BAB V
PENUTUP

5.1. Kesimpulan

1. Pada sistem EIRP sangat mempengaruhi *coverage* yang dihasilkan, pada *repeater* untuk memaksimalkan *coverage* sebaiknya dioptimalkan hingga EIRP pada tiap antenanya ≥13.989 dB dan EIRP pada setiap antena yaitu 17,28 dBm.
2. Pada BTS sebaiknya tidak menggunakan alat yang ber*losses* rendah karena dapat memenghasilkan jarak sejauh 117,41 m yang dapat menggganggu BTS mikro sel atau menyebabkan ganguan pada tampungan kapasitas BTS yang akan menyebabkan *drop call*.
3. *Coverage* yang melebihi gedung dapat dikurangi dengan menambahkan antena yang ditempatkan pada daerah *blank spot* atau mengurangi EIRP.

5.2. Saran

1. RBS *repeater* dapat digunakan pada gedung yang trafiknya tidak terlalu padat dan dipasang kurang dari 4 lantai. Atau karena EIRP *repeater* hampir mendekati BTS, *repeater* dapat digunakan untuk mencover sementara sekaligus melihat trafik pada suatu gedung yang baru dibangun untuk menentukan jumlah TRU BTS.
2. EIRP *Repeater* dimaksimalkan supaya *handover* didalam gedung terminimalisasi.

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Lampiran I

Data Power Distribution & Coverage Distance Repeater

SITE NAME : Grand Mall Bekasi

POWER DISTRIBUTION

				A-LB2-1	A-LB2-2	A-LB1-1	A-LB1-2	A-LD-1	A-LD-2	A-LD-3	A-LD-4	A-LD-5	A-L1-1	A-L1-2
1	REPEATER OUTPUT POWER	dBm		29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
2	CABLE LENGTH 1 1/4" (m)	1 1/4"	-0.0227											
	From antenna to splitter I								150.00					
	to splitter II													
	III													
	To ITS													
	TOTAL LENGTH (m)			0.00	0.00	0.00	0.00	0.00	150.00	0.00	0.00	0.00	0.00	0.00
	TOTAL loss cable	dB		0.00	0.00	0.00	0.00	0.00	-4.05	0.00	0.00	0.00	0.00	0.00
3	CABLE LENGTH 7/8" (m)	7/8"	-0.0374	98.00										
	From antenna to splitter I				43.00	132.00	44.00	119.00		52.00		43.00	119.00	100.00
	to splitter II							4.00	4.00	4.00		4.00	4.00	4.00
	III												4.00	4.00
	IV													
	V													
	VI													
	To Repeater													
	TOTAL LENGTH (m)			98.00	43.00	132.00	44.00	123.00	4.00	56.00	4.00	47.00	127.00	104.00
	TOTAL loss cable	dB		-1.67	-0.73	-4.94	-1.65	-4.60	-0.15	-2.09	-0.15	-1.76	-4.75	-4.04
4	CABLE LENGTH 1/2" (m)	1 1/4"	-0.0680											
	From antenna to splitter I													
	to splitter II													
	III													
	To Repeater													
	TOTAL LENGTH (m)			0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL loss cable	dB		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Quantity of SPLITTER	pcs												
	2 - way		-3.5										1	1
	3 - way		-5.0											
	4 - way		-6.5	1		1	1	1	1	1	1	1	1	1
	Quantity of TAPPER	pcs												
	T - 7 Port 1 (P1)		-1.1					1	1	1	1	1	1	1
	Port 2 (P2)		-7.0	1	1	1	1							
	T - 10 Port 1 (P1)		-0.4											
	Port 2 (P2)		-10.4											
	T - 15 Port 1 (P1)		-0.1											
	Port 2 (P2)		-15.1											
	TOTAL loss splitter	dB		-13.00	-10.00	-13.00	-13.00	-14.00	-14.00	-14.00	-14.00	-14.00	-12.00	-12.00
6	Quantity of JUMPER 1/2" (per 0.3 meter)	pcs	-0.1050											
	JUMPER 1/2" (per 1 meter)	pcs	-0.1050	4	4	4	4	6	6	6	6	6	6	6
	JUMPER 1/2" (per 5 meter)	pcs	-0.1050											
7	QUANTITY OF CONECTOR	pcs	-0.1	2	2	2	2	4	4	4	4	4	6	6
	TOTAL loss jumper and connector	dB		-1.0	-1.00	-1.02	-1.02	-1.94	-1.83	-1.94	-1.94	-1.94	-2.54	-2.54
	TOTAL LOSS POWER	dB		-17.67	-15.70	-18.96	-15.67	-20.54	-20.03	-18.03	-19.49	-17.69	-19.28	-16.57
8	ANTENNA GAIN	dBi		2	2	2	2	2	2	2	2	2	2	2
9	RADIATED POWER [EIRP]	dBm		13.31	15.30	12.04	15.33	10.46	10.97	12.97	11.51	13.31	11.72	12.43

