

BAB V

KESIMPULAN

Dari hasil pembahasan dan analisis data yang telah dilakukan, maka dapat diambil kesimpulan bahwa :

1. Untuk mengatasi titik daerah yang terdapat *blankspot*nya, pada lantai satu gedung Paskal Hyper Square sebaiknya menggunakan lima antenna *indoor*.
2. Hasil perhitungan pada antenna keempat yang dihasilkan dari perhitungan hasil level sinyal didapat sebesar -83.95 dBm. Dari hasil level sinyal yang diterima tersebut termasuk kategori buruk atau jelek yaitu dibawah standar sebesar -70 dBm. Hasil tersebut membuktikan pada hasil pengukuran *walktest* sama dengan hasil level yang diterima bahwa adanya daerah yang *blankspot*.
3. Hasil perhitungan untuk antenna kelima didapat jarak area cakupan pada antenna tersebut sebesar 34.43m. Sedangkan dari hasil observasi lapangan bahwa jarak titik antenna keempat ke daerah titik yang terdapat *blankspot* sebesar 18m, dari hasil perhitungan yang halangan berupa beton (*concrete*) hanya sebesar 3.31m, sehingga pada daerah titik yang terdapat *blankspot* akan dapat *tercover* dengan penambahan antenna kelima pada lantai satu gedung Paskal Hyper Square.

LAMPIRANI

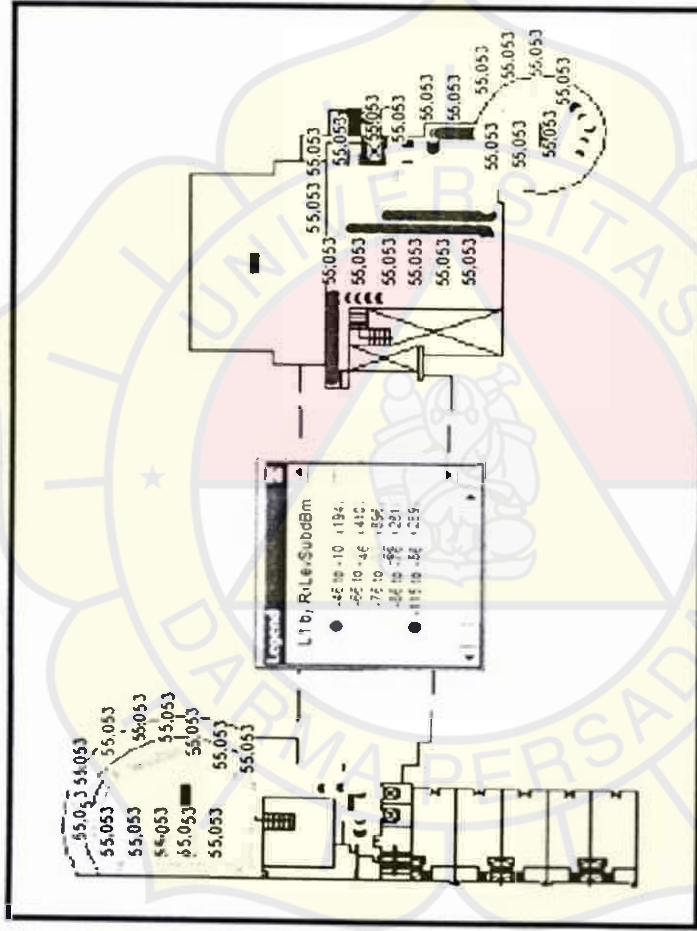
Data *Walktest* dan Konfigurasi Antena

Repeater



DAFTAR PUSTAKA

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4. TELKOMSEL "*IndoorCellPlanning_Planning.pdf*" Training Cell Planning.
5. Gemi A. Firdaus, "*Optimalisasi Jaringan Indoor Coverage di Gedung Mashill lantai 22*" Skripsi STTJ, 2005.
6. Ericsson, *Cell Planning Introduction*.
7. www.commscope.com/andrew
8. <http://www.pacificwave-wireless.com/inbuilding.html>



Rx Level Dedicated Measurement
Paskal Hyper Square (Lantai 1.log)

LAMPIRAN II

Tabel *Power Distribution* dan *Coverage*

Distance

The background features a large, faint watermark of the Universitas Darma Persada logo. The logo is a yellow, multi-lobed emblem with a central shield. The shield is divided into four quadrants: top-left (red), top-right (white), bottom-left (white), and bottom-right (white). In the center of the shield is a crest depicting a figure on horseback. The text 'UNIVERSITAS DARMA PERSADA' is written in a circular path around the shield, with two small stars on either side.

SITE NAME : Paskal Hyper Square

POWER DISTRIBUTION (GSM 900)

