Voyantic

The Essential Guide for UHF Tag Testing in Aerospace

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RFID tags in Aerospace

An aerospace RFID tag needs to endure harsh conditions since it may experience significant variations in temperature, humidity, and pressure.

It may even be mistreated mechanically in the application. The tags also need to perform in a very RF hostile environment surrounded by a lot of metal.

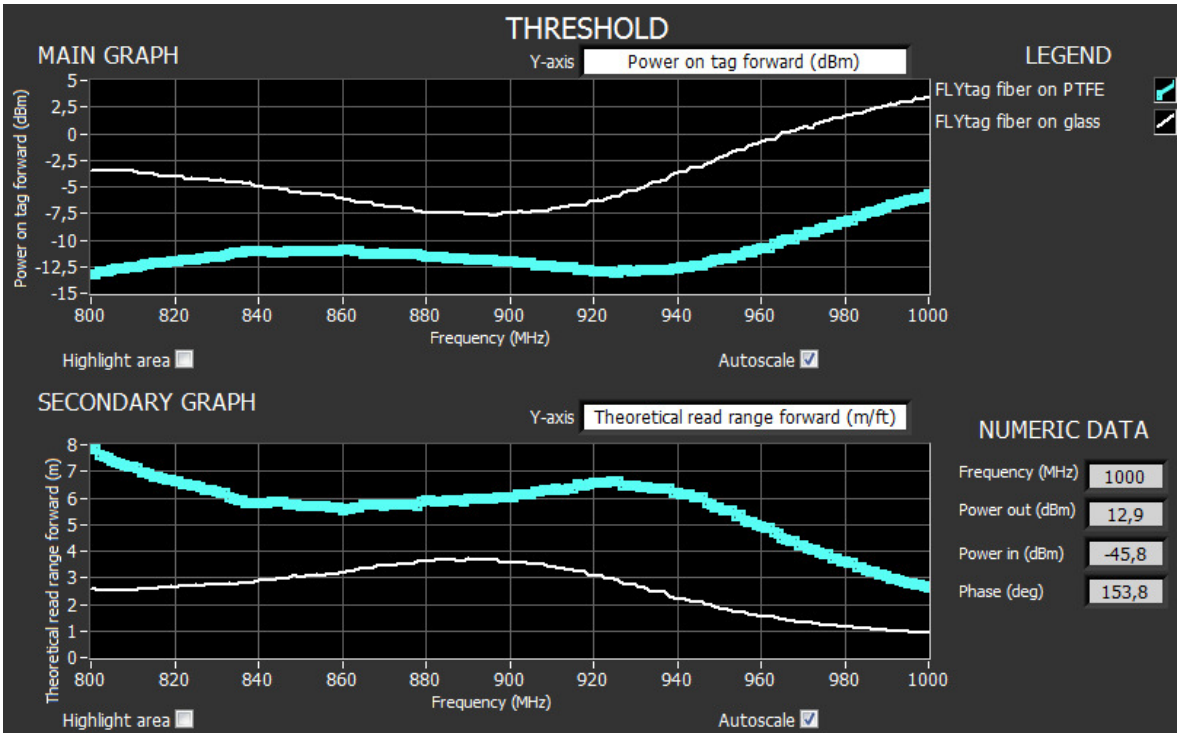
Moreover, the Air Transport Association Spec 2000 has specific requirements for the contents and organization of the tag memory.

Here are the steps that one needs to take to ensure that the RFID tags are well-tested for aerospace applications according to Voyantic engineers.

