# BAB V

# KESIMPULAN

1. Hasil dari analisa lintasan diperoleh tinggi koridor sebesar 45,5m, sehingga menunjukkan bahwa lintasan LOS (*line Of sight*).
2. Besarnya daya penerimaan (RSL) adalah (-34,92dBm), hal ini lebih besar dari batas minimum daya penerimaan (*Power Threshold*) yang dipersyaratkan pada tipe MRC (-84 dBm), maka sinyal yang diterima lebih baik. Hasil dari analisa *fade margin* pada perencanaan *link* adalah 49,08 dB hal ini menunjukkan *level* daya yang diterima pada penerima masih baik dari batas yang ditentukan sebesar 48 dB.
3. Kualitas Eb/No dari sistem sangat baik pada tipe MRC sebesar 65,65 dB, maka untuk quantitas BER akan lebih kecil karena pada BER $10^{-6}$ besarnya Eb/No untuk standart modulasi QPSK adalah 10,6 dB.
4. Pada sistem modulasi digital QPSK diperoleh dari hasil analisis C/N sebesar 57,13 dB. Maka dari hasil tersebut lebih besar dari *carrier-to-noise* 13,6 dB (dilihat dari tabel performansi modulasi untuk BER $10^{-6}$) sehingga data yang diperoleh lebih baik.
5. Untuk mentransmisikan *bit rate* dengan kecepatan 9,835 Mbps pada tipe MRC diperlukan *bandwidth* sebesar 4,9 MHz dari $10^{-6}$ hasil analisis.

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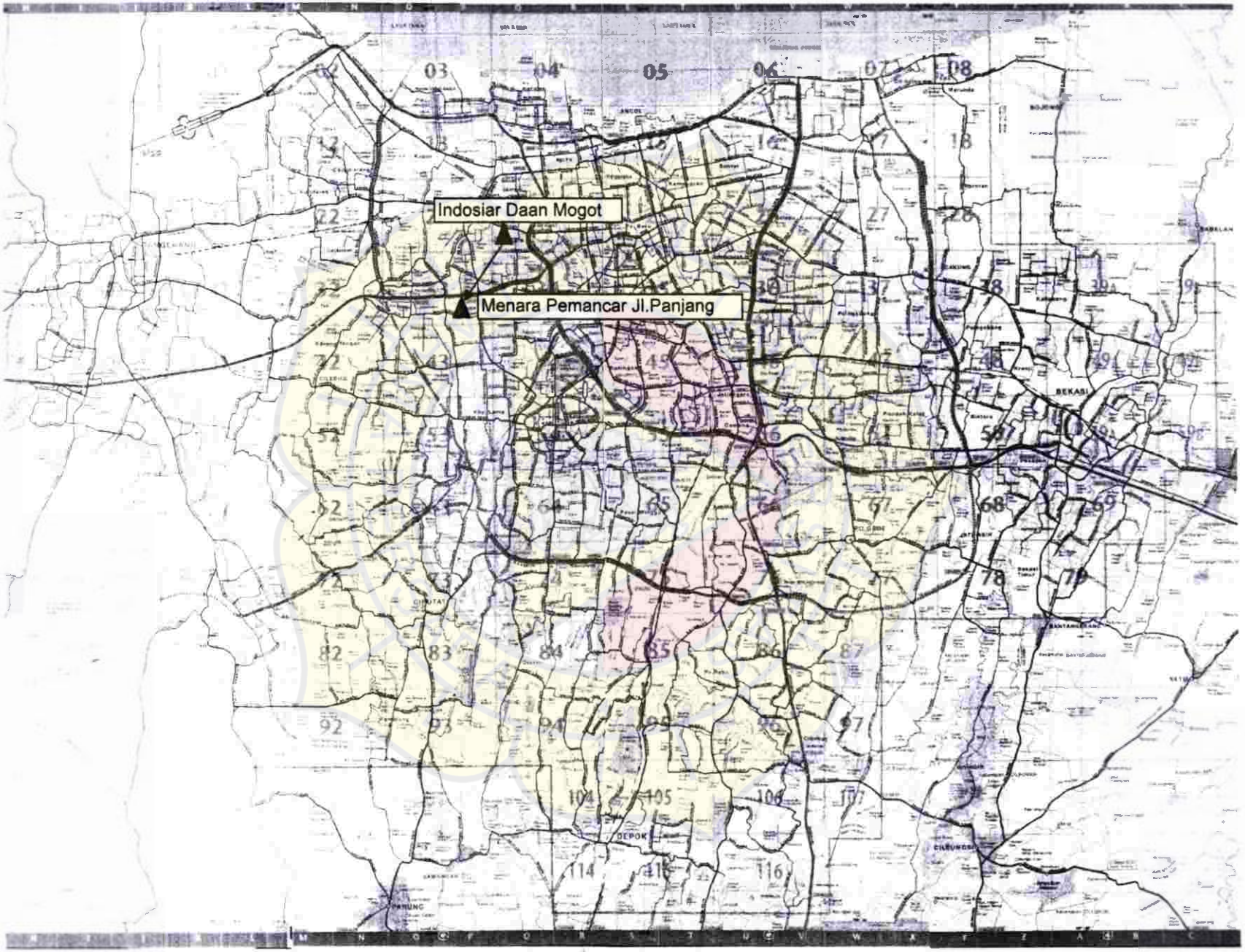
# LAMPIRANI

- Peta lokasi *master control* Daan Mogot dan menara pemancar Kebun Jeruk


Indosiar Daan Mogot
Menara Pemancar Jl.Panjang
BEKASI
DEPOK

# LAMPIRANII

- *Pathloss Terrain data* Daan Mogot

  ke menara pemancar Kebun Jeruk

Pathloss Terrain Data - DAAN MOGOT-KEBON JERUK.pl4

| | DAAN MOGOT | KEBON JERUK |
|---|---|---|
| Latitude | 06 10 29.00 S | 06 11 55.50 S |
| Longitude | 106 46 44.70 E | 106 45 14.80 E |
| True azimuth (°) | 226.13 | 46.13 |
| Calculated Distance (km) | 3.83 | |
| Profile Distance (km) | 3.83 | |
| Datum | WGS 1984 | |
| Easting (km) | 19408.730 | 19390.428 |
| Northing (km) | -4417.845 | -4428.805 |
| Elevation (m) | 32.00 | 33.00 |

