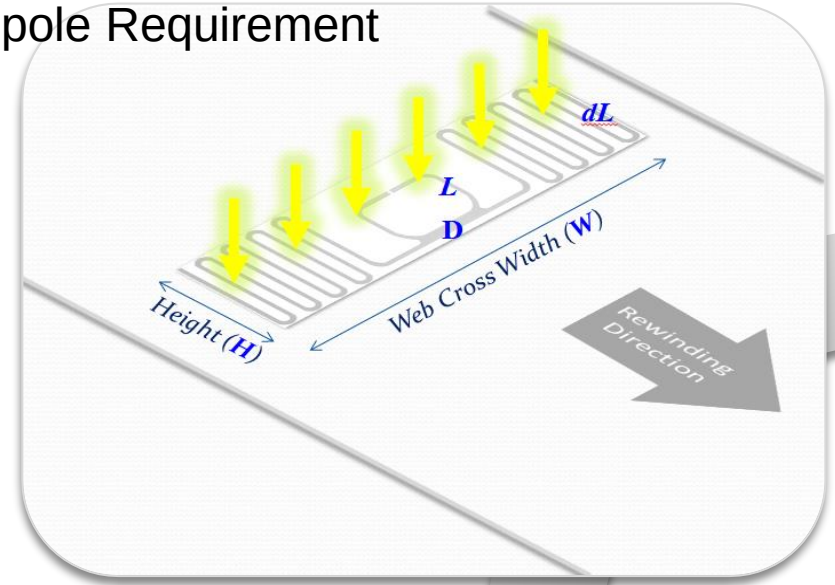
Use Tagformance to finalize the specification





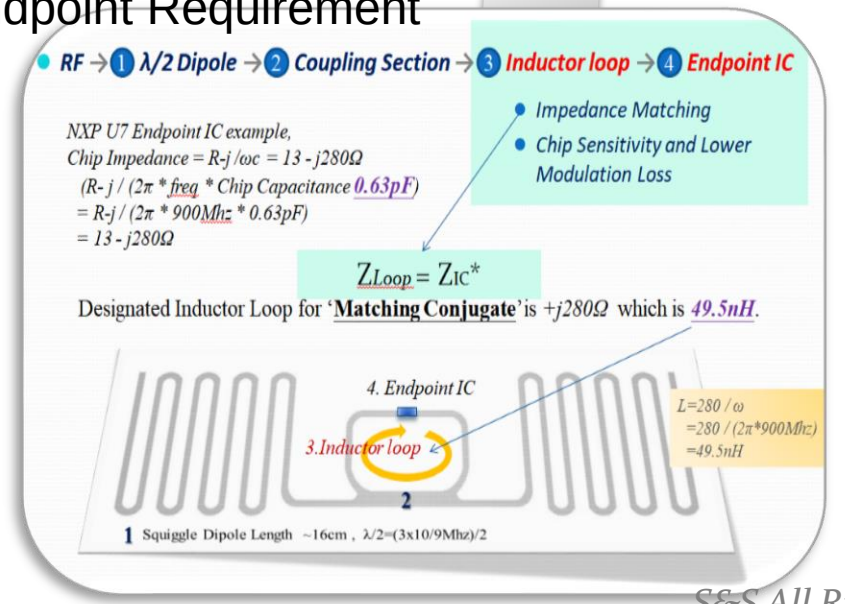
DOP Prototyping Keys

Dipole Requirement



- *Substrate: Designated Coated Paper*
- *Tag area: **W** and **H** must fit*
- *Pattern: working for RF linked*
  - *Dipole length (**dL**)*
  - *Inductor loop (**L**)*
  - *Coupling Section (**D**)*
- *Conductivity of ink:*
  - *Curing and Sintering*

Endpoint Requirement



"Blue" needs :

