Appendix 4A

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

INDUSTRIAL TRAINING REPORT

AUTOMATION TEST SCRIPT DEVELOPMENT FOR IOT0047A REGULATORY COMPLIANCE TEST SOFTWARE

By

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2023/2024

BACHELOR OF COMPUTER SCIENCE (GRAPHICS AND MULTIMEDIA SOFTWARE)

TRAINING PLACE : KEYSIGHT TECHNOLOGY MALAYSIA SDN. BHD.
BAYAN LEPAS FREE INDUSTRIAL ZONE PHASE 3,
11900 BAYAN LEPAS, PULAU PINANG, MALAYSIA

TRAINING PERIOD : 25th SEPTEMBER 2023 – 9th FEBUARY 2024

SUPERVISORS : MR. NG POH SING
DR. SIM HIEW MOI

REPORT DATE : 25th SEPTEMBER 2023

ACKNOWLEDGEMENT

First and foremost, I would like to express my gratitude to my organization supervisor, Mr. Ng Poh Sing for his guidance, assistance and mentorship throughout the whole industrial training period. I want to convey my sincere appreciation to him for offering the crucial feedback, helpful criticism and suggestions during the internship. The internship would not have been the same without his sharing of enlightening knowledge. Additionally, his astute observations and helpful critiques have been crucial in enhancing the material and guaranteeing the quality of the report and logbook. I want to also extend my heartfelt thanks to the colleagues of my department for their kind hospitality, assistance, and readiness to share their knowledge. My learning was supported by the inclusive and cooperative work atmosphere, which also gave me the opportunity to actively participate in worthwhile initiatives.

Besides that, I would like to also express my deepest thanks to my faculty supervisor, Dr. Sim Hiew Moi, for her steadfast encouragement and guidance the industrial training. She has played a significant role in shaping the result of the report and logbook by carefully reviewing and offering insightful commentary on every part. I truly appreciate that she made the effort to visit my internship company, allowing for insightful discussions with the staff of my company. I would like to also thank everyone in the industry who helped me to successfully complete my internship and write this report. Specifically, I would want to thank my family for their constant backing and encouragement. Finally, but just as importantly, I would want to express my thanks to my partner for all her support, love, and affection during the internship.

ABSTRACT

Industrial training equips students with crucial practical knowledge and skills, fostering their development into successful and top-notch professional engineers. The primary aim of this training is to impart the finest and pertinent theoretical and practical knowledge within a specific timeframe. The industrial training has taken place in the company, Keysight Technologies Malaysia Sdn Bhd. The internship period is 20 weeks from 25th of September 2023 to 9th of February 2024. My organization supervisor is Mr. Ng Poh Sing and my faculty supervisor is Dr. Sim Hiew Moi. In this internship, I have involved in a main project named as Automation Test Script Development for IOT0047A Regulatory Compliance Test Software. In this project, I have gained hands-on experience on implementing the Eggplant Functional to execute user interface (UI) and functionality testing on the Keysight IOT0047A Regulatory Compliance Test Software. Keysight IOT0047A Regulatory Compliance Test Software is mainly used to conduct regulatory compliance tests for Bluetooth and wireless devices operating in the 2.4GHz, 5GHz, and 6GHz (Wi-Fi 6E) bands. Eggplant Functional is known as a black-box graphical user interface (GUI) test automation tool that utilizes the SenseTalk programming language. I have also learned to employ various Keysight Instruments such as signal generator and signal analyzer to execute the testing. During the internship, I have successfully completed several tasks or projects and achieved the following outcome such as performance enhancing and efficiency improving for existing XA5002A automation test scripts, development of test script for XA5002A for the sections that are not covered in previous test scripts, complete Eggplant automation test script development for XA5006A and contribution on PathWave Software Solutions (PSS) proof of concept (POC). Furthermore, I have encountered several challenges and problems and resolved them with approaches such as thorough research and study as well as trial and error method. Throughout the internship in Keysight Technologies, I have acquired and enhanced on various skills including technical skills, time management and problem-solving. I have also participated in several activities held in the company such as Keysight Penang and Singapore Innovation Fair and Keysight Chief Executive Officer (CEO) Coffee Talk.

ABSTRAK

Latihan industri melengkapkan pelajar dengan pengetahuan dan kemahiran praktikal yang penting, mempromosikan pembangunan mereka menjadi jurutera profesional yang berjaya dan terkemuka. Matlamat utama latihan ini adalah untuk menyampaikan pengetahuan teoritis dan praktikal yang terbaik dan relevan dalam tempoh masa tertentu. Latihan industri telah diadakan di syarikat, Keysight Technologies Malaysia Sdn Bhd. Tempoh latihan industri ialah 20 minggu dari 25 September 2023 hingga 9 Februari 2024. Pengawas organisasi saya ialah Mr Ng Poh Sing dan pengawas fakulti saya ialah Dr Sim Hiew Moi. Dalam latihan ini, saya telah terlibat dalam projek utama yang dinamakan Pengembangan Script Ujian Automation untuk Perisian Ujian Kepatuhan Peraturan IOT0047A. Dalam projek ini, saya telah memperoleh pengalaman praktikal dalam melaksanakan Eggplant Functional untuk menjalankan antara muka pengguna (UI) dan ujian fungsi pada Perisian Ujian Kepatuhan Peraturan Keysight IOT0047A. Keysight IOT0047A Perisian Ujian Kepatuhan Peraturan digunakan terutamanya untuk menjalankan ujian kepatuhan peraturan untuk peranti Bluetooth dan peranti wayarles yang beroperasi dalam band 2.4GHz, 5GHz dan 6GHz (Wi-Fi 6E). Eggplant Functional dikenali sebagai alat automasi ujian antara muka pengguna grafis kotak hitam (GUI) yang menggunakan bahasa pemrograman SenseTalk. Saya juga telah belajar untuk menggunakan pelbagai teknologi Keysight seperti generator isyarat dan analis isyarata untuk menjalankan ujian. Semasa latihan industri, saya telah berjaya melengkapkan beberapa tugas atau projek dan mencapai hasil berikut seperti peningkatan prestasi dan peningkatan kecekapan untuk skrip ujian automasi XA5002A yang sedia ada, pembangunan skrip peperiksaan untuk XA5002A untuk bahagian-bahagian yang tidak disenaraikan dalam skrip pengujian terdahulu, penyelesaian lengkap skrip ujian automasi Eggplant untuk XA5006A dan projek tentang PathWave Penyelesaian Perisian (PSS) bukti konsep (POC) sumbangan. Selain itu, saya telah menghadapi beberapa cabaran dan masalah dan menyelesaikan mereka dengan pendekatan seperti penyelidikan menyeluruh dan kajian serta kaedah percubaan dan kesilapan. Sepanjang latihan industri di Keysight Technologies, saya telah memperoleh dan meningkatkan pelbagai kemahiran termasuk kemahiran teknikal, pengurusan masa dan penyelesaian masalah. Saya juga telah mengambil bahagian dalam beberapa aktiviti yang diadakan di syarikat seperti Keysight Penang dan Pameran Inovasi Singapura dan Ketua Pegawai Eksekutif (CEO) Keysight Coffee Talk..

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LIST OF ABBREVIATIONS

AI	-	Artificial Intelligence
API	-	Application Programming Interface
CEO	-	Chief Executive Officer
DPI	-	Dot Per Inch
EMI	-	Electromagnetic Interference
FCC	-	Federal Communications Commission
GB	-	Gigabyte
GEMS	-	General Electrical Management Solution
GHz	-	Gigahertz
GPU	-	Graphics Processing Unit
GUI	-	Graphical User Interface
IEEE	-	Institute of Electrical and Electronics Engineers
IoT	-	Internet of Things
IP	-	Internet Protocol
KCC	-	Korea Certification
MIC	-	Ministry of Internal Affairs and Communications
MIMO	-	Multiple-Input Multiple-Output
OCR	-	Optical Character Recognition
PSS	-	PathWave Software Solutions
R&D	-	Research and Development
RAM	-	Random Access Memory
RDP	-	Remote Desktop Protocol
SDLC	-	Software Development Lifecycle
SISO	-	Single-Input Single-Output
SRRC	-	State Radio Regulation of China
SUT	-	System Under Test
TCP/IP	-	Transmission Control Protocol/Internet Protocol
UI	-	User Interface
UTM	-	Universiti Teknologi Malaysia
VNC	-	Virtual Network Computing

Wi-Fi	-	Wireless Fidelity
WLAN	-	Wireless Local Area Network

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Industrial training equips students with crucial practical knowledge and skills, fostering their development into successful and top-notch professional engineers. The primary aim of this training is to impart the finest and pertinent theoretical and practical knowledge within a specific timeframe (*INDUSTRIAL TRAINING*, n.d.). This chapter will discuss on the details of the organization that involved in this industrial training program including organization's core business, activity, structure and many more. Besides that, the information of the department and the training program in which the training takes place and planned by organization will be reviewed.