| Dist (km) | Elev (m) | Struct (m) | Gnd | Dist (km) | Elev (m) | Struct (m) | Gnd |
|---|---|---|---|---|---|---|---|
| 0.000 | 32.0 | | AG | 1.360 | 31.8 | 9 B(SR) | AG |
| 0.120 | 32.4 | 5 B (SR) | AG | 1.620 | 31.7 | B (ER) | AG |
| 0.150 | 32.5 | | AG | 1.980 | 31.6 | 20 B (SR) | AG |
| 0.190 | 32.8 | | AG | 2.160 | 31.5 | B (ER) | AG |
| 0.300 | 33.0 | | AG | 2.230 | 31.5 | 12 T (SR) | AG |
| 0.350 | 32.8 | B (ER) | AG | 2.310 | 31.8 | T (ER) | AG |
| 0.400 | 32.6 | 35 B (SR) | AG | 2.390 | 32.0 | | AG |
| 0.470 | 32.4 | B (ER) | AG | 2.740 | 32.6 | 25 B (SR) | AG |
| 0.570 | 32.0 | 10 T (SR) | AG | 2.880 | 32.8 | B (ER) | AG |
| 0.700 | 32.0 | T (ER) | AG | 3.370 | 33.7 | 6 B(SR) | AG |
| 0.760 | 32.0 | 5 B (SR) | AG | 3.550 | 34.0 | | AG |
| 0.890 | 32.0 | | AG | 3.650 | 33.6 | B (ER) | AG |
| 1.270 | 31.9 | B (ER) | AG | 3.830 | 33.0 | | AG |

Ground Elevations - AMSL, Structure & Antenna Heights - AGL
Ground Type
PG-Poor, AG - Average, GG - Good, FW-Fresh Water, SW - Salt Water
Structure Type
T-Tree, B - Building, WT - Water Tower
SR - start range, ER - end range, OP - off path

# LAMPIRAN III

- Tabel layanan *microwave link*

PT. INDOSIAR VISUAL MANDIRI
NATIONAL TELEVISION BROADCASTING STATION

**Tabel Microwave Link**

| | |
|---|---|
| Frequency | 7.954 Ghz |
| FEC (Forward Error Correction) | 3 / 4 |
| Modulation | QPSK |
| Bit rate | 4:2:0 |
| Encoding | MPEG-2 |
| Video Input | PAL |
| Total BandWidth | 9835 Kbps |
| Total bandWidth Encoder | 9548 Kbps |
| Video BandWidth | 7.5 Mbps |
| A 1 BandWidth | 256 Kbps |
| A 2 BandWidth | 256 Kbps |
| A 3 BandWidth | 256 Kbps |
| A 4 Tone DTMF | 256 Kbps |
| A 1 BandWidth Radio Elsinta | 256 Kbps |
| A 2 BandWidth | 256 Kbps |
| A 3 Band Width Spare | 256 Kbps |
| A 4 | 256 Kbps |
| | |
| Mux BandWidth | 287 Kbps |
| | |

Transmission Network Operation

Ir. Toto Usprianto
Section Head

Jl. Damai No. 11 Daan Mogot, Jakarta 11510 - INDONESIA
Telp.: (62-21) 567-2222, 568-8888, Fax : (62-21) 565-5756
http://www.indosiar.com

# LAMPIRANIV

- Tabel *bit rate* video terkompresi dan yang tidak terkompresi

# Perbandingan Bit-rate terkompresi dan yang tidak terkompresi

| | Resolusi Video (pixel x Line x Frame/s) | Bit-rate tidak terkompresi | Bit-rate terkompresi |
|---|---|---|---|
| Video NTSC | 480 x 480 x 30 Hz | 168 Mbps | 4 – 8 Mbps |
| Video PAL | 576 x 576 x 25 Hz | 199 Mbps | 4 – 9 Mbps |
| Video HDTV | 1280 x 720 x 60 Hz | 1327 Mbps | 18 – 30 Mbps |

# LAMPIRANV

- Spesifikasi perangkat tipe MRC

# DAR Plus

## Analog or Digital Microwave System

### Overview

The DAR Plus radio is a versatile solution for carrying conventional video and audio, or a digital transport with rates up to 120 Mbps. The DAR Plus is field switchable between analog to digital requiring only to change a few switch settings in the RF shelf, and is easily reconfigured using the DAR Plus Menu System. The DAR Plus Menu System provides full control of the radio with alarm reporting and status.

The DAR Plus provides both video and audio modulation for NTSC and PAL formats with four audio channels. The analog video and audio components are all contained on two plug-in modules for easy swap out and service.

Perhaps DAR Plus's greatest feature is the variety of digital transport options:

- The radio can be configured for ATSC using MRC's QV2 internal modem.
- When used with MRC's Variable Rate Modem, four user selectable IF carriers can can multiplexed into one datastream with data rates up to 120 Mbps
- The SCM4000 Single Carrier provides data rate capacities up 105 Mbps

To protect your signal path, DAR Plus can be configured for hot standby on both the transmit and receive ends. In addition, the MRC Hot Standby Diversity Shelf provides "errorless" switching on the receive end for maintaining data integrity.

### Applications

- Studio-to-Transmitter Links and Transmitter-to-Studio Links
- Satellite backhauls
- Analog news gathering backhauls
- Intercity Relays (ICR)
- Cable Headend Feeds
- Multi-Hop Networks

### Features

- High Capacity up to 120 Mbps
- Architecture supports FCC and ITU channel plans from 1.9 to 15.4 GHz
- Proprietary implementation of MRC Broadcast's extremely stable, low-noise YIG oscillator technology
- Built-in diagnostics through front panel controls and display
- Analog or digital-ready
- AC or DC Versions
- Options
- Analog: FMT/FMR 70 MHz, IF, 4 audio subcarriers, high-power output options
- Digital:
  - QV2 19.39 Mbps internal modulator or demodulator
  - VRM - Variable Rate Modem modulator or demodulator for data rates of 20 to 120 Mbps
  - SCM4000 - Single Carrier Modem at data rates up 105 Mbps

Plus

## NTSC/PAL Modulation

FM Modulator (FMT): The 70 MHz ulator provides a full-performance aseband interface, with three inputs. The video-in can be filtered before modulation. The d input is wideband (15 MHz) for ite signal insertion. The subcarrier lows the independent insertion of ers carrying alarm, telephone and e information.

Subcarrier Modulators: When the ordered, a 4-channel audio oard can be installed as a slide-in within the DAR chassis. The oard can accommodate up to 4 audio subcarrier generators. Each or features a 600 ohm balanced put and a selection of subcarrier ies at either 75 or 50 microsecond hasis (Figure 1).

d Demodulator (FMR): The second signal from the IF module is routed an independent group delay r to the optional baseband lator. The demodulator contains iter-discriminator, de-emphasis, plifier and provides two baseband (one squelched and one ched) and a squelched video This configuration is commonly to as a heterodyne receiver with baseband drop or a remodulating receiver (Figure 1).