- RD Verification
- Process Control

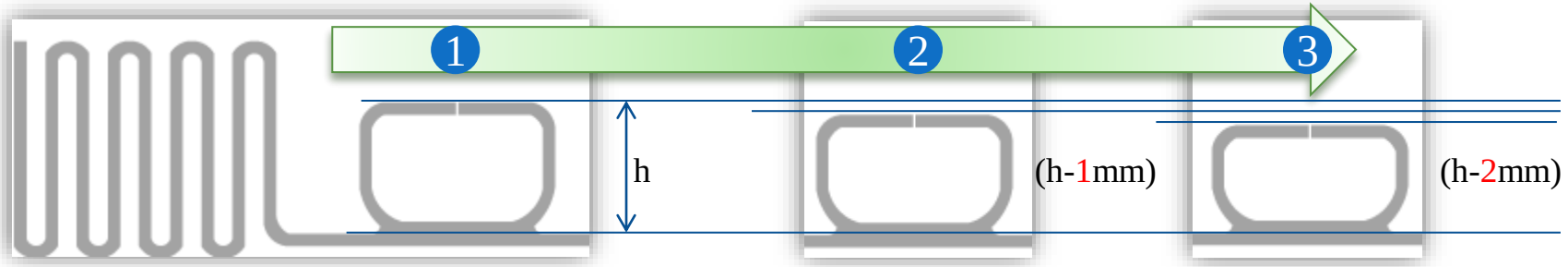
voyantic

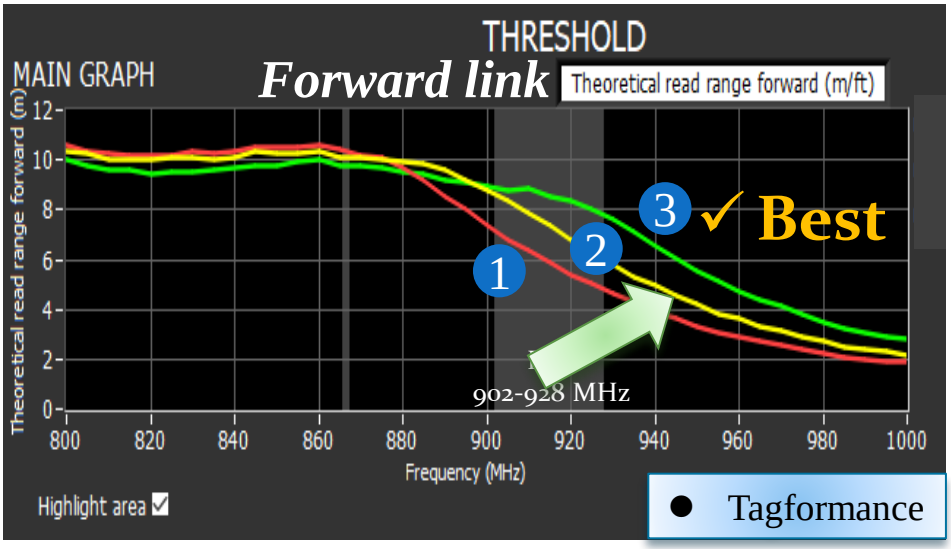
- Tagformance
- TagSurance

Optimization Example A - Loop Size

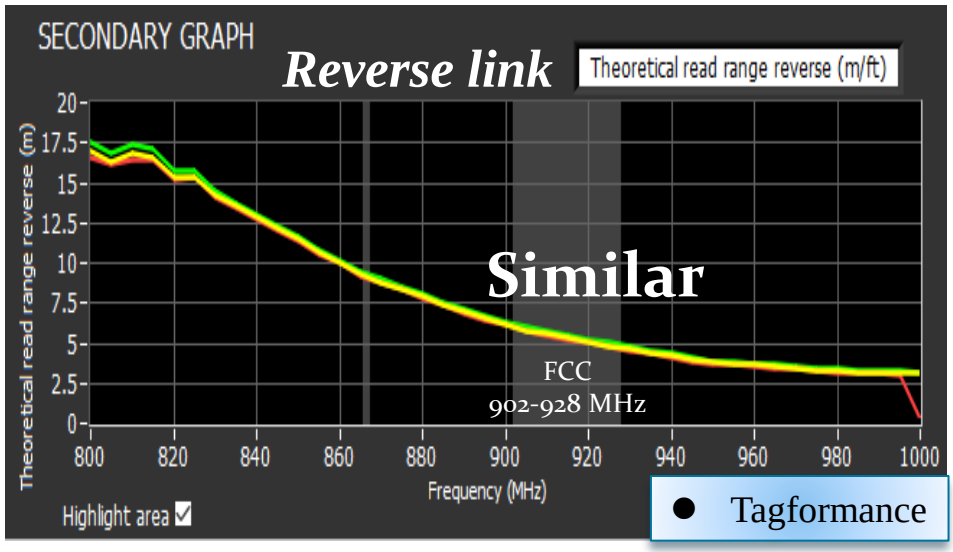
