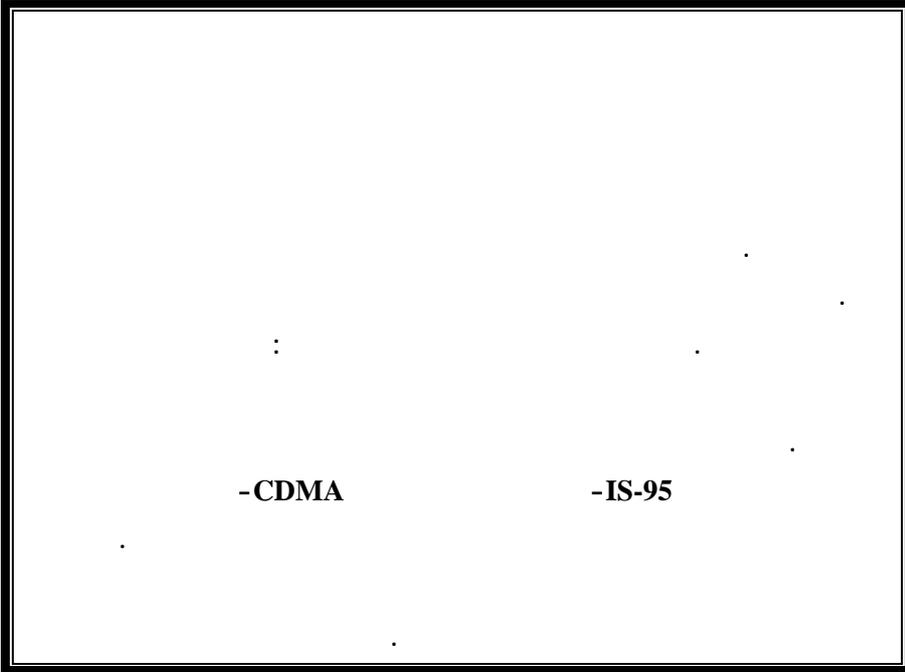


1

3

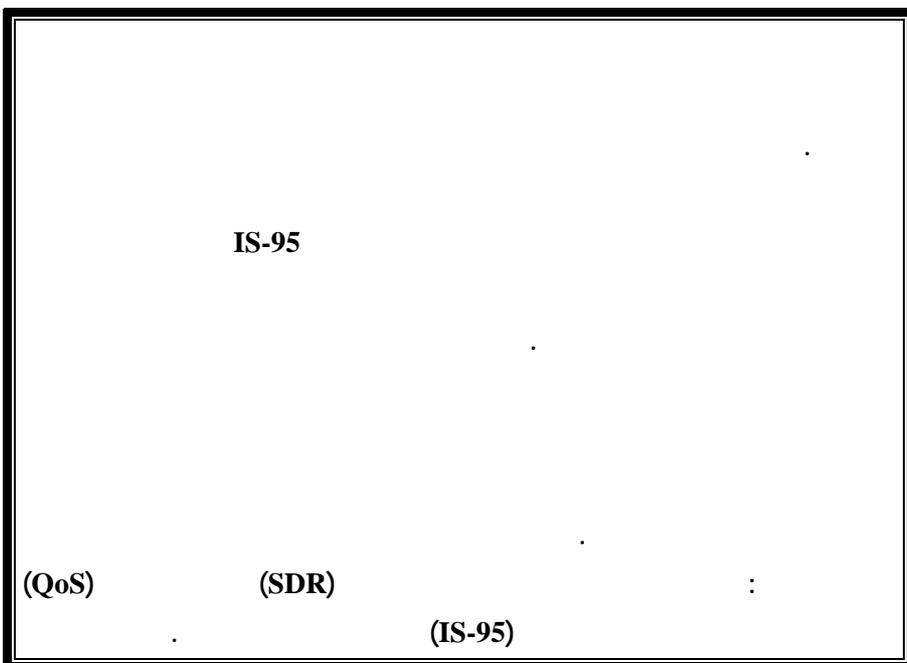
2



1

2

3



-1

quality of services )

(QoS

(standards)

( )

(ubiquitous)

(flexible)

[1]

Software )

(Defined Radio SDR

---

.(software reconfigurability)

.[2,3]

:

.

(user

defined quality of service)

(GSM, IS-95, WCDMA...)

