

## Appendix A: RFID Testing

\* Note: Confidential information is redacted.

# RFID Signal Strength Testing Results



## Testing Procedure

### Hardware:

- Antenna fixture: Stack discs to change ring height (25 total heights tested)
  - Small discs (S0-S4)
  - Large discs (L0-L5)
- RFID Reader

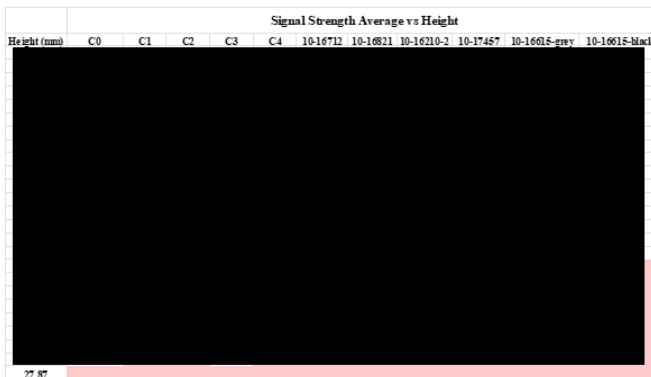
### Software:

- The RFID reading program loops through a user input range of heights. For each height, it will read the ring 20 times. It will store each read as a separate row in the data view, as well as one row of "analyzed" data for every 20 readings (each height).
- Manually change the height and click read. Repeat for each ring/height.



Record 20 readings of each height:	Height (mm)
No discs	
S0	
S0+ S1	
S0+S1+S2	
S0+S1+S2+S3	
L0	
L0+S0	
L0+S0+S1	
L0+S0+S1+S2	
L0+S0+S1+S2+S3	
L0+L1	
L0+L1+S0	
L0+L1+S0+S1	
L0+L1+S0+S1+S2	
L0+L1+S0+S1+S2+S3	
L0+L1+L2	
L0+L1+L2+S0	
L0+L1+L2+S0+S1	
L0+L1+L2+S0+S1+S2	
L0+L1+L2+S0+S1+S2+S3	
L0+L1+L2+L3	
L0+L1+L2+L3+S0	
L0+L1+L2+L3+S0+S1	
L0+L1+L2+L3+S0+S1+S2	
L0+L1+L2+L3+S0+S1+S2+S3	
2	
L0+L1+L2+L3+S0+S1+S2+S3	
2+S3	

## Data: Breakdown



### Control Rings:

- 5 rings tested
- 2500 total readings stored (20 reads per height, 25 total heights)

### Test Rings:

- 6 rings tested
- 3000 total readings stored (20 reads per height, 25 total heights)

### Raw Data Stored:

- Test height
- Signal strength
- Ring information

### Analyzed Data Stored:

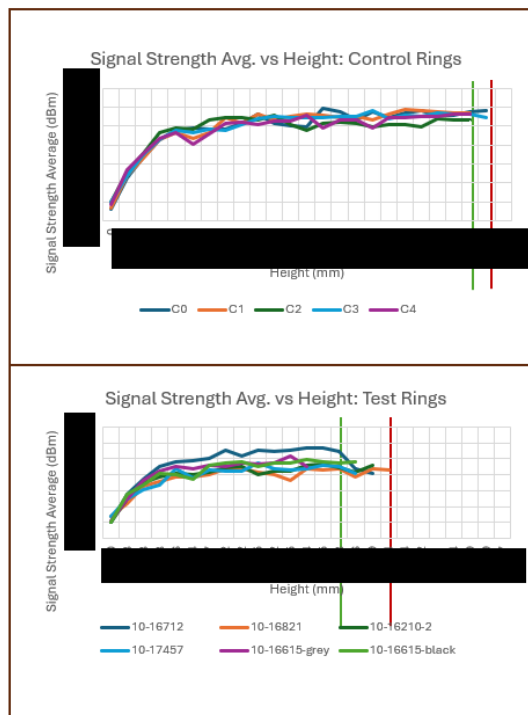
- One row per ring, per height:
  - Average signal strength
  - Standard dev.
  - Max & Min strength
  - Range

## Results

	Control	Test
Earliest Point of Failure (mm)	[Redacted]	[Redacted]
Furthest Read (mm)		
Max Height for 100% Success Rate (mm)		

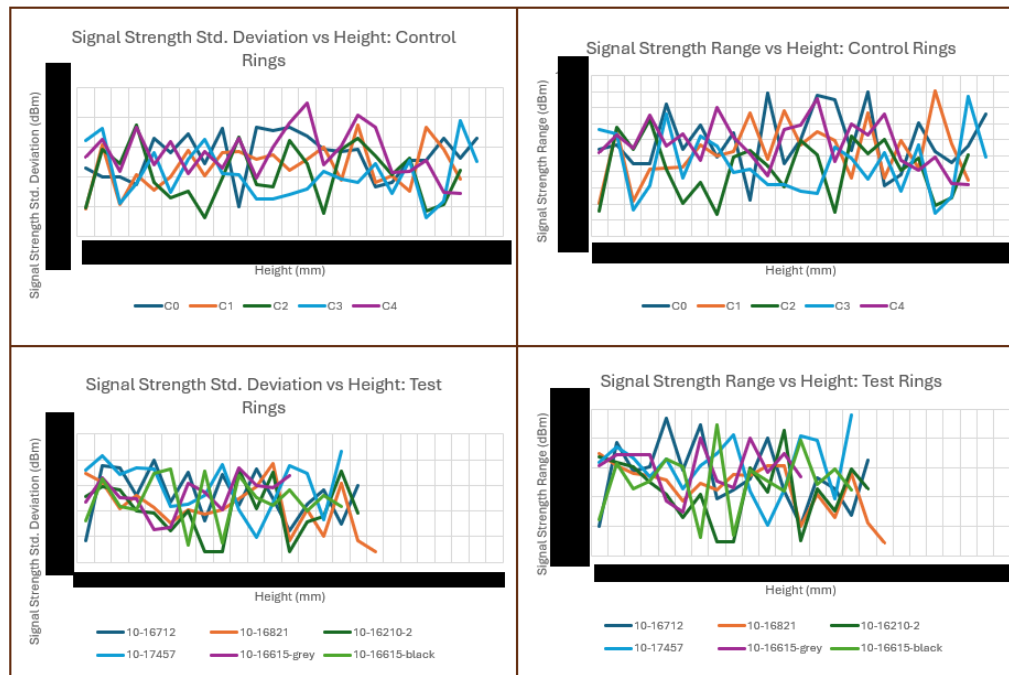
### Key Findings:

- All of the test (RMA) rings stop reading much lower/closer to the RFID reader. There is a [Redacted] mm difference between the maximum height each group had a 100% success rate at reading.



Furthest Read

Max Height for 100% Success Rate



## Findings:

- Difference in distribution for Signal Strength Standard Deviation and Range are not significantly different between the control & test ring groups.