Audio Subcarrier Demodulators: A 4-channel audio motherboard can be installed as a slide-in board within the receiver chassis. The motherboard can accommodate up to 4 optional audio subcarrier demodulators. Each demodulator features a 600 ohm balanced audio output and a selection of subcarrier frequencies at either 75 or 50 microsecond pre-emphasis.

## Analog Options

PAC-10/PAC-12 Audio Subcarrier System: The PAC-10/PAC-12 system inserts additional FM audio subcarriers above the video channel. In addition to transmitting and receiving program audio sources, it can carry telephone channels, engineering orderwire, remote control and alarm signals. Each single-rack unit chassis can accommodate up to four subcarriers.

DigiPro™ Digital Audio System: The DigiPro System conveys high-quality program material over video microwave radios. The DigiPro Encoder and DigiPro Decoder comprise a digital audio codec (coder/decoder) which converts audio material into a shaped digital signal suitable for transmission over the PAC-10WB wideband subcarrier modulator and PAC-12WB wideband subcarrier demodulator. The complete DigiPro System is supplied with the Encoder, Decoder, PAC-10WB and PAC-12WB; it can be configured for two program audio channels, or left and right discrete stereo channels and one data channel.

The DataQ Modem adds E1/T1 capability above the video signal. This features lets you multiplex engineering orderwire, alarm and status monitoring with up to 24 FDM telephony channels. (Figure 3)

## Backup Protection

The MRC Hot Standby Shelf provides complete redundancy for the system for one to three analog audio/video channels. MRC also offers baseband and IF space diversity protection with the DS-2 IF Diversity Switch.

For "errorless" switching, the MRC Diversity Shelf provides an uninterupted datastream for digital ATSC paths.

## High Power Options

High-Power Amplifier: High-power amplifiers are available in many frequency bands. These amplifiers are mounted internally and powered from the standard transmitter power supply. These GaAs FET amplifiers use microstrip transmission line techniques to provide broadband high-power outputs.

## Front Panel Controls and Display

The DAR Plus Menu System provides full control over all radio functions. Setup menus allow easy transition of the radio between analog and digital operation. System parameters are set using the Learn menus.

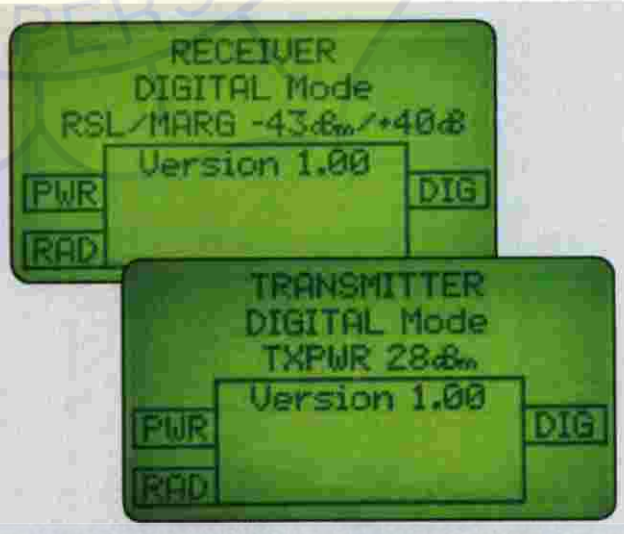
Modulator menus auto detect installation of internal or external modulators or demodulators. Alarms are displayed on the Main Menu and the system module affected.

**smitter Menu Configurations**

| | |
|---|---|
| and Configuration | Transmitter/Receiver Select, Analog/Digital Power Level |
| Menu | Output Power (dBm) |
| r Supply −15,+5 Vdc) | Current, minimum, and maximum voltage levels |
| menu | Current, Minimum, and Maximum readings for: Threshold, Phase Lock Loop, Transmit power (dBm) |
| g Alarm | FMT Phase Lock Loop, Sub-Carrier Status, Carrier Insert Status |
| l Modem Status nal) | All 1s Inserted, Carrier Level, Phase Lock Loop Status, Loss of Signal Status, T1/All 1s Inserted Status, T1/Loss of Signal Status |
| l Modem Status nal) | Summary Alarm |

**iver Menu Features**

| | |
|---|---|
| and Configuration | Transmitter/Receiver Select, Analog/Digital Threshold, Analog/Digital, Receive Carrier Level |
| Menu | Receive Signal Level, Fade Margin, Scrolling Alarm Window |
| r Supply −15,+5 Vdc) | Current, minimum, and maximum voltage levels |
| menu | Current, minimum, and maximum readings for: Phase Lock Loop Status, Receive Signal Level (Current, minimum, and maximum), Fade Margin |
| g Channel | Sub Carrier Status IF Squelch Status |
| l Modem Status nal) | IF Level, Synchronization, Phase Lock Loop, Bit Error Rate, T1 Status |
| l Modem Status nal) | Summary Alarm |




*DAR Plus Front Panel Display (Transmitter & Receiver)*

## SCM4000

The SCM4000 is a robust, variable rate, single carrier modem that provides a variety of modulation and data rate settings to allow aggregate data rates up to 105 Mbps. The choice of a single carrier system provides a simple, flexible architecture that allows a greater variety of interface options, with no sacrifice in performance at the supported data rates.

As an modulator/encoder, the SCM4000 accepts a wide variety of inputs and multiplexes up to four of them into the output stream.

As a demodulator/decoder, the SCM4000 recovers the individual streams and connects them to the selected interface connectors.

The SCM4000 can be configured for simplex, duplex, or diversity applications. The figure below shows a typical simplex application using both the IF Modem and MPEG Encoder modules.

*SCM4000 Single Carrier Modem*

***Features***

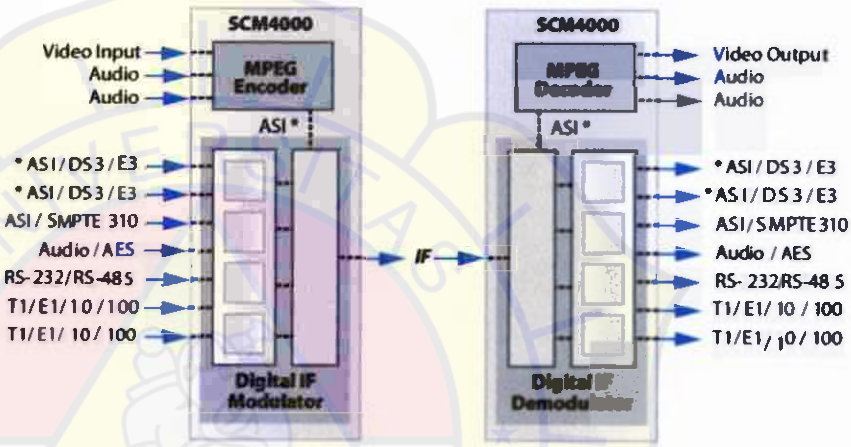
- Single carrier for optimizing data rate and spectrum efficiency for use in 25 or 12 MHz bandwidths
- Data rates up to 105 Mbps
- Adaptive Modulation Formats
- PRBS/BER & S/N
- Flexible system design using building block modules:
  - IF Modulator/ Demodulator
  - MPEG Encoder / Decoder
- Simplex, Duplex, and Diversity applications
- Seamless integration with MRC's heterodyne radio
- Four individual programmable channels supporting the following interfaces:
  - T1
  - E1
  - DS3
  - E3
  - DVB-ASI SMPTE310M
  - RS-232
  - RS-485
  - 10/100Base-T

