Voyantic

Testing RF-Friendly Foams with Tagformance Pro

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1 Introduction

This application note discusses RF-friendly foam and compares different RF-friendly foam types.

2 RF-Friendly Foam

RF-friendly foam is any material, which from an RF point of view resembles air.
In practice:

- the dielectricity should be close to 1, for the material not to detune the tags, and
- RF signals should pass through the material without reflections and absorption.

RF-friendly foam is not a single material, but a class of materials. The foams are sold with various commercial names, such as Plastazote.

3 The RF-Friendly Foam Used at Voyantic

The RF-friendly foam used in tag stands with Voyantic systems is low-density polyethylene foam. The foam consists of 2.9 % polyethylene and 97.1 % air. The foam is a compromise of structural strength and “air resemblance”.

The dielectric constant of the foam is 1.0493, which is very close to a dielectric constant of pure air.

4 Testing of RF-Friendly Materials

We tested the properties of various RF-friendly materials that are generally available. These include Styrofoam and different soft packaging materials. The comparison was also made with a tag standing on a hollow cardboard tube (on-air).

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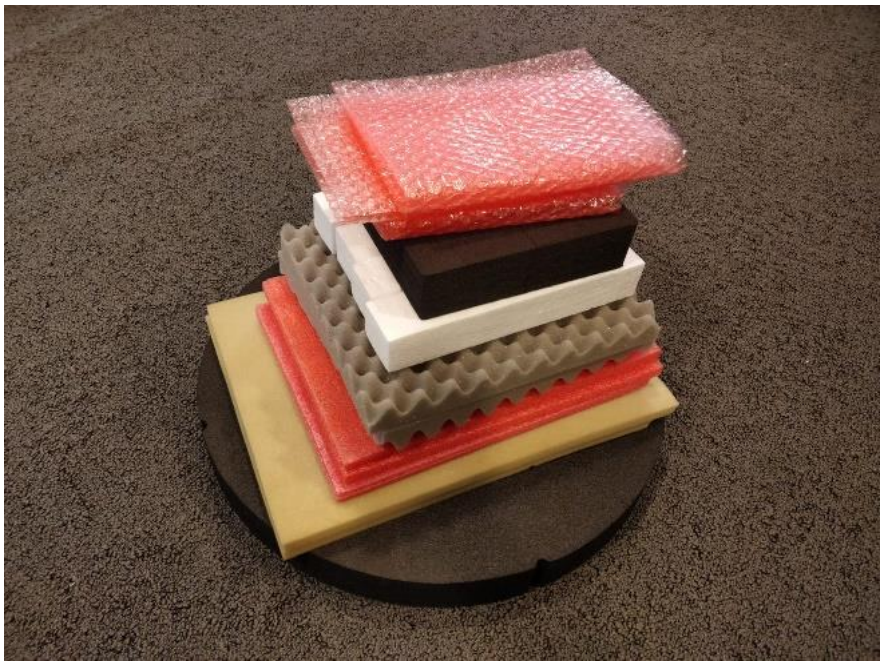
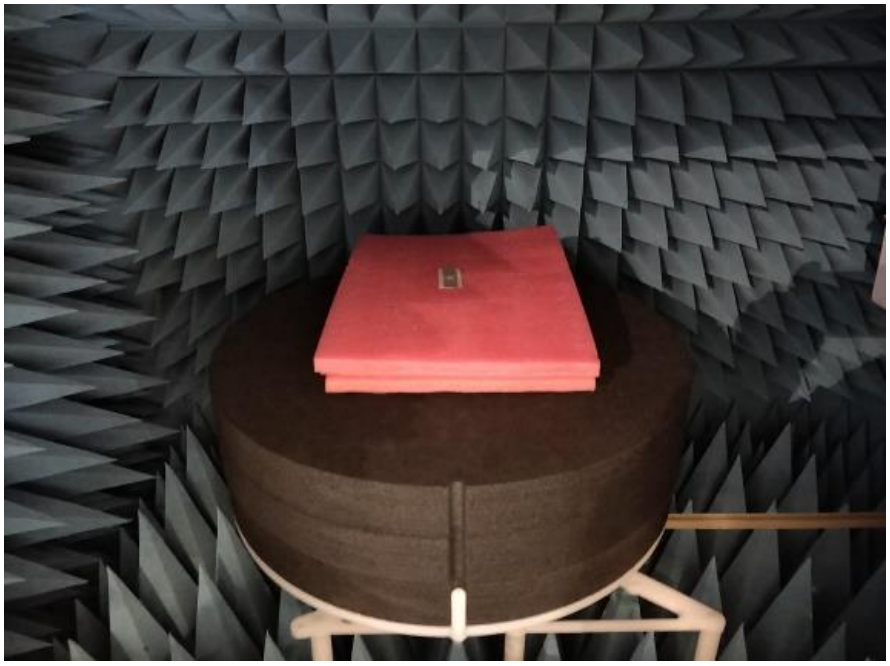


