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Performance Analysis of UMTS Networks as Reference of Signal Interference Handling

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A B S T R A C T

A network, not apart from the existence of the maintenance process, not least in the telecommunications network. In the maintenance of telecommunication networks, especially 3G -UMTS network, it is necessary to report on UMTS network performance in the previous days. The purpose of this study is to conduct a study of network performance reports in the previous days to help the UMTS network maintainers in analyzing and determining corrective measures in the area in trouble. The results of this study indicate that the RTWP method is helpful in deciding whether Node-B is affected by interference at the maximum acceptance signal threshold of -92dBm / cell. The resulting report resumes can be used as a reference of areas where signal interference is occurring for improvement in the area in which the signal interference is occurring.

Keywords: Telecommunication network, maintenance, UMTS, performance reports, signal interference

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1. Introduction

In the current era of information and communication technology, development is happening very quickly and rapidly. No exception to telecommunication technology. This development continues to be improved because of the need to communicate and exchange data quickly, easily and mobile (rfwireless,2012). One communication technology that has been widely implemented, especially in Indonesia is UMTS (Universal Mobile Telecommunication System) or 3G technology for mobile communications (Irawan,2015). UMTS technology or better known as 3G for mobile communications is a communication technology that evolved because of the demands of telecommunications technology that requires large data exchange, fast and can be used anywhere or mobile (w3ii,2016), (Effendi,2016), and (Oktaviani,2009). In the maintenance of a UMTS network, frequent signal interference occurs within the range of cells in a particular region. There are several ways to analyze signal interference on UMTS network, one of them is through RTWP report (Receive Total Wideband Power). The hypothesis is that the results of this study, it can be used for accurate references in taking steps to overcome signal interference in certain areas.

This paper will explain the performance analysis of UMTS through Interference and Analysis RTWP. After that of the method then done. Data from the results of practical work at PT. Indosat and library resources are linked to the main components of the UMTS network and its performance as a comparative instrument. One of the signals that affect the communication system on the network is the interference signal (Hidayat,2017). Signals that are not required for communication systems are also interference signals. Once again, the signals are not included in the internal system that appears on the RX frequency band but does not affect the performance of the system also called interference signals. Based on the source, interference is divided into two, namely from internal interference and external interference. Internal interferences include: Interference that is related to intermodulation on the send signal; Interference that is related to the transmission channel; Interference relates to receiver channel; self-excitation recipient; intermodulation due to send the signal at a receiver; unlocked situation; RTWP abnormal value due to frequency change; and congestion caused by a strong signal.

One of external interference is the interference between W-CDMA 2100 MHz and GSM 1900 MHz, where each other cannot coexist. Interference due to non-selective frequency design as well as an inaccurate repeater and reinforcement configurations result in noise interfering UE. The types of interference due to microwave transmission are bi-directional interference; widespread interference; and long-term interference. Non-linear components in large electromagnetic fields; Interference from the radar that occurs at certain moments; Interference from the handset that

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occurs at a specific time or on a continuous time; as well as during daytime meetings. Interference from the handset may also be due to influence from government, military, hospital, or gas station; Intermodulation signals from various transmitters (especially TV stations). Interference handling in the field refers to the source of the interference, so to solve the interference problem needs to be done in-depth analysis on the site concerned. Vendors or providers of tools has made the guidelines or procedures for handling uplink interference starting with analyzing internal interference. If no interference source is found on the internal system, it then analyzes the source of external interference. By analyzing or troubleshooting thoroughly and profoundly on either an internal or an external system it will reach a point of problem-solving. Troubleshooting can be either a repair/replacement device on an internal system or coordination with other operators and site managers to re-adjust the current site conditions.

2. Methodology

RTWP (Receive Total Wideband Power)

RTWP on Node-B is the total uplink received power. The received power of the wideband includes the noise generated from the receiver at the bandwidth determined by the filtering pulse (Hamdana,2012). The reference point for measurement is the RX antenna connector. When parts of the cells have been established, the total power received on the wideband can be measured on the part of the cells (Adi,2012). PT. Indosat Tbk has a frequency range from 890 to 900 Mhz. In these frequencies, Indosat BTS emits Radio Frequency (RF) signals. In Cell Performance Indosat Network, limited between -92 to -105 dBm / Cell. If the Cell Performance value is greater than -99 (-91, -90, etc.) then it is known that the area is interfering. The following table describes Cell Performance in Bandung region.