***Modulator / Demodulator Module***

- DS3/ASI (2 ports)
- SMPTE310M/ASI
- T1, E1, 10/100 Base-T
- RS-232
- Summary Alarm

***MPEG Encoder / Decoder Module***

- Video
- Analog Audio
- AES/EBU Audio




## TSC DTV Transport

r the DTV transition, use the DAR Plus dio as a single carrier solution to transport SC digital data. MRC offers the QV2 odulator and QV2 Demodulator in as a ug-in internal version, easily accessed m the front panel.

*QV2 Modem Plug-in Module*

## Variable Rate Multiplexing

The MRC Variable Rate Modem (Figure 4) provides a flexible solution for current and future requirements. Rated at a carrier load of 120 Mbps, the VRM can multiplex four data IF channels:

- DS3, E3, STS-1
- DVB-ASI
- RS422 Parallel, DVB-SPI Parallel, M2P
- LVDS Parallel, DVB-SPE Parallel, M2P
- T1/E1 Wayside
- SMPTE 310M
- Reed Solomon Forward Error Correction

The VRM can be configured for 4, 16, 32, 64, or 128 QAM modulation with these additional options:

- Adaptive Equalizer
- Space Diversity Option
- Remote Control from Network or Serial Interface

*MRC Variable Rate Modem*

# DAR Plus

Frequency Bands:
6.8 to 7.1 GHz, 12.7 to 13.2 GHz
requency Bands:.....Contact MRC on other bands from 1.99 to 15.4 GHz
Analog:.....525 or 625 line video audio channels pilot carrier or video signal above video
Digital:.....70 MHz modem interface

**TER**

.....Single conversion
llators:.....Ultra-low phase noise, phase-locked sources
Stability:.....±0.0005%
put:.....See Operating Summary

.....Single conversion
llators:.....Ultra-low phase noise phase-locked sources
re:.....See Specifications Summary
ith:.....30 MHz
.....See Operating Summary

**FORMANCE (OPTIONAL FMT)**

ack with CCIR Emphasis)
Response
4.5 MHz (525 line):.....±0.25 dB
5.0 MHz (625 line):.....±0.25 dB
MHz (Baseband Output):.....±0.5 dB
.....3 IRE max
.....0.5 IRE max
Chroma Delay:.....±20 nS max
Chroma Gain:.....±2 IRE max
Phase:.....±0.5° max
Gain:.....2% max
loise Ratio:
Meets / exceeds RS-250C; 67 dB (See Analog Summary)
um (p-p/RMS):.....60 dB min
Level:.....1Vp-p
Return Loss:.....+26 dB min reference to 75 Ω

**DIO PERFORMANCE**

oise:...Meets or exceeds RS-250C; 67 dB
um:.....60 dB min
screte Tones:.....65 dB min
Gain:.....1% max
Phase:.....±0.2° max
*op, 525 or 625 line video per CCIR; -40 eceiver carrier level; excludes modem.*

**ECIFICATIONS (OPTIONAL QM2 MODEM)**

o Channel
.....19.39 Mbps (ATSC transport stream)
.....SMPTE 310M, typical

**TA CHANNEL**

DS1):.....1.544 Mbps
.....G.703

**ASYNCHRONOUS SERVICE CHANNEL**

Data Rate:.....9.6 kbps
Interface:.....RS-232
Modulation:.....16 QAM
FEC:.....Reed-Solomon (204/188) and depth 12 Interleaving

**ELECTRICAL**

Power Consumption
Transmitter, unprotected terminal:....75 Watts typical
Receiver, unprotected terminal:.....55 Watts typical
Power Supply Voltages:.....110/240 Vac

**ENVIRONMENTAL**

Operating Temperature Range:.....0° to +50°C
Relative Humidity:.....0 to 95%, non condensing

**PHYSICAL**

Height:.....3 rack units: 5.25" (13.34 cm)
Depth:.....15.0" (38.1 cm)
Weight:.....22 lbs (10 kg)

**INTERCONNECTION**

RF Connections
1.71 to 4.90 GHz:.....Type "N" female connector
5.925 to 7.125 GHz:Type WR137; CPR @ top of rack
7.10 to 8.50 GHz:..Type WR112; CPR @ top of rack
10.70 to 13.25 GHz.....Type WR75
14.4 to 15.35 GHz:.....Type WR62
IF/Baseband Connectors:.....BNC

**POWER, AUDIO & ALARM CONNECTIONS:**

Audio.....Barrier strip, screw terminals
Network Management Control:.....9-pin D connector

## DIGITAL Specifications Summary

| Model | Frequency Range (GHz) | TX | RX | | |
|---|---|---|---|---|---|
| | | Output Power (dBm) (Note 1) | Noise Figure (dB) (Note 2) | BER3 ($10^{-6}$) (dBm) (Note 3) | System Gain (dB) (Note 2) |
| DAR 2 | 1.7 to 2.7 | +31 | 2.5 | –85 | 117 |
| DAR 4 | 3.3 to 4.9 | +28 | 3.5 | –84 | 113 |
| DAR 6 | 5.9 to 7.1 | +28 | 3.5 | –85 | 113 |
| DAR 6HP | 5.9 to 7.1 | +31 | 3.5 | –85 | 116 |
| DAR 7 | 7.1 to 8.5 | +28 | 3.5 | –84 | 109 |
| DAR 7HP | 7.1 to 8.5 | +31 | 3.5 | –84 | 112 |
| DAR 12 | 10.5 to 13.2 | +24 | 4.0 | –84 | 108 |
| DAR 12HP | 10.5 to 13.2 | +27 | 4.0 | –84 | 111 |

