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# Evaluating the Quality of 2G and 4G Networks on Telkomsel in Gunung Talang and Danau Kembar Sub-Districts

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***Abstract*— This study aims to evaluate the quality of 2G and 4G networks on Telkomsel operators in Gunung Talang District and Danau Kembar District, Solok Regency, West Sumatra. This research was conducted using the drive test method using TEMS Pocket and TEMS Discovery devices for network data collection and analysis. The 2G network measurements were conducted based on Rx Level and Rx Quality parameters. In contrast, the 4G network was evaluated based on RSRP (Reference Signal Receive Power) and SINR (Signal Interference to Noise Ratio) parameters. The measurement results on the 2G network show that the average Rx Level is at -85.1 dBm, with very poor signal quality reaching 27.14%, while the network quality based on Rx Quality is classified as excellent with an average value of 0.9 dB, which reaches 82.21%. On the 4G network, the average RSRP was -101.7 dBm with a good signal dominance of 30.68%, but the network quality based on SINR was lower, with an average value of 12.3 dB, where 46.98% of the signal was classified as fair. In addition, several bad spot areas were found to be affected by natural obstacles such as hills, cliffs, and tall trees that block the signal. The recommendation from this research is to optimize the nearest site to improve signal quality in these areas, especially to reduce overshooting problems that occur in certain sectors. This research is expected to be a reference for operators in improving network quality in the areas studied.**

***Keywords*— Telkomsel network; Drive test method; Signal quality parameters; Network optimization.**

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## I. INTRODUCTION

Gunung Talang District and Danau Kembar District are sub-districts in Solok Regency, which has an area of 461 Km$^2$. Gunung Talang Sub-district consists of 8 Nagari, namely Nagari Cupak, Nagari Talang, Nagari Sungai Janiah, Nagari Koto Gadang Guguak, Nagari Gaek Guguak, Nagari Jawi Jawi Guguak, Nagari Batang Barus, and Aie Batumbuak. Meanwhile, Danau Kembar Sub-district only has 2 villages, namely Nagari Kampung Batu Dalam and Nagari Simpang Tanjung Nan IV. Gunung Talang Sub-district and Danau Kembar Sub-district have a total population of 76,540 people with a male population of 38,468 people and a female population of 38,072 people [1].

Gunung Talang and Danau Kembar Sub-districts are categorized as rural areas because the area is hilly and has many trees that can block signal transmission or can also be called obstacles. The characteristic of this rural area is an area located on the outskirts which refers to small settlements that are outside the city limits and small population density [2]. This results in the UE (User Equipment) experiencing a weakening of the received signal, causing UE to fail in communication. With these problems, it is necessary to conduct a Drive Test. Drive Test is a real network check in the field. This Drive Test is carried out using a tool in the form of a cellphone that has the TEMS Pocket application [3].

2G technology is a digital cellular communication technology. GSM technology is widely applied to cellular communication, especially cell phones [4]. While 3G technology provides data rates and more varied services. However, 3G does not support video conferencing so it was developed towards 4G technology. This 4G network requires all devices to be digital, which is very different from the technology that has been implemented now [5]. In short, 4G devices and cellular services transform wireless communication into online and real-time connectivity. 4G technology will enable a person to have immediate access to location-specific services that offer on-demand information at high speed and low cost [6] [7] [8].

Therefore, the Ministry of Communication and Information Technology (Kominfo) announced the elimination of 3G networks throughout Indonesia because 3G networks are considered to have several obstacles such as suboptimal speed, unstable signals, and inadequate service capacity [9]. The goal is that the transition from 3G-based services to 4G-based services does not reduce the range of services that have been utilized by the community before [10]. For this reason, 3G services in Indonesia were switched to using a newer service, namely 4G LTE [11].

Based on the above, the Solok Regency government and based on letter number 50/554/Litbang/Bapelitbang/2022 on August 10, 2022, issued by the regional secretariat of Solok Regency proposed research and studies in Solok Regency, namely related to the availability of telecommunications networks and community surveys that are exposed or can be reached by local government development information [12]. So the research was carried out checking the network in Solok Regency as well as being appointed as the final project with the title “Checking the Quality of 2G and 4G Networks on Telkomsel Operators in Gunung Talang and Danau Kembar Districts”.