1 Verify that the tag works on both ETSI and FCC frequency bands

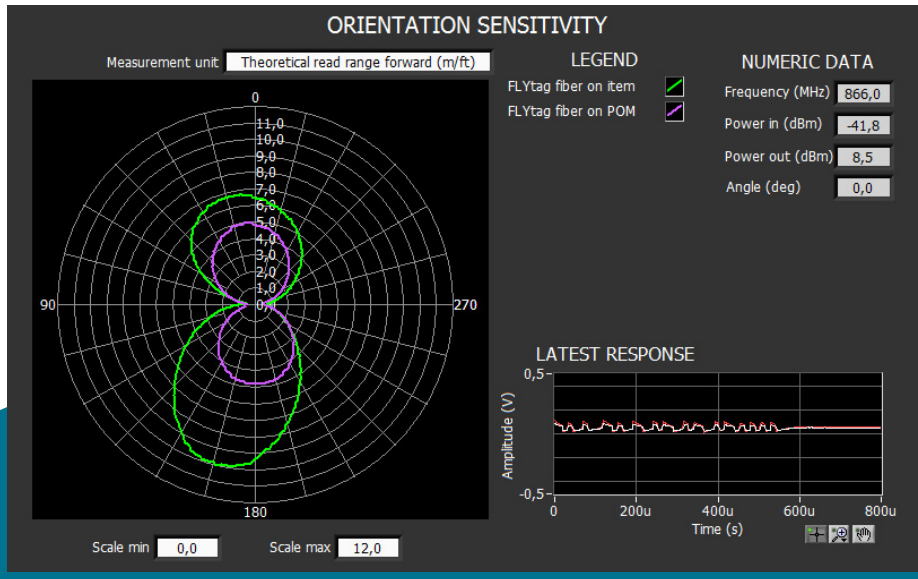
Since aerospace tags often need to be readable all over the world, it is important to verify that the tag works on both the ETSI and FCC frequency bands. As a matter of fact, the newly released AS5678B standard has performance requirements throughout the global RAIN RFID range of 865 to 930 MHz. And the material or object on which the tag is attached to will have an effect on performance as well.

Measuring the frequency response (threshold sweep) characterizes the tag or tagged item as a function of frequency, thus revealing the tuning of the tag as well as the read range that could be acquired. This measurement can just as well be used by a tag manufacturer to verify their tag design or by an RFID end-user for choosing the best tag for an application.



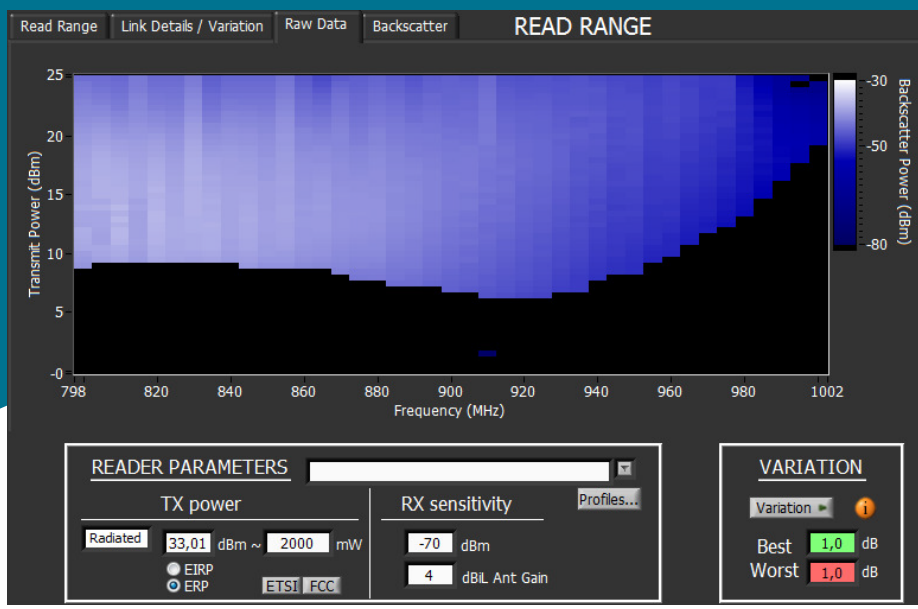
2 Ensure readability from different directions

For many applications, it is also important to be able to read the tag from different directions. The tag Orientation Sensitivity measurement allows evaluating the read performance of a tag as a function of orientation angle. Again, the item on which the tag is attached to has a big effect on the radiation pattern of the tag antenna.



