CHAPTER I
INTRODUCTION

1.1 Background

Indonesia has around 17,000 islands [1]. In addition to having a large number of islands, Indonesia's territorial waters are also very large, namely 5,321,321 Ha [25]. With a fairly wide range of waters, many activities can be carried out in the waters, such as sailing using small boats used to look for fish by fishermen and is the main profession of the community, especially those who live on the coast. Large ships such as ferries to transport passengers and vehicles, tankers that function to transport oil and its derivative products, bulk cargo which are merchant ships that transport coal, grain, and cement without packaging [7], and defense or war ships such as AT-8 and AT-9 Tank Transport that function to add to and strengthen the country's defense [8]. According to the BPS Statistics Indonesia, the number of domestic sea ship passengers in Indonesia in January until November 2024 was 23,5 million people or equivalent to 27,56%, compared to the same period in 2023. While the number of goods transported increased by 1,27% to 343,0 million tons compared to the same period in 2023 [6]. This is one of the potential uses of maritime telecommunication services in Indonesia , with the increasing need for the internet, technology is needed that can help distribute the use of the internet evenly in Indonesia’s maritime. This technology is satellite technology. The public's need for maritime telecommunication technology can only be done through satellites, especially when it is offshore. Satellites in Indonesia and foreign satellites play a very important role in good communication services that will contribute to the equitable distribution of regional coverage.

One of the innovations in satellite technology that can play an important and appropriate role for maritime telecommunications in Indonesia is Earth Stations in Motion (ESIM). ESIM is a new thing that has never existed in Indonesia, ESIM itself is able to overcome quite complex challenges such as how to provide high-bandwidth connectivity for something in motion. There are three types of ESIM, namely ESIM which are used for aircraft (Aeronautical Earth

Stations in Motion (A-ESIM)), ESIM which are used for ships (Maritime Earth Stations in Motion (M-ESIM)), and ESIM which are used for vehicles on land (Land Earth Stations in Motion (L- ESIM)) [9]. ESIM contribute to industry, innovation, and infrastructure by connecting the 3 types of ESIM itself, therefore this is very important and appropriate to be implemented in Indonesia.

With data from the BPS Statistics Indonesia regarding the number of passenger ships that continue to increase and the number of activities that can be carried out in the waters, one of which is the fishing profession which is quite widely carried out by the people of Indonesia, this is a strong grip that Indonesia needs ESIM satellite technology innovation, especially M-ESIM. The companies that have the potential to become providers of M-ESIM services in Indonesia are Telkomsat and Pasifik Satelit Nusantara (PSN).

Quoting from the words of one of the fishermen in Indonesia, Mr. Yanto, who said that he has never traveled to the sea more than 10 miles because he will have difficulty accessing the internet, he said that usually he only goes to sea up to 6-7 miles because if it is 8-10 miles, the signal will be lost [21]. In addition to the fishermen's personal experience related to limited internet access in the middle of the sea, there are also other incidents that quite often occur at sea, namely loss of contact. Loss of contact or what we can say as a loss of signal that occurs in the middle of the sea such as what happened in the waters of Tagulandang, Siau Tagulandang Biaro (Sitaro) Islands Regency, North Sulawesi on Tuesday, January 23, 2024 [22], this is the main reference and potential use of M-ESIM, but M-ESIM can also experience interference when approaching terrestrial areas, this is one of the weaknesses that can occur in M-ESIM.

There are shortcomings of interference in the implementation of ESIM, especially M-ESIM in Indonesia, requiring Indonesia to have strong regulations to regulate the existence of M-ESIM that will apply in Indonesia. Several existing regulations, based on the ITU World Radiocommunication Conference (WRC-23) regarding regulations for Earth Stations in Motion (ESIM) in order to communicate with space stations, namely Geostationary Satellites (GSO) at frequencies of 17.7-19.7 GHz (space to earth) and 27.5-29.5 (earth to space) [2]. Based on the Regulation of the Minister of Communication and Information of the

Republic of Indonesia Number 21 of 2014 concerning the Use of Radio Frequencies Spectrum for Satellite and Satellite Orbit Services, there is a discussion about the Satellite Landing Right given to telecommunication network operators and/or telecommunication service providers which will later be continuous with the discussion regarding the potential of the ESIM regulation in Indonesia. Other supporting data is based on the Frequencies Allocation Table of the Republic of Indonesia which contains possibilities that can strengthen the reasons for the implementation of ESIM in Indonesia [20].