SITE NAME : Grand Mall Bekasi

				A-L1-3	A-L2-1	A-L2-2	A-L2-3	A-L2-4	A-L3-1	A-L3-2	A-L4-1	A-L4-2
1	REPEATER OUTPUT POWER	dBm		29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
2	CABLE LENGTH 1 1/4" : m	1 1/4"	0.0270									
	From antenna to splitter					154.00						
	to splitter											
	To BTS											
	TOTAL LENGTH : m			0.00	0.00	154.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL loss cable		dB	0.00	0.00	-4.16	0.00	0.00	0.00	0.00	0.00	0.00
3	CABLE LENGTH 1/2" : m	1/2"	-0.0540									
	From antenna to splitter I			24.00	85.00		96.00	46.00	123.00	54.00	124.00	43.00
	to splitter II			4.00	4.00	2.00	4.00	4.00	4.00	4.00	4.00	4.00
	III			4.00	8.00	8.00	8.00	8.00	12.00	12.00	12.00	12.00
	IV											
	V											
	VI											
	To Repeater											
	TOTAL LENGTH : m			32.00	101.00	12.00	108.00	58.00	139.00	70.00	140.00	59.00
	TOTAL loss cable		dB	-1.73	-5.45	-0.65	-5.83	-3.13	-7.51	-3.78	-7.56	-3.19
4	CABLE LENGTH 7/8" : m	7/8"	-0.0810									
	From antenna to splitter I											
	to splitter III											
	To Repeater											
	TOTAL LENGTH : m			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL loss cable		dB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Quantity of SPLITTER	pcs										
	2 - way		-3.5									
	3 - way		-5.0									
	4 - way		-6.0	1	2	2	2	2	2	2	2	2
	Quantity of TAPPER	pcs										
	T - 5 Port 1 (P1)		-1.0	1	1	1	1	1	1	1	1	1
	Port 2 (P2)		-7.0									
	T - 10 Port 1 (P1)		-0.4									
	Port 2 (P2)		-10.4									
	T - 15 Port 1 (P1)		-0.1									
	Port 2 (P2)		-15.1									
	TOTAL loss splitter		dB	-13.00	-13.00	-13.00	-13.00	-13.00	-13.00	-13.00	-13.00	-13.00
6	Quantity of JUMPER 1/2" : per 0.3 meter	pcs	-0.1050									
	JUMPER 1/2" : per 1 meter	pcs	-0.1050	2	2	2	2	2	2	2	2	2
	JUMPER 1/2" : per 5 meter	pcs	-0.1050									
7	Quantity of CONNECTOR	pcs	-0.3	6	6	6	6	6	6	6	6	6
	TOTAL loss kanger and connector		dB	-2.54	-2.54	-2.54	-2.54	-2.54	-2.54	-2.54	-2.54	-2.54
	TOTAL LOSS POWER		dB	-19.73	-19.31	-20.14	-19.37	-17.70	-20.73	-18.04	-20.77	-17.74
8	ANTENNA GAIN		dBi	-	-	-	-	-	-	-	-	-
9	RADIATED POWER [EIRP]	dBm		15,27	11,69	10,86	11,43	13,30	10,27	12,95	15,23	13,26

Lampiran II

Data Power Distribution & Coverage Distance BTS

SITE NAME : Grand Mall Bekasi Lantai Basement 2

POWER DISTRIBUTION (GSM 900)

					A-LB2-9	A-LB2-8	A-LB2-7	A-LB2-6	A-LB2-5	A-LB2-4	A-LB2-3	A-LB2-2	A-LB2-1
1	BTS OUTPUT POWER		dBm		38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00
2	CABLE LENGTH 1 1/4" (m)		1 1/4"	-0,0270									
CABLE	From antenna to splitter	I						134,68					
	to splitter	II											
		III											
	To BTS				116,28	116,28	116,28	47,97	116,28	47,97	47,97	47,97	47,97
	TOTAL LENGTH (m)				116,28	116,28	116,28	182,65	116,28	47,97	47,97	47,97	47,97
	TOTAL loss cable		dB		-3,14	-3,14	-3,14	-4,94	-3,14	-1,30	-1,30	-1,30	-1,30
3	CABLE LENGTH 7/8" (m)		7/8"	-0,0374									
CABLE	From antenna to splitter	I			50,00					25,87	43,31	28,49	80,23
	to splitter	II			11,92	11,92	11,92		11,92				
		III											
		IV											
		V											
		VI											
	To BTS												
	TOTAL LENGTH (m)				61,92	11,92	11,92	0,00	11,92	25,87	43,31	28,49	80,23
	TOTAL loss cable		dB		-2,32	-0,45	-0,45	0,00	-0,45	-0,97	-1,62	-1,07	-3,00
4	CABLE LENGTH 1/2" (m)		1 1/4"	-0,0688									
CABLE	From antenna to splitter	I											
	to splitter	II											
		III											
	To BTS												
	TOTAL LENGTH (m)				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	TOTAL loss cable		dB		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5	Quantity of SPLITTER		pcs										
	2 - way			-3,0	1	1	1	2	1	3	2	3	2
	3 - way			-5,0	2	2	2	2	2	2	2	2	2
	4 - way			-6,0									
SPLITTER & TAPPER	Quantity of TAPPER		pcs										
	T - 7	Port 1 (P1)		-1,0									
		Port 2 (P2)		-7,0									
	T - 10	Port 1 (P1)		-0,4									
		Port 2 (P2)		-10,4									
	T - 15	Port 1 (P1)		-0,1									
		Port 2 (P2)		-15,1									
	TOTAL loss splitter		dB		-13,00	-13,00	-13,00	-16,00	-13,00	-19,00	-16,00	-19,00	-16,00
6	Quantity of JUMPER 1/2" (per 0,3 meter)		pcs	-0,1050				2					
	JUMPER 1/2" (per 1 meter)		pcs	-0,1050	6	6	6	4	6	4	4	4	4
	JUMPER 1/2" (per 5 meter)		pcs	-0,1050						3	2	3	2
7	Quantity of CONECTOR		pcs	-0,3	6	6	6	4	6	4	4	4	4
	TOTAL loss jumper and connector		dB		-2,43	-2,43	-2,43	-1,83	-2,43	-1,94	-1,83	-1,94	-1,83
	TOTAL LOSS POWER		dB		-20,89	-18,02	-18,02	-22,77	-18,02	-23,80	-20,74	-23,50	-22,13
8	ANTENNA GAIN		dBi		5	2	2	5	2	5	2	5	5
9	RADIATED POWER [EIRP]		dBm		22,11	20,98	20,98	20,23	20,98	19,80	19,26	19,70	20,87

SITE NAME : Grand Mall Bekasi Lantai Basement 2

POWER DISTRIBUTION (GSM 900)