- Tagformance

✓Best





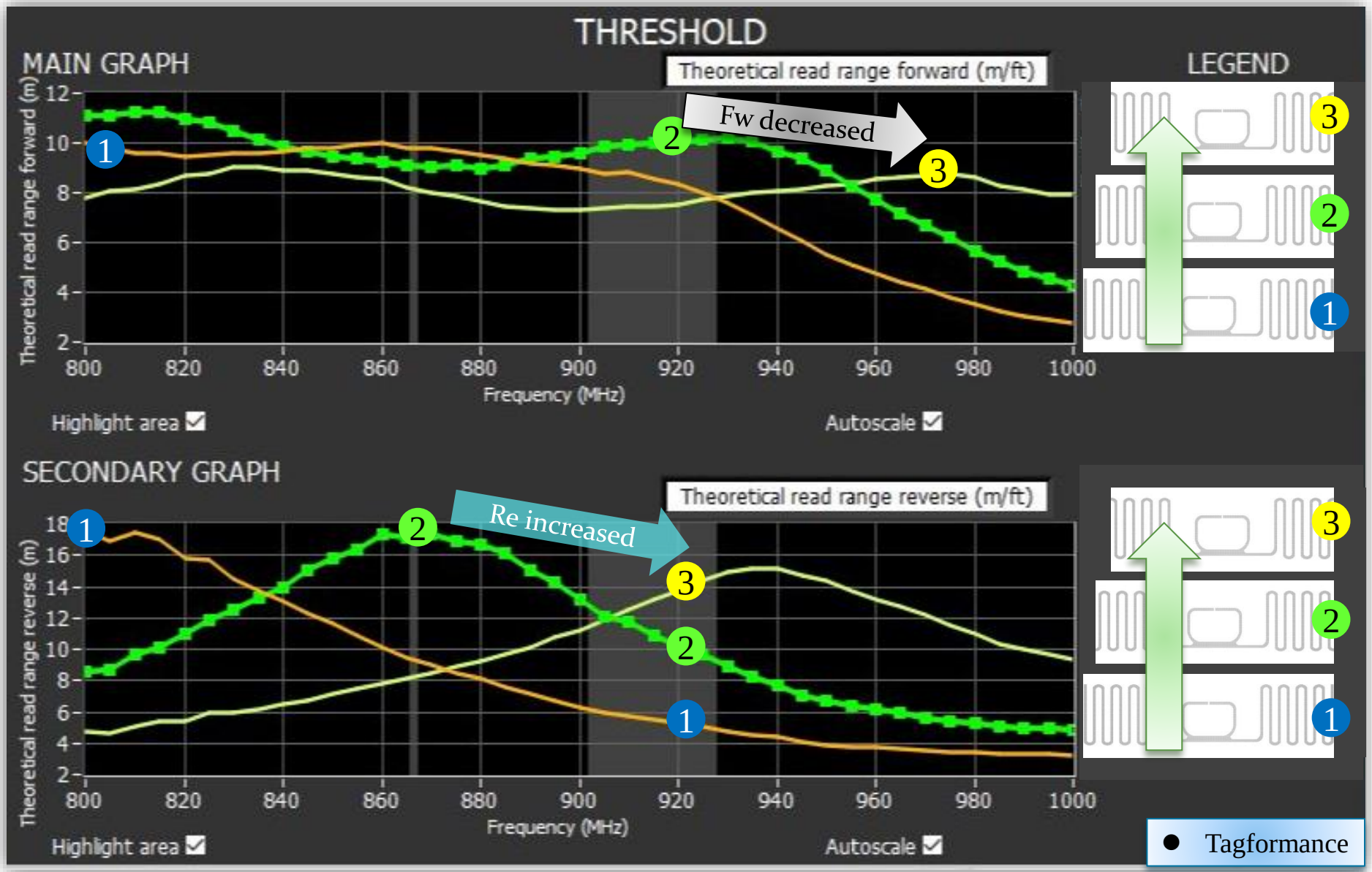
● Tagformance



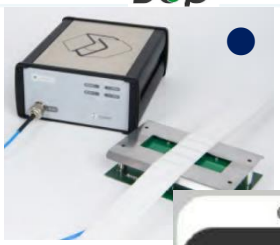
● Tagformance

Reference Source: https://support.impinj.com/hc/en-us/articles/360000157019-RFID-Tag-Antenna-Design

