



wwPDB EM Validation Summary Report ⓘ

May 20, 2024 – 06:33 PM JST

PDB ID : 8X1C
EMDB ID : EMD-37990
Title : Structure of nucleosome-bound SRCAP-C in the ADP-bound state
Authors : Yu, J.; Wang, Q.; Yu, Z.; Li, W.; Wang, L.; Xu, Y.
Deposited on : 2023-11-06
Resolution : 3.20 Å(reported)

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with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

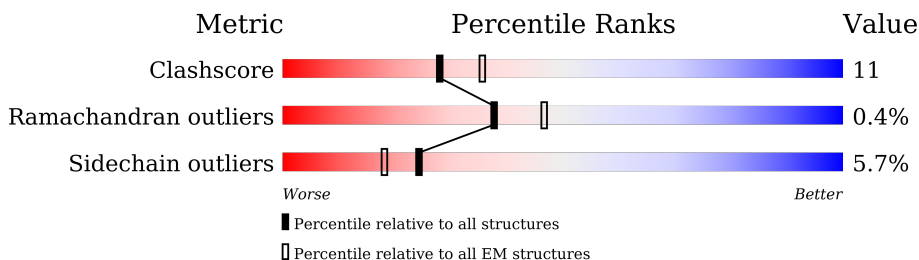
EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	130	
1	E	130	
2	B	126	
2	F	126	
3	C	136	
3	G	136	
4	D	103	
4	H	103	
5	I	3230	

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Mol	Chain	Length	Quality of chain
6	J	364	
7	K	396	
8	L	154	
9	M	456	
9	O	456	
9	Q	456	
10	N	463	
10	P	463	
10	R	463	
11	S	375	
11	U	375	
12	T	429	
13	V	467	
14	W	227	
15	X	147	
16	Y	147	

2 Entry composition [i](#)

There are 18 unique types of molecules in this entry. The entry contains 56519 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Histone H2A type 1-C.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
1	A	116	Total	C	N	O	0	0
			898	564	179	155		
1	E	105	Total	C	N	O	0	0
			808	510	158	140		

- Molecule 2 is a protein called Histone H2B type 1-C/E/F/G/I.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	96	Total	C	N	O	S	0	0
			755	473	138	142	2		
2	F	94	Total	C	N	O	S	0	0
			736	461	134	139	2		

- Molecule 3 is a protein called Histone H3.1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	95	Total	C	N	O	S	0	0
			779	491	148	136	4		
3	G	97	Total	C	N	O	S	0	0
			801	505	155	137	4		

- Molecule 4 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	81	Total	C	N	O	S	0	0
			646	407	126	112	1		
4	H	80	Total	C	N	O	S	0	0
			638	401	125	111	1		

- Molecule 5 is a protein called Helicase SRCAP.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	I	852	7031	4476	1299	1217	39	0	0

- Molecule 6 is a protein called Vacuolar protein sorting-associated protein 72 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	J	135	1114	708	203	199	4	0	0

- Molecule 7 is a protein called Actin-related protein 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	K	394	3209	2054	526	611	18	0	0

- Molecule 8 is a protein called Zinc finger HIT domain-containing protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	L	105	823	506	157	152	8	0	0

- Molecule 9 is a protein called RuvB-like 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	M	428	3293	2075	567	635	16	0	0
9	O	435	3339	2105	571	646	17	0	0
9	Q	440	3368	2121	579	651	17	0	0

- Molecule 10 is a protein called RuvB-like 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	N	415	3223	2016	565	627	15	0	0
10	P	427	3287	2054	576	642	15	0	0
10	R	424	3293	2057	578	642	16	0	0

- Molecule 11 is a protein called Actin, cytoplasmic 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	S	375	Total	C	N	O	S	0	0
			2925	1850	491	561	23		
11	U	359	Total	C	N	O	S	0	0
			2802	1775	468	540	19		

- Molecule 12 is a protein called Actin-like protein 6A.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	T	403	Total	C	N	O	S	0	0
			3146	1988	535	599	24		

- Molecule 13 is a protein called DNA methyltransferase 1-associated protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	V	204	Total	C	N	O	S	0	0
			1757	1117	327	309	4		

- Molecule 14 is a protein called YEATS domain-containing protein 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	W	187	Total	C	N	O	S	0	0
			1542	998	255	284	5		

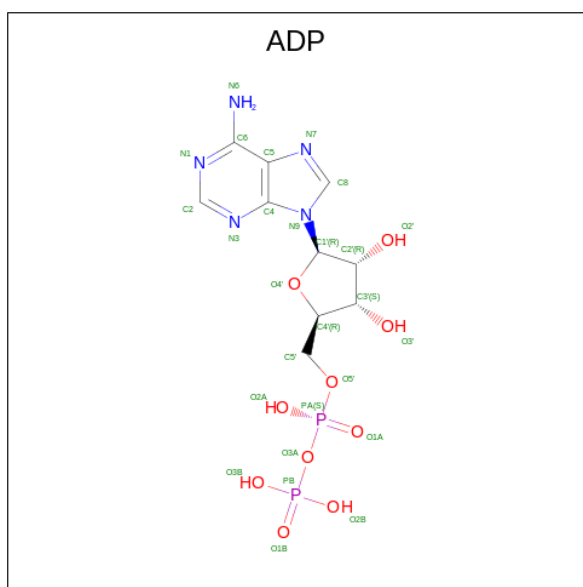
- Molecule 15 is a DNA chain called DNA (147-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
15	X	147	Total	C	N	O	P	0	0
			3034	1435	572	880	147		

- Molecule 16 is a DNA chain called DNA (147-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
16	Y	147	Total	C	N	O	P	0	0
			2990	1422	540	882	146		

- Molecule 17 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂) (labeled as "Ligand of Interest" by depositor).



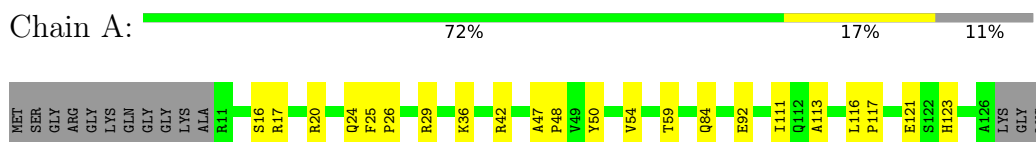
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
17	I	1	Total	C	N	O	P	0
			27	10	5	10	2	
17	M	1	Total	C	N	O	P	0
			27	10	5	10	2	
17	N	1	Total	C	N	O	P	0
			27	10	5	10	2	
17	O	1	Total	C	N	O	P	0
			27	10	5	10	2	
17	P	1	Total	C	N	O	P	0
			27	10	5	10	2	
17	Q	1	Total	C	N	O	P	0
			27	10	5	10	2	
17	R	1	Total	C	N	O	P	0
			27	10	5	10	2	

- Molecule 18 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).