## II. Method

### A. Data Collection Technique

This Drive Test aims to find out how the actual quality and coverage in the field determine the signal strength of 2G and 4G Telkomsel providers in Gunung Talang District and Danau Kembar District. Before conducting a drive test, a planning process is carried out which aims to facilitate the drive test process. The process carried out is to create a drive test route/path for instructions on which roads will be passed. After the planning process is carried out, then the data checking process (drive test) is carried out to measure the quality of the network in the area. Then data processing is carried out from the drive test results.

### B. Pathway Planning

Before conducting a drive test, several things need to be prepared to facilitate data collection such as determining which path will be passed during the drive test and preparing the tools to be carried during the drive test. The drive test path can be designed in Google Earth and then transferred to Google Maps. The following is the design of the drive test path in the Gunung Talang District tea garden area along 30.2166 Km shown in Figure 1.


Fig. 1 *Drive Test* Track

### C. Drive Test Methodology

Data collection for the trial was conducted using a Samsung Galaxy S5 with a TEMS Pocket, and the results were analyzed using the TEMS Discovery application.

### D. Data Processing Using TEMS Discovery

After conducting the drive test measurement process using the TEMS Pocket application, the next step is to process the obtained data and display it based on the desired parameters in the TEMS Discovery application. The processed data consists of logfile data from the drive test in trp format.

## III. Result and Discussion

### A. Drive Test Results

After the measurements are taken based on the parameters that align with the KPIs, the parameters measured for the 2G network are Rx Level and Rx Quality, while for the 4G network, the parameters measured are RSRP (Reference Signal Receive Power) and SINR. (Signal Interference to Noise Ratio). The data from this Drive Test was measured using TEMS Discovery and Mapinfo to assess the signal quality on the 2G and 3G networks in the Gunung Talang and Danau Kembar districts.

### B. 2G Measurement Results

The results and analysis from the 2G network measurements are based on the parameters Rx Level and Rx Quality, and the measurement results are as follows:

*1) RX Level*

After conducting a Drive Test using TEMS Pocket, the data from the log file will be processed using TEMS Discovery software, which will display a plot of the Rx Level parameter with a legend that has been set according to the KPI. To determine the quality of a signal, one can refer to Figure 2 and Table 1.

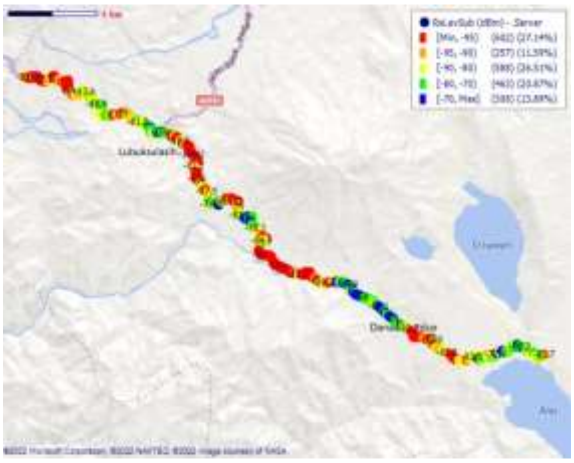

Fig. 2 *Plotting* Rx Level

Table 1 Measurement Result of Rx Level Parameters

| Signal Category | Range | Sample Size | Percentage |
|---|---|---|---|
| Excellent | >=-70 and <0 | 308 | 13.89% |
| Very Good | >=-80 and <-70 | 463 | 20.87% |
| Good | >=-90 dan <-80 | 588 | 26.51% |
| Fair | >=-95 dan <-90 | 257 | 11.59% |
| Poor | <-95 | 602 | 27.14% |

Based on the measurement results in Figure 2, 2218 sample points were obtained for the Rx Level parameter, processed using TEMS Discovery. Rx Level is the level of signal strength received by the MS. (Mobile Station). For the Rx Level parameter, five color indicators show the quality of the signal, whether good or bad, based on the operator's standards. It can be seen that there are 27.14% of signals categorized as very poor, marked by a red indicator, with 602 samples. Meanwhile, the weak signal category has 11.59% with 257 samples, marked by an orange indicator. For the yellow indicator, there are 588 samples with a percentage of 26.51%, and the green indicator has 463 samples with a percentage of 20.87%, categorized as good signals. For the very good signal category, marked by a blue indicator, the percentage is 13.89% with 308 samples. So, regarding the Rx Level parameter, the dominant signal based on the measurement results is very poor, as it reaches 27.14% of the total, with a sample size of 602 out of 2218 sampling points.