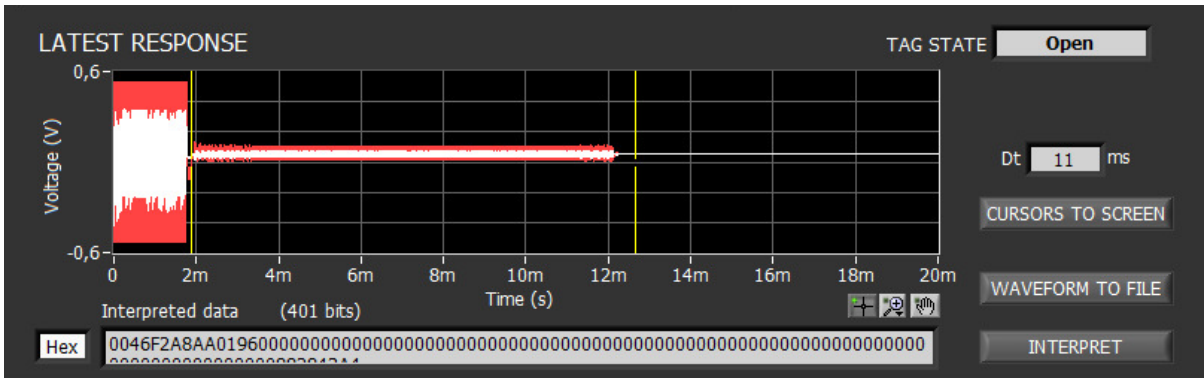
3 Measure the read range

The read range acquired by a tag can be limited by either power delivery to the tag or detecting the backscatter signal at the reader. The read range measurement takes both links into account and allows estimating the acquired read range with different reader configurations.



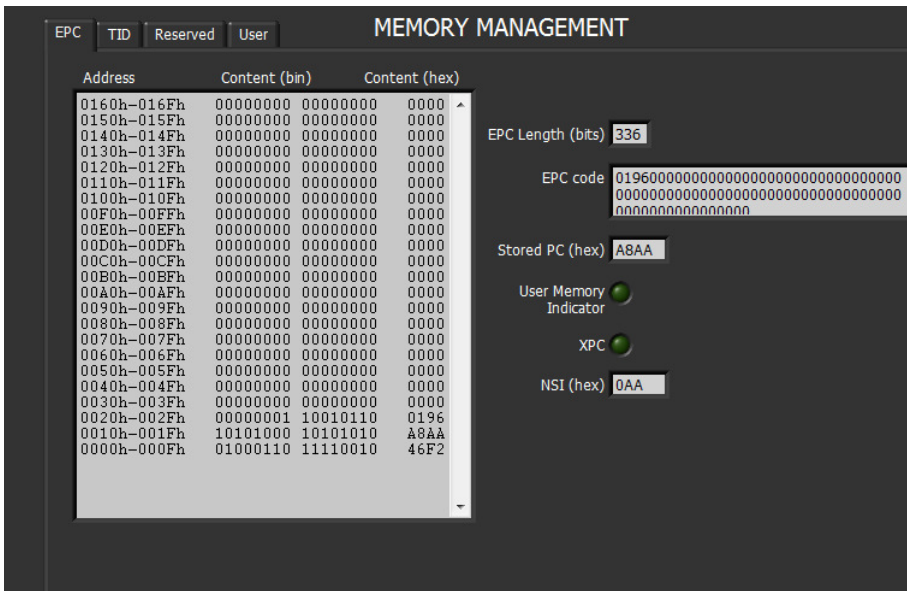
4 Test if the tag functions according to the protocol

New tag ICs keep emerging for aerospace applications. Some of them also include some special functionality that is not supported by all RFID readers. To test tag functionality, you need to send any command within the EPC Class 1 Gen 2 protocol to the tag, including any proprietary and custom commands, and to verify the answer from the tag.



5 Analyze tag memory contents

Tags designed for the aerospace industry typically feature a larger than normal memory to fulfill the requirements of ATA Spec 2000. To manage the tag memory, you would need a tool for reading and visualizing the full memory contents of a tag, as well as any changes in the memory areas.



