Evaluation of DVB-T2 Digital TV Propagation Performance in the Bali Broadcast Area

I Made Pradnyana[1], I Made Oka Widyantara[2], Nyoman Pramaita[2]

[1]Balmon Class I Denpasar, Directorate General of SDPPI-Ministry of Communication and Information, Denpasar, INDONESIA
[2] Faculty of Electrical Engineering, Udayana University, Denpasar, INDONESIA

E-mail: imade006@kominfo.go.id, oka.widiantara@unud.ac.id, pramaita@unud.ac.id

Submitted: June 01, 2023 | Revised: June 05, 2023 | Accepted: October 05, 2023 |

Published: October 10, 2023

ABSTRACT

The development of terrestrial television broadcasting technology in the world today is switching from analog broadcasting systems to digital broadcasting systems. Analog Switch Off (ASO) is the period when analog broadcasts are stopped and replaced with digital broadcasts. Through the jargon "Clean Picture, Clear Sound, Advanced Technology" people will feel better quality than analog TV. In the era of digital broadcasting, TV viewers not only watch broadcast programs but can also get additional facilities such as EPG (Electronic Program Guide) to find out the programs that have been and will be aired later. With digital broadcasting, there is the ability to provide interactive services where viewers can directly rate the sound of broadcast programs in addition to the presence of features that can be utilized, such as features related to disaster information. In this study, an evaluation of the performance of DVB-T2 Digital TV propaganda will be carried out in the Bali service area. The quality of digital TV broadcasts in the Bali broadcast area is influenced by signal propagation which is parameterized by parameters C/N (or S/N), Modulation Error Rate (MER), Bit Error Rate (BER) by measuring at the test point or location of the test point/test measurement which is the outermost limit of the service area under the Minister of Communication and Information no 23/PER/M.KOMINFO/11/2011. Sothis research can be produced a map of the quality of broadcasting services in Bali which can be used as an indicator to avoid Bali from blank spot areas that can be recommended for Digital TV operators in Bali for repeater installation planning.

Keyword: digital TV; DVB-T2; repeater; installation; planning.

INTRODUCTION

Indonesia through the Regulation of the Minister of Communication and Information No. 05 of 2012, adopts terrestrial digital television broadcasting standards Digital Video Broadcasting–Terrestrial second generation (DVB-T2) (Firdaus & Rahman, 2021) (Riza et al., 2015), DVB-T2 stands for Digital Video Broadcasting – Second Generation Terrestrial, which is a continuation of the DVB-T standard, published by the DVB consortium, designed for terrestrial digital television broadcasting transmission. The system transmits compressed digital data of audio, video and other data into Physical Layer Pipes (PLP), using OFDM modulation with a series of channel coding and interleaving. It offers a higher bitrate, compared to previous generations of DVB-T, making it suitable for transmitting HDTV signals into terrestrial TV channels

Terrestrial digital television broadcasting is broadcasting that uses UHF radio frequencies as well as analog broadcasting, but with a digital content format (Novitasari et al., 2018). In analog television broadcasting, the farther from the television transmitting station, the signal will be weaker and image reception will be poor and shaded (Yusfandini et al., 2018) (Bagaskara, 2020). Another case with digital television broadcasting which continues to convey images and sounds clearly to the point where the signal can no longer be received (Wardhana &; Muayyadi, 2018). In short, digital TV broadcasting recognizes only two statuses: Accept (1) or No (0). That is if the digital broadcast receiving device can pick up the signal, the broadcast program will be received. Conversely, if the signal is not received then the images do not appear.

