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PERFORMANCE MEASUREMENT OF THE LTE SIGNAL STRENGTH ALONG OSAKA – YOKOHAMA RAILWAY USING TOKAIDO SHINKANSEN HIGH SPEED TRAIN

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ABSTRACT

The use of high-speed train has progressively increased over the past years and it has become the most important public transportation. With the rapid development of mobile communication, mobile telephone users are expecting higher network capacity and good connection quality. In that case, passengers are demanding a high quality of voice and data-rich communication. The main objective of this research is to study the performance of LTE in a high-speed railway from Yokohama to Osaka using a commercial measurement tool namely Nemo handy. The data collected from the measurement has been analysed using a software named Nemo Outdoor. The measurement analysis of the currently deployed LTE network is being done at the velocity of up to 300 km/h. The measurements works were conducted in the morning, evening and night on six fine days. The results yields some useful information which is the SNR and RSRP are proportional to each other and the signal strength is proportional to the speeds. Furthermore, the handover activities occurred during the test period within the test area are studied too. Finally, this study has inferred that the speed of the train may affect the quality of the signal strength. It is also noted that lower variation of the RSRP and RSSI value resulted in higher RSRQ value which implies lesser interference, thus producing better quality of signal strength.

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CHAPTER ONE
INTRODUCTION

1.1 RESEARCH BACKGROUND

There are several categories of communication technology in the railway system. One of the technologies is known as GSM-Railways (GSM-R). GSM-R is one of the most indispensable communication networks for railways due to its rising recognition around the world, which replaced the legacy national railway communication technologies [1].

In recent years, the demand of accessing high data rate applications has noticeably increased. The rapid development of high-speed rail (HSR) in the world today making, it feasible to reach a maximum speed of almost 575 km/hour [1]. The communication signalling system is broadly the main part which is contributing to the safe operation of high-speed rail. Currently, in Malaysia Global System for Mobile Communications Railway (GSM-R) technology is still extensively being implemented while LTE technology still in developing phase despite the fact that this technology has been growing rapidly around the world. GSM-R is an international wireless communications standard for railway communication and applications. GSM-R is part of the European Rail Traffic Management System (ERTMS) standard and carries the signalling information directly to the train driver, enabling higher train speeds and traffic density with a high level of safety. However, GSM-R cannot support demands for high data rate communication since it only provides a maximum data rate of 200 kbps, which is of satisfactory level for voice communication and railway control [2]. The key element differentiating LTE from GSM-