

Computer Engineering - Networks, Hardware, 5G Antennas

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Lab reports contain the production process from start to finish with any invention or product. Much like engineering and manufacturing a product, the reports also contain charts, graphs, and data for trial-and-error phases. Academia reports are broken down into eight specific sections. These are as followed: title, abstract, the introduction, the various methods used for testing, the results and discussion, and lastly, the conclusion. In some scenarios, where a lab is present with pictures and graphs, there could possibly be multiple more sections to explain the specific process. The three articles that are going to be analyzed are: “*The development of a hardware- and software-based simulation platform for the training of driver candidates,*” “*Application and Analysis of Computer Network Technology in Electronic Information Engineering,*” and “*Design of circular-shaped microstrip patch antenna for 5G applications.*” With the first report, its entirety is based around the process of creating a driving platform for drivers in training. The second report discussed the computer network technology application. The last report detailed about designing an antenna and its process. As many people have cell phones or tablets with cellular technology, 5G infrastructures, hardware, and networks will continue to grow into bigger and overall better products.

The title of any report or article must be engaging to its readers. Readers will decide whether the lab report is specific and relevant to them. The third report, titled, *Design of circular-shaped microstrip patch antenna for 5G applications*, goes a bit more in detail on what type of patch antenna will be used. Adding 5G applications benefits this report as there are many other types of network applications/infrastructure, such as 4G or even 3G. The first report, titled, *The development of a hardware- and software-based simulation platform for the training of driver candidates*, also details what specific type of platform the test is being demonstrated on. The people who are going to be testing the platform are also mentioned in the title, so the reader

knows the “Who” component. The second report, titled, *Application and Analysis of Computer Network Technology in Electronic Information Engineering*, is very broad and does not give any specific details. Two of the three lab reports followed a similar title structure with specifics and the writers of the reports had a similar mindset when coming up with a great title to entice their readers.

An overview of what will be discussed about in the lab report is presented next, known as the abstract. The last report by Altufaili, Najaf, and Idan, incorporates a well-developed abstract piece with their tested experiments and what the results were (an example of this would be from page nineteen: “The proposed antenna has three resonant frequencies 41.08 GHz with a return loss of -12.4 dB, 47.4 at -18.86 dB and 54.1 at return loss -24.3 dB”). Additionally, some of the steps through their testing process were used in the abstract. The abstract starts off on page with “Using circular geometry has a great influence on many fields of science and engineering, one of which is antenna” and ends with “A computational process is conducted and analyzed by the use of computer simulation technology microwave studio.” The second report by Kang and Xiao, did not contain specific details on what the lab report will be about. No numbers or data were mentioned in said abstract. The first report by Cavusoglu and Kurnaz contains much more information compared to the second report. As mentioned before, like the second report, the first lab report was also vague with no specific details (numbers, charts, nor data). With this, the last report includes a much more interesting to read abstract as it has actual data and numbers with the microstrip antenna.

The introduction is the next important part of a lab report as the introduction usually incorporates definitions of complex or unclear words, background research, explanations of certain problems going on in a city or county (for example), and the overall study is examined.

The first report, by Cavusoglu and Kurnaz, details an in-depth introduction. In the introduction, the specific topics are brought in to cover what paragraphs/sections will be discussed in the report. However, With the introduction for the second report, it contains more sentences than its abstract, however, most of its introduction describes what the electronic information engineering system is. In the title alone, electronic information engineering is mentioned, however, there are no charts, graphs, or data. Additionally, with the second report, the sections that will be discussed is buried at the very end. The third report, by Altufaili, Najaf, and Idan, starts off with listing the sections the report will be going over or will be discussed, giving the reader ideas right off the bat, instead of at the very end. Additionally, their introduction section contains research and numbers on the different bands' carriers would use. At the end of the introduction section, Altufaili, Najaf, and Idan discuss the aim of their work, starting with designing a printed antenna, evaluating the results, and obtaining frequency ranges for 5G applications. With the introductions, the third report incorporates a well-round introduction piece over the first and second reports, with more data and research done.

The next several body paragraphs contain the various methods for testing. In the first report, by Cavusoglu and Kurnaz, the program is broken down into the different components inside the simulation/training program. These include traffic environment, the rule(s) of the training simulator, rules for traffic, turning functions, speed limits, the traffic lights, changing lane, parking/stopping in lanes, and the message system. The sections are numbered two to two-point-five. The second report by Kang and Xiao details the algorithm making (with the  $f(x)$  functions), decision making (along with the accompanying flow chart), and the framework for the simulation. The sections in this report are numbered three/three-point-one to three-point-three. The third and final report, by Altufaili, Najaf, and Idan, starts off with the theory of the

antenna, then moves onto the proposed circular microstrip antenna, the geometry of the antenna (with pictures of how the antenna would look like), and the specific port. In this report, the sections numbered are labeled two to four-point-six. With this, the first report has more sections breaking down each specific component. Although the first report, within the sections listed, has pictures, it is mostly tables, and not enough scientific data with graphs and charts. Like the first report, the second report has little to no pictures, merely  $f(x)$  functions and one flowchart, with no scientific data with proper charts/graphs. The third report, however, has scientific charts and data, including four graphs of the magnitude of the antenna in decibels, and physical visuals of the antenna, the port, and the 3D polar plot. To conclude the various methods or processes, the third report was the strongest out of the all three as it had a detailed methods section with the charts and graphs to support what the authors were writing and testing.

The second-to-last section for a lab report is to discuss or go over the results with the reports. The first report, by Cavusoglu and Kurnaz, had a dot plot/chart on the results of the test assessment questionnaire. Additionally, there were percentages discussed in the results. “As the results suggest, the users gave 4 and 5 points to the TSS for the adequacy of training in simulated traffic, with a rate of 63%-88% in terms of capability of training and realism” (Cavusoglu and Kurnaz, p. 140). The second report’s results had a function table, language tables, a target scheme table, and a chart based on said function table. The last report did not specifically have a results section, however it did have a conclusion.

The last and final component for a lab report is the conclusion, summarizing the whole lab report in one to two paragraphs. The first report had a detailed conclusion; however, I would say that it is not better than the other two lab reports. This is because towards the end of the paragraph, the authors talked about the feedback messages and how they are saves. This

conclusion paragraph did not discuss what procedures the authors will take to improve on the training simulation. The second report's conclusion was also not a good candidate as it went more in depth on the fuzzy algorithm/fuzzy multi-objective group topics. Even though these topics might be explained early on, the readers might be left confused and not want to read on further on how the authors would improve on the computer network technology. The last report's conclusion was a good choice, as although this paragraph was two small paragraphs, it listed the frequencies at the end as well as having what process or steps the authors will take to improve on the future builds of the antenna.

Overall, to officially conclude, the lab report that had the most research and data was *Design of circular-shaped microstrip patch antenna for 5G applications* by Altufaili, Najaf, and Idan. The information was well presented with each specific part dedicated to their own separate sections as not to leave the readers confused. The charts and graphs were intriguing to look at and visually pleasing.

### References

- Altufaili, M. M. S., Najaf, A. N., & Idan, Z. S. (2022, February). *Design of circular-shaped microstrip patch antenna for 5G applications*. Tekkomnika. <https://web-s-ebshost-com.ccnny-proxy1.lib.ccnny.cuny.edu/ehost/detail/detail?vid=8&sid=171b071c-82c1-4920-a3ab-080afbfe802a%40redis&bdata=JnNpdGU9ZWZWhvc3QtbGl2ZQ%3d%3d#AN=154703861&db=a9h>
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