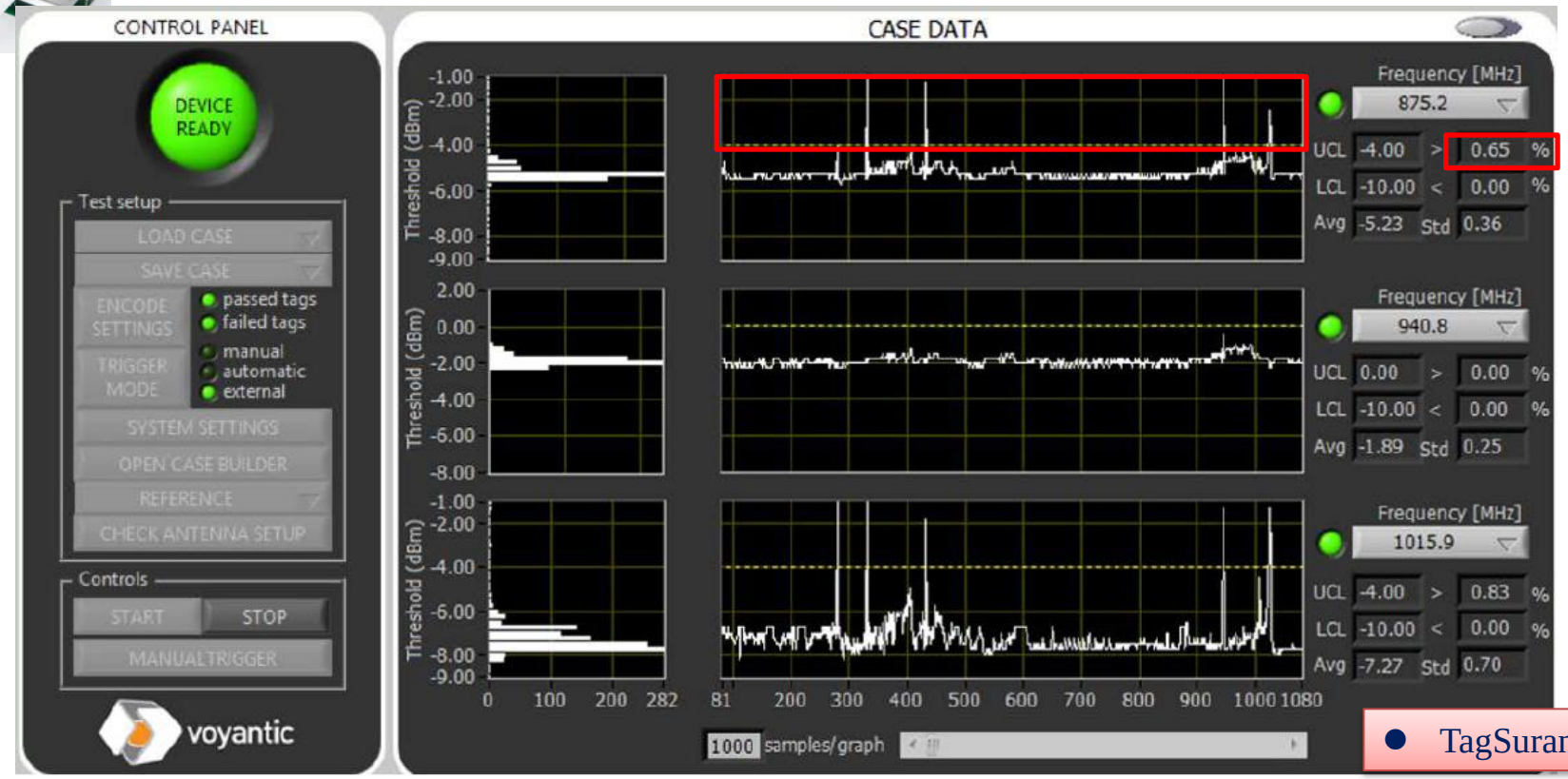
Optimization Example B – Dipole Length



Real-time Monitoring of Yield - dBm



