Investigate Shielding for Wireless Testing

Tawhai Wade
Business & Digital Technologies
Ara Institute of Canterbury
tawhai.wade@outlook.com

ABSTRACT

This paper describes the processes and methods followed while completing the "Investigate Wireless Shielding for Wireless Testing" research project. This project formed the basis of a work-integrated learning program as part of the Bachelor of Information and Communication Technologies at Ara Institute of Canterbury in 2021.

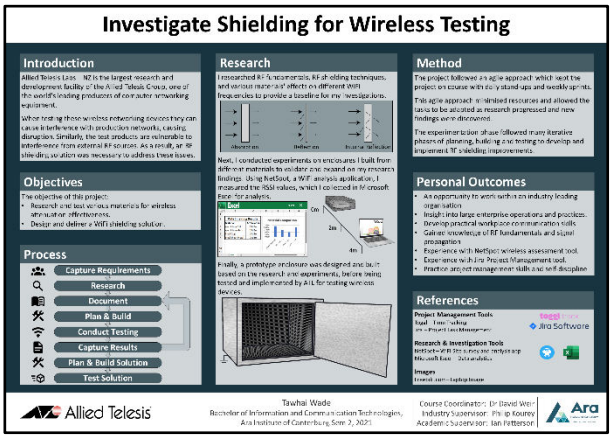
Keywords: Wireless Attenuation, Radio Frequency (RF) Interference, IEEE 802.11

1. INTRODUCTION

Allied Telesis Labs – NZ conduct performance and quality control testing on wireless access points (APs) produced by the Allied Telesis Group to ensure they are ready for the global market.

Testing wireless equipment can be a complex task. For example, operating multiple APs alongside production networks can introduce radio frequency (RF) interference to those production wireless networks in the form of co-channel interference (Metageek, 2013). Additionally, many variables, such as other wireless networks and electronic devices, can affect testing results (Ladbury, Coder, Koepke, & Young, 2015).

ATL–NZ required a wireless shielding solution to enable them to test wireless infrastructure products in a controlled testing environment, reducing interference from wireless testing on nearby production networks while also reducing the impact of those production networks on observed testing results. This requirement formed the primary objectives for the project.



2. PROCESS

Overview of the project process

The project consisted of several phases. The key phases involved research, conducting experiments and observations, and delivering a final solution.

Each major phase was followed by a report or review presented to all project stakeholders throughout the project. This interaction was beneficial in conveying progress while providing an opportunity for identifying issues and resolving problems.

Research Phase

The first of three challenges of this project required the research and documentation of Wireless Propagation and Radio Frequency principles to understand the problems observed by ATL-NZ and to embark on a design-through-prototyping journey. The research was conducted in an iterative process of discovery & reflection as wireless concepts were uncovered and understood. The research phase came to a completion with the preparation of the research findings report. This report details the key findings relevant to designing and building an effective solution for RF signal attenuation.

Experiments and Observations

Experimentation was an iterative process of planning and construction followed by testing and documenting the results. This iterative process provided discovery of key solution factors, including the importance of RF sealing, shielded cables, electrical grounding and the benefit of layered materials.

Research findings were next used to plan a testing methodology and identify possible materials suitable for RF attenuation. The defined testing methodology utilised data capture of RSSI information recorded from the NetSpot application into Microsoft Excel. Results then required statistical analysis of captured datasets averaging results to normalise data and remove noise & interference.

Ultimately, the comparison of results required a benchmark measurement taken of the unshielded AP, with this benchmark then subtracted from each averaged enclosure result. This process provided the measured attenuation of the respective test enclosures & materials experiments.

3. FINAL SOLUTION

Findings from research and experimentation provided a starting point for the prototype design. The experimentation suggested layered materials would provide the best attention results alongside shielded cabling and grounding the enclosure components.

Construction was phased over several days, preparing the selected materials, assembly, and quality and testing overview. As a result, the enclosure was found to meet the basic requirements outlined in the research findings, such as electrical continuity of all material components and effectively grounded shielded ethernet cable penetration.

Testing the prototype was conducted onsite at ATL-NZ following a similar testing methodology to the experimentation phases, with data collection accelerated due to time constraints and established baseline performance. change

4. CONCLUSION

ATL–NZ required a wireless shielding solution to improve outcomes for testing their wireless networking equipment onsite in their NZ and Japan-based offices. The primary goal of this project was to design a solution to reduce interference from wireless testing on nearby production networks while also reducing the impact of those production networks on observed testing results.

The solution presented as part of this project meets these primary requirements with measurable success. In addition, the written deliverables and reports provide ATL-NZ with a foundation of knowledge to expand and develop the prototype solution.

Throughout the project, the student developed confidence and experience while working in a professional environment. Many research materials and resources contained complex principles describing wireless propagation and how wireless signals travel through different materials. These resources provided a comprehensive learning opportunity for the student. The student was presented with a broad range of opportunities requiring academic learnings to be translated into tangible workplace experience. These learnings will be helpful in the student's career and future projects and endeavours.

5. REFERENCES

Ladbury, J., Coder, J., Koepke, G., & Young, W. (2015, July). Complexities of Testing Interference. *National Institute of Standards and Technology Technical Note 1885*, 2. Retrieved November 29, 2021, from https://dx.doi.org/10.6028/NIST.TN.1885

Metageek. (2013, 01 07). *Adjacent and Co-Channel Interference*. Retrieved 11 29, 2021, from Metageek.com: https://www.metageek.com/training/resources/adjacent-channel-congestion.html