1.2 Problem Formulation

The implementation of Maritime Earth Stations in Motion (M-ESIM) in Indonesia is very important because this technology has the potential to solve Indonesia's maritime communication problems with vast sea conditions, but there are still shortcomings that Maritime Earth Stations in Motion (M-ESIM) have, namely interference problems. So that the existence of Maritime Earth Stations in Motion (M-ESIM) will later provide 2 consequences, namely solving and the other side causing problems. This results in the need for strong regulations to regulate the occurrence of interference.

It will be very unfortunate if there are no regulations regarding Earth Stations in Motion (ESIM) in Indonesia so that it can have an impact on the Earth Stations in Motion (ESIM) service that cannot be used and the growth of Earth Stations in Motion (ESIM) in Indonesia which can cause losses in the growth of internet services, in addition to Indonesia can experience lagging behind new technologies as well as obstacles in the field of more advanced technology industries.

To avoid these losses, Indonesia needs proper regulations regarding Earth Stations in Motion (ESIM) which is a step so that Indonesia does not lag behind in new technology and follows the development of more advanced technology, and can meet the great needs of communication services for the people of Indonesia.

1.3 Research Objectives

The objectives of this study are:

1. Knowing the basic concepts, characteristics, advantages and disadvantages of Maritime Earth Stations in Motion (M-ESIM) that have been determined by WRC-23 and their implications for regulations in Indonesia.
2. Knowing and understanding the potential technical problems of M-ESIM that can strengthen M-ESIM regulations that will be implemented in Indonesia.
3. Provides several options that can be considered in M-ESIM regulation in Indonesia.
4. Building awareness of the benefits and great potential that will be obtained from M-ESIM.

1.4 Problem Limitations

In order to get optimal results, there are several limitations as follows:

1. The Earth Stations in Motion (ESIM) that will be discussed are Earth Stations in Motion (ESIM) for ships or Maritime Earth Stations in Motion (M-ESIM).
2. Potential of interference that can occur between M-ESIM and cellular services on 28 GHz, Ka-Band frequency.
3. Potential of the M-ESIM ragulation in Indonesia.

1.5 Hypothesis

The hypothesis of this thesis is as follows:

1. There is a potential for interference when frequencies, location, and time is same between Maritime Earth Stations in Motion (M-ESIM) and telecommunication networks, 5G User Terminal (UT) on 28 GHz, Ka-Band frequencies band.
2. Indonesia needs the right regulation so that Maritime Earth Stations in Motion (M-ESIM) can be implemented while still regulating interference that can occur.

1.6 Research Methodology

The research methodology carried out in this study so that the hypothesis is proven, is as follows:

1. Conducting a literature study of references regarding Maritime Earth Stations in Motion (M-ESIM) technology.
2. Conducting a technical analysis and potential interference problems between Maritime Earth Stations in Motion (M-ESIM) Satria-1 and the cellular telecommunication network in the Ka-Band frequencies band.
3. Conducting an analysis of regulations that are already in force in Indonesia.
4. Providing recommendations/conclusion.

1.7 Systematics of Writing

The systematics of writing carried out in this thesis consists of 5 chapters, is as follows:

CHAPTER II – BASIC THEORY

Basic theory is an explanation that can be support the progress of this thesis, such as Earth Stations in Motion (ESIM), Maritime Earth Stations in Motion (M-ESIM), History of Earth Stations in Motion (ESIM), Satria-1 Satellite, Viasat-3 Satellite, 5 Generation (5G), Base Transciever Station (BTS), Link Budget of Maritime Earth Stations in Motion (M-ESIM), Interference, Regulation in Indonesia, Potential Ship Market in Indonesia , Region, Ka-Band, GeoStationer (GSO) Satellite for Maritime Earth Stations in Motion (M-ESIM), and Fixed Satellite Service (FSS).

CHAPTER III – RESEARCH METHODOLOGY

Research methodology that can be prove the hypothesis for this thesis such as, Research Flow Diagram, Research Outline, Maritime Earth Stations in Motion (M-ESIM) Coverage Area, Interference Scenario, Parameter and Calculation

CHAPTER IV – DATA PRESENTATION AND ANALYSIS

Data Presentation and analysis will explain about Technical and Regulation.

CHAPTER V – CONCLUTION AND RECOMMENDATION FOR FUTURE WORKS

Conclude the entire interferece that can cause how the regulation can be implementation in Indonesia and provide suggestions which is constructive for future improvements in development research that will be carried out.