

Table S2. Summary of the measured $|m|=3$, $|K|=1$ doublet transitions for toluene of the type used in Ref.[8] in their first determination of the six-fold barrier to internal rotation of the methyl group.

		m=3, $K_c=1$					m=-3, $K_a=1$				
		this work		Ref.[8]			this work		Ref.[8]		
		obs./MHz	o-c/kHz				obs./MHz	o-c/kHz			
A2 2 1 1	A1 1 0 1	7967.0542	-2.9		A1 2 1 2	A2 1 1 1	7977.7921	4.3			
A1 2 2 1	A2 1 1 1	9086.8284	3.7		A2 2 1 1	A1 1 1 0	9097.4572	0.3			
A1 3 2 1	A2 2 1 1	12013.2625	-2.7	12013.284	A2 3 1 3	A1 2 1 2	11954.9221	-3.7	11955.096		
A2 3 3 1	A1 2 2 1	13685.1489	2.3	13685.191	A1 3 1 2	A2 2 1 1	13632.9094	-1.1	13632.894		
A2 4 3 1	A1 3 2 1				A1 4 1 4	A2 3 1 3	15919.4783	-2.5			
A1 4 4 1	A2 3 3 1	18339.0350	1.6		A2 4 1 3	A1 3 1 2	18151.0691	2.4			
A1 5 4 1	A2 4 3 1	20404.0019	-0.9		A2 5 1 5	A1 4 1 4	19869.8834	-1.9			
A2 5 5 1	A1 4 4 1	23052.7093	1.4		A1 5 1 4	A2 4 1 3	22643.9567	0.5			
A2 6 5 1	A1 5 4 1	24852.0239	-0.3		A1 6 1 6	A2 5 1 5	23807.0282	-2.7			