

Sing-Around

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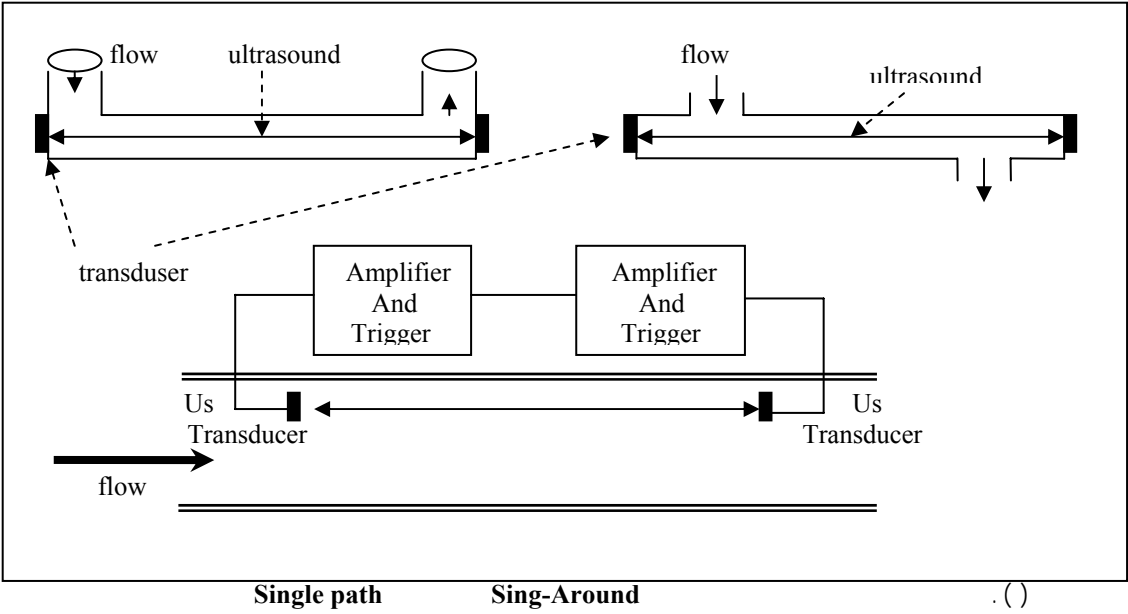
SA (Piezo-Electric) () PZT () (SA) Sing-Around [1].

, Sing-Around , :
 ()
 [2]. () ,
 Single-Phase Multi-Phase
 ()
) (SA). Sing Around
 (SA) , (,
 ,
 ,
 " "

[2]. (FA) Frequency Difference Method SA
 (Tilted Diameter)"

Sing-Around

,
 (Piezo-Electric)
 Sing-Around PZT
 :
 (Dual Path)() (Single Path)()
 Non-Wetted Wetted , Immersion:
 Sing-Around
 () , () , () , ()
 ,
 SA PZT (SA)
 (Frequency Difference Technique)
 : SA
 () ()
 : SA ,
 , () (



SA

Θ L,C

$$T = \frac{L}{C} \quad (1)$$

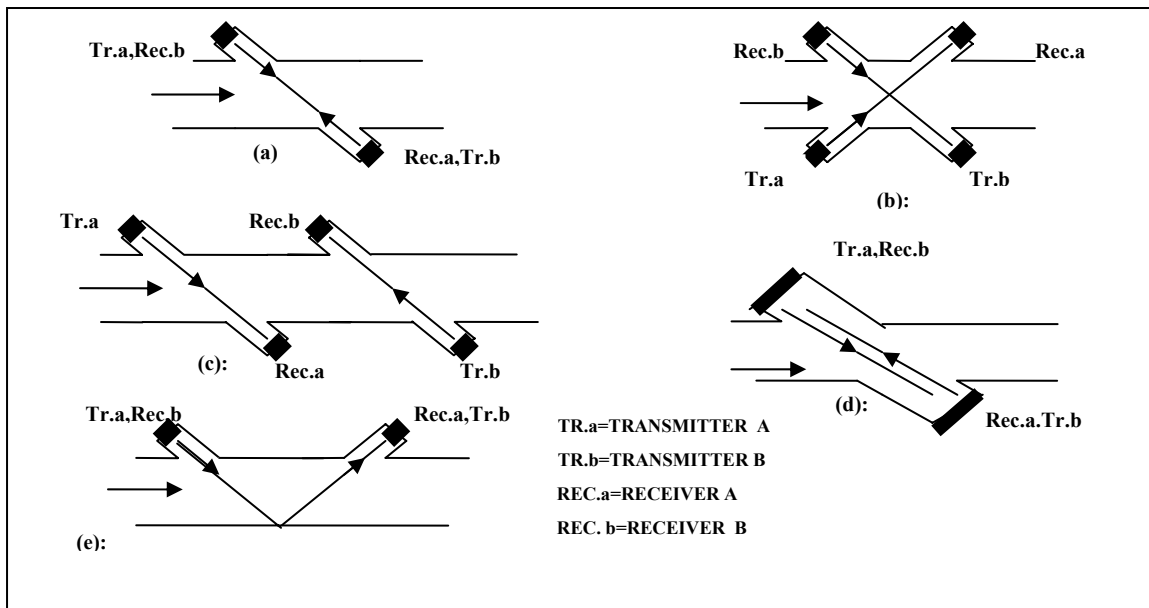
(V)