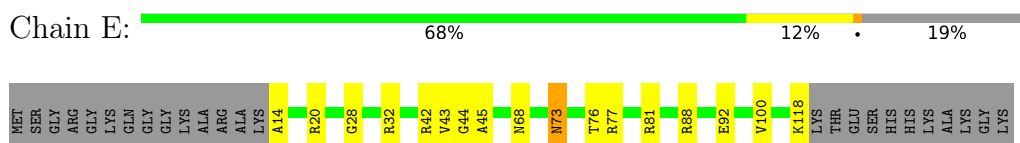
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

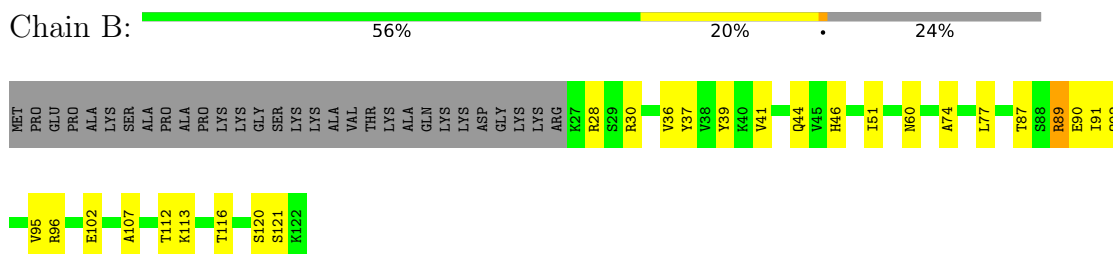
- Molecule 1: Histone H2A type 1-C



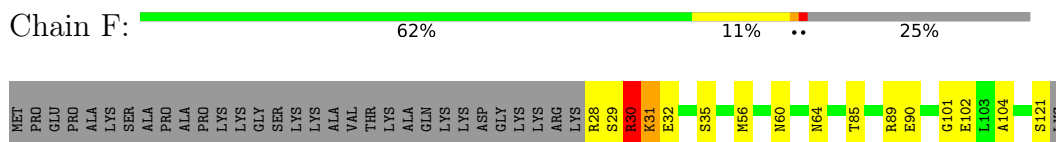
- Molecule 1: Histone H2A type 1-C



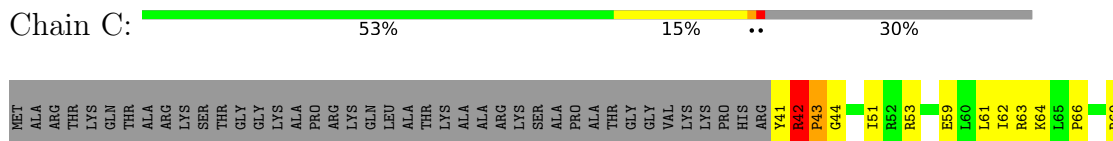
- Molecule 2: Histone H2B type 1-C/E/F/G/I



- Molecule 2: Histone H2B type 1-C/E/F/G/I

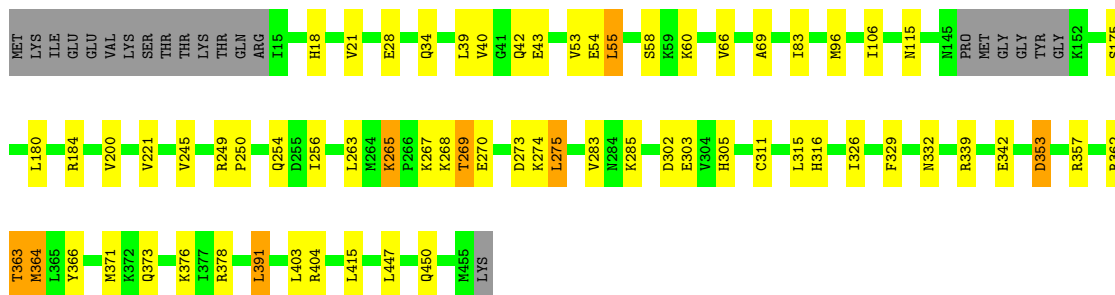
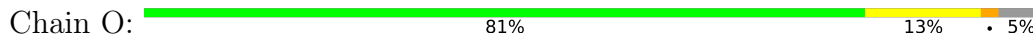


- Molecule 3: Histone H3.1

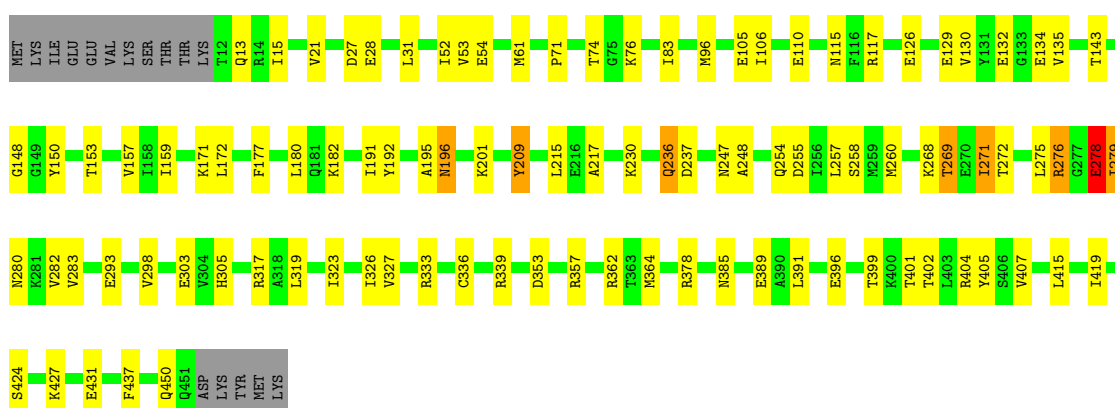




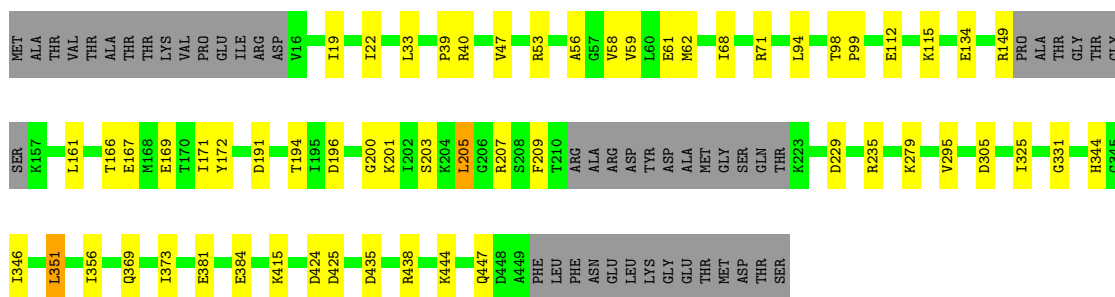
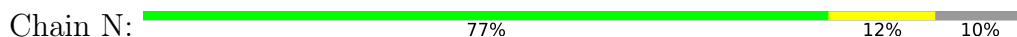
• Molecule 9: RuvB-like 1