*2) Rx Quality*

After conducting a Drive Test using a TEMS Pocket with a voice script or while making a call, the results obtained are as shown in image 3 and Table 2.

Fig. 3 *Reference Value* Rx Quality

Table 2 Result of Rx Quality Parameter Measurement

| Signal Category | Range | Sample Size | Percentage |
|---|---|---|---|
| Excellent | <=2 dan >=0 | 1433 | 82.21% |
| Good | <=4 dan >2 | 177 | 10.15% |
| Fair | <=6 dan >4 | 93 | 5.34% |
| Poor | >6 | 40 | 2.29% |

Based on the measurement results in Figure 3, 1743 samples of Rx Quality were obtained. Rx Quality refers to the level of signal quality received at the Mobile Station. For the Rx Quality parameter, there are four color indicators according to the operator's standards. It can be observed that there is 2.29% of the signal categorized as very poor, with 40 samples marked by a red indicator. Meanwhile, the signals categorized as weak and good account for 5.34% with 93 samples and 10.15% with 177 samples, marked by yellow and green indicators, respectively. For the signals marked by a blue indicator, which are classified as excellent, they make up 82.21% with 1,433 samples. Therefore, regarding the SINR parameter, it can be concluded that the dominant signal is in the very good or excellent category, accounting for 82.21% with a sample size of 1,433.

### *C. 4G Measurement Results*

The results and analysis of the 4G network in terms of coverage based on the RSRP parameter and in terms of quality based on the SINR parameter are as follows.

*1) RSRP (Reference Signal Receive Power)*

After processing the data, the resulting plot of the 4G signal based on the RSRP parameter is shown in Figure 4 and Table 3.

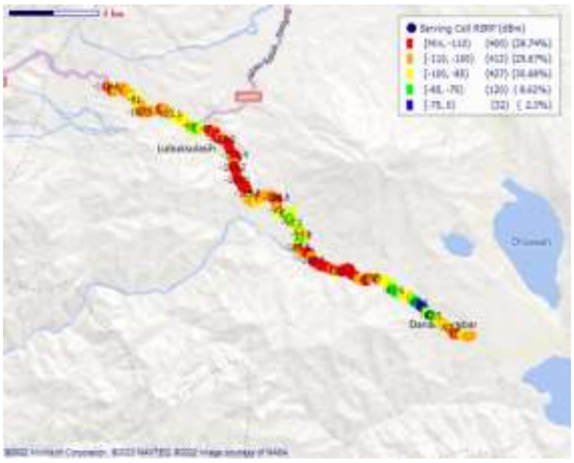

Fig. 4 *Plotting* RSRP

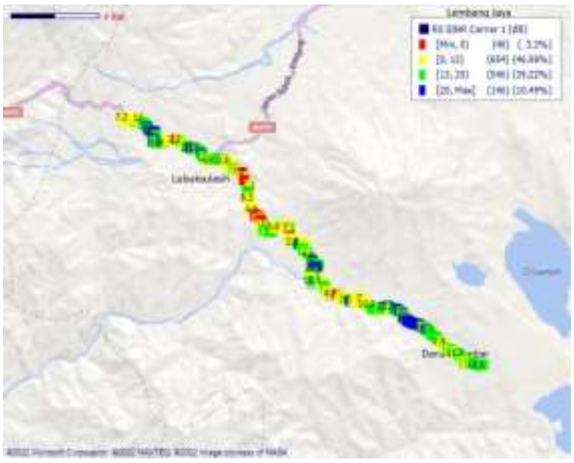

Fig. 5 *Plotting* SINR

Table 3 Results of RSRP Parameter Measurement

| Signal Category | Range | Sample Size | Percentage |
|---|---|---|---|
| Excellent | >=-75 and <0 | 32 | 2.30% |
| Very Good | >=-85 and <-75 | 120 | 8.62% |
| Good | >=-100 dan <-85 | 427 | 30.68% |
| Fair | >=-110 dan <-100 | 413 | 29.67% |
| Poor | <-110 | 400 | 28.74% |