					A-LB2-9	A-LB2-8	A-LB2-7	A-LB2-6	A-LB2-5	A-LB2-4	A-LB2-3	A-LB2-2	A-LB2-1
1	BTS OUTPUT POWER		dBm		38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00
2	CABLE LENGTH 1 1/4" (m)		1 1/4"	-0,0270									
CABLE	From antenna to splitter	I						134,88					
	to splitter	II											
		III											
	To BTS				116,28	116,28	116,28	47,97	116,28	47,97	47,97	47,97	47,97
	TOTAL LENGTH (m)				116,28	116,28	116,28	182,85	116,28	47,97	47,97	47,97	47,97
	TOTAL loss cable		dB		-3,14	-3,14	-3,14	-4,94	-3,14	-1,30	-1,30	-1,30	-1,30
3	CABLE LENGTH 7/8" (m)		7/8"	-0,0374									
CABLE	From antenna to splitter	I			50,00					25,87	43,31	28,49	80,23
	to splitter	II			11,92	11,92	11,92		11,92				
		III											
		IV											
		V											
		VI											
	To BTS												
	TOTAL LENGTH (m)				61,92	11,92	11,92	0,00	11,92	25,87	43,31	28,49	80,23
	TOTAL loss cable		dB		-2,32	-0,45	-0,45	0,00	0,45	-0,97	-1,62	-1,07	-3,00
4	CABLE LENGTH 1/2" (m)		1 1/4"	-0,0688									
CABLE	From antenna to splitter	I											
	to splitter	II											
		III											
	To BTS												
	TOTAL LENGTH (m)				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	TOTAL loss cable		dB		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5	Quantity of SPLITTER		pcs										
SPLITTER & TAPPER	2 - way			-3,0	1	1	1	2	1	3	2	3	2
	3 - way			-5,0	2	2	2	2	2	2	2	2	2
	4 - way			-6,0									
	Quantity of TAPPER		pcs										
	T - 7	Port 1 (P1)		-1,0									
		Port 2 (P2)		-7,0									
	T - 10	Port 1 (P1)		-0,4									
		Port 2 (P2)		-10,4									
	T - 15	Port 1 (P1)		-0,1									
		Port 2 (P2)		-15,1									
	TOTAL loss splitter		dB		-13,00	-13,00	-13,00	-16,00	-13,00	-19,00	-16,00	-19,00	-16,00
6	Quantity of JUMPER 1/2" (per 0.3 meter)		pcs	-0,1050				2					
	JUMPER 1/2" (per 1 meter)		pcs	-0,1050	6	6	6	4	6	4	4	4	4
	JUMPER 1/2" (per 5 meter)		pcs	-0,1050						3	2	3	2
7	Quantity of CONNECTOR		pcs	-0,3	6	6	6	4	6	4	4	4	4
	TOTAL loss jumper and connector		dB		-2,43	-2,43	-2,43	-1,83	-2,43	-1,94	-1,83	-1,94	-1,83
	TOTAL LOSS POWER		dB		-20,89	-19,02	-19,02	-22,77	-19,02	-23,80	-20,74	-23,50	-22,13
8	ANTENNA GAIN		dBi		5	2	2	5	2	5	2	5	5
9	RADIATED POWER [EIRP]		dBm		22,11	20,98	20,98	20,23	20,98	19,80	19,26	19,70	20,87

SITE NAME : Grand Mall Bekasi Lantai Basement 1

POWER DISTRIBUTION (GSM 900)

					A-LB1-10	A-LB1-9	A-LB1-8	A-LB1-7	A-LB1-6	A-LB1-5	A-LB1-4	A-LB1-3	A-LB1-2	A-LB1-1
1	BTS OUTPUT POWER		dBm		38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00
2	CABLE LENGTH 1 1/4" (m)		1 1/4"	-0,0270										
	From antenna to splitter	I			150,00									
	to splitter	II												
		III												
	To BTS				115,28	115,28	115,28	115,28	115,28	47,97	47,97	47,97	47,97	47,97
	TOTAL LENGTH (m)				265,28	115,28	115,28	115,28	115,28	47,97	47,97	47,97	47,97	47,97
	TOTAL loss cable		dB		-7,19	-3,14	-3,14	-3,14	-3,14	-1,30	-1,30	-1,30	-1,30	-1,30
3	CABLE LENGTH 7/8" (m)		7/8"	-0,0374										
	From antenna to splitter	I				125,00	81,01	63,65	46,51	27,91	69,92	119,77	33,14	110,47
	to splitter	II												
		III												
		IV												
		V												
		VI												
	To BTS													
	TOTAL LENGTH (m)				0,00	125,00	81,01	63,65	46,51	27,91	69,92	119,77	33,14	110,47
	TOTAL loss cable		dB		0,00	-4,68	-3,03	-2,38	-1,74	-1,04	-3,36	-4,48	-1,24	-4,13
4	CABLE LENGTH 1/2" (m)		1 1/4"	-0,0568										
	From antenna to splitter	I												
	to splitter	II												
		III												
	To BTS													
	TOTAL LENGTH (m)				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	TOTAL loss cable		dB		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5	Quantity of SPLITTER		pcs											
	2 - way			-3,0	2	2	2	2	2	3	2	2	3	2
	3 - way			-5,0	2	2	1	1	2	2	1	1	2	2
	4 - way			-6,0			1	1			1	1		
	Quantity of TAPPER		pcs											
	T - 5	Port 1 (P1)		-1,0										
		Port 2 (P2)		-7,0										
	T - 10	Port 1 (P1)		-0,4										
		Port 2 (P2)		-10,4										
	T - 15	Port 1 (P1)		-0,1										
		Port 2 (P2)		-15,1										
	TOTAL loss splitter		dB		-16,00	-16,00	-17,00	-17,00	-16,00	-19,00	-17,00	-17,00	-19,00	-16,00
6	Quantity of JUMPER 1/2" (per 0.3 meter)		pcs	-0,1050	1	1	2	2	1	3			3	2
	JUMPER 1/2" (per 1 meter)		pcs	-0,1050	4	4	4	4	4	4	8	8	4	4
	JUMPER 1/2" (per 5 meter)		pcs	-0,1050	1	1			1					
7	Quantity of CONECTOR		pcs	-0,3	4	4	4	4	4	4	8	8	4	4
	TOTAL loss jumper and connector		dB		-1,83	-1,83	-1,83	-1,83	-1,83	-1,94	-3,24	-3,24	-1,94	-1,83
8	TOTAL LOSS POWER		dB		-25,02	-25,64	-25,00	-24,36	-22,71	-23,27	-24,80	-25,01	-23,47	-23,26
8	ANTENNA GAIN		dBi		5	5	2	2	5	2	2	5	7	5
9	RADIATED POWER [EIRP]		dBm		17,98	17,36	15,00	15,65	20,29	16,73	15,10	16,99	21,53	19,74