• Molecule 9: RuvB-like 1

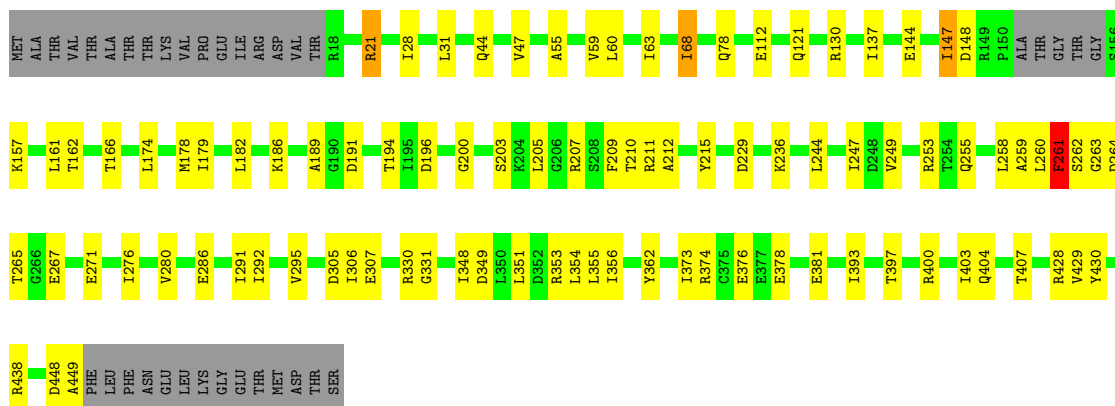


• Molecule 10: RuvB-like 2



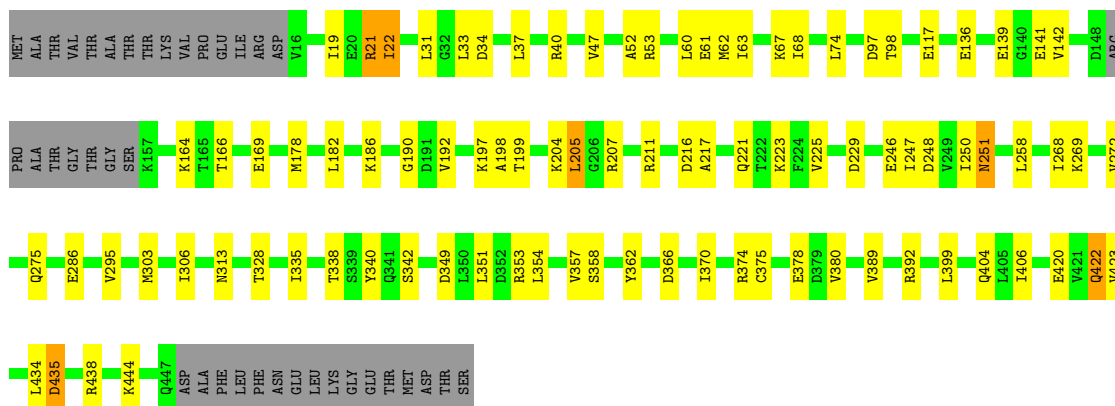
• Molecule 10: RuvB-like 2

Chain P:  72% 19% 8%



• Molecule 10: RuvB-like 2

Chain R:  72% 18% 8%



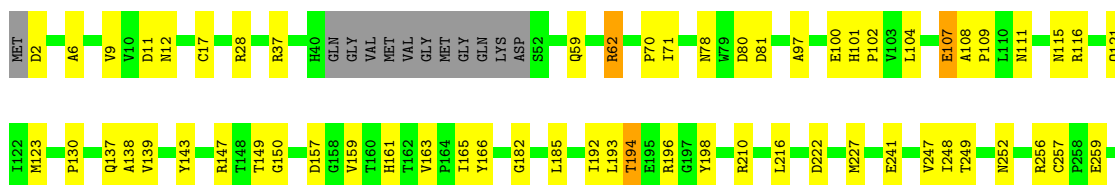
• Molecule 11: Actin, cytoplasmic 1

Chain S:  97%



• Molecule 11: Actin, cytoplasmic 1

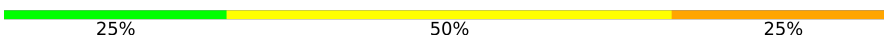
Chain U:  72% 22%



C71
A72
G73
C74
G77
T78
A79
C80
G81
T82
G83
C84
G85
T86
A87
G88
A89
A90
C91
G92
T93
A94
G95
C96
T97
A98
A99
G100
C101
A102
G103
T104
A105
G106
C107
T108
A109
C110
G111
A112
C113
G114
A115
C116
T117
A118
G119
C120
A121
G122
C123
G124
C125
A126
G127
C128
G129
A130
C131

A132
C133
G134
A135
G136
A137
C138
T139
A140
G141
C142
A143
G144
C145
A146

● Molecule 16: DNA (147-MER)

Chain Y:  25% 50% 25%

C-146
T-145
G-144
G-143
A-142
G-141
A-140
A-139
T-138
C-137
C-136
C-135
T-132
G-131
C-130
C-129
G-128
C-128
A-127
G-126
G-125
G-122
C-121
T-120
C-119
A-118
A-117
T-116
T-115
G-114
G-113
C-111
G-110
T-109
A-108
G-107
A-106
C-105
A-104
G-103
C-102
T-101
C-100
T-99
A-98
G-97
C-96
A-95
C-94
C-93
G-92
T-89
A-88
A-87
A-86
C-85
G-84

C-83
A-82
C-81
G-80
T-79
A-78
C-77
G-76
C-75
G-74
C-73
C-72
T-72
G-71
T-70
C-69
C-68
C-67
C-66
C-65
G-64
C-63
G-62
T-61
T-60
T-59
T-58
A-57
C-54
G-53
C-52
C-51
A-50
A-49
G-48
G-47
G-46
G-45
A-44
T-43
T-42
A-41
C-40
T-39
C-38
C-37
A-34
G-33
T-32
C-31
T-30
C-29
C-22
G-21
T-18
C-17
A-16

C-15
A-14
T-11
A-10
T-9
A-8
C-7
A-6
T-5
T-2
G-1
T0

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	555303	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ADP, ATP

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.23	0/910	0.39	0/1225
1	E	0.24	0/818	0.38	0/1104
2	B	0.29	0/766	0.41	0/1026
2	F	0.24	0/747	0.37	0/1004
3	C	0.24	0/789	0.39	0/1057
3	G	0.23	0/813	0.39	0/1090
4	D	0.24	0/653	0.41	0/873
4	H	0.24	0/645	0.42	0/862
5	I	0.25	0/7202	0.41	0/9725
6	J	0.29	0/1140	0.42	0/1539
7	K	0.24	0/3283	0.42	0/4445
8	L	0.24	0/841	0.41	0/1141
9	M	0.24	0/3335	0.43	0/4495
9	O	0.24	0/3382	0.41	0/4559
9	Q	0.24	0/3413	0.42	0/4603
10	N	0.24	0/3257	0.41	0/4381
10	P	0.24	0/3324	0.43	0/4477
10	R	0.24	0/3329	0.42	0/4479
11	S	0.24	0/2988	0.39	0/4045
11	U	0.25	0/2863	0.43	0/3882
12	T	0.24	0/3217	0.40	0/4362
13	V	0.24	0/1801	0.39	0/2419
14	W	0.26	0/1578	0.44	0/2128
15	X	0.96	8/3408 (0.2%)	1.38	62/5263 (1.2%)
16	Y	0.81	6/3349 (0.2%)	1.35	42/5162 (0.8%)
All	All	0.38	14/57851 (0.0%)	0.63	104/79346 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
5	I	0	2
6	J	0	2
9	M	0	1
9	Q	0	1
11	U	0	1
All	All	0	7

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	X	21	DC	C3'-C2'	27.13	1.84	1.52
15	X	60	DA	O3'-P	-14.98	1.43	1.61
15	X	130	DG	C1'-N9	-8.87	1.34	1.47
16	Y	-45	DG	C1'-N9	-7.60	1.36	1.47
16	Y	-71	DG	C1'-N9	-7.59	1.36	1.47