1.2 Organization Background

The company that I have joined during this industrial training is Keysight Technology Malaysia Sdn. Bhd. According to Keysight (2018a), Keysight is a company that serves as a collaborative partner in innovation, providing cutting-edge design, emulation, and test environments to accelerate development and deployment processes with reduced risk across the product life cycle. Keysight empowers visionaries to explore, conceptualize, and bring revolutionary technologies to fruition. Their software-driven solutions span the design and development landscape, allowing customers to expedite the delivery of groundbreaking innovations with enhanced efficiency and minimized risk.

They provide services and products that can break through the limits of engineering by swiftly addressing electronic design, network emulation, and testing

complexities, shaping unparalleled product experiences and enhance product experiences using their integrated technologies, profound measurement expertise, and customized solutions developed through co-innovation with leaders in the industry ecosystem. In addition, they can also enhance the design and development workflow, optimize the network, and leverage artificial intelligence (AI) and digital twins to pioneer solutions in the realms of 5G and 6G, Internet of Things (IoT), and quantum computing. They also allow the user to access insights earlier, enabling them to confidently build and bring their products to market (Keysight, 2018a). Figure 1.1 below displays the logo of the company, Keysight Technologies Malaysia Sdn. Bhd.

Figure 1.1 Logo of the Company (Keysight, 2018a)

1.3 Organization Structure

Figure 1.2 below displays the organization structure of my department, General Electronics Management Solution (GEMS) R&D Software. Mr. Ng Poh Sing, who works as R&D Project Manager, is my organization supervisor for this industrial training.

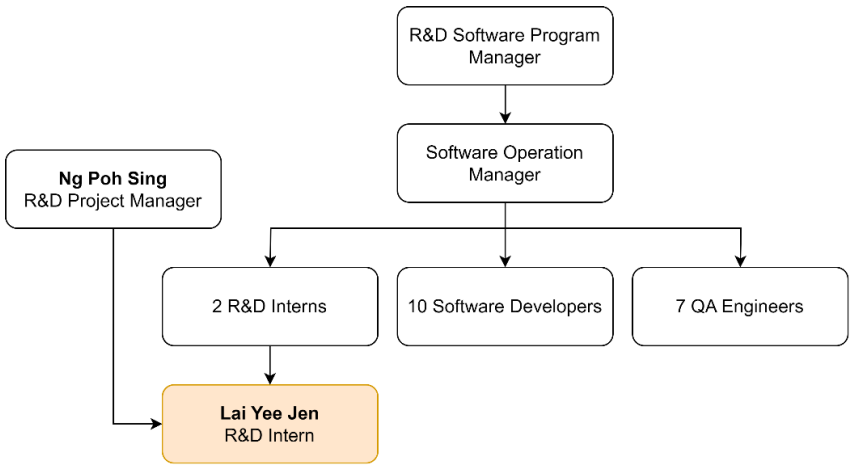


Figure 1.2 Organization Chart of GEMS R&D Software

1.4 Supervisors and Student Information

1.4.1 Faculty Supervisor Information

Name	:	Dr. Sim Hiew Moi
Phone	:	+6016 - 8557648
Email	:	hiewmoi@utm.my
Position	:	Lecturer

1.4.2 Company Supervisor Information

Name	:	Ng Poh Sing
Phone	:	+604 - 6808813
Email	:	poh-sing.ng@keysight.com
Position	:	R&D Project Manager

1.4.3 Student Information

Name	:	Lai Yee Jen
Matric No.	:	A20EC0061
Course	:	Bachelor of Computer Science (Graphics and Multimedia Software)
Phone	:	014-2290938
Email	:	laijen@graduate.utm.my

1.5 Department Information

The department of my industrial training is General Electronics Management Solution (GEMS) R&D Software. This department is located in Building B of Keysight Technology Malaysia Sdn. Bhd. at Bayan Lepas Free Industrial Zone Phase 3,11900 Bayan Lepas, Pulau Pinang, Malaysia.

This department is mainly about designing, developing, and maintaining software solutions that align with the objectives of GEMS R&D. GEMS R&D Software is committed in delivering the pioneer solutions to engineers, researchers, and industry experts in the realm of electronic testing and measurement who depend on accurate measurements for creation, validation and production of electronic devices or software. This department also implements innovative and efficient coding practices to enhance the functionality and performance of GEMS together with establishing and enforcing rigorous testing procedures to guarantee the reliability, security, and quality of the software products developed by the department.

Mr. Ng Poh Sing is my supervisor. He is an R&D project manager who is responsible for overseeing the entire lifecycle of Keysight IOT0047A Regulatory Compliance Test Solution. From defining scopes and objectives to managing resources and budgets, he ensures the project's successful execution, in alignment with the organization's goals. Additionally, he also serves as a software architect, spearheading the design of the next-gen Keysight N9048B PXE Electromagnetic Interference (EMI) Receiver.

1.6 Internship Gantt Chart

The Gantt chart of my industrial training is shown in Appendix A. It includes the activities and tasks that are assigned and planned by the organization throughout the internship period. The internship period lasts for 20 weeks from 25th of October 2023 until 9th of February 2024.

1.7 Conclusion

This chapter summarized and provided a comprehensive overview of the information and background of the organization joined during the industrial training program, covering aspects such as the organization's core business, activity, structure,

and other relevant factors. Additionally, the information such as supervisor, student and department information were also discussed in this chapter.

CHAPTER 2

SPECIFIC DETAILS ON PROJECT/TRAINING

2.1 Introduction

This chapter will discuss and review on the specifications of the projects done, and the training conducted during the industrial training period. The industrial training lasted for 20 weeks from 25th September 2023 to 9th February 2024. This chapter will also describe on the objectives, execution, output, system testing, hardware and software specifications and many more of the projects done. Besides that, the problem faced during completion and time taken to complete all the tasks are also included in this chapter.

The main project that was carried out during the internship period is Automation Test Script Development for IOT0047A Regulatory Compliance Test Software. This project revolves around developing and constructing the test script using the software, Eggplant Functional to automate the process of testing the interface of the IOT0047A Regulatory Compliance Test Software. The IOT0047A Regulatory Compliance Test Software consists of few modules, including XA5001A, XA5002A, XA5003A, XA5004A, XA5005A, XA5006A, XA5007A and XA5008A as shown in Figure 2.1 below. Each of the modules is responsible for the latest regulatory compliance test for Bluetooth devices and wireless device operating in 2.4GHz, 5GHz, 6GHz bands of different countries.

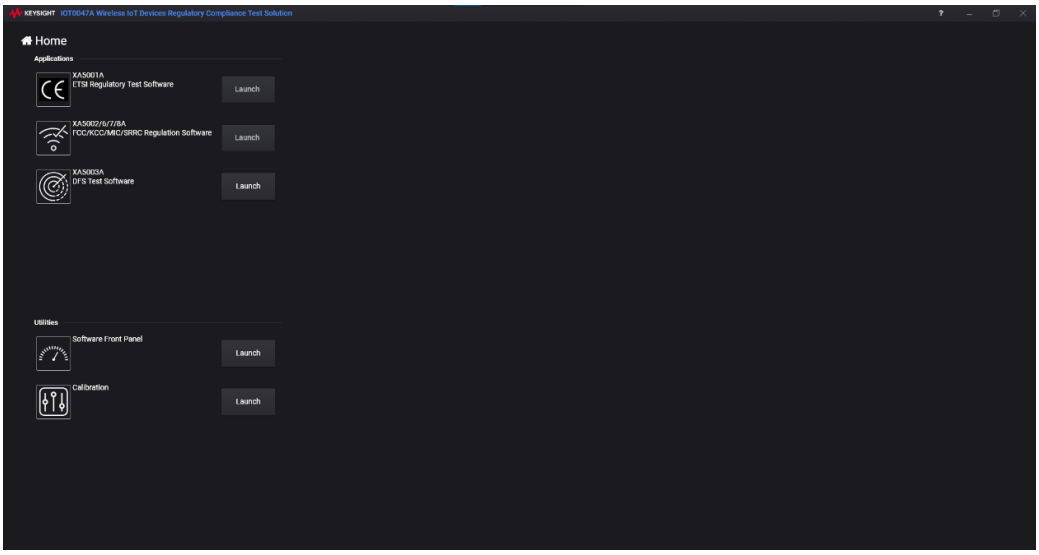


Figure 2.1 Main Menu Interface of the IOT0047A Regulatory Compliance Test Software

This project also involves in familiarize IOT0047A Regulatory Compliance Test Software for the modules of XA5002A, XA5006A, XA5007A, XA5008A and test scripts created by previous developers to test on the user interface (UI) module of XA5002A. The project then proceeds to refining and increasing the efficiency of the test scripts on testing the UI of module XA5002A. Furthermore, the project requires to develop the complete full automation test scripts for the module XA5006A by using the flow of the test script in testing module XA5002A as reference.

2.2 Objectives of Project / Training

The objectives of the project are:

(a) To develop and construct the automation test script using the software Eggplant Functional to automate the process of testing the UI of the IOT0047A Regulatory Compliance Test Software.

(b) To refine the existing test scripts to increase the efficiency of the test script in testing the UI of the IOT0047A Regulatory Compliance Test Software.