(frequency band)

.[4,5]

- -



---

) IS-95

CDMA

:

(

(Software Reconfigurability)

**IS-95**

**-2**

(Interim Standard IS-95)

Global System for Mobile Communications )

70%

(GSM

20%

10% )

IS-95

(

GSM

(time division multiple access TDMA)

IS-95

) GSM

CDMA

CDMA

( 40%

(

)

( ) IS-95

GSM



1.2288 Mcps

(19.2\*64=1228.8) 64

QPSK

BPSK

(soft hand-off)

(1)

Rx: 869-894 Tx: 824-849 Rx: 1930-1990 Tx: 1850-1910 Rx: 2110-2170 Tx: 1920-1980	(MHz)
CDMA/FDMA	
15...50	
1.25	(MHz)
QPSK/BPSK	
1.2288 Mcps	( )
20	
9.6...1.2	(kb/s)
1/2-1/3-k=9	
19.2...2.4	(kb/s)
20	(ms)
0.6	(W)
موجود	
6	(dB)
3/4 fingers	

IS-95

:(1)

) :

(...

( )

...( ) ( 2%)  
(operator)

IS-

95

.(2)

voice activity )

.(detection VAD

near-far )

DS-CDMA

(problem

)

.(IS-95 800 Hz



( )  
)

.(

[1,7]

2.5G IS-95

.(IS-95B ) 2.5G

IS-95

IS-95 )

2.5G IS-95B .(14.4 kbps

144 IS-95C 64 kbps

IS-95 (Qualcomm) .kbps

.[6] 2.4 Mbps

[8]

: (QoS)

(interoperability)

-1-2

-(BER)

-2-2

:

BER=10<sup>-3</sup>

( )

(fading)

**IS-95**

**-3**

(diversity)

CDMA

( correlation )

---

)  
 (chip) (

(frequency selective fading)

fast )

(fading

:[9]

$T_c$  -1-3

) (channel coherence time)  $T_0$

.(

$T_c$  -2-3

) (maximum excess delay)  $T_m$

- -

.(

$T_m < T_c < T_0$  :

[1,10]

( )

PN

CDMA

-4

(fingers )

( ) (symbol)

(3)

:[1]

$$s(t) = \sum_{k=0}^K \sum_{n=-\infty}^{+\infty} b_k(n) c_k(t - nT_s) c_s(t)$$

(1)

$s(t)$   
 $bk(n)$   
 $T_s$   $k$   
 $ck(t)$   
 $cs(t)$   
 $L$

$$h(t) = \sum_{l=0}^{L-1} \gamma_l(t) \delta(t - lT_c) \quad (2)$$

$\gamma_l(t)$  :

$$r(t) = s(t) * h(t) + \eta(t) \quad (3)$$

$\eta(t)$  :

Additive White Gaussian ) (Noise AWGN

$$r(t) = \sum_{l=0}^{L-1} \sum_{n=-\infty}^{+\infty} \sum_{k=0}^K [b_k(n)c_k(t - nT_s - lT_c)c_s(t - lT_c)]\gamma_l(t) + \eta(t) \quad (4)$$

( [1,12] )

:[1, 10, 11] : -1-4

( correlator)

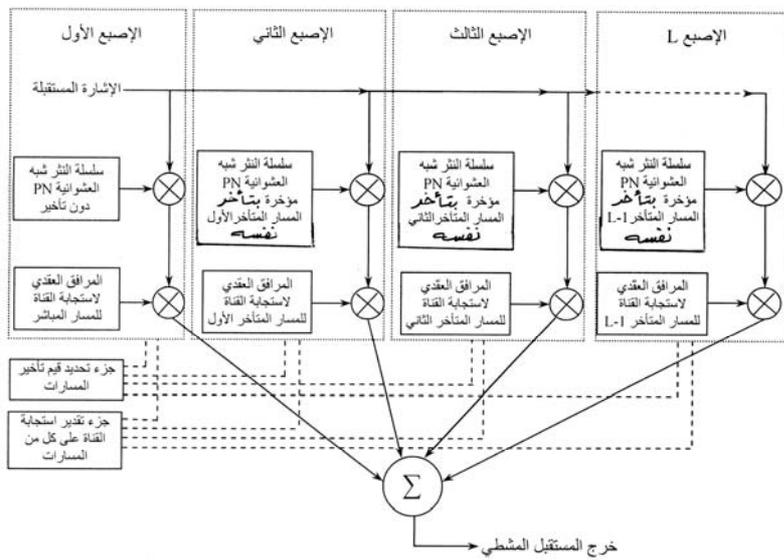
( threshold)

