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## Project Details

Name: Speedway RFID Swimming Prototype  
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## Work Carried Out

Initially some further analysis into the various settings used by the reader but this time looking more in-depth into how the signals are specifically read and what known factors contribute to their strength, speed of being initially read, rate of being read and potential interference. Especially factors that are under configurable control.

The more detail on this the more options to be able to test and adjust later on to tackle any potential issues, especially in a pool environment.

Preliminary findings were carried out based around :

- signal strength
- read range discover
- positioning of the tag
- direct line of sight

Equipment used -

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

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

Power: 30 dBm

Tag angle: 80 degrees (approximate)

Direct line of sight.

Level of antenna to tag approximately equal (no height difference)

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads
15cm	-33.5	-38.1	-58.5	999
40cm	-41	-43.7	-53	674
50cm	-47	-49.2	-53	655
1m	-57.5	-60.7	-66	665
1.25m	-61.5	-64.1	-70	663
<b>1.5m</b>	<b>-71</b>	<b>-71.4</b>	<b>-71.5</b>	<b>27</b>

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***Moved away from the factory settings and configured the power to 31.5 dBm - which is the limit.***

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

Power: 31.5 dBm

Tag angle: 80 degrees (approximate)

Direct line of sight.

Level of antenna to tag approximately equal (no height difference)

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads
1.75m	-67	-68.6	-74.6	311
2m	-62	-67.4	-72.5	622
2.25m	-65	-68.1	-70	383
2.5m	-63	-66.0	-71.5	595
<b>2.75m</b>	<b>-71.5</b>	<b>-72.1</b>	<b>-72.5</b>	<b>47</b>

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***Adjusted the angle of the tag from 80 degrees to two other approximations at 30 & 60 degrees.***

Time executed: 15 seconds (approximate - manually started and stopped)  
Power: 31.5 dBm

Tag angle: 60 degrees for first run then 30 degrees for second run (approximate)

Direct line of sight.

Level of antenna to tag approximately equal (no height difference)

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle
2.75m	-67.5	-68.8	-71	328	60
2.75m	-66	-67.7	-69	313	30

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***Adjusted the distance back to 2 meters.***

Time executed: 15 seconds (approximate - manually started and stopped)  
Power: 31.5 dBm

Tag angle: 60 degrees for first run then 30 degrees for second run (approximate)

Direct line of sight.

Level of antenna to tag approximately equal (no height difference)

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle
2m	-55	-59.1	-67	310	60
2m	-59.9	-62.5	-65.5	334	30

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***Adjusted the height of the Antenna in relation to the Tag. Put the Antenna approximately 13cm higher than the Tag. Also tested Tag at zero degrees.***

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

Power: 31.5 dBm

Tag angle: In order of 60 degrees, 30 degrees and 0 degrees (approximate)

Direct line of sight.

Level of antenna to tag: 13cm higher (approximate)

Distance	Max RSSI	Avg RSSI	Min RSSI	No. Reads	Tag Angle
2m	-62	-63.3	-64.5	301	60
<b>2m</b>	<b>-52</b>	<b>-52.7</b>	<b>-53.5</b>	<b>300</b>	<b>30</b>
2m	-60	-60.7	-61.5	300	0

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## Known Blockers

Currently none

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## Next Steps

To extend the current set of measurements based around the following configurations -

*Read rate*

*Response time*

*Session*

*Search Mode*

*Reader Mode*

Having already set some baseline measurements allows to further test which of these could influence the RSSI.

*"While the RSSI is a good indicator of how well each tag will respond in a similar environment, RSSI alone is not a reliable measurement to use when calculating tag distance. Instead other tag data values such as the tag's read rate and response time should be used in addition to RSSI"*

We have captured *Read Rates* but currently not the *Response Time*.

In addition to these it is worth configuring and testing other potential read rates by changing the modulation scheme that encodes the data.

Further to response time and changing the read rates the *Session* and *Search Modes* can be further investigated.

The *Sessions* impact on when a tag will respond to a query from a reader and allows tags to maintain independent states when communicating with multiple readers.

Various *Search Modes* associated with the *Sessions* can be set to establish different types of persistence which can be used in controlling the state within the read zone more accurately.