To produce a receive signal (1) in digital TV broadcasting is greatly influenced by DVB-T2 signal propagation, where radio wave propagation is the process of propagating radio waves starting from

pISSN 2302-4240
eISSN 2655-2086
Volume 12, Issue 3, October 2023, pp.886-896
DOI: http://dx.doi.org/10.32832/astonjadro.v12i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

the transmitter to the receiving point. In the course of the radio wave undergoes several properties or treatments caused by the natural conditions through which it passes. Radio waves emitted by the transmitting antenna can propagate in all directions. The propagation nature of radio waves emitted by the antenna depends on the frequency of radio waves that propagate (Timor et al., 2016). In the VHF and UHF frequency fields, signals are propagated by radio waves close to the earth's surface (Pradana & Ardhyananta, 2017).

DVB-T2 television broadcasting system is one of the wireless communication systems that uses air as a transmission channel (Fath, 2015), so that there are objects between the transmitting and receiving antennas. The sent signal is reflected, diffracted, and faded by these objects. As a result, the information signal sent does not travel a single trajectory but travels a plural trajectory so that the signal shrinks and delays time variations. Variations in delay time can result in signals arriving at the receiver reinforcing or weakening each other (Wahyu Kurniawati, 2022). Bali Province has 1 broadcast service area where the Service Area is a radio station reception area that is protected from interference/interference of other radio frequency signals. Bali Island based on relief and topography, in the middle of the island of Bali lies a mountain range that extends from west to east, the existence of these mountains causes the Bali area to be geographically divided into 2 (two) unequal parts, namely North Bali with narrow and less sloping lowlands and South Bali with wide and gently sloping lowlands. With the topographic condition of the island of Bali which has obstacles in the form of mountains in the middle of the middle which divides into 2 parts while Bali has 1 service area, it is necessary to evaluate the propagation performance of DVB-T2. This condition causes the antenna to transmit area to be not optimal even though it is supported by a large transmit power (Aryanta, 2013). To get coverage areas with good broadcast quality categories, it is necessary to evaluate propagation which includes C/N (or S/N) parameters, Modulation Error Rate (MER), and Bit Error Rate (BER) not discussing image quality (quality experience).

Bali Province Service Area

In general, the topographic conditions of Bali also vary from lowlands, beaches, highlands, and mountains (Wahyudi & Kharisma, 2017). In the middle of the island of Bali lies a mountain range that extends from west to east, the existence of these mountains causes the area of Bali geographically divided into 2 (two) parts that are not the same, namely North Bali with narrow and less sloping lowlands and South Bali with wide and sloping lowlands. With the establishment that separates North Bali and South Bali, it is necessary to plan a DVB-T2 network that can cover all service areas on the island of Bali.

Based on the Regulation of the Minister of Communication and Information Number 6 of 2019 concerning the Radio Frequency Master Plan to implement Terrestrial Digital Broadcast Television in the Ultra High-Frequency Radio Frequency Band of the Minister of Communication and Information No. 6 of 2019 The service area of Bali Province has been determined, there is one service area and 6 terrestrial Digital Television channels are allocated, as in Figure 1.

Table 1. Bali Service Area

Bali Service Area		
District / City Service Area		**Frequency Channel**
51.01	Jembrana Regency	30, 33, 36, 39, 42, 45
51.02	Tabanan Regency	
51.03	Badung Regency	
51.04	Gianyar Regency	
51.05	Klungkung Regency	
51.06	Bangli County	
51.07	Karangasem Regency	
51.08	Buleleng Regency	
51.71	Denpasar City	

Service Area Boundaries

Figure 1. DVB-T2 Bali Service Area

Table 2. Test Point

No	Test Point Name	Longitude	latitude	References Fieldstrenght Value (dBµV/m)
1	TP 1	114E26 15.050	08S10 12.990	88.7 ± 3 dB
2	TP 2	114E55 48.500	08S11 13.040	89.2 ± 3 dB
3	TP 3	114E05 19.370	08S06 13.580	81.6 ± 3 dB
4	TP 4	114E20 42.510	08S07 39.700	121.0 ± 3 dB
5	TP 5	114E36 54.930	08S26 42.700	97.7 ± 3 dB
6	TP 6	114E34 53.430	08S23 34.430	89,2 ± 3 dB