			A-L1-4	A-L1-3	A-L1-2	A-L1-1		
1	REPEATER OUTPUT POWER		dBm		26,00	26,00	26,00	26,00
	CABLE	CABLE LENGTH 1 1/4" (m)	1 1/4"	-0,0565				
		From antenna to splitter I						
		to splitter II						
		III						
To Repeater								
TOTAL LENGTH (m)			0,00	0,00	0,00	0,00	0,00	
TOTAL loss cable		dB		0,00	0,00	0,00	0,00	
3	CABLE LENGTH 7/8" (m)		7/8"	-0,0387				
	CABLE	From antenna to splitter I						
		to splitter II						
		III						
		IV						
		V						
		VI						
To Repeater								
TOTAL LENGTH (m)			0,00	0,00	0,00	0,00		
TOTAL loss cable		dB		0,00	0,00	0,00	0,00	
4	CABLE LENGTH 1/2" (m)		1/2"	-0,0685				
	CABLE	From antenna to splitter I						
		to splitter II						
		III						
		To Repeater						
TOTAL LENGTH (m)			35,00	25,00	63,00	50,00		
TOTAL loss cable		dB		-2,40	-1,71	-4,32	-3,43	
5	Quantity of SPLITTER		pcs					
	2 - way		-3,0	1	1	1	1	
	3 - way		-4,8	1	1	1	1	
	4 - way		-6,0					
	Quantity of COUPLER		pcs					
	Directional Coupler		-1,5	1	1	1	1	
Hybrid Coupler		-3,0						
TOTAL loss splitter		dB		-9,30	-9,30	-9,30	-9,30	
6	Quantity of JUMPER 1/2" (per 0.3 meter)		pcs	-0,1050		1	1	
	JUMPER 1/2" (per 1 meter)		pcs	-0,1050	1	1		
	JUMPER 1/2" (per 5 meter)		pcs	-0,1050				
7	Quantity of CONECTOR		pcs	-0,1	6	6	6	
TOTAL loss jumper and connector		dB		-0,41	-0,41	-0,41	-0,41	
TOTAL LOSS POWER		dB		-12,10	-11,42	-14,02	-13,13	
8	ANTENNA GAIN		dBi		2	2	2	2
9	RADIATED POWER [EIRP]		dBm		15,90	16,58	13,98	14,87

LAMPIRAN III

Spesifikasi Repeater, Antena, *Feeder*, *Splitter*,

Coupler, *Connector*, dan *Jumper*



AR1200/053

Standard Band Selective, 900 MHz

ELECTRICAL DATA*

Range	900
Frequency Band UL (MHz)	890-915
Frequency Band DL (MHz)	935-960
No. of Channels	Broad Band
Bandwidth	0.5 to 25 MHz
Output Power DL (min)	-26 dBm Compo:
Output Power UL (min)	-26 dBm Compo:
Gain adjustment range	55 to 85 dB
Noise Figure	6 dB
Group Delay	6 ns

TECHNICAL SPECIFICATIONS*

Power Supply	115/230 VAC
Power Supply (Optional)	24-60 VDC (optional)
Power Consumption	20 Watts

MECHANICAL DATA*

RF Connection	N-Female (7.15mm dia)
Dimension (Width) mm (in)	44.0x53.0x195 (1.73x2.1x7.68)
Weight kg (lbs)	22 (49)

ENVIRONMENTAL DATA*

Operating Temperature Fahrenheit (Celsius)	+13 to +131° (-25 to +55°)
Housing Specification	NECA 4 IP65

APPROVALS AND TESTS*

Regulatory Compliance Radio	TC 45706
Regulatory Compliance EMC	EN 301489-1

* All specifications subject to change

Note: Values within [] is valid for a max configuration

Indoor Omnidirectional Antennas – Multi-band
 AMPS/CDMA/GSM/PDC/PCN/DECT/PCS/UMTS
 Vertical Polarization
 741 572, 741 571

- The antenna can be operated in all frequency ranges simultaneously.
- The antennas need no additional groundplane.

Indoor 800/2000 360° 2dBi
 Indoor 900/2000 360° 2dBi

Type No.	741 572	741 571
Frequency range	824 – 960 MHz 1425 – 2170 MHz	876 – 960 MHz 1710 – 2170 MHz
VSWR	<2.0: 824– 960 MHz <2.0: 1425 – 1710 MHz <1.6: 1710 – 1990 MHz <2.0: 1990– 2170MHz	<1.8: 876– 890 MHz <1.6: 890– 960 MHz <1.6: 1710 – 1990 MHz <2.0: 1990–2170 MHz
Input	1 x N female	
Gain	2 dBi	
Impedance	50 Ω	
Polarization	Vertical	
Max. power (per band)	50 Watt (at 50 °C ambient temperature)	
Weight	400 g	300 g
Diameter	260 mm	210 mm
Height	78 mm (without connector)	



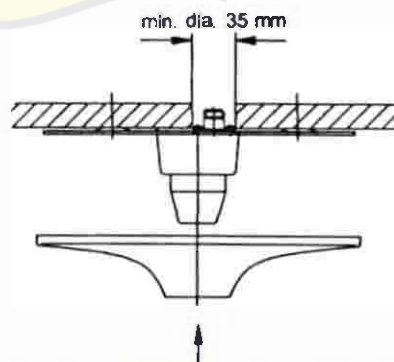
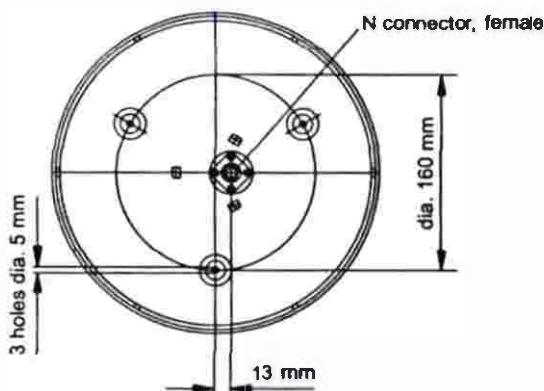
741 572

Material: Base: Aluminum.
 Protective housing: High impact polystyrol, colour: White.
 Additional painting is possible.

Mounting: Three holes in the base enable a mounting on the ceiling. Two types of screws are supplied. For the N connector a hole in the ceiling with a diameter of 35 mm is required.

Grounding: All metal parts including the inner conductor are DC grounded.

Available accessories: Broadband power splitters and tappers (800 – 2200 MHz).



Clip the protective housing into position after the antenna has been mounted with the help of the three supplied screws.

