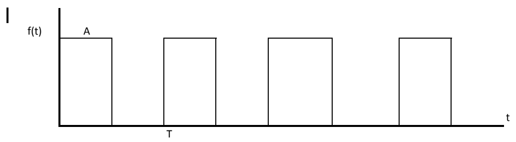


This time waveform can be written as a Fourier Series because it is periodic with period T and amplitude A.

$$f(t) = \frac{A}{2} \text{ "+" } \sum_{n\ odd}^{\infty} \frac{2A}{n\pi} \sin(2\pi fnt)$$

50% DUTY CYCLE

Using Eulers Formula :

$$\sin(2\pi fnt) = \frac{e^{j2\pi fnt} - e^{-j2\pi fnt}}{2}$$

$$A * \sin(2\pi fnt) = \frac{A\{e^{j2\pi fnt} - e^{-j2\pi fnt}\}}{2}$$

$$P = 1/T \int_0^T x(t)^2\, dt = 1/T \int_0^T \{A\sin(2\pi fnt)\}^2\, dt$$

$$A^2/T \int_0^T \{\sin(2\pi fnt)\}^2\, dt$$

$$\int_0^T \{\sin(at)\}^2\, dt = (t/2) - (\sin(2at)/4a)$$

$$A^2/T \int_0^T \{\sin(2\pi fnt)\}^2\, dt = A^2/T\ \{(t/2) - (\sin(4\pi fnt)/8\pi fn)\}\Big|_0^T$$

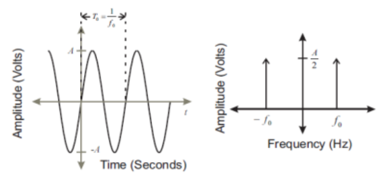
$t = T$; $f = 1/T$

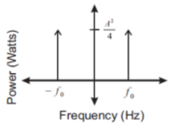
$$= A^2/T\ \{(T/2) - (T\sin(4\pi fnT)/8\pi n)\}$$

$$= A^2/T\ \{(T/2) - (T\sin(4\pi n)/8\pi n)\}$$

for n is odd
$\sin(4\pi n) = 0$

$$= A^2/T\ \{(T/2)\}$$
$$= A^2/2$$





To provide a nomalised response the Fourier coefficient for f(1) = 1 i.e. multiply by π/2*A

NORMALISATION

AMPLITUDE
A = 1

					HARMONIC	PEAK VOLTAGE 1 line spectra	AVERAGE POWER (WATTS) 1 line spectra	dB_M 1 line spectra	PEAK VOLTAGE 2 line spectra	AVERAGE POWER (WATTS) 2 line spectra	dB_W 2 line spectra	dB_M 2 line spectra	DIFF dB_M				dBm
f(t) =	A/2				n = 0	0.5	0.25	23.97940009	0.5	0.25	-6.0206	23.979400	0			0.79	27.901798
f(t) =	A/2	"+"	2*A/π	sin (2πft)	n = 1	0.636620	0.202642	23.0673025	0.318310	0.101321184	-9.943	20.057003	3.0103	2.00E-03		1.00	30
													i.e. multiply by 2				
					n= 2	0				0		0.000000	-3.0103	5.00E-04			
f(t) =	A/2	"+"	2*A/3π	sin (6πft)	n = 3	0.212207	0.022516	13.52487741	0.106103	0.011257909	-19.4854	10.514577			1/3	0.33	20.457575
					n= 4												
f(t) =	A/2	"+"	2*A/5π	sin (10πft)	n = 5	0.127324	0.008106	9.087902416	0.063662	0.004052847	-23.9224	6.077602			1/5	0.20	16.0206
					n= 6	0				0							
f(t) =	A/2	"+"	2*A/7π	sin (14πfnt)	n = 7	0.090946	0.004136	6.165341702	0.045473	0.002067779	-26.845	3.155042			1/7	0.14	13.098039
					n= 8	0				0		0.000000					
f(t) =	A/2	"+"	2*A/9π	sin (18πfnt)	n = 9	0.070736	0.002502	3.982452314	0.035368	0.001250879	-29.0278	0.972152			1/9	0.11	10.91515
					n= 10	0				0		0.000000					
f(t) =	A/2	"+"	2*A/11π	sin (22πfnt)	n = 11	0.057875	0.001675	2.2394488	0.028937	0.000837365	-30.7709	-0.770851			1/11	0.09	9.1721463
					n= 12	0				0		0.000000					
f(t) =	A/2	"+"	2*A/13π	sin (26πfnt)	n = 13	0.048971	0.001199	0.788435457	0.024485	0.000599534	-32.2219	-2.221865			1/13	0.08	7.721133
											-172.216	61.76306					
							0.492775			0.371387497							
							CORRECT !!!!			**CORRECT !!!!**							

This is the power in watts only upto n=13 if we let n = ∞ the total power = 0.5 W.

-4.30172721 dB_W

$$P = 1/T \int_0^T x(t)^2\, dt \qquad P = 1/T \int_{0.5}^{1} (1)^2\, dt \quad = \quad 0.5\ W$$

	dB_M 1 line spectra		dB_M 2 line spectra
0.000000	23.979400	0	23.9794
2000	23.0673025	1	20.0570
	0	2	0.0000
6000	13.52487741	3	10.5146
	0	4	0.0000
10000	9.087902416	5	6.0776
	0	6	0.0000
14000	6.165341702	7	3.1550
	0	8	0.0000
18000	3.982452314	9	0.9722
	0	10	0.0000
20000	2.2394488	11	-0.7709
	0	12	0.0000
24000	0.788435457	13	-2.2219

0	23.97940009	23.9794
2000	23.0673025	20.057
6000	13.52487741	10.51458
10000	9.087902416	6.077602
14000	6.165341702	3.155042
18000	3.982452314	0.972152
20000	2.2394488	-0.770851
24000	0.788435457	-2.221865