Digital TV Mux Organizer in Bali

Under the evaluation results of the selection team no 18/Mux Selection Team/KOMINFO/4/2001, private broadcasters as organizers of terrestrial digital television broadcast multiplexing in 2021 have been determined winners for the Bali service area, namely:

a. ANTV
b. Metro TV
c. NTV

Measurement Procedure Using a Spectrum Analyzer or Digital Monitoring Receiver Device

Based on Rec. ITU-R SM.443-3, the following is a measurement procedure using a spectrum analyzer or digital monitoring receiver:

a. Frequency: approximate mid-emission frequency
b. Span: 1.5 to 2 times the estimated required emission bandwidth
c. Resolution Bandwidth (RBW): less than 3% span
d. Video Bandwidth (VBW): 3 times that of RBW or more
e. Level/Attenuation: adjusted so that the S/N ratio is more than 30 dB
f. Sweep time or acquisition time: auto (for emission pulses long enough that one pulse is recorded for each pixel on the screen).
g. Trace: MaxHold (for analog modulation), ClearWhite (for digital modulation)

Standard Value of Measurement Parameters

The following are the Digital TV measurement value standards based on PM Number 32 of 2012 concerning DVB-T2 Transmitting Devices:

Table 3. Standard Value of Measurement Parameters

1	Frequency Bandwidth Standard	8 MHz
2	Frequency Range	478 MHz – 694 MHz
3	Modulation	4 QAM (QPSK), 16QAM, 64QAM, 256QAM

pISSN 2302-4240
eISSN 2655-2086
Volume 12, Issue 3, October 2023, pp.886-896
DOI: http://dx.doi.org/10.32832/astonjadro.v12i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

4	Guard Interval	¼, 19/256, 1/8, 19/128, 1/16, 1/32, 1/128
5	Code Rates	½, 3/5, 2/3, ¾, 4/5, 5/6
6	Compression System	MPEG-4
7	Output Impedance	50 Ohms
8	MER rms	≥ 31 dB
9	Shoulder Attenuation	≥ 36 dB
10	Spurious Emission	≥ 60 dB

The following is a standard protection ratio for Digital TV measurements based on PM Number 23 of 2011 concerning the Radio Frequency Master Plan for Terrestrial Digital Broadcast Television in the Radio Frequency Band 478-694 MHz, Protection Ratio for the Implementation of DVB-T Digital Broadcast Television in the UHF Band:

Table 4. Protection Ratio for the Implementation of DVB-T Digital

Protection Ratio	
Protection ratio for the same channel (co-channel)	**20 dB**
Protection Ratio for Adjacent-Channel:	
i. Lower Adjacent Channel	-30 dB
ii. Upper Adjacent Channel	-30 dB

Digital TV has a Minimum Signal Level Reception Standard on TV receivers, along with digital TV reception standards

a. Fixed Acceptance: 42 dBμV (equivalent to -65 dBm)
b. Indoor Portable Reception: 52 dBμV (equivalent to -55 dBm)
c. Indoor Mobile Reception: 62 dBμV (equivalent to -45 dBm)
d. Outdoor Mobile Reception: 57 dBμV (equivalent to -50 dBm)

Performance parameters and measuring instruments

There is a fundamental difference in measuring the performance of digital TV networks compared to analog. The main difference lies in more parameters or performance indicators. But among these performance indicators, there are still some similarities, among them those relating to spectrum use and image quality testing. The relevant measuring instruments are a spectrum analyzer to measure the spectrum and a digital TV signal measuring instrument which includes a BER test set so that it can detect parameters such as BER and MER

Spectrum

Spectrum measurement is mainly directed at meeting the protection ratio criteria or spectrum masks that have been outlined. Basically, for spectrum measurement, a spectrum analyzer is installed at the front-end stage of the transmitter, both before and after the final amplifier stage. This is important to guard against mutual interference between contiguous RF channels