$$T_1 = \frac{L}{C + V \cos \Theta} \quad (2)$$

(V)

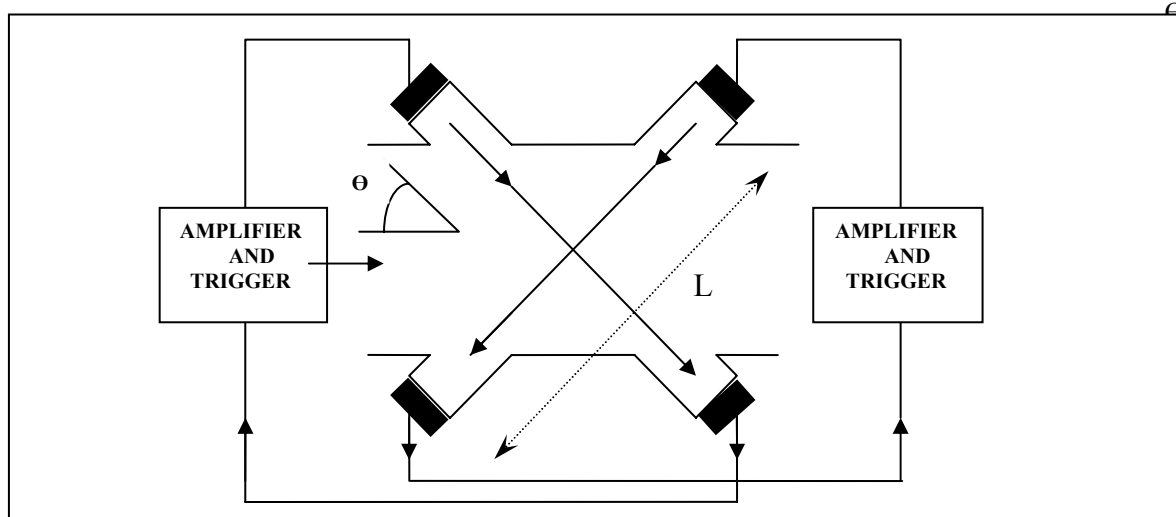
$$T_2 = \frac{L}{C - V \cos \Theta} \quad (3)$$

SA $T_2 - T_1$, () ()



