

FOR USE WITH A TRIPLE PENDULUM
 RM values updated 16 Jan 2008
 NAR and CIT

**KEY: - INPUT BLUE
 OUTPUT RED**

1. CALCULATION OF VARIOUS BLADE PARAMETERS,
2. the flats mass and moment of inertia
3. the aluminium intermediate mass with hole
4. and choice of radius for the wire

Modified for the TT/IBS vertical Blades July 2009
based on HLTS lower blade procurement March/April 2009

BJJS
NAR and CIT

1. Option with 254 micrometer blade

thickness	0.254 mm	0.000254 m	masstotal / blade	0.0627 kg
length,l	5 cm	0.05 m	mass supported	0.0627 kg
width,a	2.6 cm	0.026 m	load, P	0.62
			cross sectional	3.6E-14
mass1	0.124 kg			
clamps etc...	0.0014 kg			
MASS 1	0.1254 kg			
mass2	0 kg			
mass3	0 kg			
no. of blades	2			
Young's modulus	1.31E+11	(BeCu)		
shape factor	1.5 ???			

Deflection	8.265 mm
frequency	5.48 Hz
Stress	110 Mpa
MAX STRESS	400 (BeCu)

tip angle	19.124092
base to tip [mm]	135.90725
lateral shift [mm]	-83.9072501
	0.7

INTERNAL MODE (SCALED FROM ORIGINAL BLADE)		
length	0.37	
thickness	0.002	382 Hz
internal mode	55	

1b. Option with 500 micrometer blade

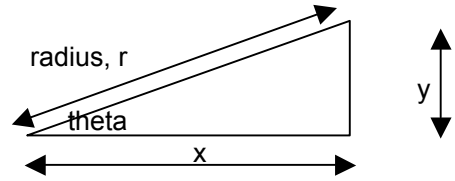
thickness	0.5 mm	0.0005 m	masstotal / blade	0.063 kg
length,l	7 cm	0.07 m	mass supported	0.0634 kg
width,a	2 cm	0.02 m	load, P	0.62
			cross sectional	2.08E-13
mass2	0.124 kg			
mass3	0.0014 kg			
no. of blades	2			
Young's modulus	1.31E+11			
shape factor	1.5 ???			

Deflection	3.908 mm
frequency	7.97 Hz
Stress	52 Mpa
	Good

	(1.55 used before)
tip angle	6.4068763
base to tip [mm]	219.726673
lateral shift [mm]	-147.726673

INTERNAL MODE (SCALED FROM ORIGINAL BLADE)		
length	0.37	
thickness	0.002	384 Hz
internal mode	55	

FUSED SILICA MASS



radius of mass	75 mm	0.075	mass	2.92 kg
thickness	75 mm	0.075	lx	0.0082
height of flat	50 mm	0.05	ly	0.0055
density of material	2202		lz	0.0055

1/2 height, y	0.025 m
distance,x	0.071 m
theta	19.5

flat width	4.3 mm
mass of flat	23.8 g

THE FLAT

equiv. Flat width	0.0029
equiv. Mass	23.94675 g
length, l	0.07355 m

lx	0.00002
ly	0.00013455
lz	0.00014078

NB:- Match equiv. Mass with mass of flat

FUSED SICIA OVERALL (2 FLATS)

mass	2.871 kg
lx	0.0082
ly	0.00520
lz	0.00519

mass	2.92 kg
lx	0.0082
ly	0.0055
lz	0.0055

ALUMINIUM MASS M WITH HOLE

outer radius of mass	75 mm	0.075	mass	2.927029729 kg
inner radius of mass	32 mm	0.032	lx	0.00973091
thickness	75 mm	0.075	ly	0.0062375
height of flat	50 mm	0.05	lz	0.0062375
density	2700			

outer mass	3.57847038 kg
inner mass	0.65144065 kg

THE FLAT

1/2 height, y	0.025 m
distance,x	0.071 m
theta	19.5

equiv. Flat width	0.0029
equiv. Mass	29.3625 g
length, l	0.07355 m

lx	0.000020
ly	0.000165
lz	0.000173

NB:- Match equiv. Mass with mass of flat

OVERALL (2 FLATS AND A HOLE)

mass	2.8688 kg
lx	0.0097
ly	0.00591
lz	0.00589

3. CHOICE OF THE WIRE

BREAKING STRESS of THE WIRES			
mass1	0		
mass2	0.062		
mass3	0		
total mass	0.062 kg		working to ~ 1/3 of the Breaking Stress
number of wires	2		
gravity	9.81	radius of wire	1.205E-05
B.S. of steel wire			12.04997217
spring steel	2.00E+09		
However, I have wire of radius	127	0.000127	
Wire is tensioned to tensile stress =	6001688		
Want this as a % of the BS =	0.30 %		

WIRE IMPERIAL	EQUIV.	WIRE METRIC (RADIUS)
6thou diam	6	76.2 microns radius
8thou diam	8	101.6 microns radius
10thou diam	10	127
	12	152.4
	14	177.8
	16	203.2
	18	228.6
	20	254
	22	279.4
	24	304.8

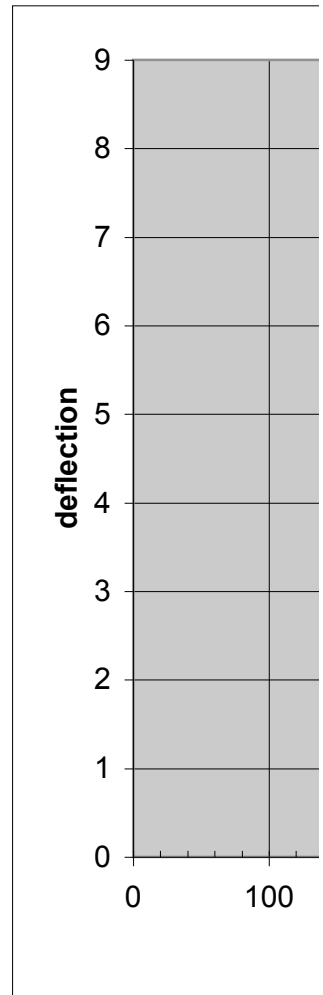
EXPT. TO SNAP WIRE	
Mass added	25
Tensile Strength	4.84E+09

HAVE L and h NEED TO GET SAME

VALUE OF h for a VALUE OF R

Length, L 50 mm
 deflection, λ 8.27 mm

R	mm	deflection, h	λ mm
	148		8.36592
	148.2		8.354845
	148.4		8.343798
	148.6		8.332781
	148.8		8.321792
	149		8.310832
	149.2		8.299901
	149.4		8.288998
	149.6		8.278123
	149.8		8.267276
	150		8.256458
	150.2		8.245668
	150.4		8.234905
	150.6		8.22417
	150.8		8.213463
	151		8.202784
	151.2		8.192132
	151.4		8.181507
	151.6		8.17091
	151.8		8.16034
	152		8.149797
	600		4.078704
	602		4.065184
	604		4.051753
	606		4.038411
	608		4.025156
	610		4.011988
	612		3.998905
	614		3.985908
	616		3.972995
	618		3.960165
	620		3.947417
	622		3.934751
	624		3.922166
	626		3.909662
	628		3.897236
	630		3.88489
	632		3.872621
	634		3.860429
5cm blade	149.8		8.267276
7cm blade	626		3.909662
	138.3		8.940303



138.1

8.952968

2.92
2.92
5.84