Signal Quality

In digital TV systems, objective indicators for signal quality are BER, MER, and S/N. Meanwhile, as an indicator of image quality, subjective evaluation can be used by involving several respondents as assessors (Nurlita &; WPT, 2022). BER, MER, or S/N measurements can only be done with a BER test set or measuring instrument for digital TV systems. BER is a measure of the proportion of bits of information, both video, and audio, that the receiver detects does not correspond to the actual value. The BER value can be measured at different stages of the receiving structure. For example, in DVB-T systems the BER measurement at the stage between the Viterbi decoder and the RS decoder can be directly linked to the receiving conditions, whether it reaches QEF (Quasi Error Free) or not. QEF conditions are equivalent to BER < 10-3 measured at the stage before the Viterbi decoder, < 2×10-4 between the Viterbi and RS decoder, or < 10-11 after the RS decoder. In the output MPEG-2 decoder, this is equivalent to a maximum occurrence of one error event in one hour. Figure 5.20: FCC-required emission mask for digital TV transmitters. MER reflects the magnitude of deviations that occur in the signal constellation, both in the in-phase and quadrature components, according to the modulation system used. MER is calculated by the following formula

$$MER_{\mathrm{dB}} = 10\log_{10}\left(\frac{\sum_{k=1}^{N}|S_k|^2}{\sum_{k=1}^{N}|e_k|^2}\right)$$

Power and Signal Spectrum

Signal power measurement is required to regulate and monitor signal levels at transmitters and receivers. In measuring the received signal power, the measurement must be limited to the desired signal bandwidth. If a spectrum analyzer or power meter is used as a measuring instrument, it must be ensured that the measuring instrument integrates the signal power in nominal bandwidth according to the number of subcarriers and frequency spaces.
Measurement of the signal spectrum is intended to ensure the conformity of the spectrum to the spectrum mask outlined. Measurements are made by connecting the spectrum analyzer to the K and/or M points on the transmitter. ETSI recommends using a spectrum analyzer with a bandwidth resolution of 30 kHz or less
Rated spectral power density is defined as the average time of signal power per unit bandwidth. Thus the power density for different bandwidths can be obtained proportionally from that value. To test spectrum-limiting filters, a special input signal in the form of pseudo-noise can be used

RESEARCH METHODS

Research design evaluation of DVB-T2 performance for fixed receivers in the Bali service area where the service area is a radio station reception area that is protected from interference/interference of other radio frequency signals. The study was conducted by measuring the existing DVB-T2 transmitter. At the Transmitter Station, technical parameters are measured at the transmitting station and take measurements at the location of the test point which is the outermost boundary of a service area (Budiman, 2016).

The research location was carried out in Balmon Class I Denpasar All stages of research start from January 2022 and are estimated to spend an effective time of 4 (four) months consisting of planning, measuring, and analyzing the measurement results.

Administration data needs to be prepared in the form of identity, legality, and position data from the Digita TV organizer. Technical data that at least needs to be known or prepared include data on transmitter characteristics, assigned frequency, channel allocation, transmitter antenna characteristics, feeders, and towers owned by Digital TV operators.

Research Flow is a chart or flowchart that illustrates the stages in research, shown in Figure 2.

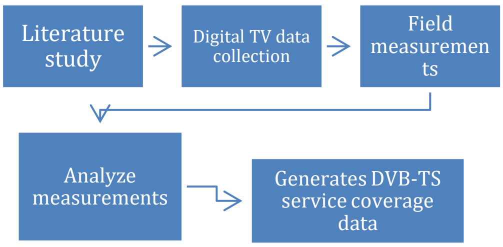

Figure 2. Research Flow

Figure 2. shows that the first stage of this research is a literature study on DBV-T2 technology, propagation, and technical parameters of DVB-T2 along with data collection of DVB-T2 transmitter stations regarding location, type of device, and transmitter antenna.

pISSN 2302-4240
eISSN 2655-2086
Volume 12, Issue 3, October 2023, pp.886-896
DOI: http://dx.doi.org/10.32832/astonjadro.v12i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

The second stage is carried out validation and measurement at each DVB-T2 transmitter location to find out whether the device used is under the standards of the Minister of Communication and Information No. 4 of 2019

In stage three, DVB-T2 broadcast coverage measurements were carried out, by measuring the Test Point of the service area according to the provisions (quality of coverage), the calculated parameter was field strength (dBµV / m) which was measured at the test point of the Bali service area according to the Minister of Communication and Information No. 6 of 2019.