The worst 5 of 104 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	Y	-78	DA	O5'-P-OP2	-19.21	87.64	110.70
16	Y	-78	DA	O5'-P-OP1	18.91	133.39	110.70
15	X	21	DC	C3'-C2'-C1'	-11.27	88.98	102.50
15	X	141	DC	P-O3'-C3'	-10.40	107.22	119.70
16	Y	-110	DG	P-O3'-C3'	-10.24	107.41	119.70

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
5	I	2029	ARG	Sidechain
5	I	860	ARG	Sidechain
6	J	260	ARG	Sidechain
6	J	263	ARG	Sidechain
9	M	263	LEU	Peptide

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	898	0	958	35	0
1	E	808	0	863	22	0
2	B	755	0	782	39	0
2	F	736	0	755	15	0
3	C	779	0	816	63	0
3	G	801	0	839	20	0
4	D	646	0	686	31	0
4	H	638	0	676	3	0
5	I	7031	0	7121	218	0
6	J	1114	0	1136	27	0
7	K	3209	0	3132	66	0
8	L	823	0	793	11	0
9	M	3293	0	3397	65	0
9	O	3339	0	3425	41	0
9	Q	3368	0	3453	82	0
10	N	3223	0	3309	41	0
10	P	3287	0	3335	61	0
10	R	3293	0	3373	58	0
11	S	2925	0	2891	17	0
11	U	2802	0	2760	51	0
12	T	3146	0	3086	35	0
13	V	1757	0	1736	43	0
14	W	1542	0	1553	53	0
15	X	3034	0	1648	227	0
16	Y	2990	0	1651	207	0
17	I	27	0	12	0	0
17	M	27	0	12	1	0
17	N	27	0	12	0	0
17	O	27	0	12	2	0
17	P	27	0	12	2	0
17	Q	27	0	12	0	0
17	R	27	0	12	2	0
18	K	31	0	12	1	0
18	T	31	0	12	0	0
18	U	31	0	12	1	0
All	All	56519	0	54294	1168	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 11.

The worst 5 of 1168 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:I:898:ARG:CZ	5:I:2140:TRP:CH2	1.82	1.59
3:C:43:PRO:HG2	16:Y:-78:DA:C4'	1.33	1.54
15:X:21:DC:N4	16:Y:-21:DG:N1	1.63	1.47
15:X:21:DC:C2'	15:X:21:DC:C3'	1.84	1.43
3:C:42:ARG:HH22	15:X:81:DG:C1'	1.33	1.39

There are no symmetry-related clashes.

5.3 Torsion angles [\(i\)](#)

5.3.1 Protein backbone [\(i\)](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	114/130 (88%)	110 (96%)	4 (4%)	0	100	100
1	E	103/130 (79%)	102 (99%)	1 (1%)	0	100	100
2	B	94/126 (75%)	93 (99%)	1 (1%)	0	100	100
2	F	92/126 (73%)	86 (94%)	4 (4%)	2 (2%)	6	35
3	C	93/136 (68%)	88 (95%)	2 (2%)	3 (3%)	4	26
3	G	95/136 (70%)	93 (98%)	2 (2%)	0	100	100
4	D	79/103 (77%)	78 (99%)	1 (1%)	0	100	100
4	H	78/103 (76%)	75 (96%)	3 (4%)	0	100	100
5	I	844/3230 (26%)	808 (96%)	32 (4%)	4 (0%)	29	67
6	J	129/364 (35%)	120 (93%)	8 (6%)	1 (1%)	19	58
7	K	392/396 (99%)	353 (90%)	36 (9%)	3 (1%)	19	58
8	L	101/154 (66%)	95 (94%)	5 (5%)	1 (1%)	15	54
9	M	424/456 (93%)	406 (96%)	17 (4%)	1 (0%)	47	79
9	O	431/456 (94%)	417 (97%)	14 (3%)	0	100	100
9	Q	438/456 (96%)	409 (93%)	26 (6%)	3 (1%)	22	61
10	N	409/463 (88%)	394 (96%)	15 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
10	P	423/463 (91%)	401 (95%)	20 (5%)	2 (0%)	29	67
10	R	420/463 (91%)	406 (97%)	14 (3%)	0	100	100
11	S	373/375 (100%)	370 (99%)	3 (1%)	0	100	100
11	U	355/375 (95%)	311 (88%)	44 (12%)	0	100	100
12	T	399/429 (93%)	387 (97%)	11 (3%)	1 (0%)	41	74
13	V	200/467 (43%)	190 (95%)	10 (5%)	0	100	100
14	W	185/227 (82%)	177 (96%)	6 (3%)	2 (1%)	14	51
All	All	6271/9764 (64%)	5969 (95%)	279 (4%)	23 (0%)	38	69

5 of 23 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
10	P	261	PHE
9	Q	278	GLU
9	Q	279	ILE
7	K	201	VAL
9	M	263	LEU

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	91/99 (92%)	87 (96%)	4 (4%)	28	64
1	E	82/99 (83%)	77 (94%)	5 (6%)	18	54
2	B	83/106 (78%)	76 (92%)	7 (8%)	11	39
2	F	81/106 (76%)	78 (96%)	3 (4%)	34	68
3	C	82/111 (74%)	74 (90%)	8 (10%)	8	31
3	G	85/111 (77%)	84 (99%)	1 (1%)	71	88
4	D	66/79 (84%)	66 (100%)	0	100	100
4	H	65/79 (82%)	65 (100%)	0	100	100
5	I	765/2721 (28%)	691 (90%)	74 (10%)	8	31

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
6	J	123/312 (39%)	105 (85%)	18 (15%)	3	15
7	K	359/361 (99%)	336 (94%)	23 (6%)	17	52
8	L	89/133 (67%)	83 (93%)	6 (7%)	16	50
9	M	361/387 (93%)	342 (95%)	19 (5%)	22	58
9	O	364/387 (94%)	342 (94%)	22 (6%)	19	54
9	Q	366/387 (95%)	349 (95%)	17 (5%)	27	63
10	N	351/390 (90%)	343 (98%)	8 (2%)	50	78
10	P	352/390 (90%)	334 (95%)	18 (5%)	24	60
10	R	358/390 (92%)	339 (95%)	19 (5%)	22	58
11	S	318/318 (100%)	318 (100%)	0	100	100
11	U	305/318 (96%)	281 (92%)	24 (8%)	12	43
12	T	346/364 (95%)	336 (97%)	10 (3%)	42	74
13	V	183/400 (46%)	162 (88%)	21 (12%)	5	24
14	W	168/203 (83%)	163 (97%)	5 (3%)	41	73
All	All	5443/8251 (66%)	5131 (94%)	312 (6%)	24	56

5 of 312 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
9	Q	427	LYS
13	V	51	GLU
10	R	207	ARG
12	T	383	ASN
13	V	245	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 46 such sidechains are listed below:

Mol	Chain	Res	Type
9	O	408	GLN
12	T	143	HIS
9	O	451	GLN
10	P	121	GLN
12	T	383	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

