ROHDE&SCHWARZ

SOUND AND TV BROADCASTING DIVISION

APPLICATION NOTE

Vision-sound intercarrier measurement

Products:

CCVS + COMPONENT	***GENERATOR***	***SAF***
CCVS	***GENERATOR***	***SFF***

7BM28_0E

Vision-sound intercarrier measurement

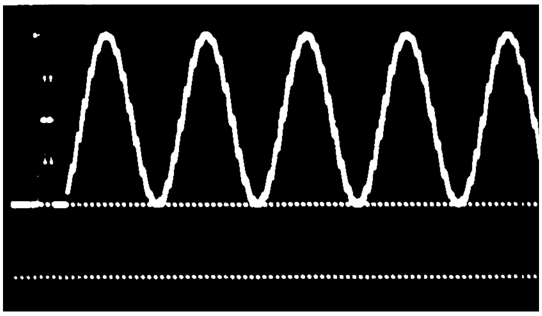
To measure vision-to-sound crosstalk, video signals containing low-frequency sinewave signals are used. The frequency range of these sinewave signals covers 50 Hz to 100kHz; for this reason, an additional AF sinewave generator has been required so far. The sinewave signals were superimposed on the sync and burst frames of the video signal generator via an external signal input.

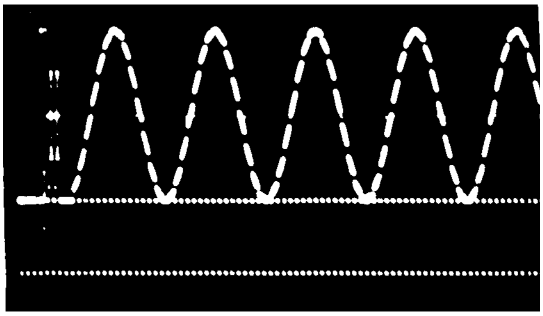
This is no longer necessary when using the SAF/SFF. These generators allow the AF sinewave signals to be produced by means of the variable zone-plate signals, all integer multiples of 50 Hz being feasible. To ensure an optimum shape of the sinewave signals, the zone-plate coefficients of the following table are to be used.

For this application the coefficients k_x^2 , k_{xy}, k_y^2 and k_t^2 must be zero. If the AF and the VF are not to be phase-locked, k_t not equalling 0 must be selected. For the coefficients k_x and k_y see the table on the next page. Because of the inherent SAF/SFF computing accuracy, certain factors are not displayed with the same value as entered. The values given in parentheses are displayed on the SAF/SFF. In the critical frequency ranges about 3.9 [kHz] (f_H/4) and
7.8 (f_H/2) the frequencies are listed in 100-Hz steps.