1/2" Foam Dielectric, LDF Series - 50-ohm

ANDREW® LDF4-50A HELIAX®

LDF4-50A

Description	Type No.	Attenuation and Average Power Ratings			
		Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100 m	Average Power, kW
Cable Ordering Information					
Standard Cable		0.5	0.045	0.149	40.0
1/2" Standard Cable, Standard Jacket	LDF4-50A	1	0.064	0.211	35.8
		1.5	0.079	0.259	29.2
Fire Retardant Cables		2	0.091	0.299	25.3
1/2" Fire Retardant Jacket (CATVX)	LDF4RN-50A	10	0.205	0.672	11.3
1/2" Fire Retardant Jacket (CATVR)	LDF4RN-50A	20	0.291	0.954	7.93
		30	0.357	1.17	6.46
		50	0.463	1.52	4.98
Low VSWR and Specialized Cables		88	0.619	2.03	3.73
1/2" Low VSWR, specify operating band	LDF4P-50A(**)	100	0.661	2.17	3.49
Phase Stabilized and Phase Measured Cable	See page 590	108	0.688	2.26	3.36
		150	0.815	2.67	2.83
Jumper Cable Assemblies - See page 584		174	0.880	2.89	2.62
		200	0.946	3.10	2.44
		300	1.17	3.83	1.97
		400	1.36	4.46	1.70
		450	1.45	4.75	1.59
		500	1.53	5.02	1.51
Electrical		512	1.55	5.08	1.49
Impedance, ohms	50 ± 1	600	1.69	5.53	1.37
Maximum Frequency, GHz	8.8	700	1.83	6.01	1.26
Velocity, percent	88	800	1.97	6.46	1.17
Peak Power Rating, kW	40	824	2.00	6.56	1.15
dc Resistance, ohms/1000 ft (1000 m)		894	2.09	6.85	1.10
Inner	0.45 (1.48)	960	2.17	7.12	1.06
Outer	0.58 (1.90)	1000	2.22	7.28	1.04
dc Breakdown, volts	4000	1250	2.51	8.23	0.921
Jacket Spark, volts RMS	8000	1500	2.77	9.09	0.833
Capacitance, pF/ft (m)	23.1(75.8)	1700	2.97	9.74	0.777
Inductance, µH/ft (m)	0.058 (0.19)	1800	3.07	10.1	0.753
		2000	3.25	10.7	0.710
		2100	3.34	11.0	0.691
Mechanical		2200	3.43	11.2	0.673
Outer Conductor	Copper	2300	3.52	11.5	0.657
Inner Conductor	Copper-Clad Aluminum	3000	4.09	13.4	0.565
Diameter over Jacket, in (mm)	0.63 (16)	3400	4.39	14.4	0.526
Diameter over Copper Outer Conductor, in (mm)	0.55 (14)	4000	4.82	15.8	0.479
Diameter Inner Conductor, in (mm)	0.189 (4.6)	5000	5.49	18.0	0.421
Nominal Inside Transverse Dimensions, cm	1.11	6000	6.11	20.1	0.378
Minimum Bending Radius, in (mm)	5 (125)	8000	7.26	23.8	0.318
Number of Bends, minimum (typical)	15 (50)	8800	7.69	25.2	0.300
Bending Moment, lb-ft (N·m)	2.8(3.8)				
Cable Weight, lb/ft (kg/m)	0.15 (0.22)				
Tensile Strength, lb (kg)	250 (113)				
Flat Plate Crush Strength, lb/in (kg/mm)	110 (20)				

Standard Conditions:
For attenuation VSWR 1.0, ambient temperature 20°C (68°F).
For Average Power, VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

ANDREW.

Revised 9/00

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

7/8" Foam Dielectric, LDF Series - 50-ohm



LDF5-50A

Attenuation and Average Power

Description	Type No.	Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100 m	Average Power, kW
Cable Ordering Information					
Standard Cable		0.5	0.025	0.081	91.0
7/8" Standard Cable, Standard Jacket	LDF5-50A	1	0.035	0.115	78.6
Fire Retardant Cable		1.5	0.043	0.141	64.1
7/8" Fire Retardant Jacket (CATVR)	LDF5RN-50A	2	0.050	0.163	55.5
Low VSWR and Specialized Cables		10	0.112	0.366	24.6
7/8" Low VSWR, specify operating band	LDF5P-50A-(**)	20	0.159	0.521	17.3
		30	0.195	0.641	14.1
		50	0.254	0.833	10.8
		88	0.340	1.12	8.08
		100	0.364	1.19	7.56
		108	0.378	1.24	7.26
		150	0.449	1.47	6.12
		174	0.486	1.59	5.66
		200	0.523	1.72	5.26
		300	0.649	2.13	4.24
		400	0.758	2.49	3.63
		450	0.808	2.65	3.41
		500	0.855	2.81	3.22
		512	0.866	2.84	3.17
		600	0.945	3.10	2.91
		700	1.03	3.37	2.67
		800	1.11	3.63	2.48
		824	1.13	3.69	2.44
		894	1.18	3.87	2.34
		960	1.23	4.02	2.24
		1000	1.25	4.12	2.19
		1250	1.42	4.67	1.93
		1500	1.58	5.18	1.74
		1700	1.70	5.56	1.62
		1800	1.75	5.75	1.57
		2000	1.86	6.11	1.48
		2100	1.92	6.29	1.44
		2200	1.97	6.46	1.40
		2300	2.02	6.63	1.36
		3000	2.37	7.76	1.16
		3400	2.55	8.37	1.08
		4000	2.81	9.23	0.978
		5000	3.23	10.6	0.853
Characteristics					
Electrical					
Impedance, ohms	50 ± 1				
Maximum frequency, GHz	5.0				
Velocity, percent	89				
Peak Power Rating, kW	91				
dc Resistance, ohms/1000 ft (1000 m)					
Inner	0.32 (1.05)				
Outer	0.36 (1.18)				
dc Breakdown, volts	6000				
Jacket Spark, volts RMS	8000				
Capacitance, pf/ft (m)	22.8 (75.0)				
Inductance, µH/ft (m)	0.057 (0.187)				
Mechanical					
Outer Conductor	Copper				
Inner Conductor	Copper				
Diameter over Jacket, in (mm)	1.09 (28)				
Diameter over Copper Outer Conductor, in (mm)	0.98 (24.9)				
Diameter Inner Conductor, in (mm)	0.355 (9.0)				
Nominal Inside Transverse Dimensions, cm	2.11				
Minimum Bending Radius, in (mm)	10 (250)				
Number of Bends, minimum (typical)	15 (50)				
Bending Moment, lb-ft (N-m)	12 (16.3)				
Cable Weight, lb/ft (kg/m)	0.33 (0.49)				
Tensile Strength, lb (kg)	325 (147)				
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)				

