

$\alpha_X$ force constants associated with each type of restraint in the ubiquitin refinement								
Ensemble label	E <sub>1</sub>	VN <sub>1</sub>	VNJ <sub>1</sub>	VN <sub>2</sub>	VNJ <sub>2</sub>	EN <sub>2</sub>	ENJ <sub>2</sub>	ENJS <sub>2</sub>
Number of replicas	1	1	1	2	2	2	2	2
Solvation	E	V	V	V	V	E	E	E
Restraints applied		NOE	NOE, $^{h3}J_{NC'}$	NOE	NOE, $^{h3}J_{NC'}$	NOE	NOE, $^{h3}J_{NC'}$	NOE, $^{h3}J_{NC'}, S^2$
$\alpha_{NOE}$ (kcal/mol Å <sup>4</sup> )	-	1.6·10 <sup>9</sup>	2.0·10 <sup>9</sup>	3.1·10 <sup>9</sup>	1.6·10 <sup>9</sup>	5.6·10 <sup>9</sup>	3.8·10 <sup>9</sup>	3.2·10 <sup>9</sup>
$\alpha_{h3J_{NC'}}$ (kcal/mol Hz <sup>4</sup> )	-	-	4.8·10 <sup>5</sup>	-	6.8·10 <sup>5</sup>	-	6.8·10 <sup>5</sup>	7.0·10 <sup>5</sup>
$\alpha_{S^2}$ (kcal/mol)	-	-	-	-	-	-	-	1.4·10 <sup>7</sup>

Table 6: Supplementary Table

$\alpha_X$ force constants associated with each type of restraint in the protein G refinement				
Ensemble label	VN <sub>2</sub>	VNJ <sub>2</sub>	EN <sub>2</sub>	ENJ <sub>2</sub>
Number of replicas	2	2	2	2
Solvation	V	V	E	E
Restraints applied	NOE	NOE, <sup>h3</sup> J <sub>NC'</sub>	NOE	NOE, <sup>h3</sup> J <sub>NC'</sub>
$\alpha_{NOE}$ (kcal/mol Å <sup>4</sup> )	2.5·10 <sup>9</sup>	1.3·10 <sup>9</sup>	1.6·10 <sup>9</sup>	1.3·10 <sup>9</sup>
$\alpha_{h^3 J_{NC'}}$ (kcal/mol Hz <sup>4</sup> )	-	8.0·10 <sup>5</sup>	-	1.0·10 <sup>6</sup>

Table 7: Supplementary Table