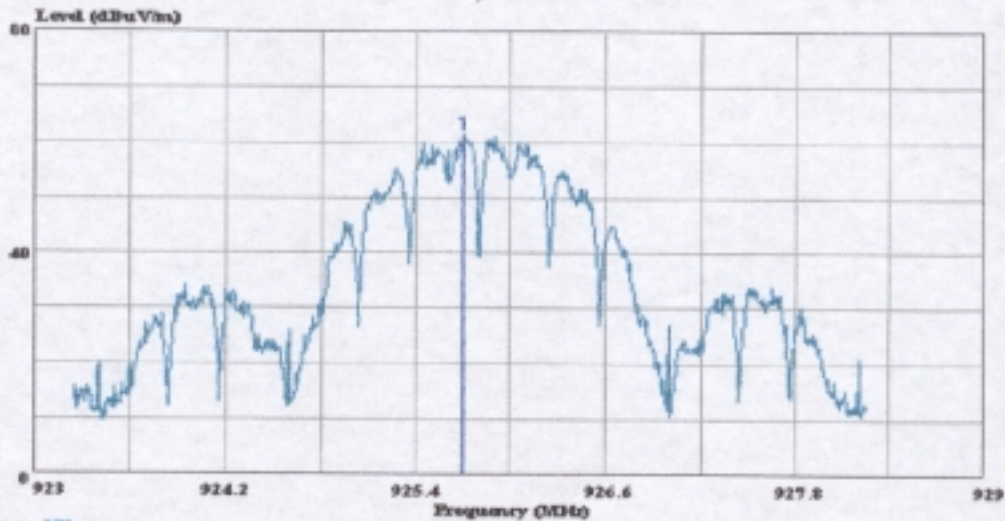




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Data#: 172 File#: 1g-5g.emi Date: 2001-05-30 Time: 19:52:52



Trace: 171

Site : Chamber No.3(Jason Gong)-Linko Site
Condition: 3m ANT.3M(H) HORIZONTAL
cut : F004U
power : AC 115V 60Hz
memo : Peak Value
 : The Peak Power Density
 : RBW:3KHz;VBW:10KHz;Span:5MHz
 : Part No. FB004
 : Channel 20 : 925.8MHz

Page: 1

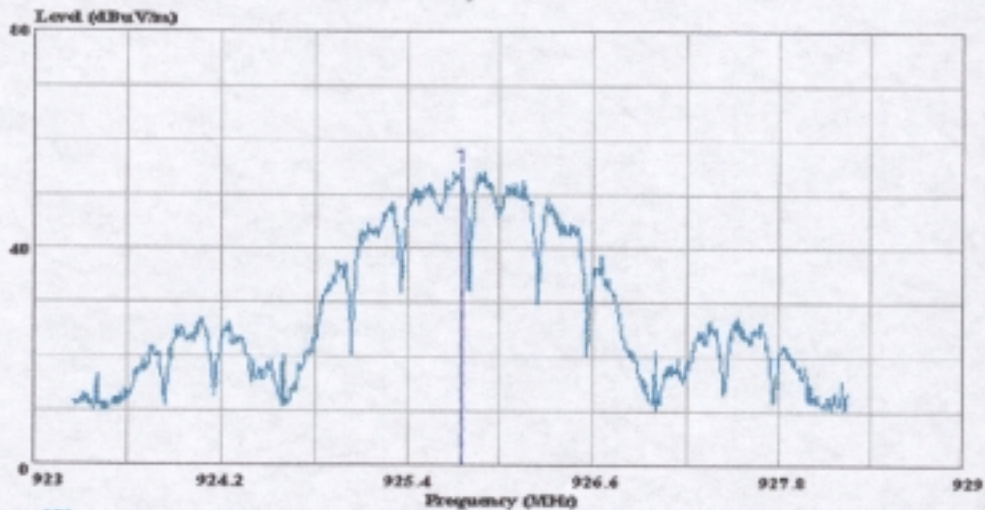
	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor
			dB	dBuV/m	dBuV	dB	dB	dB
1	925.705	61.23	-----	-----	54.08	24.38	2.77	20.00

E (dBmV) = 61.23
E (v/m) = $10^{(61.23/20)} \times 10^{-6} = 10^{3.1} \times 10^{-6} = 0.0013$
E.R.P = $[0.0013 \times 3]^2 / 30 = 0.0005\text{mw}$
dBm = $10 \log \left(\frac{0.0005\text{mw}}{1\text{mw}} \right) = -33$
 $\therefore -33 < +8$ 故 pass