SITE NAME : Grand Mall Bekasi Lantai Dasar, Lantai 1, dan Lantai 2

POWER DISTRIBUTION (GSM 900)

					A-LD-2	A-LD-1	A-L1-3	A-L1-2	A-L1-1	A-L2-3	A-L2-2	A-L2-1
1	BTS OUTPUT POWER		dBm		38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00
2	CABLE LENGTH 1 1/4" (m)		1 1/4"	-0,0270								
CABLE	From antenna to splitter	I										
	to splitter	II										
		III										
	To BTS				116,28	116,28	116,28	116,28	47,97	116,28	116,28	47,97
	TOTAL LENGTH (m)				116,28	116,28	116,28	116,28	47,97	116,28	116,28	47,97
	TOTAL loss cable		dB		-3,14	-3,14	-3,14	-3,14	-1,30	-3,14	-3,14	-1,30
3	CABLE LENGTH 7/8" (m)		7/8"	-0,0374								
CABLE	From antenna to splitter	I			96,47	27,03	120,35	28,49	86,05	95,93	27,03	123,84
	to splitter	II										
		III										
		IV										
		V										
		VI										
	To BTS											
	TOTAL LENGTH (m)				96,47	27,03	120,35	28,49	86,05	95,93	27,03	123,84
	TOTAL loss cable		dB		-3,61	-1,01	-4,50	-1,07	-3,22	-3,59	-1,01	-4,63
4	CABLE LENGTH 1/2" (m)		1 1/4"	-0,0658								
CABLE	From antenna to splitter	I										
	to splitter	II										
		III										
	To BTS											
	TOTAL LENGTH (m)				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	TOTAL loss cable		dB		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5	Quantity of SPLITTER		pcs									
SPLITTER & TAPHER	2 - way			-3,0	2	2	2	2	1	2	2	2
	3 - way			-5,0	1	1	1	1	1	1	1	1
	4 - way			-6,0	1	1	1	1	1	1	1	1
	Quantity of TAPPER		pcs									
	T - 7	Port 1 (P1)		-1,0								
		Port 2 (P2)		-7,0								
	T - 10	Port 1 (P1)		-0,4								
		Port 2 (P2)		-10,4								
	T - 15	Port 1 (P1)		-0,1								
		Port 2 (P2)		-15,1								
	TOTAL loss splitter		dB		-17,00	-17,00	-17,00	-17,00	-14,00	-17,00	-17,00	-17,00
6	Quantity of JUMPER 1/2" (pc: 0.3 meter)		pcs	-0,1050	2	2	1	1		1	1	1
	JUMPER 1/2" (per 1 meter)		pcs	-0,1050	4	4	6	6	5	6	6	6
	JUMPER 1/2" (per 5 meter)		pcs	-0,1050		2						
7	Quantity of CONECTOR		pcs	-0,3	2		6	6	6	6	6	6
	TOTAL loss jumper and connector		dB		-1,23	-1,23	-2,64	-2,64	-2,33	-2,64	-2,64	-2,64
	TOTAL LOSS POWER		dB		-24,98	-22,36	-27,18	-23,74	-20,84	-26,16	-23,48	-25,48
8	ANTENNA GAIN		dBi		2	2	5	2	2	2	2	2
9	RADIATED POWER [EIRP]		dBm		15,02	17,62	15,82	16,26	19,16	13,74	16,31	14,54

SITE NAME : Grand Mall Bekasi Lantai 3 dan Lantai 4

POWER DISTRIBUTION (GSM 900)

					A-L3-6	A-L3-5	A-L3-4	A-L3-3	A-L3-2	A-L3-1	A-L4-3	A-L4-2	A-L4-1
1	BTS OUTPUT POWER			dBm	38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00	38,00
2	CABLE LENGTH 1 1/4" (m)		1 1/4"	-0,0270									
CABLE	From antenna to splitter	I			80,23	88,76		101,16					
	to splitter	II											
		III											
	To BTS				116,28	116,28	116,28	116,28	47,97	47,97	47,97	47,97	47,97
	TOTAL LENGTH (m)				196,51	205,04	116,28	217,44	47,97	47,97	47,97	47,97	47,97
	TOTAL loss cable			dB	-5,31	-5,54	-3,14	-5,87	-1,30	-1,30	-1,30	-1,30	-1,30
3	CABLE LENGTH 7/8" (m)		7/8"	-0,3374									
CABLE	From antenna to splitter	I					86,11		90,70	62,40	81,78	62,21	35,76
	to splitter	II							19,77	19,77	12,50	12,50	12,50
		III			10,76	10,76	10,76	10,76			19,77	19,77	19,77
		IV											
		V											
		VI											
	To BTS												
	TOTAL LENGTH (m)				10,76	10,76	99,91	10,76	110,47	82,17	114,05	94,48	68,03
	TOTAL loss cable			dB	-0,40	-0,40	-3,74	-0,40	-4,13	-3,07	-4,27	-3,53	-2,54
4	CABLE LENGTH 1/2" (m)		1 1/4"	-0,0568									
CABLE	From antenna to splitter	I											
	to splitter	II											
		III											
	To BTS												
	TOTAL LENGTH (m)				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	TOTAL loss cable			dB	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5	Quantity of SPLITTER			pcs									
SPLITTER & TAPPER	2 - way			-3,0	2	2	2	2	2	2		1	1
	3 - way			-4,8	1	1	1	1	1	1	2	2	2
	4 - way			-6,0	1	1	1	1	1	1	1	1	1
	Quantity of TAPPER			pcs									
	T - 7	Port 1 (P1)		-1,0					1				
		Port 2 (P2)		-7,0						1			
	T - 10	Port 1 (P1)		-0,4									
		Port 2 (P2)		-10,4									
	T - 15	Port 1 (P1)		-0,1									
		Port 2 (P2)		-15,1									
	TOTAL loss splitter			dB	-17,00	-17,00	-17,00	-17,00	-18,00	-24,00	-19,00	-19,00	-19,00
6	Quantity of JUMPER 1/2" (per 0,3 meter)		pcs	-0,1050	6	6	6	6	6	6			
	JUMPER 1/2" (per 1 meter)		pcs	-0,1050					1	1	8	8	8
	JUMPER 1/2" (per 5 meter)		pcs	-0,1050	1	1	1	1	1	1			
7	Quantity of CONECTOR		pcs	-0,3	8	8	8	8	8	8	8	8	8
	TOTAL loss jumper and connector			dB	-2,54	-2,54	-2,54	-2,54	-2,64	-2,64	-3,24	-3,24	-3,24
10	TOTAL LOSS POWER			dB	-25,34	-25,47	-23,41	-25,81	-25,07	-31,01	-27,80	-27,07	-25,08
8	ANTENNA GAIN			dBi	2	5	2	5	2	5	2	2	7
9	RADIATED POWER (EIRP)			dBm	14,76	17,53	13,59	17,19	13,93	11,99	12,20	12,93	18,92