(c) To modify and optimize the current test script by removing or eliminating the unused or duplicated part in order to reduce redundancy.

2.3 Main Project: Automation Test Script Development for IOT0047A Regulatory Compliance Test Software

The IOT0047A Regulatory Compliance Test Software is a software developed by Keysight Technologies that is able to conduct regulatory compliance tests for Bluetooth and wireless devices operating in the 2.4GHz, 5GHz, and 6GHz (Wi-Fi 6E) bands. In the hyperconnected Internet of Things (IoT) world, wireless connectivity plays a crucial role in lots of aspects. Prior to market deployment, each wireless device must undergo comprehensive regulatory testing. Wireless technologies are rapidly advancing to meet the demanding needs of IoT applications. Regulatory standards are revised on a regular basis to ensure interference-free, efficient utilization of wireless spectrums (Keysight Technologies, 2023).

Regulatory testing is a complicated, time-consuming, and costly process that consists of immediate influences on the project timeline and the new product launch period. Therefore, careful planning of regulatory testing within the project schedule is imperative. The Keysight IOT0047A Regulatory Compliance Test requires some instruments such as signal generator and signal analyzer as shown in the example in Figure 2.2 to act as a solution that simplifies and streamlines testing for unlicensed bands wireless devices of 2.4GHz, 5GHz, or 6GHz. This solution is adaptable to a broad range of IoT device types, including common radio formats, multiple-input multiple-output (MIMO) up to eight channels, adaptivity, and frequency hopping (Keysight Technologies, 2023).

Figure 2.2 Example System Configuration of IOT0047A Regulatory Compliance Test Solution (Keysight, 2018b)

In the IOT0047A Regulatory Compliance Test Software, it consists of a few different modules that each symbolize the regulation standard of different countries. The modules that are covered in the project are XA5002A for Federal Communications Commission (FCC), XA5006A for Korea Certification (KCC), XA5007A for Ministry of Internal Affairs and Communications (MIC) and XA5008A for State Radio Regulation of China (SRRC). The user interfaces (UI) of each of the modules in the IOT0047A Regulatory Compliance Test Software are tested using the automation test scripts developed in the Eggplant Functional software in order to save time and energy instead of doing it manually.

Eggplant Functional is known as a black-box graphical user interface (GUI) test automation tool. Eggplant Functional employs a dual-system framework, comprising a controller machine for script authoring and execution, and a system under test (SUT) that is hosting a Virtual Network Computing (VNC) server. The connection to the VNC server can be established through Eggplant Functional's integrated viewer using Transmission Control Protocol/Internet Protocol (TCP/IP), or it can connect to a system supporting Remote Desktop Protocol (RDP). Essentially, any system equipped with a VNC server has the potential to serve as a SUT. (*Getting Started With Eggplant Functional | EPF Docs*, 2023)

With Eggplant Functional, scripts form the foundation of automated testing. SenseTalk is a language for creating scripts that resembles English and is used to

operate the SUT (*Creating Scripts With Eggplant Functional | EPF Docs*, 2023). SenseTalk is define as a high-level object-oriented interpreted scripting language built on a modular, extendable architecture. With the help of SenseTalk, the user may interact with the computer, access all of the features and make use of its capabilities in a way that is simple and easy to comprehend. (*About SenseTalk | EPF Docs*, 2023). Hence, this project revolves around developing and creating the test script using Eggplant to automate the process of testing the UI of the IOT0047A Regulatory Compliance Test Software.

2.3.1 Project Execution

The project execution first started from the installation of the IOT0047A Regulatory Compliance Test Software with the license provided by the company following by the process of researching and studying of the IOT0047A Regulatory Compliance Test Software using the documentations provided in the software. Besides that, participation in the session of knowledge sharing from the senior colleagues is occurred to assist in better understanding of the usage of the user interface (UI) and software itself. Other than that, the concept of wireless local area network (WLAN) and Institute of Electrical and Electronics Engineers (IEEE) 802.11 is also researched and studied to have a clearer view on the area of project execution.

In addition, the second computer device is given to act as the controller machine for the script execution of Eggplant Functional. Eggplant Functional is then installed with the license given by the company for internal usage. The language used in the software and software itself are studied with the documentation and online resources provided for that software. Eggplant Functional test scripts are then able to be executed on the computer device that has the IOT0047A Regulatory Compliance Test Software installed. This computer device has played the role of system under test (SUT). The connection between two devices is then set up using the Virtual Network Computing (VNC) server and the Internet Protocol (IP) of the SUT. Figure 2.3 below shows the interface of Eggplant displayed in the machine controlling the SUT.

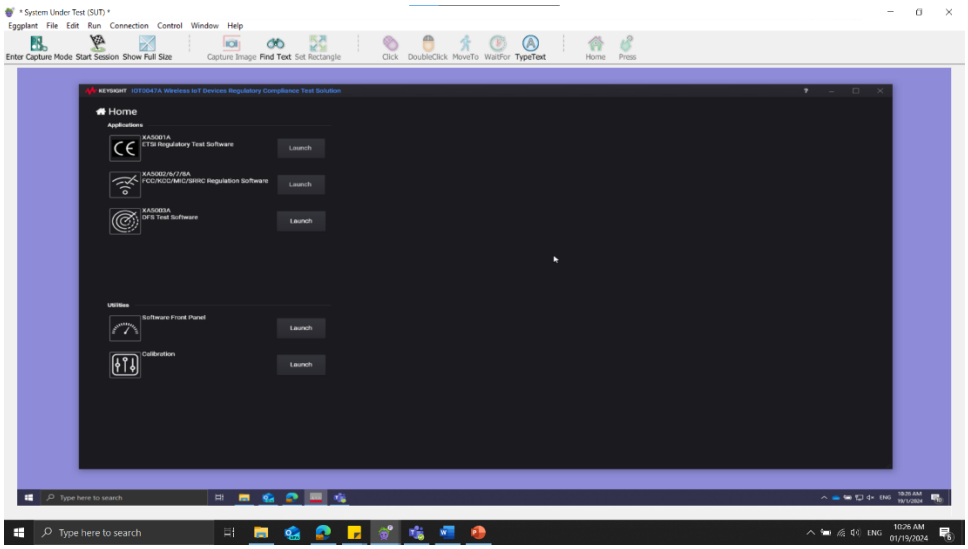


Figure 2.3 Interface of Eggplant Functional Displayed in the Machine Controlling the SUT

In the IOT0047A Regulatory Compliance Test Software, each of the module XA5006A, XA5007A and XA5008A have mostly similar interface with some minor differences in the specification of the regulations compared to the module XA5002A. All modules consist of these several parts including Instrument, Parameter, Sequence Setup, Test Procedure, Test Result and Export as shown in Figure 2.4 below. Hence, this project mainly is to automate the process of testing the interface of the IOT0047A Regulatory Compliance Test software of module XA5006A of each of the parts listed above. This can be done by executing the test scripts developed and constructed with Eggplant Functional.

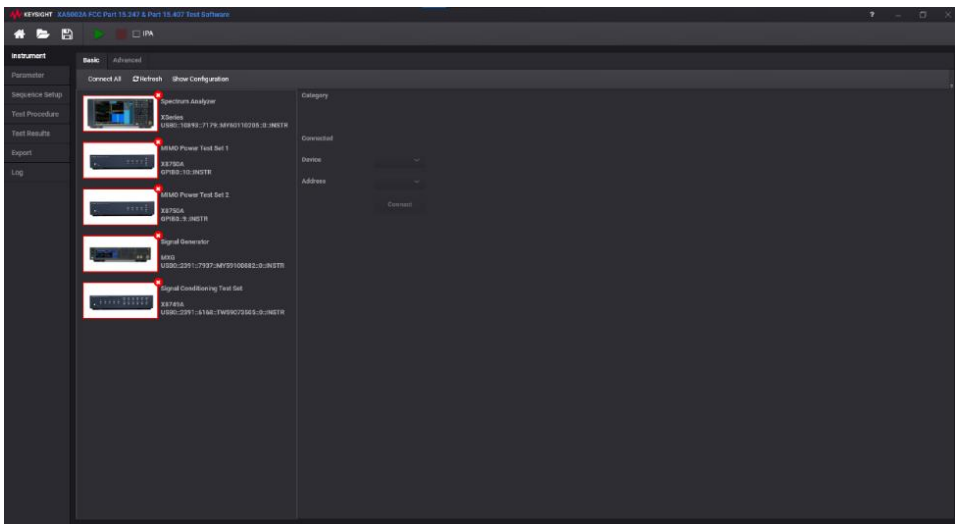


Figure 2.4 Interface of the module XA5002A

The main purpose of the test scripts is to automate the process of assuring the quality of the software in order to save the resource and time instead by doing the whole process manually. Before starting the development of the test scripts, the existing test scripts created by previous developer used to execute testing on the UI of the module XA5002A is then given from the senior colleague to familiarize the workflow of testing the interface. While familiarizing the test scripts, the project also requires enhancing and increasing the efficiency of the previous test scripts used to test the UI of module XA5002A. In order to minimize the redundancy of the current test scripts, unnecessary or duplicated portions of the test scripts are removed or eliminated to optimize the performance of the automation test scripts in testing the UI.

