



Figure S1: Cross experiment peak intensities in dependence of the evolution delay τ_M of the cross-correlated relaxation for the 14mer (above) and the 30mer RNA (below). Data has been obtained at 700MHz with 512 transients per t_1 -increment for the 14mer and 1024 transients for the 30mer.

Residue	$\Gamma_{H1'C1',N1/9}^{DD,CSA}$	
	600MHz	700MHz
G1	-	-
G2	-0.72	-0.75
C3	-0.15	-0.15
A4	-	-0.52
C5	-0.39	-0.29
U6	-	0.34
U7	0.84	1.20
C8	1.13	1.12
G9	1.66	2.41
G10	-0.92	-1.08
U11	-0.29	-
G12	-0.59	-0.58
C13	-0.25	-0.20
C14	0.60	0.72

Table S1: $\Gamma_{C1'H1',N1/9}^{DD,CSA}$ for the 14mer RNA at 600MHz and 700Mz field strength.

Residue	$\Gamma_{H1'C1',N1/9}^{DD,CSA}$ [Hz]	χ [°]		
		$\Gamma_{H1'C1',N1/9}^{DD,CSA}$	${}^3J(C,H)$	NMR-structure
G2	-1.17	211 ± 1	194 ± 4	193.6 ± 0.5
C3	-3.21	196 ± 1	194.5 ± 4.5	204.3 ± 0.9
C5	-3.57	194 ± 1	191.5 ± 4.5	201.1 ± 1.3
C7	1.59	209 ± 1	201 ± 9	206 ± 3
G9	-	-	209.5 ± 2.5	198.7 ± 1.6
G10	-	-	195 ± 0	196.7 ± 1.5
C14	2.05	210 ± 1	197 ± 4	201.6 ± 2.2
C16	-	-	202.5 ± 10.5	197.8 ± 4.9
G17	1.91	90 ± 1	97 ± 5	65.2 ± 1.1
G18	-	-	-	
C21	-2.43	198 ± 1	200 ± 8	199.8 ± 1.6
C22	-3.38	196 ± 1	194 ± 4	197.5 ± 1.6
G26	-	-	222.5 ± 14.5	196.8 ± 0.9
G28	-0.75	212 ± 1	200 ± 3	193.2 ± 0.7
C30	1.49	209 ± 1	208 ± 4	211.1 ± 1.5
RMSD [°]		9.3	8.7	

Table S2: $\Gamma_{H1'C1',N1/9}^{DD,CSA}$ for the 30mer RNA at 900MHz and resulting χ angles compared to the χ angles from the NMR-structure and from the interpretation of ${}^3J(C,H)$ -coupling constants. Angle deviations for the Γ -rates were calculated using the averaged RMSD of 0.1Hz as determined for the 14mer; deviations for ${}^3J(C,H)$ -derived χ angles were calculated from the deviations of angles resulting from the analysis of ${}^3J(C2/4,H1')$ and ${}^3J(C6/8,H1')$.