* A 75-ohm 7/8" diameter cable is available. Contact Andrew for further information.

Standard Conditions:

For Attenuation: VSWR 1.0, ambient temperature 20°C (68°F).

For Average Power: VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F); no solar loading.

ANDREW.

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

Product Specifications



CPUSE-L-N

2-way Low Power Splitter, 698-2700 MHz



CHARACTERISTICS

Electrical Specifications

Operating Frequency Band	698 – 2700 MHz
Order IMD	-130 dBc (relative to carrier)
Order IMD Test Method	Two +43 dBm carriers
Age Power, maximum	50 W
Insertion Loss at Frequency Band	0.3 dB @ 698-2500 MHz 0.4 dB @ 2500-2700 MHz
Impedance	50 ohm
Reflection Loss at Frequency Band	0.3 dB @ 698-2500 MHz 0.4 dB @ 2500-2700 MHz
Return Loss at Frequency Band	20 dB @ 698-2700 MHz
Power, maximum	1 k W
Power Rating, Combining	0.5 W
Power Rating, Splitting	50 W
Rated Power, maximum	3 W
Return Loss	20.8 dB
Insertion Loss	3.0 dB
Isolation	1.2:1

General Specifications

Device Type	Splitter
Face	N Female
Color	Black

Mechanical Specifications

Contact Plating	Silver
Contact Plating	Trimetal

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Product Specifications



CPUSE4-N

Environmental Specifications

Location	Indoor/Outdoor
Ingress Protection Test Method	IEC 60529:2001, IP65
Operating Temperature	-25 °C to +85 °C (-13 °F to +185 °F)
Relative Humidity	Up to 100%

Dimensions

Height	22.00 mm 0.87 in
Depth	107.00 mm 4.21 in
Weight	240.00g 0.53 lb
Width	79.00 mm 3.11 in

Pack Dimensions

Height	40.0 mm 1.6 in
Depth	130.0 mm 5.1 in
Shipping Weight	290.00 g 0.64 lb
Volume	520.0000 cc
Width	100.0 mm 3.9 in

Regulatory Compliance/Certifications

RoHS
2002/95/EC



Classification

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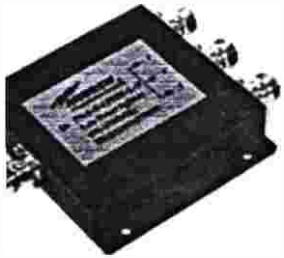
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Product Specifications



CPUSE-L-N

2-Way Low Power Splitter, 698-2700 MHz



CHARACTERISTICS

Electrical Specifications

Operating Frequency Band	698 – 2700 MHz
Order IMD	-130 dBc (relative to carrier)
Order IMD Test Method	Two +43dBm carriers
Power, maximum	50 W
Insertion Loss at Frequency Band	0.6 dB @ 698-2700 MHz
Impedance	50 ohm
Reflection Loss at Frequency Band	0.6 dB @ 698-2700 MHz
Return Loss at Frequency Band	20 dB @ 698-2700 MHz
Power, maximum	1 kW
Power Rating, Combining	0.5 W
Power Rating, Splitting	50 W
Rated Power, maximum	5 W
Return Loss	19.1 dB
Insertion Loss	4.8 dB
VSWR	1.25:1

General Specifications

Device Type	Splitter
Mounting Style	N Female
Color	Black

Mechanical Specifications

Contact Plating	Silver
Shielding Plating	Trimetal

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Product Specifications

CPUSE4-N



Environmental Specifications

Location	Indoor/Outdoor
Ingress Protection Test Method	IEC 60529:2001, IP65
Operating Temperature	-25 °C to +85 °C (-13 °F to +185 °F)
Relative Humidity	Up to 100%