Table 5. Test Point Location of Bali service area

No	Test Point Name	Test Point Longitude	Test Point latitude	References Fieldstrenght Value (dBµV/m)
1	TP 1	114E26 15.050	08S10 12.990	88.7 ± 3 dB
2	TP 2	114E55 48.500	08S11 13.040	89.2 ± 3 dB
3	TP 3	114E05 19.370	08S06 13.580	81.6 ± 3 dB
4	TP 4	114E20 42.510	08S07 39.700	121.0 ± 3 dB
5	TP 5	114E36 54.930	08S26 42.700	97.7 ± 3 dB
6	TP 6	114E34 53.430	08S23 34.430	89,2 ± 3 dB

In stage four, an analysis was carried out comparing the results of the Digital TV application with the measurement results of the MER, BER, and C / N parameters, and comparing the influence of topology along with the distance from the measurement point. Finally, in stage five, based on measurements and analysis of measurement results, conclusions were drawn from the results of this study.

Radio Frequency Spectrum observation using monitoring tools and devices in the form of:
Measuring instruments used in Digital TV measurement can be:

a. Spectrum Analyzer;
b. TV Analyzer; or
c. Test Portable TV Receiver
d. Directional Antenna and/or Dipole 1/2 λ
e. Coaxial/Feeder with adjustable impedance

Data Analysis

1. DVB-T2 measurement data collection is carried out using a device owned by the Denpasar Class II Radio Frequency Spectrum Monitor Office, where monitoring devices have been calibrated and maintained regularly so that accurate and accountable measurement results are produced with Digital TV providers.
2. Measurement is carried out once for each MUX provider (TVRI, ANTV, Metro TV, and Nusantara TV) by observing monitoring for 1 hour on each MUX service at 6 test point locations around the island of Bali.

Measurements at the transmitter location will be carried out in an open shelter to check the standard of the device used and validate the measurement results at each test point location with data from the transmitter station.

RESULT AND DISCUSSION

In this study, an analysis of DVB-T2 Digital TV propagation performance will be carried out in the Bali service area. As an initial discussion, it is necessary to explain the condition of Digital TV broadcasts in the Bali service area using the chirplus application to find out the condition of the transmitter service area using the appropriate parameters. To determine the quality of the TV beam service area, a field strength measurement is carried out on Digital TV at certain test points to determine the quality of the Digital TV beam service area, this test point is also a measurement point whose location has been determined in PM Kominfo No. 6 of 2019.

The results obtained are described in the google earth image display on the Image

Figur 2. Images of Indonesian Television Media service areas

Figure 3. Image of Nusantara Media Mandiri service area

Figure 4. Image of TVRI service area

pISSN 2302-4240
eISSN 2655-2086
Volume 12, Issue 3, October 2023, pp.886-896
DOI: http://dx.doi.org/10.32832/astonjadro.v12i3 http://ejournal.uika-bogor.ac.id/index.php/ASTONJADRO

Figure 5. Images Service area Cakrawala Andalas Television

From the results of the chair plus application by applying SFN, it can be seen that TVRI mux and ANTV signal beams have reached all regencies/cities in the province of Bali.

Based on the SIMS Database, UHF digital broadcast television multiplexing operators located in the Bali Region are as follows.