Furthermore, the project involved in generating ideas for developing the test script for several troublesome and tricky parts that have been skipped during development by previous developers and constructing the test script based on the ideas established. After refining and familiarizing the existing test script, the development of the automation test scripts used to test the UI of module XA5006A began by referring to the workflow of previous test scripts. The development process started with the first section of the software, Instruments and progressed towards the last section, Export. When testing the Instrument and Test Result part, the essential instruments used to execute the regulatory compliance test are connected to the system under test (SUT). Each critical and crucial functionality and features as well as the specific terms in the UI of the IOT0047A Regulatory Compliance Test Software are tested using the developed automation test scripts to ensure the quality of the software.

2.3.2 Project Output

The developed test scripts are saved in a suite with the module name respectively such as “XA5006A KCC”. The automation of the process is split into few scripts separated according to the sections such as Instrument, Parameter and others in the IOT0047A Regulatory Compliance Test Software. For example, the whole Instrument part of the software is tested by running one main script using a single click on the execution button. Similarly, the other sections are mostly tested by running one

main script respectively for easier maintenance. Hence, there will be several main scripts created as the script to be executed as shown in the upper left panel of the interface of the Eggplant Functional in Figure 2.5 below.

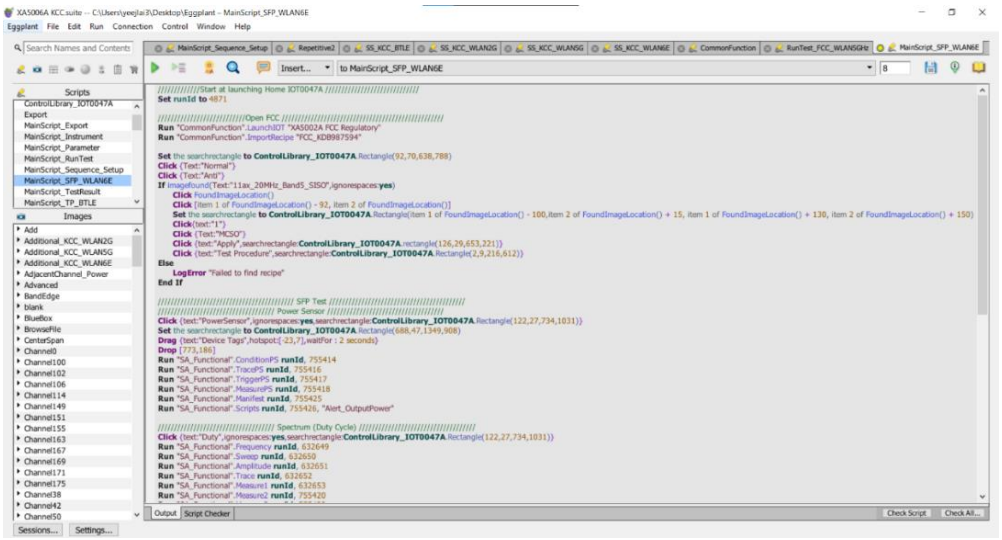


Figure 2.5 Interface of the Eggplant Functional Opening a Suite

In the main scripts, there are functions that will be called to carry out different actions and these functions are saved in different script files for tidier and more sorted out script, besides to reduce redundancy by calling the function with one line instead of duplicating the same whole function for several times. The automation process executed in the test scripts can be divided into several sections including validating the spelling of the terms used and the visuals showed are accurate, ensuring the buttons work and displaying the correct information when clicked, modifying the value of the parameter, validating the upper and lower boundary of the parameter, ensuring the result generated as well as the file exported is accurate and precise.

In most of the test scripts developed during the project execution, it specifies the coordinates to allow the program to first draw a search rectangle in yellow outline. This will identify and narrows the search area for the Optical Character Recognition (OCR) feature in the Eggplant Functional to search for a certain term or image on the system under test (SUT). This helps to ease and decrease the time taken needed for the searching process due to the smaller searching region. The program then starts searching for the certain parameter such as some texts to validate their spelling or even

to navigate in the UI by clicking on the text or searching for a button or image to ensure the UI of the software is properly displayed or functioned. When certain parameter is found in the interface of the SUT, it will display a green rectangle around the found location as shown in Figure 2.6 below together with the specified search rectangle.

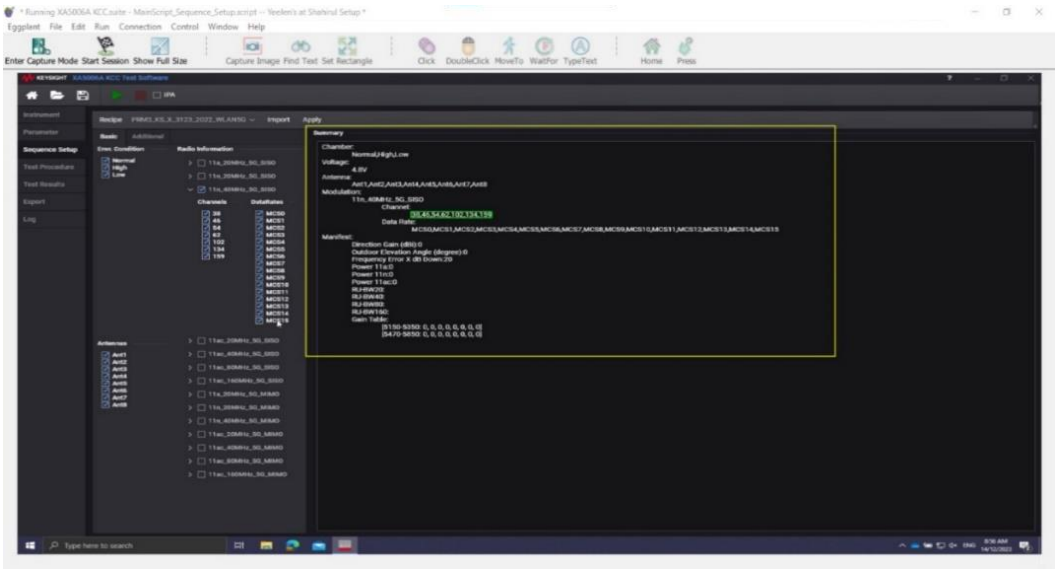


Figure 2.6 Execution of Test Script testing Sequence Setup

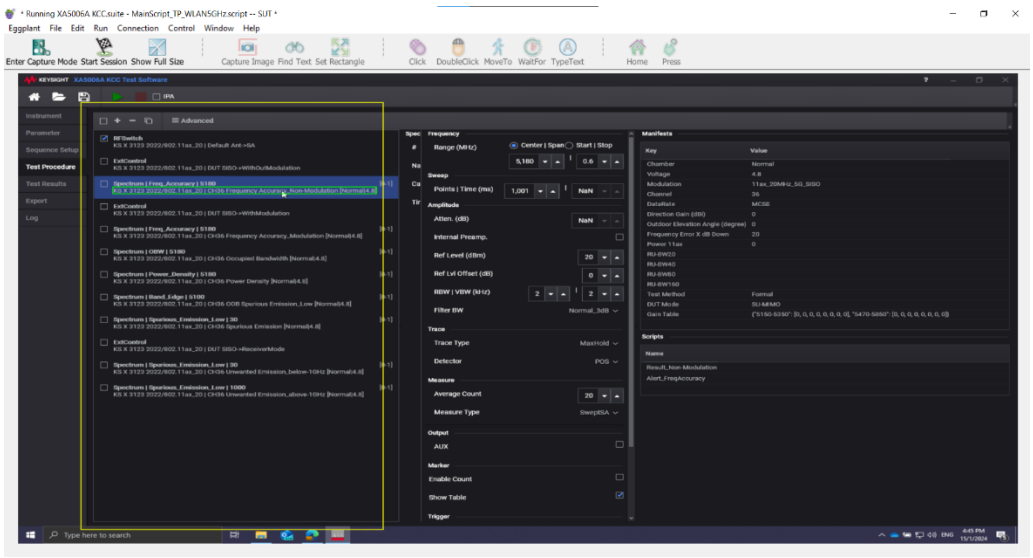


Figure 2.7 Execution of Test Script testing Test Procedure

The images used to carry out validation are also pre-defined and saved in the suite as shown in the lower left panel of the interface of the Eggplant Functional in Figure 2.8 below. The automation test scripts are capable of testing all the different

sections of the IOT0047A Regulatory Compliance Test Software and ensuring their functionality and quality. The testing of each section can used up to several hours and the automation testing process can help to optimize resource allocation and time efficiency by transitioning from manual testing to automated testing methodologies.