Dimensions

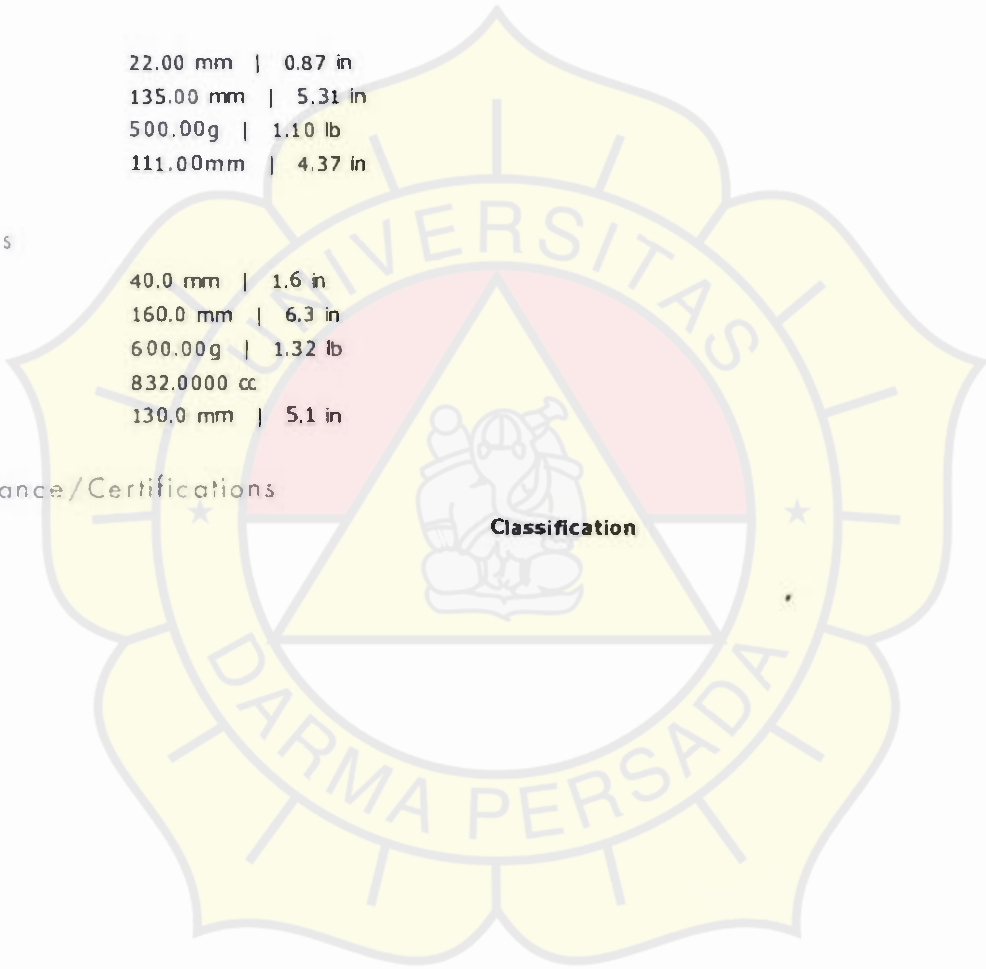
Height	22.00 mm 0.87 in
Length	135.00 mm 5.31 in
Weight	500.00g 1.10 lb
Width	111.00mm 4.37 in

Stacked Dimensions

Height	40.0 mm 1.6 in
Length	160.0 mm 6.3 in
Shipping Weight	600.00g 1.32 lb
Volume	832.0000 cc
Width	130.0 mm 5.1 in

Regulatory Compliance/Certifications

CE
2002/95/EC



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Product Specifications



CPUSE-N
Directional Coupler, 698–2700 MHz



CHARACTERISTICS

Electrical Specifications

Operating Frequency Band	698 – 2700 MHz
3rd Order IMD	-140 dBc (relative to carrier)
3rd Order IMD Test Method	Two +43dBm carriers
Average Power, maximum	200 W
Coupling Tolerance	±0.8 dB
Impedance	50ohm
Insertion Loss at Frequency Band	1.5 dB @ 698–2700 MHz
Isolation at Frequency Band	26 dB @ 698–2700 MHz
Peak Power, maximum	1 kW
Reflected Power, maximum	40 W
Return Loss	20.8 dB
VSWR	1.2:1

General Specifications

Device Type	Coupler
Interface	N Female
Color	Black

Mechanical Specifications

Inner Contact Plating	Silver
Outer Contact Plating	Tinmetal

Environmental Specifications

Application	Indoor/Outdoor
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Product Specifications