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PEP Testing Laboratory

Data#: 174 File#: 1g-5g.emi Date: 2001-05-30 Time: 19:59:20



Trace: 173
Site : Chamber No.3(Jason Gong)-Linko Site
Condition: 3m ANT.3M(V) VERTICAL
cut : F004U
power : AC 115V 60Hz
memo : Peak Value
 : The Peak Power Density
 : RBW:3KHz;VBW:10KHz;Span:5MHz
 : Part No. EB004
 : Channel 20 : 925.8MHz

Page: 1

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor
			dB	dBuV/m	dBuV	dB	dB	dB
1	925.755	54.93	-----	-----	47.78	24.36	2.77	20.00

E (dBmv) = 54.93
E (v/m) = $10^{[54.93/20]} \times 10^{-6} = 10^{2.7} \times 10^{-6} = 0.0005$
E.R.P = $[0.0005 \times 3]^2 / 30 = 0.000075mw$
dBm = $10 \log (\frac{0.000075mw}{1mw}) = -41.2$
∴ -41.2 < +8 故 pass

VII. § 15.247(e) :Processing Gain

7.1 Test Condition & Setup

A, Bit Error Rate (Pe)

The subjective device RF interface base module digital modulation by Differential Phase Shift Keying (DPSK), the DPSK can use its previous waveform as the phase reference for demodulation and thus requires no coherent detection, which greatly simplifies the receiver structure but with some Bit Error Rate (BER) degradation because of noisy phase reference. There is a tradeoff between system complexity and system performance. In order to derive the DPSK error probability, we observe that DPSK using differential coding, we observe that DPSK using differential coding is essentially an orthogonal signal scheme. A binary 1 is transmitted a sequence of two pulses (P,P) or (-P,-P) (-P, P) over 2T seconds (no transition). Similarly, a binary 0 is transmitted by a sequence of two pulses (P,-P) or (-P, P) over 2T seconds (transition). Either of the pulse sequences used for binary 1 is orthogonal to either of the pulse sequences used for binary 0. Because no local carrier is generated for demodulation, the detection is noncoherent, with an effective pulse energy equal to $2 E_p$ (twice the energy of pulse P). The actual energy transmitted per digit is only E_p , however, the same as in noncoherent FSK. Consequently, the performance of DPSK is 3 dB superior to that of noncoherent FSK. We can write P_e for DPSK as:

The major component inside the subjective device are supplied by Rockwell, including RF block transmitter (RF105), Receiver (RF 100), and Base band block ASIC (c8502-13), CODEC (10497-14), above 4 IC chips are affected the processing gain as following:

$$J/S = (W/R_b) \cdot (E_b/N_0) \text{ [without CODING]}$$

Where: W = Spread Chip Rate = Required Transmitted Base band Bandwidth.

R_b = Information Data Rate

E_b/N_0 = Required Energy per Bit over noise Spectral Density for a Specific Bit Error Probability.

The subjective Device Information Data Rate are 80k and the Spread Chip Rate are 960k. So the processing gain ($10 \log W/R_b$) is at least 10.79dB (without Coding).

The ASIC (c8502-13) and CODEC (10497-14) these two chips included the coding function. So, it is great to improve the processing gain and also improve the J/S ratio.

The Engineer worked for Rockwell System in Taiwan had passed us the information about the probability of error rate (P_e) must be lower than 0.001. That the system performance will satisfy for communication between Handset and Base station.

Why we need the P_e lower than 0.001, the Rockwell Semiconductor System is not explained. Since it is relative with ASIC and Codec, it is a confidential area that Rockwell is not allowed to disclose to the public. When $P_e = 0.001$ and then Signal to Noise Ratio (S/N) = 6.2194 = 7.9dB.

B. Jamming Margin Method

The Rockwell semiconductor System give us a software operated in the personal computer. And use the computer series port COM1 and COM2 connect headset and interlace module than we can measure the Bit Error Rate.

Using this software we can perform Jamming Margin method testing, The test consists of stepping a signal generator in 50KHz increments across the pass band of the system (up to 960KHz away in RI's DCT). At each point, the generator level required to produce the recommend Bit ERROR Rate (BER = $10e - 3$) is recorded. This level is the jamming level. The maximum implementation loss a system can claim in calculating processing gain is 2 dB. The equation to calculate the processing gain (Gp) is the following :