## Analog Specifications Summary

| Model | Frequency Range (GHz) | TX | RX | | | |
|---|---|---|---|---|---|---|
| | | Output Power (dBm) (Note 1) | Noise Figure (dB) (Note 2) | Thresh-hold (dBm) (Note 3) | System Gain (dB) (Note 2) | Signal/ Noise (dBm) (Note 3) |
| DAR 2 | 1.7 to 2.7 | +37 | 2.5 | –88 | 123 | –75 |
| DAR 4 | 3.3 to 4.9 | +33 | 3.5 | –84 | 118 | –73 |
| DAR 6 | 5.9 to 7.1 | +33 | 3.5 | –85 | 118 | –73 |
| DAR 6HP | 5.9 to 7.1 | +37 | 3.5 | –85 | 122 | –73 |
| DAR 7 | 7.1 to 8.5 | +30 | 3.5 | –84 | 115 | –73 |
| DAR 7HP | 7.1 to 8.5 | +34 | 3.5 | –84 | 119 | –70 |
| DAR 12 | 10.5 to 13.2 | +30 | 4.0 | –84 | 114 | –70 |
| DAR 12HP | 10.5 to 13.2 | +33 | 4.0 | –84 | 117 | –70 |
| DAR 15 | 14.4 to 15.35 | +30 | 4.0 | –84 | 114 | –70 |

**Notes:**

1 Transmitter output values calculated prior to branching. Digital operation assumes 3 dB back-off QPSK, 6dB @ 16QAM
2 Does not include branching filter.
3 For one-hop, NTSC video; EIA/CCIR weighting.
4 Contact factory for other modulation power output
5 "HP" suffix indicates high power option.

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www.mrcbroadcast.com

# DVC4000

## MPEG Encoder / Decoder

### Overview

MRC introduces the DVC4000, an MPEG-2 Encoder or Decoder in a 1 RU enclosure. The DVC4000 offers 4:2:0/4:2:2 encoding with variable GOP structures and resolution to 720 horizontal lines. Signal interfaces include NTSC composite and SDI video plus analog and AES audio. The encoding rates can be set for a maximum of 15 Mbps in 4:2:0 mode, and up to 50 Mbps in 4:2:2 mode.

The DVC4000 provides a flexible and expandable design, providing a practical and cost effective method to upgrade your current STL.

When used with the new MRC QV2 modem, you can build a system that provides variable rate signal between the respective modems and encoders. Figure 1 shows DAR Plus transmitter and receiver using the QV2 Modulator and Demodulator with the DVC4000 Encoder and Decoder.

### Features

- 4:2:2/4:2:0 MPEG Encoder / Decoder
- DVB-T compliant
- Vidaeo Input / Output:
  - NTSC/ PAL
  - Composite (NTSC/PAL)
  - SDI
- Audio Input / Output:
  - Analog (2 stero pairs)
  - AES/EBU
- DVC4000 Control Software accessed from RS-232 front panel connector
- Simplified Front Panel Design & Display
- Compact 1 Rack Unit Design
- Compatible with the following modems:
  - MRC QV2

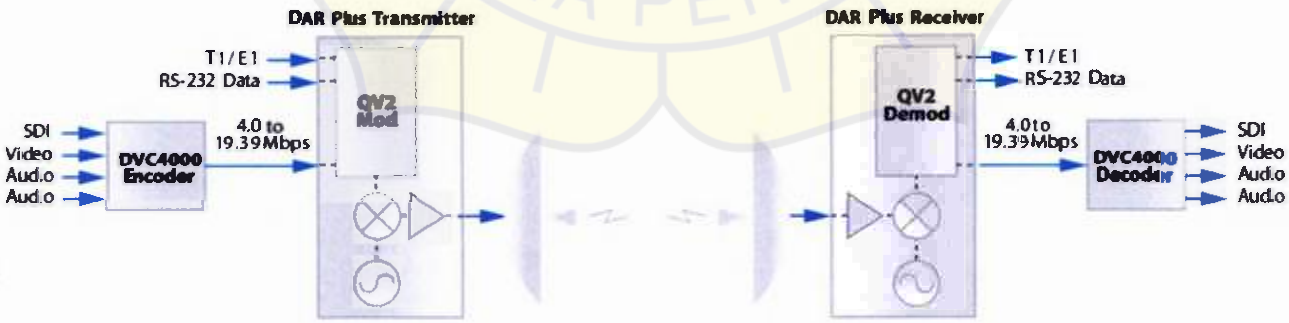


*Figure 1 – Simplex Configuration showing DVC4000 Encoder & Decoder used with QV2 Modulator and Demodulator*

# DVC4000

**IENTAL**

..... –10°C to 50°C
Storage) Range..... –40°C to +70°C

**DS**

..... RTCA/DO-160D
S tandard..... CE EN60950
:..... IAW EN301489-1, Table 2,3

..... 1RU 19" CHASSIS
..... X to X lbs.

**IONS**

coder/Decoder (Rear PANEL)
..... 75 Ohm BNC Female
.....DB-9 Male

tacle .....IEC320-C14

**NEL**

ontrol: ..... DB-9 Male

**/ DECODER**

CODER
.....SDI, Composite Video
Profile: ..... 4:2:2/4:2:0
dard: ..... 526/625
ctures: ..... Variable GOP
Resolution (Selectable)
720,704,544,352
esolution: ... 576 (625 line), 480 (525 line)
..... 4:2:0–1.5 Mbits – 15 Mbits
4:2:2–2.0 Mbits – 50 Mbits
Type: ..... MPEG II Layer 2
..... 384K/Stereo
e Video Output: NTSC (w/wo pedestal) /PAL
put ..... Analog or Digital
n.....BISS-1, BISS-E

**MPEG ENCODER**

Video Input .....NTSC/PAL
1 V pp - NTSC or PAL – BNC
Composite Video: ..... Composite - (75 ohms)
Serial Digital Input (SDI): ANSI/SMPTE 259M Level C
270Mb/s, 525/625 Component
2 Stereo Audio De-embedding provided AES/EBU
Return Loss, Minimum 28dB at 6MHz
Chroma/Level (Selectable): 4:2:2Profile @ Main Level
or 4:2:0 Main Profile @ Main Level
Frame Size: ..... Horizontal Res. 720 pixels
Vertical Res:..... (480 lines 525 Line NTSC)
(576 lines in 625 Line PAL)
Video Encoding Rate:
2 to 30 Mbits, Constant Bit Rate (4:2:2)
1.5 to 15 Mbits, Constant Bit Rate (4:2:0)
Latency (Selectable): ..... Standard Mode: < 200 mS
Low Delay Mode: <100ms
VBI Processing: ..... Extended Picture Mode (4:2:2)
6 Mbps
Closed Caption: ..... Support for line 21 (NTSC)
CC per EIA 608 standard
Audio Coding: ... MPEG–II layer 2 (ISO/IEC 13818-3)
ISO/MPEG 11172.3 Layer II (MUSICAM)
Digital Audio Inputs (Configurable):
Supports AES/EBU audio inputs (2 pairs)
balanced inputs – 48 KHz sampling
supports audio de-embedding
Audio Channels (selectable):
Analog audio (2 stereo pairs)
balanced, 600 ohm/600 ohms High Z (selectable)
Min. Audio Bit Rate: ..... 192 Kbits/channel,
384 Kbits –stereo
..Lower audio bit rates down to 128 Kbits selectable
Audio Input Levels: ..... +18dBm clip level
Transport Stream Output:
Fully DVB compliant DVB–ASI
per ISO/IEC 13818-2 (188 byte packets)
Encryption: .....BISS-1, BISS-E


*DVC4000 Front Panel Display & Controls*

**Microwave Radio Communications**
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# SCM4000

## Single Carrier High Speed Modem

## Overview

MRC introduces the new SCM4000 Single Carrier Modem as a companion unit to MRC's line of heterodyne radio systems, or to any other radio system with standard IF interface levels.