Based on the measurement results in Figure 4, 1392 RSRP sample points were obtained. RSRP is a parameter for the level of received signal strength. For the RSRP parameter, there are five color indicators based on the operator's standards. It can be seen that there are 28.74% of signals categorized as very poor, marked by a red indicator, with 400 samples. Meanwhile, signals marked with an orange indicator account for 26.67% of 413 samples, categorized as weak or fair, and signals marked with a yellow indicator account for 30.68% of 427 samples, categorized as fairly good. For signals categorized as good or very good, they make up 8.62% with 120 samples, marked by a green indicator. Lastly, signals categorized as excellent, marked by a blue indicator, are only 2.3% with 32 samples. It can be concluded that the 4G network's RSRP parameter indicates a fairly good signal quality, as the dominant signal in this parameter falls into the good category, reaching 30.68% with 427 samples. Meanwhile, the signal in the very good or excellent category is only 2.3% with 32 samples.

*2) SINR (Signal Interface to Noise Ratio)*

The result of plotting the 4G signal based on the SINR parameter is shown in Figure 5 and Table 4.

Table 4 Results of SINR Parameter Measurement

| Signal Category | Range | Sample Size | Percentage |
|---|---|---|---|
| Excellent | >=20 | 146 | 10.49% |
| Good | >=13 dan <20 | 546 | 39.22% |
| Fair | >=0 dan <13 | 654 | 46.98% |
| Poor | <0 | 46 | 3.30% |

Based on the measurement results in Figure 5, 1392 SINR samples were obtained. SINR is the ratio comparing the main signal transmitted with the interference and noise that arise or mix with the main signal. For the SINR parameter, there are four color indicators according to the operator's standard. It can be seen that there are 3.3% of signals categorized as very poor, with 46 samples marked by a red indicator. Meanwhile, signals categorized as weak and good account for 46.98% with 654 samples and 39.22% with 546 samples, marked by yellow and green indicators, respectively. For signals marked by a blue indicator, which are considered excellent, they make up 10.49% of 146 samples. Therefore, regarding the SINR parameter, it can be concluded that the dominant signal is the one categorized as weak or fair, accounting for 46.98% with a total of 654 samples.

*D. Bad Spot and Blank Spot*

Based on the results of the drive test data processed in TEMS Discovery, it can be seen that there are several locations with poor signal quality, indicated by plotting with a red color indicator. The bad spot and blank spot in the Gunung Talang area can be observed based on the following parameters.

*1) Rx Level*

The bad spot area in the 2G network based on the Rx Level parameters is as follows.

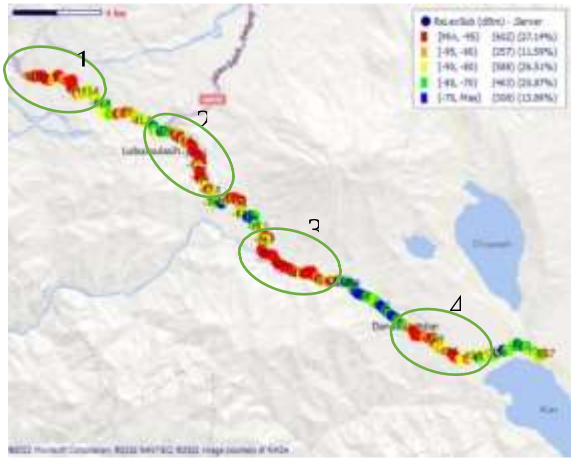

Fig. 6 *Bad Spot* Rx Level

Fig.7 *Bad Spot Area* 1 Rx Level

In the bad spot area 1 located at longitude 100.556402 and latitude -0.946506. The bad spot area is 3.616 km long. The nearest site to the bad spot area is site SLK109. The distance of the site to this bad spot area is quite far, reaching 3.89 km. It is this considerable distance that causes the area to have poor signal quality. In addition, the area is hilly and has many tall trees that obstruct the signal transmission. Therefore, the area is said to be bad, marked by indicators of red, orange, and yellow, and a reception power of <-95 dBm. The solution to this problem is the need for optimization or elevation of the antenna at site SLK109.