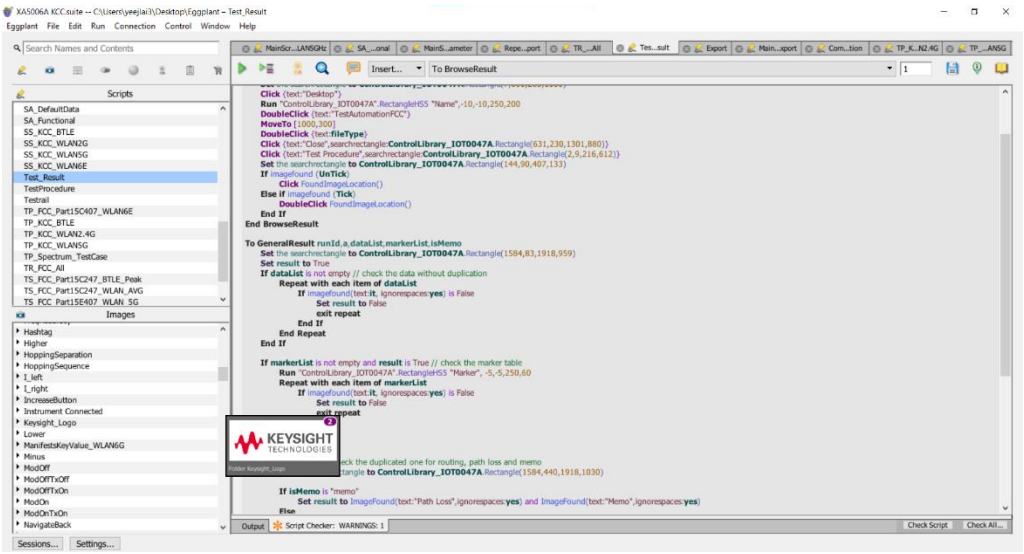


Figure 2.8 Interface of Eggplant Functional with Image Preview Prompt from Pointing One of the Image in Image Panel

In addition, performance enhancing and efficiency improving for existing test scripts used to test the module XA5002A has carried out before the development of the automation test scripts of the module XA5006A. The functions of the existing test scripts are mostly unified, and the unused or redundant part of the scripts are eliminated. Besides that, the previous test scripts are also refined with better ideas that allows the execution to achieve higher performance and accuracy. Figure 2.9 below shows one part of the test script before modifying and Figure 2.10 below displays the modified version of the test script shown in Figure 2.9.

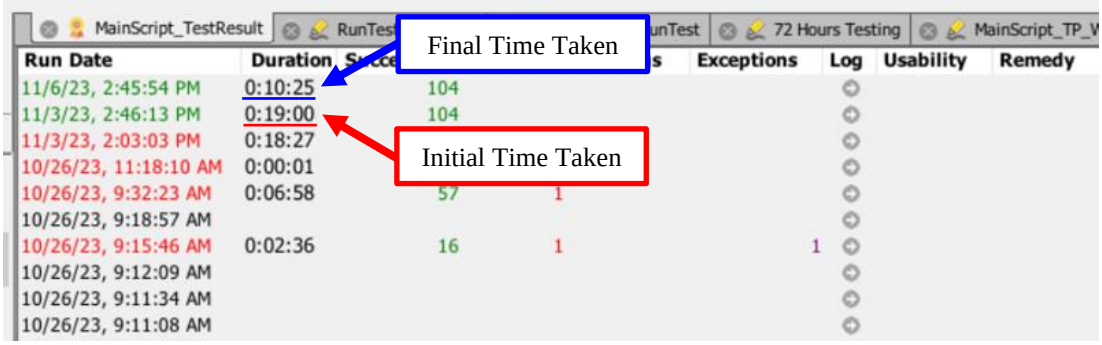
```
To NameCategory Text,Name1,Name2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,710,1047)
    Click{text:Text,ignorespaces:yes}
    set result to imagefound{text:Name1,ignorespaces:yes} or imagefound{text:Name2,ignorespaces:yes}
    Testrail.Update result, runId, a //NameCategory Ouput power"
End NameCategory

To NameCategory2 Text,Name1,Name2,runId,a,b
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,710,1047)
    Click item b of EveryImageLocation{text:Text,ignorespaces:yes)
    If imagefound{text:Name1,ignorespaces:yes) >1 then
        set result to true
    End If
    Testrail.Update result, runId, a //NameCategory Ouput power"
End NameCategory2

To NameCheckBox Text,Text2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click {text:Text,ignorespaces:yes}
    Click {text:Text,ignorespaces:yes, HotSpot:[-80,10]}
    Run "ControlLibrary_IOT0047A".RectangleHS Text2
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox

To NameCheckBox2 Text,Text2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click item 3 of everyimagelocation(text:Text,HotSpot:[-80,10])
    Run "ControlLibrary_IOT0047A".RectangleHS Text2
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox2

To NameCheckBox3 Text,Text2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click {text:Text,ignorespaces:yes}
    Click {text:Text,ignorespaces:yes, HotSpot:[-380,-6]}
    Run "ControlLibrary_IOT0047A".RectangleHS Text2
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox3

To NameCheckBox4 Text,Text2,runId,a,HS1,HS2
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click {text:Text,ignorespaces:yes}
    Click {text:Text,ignorespaces:yes, HotSpot:[HS1,HS2]}
    Run "ControlLibrary_IOT0047A".RectangleHS Text2
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox4

To NameCheckBox5 Text,Text2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    wait 10
    Click item 2 of everyimagelocation(text:Text,HotSpot:[-80,10])
    Run "ControlLibrary_IOT0047A".RectangleHS Text2
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox5

To NameCheckBox6 Text,x,y,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click {text:Text,ignorespaces:yes}
    Click {text:Text,ignorespaces:yes, HotSpot:[x,y]}
    Run "ControlLibrary_IOT0047A".RectangleHS Text
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox6

To NameCheckBox7 Text,x,y,x1,y1,x2,y2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click item 2 of everyImageLocation(text:Text,ignorespaces:yes)
    Click item 2 of everyImageLocation(text:Text,ignorespaces:yes, HotSpot:[x,y])
    Set result to ImageFound(imageName:"Tick",SearchRectangle:ControlLibrary_IOT0047A.Rectangle(x1,y1,x2,y2))
    Testrail.Update result, runId, a //Check box
End NameCheckBox7

To NameCheckBox8 Text,Text2,runId,a
    set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,680,1047)
    Click item 1 of EveryImageLocation(text:Text,ignorespaces:yes)
    Click item 1 of EveryImageLocation(text:Text,ignorespaces:yes, HotSpot:[-80,10])
    Run "ControlLibrary_IOT0047A".RectangleHS Text2
    Set result to ImageFound("Tick")
    Testrail.Update result, runId, a //Check box
End NameCheckBox8
```

Figure 2.9 One Part of the Test Script before Modifying

```
To Name_List List1, runId, a
    If param(5) is not empty
        Set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(item 1 of param(5) - 300, item 2 of param(5) - 40, item 1 of param(5) + 300, item 2 of param(5) +20)
    Else
        Set the searchrectangle to ControlLibrary_IOT0047A.Rectangle(122,68,700,1047)
    End If
    Put "CommonFunction".checkText(List1) into tempList
    Set result to item 2 of tempList
    If result is True
        Run "ControlLibrary_IOT0047A".RectangleHS5 item 1 of tempList, -200,-35,50,20
        If ImageFound("Untick") then Click FoundImageLocation()
        Set result to ImageFound("Tick")
    End If
    Testrail.Update result, runId, a
End Name_List
```

Figure 2.10 One Part of the Test Script after Modifying

Figure 2.11 below shows the comparison of the time taken to execute one of the test scripts in the Eggplant Functional execution log. The initial time taken to execute that test script was 19 minutes and the final time taken has reduced to 10 minutes and 25 seconds which is approximately 45.17% improvement in the terms of performance and efficiency of the execution of the test script in testing that part of the UI in the IOT0047A Regulatory Compliance Test Software.



Run Date	Duration	Exceptions	Log	Usability	Remedy
11/6/23, 2:45:54 PM	0:10:25	104			
11/3/23, 2:46:13 PM	0:19:00	104			
11/3/23, 2:03:03 PM	0:18:27				
10/26/23, 11:18:10 AM	0:00:01				
10/26/23, 9:32:23 AM	0:06:58	57	1		
10/26/23, 9:18:57 AM					
10/26/23, 9:15:46 AM	0:02:36	16	1	1	
10/26/23, 9:12:09 AM					
10/26/23, 9:11:34 AM					
10/26/23, 9:11:08 AM					

2.4 Hardware and Software Used

Table 2.1 and Table 2.2 below describe the list of hardware and software used during the industrial training period respectively. The specifications and descriptions of each hardware and software are also provided in the tables below.