The SCM4000 is a robust, variable rate, single carrier modem that provides a variety of modulation and data rate settings to allow aggregate data rates up to 105 Mbps. The choice of a single carrier system provides a simple, flexible architecture that allows a greater variety of interface options, with no sacrifice in performance at the supported data rates.

As an modulator/encoder, the SCM4000 accepts a wide variety of inputs and multiplexes up to four of them into the output stream.

As a demodulator/decoder, the SCM4000 recovers the individual streams and connects them to the selected interface connectors.

The SCM4000 can be configured for simplex, duplex, or diversity applications. The figure below shows a typical simplex application using both the IF Modem and MPEG Encoder modules.

For fixed or portable applications, the SCM4000 is versatile solution for your present or future needs.

For portable applications, the SCM4000 modem can also provide full control to a remotely located STRATA Transmitter.

## Features

- Single carrier for optimizing data rate and spectrum efficiency for use in 25 or 12 MHz bandwidths
- Data rates up to 105 Mbps
- Adaptive Modulation Formats
- PRBS/BER & S/N
- Flexible system design using building block modules:
  - IF Modulator / Demodulator
  - MPEG Encoder/ Decoder
- Simplex, Duplex, and Diversity applications
- Seamless integration with MRC's hetrodyne radio
- Four individual programmable channels supporting the following interfaces:
  - T1
  - E1
  - DS3
  - E3
  - DVB-ASI SMPTE310M
  - RS-232
  - RS-485
  - 10/100Base-T

### Modulator /Demodulator Module

- DS3/ASI(2 ports)
- SMPTE310M/ASI
- T1, E1, 10/100 Base-T
- RS-232
- Summary Alarm

### MPEG Encoder /Decoder Module

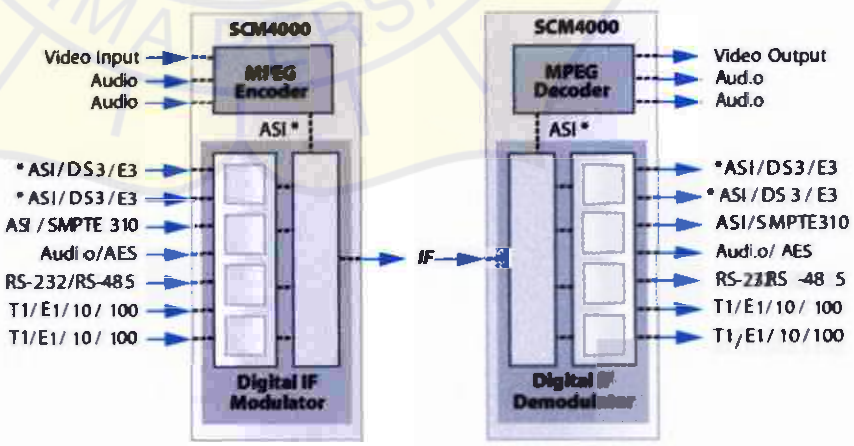
- Video
- Analog Audio
- AES/EBU Audio

### Configurations

- Modulator Only
- Demodulator Only
- Modulator / Demodulator (Duplex)
- MPEG Encoder and Modulator
- MPEG Decoder and Demodulator
- Diversity Receive

### Controls

- Simplified Front Panel Keypad & Display
- Front Panel Diagnostic/Control Port
- Remotely configured with SCM4000 Control Software
- Direct control of STRATA operating parameters




* When installed, the MPEG Encoder/Decoder replaces and disables an ASI/DS3/E3 Port

*SCM4000 Simplex Configuration with IF Modulator & MPEG Encoder*

MICROWAVE RADIO COMMUNICATIONS

www.mrcbroadcast.com

# SCM4000

**OR IF OUTPUT**
power level
–5dbm, –15 dbm (–10 dbm typical)
impedance: 75 Ohm
turn loss.. –15 dB or better
frequency 70 MHz ±50 ppm
tions ..... QPSK, 16QAM, 32QAM, 64QAM
..... Reed-Solomon & Depth 12 interleaving
power adjust 0.5 db steps
Power accuracy +/– .25 dB
MER 30dB

**ATOR IF INPUT**
power level:
–5 dBm, –15 dBm (–10 dBm – typical)
mpedance: 75 Ohm
rn loss: –15 dB or better
requency: 70 MHz ±100 kHz
tions: ..... QPSK, 16QAM, 32QAM, 64QAM
..... Reed-Solomon & Depth 12 interleaving
al: ..... Supports 70 MHz CW test tone
n range: +/–100 KHz
I C/N @BER: 1x10-6

**ES**
Symbol Rate of 20 Mega Symbols)
36 Mbps
7 2 Mb ps
90 Mbps
105 Mbps

**IENTAL**
–10°C to 50°C
Storage) Range –40°C to +70°C

**S**
RTCA/DO-160D
Standard CE EN60950
IAW EN301489-1, Table 2,3

**PHYSICAL**
Size: 1RU 19" CHASSIS
Weight: X to X lbs.Connections

**MODULATOR/DEMODULATOR (REAR PANEL)**
ASI/DS3/E3 (3): 75 Ohm BNC Female
T1/E1,10/100 Base T (2): RJ-45
Summary Alarm: DB-9 Female
RS-232/RS-485: DB-9 Female

**MPEG ENCODER/DECODER (REAR PANEL)**
Video: 75 Ohm BNC Female
Audio or AES/EBU: DB-9 Male
Audio or AES/EBU: DB-9 Female

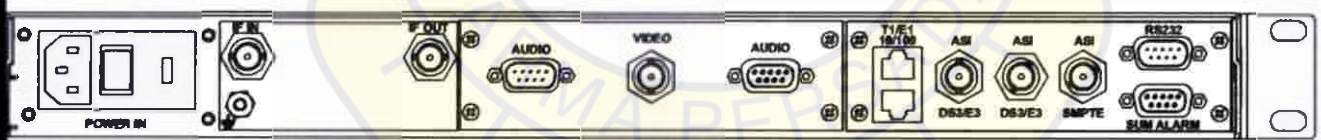
**IF PANEL (REAR PANEL)**
IF Input / Output (2): 75 Ohm BNC Female
IF Output: 75 Ohm BNC Female