Fig. 8 *Bad Spot Area* 2 Rx Level

The bad spot area 2 is located at longitude 100.610902 and latitude -0.975672. The bad spot area is 3.224 km long. The nearest site to this bad spot area is quite far, with the distance to site SLK240 reaching 2.65 km. This area also has high cliffs along the road, which obstructs the signal transmission from the BTS. Therefore, the signal is considered poor, with the signal plotting marked in red and the reception power at <-95 dBm. The solution to this problem is the need for optimization of the nearest site, SLK240, in the form of antenna azimuth so that the signal transmission from that site reaches the area with poor signal.

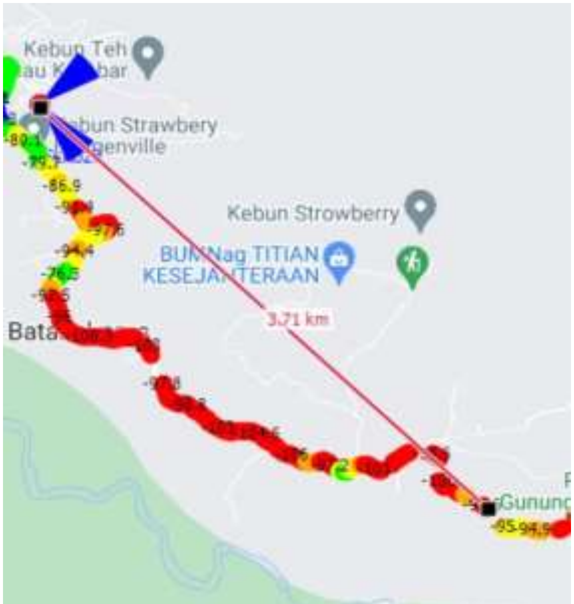

Fig. 9 *Bad Spot Area* 3 Rx Level

Then, in the bad spot area 3 located at longitude 100.649660 and latitude -1.021050, the length is 3.687 km. The nearest site to this bad spot area is quite far, with site SLK525 being 3.71 km away. This area also features high cliffs and hills. Therefore, the signal plotting is marked by a red indicator, and there are even blanks with a reception power of <-95 dBm. The solution to this problem is the need for optimization of the nearest site, namely SLK525, to expand coverage so that the signal transmission from the antenna at that site reaches areas with poor signal.


Fig. 10 *Bad Spot Area* 4 Rx Level

The bad spot area 4 is located at longitude 100.707916 and latitude -1.049712. The length of this bad spot area is 2.883 km. This area is a hilly region with high cliffs. Therefore, the signal plotting is marked by the indicators of red, orange, and yellow colors. However, it is predominantly marked by the red color indicator. The nearest site, SLK547, is located 3.35 km away. Therefore, optimization is needed for site SLK547 in the form of antenna elevation.

2) Rx Quality

In the Rx Quality parameter, there are blank spots indicated by images 11 and 12.

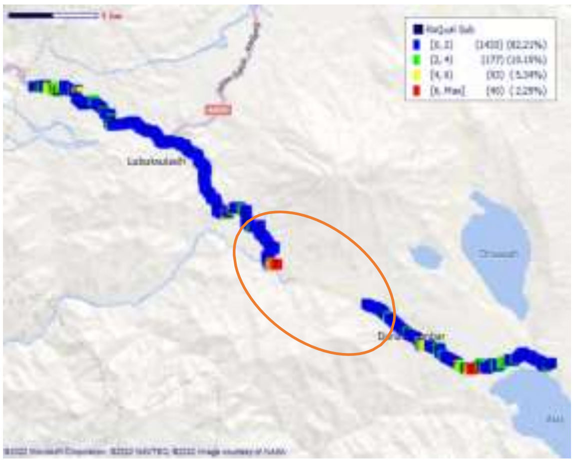

Fig. 11 *Blank Spot* Rx Quality


Fig. 12 *Blank Spot* Parameter Rx Quality

The Blank Spot is located at longitude 100.642227 and latitude -1.015159. This Blank Spot occurs due to the call being disconnected during data collection with the voice script. The call drop occurred at a distance of 5,128 km. This happened because this area also has a signal categorized as poor in terms of coverage, which is indicated by the Rx Level parameter marked in red, as shown in Figure 4.7. The nearest site from this blank area is site SLK608, where the distance to the area experiencing call disconnection is 3.66 km.

3) RSRP (Reference Signal Receive Power)

In the RSRP parameter, there are several areas where the signal quality is very poor. The bad spot area in the 4G network with the RSRP parameter is as follows.