NF-BH

N Female Bulkhead for 1/2 in LDF4-50A cable



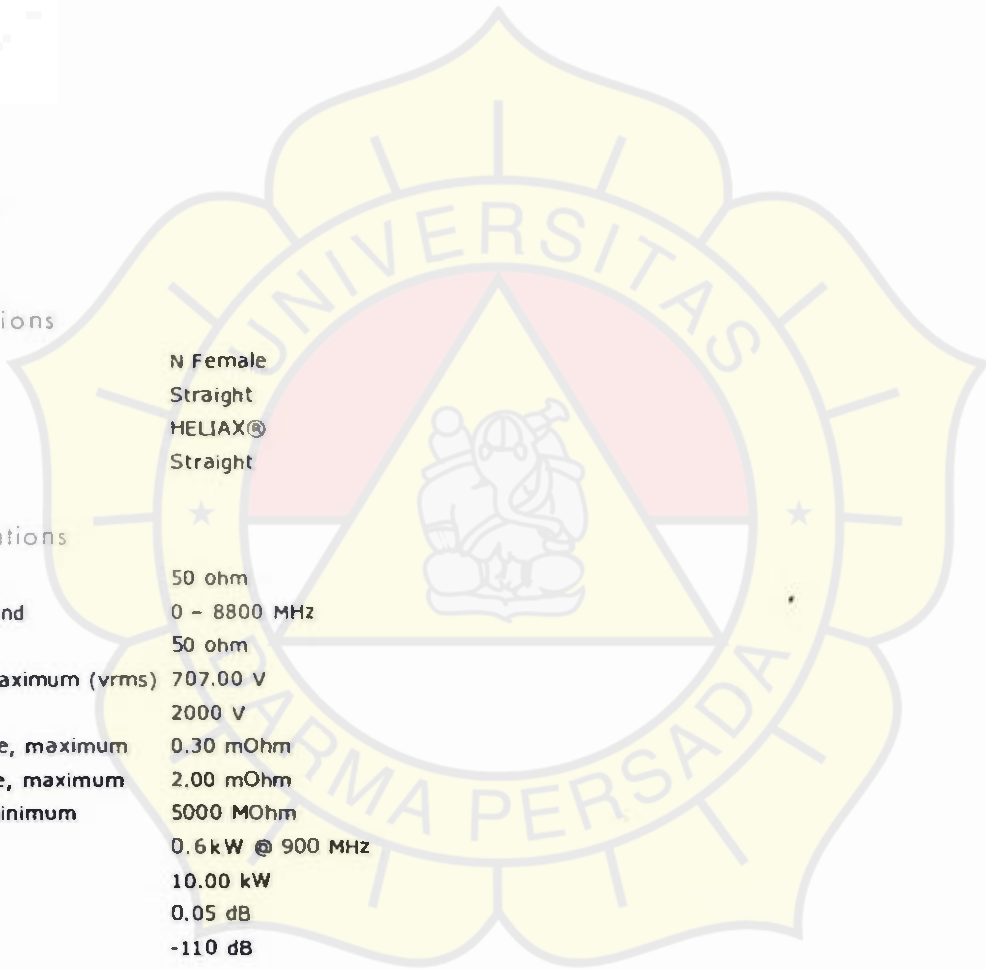
CHARACTERISTICS

General Specifications

Interface	N Female
Style	Straight
Material	HELIAX®
Bending Angle	Straight

Electrical Specifications

Characteristic Impedance	50 ohm
Operating Frequency Band	0 – 8800 MHz
Characteristic Impedance	50 ohm
Operating Voltage, maximum (vrms)	707.00 V
Test Voltage	2000 V
Insertion Contact Resistance, maximum	0.30 mOhm
Return Contact Resistance, maximum	2.00 mOhm
Isolation Resistance, minimum	5000 MOhm
Maximum Power	0.6 kW @ 900 MHz
Power, maximum	10.00 kW
Return Loss, typical	0.05 dB
Shielding Effectiveness	-110 dB



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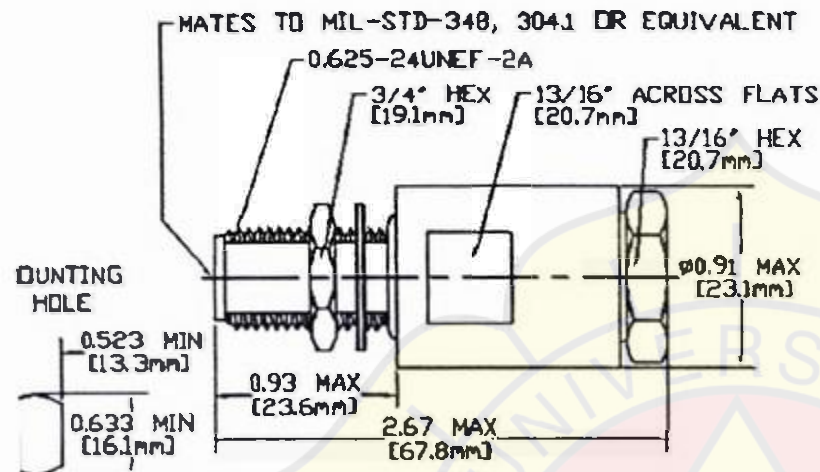
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Product Specifications



WFBH

Line Drawing



Mechanical Specifications

Contact Attachment Method	Self-flare
Contact Attachment Method	Solder
Contact Plating	Trimetal
Contact Plating	Gold
Insertion Durability	25 cycles
Face Durability	500 cycles
Face Durability Method	IEC 61169-16:9.5
Insertion Retention Tensile Force	890 N 200 lbf
Insertion Retention Torque	5.42N-m 48.00 in lb
Insertion Force	66.72N 15.00 lbf
Insertion Force Method	MIL-C-39012C-3.12, 4.6.9
Reversible	No

Dimensions

Overall Size	1/2 in
Length	25.40 mm 1.00 in
Width	66.04 mm 2.60 in
Weight	145.00g 0.32 lb

Environmental Specifications

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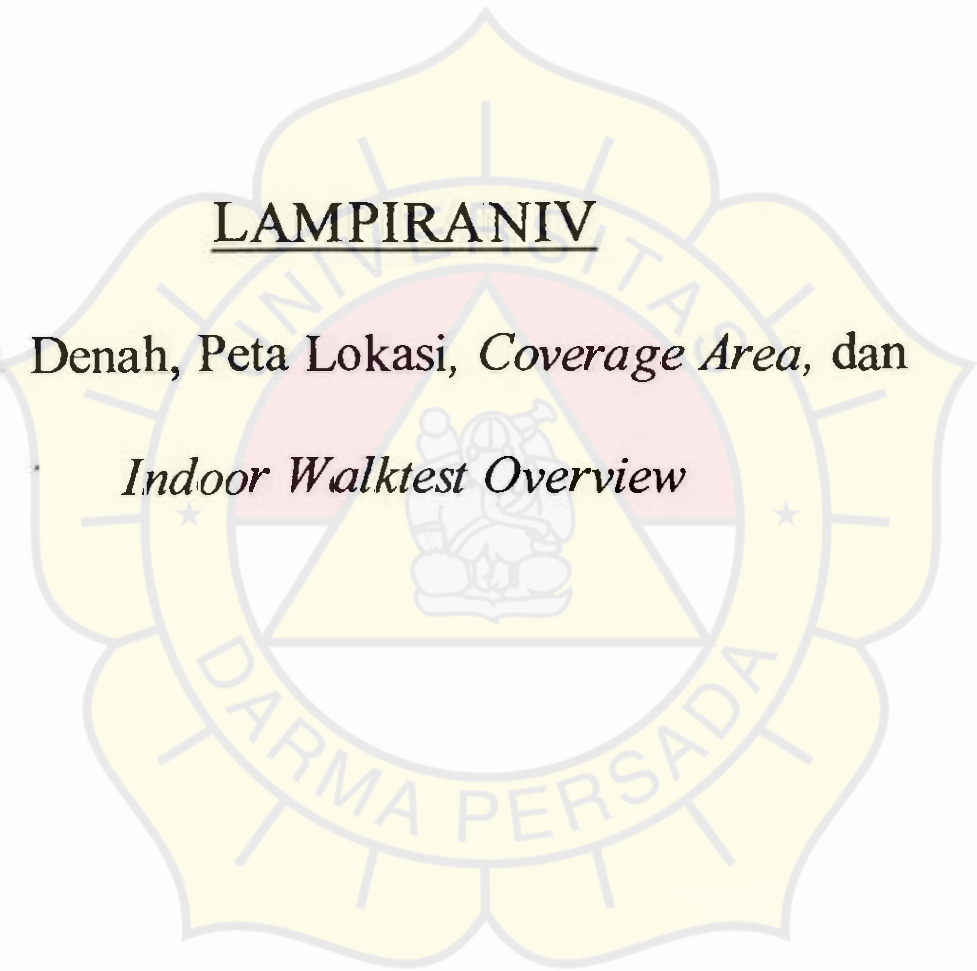
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LAMPIRAN IV