COVERAGE DISTANCE (meter) EACH ANTENNA 900 MHz

Prediction Coverage at Rx_Lev		-70
Standard Deviation (INDOOR)		8 dB
Keenan-Motley Factor	(1800 MHz)	
	(900 MHz)	31,5 dB
Indoor Diffraction Loss (Ld)		16 dB
Wall attenuation		
	Concrete	10 dB
	Bricks	6 dB
	Gypsum	5 dB
	Glass	3 dB
	Wood	2 dB

Floor	ANT. NUMBER	EIRP	Receive Level	Path loss	Wall attenuation					Total Attenuation	Free Space Loss	Coverage (Distance) meter
					Concrete	Bricks	Gypsum	Glass	Wood			
Basement 2	A-LB2-9	22,11	-70	92,11						0	92,11	67,72
	A-LB2-8	20,98	-70	90,98						0	90,98	59,46
	A-LB2-7	20,98	-70	90,98						0	90,98	59,46
	A-LB2-6	20,23	-70	90,23						0	90,23	54,53
	A-LB2-5	20,98	-70	90,98						0	90,98	59,46
	A-LB2-4	19,80	-70	89,80						0	89,80	51,89
	A-LB2-3	19,26	-70	89,26						0	89,26	48,72
	A-LB2-2	19,70	-70	89,70						0	89,70	51,31
	A-LB2-1	20,87	-70	90,87						0	90,87	58,71
Basement 1	A-LB1-10	17,98	-70	87,98						0	87,98	42,07
	A-LB1-9	17,36	-70	87,36						0	87,36	39,15
	A-LB1-8	15,00	-70	85,00						0	85,00	29,86
	A-LB1-7	15,65	-70	85,65						0	85,65	32,17
	A-LB1-6	20,29	-70	90,29						0	90,29	54,90
	A-LB1-5	16,73	-70	86,73						0	86,73	36,42
	A-LB1-4	15,10	-70	85,10						0	85,10	30,21
	A-LB1-3	16,99	-70	86,99						0	86,99	37,52
	A-LB1-2	21,53	-70	91,53						0	91,53	63,32
	A-LB1-1	19,74	-70	89,74						0	89,74	51,54

Floor	ANT. NUMBER	EIRP	Receive Level	Path loss	Wall attenuation					Total Attenuation	Free Space Loss	Coverage (Distance) meter
					Concrete	Bricks	Gypsum	Glass	Wood			
Lantai Dasar	A-LD-2	15,02	-70	85,02						0	85,02	29,93
	A-LD-1	17,62	-70	87,62						0	87,62	40,36
Lantai 1	A-L1-3	15,82	-70	85,82						0	85,82	32,83
	A-L1-2	16,26	-70	86,26						0	86,26	34,51
	A-L1-1	19,16	-70	89,16						0	89,16	48,20
Lantai 2	A-L2-3	13,74	-70	83,74						0	83,74	25,82
	A-L2-2	16,31	-70	86,31						0	86,31	34,73
	A-L2-1	14,54	-70	84,54						0	84,54	28,31
Lantai 3	A-L3-6	14,76	-70	84,76						0	84,76	29,03
	A-L3-5	17,53	-70	87,53						0	87,53	39,93
	A-L3-4	13,59	-70	83,59						0	83,59	25,38
	A-L3-3	17,19	-70	87,19						0	87,19	38,42
	A-L3-2	13,93	-70	83,93						0	83,93	26,40
	A-L3-1	11,99	-70	81,99						0	81,99	21,11
Lantai 4	A-L4-3	12,20	-70	82,20						0	82,20	21,63
	A-L4-2	12,93	-70	82,93						0	82,93	23,53
	A-L4-1	18,92	-70	88,92						0	88,92	46,88

Lampiran III

Data Alat - Alat

Data Repeater

ALLGON SYSTEM AB

PRODUCT SPECIFICATION					

Specification of a Band selective Repeater
900 MHz
Product Number: AR 1200/052

1. Electrical specification (typical values)
Inter Repeater complies with the requirements of ETS 300 609-4

		MHz
		MHz
		MHz
		dB
		dB
		MHz
		MHz
		MHz
		MHz
		dB
		dB
		dB
		dB
		dB
		dB

2. Environmental specification

3. Mechanical Specification

Data Base Transcivier Station

Technical specification for RBS 2206

Frequency band:	GSM 800, E-GSM 900, P-GSM 900, GSM 1800, GSM 1900
Tx:	869–894, 925–960, 1805–1880, 1930–1990 MHz
Rx:	824–849, 880–915, 1710–1785, 1850–1910 MHz
Number of transceivers per cabinet:	2–12
Number of sectors:	1–3
Dimension (H x W x D):	1850 x 600 x 400 mm (72.8 x 23.6 x 15.74 inch) including installation frame
Weight:	230 kg (506 lbs) fully equipped
Power into antenna feeder:	35 W (45.5 dBm) (GSM 800, GSM 900) 28 W (44.5 dBm) (GSM 1800, GSM 1900) With TCC subtract 1.5 dB from above values
Receiver sensitivity:	-110 dBm (dynamic, without TMA and diversity gain)
Power supply:	120 – 250V AC, 50 – 60Hz -48 – -72V DC +20.5 – +29V DC
Battery backup:	Optional external
Operating temperature:	+5°C – +40°C (+41°F – +104°F)