Table 2.1 List of Hardware Used during Internship Period

Hardware	**Specification**	**Description**
Controller Machine	Model	HP ZBook Power 15.6 inch G9 Mobile Workstation PC
	Processor	Intel(R) Core(TM) i7-12800H 2.40GHz
	Random Access Memory (RAM)	32.0 GB
	Graphics Processing Unit 1 (GPU)	Intel(R) Iris(R) Xe Graphics
	Graphics Processing Unit 2 (GPU)	NVIDIA RTX A2000 8GB Laptop GPU
	System Type	64-bit Operating System, x64-based processor
	Input Device(s)	Mouse
	Output Device(s)	Computer Screen Monitor
System Under Test (SUT)	Model	HP ZBook Power 15.6 inch G9 Mobile Workstation PC
	Processor	Intel(R) Core(TM) i7-12800H 2.40GHz
	Random Access Memory (RAM)	32.0 GB
	Graphics Processing Unit 1 (GPU)	Intel(R) Iris(R) Xe Graphics

Hardware	Specification	Description
	Graphics Processing Unit 2 (GPU)	NVIDIA RTX A2000 8GB Laptop GPU
	System Type	64-bit Operating System, x64-based processor
	Input Device(s)	Mouse, Keysight N9020B X-Series Signal Analyzer, Keysight X8749A Signal Conditioning Test Set, two Keysight X8750A MIMO Power Test Set, Keysight N517x/N518xB Vector Signal Generator, Keysight N5182BX07 Frequency Extender
	Output Device(s)	Computer Screen Monitor

Table 2.2 List of Software Used during Internship Period

Software	Description
IOT0047A Regulatory Compliance Test Software	Perform regulatory compliance tests for Bluetooth and wireless devices operating in the 2.4GHz, 5GHz, and 6GHz (Wi-Fi 6E) bands
Eggplant Functional	Used as a black-box graphical user interface (GUI) test automation tool

2.5 Time Period to Complete All Tasks

The time period used to complete all the projects, tasks and activities is throughout the whole internship period from Week 1 until Week 20. A clearer view of the time period is shown in the Gantt Chart at Appendix A.

2.6 Theoretical and Practical Knowledge

During the internship period, I have learned about some specific industry concepts. I have learned how a solution team works and also learned about the workflow of software qualifications. Besides that, I have also learned about the company policies and procedures as well as the culture of the company such as work life balance. I have gained the knowledge regarding the regulation standard and compliance requirements of each of the countries on their wireless devices. I have also sharpened my soft skills such as communication skills and time management throughout the industrial training period.

In addition, I have gained the practical knowledge of hands-on experience on the solution or product provided by the company for example, I have learned to use the provided signal generator from the company to carry out my automation testing. I have learned to implement the programming language of SenseTalk in order to develop the automation test script for testing the user interface (UI). Besides, I have learned to carry out regulatory compliance tests for each different frequency using the IOT0047A Regulatory Compliance Test Software. I have also acquired the knowledge and experience in employing the software development lifecycle (SDLC) workflow into the development. I have gained the knowledge to implement the scrum model and follow the timeline of project planning. I have broadened my horizon on professional working etiquette including workplace behaviors.

2.7 Problem Faced During Practical

During the industrial training, I have faced several problems or challenges. Eggplant Functional implements the technologies of Optical Character Recognition (OCR) in testing which sometimes tends to struggle in identifying and handling special characters, symbols, and non-alphabetic characters. OCR sometimes failed to recognize the characters such as underscore and it was causing the progress of developing the test script to be slowed down. This problem happened intermittently, and this was the challenging part due to being unable to identify what the issue was.

Furthermore, the tasks assigned were difficult to carry out due to the complexity of the project. There are enormous amounts of specific terms or knowledge that require advanced level of expertise and technical requirements. Due to lack of knowledge in this field, it hinders the progression of the project.

2.8 Other Projects, Tasks and Activities

In this section, the other projects, tasks and activities that have been carried out during the internship period will be described.

2.8.1 PathWave Software Solutions (PSS) Proof of Concept (POC)

During the internship period, I have been requested by another team to join a project on PathWave Software Solutions (PSS) proof of concept (POC) for the automation of some function or workflow of the Keysight Advance System Design (ADS) software. In this project, I have conducted research on the internet regarding automation and study the usage of the ADS software itself. After meticulous research, I have found an example script for one of the automations, SIProAutomation written in Python on the Keysight's website. However, the script itself is unable to execute due to the lack of libraries and instructions. I then proceeded to investigate and carry out research on the example script. After some time, I found out that the script uses some particular application programming interface (API) interconnected with the ADS software. In order to implement the API, it requires further installation and environment modification so that it suits the API.

After some further exploration and trial and error, I have achieved success in executing the script and generated desired results. However, due to the time factor and the complexity of the project, I was requested to withdraw from the project after attaining that contribution. As a result, I have provided a detailed step-by-step guide to execute the example script to ease the future developer that inherits this task. The comprehensive steps allow seamless execution to generate the result without any

hassle. The findings, detailed steps for execution and the result generated of the project are shown in the Figure 2.12, Figure 2.13 and Figure 2.14 below respectively.

Application	Status	Task	Duration	Remarks
SIProAutomation	Done • •	Study the usage of the Advance Design System (ADS) Study Python programming language	1 week	Need longer time to further understand the in-depth ADS usage due to the lack of engineering knowledge
	Done	Run the example script with specific installation and command input steps to obtain the result	1 week	Require specific steps to be able to run the example script and generate result (listed below)
	Done	Study the Python API (EDAToolBox) and the example script	1 week	Need longer time to further study API & the Python script due to the complexity (hundreds to thousands line of code each file)
	Pending	Understand the detailed implementation flow of SIPro Automation Simulation	TBA	NA
	Pending	Study the Python API of the software (PWDataTools) and understand clearly the code on executing the implementation flow	TBA	NA
	Pending	Create the POC	TBA	To act as a confirmation that we can do it
C-PHY ChannelSim	Pending	Understand the detailed implementation flow of C-PHY Channel Simulation	TBA	Same demo video link found on YouTube: MIPI C-PHY Channel Simulation with Report Generation and Automation
	Pending	Create the POC	TBA	To act as a confirmation that we can do it
C-PHY Compliance app	Pending	Understand the detailed implementation flow of C-PHY Compliance app	TBA	NA
	Pending	Create the POC	TBA	To act as a confirmation that we can do it
Model Sweep	Pending	Understand the detailed implementation flow of Model Sweep	TBA	NA
	Pending	Create the POC	TBA	To act as a confirmation that we can do it

Findings for SIProAutomation

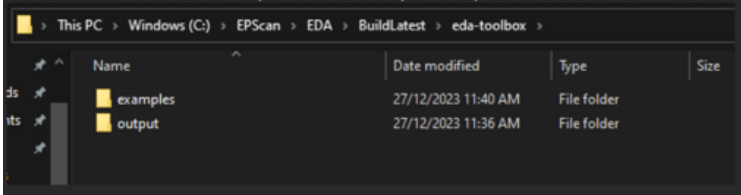
Reference for SIProAutomation:

1. PathWave Documentation Link: Welcome to the PathWave Data Tools Docs - PathWave Data Tools (keysight.com)
2. Example Script Folder Link ("ex_sipro_channelsim_flow.py" is the exact one): https://edadocs.software.keysight.com/eesofkcads/files/762705202/807168644/1/1687959076000/eda-toolbox-1.0.0-examples.zip
3. EDAToolBox Python API Installer Wheel File: https://edadocs.software.keysight.com/eesofkcads/files/762705202/810429490/1/1689327604000/keysight_edatoolbox-1.0.1-py3-none-any.whl
4. Example Script HTML Documentation Link (under "Step-by-step > SIPro Setup and Simulation"): https://edadocs.software.keysight.com/eesofkcads/files/762705202/807168645/1/1687959317000/eda-toolbox-1.0.0-docs.zip

Figure 2.12 Findings Contributed

Steps to run the example script:

1. Install Advance Design System 2024 (ADS) with the appropriate license (for me I used ADS version "W3626B").
2. Install Python by downloading the file from https://www.python.org/ftp/python/3.12.1/python-3.12.1-amd64.exe and run the installer.
3. Create folder following the exact same file path "C:\EPScan\EDA\BuildLatest\eda-toolbox\".
4. Download the example script folder from the link in the reference number 2 and extract it in the download folder.
5. Cut the "examples" folder in the extracted folder and paste it into the file path of step number 2.
6. Create another folder named "output" in the same file path of step number 2 and the result would look like below.