Table 6. Bali Regional MUX Organizer Based on SIMS Database

CLNT_NAME	STATUS_SIMF	SERVICE	SUBSERVICE	TRANS_TYPE	FREQ	STN_NAME	STN_ADDR	SID_LONG	SID_LAT
LEMBAGA PENYIARAN PUBLIK TELEVISI REPUBLIK INDONESIA	Granted	Broadcast	DVB-T	Transmitter	546	TVRI SATUAN TRANSMISI BUKIT BAKUNG	JL. DHARMA WANGSA BADUNG DS. UNGARAN, KUTA, BADUNG, BALI	115.18823333	-8.81874444
CAKRAWALA ANDALAS TELEVISI, PT.	Granted	Broadcast	DVB-T	Transmitter	642	ANTV	JL. DHARMAWANGSA, BANJAR PETANGAN, DESA KUTUH	115.18443056	-8.82241667
MEDIA TELEVISI INDONESIA, PT	Granted	Broadcast	DVB-T	Transmitter	594	METRO TV	JLN. GUBUG SARI. BANJAR KAJA JATI - DESA KUTUH	115.18558611	-8.822575
NUSANTARA MEDIA MANDIRI, PT.	Granted	Broadcast	DVB-T	Transmitter	618	NUSANTARA TV BALI	JL. TUKAD CELUT BR. SANTHI KARYA DESA UNGASAN	115.17355556	-8.82375
LEMBAGA PENYIARAN PUBLIK TELEVISI REPUBLIK INDONESIA	Granted	Broadcast	DVB-T	Transmitter	546	TVRI BALI	JL. RAYA SINGARAJA DESA SUKAWANA	115.32593889	-8.20804444
CAKRAWALA ANDALAS TELEVISI, PT.	Granted	Broadcast	DVB-T	Transmitter	642	ANTV	JL. PUNCAK PENULISAN, DESA SUKAWANA	115.32895	-8.20725
CAKRAWALA ANDALAS TELEVISI, PT.	Granted	Broadcast	DVB-T	Transmitter	642	ANTV	BANJAR DINAS ASAH, DESA GOBLEG	115.07586111	-8.24294167
NUSANTARA MEDIA MANDIRI, PT.	Granted	Broadcast	DVB-T	Transmitter	618	NUSANTARA TV	JL. P. MENJANGAN BTN BLK. H NO.43, BANYUNING	115.10569444	-8.11688889
CAKRAWALA ANDALAS TELEVISI, PT.	Granted	Broadcast	DVB-T	Transmitter	642	ANTV	JL. KUWUM, DESA RINGDIKIT	114.95135833	-8.24723611
MEDIA TELEVISI INDONESIA, PT	Granted	Broadcast	DVB-T	Transmitter	594	METRO TV	JL. I GUSTI KETUT JEJER, DESA SAMBANGAN, KELURAHAH SAMBANGAN	115.10095833	-8.15902222
CAKRAWALA ANDALAS TELEVISI, PT.	Granted	Broadcast	DVB-T	Transmitter	642	ANTV	JL. PELOPOR, DESA BLIMBINGSARI	114.51743889	-8.24353889

CAKRAWALA ANDALAS TELEVISI, PT.	Granted	Broadcast	DVB-T	Transmitter	642	ANTV	BANJAR DINAS GULINTEN, DESA BUNUTAN	115.63731111	-8.37860556
MEDIA TELEVISI INDONESIA, PT	Granted	Broadcast	DVB-T	Transmitter	594	METRO TV	JL. GULINTEN KEL. BUNUTAN	115.63511111	-8.37861389

From the results of mapping the transmitter location according to the SIMS database juxtaposed with the Test Point location, mapping is obtained as shown below.