**POWER**
AC Receptacle IEC320-C14

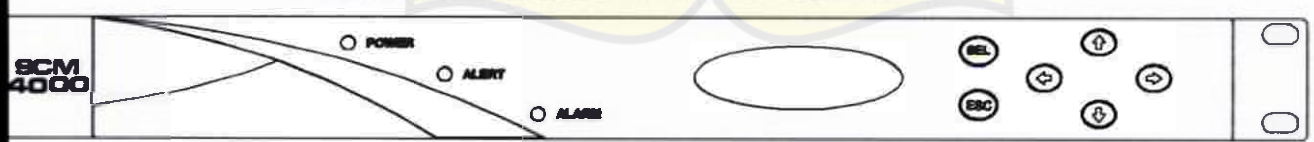
**FRONT PANEL**
System Control DB-9 Male

**MPEG DECODER**
Output: SDI, Composite Video
Chroma Profile: 4:2:2/4:2:0
Line Standard: 526/625
GOP Structures: Variable GOP
Horizontal Resolution (Selectable):
720, 704, 544, 352
Vertical Resolution: ... 576 (625 line), 480 (525 line)
Bit rates: 4:2:0 – 1.5 Mbits – 15 Mbits
4:2:2 – 2.0 Mbits – 50 Mbits
Decoding Type: MPEG II Layer 2
Bit Rates: 384K/Stereo
Composite Video Output: NTSC (w/wo pedestal) /PAL
Audio Output Analog or Digital
Decryption BISS-1, BISS-E

**MPEG ENCODER**
Video Input NTSC/PAL
1 Vpp - NTSC or PAL – BNC
Composite Video: Composite - (75 ohms)
Serial Digital Input (SDI): ANSI/SMPTE 259M Level C
270Mb/s, 525/625 Component
.....2 Stereo Audio De-embedding provided AES/EBU
Return Loss, Minimum 28dB at 6MHz
Chroma/Level (Selectable):4:2:2Profile @ Main Level
or 4:2:0 Main Profile @ Main Level
Frame Size: Horizontal Res. 720 pixels
Vertical Res: (480 lines 525 Line NTSC)
(576 lines in 625 Line PAL)
Video Encoding Rate:
2 to 30 Mbits, Constant Bit Rate (4:2:2)
1.5 to 15 Mbits, Constant Bit Rate (4:2:0)
Latency (Selectable): ..... Standard Mode: < 200 mS
Low Delay Mode: <100ms
VBI Processing: ..... Extended Picture Mode (4:2:2)
6 Mbps
Closed Caption: ..... Support for line 21 (NTSC)
CC per EIA 608 standard
Audio Coding: ... MPEG–II layer 2 (ISO/IEC 13818-3)
ISO/MPEG 11172.3 Layer II (MUSICAM)
Digital Audio Inputs (Configurable):
Supports AES/EBU audio inputs (2 pairs)
balanced inputs – 48 KHz sampling
supports audio de-embedding
Audio Channels (selectable):
Analog audio (2 stereo pairs)
....balanced, 600 ohm/600 ohms High Z (selectable)
Min. Audio Bit Rate: 192 Kbits/channel
384 Kbits –stereo
..Lower audio bit rates down to 128 Kbits selectable
Audio Input Levels: +18dBm clip level
Transport Stream Output:
Fully DVB compliant DVB–ASI
per ISO/IEC 13818-2 (188 byte packets)
Encryption: BISS-1, BISS-E




*SCM4000 Rear Panel Connections showing the MPEG & Digital IF Modules*

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# LAMPIRANVI

- Spesifikasi *Waveguide* tipe EW 77

# LAMPIRAN VII

- Spesifikasi antena

## 7.125-7.75 GHz (WR112/R84)

| Type Number | Diameter ft (m) | Gain, dBi Bottom | Mid-Band | Top | Beamwidth degrees | Cross Pol Disc., dB | F/B Ratio dB | VSWR max (R.L., dB) | Fine Adjustment degrees Azimuth | Elevation | Survival Wind Speed mph (km/h) | Net Weight lb (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VP2-71 | 2 (0.6) | 30.6 | 31.0 | 31.4 | 4.9 | 30 | 40 | 1.15 (23.1)* | ±15 | ±5.0 | 155 (250) | 19 (8.5) |
| VP4-71 | 4 (1.2) | 36.8 | 37.2 | 37.5 | 2.4 | 32 | 45 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 79 (36.0) |
| VP6-71 | 6 (1.8) | 40.5 | 40.9 | 41.3 | 1.6 | 32 | 49 | 1.15 (23.1)* | ±5 | ±5 | 125 (200) | 160 (72.5) |
| VHP2-71 | 2 (0.6) | 29.8 | 30.1 | 30.4 | 4.9 | 30 | 53 | 1.15 (23.1)* | ±15 | ±50 | 155 (250) | 33 (15.0) |
| VHP4-71 | 4 (1.2) | 36.0 | 36.4 | 36.7 | 2.4 | 32 | 60 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHP6-71 | 6 (1.8) | 39.8 | 40.2 | 40.6 | 1.6 | 32 | 64 | 1.15 (23.1)* | ±5 | ±5 | 125 (200) | 347 (157.5) |
| VHPX2-71 | 2 (0.6) | 29.2 | 29.5 | 29.8 | 4.8 | 30 | 53 | 1.30 (17.7)** | ±15 | ±50 | 155 (250) | 33 (15.0) |
| VHPX4-71 | 4 (1.2) | 35.9 | 36.3 | 36.6 | 2.4 | 32 | 60 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHPX6-71 | 6 (1.8) | 39.7 | 40.1 | 40.5 | 1.6 | 32 | 64 | 1.15 (23.1)* | ±5 | ±5 | 125 (200) | 347 (157.5) |