Picture 1. Selection of RF-friendly materials



Picture 2. Test setup with an RF-friendly material

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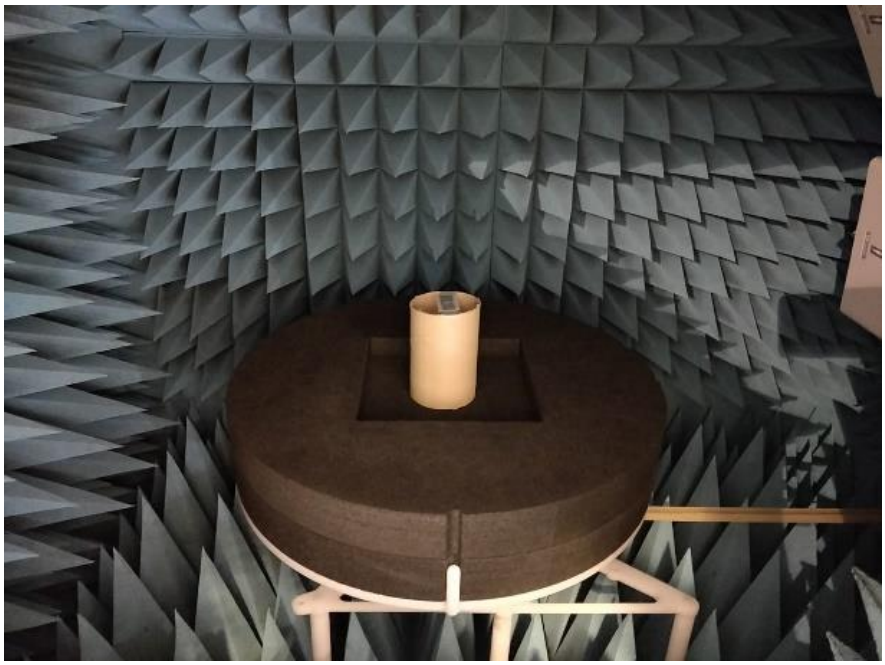
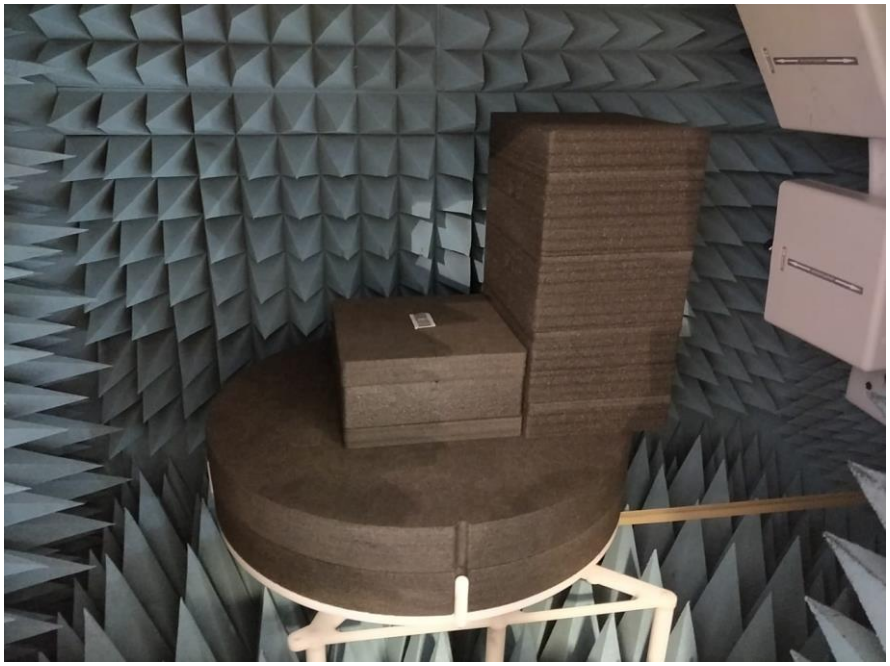