10 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
18	ATP	T	501	-	26,33,33	0.93	1 (3%)	31,52,52	1.62	6 (19%)
17	ADP	I	3301	-	24,29,29	0.96	1 (4%)	29,45,45	1.45	4 (13%)
17	ADP	N	501	-	24,29,29	0.95	1 (4%)	29,45,45	1.55	4 (13%)
17	ADP	R	501	-	24,29,29	0.95	1 (4%)	29,45,45	1.49	4 (13%)
17	ADP	M	501	-	24,29,29	0.95	1 (4%)	29,45,45	1.53	5 (17%)
17	ADP	O	501	-	24,29,29	0.94	1 (4%)	29,45,45	1.54	5 (17%)
17	ADP	P	501	-	24,29,29	0.95	1 (4%)	29,45,45	1.56	5 (17%)
18	ATP	U	401	-	26,33,33	0.93	1 (3%)	31,52,52	1.61	6 (19%)
18	ATP	K	401	-	26,33,33	0.92	1 (3%)	31,52,52	1.59	6 (19%)
17	ADP	Q	501	-	24,29,29	0.96	1 (4%)	29,45,45	1.46	5 (17%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
18	ATP	T	501	-	-	3/18/38/38	0/3/3/3
17	ADP	I	3301	-	-	6/12/32/32	0/3/3/3
17	ADP	N	501	-	-	4/12/32/32	0/3/3/3
17	ADP	R	501	-	-	1/12/32/32	0/3/3/3
17	ADP	M	501	-	-	3/12/32/32	0/3/3/3
17	ADP	O	501	-	-	5/12/32/32	0/3/3/3
17	ADP	P	501	-	-	4/12/32/32	0/3/3/3
18	ATP	U	401	-	-	4/18/38/38	0/3/3/3
18	ATP	K	401	-	-	4/18/38/38	0/3/3/3
17	ADP	Q	501	-	-	5/12/32/32	0/3/3/3

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	R	501	ADP	C5-C4	2.47	1.47	1.40
17	I	3301	ADP	C5-C4	2.45	1.47	1.40
17	Q	501	ADP	C5-C4	2.45	1.47	1.40
18	T	501	ATP	C5-C4	2.44	1.47	1.40
18	U	401	ATP	C5-C4	2.44	1.47	1.40

The worst 5 of 50 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
17	P	501	ADP	PA-O3A-PB	-3.85	119.60	132.83
18	U	401	ATP	PB-O3B-PG	-3.73	120.03	132.83
17	N	501	ADP	PA-O3A-PB	-3.70	120.13	132.83
17	P	501	ADP	N3-C2-N1	-3.70	122.90	128.68
17	O	501	ADP	PA-O3A-PB	-3.69	120.15	132.83

There are no chirality outliers.

5 of 39 torsion outliers are listed below:

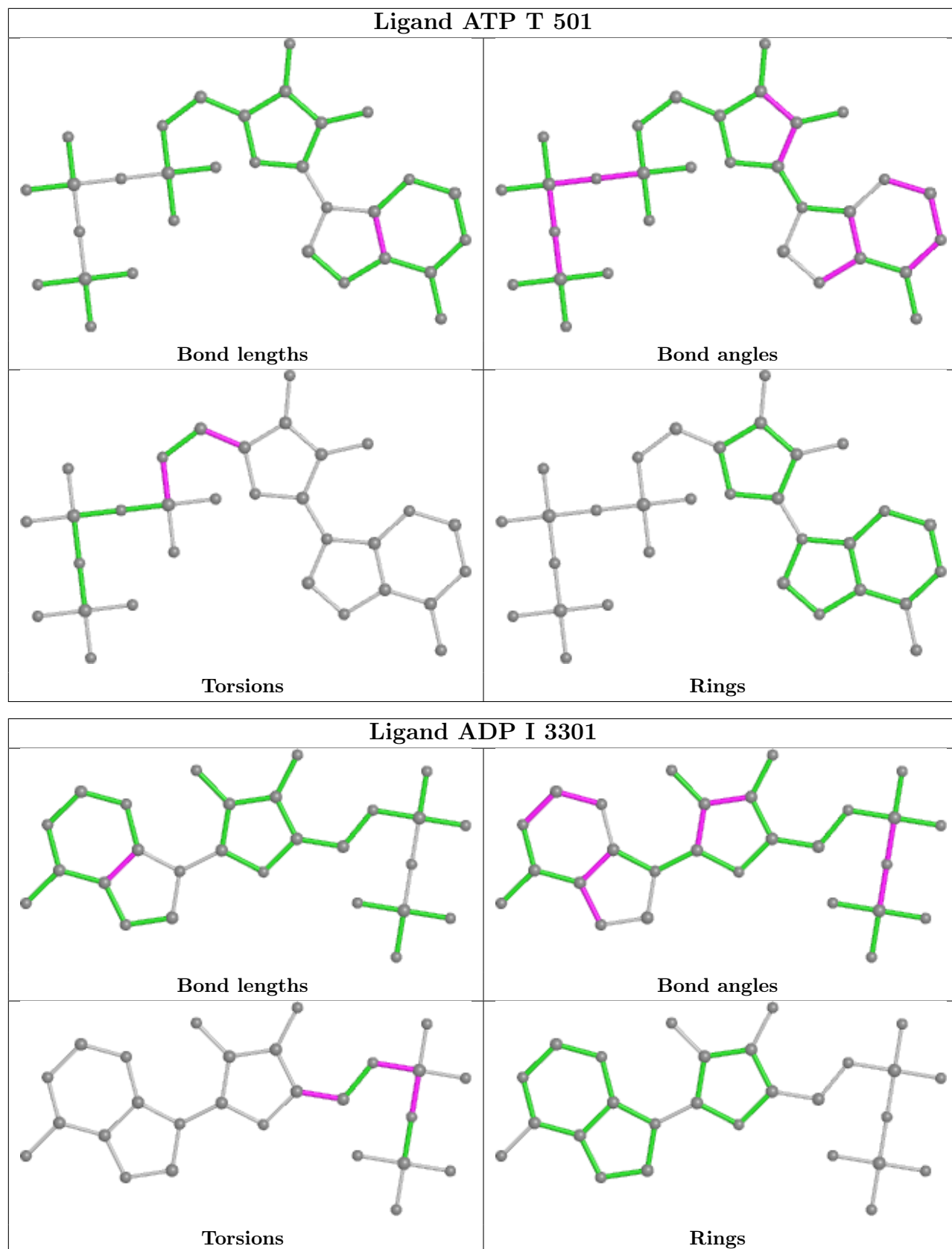
Mol	Chain	Res	Type	Atoms
17	I	3301	ADP	C5'-O5'-PA-O3A
17	M	501	ADP	PA-O3A-PB-O2B
17	M	501	ADP	PA-O3A-PB-O3B
17	N	501	ADP	C5'-O5'-PA-O1A
17	N	501	ADP	C5'-O5'-PA-O2A