Data Denah, Peta Lokasi, *Coverage Area*, dan

Indoor Walktest Overview





KETERANGAN GAMBAR

- DOK. ARSIT.
- DOK. STRUK.
- DOK. KONSTR.
- DOK. ELEK.

NO.	REVISI	ALASAN	DIKOR.

CATATAN KETERANGAN
1. Semua dimensi adalah dalam meter.
2. Semua dimensi adalah dalam meter.
3. Semua dimensi adalah dalam meter.
4. Semua dimensi adalah dalam meter.
5. Semua dimensi adalah dalam meter.
6. Semua dimensi adalah dalam meter.
7. Semua dimensi adalah dalam meter.
8. Semua dimensi adalah dalam meter.
9. Semua dimensi adalah dalam meter.
10. Semua dimensi adalah dalam meter.

DIREKTOR PT. TELKOMSEL

DIREKTUR OPERASIONAL

MANAJER KONTAKTOR

PT. GLOBAL SEJAHTERA
BINA MANDIRI

LOKASI

PASKAL HYPER SQUARE

JUDUL GAMBAR

Daerah Lokasi Lantai 1

DRUMBAR

DESKRIPSI

DESKRIPSI

REVISI

NO. TANGGAL

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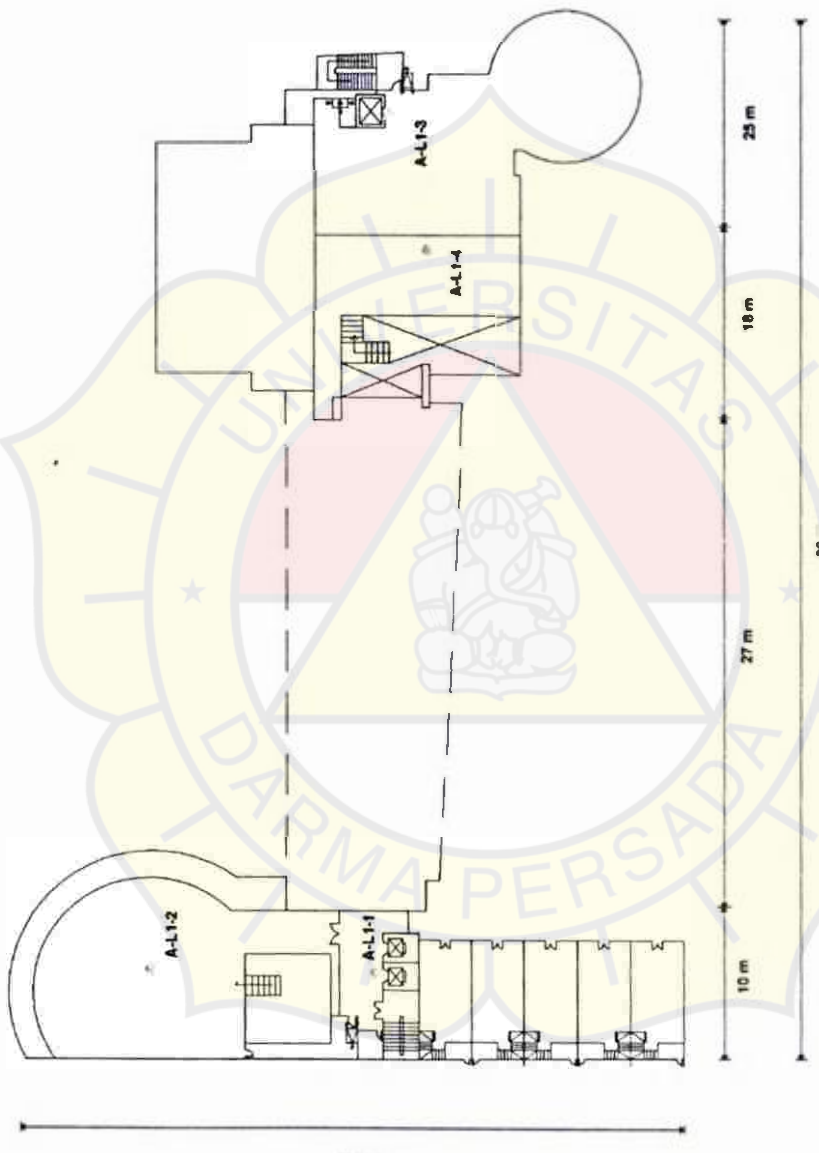
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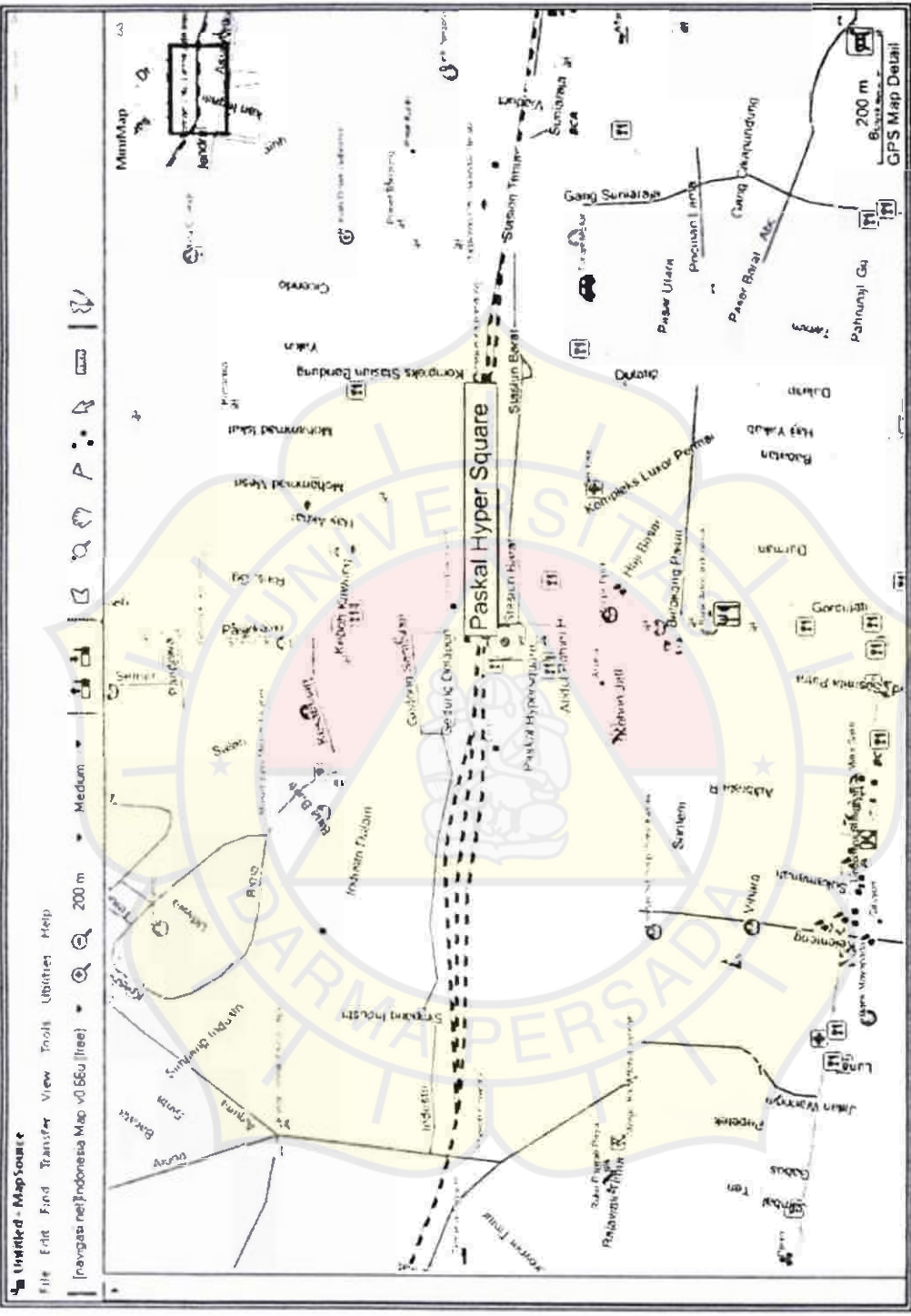
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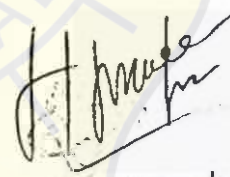
A3



PT TELKOMSEL selaku pihak operator telah menetapkan standar nilai Rx Level atau daya penerimaan rata-rata yang dapat diterima oleh MS sebesar -70 dBm. Untuk menjaga kualitas komunikasi dan mencegah interferensi, beberapa warna digunakan PT TELKOMSEL untuk membedakan besarnya level sinyal radio. Indikator warna yang menjadi standar PT TELKOMSEL terlihat pada tabel berikut :