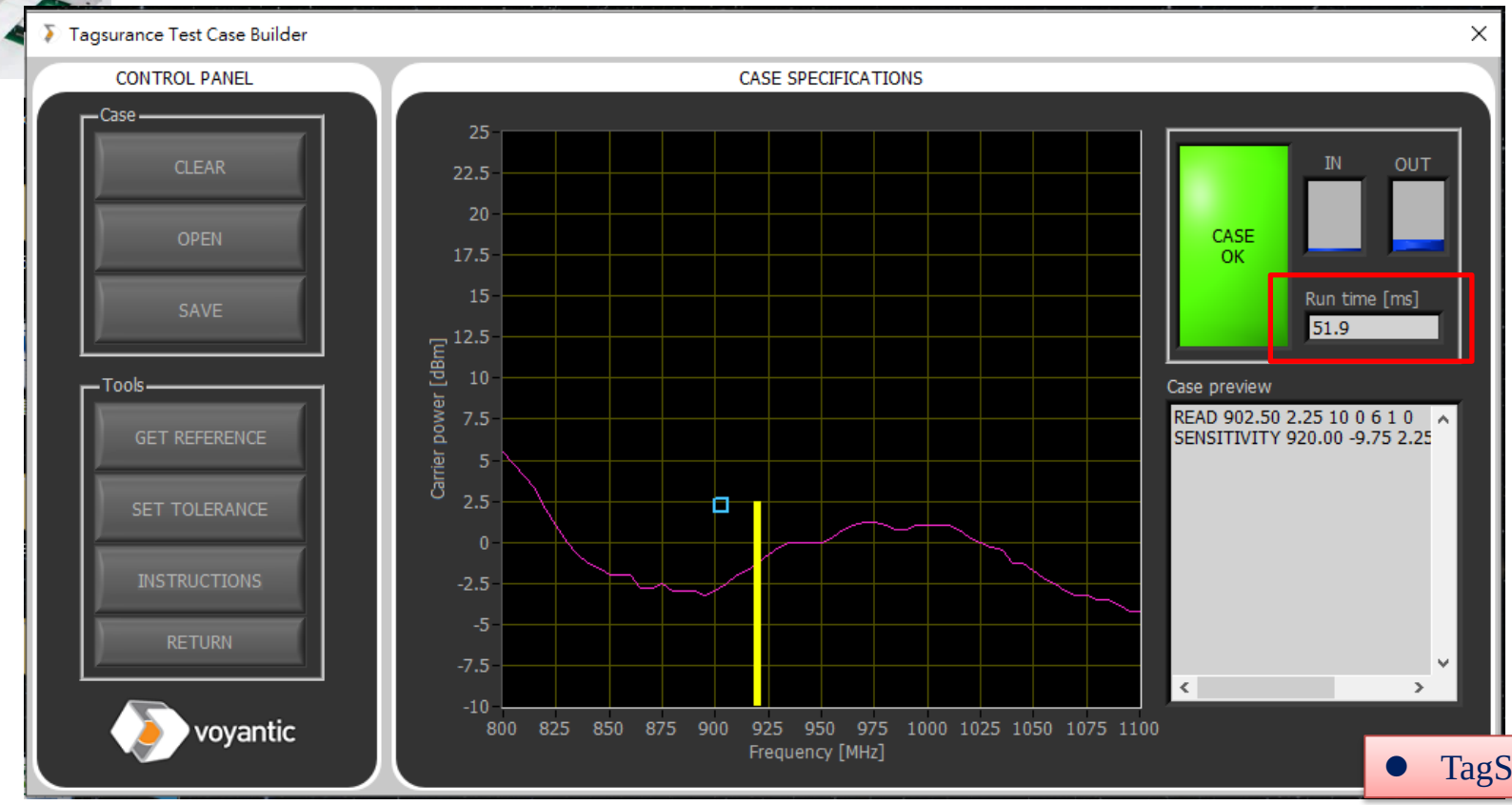
- TagSurance



- All DOP labels Yield rate can be well-monitored by dBm.