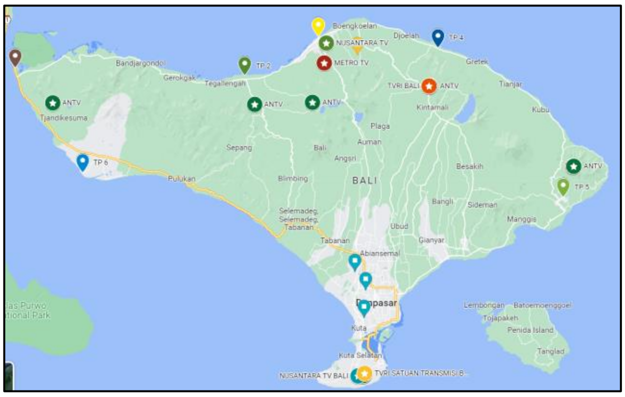

Figure 6. Location of Digital TV Transmitter and Test Point Bali service area

From the picture above, you can see the distribution of transmitter locations for multiplexing organizers including:

a. TVRI: 2 transmitters (Bukit Bakung and Kintamani)
b. Nusantara Media Mandiri: 2 transmitters (Bukit Bakung and Singaraja)
c. Cakrawala Andalas Television: 6 transmitters (Kutuh, Kintamani, Gobleg, Ringdikit, Gulinten and Melaya).
d. Indonesian Television Media: 3 transmitters (Kutuh, Gulinten, and Sambangan).

The entire test point location is quite close to the location of Digital TV transmitters, especially ANTV MUX transmitters and Metro TV.

The results of measuring the strength of the terrain in the six Digital TV Test Points of the Bali service area are shown in the following table.

Table 7. Field Strength Test Point Measurement Table Digital TV Bali Service Area

No	Test Point	Lat	Long	References Nilai FS	Field Strength (dBµV/m)			
					TVRI (546 MHz)	METRO TV (549 MHz)	NTV (626 MHz)	ANTV (642 MHz)
1	TP 1	-8,170275	114,437139	88,7 ± 3 dB	18,28	18,58	19,14	19,19
2	TP 2	-8,1869556	114,9301389	89,2 ± 3 dB	27,44	41,74	19,08	33,28
3	TP 3	-8,1033772	115,0887139	81,6 ± 3 dB	37,09	48,87	20,92	47,94
4	TP 4	-8,1276944	115,3451417	121 ± 3 dB	39,31	18,98	20,82	17,13
5	TP 5	-8,4451944	115,6152583	97,7 ± 3 dB	32,22	53,44	32,91	45,22
6	TP 6	-8,3928972	114,581083	89,2 ± 3 dB	18,96	19,92	19,24	18,54

Based on the results of the data collection above, it can be analyzed as follows:

1. From the results of measuring the field strength of all DVBT-2 ISR channels in the Bali service area (6 Test Point points), various field strength values were obtained with a range of 17.13 dBuV/m to 53.44 dBuV/m (below the maximum limit of the Field Strength reference value in PM Kominfo No. 6 of 2021 (81.6 dBuV/m to 121 dBuV/m).
2. The difference in field strength values is quite large between the measuring results and the reference value due to several factors including the transmitting power of the MUX that has not been maximized, the height of the transmitting antenna not being optimal, and the influence of propagation due to obstacles between the transmitter and the receiver antenna / measuring instrument.

MUX organizers in Bali have not implemented SFN, especially ANTV MUX, so to avoid co-channel interference, organizers still limit the transmit power. SFN implementation requires additional devices on the Multiplexer output with several parameter settings. The high cost of SFN investment is still a consideration for MUX organizers in determining the placement of Gap Filler in areas with weak signal reception.

CONCLUSION

Referring to PM Kominfo No. 6 of 2019, the value of field strength at Digital TV Test Point locations in the Bali Service Area does not exceed the maximum limit of the specified field strength reference value. Broadcast reception at test point locations fluctuates and is uneven for each MUX channel due to the distribution of MUX transmitter locations that vary from one operator to another. The Bali service area has been set using Single Frequency Network (SFN) mode with one service area to cover the entire Bali Province, but currently, the coverage of Digital TV services has not been maximized due to several factors including the MUX transmitting power that has not been maximized because it is still in Simulcast beam mode, the transmitter antenna height is not optimal and the organizer has not fully implemented SFN mode. Single Frequency Network (SFN) implementation should be implemented appropriately by multiplexing operators so that service area coverage can be achieved optimally. Field strength measurements are ideally carried out after the Analog Switch Off is carried out so that the transmit power of the multiplexing organizer can be maximized according to the ISR.