Indikator Warna Standar PT TELKOMSEL

RX Lev (dBm)	Colour	Category
-46 to -10 (dBm)	Blue	Very Good
-66 to -46 (dBm)	Sea Blue	Good
-76 to -66 (dBm)	Green	Average
-86 to -76 (dBm)	Yellow	Poor
-115 to -86 (dBm)	Red	Worst



Hendri Santoso

20/07

2010



PT. GLOBAL SEJAHTERA BINA MANDIRI

Jl. Manggar Blok AE 5/ 4, Kav. DPRD
Pondok Kelapa Permai, Jakarta Timur 13450
Telp. (021) 99603869 Email : gsbmjkt@gmail.com

SURAT KETERANGAN
NO : 022 / GSBM - HR / V - 2010

Yang bertanda tangan dibawah ini :

Nama : Reza Ardhy F, ST
Jabatan : Manager Teknik
Alamat : Jl. Manggar Blok AE 5/ 4, Kav. DPRD Pondok Kelapa Permai

Menerangkan bahwa mahasiswa dibawah ini:

Nama : Muhamad Sahrul Ibdani
NIM : 04210011
Fakultas : Teknik
Jurusan : Elektro Telekomunikasi
Perguruan Tinggi : Universitas Darma Persada

Yang bersangkutan telah melaksanakan magang dan pengambilan data dibagian Radio Network Planning periode 2 Februari s/d 19 Mei 2010.

Demikian surat keterangan ini dibuat untuk dipergunakan seperlunya.

Jakarta, 21 Mei 2010

PT. GLOBAL SEJAHTERA BINA MANDIRI

Reza Ardhy F, ST

Manager Teknik