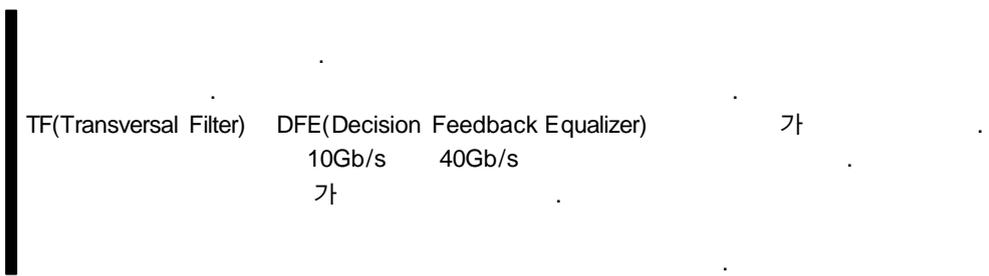


EDC

Trend of Electronic Dispersion Compensation Technique for Optical Transmission

(S.U. Lee) TDM
(J.S. Ko) TDM



I.

ISI(intersymbol interference)

$$signal(t) = \sum_{k=1}^N s_k(t - t_0 - kT) \quad (1) \quad [1].$$

$$signal(t) = k s\left(t - \frac{t_0}{2}\right) + (1 - k) s\left(t + \frac{t_0}{2}\right) \quad (1)$$

10Gb/s

40Gb/s

$s(t)$

(0 ? 1) t_0 DGD

ISI

가 (PMD)

II.

가 가

가

ISI

PMD 1

(port,

가 DGD(Differential Group

()

Delay)

가

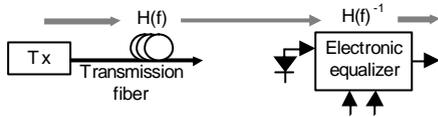
H(f)

(,)

H(f)⁻¹ 가

H_{comp}(f)

가



(1)

가 $H(f) \times H(f)^{-1} = 1$ 가 [2]. $H(f)^{-1}$ 가

((1)).

1.

(transversal filter)

. (2) N (tap) [3].

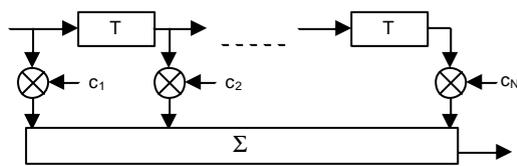
(T) () () . ISI가

c_i 가 가 $y(t)$ (2) 가

$$y(t) = \sum_{j=1}^N c_j n(t - (j-1)T) \quad (2)$$

$v(t)$ 가 $H_{comp}(f)$ 가

가 LMS(Least - Mean-Square) 가 (3)



(2) 가

[4].

$$c_j^{k+1} = c_j^k + \Delta e_k n_{k-j}, \quad k = 1, 2, \dots, j = 1, 2, \dots, N \quad (3)$$

c_j^k k j 가

, Δ 가

, v_k k

, ϵ_k (4)

y_k .

$$e_k = I_k - y_k \quad (4)$$

I_k k .

2.

DFE(Decision Feedback Equalizer)

. (3)

[2].

DFE 가

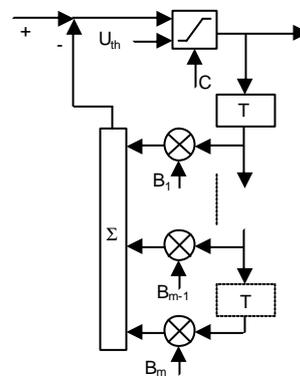
B_i 가 DFE

'1' '0'

ISI

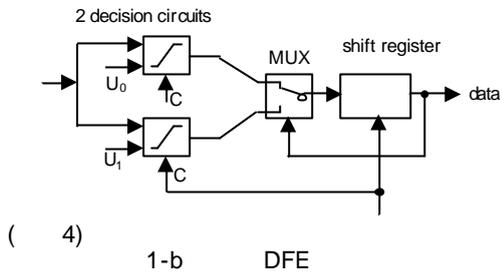
(gate), , 가

(loop) DFE 가



(3)

DFE



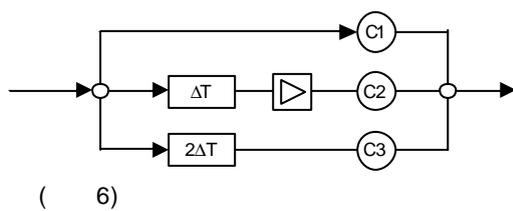
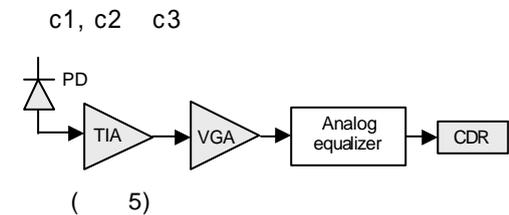
DFE ((4))
 [5]. 1 (bit shift) DFE

III.

1.