$$Gp = (S/N) + Mj + Lsys$$

$$Gp = 8 \text{ dB} + Mj + 2 \text{ dB}$$

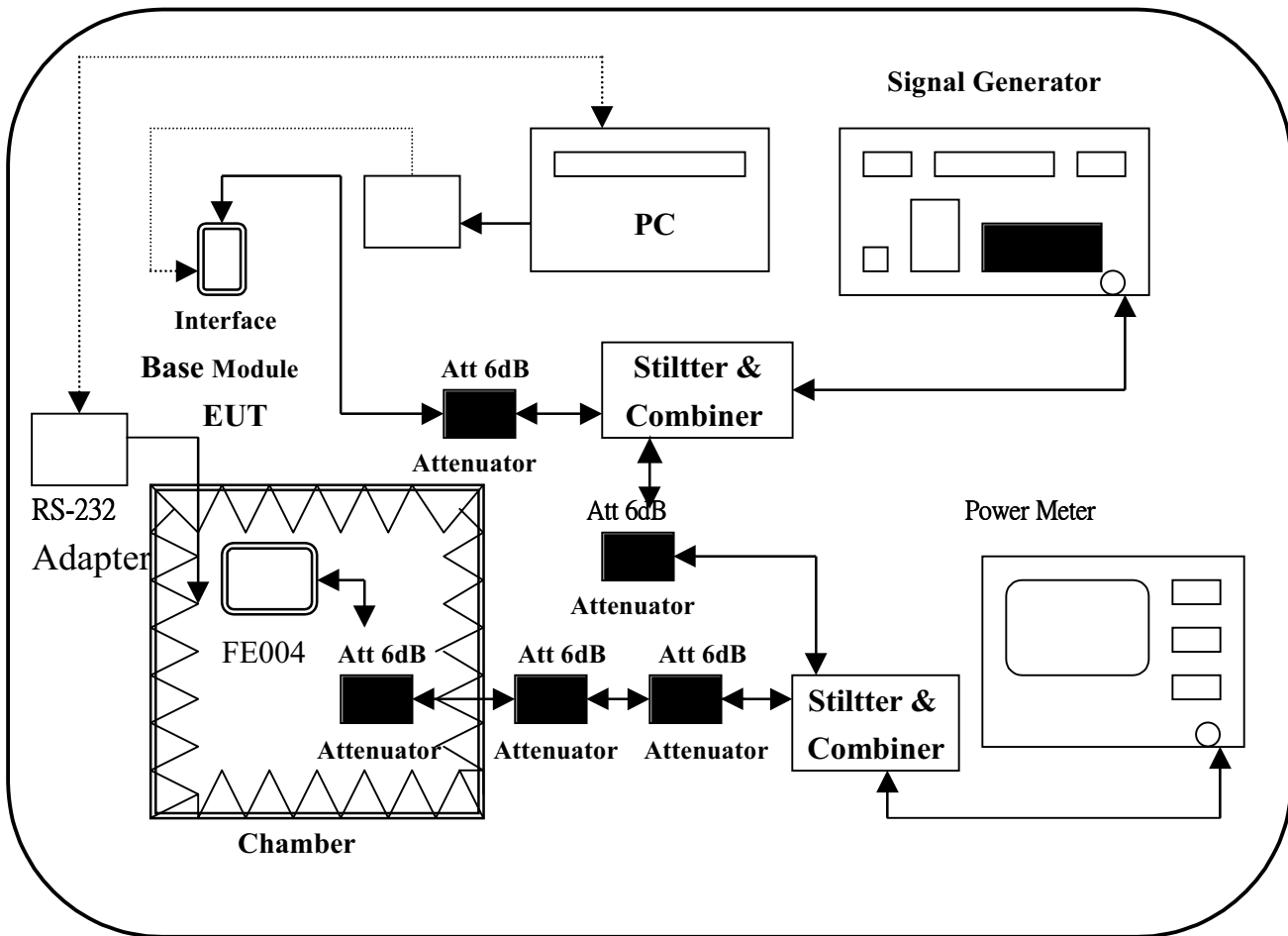
FCC regulation section 15.247(e) require the processing gain of a direct sequence system shall be at least 10dB, when Gp must be greater than 10dB, then the Jammer must be greater than 0dB.

The processing gain may be measured using the CW jamming margin method. The Jammer to Signal (J/S) ratio is then calculated Discard the worst 20% of the J/S data points.

1. For avoid the headset and interface module station are situation, so, the BUT were in low power mode.

2. The signal generator was selected in interference band, using this software we can perform Jamming Margin method testing, the test consists of stepping a signal generator is 50KHz increments across the pass band of the System (up to 960 KM' away in RI's EUT) So, the BER will keep in 0.1%.

7.2 Test Instruments Configuration



P.S: A serial port from computer to control the EUT at power output and channel number.

Test Configuration of processing gain for Interface Base Unit

7.3 Test Procedure

Measure the high power output of the channel 11 of the Interface Base Unit while it is in “Transmit-Only-Test” and the whole circuit is as same as attachment. What we measure in this step is “S”.