(tracking والملاحقة acquisition )

) (IS-95 20 ms) (

[11]

(chip rate)



L : (3)

-2-4

.( )

---

( )

(  
:  
-3-4

( )

IS-95  
(training sequence)

)  
(  
:  
-4-4

IS-95  
(maximal ratio coherent combining)  
.[1, 10, 11]  
-5  
-1-5

( /2-2/ /1/ ) QoS

[5,8]

:  
 (spreading gain) (quantization levels)

IS-95 (chip rate) BER  
 [12]

10 dB  
 6 4  $10^{-2}$   $5 \cdot 10^{-2}$  BER

( )

(computation load)  
 [12] ( )  
 (spreading gain)

IS-95  
 )

(/2/

[12]

- -

BPSK )

: L Eb/No (IS-95

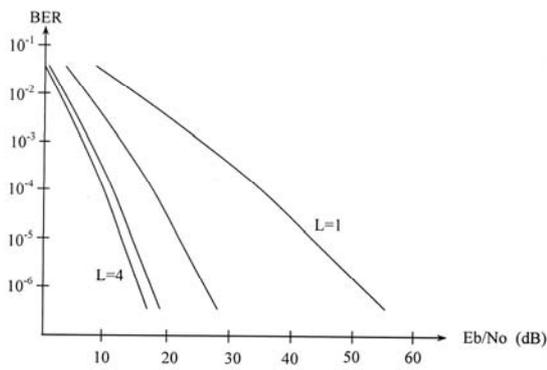
$$P_e = \left( \frac{1}{4Eb/No} \right)^L \binom{2L-1}{L} \quad (5)$$

BER Eb/No (4)

Eb/No BER  
Eb/No (2)

IS-95 .BER

[1, 13]



L=4 L=1 BER Eb/No :(4)

$E_b/N_0 = 17$  dB

BER =  $10^{-3}$       !  $10^{-6}$        $10^{-2}$       BER  
 )      50%      BER =  $10^{-6}$

$E_b/N_0 = 15$  dB      (

	BER				
	$10^{-2}$	$10^{-3}$	$10^{-4}$	$10^{-5}$	$10^{-6}$
<b>1</b>	17	27	37	46	54
<b>2</b>	9	15	19	22	25
<b>3</b>	5	10	13	15.5	17
<b>4</b>	3.5	8	11	13.5	15
<b>5</b>	2.5	6	9	11.5	13
<b>6</b>	1.5	5	8	10.5	12
<b>7</b>	1	4	7	9.5	11
<b>8</b>	1	4	6	8.5	10

$E_b/N_0$  : (2)

BER

$E_b/N_0 = 10$  dB       $10^{-6}$        $10^{-5}$   
 .[10]      12

BER

---

2  $\mu$ s 1  $\mu$ s  
.[10] 20  $\mu$ s

5  $\mu$ s

(IS-95 0.8  $\mu$ s)  
234

(3x108/1.28x106)

IS- )

[10] 95

.( 2

1 )

(

:

\_\_\_\_\_

:

IS-95  
 (IS-95 )  
 .delay BER  
 (IS-95  $10^{-4}$ ) BER  
 (3)

	<b>50 ms</b>
	<b>100 ms</b>
	<b>150 ms</b>
-	<b>250 ms</b>
	<b>400 ms</b>
	<b>600+ ms</b>

:(3)

---

(20ms)

IS-95

[1]

:

:

(background)

(streaming)

(interactive)

( )  
)

:

.(

[6]

)

:(

:

[7]

5 )

:

)

(3 4

- 1
- 2
- 3
- 4
- 5
- 6

.(IS-95 )



:  
:-1

: -2

: -3

: -4

)

[14] (Cognitive Communications)

.(

(20 ms)

Eb/No (4)

( )

4	3	2	1		
-	-	-	+9		/1/
-	-	-	0		
+2.5	+2.5	+3	+9	/2/	
				/3/	
+2.5	-	-	-		/4/
0	-	-	-		

Eb/No (dB) : (4)

/1/ (4)