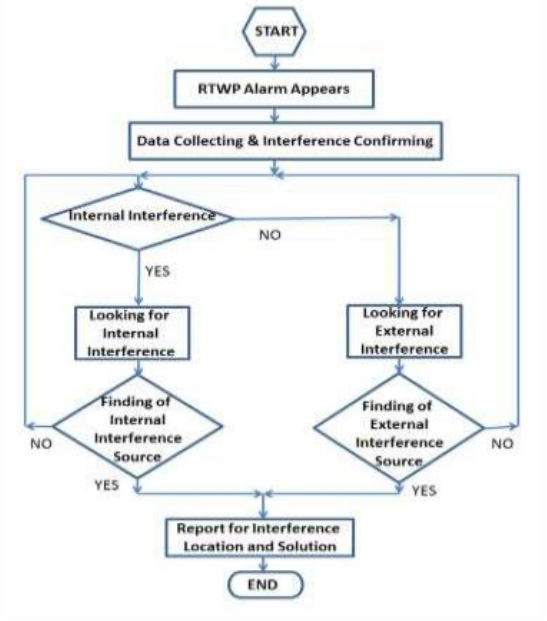
Table-1. Cell performance sample

BSC6900UCell	CellID	10/16/2016	10/17/2016	10/18/2016	10/19/2016	10/20/2016
U_ISTANABUNGA_MT2	16988	-94.695	-93.833	-93.29	-93.496	-92.86
U_CICADAS_MT5_XYX	23875	-94.201	-96.361	-94.019	-94.034	-90.773
U_BIP_BDG6_XYX	23476	-91.471	-91.5	-91.257	-91.415	-91.541
_3G2_BEC_BDG4	15124	-92.797	-93.08	-94.962	-94.363	-94.137
U_CIKUTRA6_XYX	23526	-91.674	-91.353	-91.368	-91.422	-91.411
U_WIRAYUDA5	23855	-92.686	-92.908	-92.473	-92.729	-92.813
U_BUAHBATU5_XYX	23825	-92.794	-92.256	-92.331	-92.443	-92.322
U_KIARA_CONDONG6	23506	-92.041	-90.948	-90.897	-91.637	-91.725
U_DAGO_PAKAR5_XYX	26545	-92.699	-92.427	-92.635	-92.913	-92.657
U_RSI_SANTOSA4	23964	-92.928	-92.725	-92.21	-91.756	-92.617
U_CIKUTRA_IM5_XYX	23865	-92.872	-92.574	-91.839	-91.413	-91.843
U_GRANDPASUNDAN6	23996	-92.15	-92.576	-92.11	-92.255	-92.536
U_AEB_KOPO2	10988	-89.83	-92.048	-91.429	-92.243	-92.859

2.1. Interference Handling Procedures

In the Figure-1, it is seen that some areas in Bandung experience interference with marked yellow.

RTWP helps decide whether Node-B is affected by the interference and location it affects.



2.2. RTWP Alarm Monitoring

Maintenance of the UMTS network cannot be separated from the Supervision of BTS-BTS in West Java which is monitored through BSC (Base Station Controller) by TOC (Trunk Operation Center) by observing the alarms that appear in real-time from U2000 software.

2.3. Collecting Data and Confirming Interferences

This activity aims to confirm uplink interference on the site. To confirm required valid data based on the latest state that appears on i-Manager U2000 and in the field. It is necessary to check the frequency of the alarm and the change of the average value of the RTWP, whether the alarm appears on i-Manager U2000 or on field checking.

2.4. Source Analysis and Interference Location

When confirmed the uplink interference on a site then the next is to analyze in depth to find a breaking point.

2.5. Checking Configuration on RNC or Node-B

At this point, the authors were unable to perform any analysis regarding the configuration checks on RNC and NodeB because access was limited by the vendor.

2.6. Installation or Device Error

Before performing a physical check, you should check your device. Is there a connector and feeder that is not installed fast or even detached.

2.7. Solutions Report and Interference Location

The report works to get Troubleshooting Solutions and Locations. If the Solution handles problems with other operators then coordinate with the relevant operators on troubleshooting and shared steps to take.

3. Result and Discussion

Interference handling procedures have been performed. Based on existing data on the i-Manager U2000 application, it can be done per performance comparison of cells that have been in the procedure of handling interference as the following table.