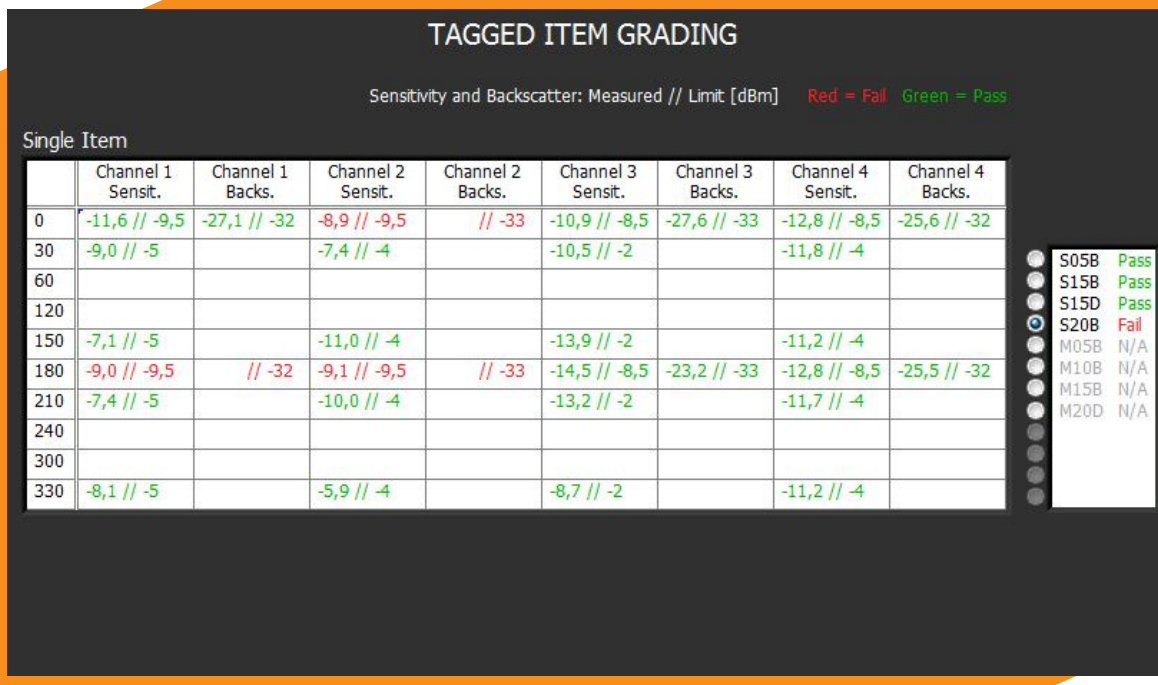
6 Test against the SAE AS5678B standard grades

The SAE AS5678 standard defines performance grades for flyable tags. The latest version of the protocol (as of May 2020), AS5678B Passive RFID Tags Intended for Airborne Equipment Use has a total of 10 grades for mounting tags on metal and plastic.

As the sensitivity of tags has improved, in more and more cases the return link from the tag to the reader may limit read range.

This is reflected in the new standard revision; in AS5678B, the grades are determined by both minimum read sensitivity and minimum backscatter.

Testing according to AS5678B is very similar to the Tagged-Item Performance Protocol (TIPP) by GS1. As a result, the TIPP measurement software works also with it.



TAGGED ITEM GRADING

Sensitivity and Backscatter: Measured // Limit [dBm] Red = Fail Green = Pass

Single Item

	Channel 1 Sensit.	Channel 1 Backs.	Channel 2 Sensit.	Channel 2 Backs.	Channel 3 Sensit.	Channel 3 Backs.	Channel 4 Sensit.	Channel 4 Backs.
0	-11,6 // -9,5	-27,1 // -32	-8,9 // -9,5	// -33	-10,9 // -8,5	-27,6 // -33	-12,8 // -8,5	-25,6 // -32
30	-9,0 // -5		-7,4 // -4		-10,5 // -2		-11,8 // -4	
60								
120								
150	-7,1 // -5		-11,0 // -4		-13,9 // -2		-11,2 // -4	
180	-9,0 // -9,5	// -32	-9,1 // -9,5	// -33	-14,5 // -8,5	-23,2 // -33	-12,8 // -8,5	-25,5 // -32
210	-7,4 // -5		-10,0 // -4		-13,2 // -2		-11,7 // -4	
240								
300								
330	-8,1 // -5		-5,9 // -4		-8,7 // -2		-11,2 // -4	

S05B	Pass
S15B	Pass
S15D	Pass
S20B	Fail
M05B	N/A
M10B	N/A
M15B	N/A
M20D	N/A

Learn more at
voyantic.com/tagformance

Voyantic solutions are designed to speed up development, improve production quality, and increase sales of RFID technology. We have a proven track record with hundreds of solutions delivered to more than 30 countries around the globe. We continuously invest in R&D and improve the technology. Our distributor network brings our products & support to customers worldwide.

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