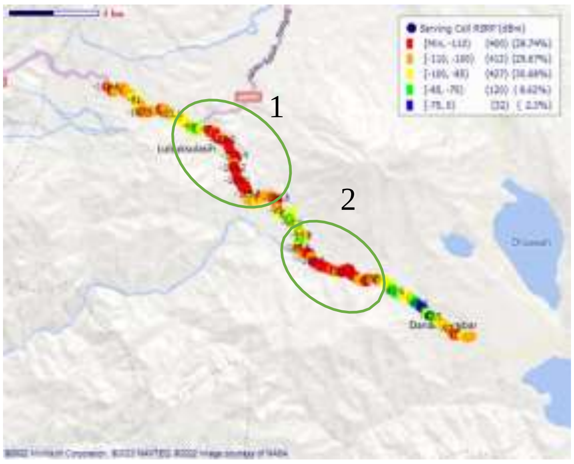


Fig. 13 *Bad Spot* Parameter RSRP


Fig. 14 *Bad Spot Area* 1 RSRP

The bad spot in Area 1 is located at longitude 100.612102 and latitude -0.982358. This bad spot is 4.393 km long. This area is hilly and has many tall trees that obstruct the signal transmission. Thus, the signal plotting is marked by a red indicator, and there are even areas that are blank with the received signal strength of <-110 dBm. The nearest site is SLK525, which is 5.59 km away from the bad spot. Therefore, it is recommended to add a new site due to the length of the detected bad spot. In addition to bad signal, two more requirements are needed for determining a new site, namely the number of users and the length of the bad spot itself. For the distance of the bad spot, the minimum limit is set at 2 km, and the minimum number of users is 200 subscribers [14]. This area has exceeded the minimum distance and the number of users that meet the requirements, as this bad spot is located in a residential area in Kenagarian Batang Barus, Gunung Talang District.


Fig. 15 *Bad Spot Area 2* RSRP

Then, in the bad spot area 2 located at the longitude of 100.649605 and latitude of -1.021027, the length is 4.234 km. This area is characterized by hills and many high cliffs. Thus, the signal plotting is marked by red and orange colors. The SLK608 site is not far from the bad spot area, and even the direction of its sector is already pointing towards that area. However, the bad spot is detected at a distance of 4.28 km from the site. The signal is still categorized as poor because it is marked by red and orange indicators. To address this issue, optimization or improvement of the antenna at site SLK608 is required.

4) SINR (Signal Interference to Noise Ratio)

In the SINR parameter, there are areas where the signal tends to be poor or even blank. The bad spot area in the 4G network for the SINR parameter is as follows.

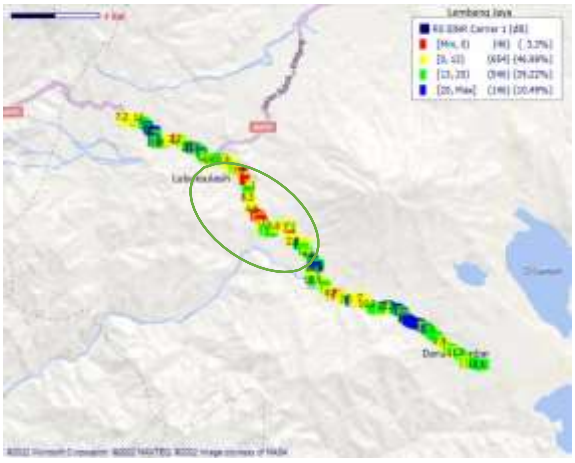

Fig. 16 *Blank Spot* SINR


Fig. 17 *Bad Spot Area* 1 SINR

The bad spot area 1 is located at longitude 100.610981 and latitude -0.975746. This area has a signal plotting with a yellow indicator, which means the signal category in this area is weak or fair, but there are also some samples with a red indicator, indicating that the signal category is poor. There are even areas that are blank with a length of 0.811 km. This region is hilly, with many high cliffs and tall trees, which causes the SINR in this area to tend to be blank. This is because the SLK240 site's sector does not point towards that area. Therefore, an azimuth antenna is needed to address that issue.