ACKNOWLEDGEMENT

The authors would like to thank the University of Pertamina LPPMI assists this research with an annual community service scheme (SK No. 0197F/UP-R/SK/XII/2020). The author is also grateful to those who have helped in carrying out this service.

REFERENCES

Aryanta, D. (2013). Performance Analysis of WiMAX Subscriber Station in Urban Area Bandung. ELKOMIKA: Journal of Electrical Energy Engineering, Telecommunication Engineering, & Electronic Engineering, 1(2), 128.

Bagaskara, A. Y. (2020). DESIGN OF RECTANGULAR PATCH MICROSTRIP ANTENNA AS TELEVISION RECEIVER. Journal of Research, 5(1), 11–20.

Budiman, A. (2016). Management Model of Broadcasting Digitalization in Indonesia. Journal of Politica Dynamics of Domestic Political Issues and International Relations, 6(2).

Fath, N. (2015). THE FLATNESS OF THE FREQUENCY SPECTRUM OF THE RECEIVE SIGNAL DVB-T2. Gadjah Mada University.

Firdaus, M. R., &; Rahman, A. (2021). MCR and Campers Implementation Program on Nusantara TV. Proceedings of the National Seminar on Community Service LPPM UMJ, 1(1).

Hidayat, A. (n.d.). Analysis of Digital Matv (Master Antenna) System Design at Golden Tulip Essential Hotel Pontianak. Journal of Electrical Engineering, Tanjungpura University, 2(1).

Novitasari, S. F. Y., Wijanto, H., &; Wahyu, Y. (2018). Crossed bowtie antenna for digital tv receiver 478-694 MHz. EProceedings of Engineering, 5(1).

Nurlita, A. I., &; WPT, A. A. (2022). dZThe influence of brand trust in mediating the relationship between quality perception and Asu's laptop purchase intent. SINOMIKA Journal: Scientific Publications in Economics and Accounting, 1(4), 693–708.

Pradana, M. A., &; Ardhyananta, E. H. (2017). Sound Absorption and Microwave Absorption Coefficient Analysis of Barium Hexaferrite Dopping Zn Reinforced Silicone Rubber Composites and Palm Oil Empty Bunches Microfibers. Department of Material Engineering, Faculty of Industrial Technology, Sepuluh Nopember Institute of Technology. Surabaya.

Riza, T. A., Wahyu, Y., &; Ibrahim, R. A. (2015). Bowtie Antenna Analysis at 500-700 MHz Frequency for Digital TV in Indonesia. Journal of Applied Electrical and Telecommunications (e-Journal), 2(2).

Timor, A. R., Andre, H., &; Hazmi, A. (2016). Analysis of electromagnetic and seismic waves generated by earthquake symptoms. National Journal of Electrical Engineering, 5(3), 315–324.

Wahyu Kurniawati, U. P. Y. (2022). SCIENCE (LIVING THINGS & THEIR ENVIRONMENT AND ORGAN SYSTEMS IN HUMANS). UPY Press.

Wahyudi, A., &; Kharisma, N. N. (2017). Social sciences (IPS) Package A equivalent to SD/MI level II, module theme 1: do not know then do not love.

Wardhana, D., &; Muayyadi, A. (2018). Performance Analysis of Statistical Multiplexing System on Digital Video Broadcasting T2. EProceedings of Engineering, 5(1).

Yusfandini, S. A., Wijanto, H., &; Wahyu, Y. (2018). Koch fractal microstrip antenna for digital television receiver (478-694 MHz). EProceedings of Engineering, 5(1).