Table-2. Cell Performance results after interference handling procedure

U_DAGO_PAKAR5_XYX	26545	-93.567	-93.212	-92.44	-93.456	-93.425	-93.602	-93.649
U_CIKUBANG2	17738	-95.393	-93.49	-93.596	-93.562	-93.312	-93.692	-93.717
U_PRKN_SAAT6	24116	-91.568	-91.344	-91.217	-92.467	-92.077	-92.238	-93.748
U_CIKUTRA_IM1	14047	-96.384	-96.197	-95.892	-96.145	-94.499	-94.554	-93.766
U_BIP_BDG5_XYX	23475	-93.166	-93.096	-93.826	-94.011	-94.256	-93.956	-93.874
U_CIKAWAO_MT3_XYX	16759	-99.163	-99.828	-99.056	-98.542	-94.308	-89.174	-93.919
U_CIWARUGA3	14389	-92.161	-92.595	-92.688	-93.21	-93.593	-93.907	-94.023
U_TEGALEGA_MT5	23465	-94.088	-93.936	-94.458	-94.353	-94.085	-93.828	-94.025
U_LEUWIGOONG_TB3	27219	-95.162	-93.133	-92.606	-93.179	-94.501	-94.732	-94.031
U_JLJAMIKA_PL5	23975	-94.394	-94.078	-93.995	-94.064	-94.002	-93.874	-94.077
U_TANJUNGSARI1	10467	-94.281	-94.491	-93.691	-93.926	-93.545	-93.391	-94.09
U_HEGARMANAH_MT5	23545	-95.255	-92.905	-88.222	-89.971	-92.269	-91.229	-94.133
U_CIWIDEY1_XYX	11237	-100.982	-99.629	-89.852	-93.673	-95.682	-92.534	-94.186

From the Table-2, it can be seen that after the interference handling procedure, the performance on cell BTS becomes more stable (between -95 and -105). This activity is done routinely so that cell performance in each BTS remain stable and can provide good service and data exchange become smoothly.

Another way to eliminate interference can be done with the following methods, namely :

1. Change the design of the quality system by department engineer operator.
2. Optimize DCS configuration by operator RF department.
3. Eliminating external interferences such as PHS, repeater, and EU interference is very difficult for vendor equipment, so there must be cooperation between vendors and operators.
    a. Interference PHS, that is by moving the WCDMA antenna as far as possible, high WCDMA antenna must be higher or lower than PHS.
    b. GSM Interference, i.e. by using the right frequency according to a normal method for spectrum allocation.
    c. Repeater, that is by changing the use of repeaters to ensure repeater selective frequency and ensure the stability of the repeater host link and set the repeater gain for the right range.
    d. Interference of a microwave transmission, that is by adjusting to microwave frequency.

4. Conclusion

That to know the performance of UMTS network through RTWP analysis, the result of this research, can be used as an accurate reference in overcoming signal interference in the certain area. Given the cell performance is very important for the quality of service to consumers so for the future development is needed handling faster and more easily from interference problems that exist.

REFERENCES

[1] Adi, J.P., 2012. Analisis RTWP pada jaringan 3G AXIS menggunakan perangkat lunak LMT. Politeknik Negeri Bandung
[2] Effendi, I. , 2016. perbedaan- jaringan-3g-dan-4g, www.it-jurnal.com [Online on December,30th 2016]
[3] Hamdana, E.N. , et al. , 2012. Optimasi perencanaan jaringan UMTS pada node B menggunakan probabilistik monte carlo, EECCIS Journal, 6(1), Malang: Universitas Brawijaya.
[4] Hidayat,R., Setiawan,H., Liklikwatil,Y., Santoso,S., Lestari,N.S., 2017. Antena cerdas untuk mitigasi interferensi dengan algoritma least mean square. Jurnal Ilmiah SETRUM, 6(1). Universitas Sultan Ageng Tirtayasa.
[5] Irawan,D., 2015. Interference uplink, www.document.mx [Online on January, 2nd 2017]
[6] Oktaviani., 2009. Mengenal teknologi 3G. Jakarta: Universitas Gunadarma
[7] Rfwireless-world team., 2012. UMTS tutorial, rfwireless. [Online on January,2nd 2017]
[8] W3ii team, 2016. UMTS WCDMA technology, www.w3ii.com [Online on December,28th 2016]