## E. *Overshooting*

Overshooting is when a cell/sector covers an area too far or covers an area that is not its designated area with a strong signal, making that cell dominant. A cell is certainly built with planning to cover a specific area, and if this cell takes coverage from another site, that is what is referred to as an overshooting cell [17].

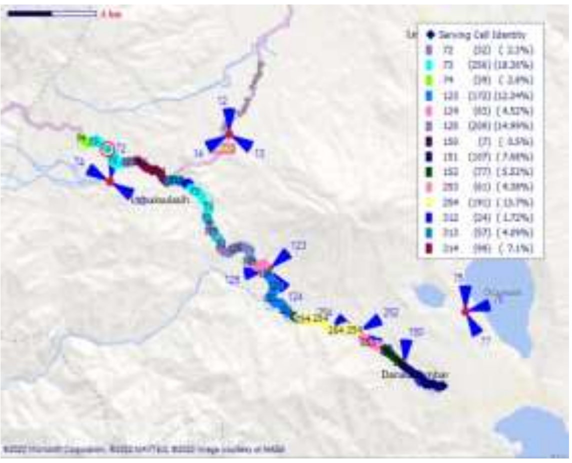

Fig. 18 PCI Parameter with Site

Figure 18 the PCI parameters to observe the occurrence of overshoot issues. In the drive test data from Gunung Talang District and Danau Kembar District, overshooting can be seen in Figure 19.

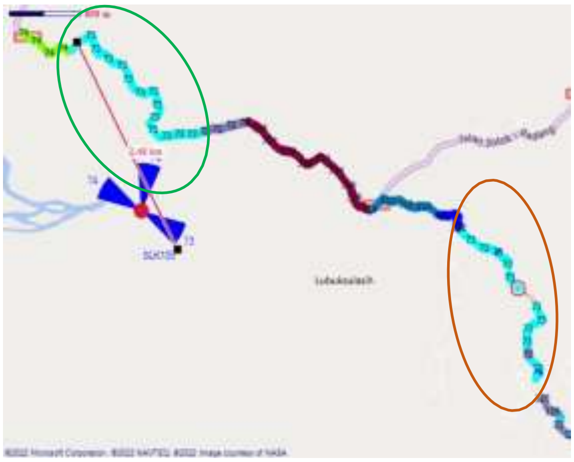

Fig. 19 *Overshoot* in 4G Networks

Based on image 19, it can be observed that there is an overshooting of 2.48 km by site SLK109, where in sector 2 with a PCI of 73, the signal is transmitted incorrectly according to the antenna azimuth and covers an area that is not part of the cell marked by the green line. As a result, the signal in the area became weak and was marked by orange and yellow indicators when viewed from the coverage perspective based on the RSRP parameter. However, in terms of quality, when viewed based on the SINR parameter, the signal in that area is quite good. Due to this overshooting, the area that should receive the signal from sector 2 has become very poor, as indicated by the orange line. This can be seen from the coverage perspective based on the RSRP parameter, where the signal plotting is marked by red indicators, and there are even several points that are blank, as shown in Figure 10. Similarly, when viewed from the quality perspective based on the SINR parameter, the signal is marked by yellow indicators, and there are also blank areas indicating that the signal in that area is weak, as seen in Figure 12. It can be concluded that the SLK109 site's antenna radiation pattern is less than optimal, and the signal strength being transmitted does not meet the desired target. The solution to address this issue is to conduct physical tuning as a correction for the antenna radiation pattern.

## IV. Conclusion

The signal quality of the Telkomsel operator in the Gunung Talang and Danau Kembar sub-districts, based on measurements of the 2G network in terms of coverage according to the Rx Level parameter, yielded an average value of -85.1 dBm, with the dominant signal quality being very poor, reaching 27.14%. In terms of quality, based on the Rx Quality parameter, the average value obtained was 0.9 dB, with the dominant signal quality being excellent, reaching 82.21%.

Measurements of the 4G network in terms of coverage based on the RSRP parameter showed an average value of -101.7 dBm, with the dominant signal quality being good, reaching 30.68%. In terms of quality, based on the SINR parameter, the average value obtained was 12.3 dB, with the dominant signal quality being fair, reaching 46.98%.

From the measurements conducted, several bad spot areas were identified, caused by obstacles such as hills, high cliffs, and tall trees, which hinder signal transmission. To address this issue, it is recommended to optimize the site closest to the bad spot.