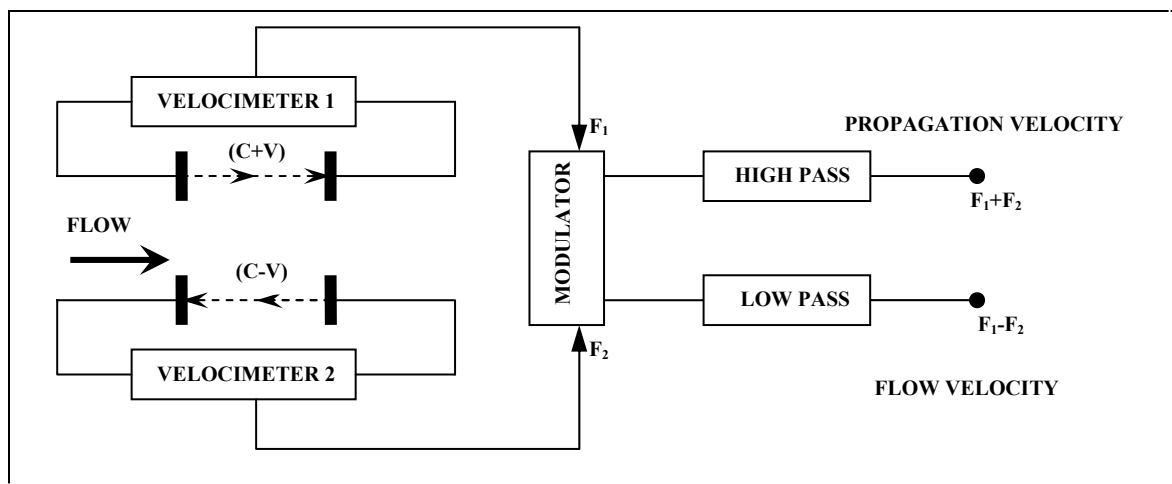
Sing-Around

()



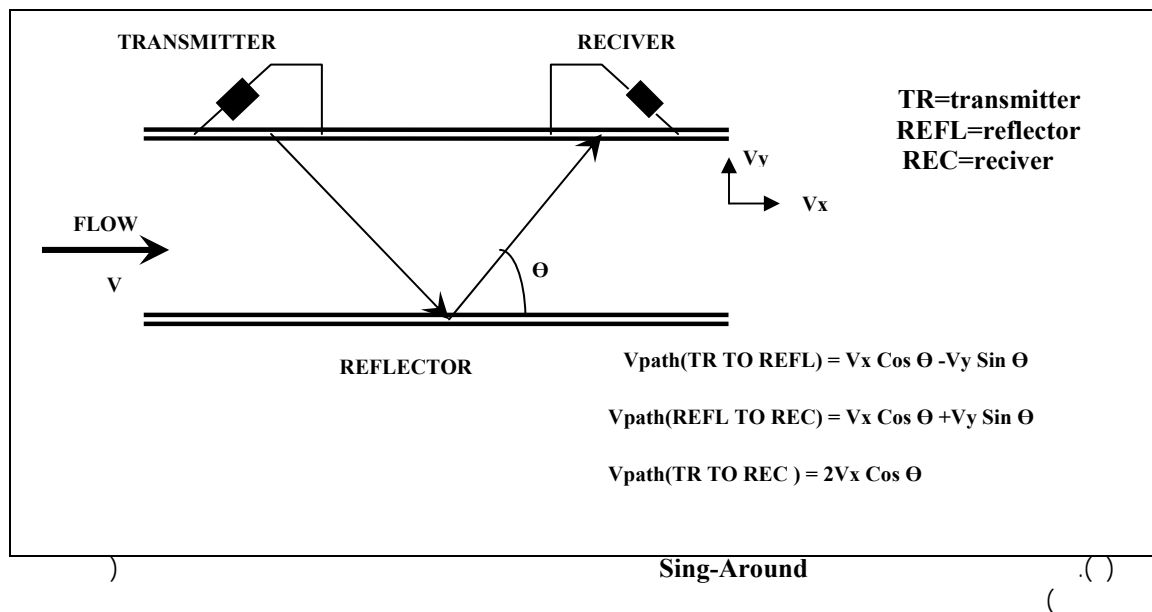
Sing-Around

()



Sing-Around

()



,SA

Muston Loosemore

[4].

[5].

SA

(FD)

()

() Intrusive

[2].

Sing-Around

SA

[6],[2]. TASAP

(single-phase)

[6], [2].

[2]. (,)

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(
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(,)
, Sing-Around

, SA

).

(SA)

(I
(II
(III
(IV

.()

..... (,) (V

Sing- "Ph.D : [1]
, ; " Around

[2]:BAGHRI,J.(1995)"Ultrasonic Flow Measurement Using Two Asymmetric'Sing-Around'Paths.Ph.D. Thesis Control Engineering Department, University of Bradford.

[3]: LYNNWORTH,L.C(1975)"ULTRASONIC FLOWMETERS";PHYSICAL Acoustics, Vol. 14(W.P.Mason and R.N.Thurston, eds.),Academic Press, New York. PP.407-525

[4]:Muston,A.H.and LOOSEMORE, W.R.(1972)U.K. Patent Application 15554/72

[5]:Frederick, J.R.(1965)"Ultrasonic Engineering";Willy,New York.

: [6]