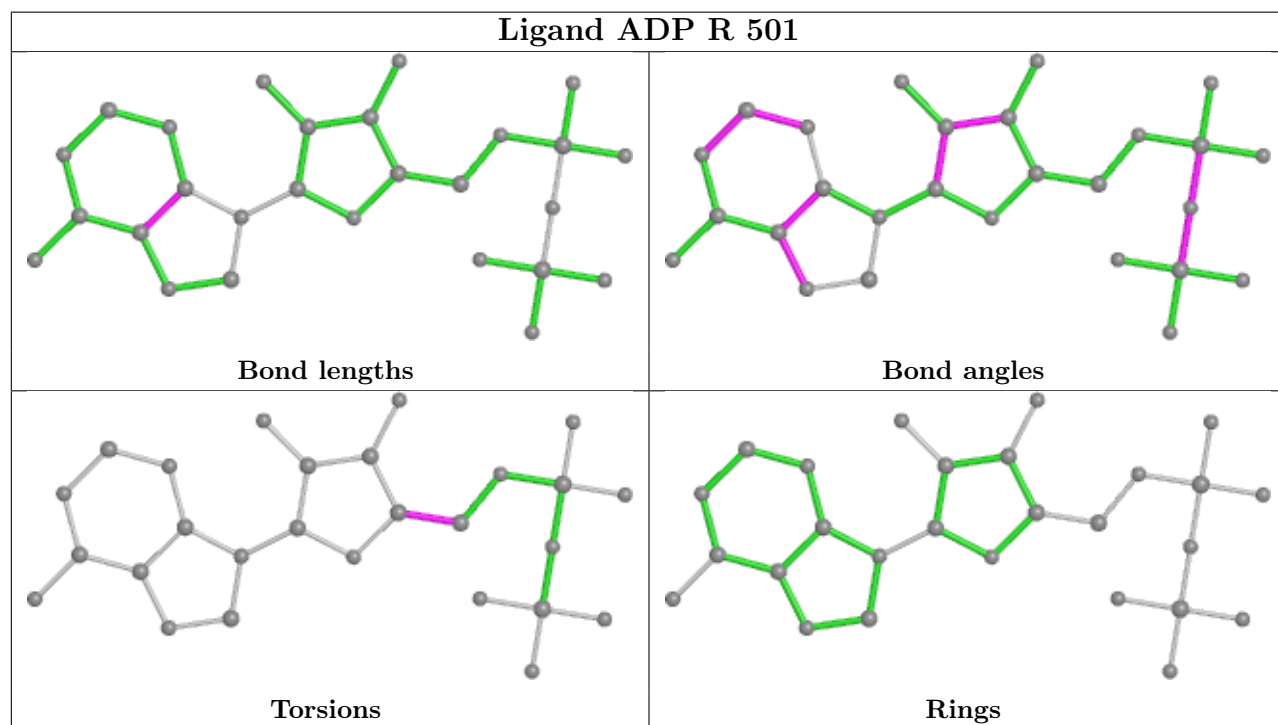
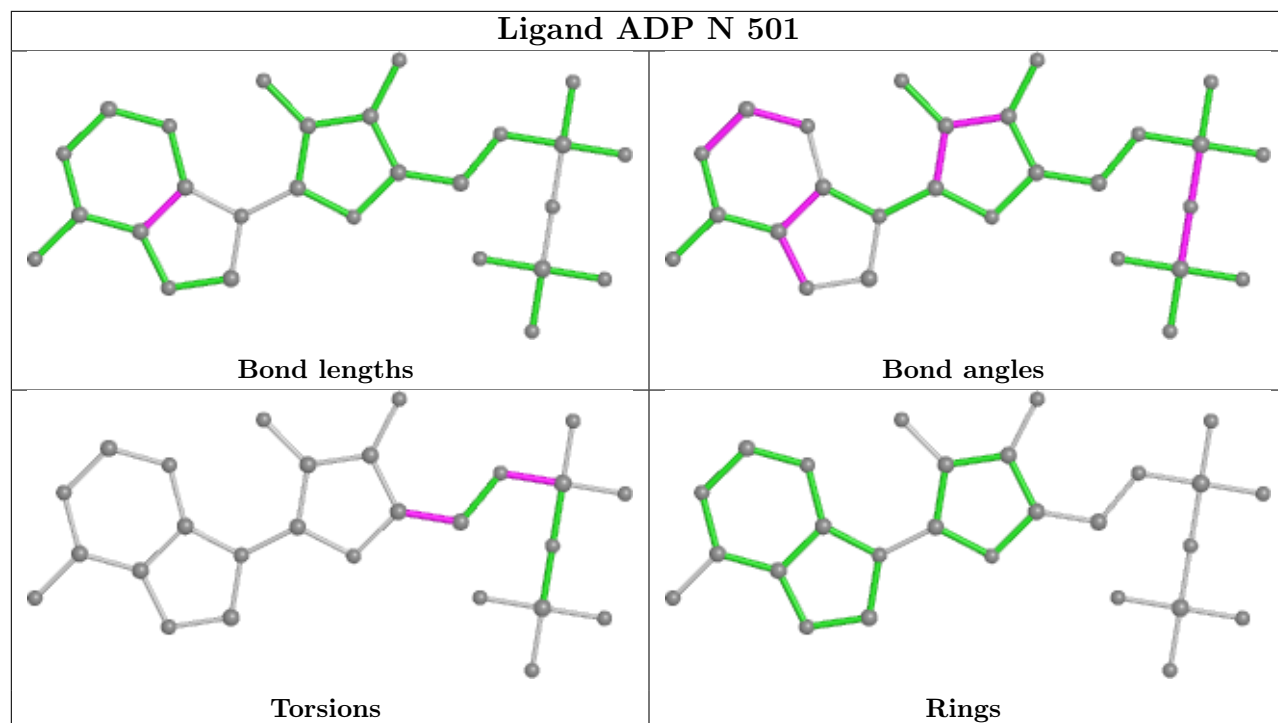
There are no ring outliers.