## References


[1] Hilda.2022. *Kabupaten Solok Dalam Angka : Solok Regency in Figures 2022*. Solok: Badan Pusat Statistik Kabupaten Solok.

[2] Pramukantoro, E. S. (2018). *Solusi Kesenjangan Informasi Digital di Daerah Rural: Pendekatan Praktis*. Universitas Brawijaya Press.

[3] Ramadianty, V. D. (2018). Analisis Pengukuran Performansi Jaringan 4G LTE Telkomsel Dalam Event Game Mobile Legends: Bang-Bang Pontianak. *Jurnal Teknik Elektro Universitas Tanjungpura*, *2*(1).

[4] Santoso, G. (2016). Perkembangan Jaringan Komunikasi Wireless Menuju Teknologi 4G. *PROSIDING SNAST*, 250-254.

[5] Riyanto, G. P. (2022, Maret 1). Kapan Seluruh Sinyal 3G di Indonesia Dimatikan, Kominfo?. *Kompas.com.* (Online). Diambil dari https://bit.ly/3QVY4ad, diakses pada 14 Agustus 2022.

[6] Nurlatifah (2016) "Arsitektur 2G, 3G, 4G" (Online). Diambil dari bit.ly/3RhCYTu, diakses pada 6 Agustus 2022

[7] Evalina, N. (2021). Analisis Perbandingan Kualitas Jaringan 4G LTE Operator X Dan Y Di Wilayah Kampus Utama UMSU. *Teknologi Rekayasa Jaringan Telekomunikasi (TRekRiTel)*, *1*(1), 13-20.

[8] ADHIMA, F., & JAYA, A. ANALISIS PERBANDINGAN JARINGAN 3G DAN 4G PADA PROVIDER XL DI KOTA MAKASSAR

[9] Efriyendro, R., & Rahayu, Y. (2017). *Analisa Perbandingan Kuat Sinyal 4G LTE Antara*

*Operator Telkomsel dan XL AXIATA Berdasarkan Paramater Drive Test Menggunakan Software G-NetTrack Pro Di Area Jalan Protokol Panam* (Doctoral dissertation, Riau University).

[10] Karo, F. K., Nugraha, E. S., & Gustiyana, F. N. (2019). Analisis hasil pengukuran performansi jaringan 4g lte 1800 mhz di area sokaraja tengah kota purwokerto menggunakan genex asistant versi 3.18. *AITI*, *16*(2), 115-124.

[11] Harlin, Syaza Ibra. 2021. "Analisis Performansi Kualitas Sinyal Pada Provider Telkomsel di Kecamatan Simpang Alahan Mati Kabupaten Pasaman".
Tugas Akhir. Padang: Politeknik Negeri Padang

[12] Widyastoro, D. R., Hafidudin, H., & Saputra, D. A. (2015). Evaluasi Coverage Area Untuk Jaringan Selluler 2g (studi Kasus Kota Semarang). *eProceedings of Applied Science*, *1*(3).

[13] Nuari, F. A. I., Usman, U. K., & Hanuranto, A. T. (2021). Penerapan Unmanned Aerial Vehicle (UAV) untuk Pengukuran Kuat Sinyal (Drive Test) pada Jaringan 4G LTE. *Aviation Electronics, Information Technology, Telecommunications, Electricals, Controls*, *3*(1), 69-82.

[14] Yusnita, S., Saputra, Y., Chandra, D., & Maria, P. (2019). Peningkatan Kualitas Sinyal 4G Berdasarkan Nilai KPI Dengan Metode Drivetest Cluster Padang. *Elektron: Jurnal Ilmiah*, 43-48.

[15] Hendra, Farid. 2013. "Google Earth", (Online). Diambil dari https://bit.ly/3QYLqqI, diakses pada 6 Agustus 2022

[16] Geosriwijaya. 2016. "Pengertian dan Fungsi Mapinfo", (Online). Diambil dari https://bit.ly/3PVVDCU, diakses pada 6 Agustus 2022.

[17] Hanif, M., Usman, U. K., & Vidyaningtyas, H. (2019). Analisis Dan Optimasi Overshoot Pada Jaringan 4g Lte 1800 Mhz Di Daerah Situ Pondok Benda Tangerang Selatan. *eProceedings of Engineering*, *6*(1).