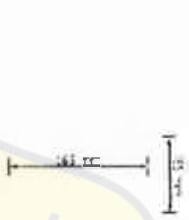
Data Antena Omni directional

824 - 960 MHz
1710 - 2500 MHz

AlanDick

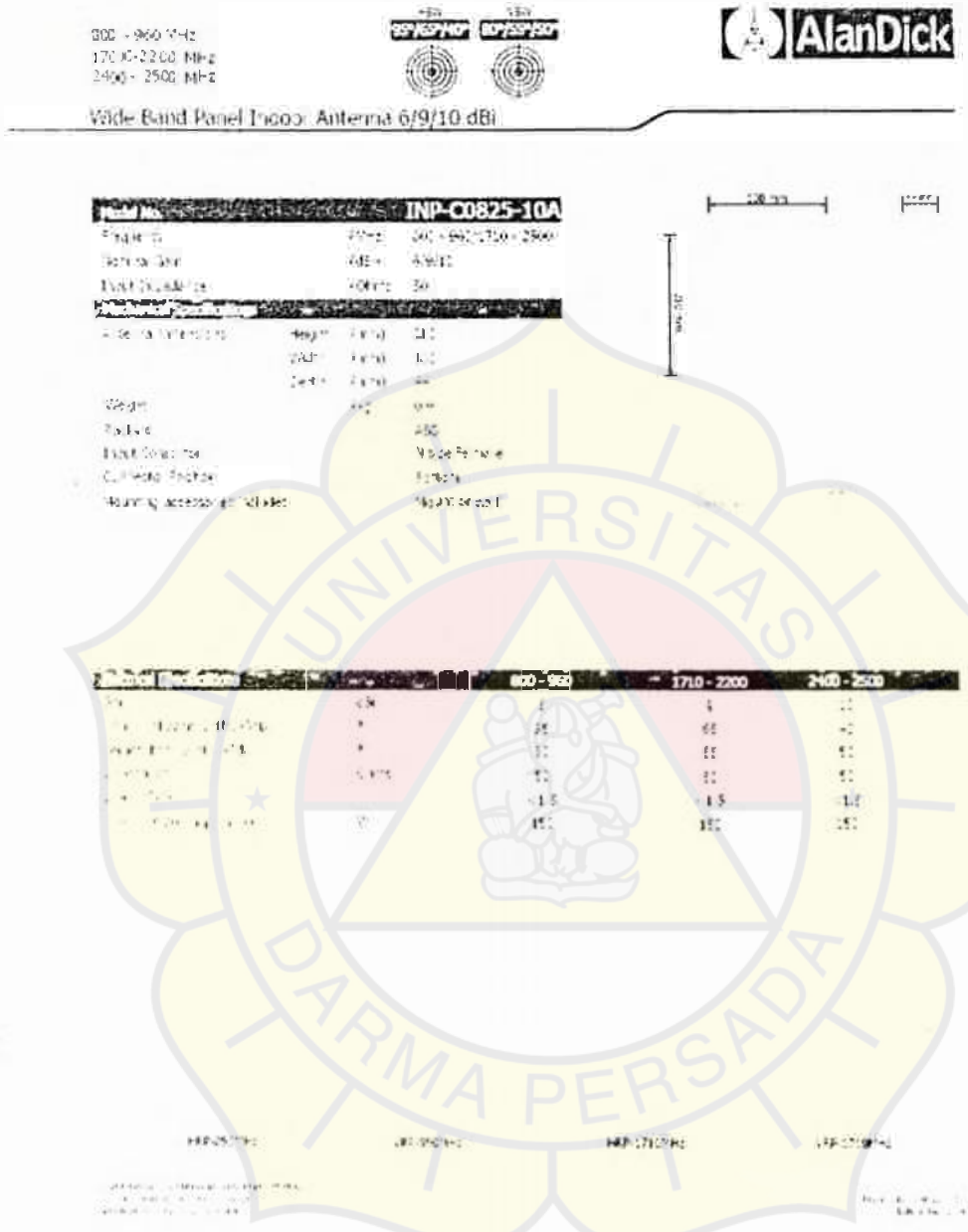
Wide-Band Ceiling Mount Indoor Antenna 3 dBi

Model No.	INO-C0825-3A
Frequency	
Gain	
Impedance	
Mechanical Specification	
Dimensions	
Weight	
Radome	ABS
Color of Radome Cover	White
Mounting	



Electrical Specification	824 ~ 960	1710 ~ 2500
	350	350
	55	55
	50	50
	150	150

Data Antena Directional



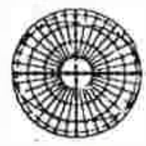
Data Antena Bi - Directional

BDM5 6-890 1940D — 738-445

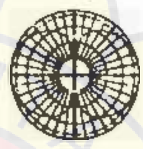
BDM5 6-890 1940N — 738-446

Bi-Directional Multiband Antenna

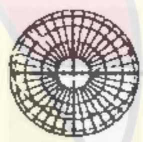
Specifications		
Frequency range		[illegible]
Gain	[illegible]	[illegible]
Impedance		[illegible]
VSWR	[illegible]	[illegible]
Polarization		Vertical
Maximum input power		[illegible]
Connector		[illegible] 7-16 DIN female
Weight		[illegible]
Dimensions		[illegible]
Equivalent flat plate area		[illegible]
Wind survival rating		[illegible]
Shipping dimensions		[illegible]
Shipping weight		[illegible]
Mounting		[illegible]