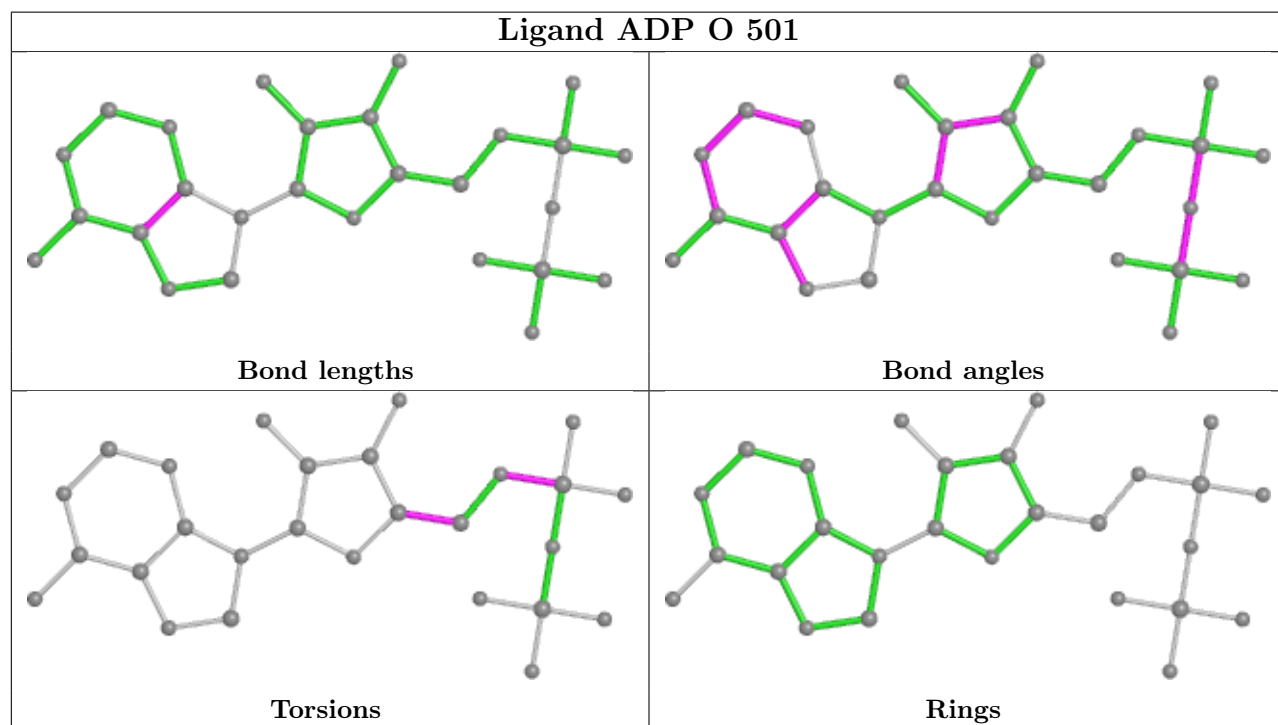
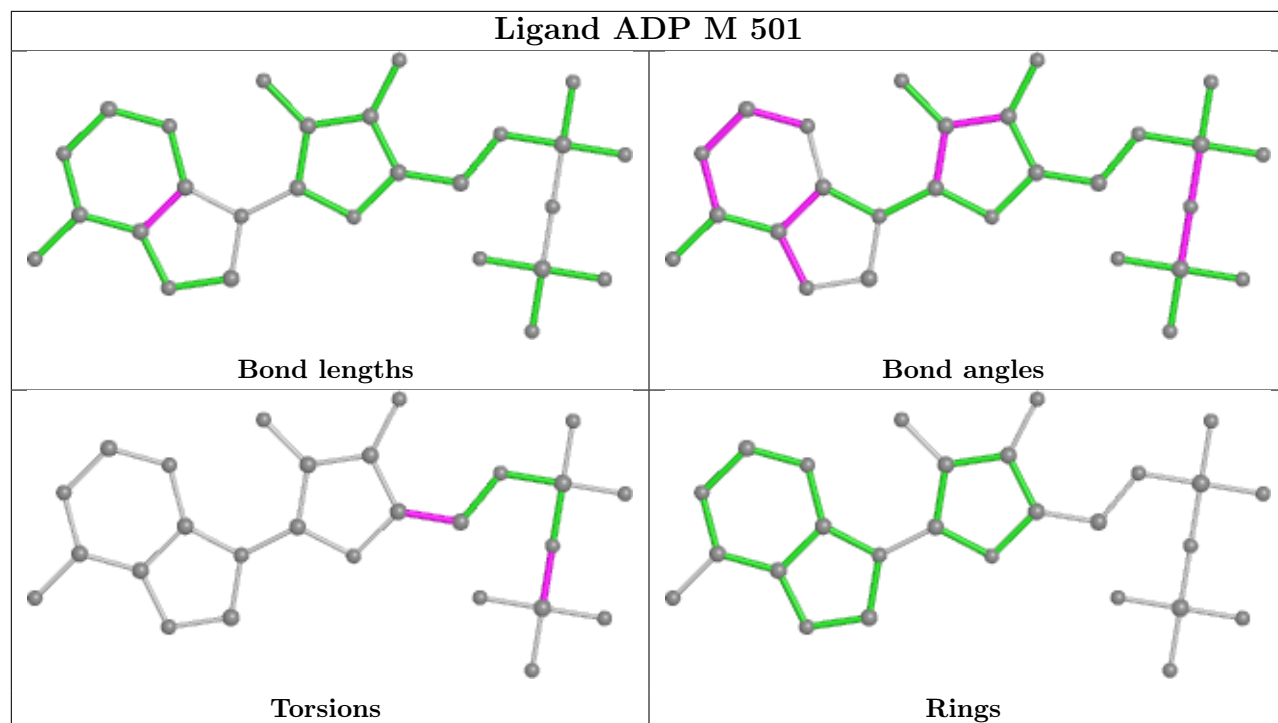
6 monomers are involved in 9 short contacts:

