

# Supplementary Material for the manuscript “Measurement of Orthotropic Material Constants and Discussion on 3D Printing Parameters in Additive Manufacturing” Applsci-1801279

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**Table S1.** Natural resonance frequency of  $xy$  plane- $x$  direction test piece.

Mode	Theory	Impact Point A		Impact Point B		FEM	Err. (%) (Theory)	Err. (%) (Exp.)
		Exp.	Error (%)	Exp.	Error (%)			
1_B	29.1	29.1	0.0	29.1	0.0	29.6	1.7	1.7
2_B	182.4	182.8	0.2	182.4	0.0	185.0	1.4	1.2
3_B	510.7	513.9	0.6	512.9	0.4	518.1	1.4	0.8
4_B	1000.8	1009.6	0.9			1016.2	1.5	0.7
5_B	1654.3	1670.8	1.0	1671.0	1.0	1680.4	1.6	0.6
6_B	2471.3	2495.2	1.0	2525.5	2.2	2507.8	1.5	0.5
1_T	331.7			331.7	0.0	333.4	0.5	0.5
2_T	995.1			1014.1	1.9	1014.4	1.9	0.0
3_T	1658.5			1738.5	4.8	1736.6	4.7	-0.1

B: bending mode; T: torsion mode

Unit: Hz

**Table S1-1.** Natural resonance frequency of  $xy$  plane- $y$  direction test piece.

Mode	Theory	Impact Point A		Impact Point B		FEM	Err. (%) (Theory)	Err. (%) (Exp.)
		Exp.	Error (%)	Exp.	Error (%)			
1_B	26.8	26.8	0.0	27.1	1.1	27.3	2.0	2.0
2_B	168.0	168.2	0.1	170.1	1.3	170.9	1.8	1.6
3_B	470.4	473.1	0.6	478.5	1.7	478.6	1.7	1.2
4_B	921.7	928.7	0.8	940.7	2.1	938.6	1.8	1.1
5_B	1523.5	1537.4	0.9	1557.3	2.2	1552.2	1.9	1.0
6_B	2276.0	2299.9	1.1	2330.0	2.4	2317.1	1.8	0.7
1_T	328.9			328.9	0.0	327.7	-0.4	-0.4
2_T	986.7			1003.4	1.7	995.6	0.9	-0.8
3_T	1644.5			1719.6	4.6	1699.5	3.3	-1.2

B: bending mode; T: torsion mode

Unit: Hz

**Table S1-2.** Natural resonance frequency of  $xz$  plane- $x$  direction test piece.

Mode	Theory	Impact Point A		Impact Point B		FEM	Err. (%) (Theory)	Err. (%) (Exp.)
		Exp.	Error (%)	Exp.	Error (%)			
1_B	29.7	29.7	0.0	29.7	0.0	30.6	3.0	3.0
2_B	186.1	186.9	0.4	187.1	0.5	191.3	2.8	2.3
3_B	521.3	522.3	0.2	522.5	0.2	534.9	2.6	2.4
4_B	1021.5	1016.2	-0.5			1046.8	2.5	3.0
5_B	1688.4	1658.4	-1.8	1665.5	-1.4	1726.8	2.3	4.1
6_B	2522.3	2455.9	-2.6	2514.9	-0.3	2571.4	1.9	4.7
1_T	332.2			332.2	0.0	335.8	1.1	1.1
2_T	996.6			1021.1	2.5	1022.1	2.6	0.1
3_T	1661.0			1738.7	4.7	1750.5	5.4	0.7

B: bending mode; T: torsion mode

Unit: Hz

**Table S1-3.** Natural resonance frequency of  $xz$  plane- $z$  direction test piece.

Mode	Theory	Impact Point A		Impact Point B		FEM	Err. (%) (Theory)	Err. (%) (Exp.)
		Exp.	Error (%)	Exp.	Error (%)			
1_B	22.5	22.5	0.0	22.5	0.0	22.6	0.5	0.5
2_B	141.0	141.2	0.1	141.4	0.3	141.6	0.4	0.3
3_B	394.9	397.5	0.7	398.5	0.9	396.1	0.3	-0.4
4_B	773.8	780.3	0.8	782.8	1.2	775.7	0.2	-0.6
5_B	1279.1	1293.8	1.1	1298.1	1.5	1281.0	0.1	-1.0
6_B	1910.8	1938.1	1.4	1943.4	1.7	1910.4	0.0	-1.4
1_T	278.3			278.3	0.0	279.6	0.4	0.4
2_T	834.9			848.9	1.7	848.5	1.6	0.0
3_T	1391.5			1452.4	4.4	1446.3	3.9	-0.4

B: bending mode; T: torsion mode

Unit: Hz

**Table S1-4.** Natural resonance frequency of  $yz$  plane- $y$  direction test piece.

Mode	Theory	Impact Point A		Impact Point B		FEM	Err. (%) (Theory)	Err. (%) (Exp.)
		Exp.	Error (%)	Exp.	Error (%)			
1_B	55.9	55.9	0.0	55.9	0.0	56.7	1.5	1.5
2_B	350.3	348.3	-0.6	348.1	-0.6	353.4	0.9	1.5
3_B	981.1	966.4	-1.5	966.4	-1.5	983.7	0.3	1.8
4_B	1922.6	1878.4	-2.3			1912.2	-0.5	1.8
5_B	3177.8	3080.4	-3.1	3081.5	-3.0	3127.6	-1.6	1.5
6_B	4747.3	4540.4	-4.4	4553.5	-4.1	4608.7	-2.9	1.5
1_T	641.0			641.0	0.0	610.5	-4.8	-4.8
2_T	1923.0			1927.4	0.2	1852.8	-3.7	-3.9
3_T	3205.0			3298.7	2.9	3156.2	-1.5	-4.3

B: bending mode; T: torsion mode

Unit: Hz

**Table S1-5.** Natural resonance frequency of  $yz$  plane- $z$  direction test piece.

Mode	Theory	Impact Point A		Impact Point B		FEM	Err. (%) (Theory)	Err. (%) (Exp.)
		Exp.	Error (%)	Exp.	Error (%)			
1_B	54.7	54.7	0.0	54.9	0.4	55.0	0.5	0.5
2_B	342.8	345.7	0.8	344.9	0.6	342.7	0.0	-0.9
3_B	960.0	966.4	0.7	963.7	0.4	953.8	-0.6	-1.3
4_B	1881.3	1878.4	-0.2	1878.2	-0.2	1853.9	-1.5	-1.3
5_B	3109.6	3083.9	-0.8	3079.4	-1.0	3031.8	-2.5	-1.7
6_B	4645.4	4540.0	-2.3	4547.6	-2.1	4467.3	-3.8	-1.6
1_T	635.0			635.0	0.0	603.9	-4.9	-4.9
2_T	1905.0			1935.0	1.6	1831.9	-3.8	-5.3
3_T	3175.0			3291.1	3.7	3118.1	-1.8	-5.3

B: bending mode; T: torsion mode

Unit: Hz