Project Details

Name: Speedway RFID Swimming Prototype
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Work Carried Out

Extending on the initial preliminary findings to now include tests in the following areas -

- Signal strength and read count at further distances (*Dry and Wet tag*)
- Placing the tag underneath water
- On head test

Equipment used -

- Speedway Connect Reader r420
- Smartrac Frog 3D tag
- CS-777 Brickyward Near Field Antenna

Signal strength and read count at further distances

Time executed: 15 seconds (approximate - manually started and stopped)

Power: 31.5 dBm

Direct line of sight.

Height Diff refers to the difference in height between the antenna and tag with the antenna always being at the higher point. (approximate measurements)

Tag is dry

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle	Height Diff
2.75m	-69	-70.6	-74.5	640	0	10cm
2.75m	-68	-70.3	-73	660	0	10cm
2.75m	-55.5	-58.7	-60	654	80	10cm

Tag is dry

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle	Height Diff
2.75m	-59.5	-61.2	-62.5	1729	60	20cm
2.75m	-64	-69.1	-75	1727	30	20cm
2.75m	-59	-60.4	-61.5	1754	0	20cm

Tag is dry

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle	Height Diff
3m	-59.5	-60.7	-61.5	1650	0	85cm
4m	-61.5	-62.8	-64	1686	0	85cm
4m	-60.5	-62.0	-63.5	1680	0	20cm

Tag is wet

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle	Height Diff
2.75m	-62.5	-64.1	-66	1481	0	20cm
2.75m	-58	-59.3	-61	1764	60	85cm
4m	-66.5	-68.0	-70	1553	0	85cm

Placing the tag underneath water

For this the tag was placed in a bucket of water 5cm underneath the surface. The antenna was brought very close to the surface and the test started from which the following observations were made -

There were zero tag reads no matter how close the antenna was brought to the surface of the water.

Reset the modulation rate of data encoding to increase resistance to interference but there were still zero tag reads.

Reset the search mode to a single target inventory to allow for its deepest scan but there were still zero tag reads.

Reset the reader to the original settings and then started altering the angle of the tag underneath the water, rotating it through various angles from both its X and Y axis but there were still zero tag reads.

Started to “flash” the tag to the surface of the water and instantly got multiple tag reads.

As soon as the tag was put under the surface the tag reads would immediately stop but return the instant the tag was brought to the surface and stop again once brought under.

The process of bringing the tag as quickly as possible to the surface and under was repeated multiple times with moving the antenna as far up from the water surface as was possible to do with current set up (over 1m) and it yielded the same result each time, multiple tag reads at the surface.

On head test

Placed a tag (with sellotape) on the top of a standard racing swimming hat. The position of the tag was kept near the top to try and simulate close to a 0 - 20 degree angle during the test.

Note: The angles and height differences used here are very much a rough approximation as the test was conducted alone with no easy way to verify exactly but based on using certain marker points and reflections of head position an effort was made to keep the tag angle closer to 0 degrees and the height difference between the antenna and the head above 20cm (with the antenna being higher).

Time executed: 15 seconds (approximate - manually started and stopped)

Power: 31.5 dBm

Direct line of sight.

Tag is dry and placed on a swimming hat on the head

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads
2m	-66	-67.6	-69	1701
4m	-67.5	-69.1	-71	1544

Known Blockers

Currently none

Next Steps

To be decided.

Images

In the first image the chair is 4 meters away from the antenna. You can’t see it easily in the image but there is a tag lying flat that chair that was read 1680 times in 15 seconds.

In the second image you can see a sample height difference between the antenna and the tag. The tag is being tried at various angles there. This particular test was under 2 meters.

The third image shows the tag taped to a swimming hat.

The fourth image shows the position of the tag on the swimming hat on the head.