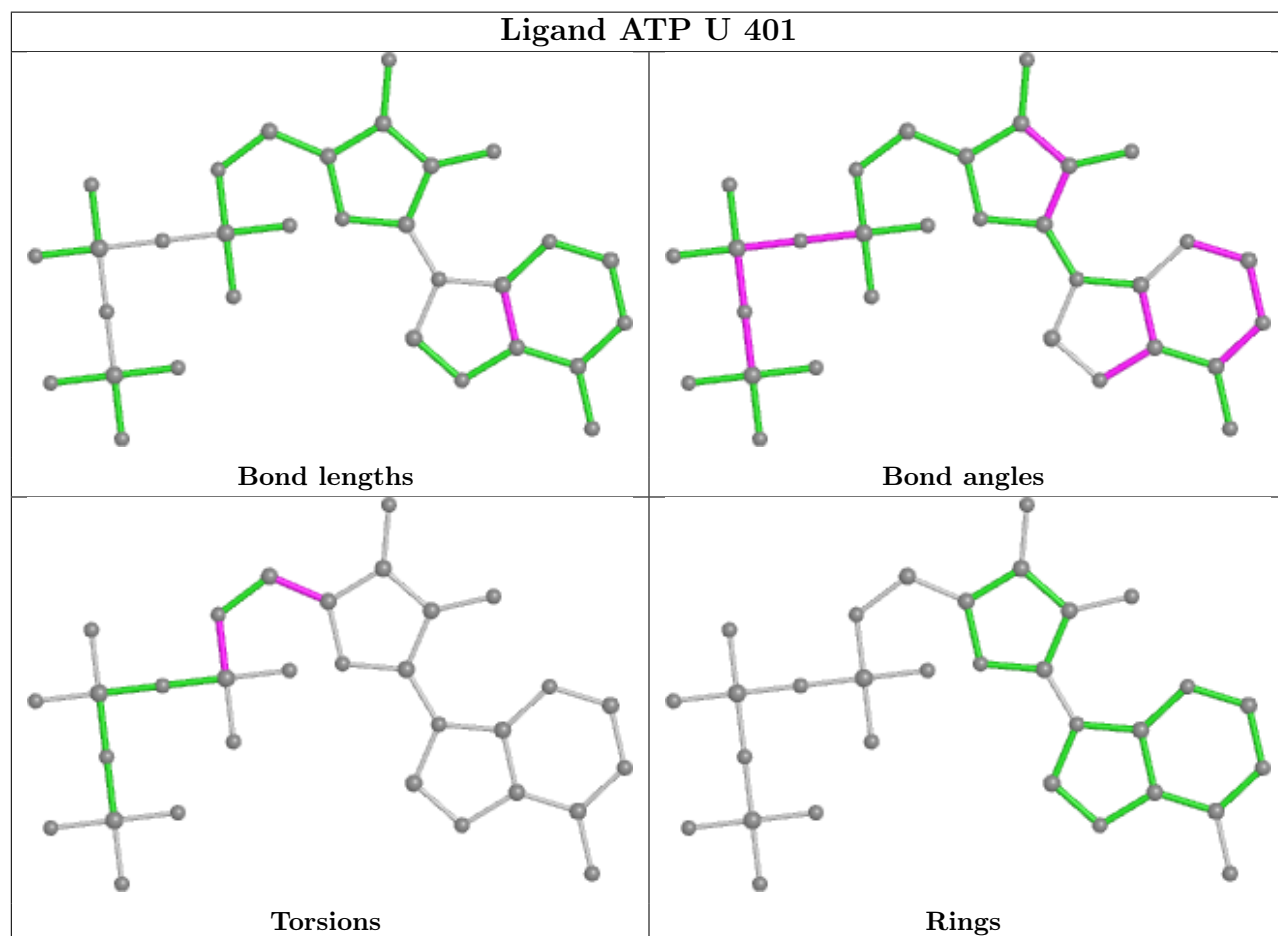
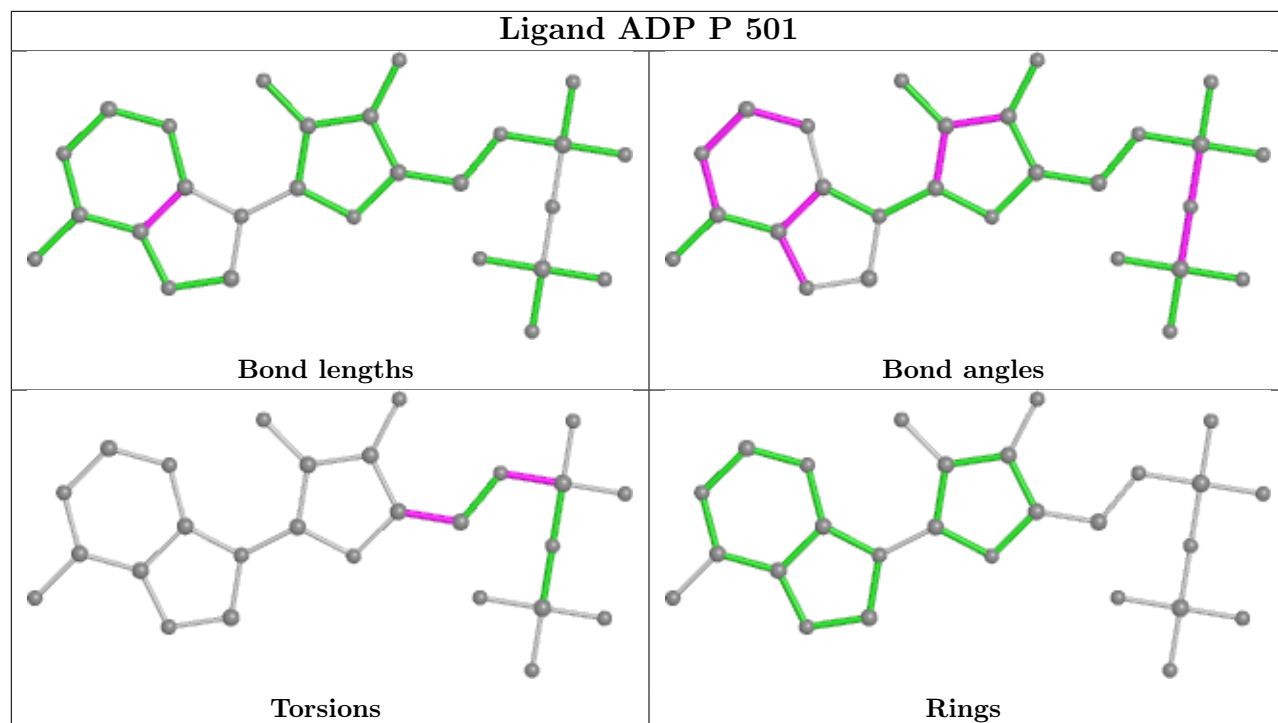
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	R	501	ADP	2	0
17	M	501	ADP	1	0
17	O	501	ADP	2	0
17	P	501	ADP	2	0
18	U	401	ATP	1	0
18	K	401	ATP	1	0

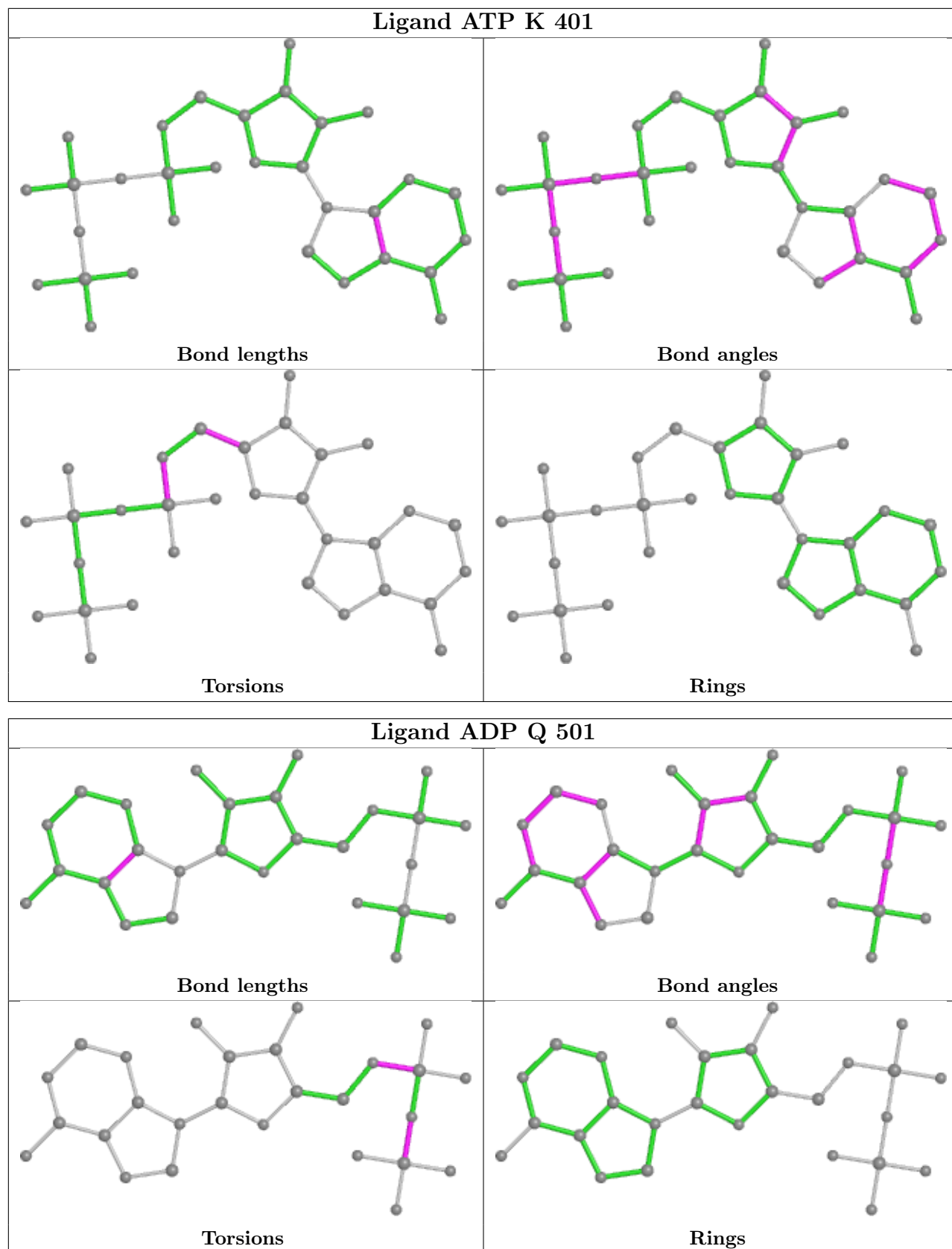
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.