(/1/ ) /2/

/3/

/2/ /4/

(/4/ )

/3/



)

/3/ /2/

(

-

-

**-2-5**

(/4/

)

-

-

(correlator)

-

-

(Estimator)

)

.(/4/

)

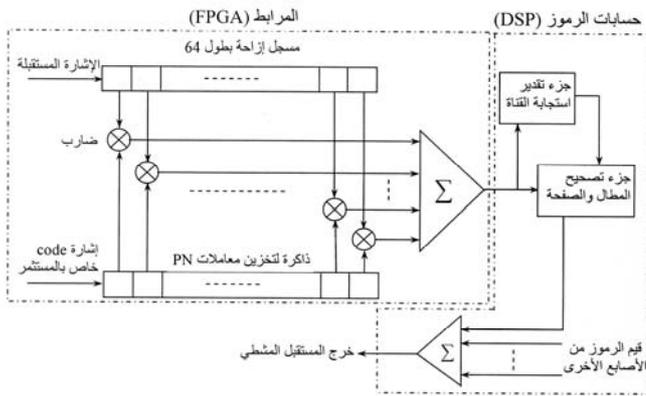
.(

)

(

)  
 (  
 .(Field Programmable Gate Array FPGA)  
 )  
 .(Digital Signal Processor DSP) (  
 (FPGAs DSPs )  
 .[5]

(5)



:(5)

-3-5

-1-3-5

(6)

:( )

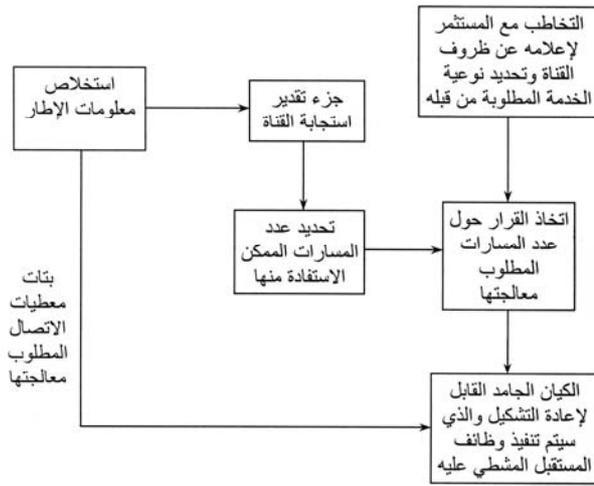
-1

-2

( ) :  
(/1-5/ )

-3

-4



:(6)

-2-3-5

:  
MATLAB :

(DSP+FPGA)  
.[5] ( )

C :

.( ) DSP+FPGA

:  
( )  
)

.(/1-5/

64

x 64 :

-1 +1

---

64

x 64 :

( )

( )

64

9

-2-3-5

(5)

( )

(/4/ )

(discrete uniform distribution)

(5)

.50%

4	3	2	1		
-	-	-	-75%		/1/
-	-	-	-75%		
	-25%	-50%	-75%	/2/	
	-25%	-50%	-75%	/3/	
	-	-	-		/4/
	-	-	-		

:(5)

)

(

50%

( )

-6

( )



75% 25%

---

<b>SDR</b>	<b>Software Defined Radio</b>	
<b>IS-95</b>	<b>Interim Standard 95</b>	<b>95</b>
<b>CDMA</b>	<b>Code Division Multiple Access</b>	
<b>QoS</b>	<b>Quality of Service</b>	
<b>GSM</b>	<b>Global System for Mobile Communications</b>	
<b>WCDMA</b>	<b>Wideband Code Division Multiple Access</b>	
<b>TDMA</b>	<b>Time Division Multiple Access</b>	
<b>PN</b>	<b>Pseudo Noise</b>	
<b>CELP</b>	<b>Code Excited Linear Prediction</b>	
<b>BPSK</b>	<b>Binary Phase Shift Keying</b>	
<b>QPSK</b>	<b>Quaternary Phase Shift Keying</b>	
<b>DS-CDMA</b>	<b>Direct Sequence-Code Division Multiple Access</b>	
<b>BER</b>	<b>Bit Error Rate</b>	
<b>FPGA</b>	<b>Field Programmable Gate Array</b>	
<b>DSP</b>	<b>Digital Signal Processor</b>	

- 
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