Real-time Monitoring of Yield - Fast

- TagSurance

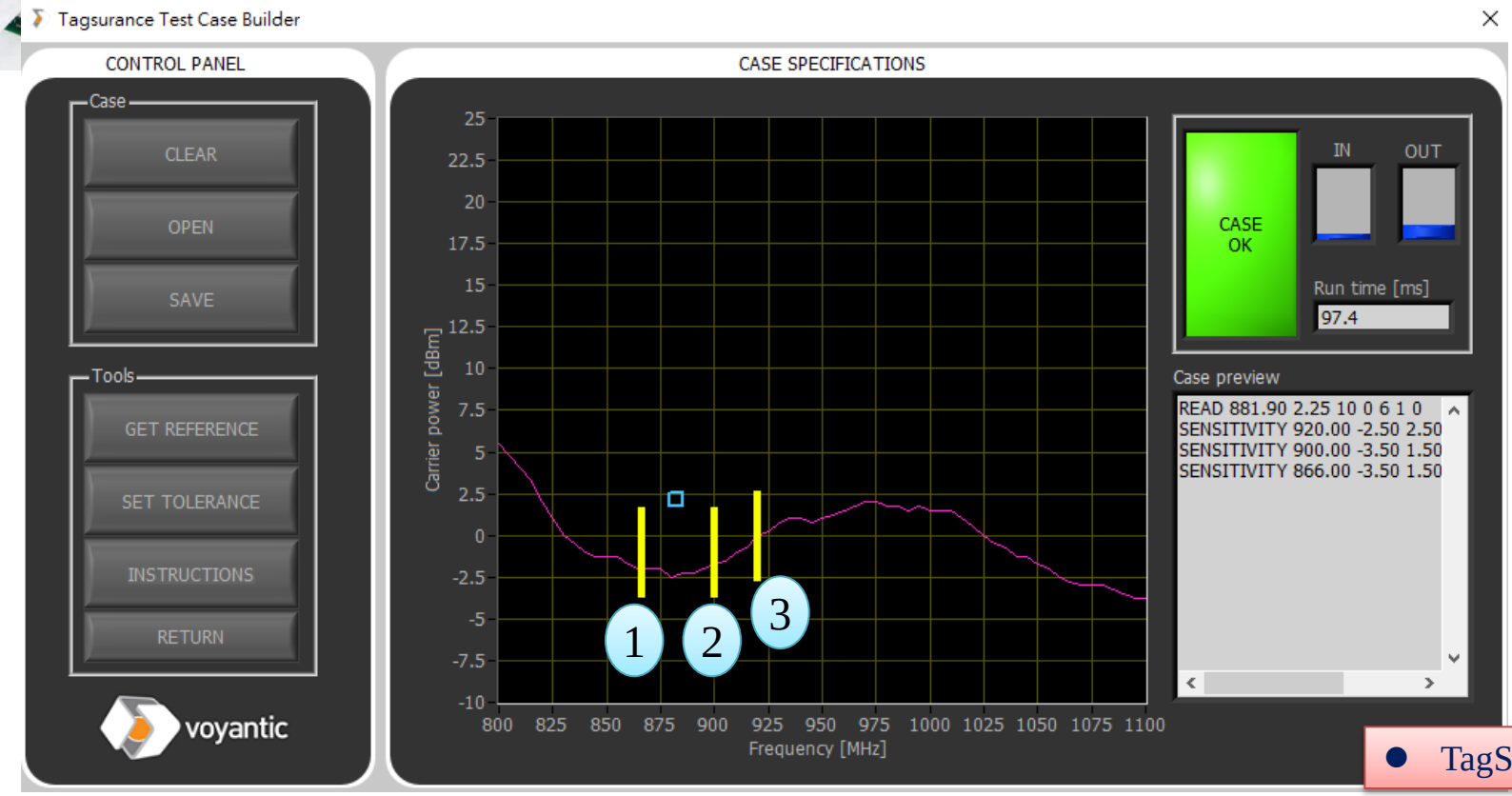


- TagSurance

- Faster measurement speed: It only takes 51.9ms for each tag to measure both TID and Sensitivity.

Real-time Monitoring of Yield - Accurate

- TagSurance



- Multi-point detection can be used to improve accuracy.

Beyond Go or No-Go

- TagSurance

Tagsurance	2021/3/11	09:54:00					
Test unit:	UT-0379						
Read specifications	Frequency [MHz]	Power [dBm]	Bank	Start adress	Word count	Repetitions	Tolerance
Read 1	902.5	2.25	TID (10)	0	6	1	0
Sensitivity test specifications	Frequency [MHz]	Lowest tested power [dBm]	Highest tested power [dBm]	Lower control limit [dBm]	Upper control limit [dBm]	Uncertainty criterion [dBm]	
Sensitivity 1	920	-9.75	2.25	-7.75	0.25	0.25	
Case specifications							
Frequency [MHz]		902.5	920				
Power [dBm]		2.25					
Mode		Read 1	Sensitivity 1				
Results (Tags tested: 7015, Yield: 99.42%)							
Time stamp	Pass/Fail	Read data (err/data)	Sensitivity 1				
09:54:23	PASS	0/E2806894200050119F364945	-2.75				
09:54:25	PASS	0/E2806894200050119F364946	-2.5				
09:54:25	PASS	0/E2806894200040119F364947	-1.75				
09:54:26	PASS	0/E2806894200040119F364948	-1.5				
09:54:27	FAIL	1/00000000000000000000000	2.25				
09:54:28	FAIL	1/00000000000000000000000	2.25				
09:54:29	FAIL	1/00000000000000000000000	2.25				
09:54:30	PASS	0/E2806894200040119F36494B	-2.25				
09:54:44	PASS	0/E2806894200050119F36494C	-2.25				
09:54:45	PASS	0/E2806894200040119F36494D	-2.75				
09:54:46	PASS	0/E2806894200040119F364550	-1.5				
09:54:46	PASS	0/E2806894200050119F364551	-1.75				