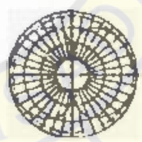
H-plane 806-960 MHz
Horizontal pattern



E-plane 806-960 MHz
Vertical pattern



H-plane 1710-2170 MHz
Horizontal pattern



E-plane 1710-2170 MHz
Vertical pattern

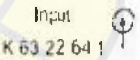
Data Spliter

Low-loss Power Splitters – Multi-band
800– 2200 MHz
Indoor use

KATHREIN
Antennen · Electronic

2-way Splitter 800–2200
3-way Splitter 800–2200
4-way Splitter 800–2200

Type No.	K 63 2 2 62	K 63 22 63 1	K 632264 1



Data Tapper

Low-loss Power Tappers – Multi-band
800 – 2200 MHz
Indoor use

KATHREIN
Antennen · Electronic

2-way-Tapper 800–2200 7.0 /1.0dB
2-way-Tapper 800–2200 10.4/0.4dB
2-way-Tapper 800–2200 15.1/0.1dB

Type No.	K 63 23 60 61	K 63 23 61 01	K 63 23 61 51
[illegible]			
Input – P_1	[illegible]	[illegible]	[illegible]
Input – P_2	[illegible]	[illegible]	–15.1 dB
[illegible]	N female		
Max. power	[illegible] ambient temperature		
[illegible]	2		
[illegible]	800 – 2200 MHz		
VSWR	[illegible]		
Impedance	50 Ω		
[illegible]	[illegible]		
Weight	approx. 0.5 kg		
[illegible]	25 x 25 mm		
[illegible]	[illegible]		
[illegible]	[illegible]		

[illegible] Housing: [illegible]
[illegible]

[illegible] [illegible]
[illegible]

1/2" COAXIAL CABLE

FREQUENCY MHz	ATTENUATION dB/100 m	POWER RATING kW
10	0.669	12
30	1.17	6.9
50	1.51	5.3
88	2.02	4.0
100	2.16	3.7
108	2.25	3.6
174	2.88	2.8
200	3.09	2.6
300	3.83	2.1
400	4.45	1.8
450	4.74	1.7
500	5.01	1.6
512	5.08	1.6
600	5.53	1.4
700	6.01	1.3
800	6.45	1.2
850	6.67	1.2
890	6.84	1.2
900	6.88	1.2
950	7.03	1.1
960	7.13	1.1
1000	7.29	1.1
1200	8.05	0.99
1400	8.77	0.90
1600	9.44	0.84
1800	10.1	0.79
1900	10.4	0.76
2000	10.7	0.74
2200	11.3	0.70
2400	11.9	0.66
2600	12.4	0.63
2800	12.9	0.61
3000	13.5	0.58
3400	14.5	0.54
6000	20.2	0.39
8800	25.5	0.31

Attenuation values are typical at ambient temperature +20°C.
Power rating ambient temperature +40°C, inner conductor +100°C.

CODES FOR NKC CONNECTORS

CONNECTOR TYPE	NK CODE Sealing compound	NK CODE O-ring seal*
N male	NKC1012310	NKC1012300
N female	NKC1012410	NKC1012400
7-16male	NKC1012110	NKC1012100
7-16 female	NKC1012210	NKC1012200
Nmale Right angle	NKC1012610	NKC1012600
7-16 male Right angle	NKC1012510	NKC1012500

*Secondary shrink sleeve seal recommended

P.OBox 269, FIN-90651 OULU
Phone + 358-10-566 1
Fax +358-10-566 4294

7/8" COAXIAL CABLE

FREQUENCY MHz	ATTENUATION dB/100 m	POWER RATING kW
10	0.360	26
30	0.629	15
50	0.817	12
88	1.09	8.5
100	1.17	8.0
108	1.21	7.7
174	1.56	6.0
200	1.67	5.6
300	2.07	4.5
400	2.42	3.8
450	2.57	3.6
500	2.72	3.4
512	2.75	3.4
600	3.00	3.1
700	3.26	2.8
800	3.51	2.6
850	3.63	2.5
890	3.72	2.5
900	3.74	2.5
950	3.86	2.4
960	3.87	2.4
1000	3.97	2.3
1200	4.39	2.1
1400	4.78	1.9
1600	5.15	1.8
1800	5.51	1.7
1900	5.68	1.6
2000	5.85	1.6
2200	6.18	1.5
2400	6.49	1.4
2600	6.80	1.3
2800	7.09	1.3
3000	7.38	1.2
3400	7.95	1.1
4000	8.75	1.0
5000	10.0	0.9

Attenuation values are typical at ambient temperature +20°C
Power rating ambient temperature +40°C, inner conductor +100°C

CODES FOR NKC CONNECTORS

CONNECTOR TYPE	NK CODE Sealing compound	NK CODE O-ring seal*
N male	NKC1078310	NKC1078300
N female	NKC1078410	NKC1078400
7-16 male	NKC1078110	NKC1078100
7-16 female	NKC1078210	NKC1078200
7-16 male Right angle	NKC1078510	NKC1078500

*Secondary shrink sleeve seal recommended

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Phone + 358-10-566 1
Fax + 358-10-566 4294

1 1/4" COAXIAL CABLE

FREQUENCY MHz	ATTENUATION dB/100 m	POWER RATING kW
10	0.250	41
30	0439	23
50	0571	18
88	0.766	13
100	0819	12
108	0852	12
174	1.10	9.2
200	1.18	8.5
300	1.47	6.8
400	172	5.8
450	183	5.4
500	194	5.1
512	197	5.1
600	215	4.6
700	234	4.2
800	253	3.9
850	261	3.8
890	2.68	3.7
900	2.70	3.7
950	279	3.6
960	280	3.6
1000	287	3.5
1200	3.18	3.1
1400	3.48	2.8
1600	376	2.6
1800	403	2.4
1900	416	2.4
2000	429	2.3
2200	454	2.2
2400	4.79	2.0
2600	502	1.9
2800	5.26	1.9
3000	5.48	1.8
3300	5.81	1.7

Attenuation values are typical at ambient temperature +20°C.
Power rating ambient temperature +40°C, inner conductor +100°C.