7. Download the EDAToolBox Python API Installer file from the link in the reference number 3 and save it into the existing wheelhouse file path in ADS folder (for me it was "C:\Program Files\Keysight\ADS2024_Update1\tools\python\wheelhouse").
8. Open a Command Prompt by pressing "Windows + R", type "cmd" and press "Ok".
9. Type each of the following command in the Command Prompt after each of them finished running (please change the version of the file to your respective version):
   - cd C:\EPScan\EDA\BuildLatest\eda-toolbox\examples
   - "C:\Program Files\Keysight\ADS2024_Update1\fem\2024.10\win32_64\bin\emproenv.bat"
   - python -m pip install pandas NumPy h5py plotly
   - python -m pip install "C:\Program Files\Keysight\ADS2024_Update1\tools\python\wheelhouse\keysight_pwdatatools-0.7.0-cp310-cp310-

Figure 2.13 Detailed Steps for Execution of SIProAutomation

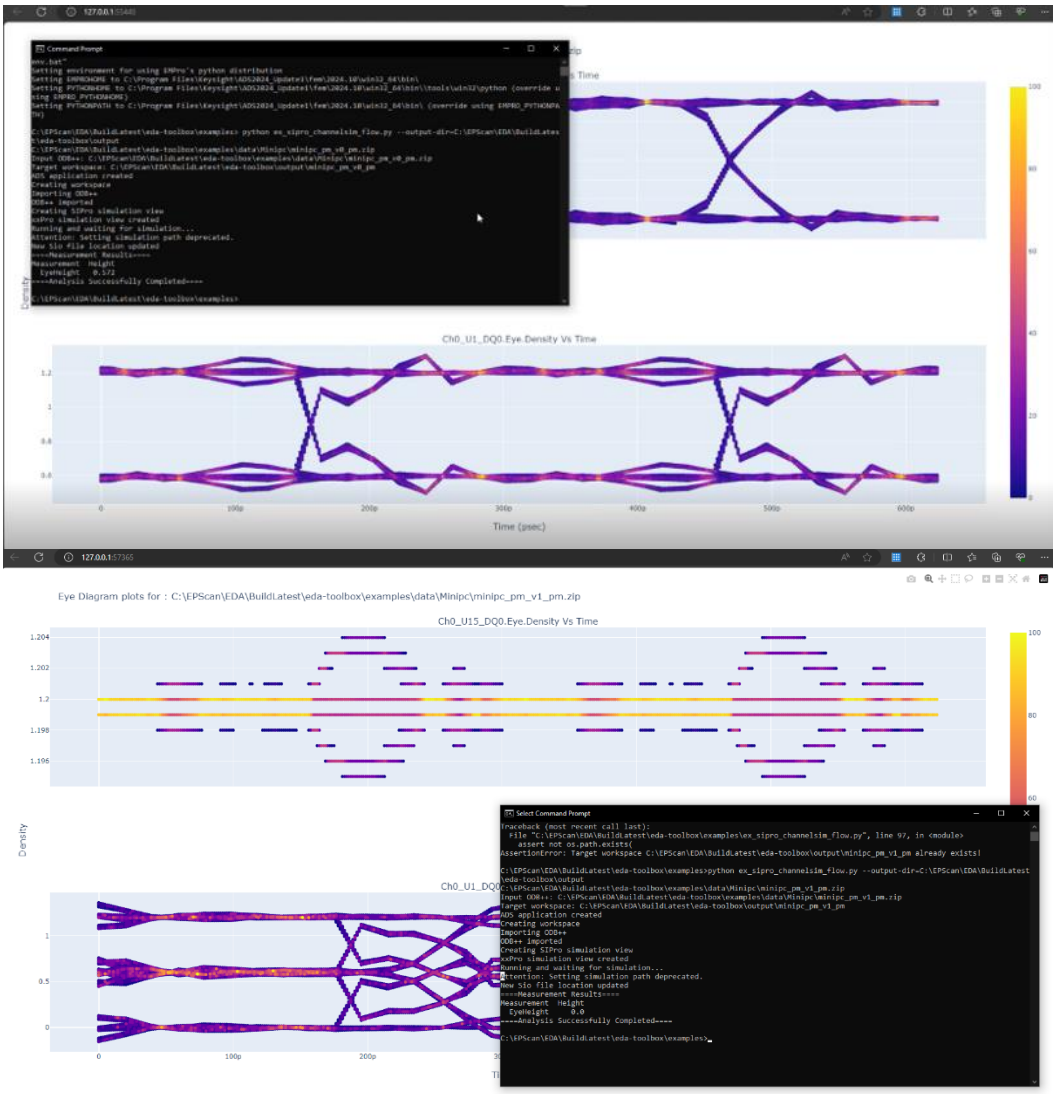


Figure 2.14 Results Generated of SIProAutomation

2.8.2 Keysight Penang and Singapore Innovation Fair

In this activity, I have gained insights and acquired knowledge on their cutting-edge ideas, transformative technologies, and novel solutions that are provided by the company from different departments and teams. Through engaging and captivating exhibits, interactive demonstrations, and passionate presentations, the participants not only unveil their innovations but also immerse themselves in a vibrant ecosystem of creativity and invention. Beyond the tangible advantages of exposure and networking, the innovation fair's atmosphere encourages a culture of inquiry, experimentation, and

constant growth, reinforcing its critical role in determining the direction of business, technology, and society in the future. The event was held on the 3rd of October 2023.

Figure 2.15 Keysight Penang and Singapore Innovation Fair Participation

2.8.3 Keysight Intern Lunch Gathering

During the internship, I have attended a few intern lunch gatherings held by the company. Attending the intern lunch gathering provides a priceless opportunity for aspiring professionals to network, share experiences, and develop meaningful relationships within the working environment. In addition to exchanging ideas, the gatherings frequently act as a source of mentorship opportunities, allowing us interns to ask the seasoned professionals for guidance, advice, and career counsel. Besides that, intern lunch gatherings offer a glimpse into working culture, providing us a better understanding of the company's ethos and values. Furthermore, various group activities are also held during the lunch gathering that allows us to foster our relationships among the interns even more.

Figure 2.16 Keysight Intern Lunch Gathering Participation

2.8.4 Keysight Chief Executive Officer (CEO) Coffee Talk

In the process of having industrial training in Keysight, I was also provided with the unique opportunity to participate in a coffee talk with the CEO of Keysight Technologies, Satish Dhanasakeran. The Coffee Talk allows the employee to voice out their concerns, discuss issues, exchange ideas, and inquires the CEO in a casual and informal setting. The talk itself was incredibly informative and enlightening, offering an in-depth review into the complexities of Keysight as well as the vision, financial performance, and future goals. By attending the CEO coffee talk, Keysight workers

like us feel more empowered to make a significant contribution to the company's success and have a better grasp of its direction, which eventually builds a more cohesive and engaged workforce. The Coffee Talk was held in the auditorium on 5th of December 2023.

Figure 2.17 Keysight CEO Coffee Talk Participation

2.8.5 Keysight Insurance Awareness Talk

Last but not least, I have joined the event of Keysight Insurance Awareness Talk held in the auditorium on the 9th of January 2024. Employees like us who attended this insurance awareness talk have gained invaluable knowledge and information about our benefits and coverage choices, enabling us to make well-informed decisions regarding our health and well-being. This talk offers a platform for the employees to comprehend the nuances of various insurance plans, including health, vision, dental, life insurance, as well as those pertaining to disability and wellness programs. By

having to participate in the engagement of the discussion, employees can acquire information about available resources, and discover ways to customize our coverage that suit our individual needs.

Figure 2.18 Keysight Insurance Awareness Talk Participation

2.9 Conclusion

In this chapter, the in-depth details of the projects done, and the training conducted during the industrial training period are described. This chapter also elaborated on the objectives, execution, output, system testing, hardware and software specifications, other project, task, and activities. Furthermore, the problem faced during completion, theoretical and practical knowledge gained, and time taken to complete all the tasks are also explained in this chapter.

CHAPTER 3

OVERALL INFORMATION OF INDUSTRIAL TRAINING

3.1 Introduction

This chapter will describe and elaborate the skills improved or attained during the internship period. This chapter will also discuss on the reference materials used and constructive comments made for the internship.

3.2 Skills Improvement

During the industrial training of 20 weeks in Keysight Technologies, I have acquired and sharpened several skills that can contribute to the success of my future. These skills are elaborated and explained in this section.

3.2.1 Technical Skills

I have acquired proficiency and hands-on experience in using industry-specific technologies and platforms. For example, I have learned to implement the IOT0047A Regulatory Compliance Test Software to carry out regulatory compliance testing on the wireless device. I have also learned to construct and develop automation test script using the programming language of SenseTalk. Apart from that, I have also gained knowledge to employ Eggplant Functional software to execute testing with the new knowledge of using Virtual Network Computing (VNC) server with Transmission Control Protocol/Internet Protocol (TCP/IP) to establish the connection between the controller machine and system under test (SUT). I have also gained experience in using

the signal analyser, signal generator and various instruments in performing the assigned task.

3.2.2 Time Management

Throughout the internship, I have learned to balance multiple tasks and meeting deadlines in the given amount of time frame. I have also learned to prioritize the tasks based on the importance and urgency. Besides that, I have acquired the knowledge and experience in employing the software development lifecycle (SDLC) methodology in project development. I have attained the knowledge to apply the scrum model and adhere to the project planning schedule. I have also gained the skill to maintain a healthy work-life balance for overall well-being and long-term productivity.

3.2.3 Problem-solving

I have enhanced my problem-solving skill during the industrial training period in Keysight Technologies. During executing the assigned task, I have encountered challenges and problems that required me to recognize the issues and analyse the reason of causing the issues. After breaking down the problem, I have learned to think critically to generate and obtain effective solutions that are able to tackle the problem. For example, the issue of Optical Character Recognition (OCR) of Eggplant Functional struggling to recognize the special characters are fixed by increasing the dot per inch (DPI) of character recognition parameter or apply contrast to the image. This can help to ease the detection of the special character and allow more effective and accurate testing.