Frequency f [Hz]	Coefficient k_y [c/ph]	Coefficient k_x [c/pw]	Frequency f [Hz]	Coefficient k_y [c/ph]	Coefficient k_x [c/pw]
50	1 (0.99)	0	5000	100 (99.98)	0.32
100	2 (1.98)	0	5500	110 (110.02)	0.32
150	3 (3.01)	0	6000	120 (120.01)	0.37
200	4 (4.01)	0	6500	130 (130.00)	0.37
250	5 (5.00)	0	7000	140 (140.00)	0.47
400	8 (8.01)	0	7100	142 (141.98)	0.47
500	9 (9.99)	0.05	7200	144 (144.00)	0.47
600	12 (12.02)	0.05	7300	146 (145.99)	0.47
700	14 (14.00)	0.05	7400	148 (148.01)	0.47
800	16 (15.98)	0.05	7500	150 (149.99)	0.47
1000	20 (19.99)	0.05	7600	152 (152.02)	0.47
1250	25 (24.99)	0.11	7700	154 (154.00)	0.47
1500	30 (29.98)	0.11	7800	156 (155.98)	0.53
1750	35 (35.02)	0.11	7900	158 (158.00)	0.53
2000	40 (40.02)	0.11	8000	160 (159.99)	0.53
2500	50 (50.01)	0.16	8100	162 (162.01)	0.53
3000	60 (60.01)	0.21	8200	164 (163.99)	0.53
3100	62 (61.99)	0.21	8300	166 (166.02)	0.53
3200	64 (64.01)	0.21	8400	168 (168.00)	0.53
3300	66 (65.99)	0.21	8500	170 (169.98)	0.53
3400	68 (68.02)	0.21	9000	180 (180.02)	0.58
3500	70 (70.00)	0.21	10000	200 (200.00)	0.63
3600	72 (71.98)	0.21	15000	300 (299.99)	0.95
3700	74 (74.01)	0.21	15625	0	1
3800	76 (75.99)	0.26	20000	87.5 (87.51)	1.28 (1.28)
3900	78 (78.01)	0.26	30000	287.5 (287.51)	1.92 (1.90)
4000	80 (79.99)	0.26	40000	175.0 (175.02)	2.56 (2.58)
4100	82 (82.02)	0.26	50000	62.5 (62.48)	3.20 (3.22)
4200	84 (84.00)	0.26	60000	262.5 (262.49)	3.84 (3.85)
4300	86 (85.98)	0.26	80000	37.5 (37.50)	5.12 (5.12)
4400	88 (88.01)	0.26	100000	125.0 (125.01)	6.40 (6.38)
4500	90 (89.99)	0.26			

In the frequency range 50 to 15000 [Hz], the frequency-determining coefficient is k_y whereas k_x yields an optimum shape for the sinewave. The frequency is calculated as $f = k_y \; 50[Hz]$.





not optimal   optimal

Sinewave compensated by way of k_x

From 15625 [Hz] (line frequency) the sinewave should be compensated with k_y since, starting with this value, the frequency is calculated $f = k_x \; 15625$ [Hz], which corresponds to multiples of the line frequency.

The detailed equations are given in

Zone-plate signals for the advanced user

Calculations of k_x und k_y for continuous sinewave signals with a fixed frequency without phase offset at the start of a line in the frequency range 50 Hz $\geq f \geq$ 6 MHz.

The equation for this zone-plate signal with a sinewave signal of Upp=700mV superimposed on a grey pedestal of 350 mV reads:

$$A (x,y) [mV] = 350 + 350 \sin (k_x \; x + k_y \; y)$$
$$= 350 (1 + \sin (k_x \; 2\pi \, x [\mu s] / 64 [\mu s] + k_y \; 2\pi \, y [l] / 312.5 [l]))$$

k_x determines the frequency f. Without compensating with k_y, a phase offset is produced from line to line for all frequencies f not equalling n f_H (f_H = line frequency), eg

$f = 20000$ Hz
$k_x = f / f_H = 20000 / 15625 = 1.28$

A “residual phase“ of $\Delta\varphi = (1.28\text{-}1) \; 360° = 100.8°$ remains at the start of a line and must be compensated with the coefficient k_y in each line.

$y [l] = 1$ line
$\Delta\varphi = 100.8°$

The following is required for one “vertical“ sinewave:

1 cycle = 360° / 108° = 3.571lines

With progressive sampling this means:

k_y = 625 / 3.571 = 175 [l/ph]

But since the sinewave signals are produced in the 2:1 interlace mode, only half the value must be used for k_y:

k_y = 87.5 [l/ph] (2:1 interlaced)

The following applies for a 20000-Hz sinewave

k_x = 1.28 [c/pw]
k_y = 87.5 [l/ph]

The coefficients for different frequencies can be calculated as shown in the above example.

The following short-form equations are used for calculating k_x and k_y:

kx = f / f_H	f= frequency to be selected
k_y = (f / f_H -T) 625 / 2	f_H = line frequency T = TRUNC (f / f_H) eg: f / f_H = 3.473 T = 3 ie the digits after the decimal point are truncated

and if the 525-line system is used:

k_x = f / f_H k_y = (f / f_H -T) 525 / 2	(f_H = 15734.25 Hz)