* 1.20 (20.8) available on request ** 1.25 (19.1) available on request

## 7.125-8.5 GHz (WR112/R84)

| Type Number | Diameter ft (m) | Gain, dBi Bottom | Mid-Band | Top | Beamwidth degrees | Cross Pol Disc., dB | F/B Ratio dB | VSWR max (R.L., dB) | Fine Adjustment degrees Azimuth | Elevation | Survival Wind Speed mph (km/h) | Net Weight lb (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VP2-71W | 2 (0.6) | 30.6 | 31.4 | 32.1 | 4.8 | 30 | 40 | 1.20 (20.8) | ±15 | ±50 | 155 (250) | 19 (8.5) |
| VP4-71W | 4 (1.2) | 36.8 | 37.5 | 38.3 | 2.3 | 32 | 45 | 1.15 (23.1) | ±15 | ±20 | 125 (200) | 79 (36.0) |
| VP6-71W | 6 (1.8) | 40.5 | 41.3 | 42.0 | 1.5 | 32 | 49 | 1.15 (23.1) | ±5 | ±5 | 125 (200) | 160 (72.5) |
| VHP2-71W | 2 (0.6) | 29.8 | 30.4 | 31.1 | 4.9 | 30 | 54 | 1.15 (23.1) | ±15 | ±50 | 155 (250) | 33 (15.0) |
| VHP4-71W | 4 (1.2) | 36.0 | 36.6 | 37.5 | 2.4 | 32 | 62 | 1.15 (23.1) | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHP6-71W | 6 (1.8) | 39.7 | 40.5 | 41.2 | 1.7 | 32 | 66 | 1.15 (23.1) | ±5 | ±5 | 125 (200) | 347 (157.5) |
| VHPX2-71W | 2 (0.6) | 29.2 | 29.8 | 30.4 | 4.8 | 30 | 53 | 1.30 (17.7) | ±15 | ±50 | 155 (250) | 33 (15.0) |
| VHPX4-71W | 4 (1.2) | 35.9 | 36.7 | 37.4 | 2.4 | 32 | 60 | 1.20 (20.8) | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHPX6-71W | 6 (1.8) | 39.7 | 40.5 | 40.7 | 1.7 | 32 | 64 | 1.20 (20.8) | ±5 | ±5 | 125 (200) | 347 (157.5) |

## 7.425-7.9 GHz (WR112/R84)

| Type Number | Diameter ft (m) | Gain, dBi Bottom | Mid-Band | Top | Beamwidth degrees | Cross Pol Disc., dB | F/B Ratio dB | VSWR max (R.L., dB) | Fine Adjustment degrees Azimuth | Elevation | Survival Wind Speed mph (km/h) | Net Weight lb (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VP2-74 | 2 (0.6) | 31.0 | 31.2 | 31.5 | 4.8 | 30 | 40 | 1.15 (23.1)* | ±15 | ±50 | 155 (250) | 19 (8.5) |
| VP4A-74 | 4 (1.2) | 37.2 | 37.4 | 37.7 | 2.3 | 32 | 45 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 79 (36.0) |
| VHP2-74 | 2 (0.6) | 30.1 | 30.4 | 30.6 | 4.8 | 30 | 54 | 1.15 (23.1)* | ±15 | ±50 | 155 (250) | 33 (15.0) |
| VHP4A-74 | 4 (1.2) | 36.4 | 36.6 | 36.9 | 2.3 | 32 | 62 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHP4-74 | 4 (1.2) | 36.2 | 36.4 | 36.7 | 2.3 | 32 | 62 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHP6A-74 | 6 (1.8) | 40.2 | 40.4 | 40.6 | 1.5 | 32 | 64 | 1.15 (23.1)* | ±5 | ±5 | 125 (200) | 347 (157.5) |
| VHPX2A-74 | 2 (0.6) | 29.5 | 29.7 | 29.9 | 4.7 | 30 | 53 | 1.30 (17.7)** | ±15 | ±50 | 155 (250) | 33 (15.0) |
| VHPX4A-74 | 4 (1.2) | 36.3 | 36.5 | 36.8 | 2.4 | 32 | 60 | 1.15 (23.1)* | ±15 | ±20 | 125 (200) | 126 (57.0) |
| VHPX6A-74 | 6 (1.8) | 40.1 | 40.3 | 40.5 | 1.5 | 32 | 64 | 1.15 (23.1)* | ±5 | ±5 | 125 (200) | 347 (157.5) |

* 1.20 (20.8) available on request ** 1.25 (19.1) available on request

# LAMPIRAN VIII

- Tabel *performance Comparison Of Various Digital Modulation Schemes* (BER $10^{-6}$)

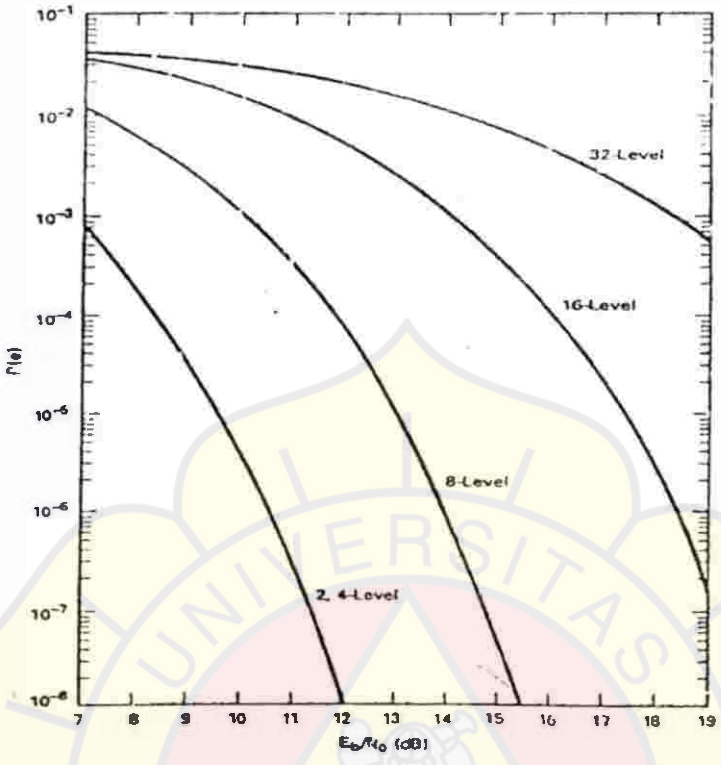


Figure 1-42 Error rates of PSK modulation systems.

TABLE 1-3 PERFORMANCE COMPARISON OF VARIOUS DIGITAL MODULATION SCHEMES (BER = $10^{-6}$)

| Modulation technique | C/N ratio (dB) | $E_b/N_0$ ratio (dB) |
|---|---|---|
| BPSK | 10.6 | 10.6 |
| QPSK | 13.6 | 10.6 |
| 4-QAM | 13.6 | 10.6 |
| 8-QAM | 17.6 | 10.6 |
| 8-PSK | 18.5 | 14 |
| 16-PSK | 24.3 | 18.3 |
| 16-QAM | 20.5 | 14.5 |
| 32-QAM | 24.4 | 17.4 |
| 64-QAM | 26.6 | 18.8 |

# LAMPIRANIX

- Surat Keterangan