3.2.4 Adaptability

During the internship, I have prepared myself to embrace and adjust to new changes and work environments. I have learned to be more open to new perspectives and ideas as well as be more flexible in the approach to any tasks and projects. In addition, I have demonstrated my capability to adapt to new working environments and thrived in the new workplace culture. For example, I have adapted to the workplace culture in Keysight Technologies of work life balance. I have developed the skills and knowledge to be one of the members of a solution team. I have broadened my horizon by accepting constructive criticism and incorporating feedback from professionals into the work.

3.3 Reference Materials

While carrying out my task in the internship, I often collect information from the internet resources such as Keysight website and documentations. This allows me to attain the necessary information and knowledge to complete my task. Apart from that, I have employed the previous automation test scripts created as a reference of its workflows in aiding the development of the test scripts for a brand-new module. I have also obtained required information from my supervisor and senior colleagues after having knowledge sharing sessions with them.

3.4 Constructive Comments

A huge thanks to Keysight Technologies for providing me the opportunity and chance to carry out industrial training for 20 weeks in their company. I cherish the opportunities that were offered to me during the internship to contribute to projects, allowing me to expand my practical experience and understanding of the industry. However, I recommend that the project deliverables and expectations can be more clearly defined during the assignments, giving us more thorough instructions might aid

in better understanding of the duties and responsibilities and result in more productive contributions.

3.5 Conclusion

This chapter has elaborated on the overall information and the skills improved such as technical skills and time management during the internship. Besides that, the reference material used, and constructive comments given for the internship are also included in this chapter.

CHAPTER 4

CONCLUSION

4.1 Introduction

In this chapter, the overall achievements, problems and executions, opinion and suggestions throughout the whole industrial training period in Keysight Technologies are discussed.

4.2 Overall Achievements

After the industrial training of 20 weeks in Keysight Technologies, I reflect on a path that was defined by vital and essential professional and personal improvement. Throughout this internship period, I was able to utilize the theoretical knowledge that I have mastered in the classroom to real-world scenarios and examine the intricacies of the assigned tasks. I have gained invaluable experience, practical skills, and knowledge as well as expanded my comprehension of the industry by working on actual projects and interacting with skilled experts. For example, I have applied the programming knowledge and concepts that I learned into refining and modifying as well as constructing automation test scripts.

In addition, the internship offered an environment for continuous learning and personal growth. I took advantage of every chance to broaden my knowledge and improve my professional abilities, from attending training sessions and seminars to looking for mentoring from seasoned experts. Utilizing on new technology, approaches, and industry best practices gave me the knowledge and abilities I needed to succeed in this rapidly growing world. One of the most noteworthy achievements of my internship was to develop and construct the complete automation test scripts that are capable of executing the user interface (UI) testing and functionality of the

IOT0047A Regulatory Compliance Test Software. Through this experience, I was able to demonstrate my technical proficiency while also improving my problem-solving and project management capabilities.

4.3 Problems and Executions

Throughout the internship period, I have encountered a few problems and difficulties. Optical Character Recognition (OCR) technology that is employed by Eggplant Functional occasionally has trouble recognizing and processing symbols, non-alphabetic letters, and special characters. On top of that, the complexity of the task or project assigned makes it challenging to accomplish due to the lack of expertise in this area.

Hence, in order to solve these issues, I have carried out exhaustive exploration and thorough research and study. I have aimed to gain profound understanding on the intricacies to proceed with the comprehensive evaluation and inspection on the problems. I have performed detailed examinations on the scripts to identify and resolve the issues that existed. Other than that, I have utilized trial and error approach by systematically testing different methods or strategies, learning from each of the outcomes and iteratively refining the approach. As a result, the problems that have arisen are tackled and the assigned tasks and projects have been completed successfully.

4.4 Opinion and Suggestions

After the industrial training, these are the couple of opinions and suggestions that I think would be beneficial. Prioritizing both mental and physical well-being is imperative for interns that are starting their professional journeys in order to ensure an enriching and fulfilling internship experience. Building routines that support self-care, such consistent exercise, enough sleep, and a balanced diet, can strengthen resilience and improve general wellbeing. In addition, establishing open communication and

addressing concerns or asking for clarification before assignments can mitigate misunderstandings and promote a collaborative work environment. It is encouraged to share the problems, concerns, and opinions to supervisor or colleagues to ensure alignment with project goals.

4.5 Conclusion

This chapter described the overall achievements acquired, problems and executions as well as opinion and suggestions of the industrial training period. As a conclusion, the internship experience has been a vital journey filled with growth, education, and incommutable precious knowledge. Through practical and hands-on projects, mentorship opportunities, and cooperative initiatives, I have increased my knowledge base, developed meaningful connections, and acquired practical skills. The difficulties faced have provided potential for growth and development, adaptation, and creativity, highlighting the significance of flexibility and proactive problem-solving that will definitely aid in embarking my future endeavors with courage and confidence.

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Appendix A Internship Gantt Chart

Task	Keysight Quarter / Week																			
	Q4'23					Q1'24													Q2'24	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Onboarding																				
Report Duty																				
New Hire Briefing and Orientation																				
Study and research on documentation of the company																				
Hardware and software installation and setup																				
IOT0047A XA5002A Regulatory Compliance Test Software																				
Study documentation and user guide																				
Attend mentoring session by senior																				
Hands-on Eggplant software																				
Refine and enhance the test scripts to improve in term of accuracy, efficiency and reduce redundancy																				
Develop Eggplant automation test scripts for the sections that are not covered in previous test script																				
Overall UI Testing																				
IOT0047A XA5006A Regulatory Compliance Test Software																				
Understand KC non-signaling test cases																				
Develop Eggplant automation test scripts for UI test on whole module																				
Script Verification and Test Run																				
Project on Proof of Concept (POC)																				
Study the Advance Design System (ADS)																				
Study the Python API used in the script																				
Script Execution																				

Figure A.1 Internship Gantt Chart

Appendix B Industrial Training Achievements & Checklists

Sekretariat Latihan Industri
Sekolah Komputeran,
Universiti Teknologi Malaysia,81310 SKUDAI, JOHOR
Fax: 07-5565044 Tel: 07-5532008

INDUSTRIAL TRAINING ACHIEVEMENTS

(This form must be filled by student and must be attached in the Industrial Training report)

Student's Name : LAI YEE JEN

Organisation : KEYSIGHT TECHNOLOGIES MALAYSIA SDN BHD

No.	Task (List all tasks have been completed)	Month of Task Achieved				
		Month 1	Month 2	Month 3	Month 4	Month 5
1	Hardware and software installation and setup	√				
2	Study and research on documentation of software	√				
3	Refine and enhance the existing XA5002A test scripts	√	√			
4	Develop Eggplant automation test scripts for XA5002A for the sections that are not covered in previous test scripts	√	√			
5	Develop Eggplant automation test script for UI test for XA5006A		√	√	√	√
6	PathWave Software Solutions (PSS) Proof of Concept (POC)				√	

Deliverable/Training reflection (Outcomes that have been achieved)
• Performance enhancing and efficiency improving for existing XA5002A automation test scripts • Development of test script for XA5002A for the sections that are not covered in previous test scripts • Complete Eggplant automation test script development for XA5006A • Contribution on PathWave Software Solutions (PSS) Proof of Concept (POC)

Student Signature: Lai Date: 27/1/2024

Approval

Organisation's Supervisor:

.....
(Signature)

Name: NG POH SING
Date: 01/02/2024

Faculty Supervisor :

.....
(Signature)

Name: Sim Hiew Moi
Date: 1/2/2024

INDUSTRIAL TRAINING CHECKLISTS (PLACEMENT)

No.	Activities/Tasks	Tick (√)	Endorse by and date
1.	Report Duty To The Organization Approved by faculty	√	25/9/2023
2.	E-mail Report Duty Verification (BLI-1D) to faculty supervisor.	√	5/10/2023
3.	Upload Report Duty Verification (BLI-1D) in e-learning for course code SCS*4114.	√	5/11/2023
4.	Contact faculty supervisor to inform the job scope and organization information	√	5/10/2023
5.	Fill in organization supervisor information survey in e-learning	√	5/10/2023
6.	*Update of Industrial Training site (address). Inform faculty supervisor and JKL, if any changes.*	-	
7.	Updating Industrial Training Logbook online – daily basis	√	
8.	Ensure that organization supervisor able to login to ITS successfully (Organization supervisor get ITS userid and password).	-	
9.	Faculty Supervisor Visit. Date: 23/1/2024	√	23/1/2024
10.	Industrial Training Presentation.	√	23/1/2024
11.	Performance evaluation by organisation supervisor. Online or *submission BLI-2B during supervisor visit.*	√	2/2/2024
12.	Submission of Industrial Training Logbook.	√	9/2/2024
13.	Submission of Industrial Training Report with checklist and achievement form as Appendix.	√	2/2/2024
14.	Fill in Industrial Training Performance Evaluation by student (BLI-1E) in Google form.	√	27/1/2024
15.	End Industrial Training	√	9/2/2024

Note:

1. *Italic activities are optional depending on student situation.*

IIMPORTANT: This checklist must be put as attachment in the industrial training report.