TID

Sensitivity

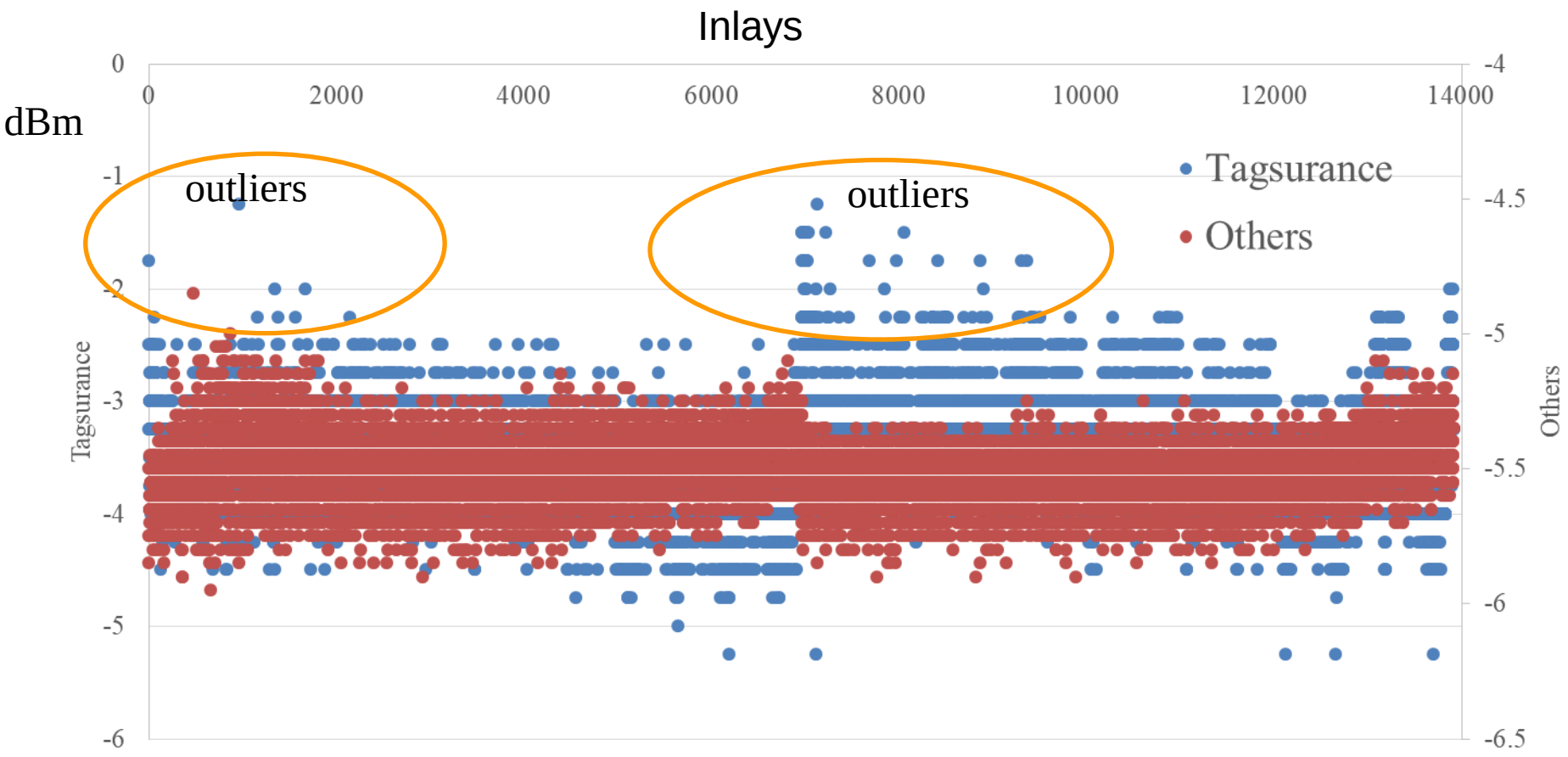
- TagSurance

- Different from the Go or No-Go of other factory's equipment.
- TS can records TID/Sensitivity, which is helpful for follow-up analysis and pinpoint the issue and help improvement of product yield.

Stable and Repeatable

- The measurement has good stability and Repeatability from tests.

Better Resolution



- Measurement Comparison of the same label, Tagsurance has better resolution to capture the outliers than other tool.

Stop the Excursion In Time

- Improve mass production yield by stopping the IC Bonding machine as it is in a poor running condition.

Summary

- DOP RD developing needs good tool like Voyantic Tagformace as a verification for the new antenna design.
- In-line monitoring is critical for the Inlay and label quality assurance, yield can be enhenced by using Voyantic Tagsurance.
- Tagsurance provides S&S a reassuring solution for real-time quality assurance, we can focus on further product development and process optimization.

Thank you for your Attention.

Time for Q&A.

- For further questions, please contact:

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  Linkedin

  http://www.dop.asia