Picture 3. Test setup with a cardboard tube (tag on air)

Another test was made with RF-friendly foam shadowing the tag under testing. If the material passes RF signals, it will not change the result.



Picture 4. Test setup for shadowing test

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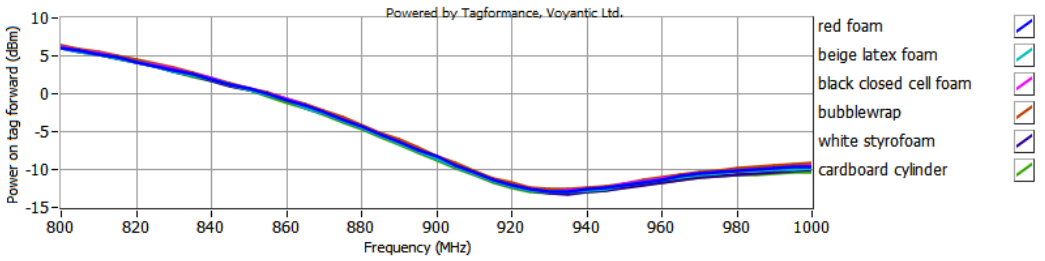
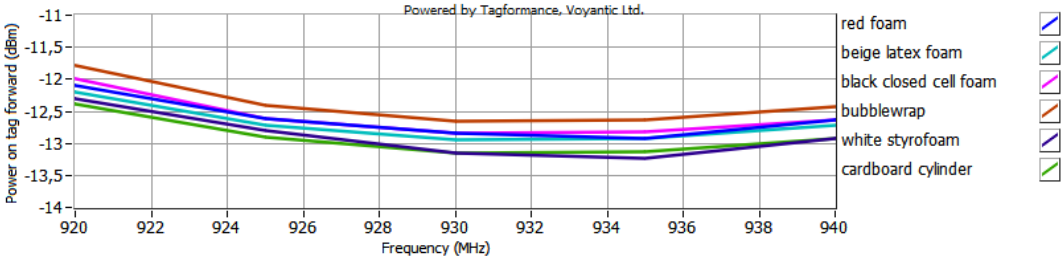
4.1 Test Results

In general, any RF-friendly foam can be used as a tag stand in RFID testing. In the below graphs, there are threshold sweeps with a tag on various RF-friendly foams. Regardless of the RF-friendly foam used, the results are close to each other.



Picture 5. Threshold Sweep – Power on Tag Forward with different RF-friendly materials

When the threshold sweep results are looked at more closely, it can be seen that all of the results are within 1 dB from each other.



Picture 6. Detail of the threshold sweep results

Even though the 1 dB difference in results cannot be attributed solely to the material in use, it includes also differences in tag placement. In a conclusion, all of the tested materials are RF-friendly.

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5 Summary

In practice, almost any RF-friendly foam can be used in testing RFID tags.

The suitability of the material can be tested by running threshold sweeps with a tag

- without additional material (tag on Voyantic Desktop Tag Stand or on Tag Rotation Table),
- additional material on top of the tag, and
- additional material shadowing the tag.

If the results are the same or similar enough in all three test scenarios, the material is RF-friendly.

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