Change to the “BER Test“ program. Increase the RF output of the signal generator till the BER is close to the 0.1%but under 0.1%.

Stop the program and turn off the interface module, headset then record the highest point of the spectrum. What we measure in this step is ”J” .

Star the Program again and test the next point.

7.4 Test Result of Processing Gain

[Processing Gain for Channel 11 : 914.600 to 915.950 MHz]

Jammer Frequency (MHz)	S (dBm)	J (dBm)	Mj (J/S)	Process Gain (dB)
914.600	-52.80	-45.88	6.92	16.82
914.650	-52.80	-49.85	2.95	12.85
914.700	-52.80	-50.15	2.65	12.55
914.750	-52.80	-49.74	3.06	12.96
914.800	-52.80	-49.48	3.32	13.22
914.850	-52.80	-51.30	1.50	11.40
914.900	-52.80	-51.18	1.62	11.52
914.950	-52.80	-44.00	8.80	18.70
915.000	-52.80	-50.63	2.17	12.07
915.050	-52.80	-45.60	7.20	17.10
915.100	-52.80	-49.72	3.08	12.98
915.150	-52.80	-49.70	3.10	13.00
915.200	-52.80	-46.07	6.73	16.63
915.250	-52.80	-45.05	7.75	17.65
915.300	-52.80	-45.06	7.74	17.64
915.350	-52.80	-43.00	9.80	19.70
915.400	-52.80	-41.00	11.80	21.70
915.450	-52.80	-49.85	2.95	12.85
915.500	-52.80	-49.85	2.95	12.85
915.550	-52.80	-47.52	5.28	15.18
915.600	-52.80	-42.55	10.25	20.15
915.650	-52.80	-45.21	7.59	17.49
915.700	-52.80	-45.20	7.60	17.50
915.750	-52.80	-46.20	6.60	16.50
915.800	-52.80	-42.85	9.95	19.85
915.850	-52.80	-44.28	8.52	18.42
915.900	-52.80	-44.19	8.61	18.51
915.950	-52.80	-41.88	10.92	20.82

[Processing Gain for Channel 11 : 916.000 to 916.600 MHz]

Jammer Frequency (MHz)	S (dBm)	J (dBm)	Mj (J/S)	Process Gain (dB)
916.000	-52.80	-41.88	10.92	20.82
916.050	-52.80	-41.75	11.05	20.95
916.100	-52.80	-41.88	10.92	20.82
916.150	-52.80	-34.84	17.96	27.86
916.200	-52.80	-39.85	12.95	22.85
916.250	-52.80	-34.85	17.95	27.85
916.300	-52.80	-36.26	16.54	26.44
916.350	-52.80	-37.47	15.33	25.23
916.400	-52.80	-32.64	20.16	30.06
916.450	-52.80	-32.74	20.06	29.96
916.500	-52.80	-30.35	22.45	32.35
916.550	-52.80	-30.40	22.40	32.30
916.600	-52.80	-30.00	22.80	32.70

Test Result : Processing Gain = 12.98dB

Note : 1. $GP = (S/No) + Mj + Lsys$
 $= 7.9dB + Mj + 2dB$

2. S = Signal Level

3. J = Signal Generator RF Output

VIII. List of Test Instruments

Emission	Instrument	Model No.	Serial No.	Next Cal. Date	Cal. Interval
Conduction (No.2)	HP Spectrum	8591A	3225A03039	May 19, 2002	1 Year
	R & S LISN	ESH2-Z5	831886/00A	Jan. 30, 2002	1 Year
	Kyoritsu LISN	KNW-242	8-837-7	N/A	N/A
	RF Cable	No.4	N/A	Feb. 20, 2002	1 Year
Radiation (OP No.2)	R & S Receiver	ESVS10	826148/012	Apr. 17, 2002	1 Year
	Advantest Spectrum	R3261C	81720343	N/A	N/A
	Schaffner Pre-Amp.	CPA-9232	1012	Feb. 25, 2002	1 Year
	R & S Pre-Amp.	ESMI-Z7	612278/011	Jun. 01, 2002	1 Year
	EMCO Antenna	3142B	9909-1420	Jun. 01, 2002	1 Year
	COM-Power Horn Ant.	AH-118	10056	Aug. 24, 2001	1 Year
	RF Cable	No.1	N/A	Feb. 20, 2002	1 Year
	SCHWARZBECK Precision Dipole Ant.	VHAP	970+971 953+954	Jun. 27, 2003	3 Year
	R & S Signal Generator	SMY02	839846/038	Jan. 30, 2002	1 Year