CODES FOR NKC CONNECTORS

CONNECTOR TYPE	NK CODE Sealing compound	NK CODE O-ring seal*
N male	NKC1114310	NKC1114300
N female	NKC1114410	NKC1114400
7-16 male	NKC1114110	NKC1114100
7-16 female	NKC1114210	NKC1114200

*Secondary shrink sleeve seal recommended

P.O.Box 269, FIN-90651 OULU
Phone +358-10-566 1
Fax +358-10-566 4294

1 5/8" COAXIAL CABLE

FREQUENCY MHz	ATTENUATION dB/100 m	POWER RATING kW
10	0.197	59
30	0.346	32
50	0.452	25
88	0.610	18
100	0.653	17
108	0.680	16
174	0.880	12
200	0.950	12
300	1.19	9.3
400	1.40	7.9
450	1.49	7.4
500	1.59	7.0
512	1.61	6.8
600	1.76	6.2
700	1.93	5.7
800	2.08	5.3
850	2.16	5.1
890	2.22	4.9
900	2.23	4.9
950	2.30	4.8
960	2.32	4.7
1000	2.38	4.6
1200	2.65	4.1
1400	2.91	3.8
1600	3.16	3.5
1800	3.40	3.2
1900	3.51	3.1
2000	3.63	3.0
2200	3.85	2.8
2400	4.07	2.7
2600	4.28	2.5

Attenuation values are typical at ambient temperature +20°C.
Power rating: ambient temperature +40°C, inner conductor +100°C.

CODES FOR NKC CONNECTORS

CONNECTOR TYPE	NK CODE Sealing compound	NK CODE O-ring seal*
N male	NKC1158310	NKC1158300
N female	NKC1158410	NKC1158400
7-16 male	NKC1158110	NKC1158100
7-16 female	NKC1158210	NKC1158200

*Secondary shrink sleeve seal recommended

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Lampiran IV

Teori

Keenan - Motley

in case a good map without too much text can be found. See ref. 10 for more information about TEMS Prediction.

8.2.4 Estimate path loss manually

In a simplified[3] form the Keenan-Motley model can be written in the following way for 900 MHz.

$$L = 31.5 + 20\log(d) + N_w W'$$

where

L	is the path loss between isotropic antennas (dB).
d	is the transmitter-receiver separation (m).
N_w	is the number of walls passed by the direct ray.
W'	is the wall attenuation factor (dB).

The free space path loss increases with 6 dB for 1800 MHz in the equation above, a figure that can be used for 1900 MHz as well. The free space path loss is shown in figure 32 for different distances.

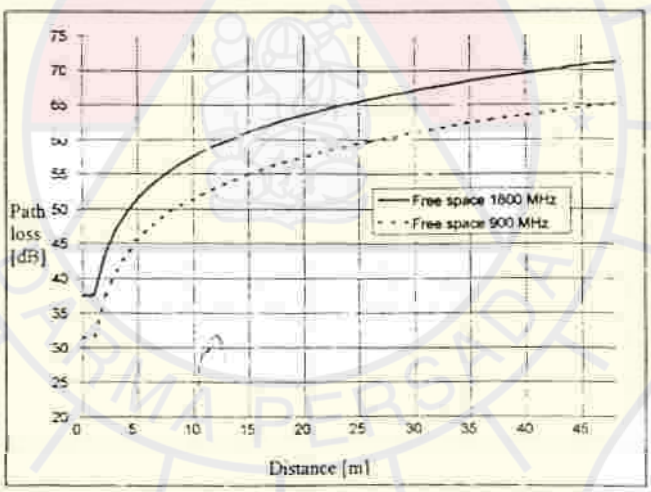

Figure 32. *Free space path loss as a function of transmitter - receiver distance.*

The total wall loss is given by counting the number of walls between the antenna and estimated location and multiplying by the wall attenuation factor according to the estimates in section 8.2.3.

An example of how to calculate path loss is shown in figure 33.

[3] The estimations are assumed to be made on the same floor as the antennas, so the floor dependent parts are excluded.

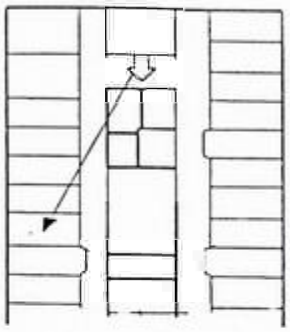

Figure 33 *Example of how to estimate the path loss from an antenna to a specific location.*

It is assumed that the thin walls have 2dB attenuation and the thick walls have 5dB attenuation. The number of thick walls between the antenna and the location is 2 and the number of thin walls is 3. This gives 16 dB estimated wall loss which should be added to the estimated free space path loss of 58 dB (assumed distance: 20 m), giving a total of 74 dB. This is the value representing L_p in the link budget, section 7.1. The measured signal strength would probably be slightly higher than in the prediction example, due to the "corridor effect".

A simpler way of using the Keenan-Motley Model shown in figure 3_4-36. In the equation, loss depending on walls is added.

INDOOR PROPAGATION

Modified Keenan-Motley Model

$$L(dB) = 32.5 + 20 * \log f + 20 * \log d + k * F(k) + pW(k) + D(d - d_b)$$

Free-space formula

L = path loss (dB)
f = frequency (MHz)
d = transmitter to receiver separation (km)
k = number of floors traversed by the direct wave
F = floor attenuation factor (dB)
p = number of walls traversed by the direct wave
W = wall attenuation factor (dB)
D = linear attenuation factor (dB/m) (note 1)
d_b = indoor breakpoint (m) (note 1)

Note 1: For distances above the breakpoint, add typically 0.2 dB/m
Typical breakpoint = 65m

Figure 34. *Loss in free space plus loss in walls.*

This can be simplified by a straight line shown in fig 35.