(5) 가 TIA (transimpedance amplifier), VGA(Variable Gain Amplifier) CDR(Clock and Data Recovery)

[1]. Schlump ((6).)
 6) PMD , 가 가

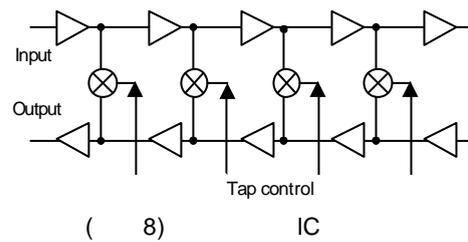
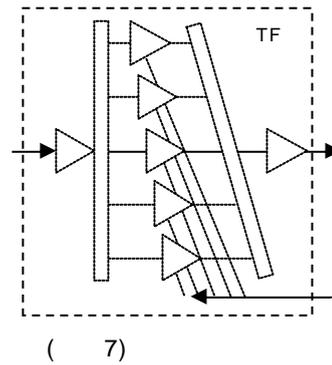


Frazer 가 (7)
 (TF)
 [7]. 5

가
 50ps (50ps)
 가) 5

가 40dB
 0 180
 10Gb/s (8)
 [8]. 1 가

가 -1 1
 3dB 15.5GHz

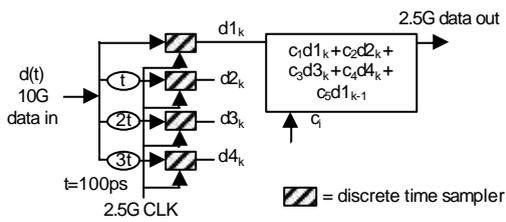


Buelow 가
 7 55ps 가 8 가 [9]. (10) ,
 가 가 (mixer), 가 (adder)
 10Gb/s 가 가 "-1" "1"
 Buelow 4 T_{d1} T_{d2}
 IC [10]. 가 가
 IC 가 가
 -1 +1 IC PMD
 70ps 12GHz 20ps DGD

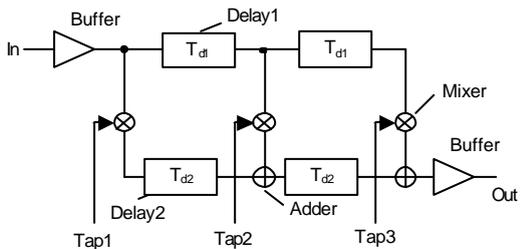
Woodward (9)
 5 [11].
 (impulse)
 (c_n)

10Gb/s
 4 1 4

Nakamura 40Gb/s
 [12].



(9) (pipeline) TF

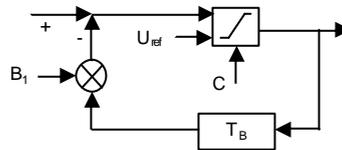


(10)

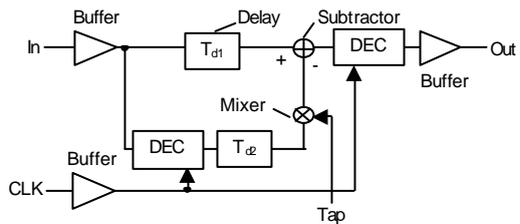
2.
 Buelow (11)
 DFE [9]. DFE
 가 (B₁)
 (T_B=100ps)

DFE U_{ref}
 가 B₁

Nakamura 40Gb/s DFE [12].
 DFE (12)
 (feed-forward)
 DFE 가



(11) DFE



(12) DFE

가

40Gb/s DFE

가

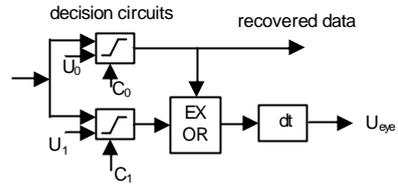
3. PMD가 가

가 Buelow (eye)

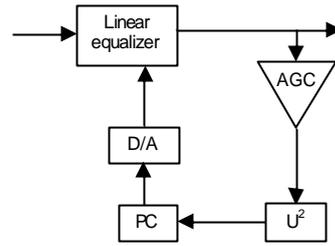
[13]. IC 가

13) U_0 U_1 EX- OR U_{eye} 가

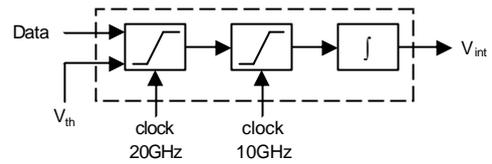
Buelow (14) AGC IC [10]. Buchali 40Gb/s (15) [14]. 가 10Gb/s "0" "1" . PRBS



(13)



(14)



(15) 40Gb/s

(Pseudorandom binary sequence) (pattern)

"0" "1" 가

"1" "0"

"0"/"1"

"0" "1"

"1/2"

4.

Buelow DFE (TF+DFE) [9]. TF DFE 가 TF PMD TF Moeller 1 DFE 10Gb/s 120ps DGD ISI

[15].

10Gb/s 80km 가
 20km 10Gb/s 40Gb/s
 [11].
 EAM(electroabsorption modulator)
 , 가
 . EAM LiNbO₃ 가
 DML(directly modulated distributed feedback laser) 가
 (metro) 2.5Gb/s
 . Feuer 10Gb/s
 DML
 [16].
 20km 가
 Kanter 가
 Mach-Zehnder EAM
 [17].
 40km 10Gb/s EAM 가
 50% 가
 10 가
 LAN SAN
 . 10Gb/s
 . Pepeljugoski
 850nm 7
 [18].
 50ps 10Gb/s
 ISI
 11dB 2.2dB

IV.

FEC(Forward Error Correction)

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