



## wwPDB EM Validation Summary Report ⓘ

May 20, 2024 – 06:36 PM JST

PDB ID : 8X15  
EMDB ID : EMD-37984  
Title : Structure of nucleosome-bound SRCAP-C in the apo state  
Authors : Yu, J.; Wang, Q.; Yu, Z.; Li, W.; Wang, L.; Xu, Y.  
Deposited on : 2023-11-06  
Resolution : 3.20 Å (reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

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>.

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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

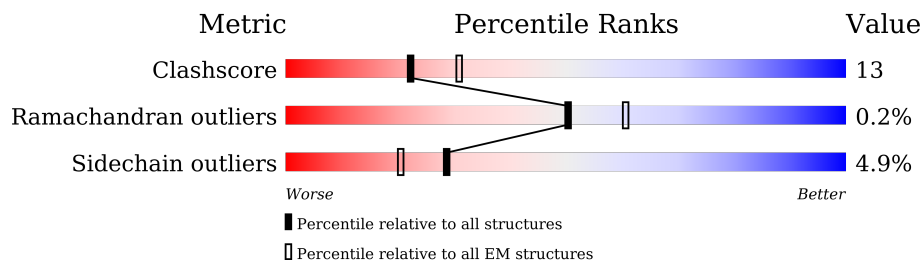
# 1 Overall quality at a glance i

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  $\geq 3$ , 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	62% (Green), 20% (Yellow), 17% (Grey), 1% (Red), 1% (Orange)
1	E	130	66% (Green), 12% (Yellow), 19% (Grey), 1% (Red), 2% (Orange)
2	B	126	56% (Green), 21% (Yellow), 24% (Grey), 1% (Red), 1% (Orange)
2	F	126	66% (Green), 6% (Yellow), 25% (Grey), 1% (Red), 2% (Orange)
3	C	136	51% (Green), 18% (Yellow), 30% (Grey), 1% (Red), 1% (Orange)
3	G	136	59% (Green), 12% (Yellow), 29% (Grey), 1% (Red), 1% (Orange)
4	D	103	63% (Green), 16% (Yellow), 21% (Grey), 1% (Red), 1% (Orange)
4	H	103	61% (Green), 16% (Yellow), 22% (Grey), 1% (Red), 1% (Orange)
5	I	3230	19% (Green), 5% (Yellow), 75% (Grey), 1% (Red), 1% (Orange)

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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	137	
16	Y	137	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
17	ADP	M	501	-	-	X	-
17	ADP	N	501	-	-	X	-
17	ADP	O	501	-	-	X	-
17	ADP	P	501	-	-	X	-
17	ADP	Q	501	-	-	X	-
17	ADP	R	501	-	-	X	-
18	ATP	U	401	-	-	X	-

## 2 Entry composition

There are 18 unique types of molecules in this entry. The entry contains 55488 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	108	Total	C	N	O	0	0
			833	525	165	143		
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	792	6519	4147	1202	1134	36	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	158	1316	826	252	234	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	113	893	546	173	165	9	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	M	418	3213	2026	557	614	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	411	3185	1988	560	622	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, N-terminally processed.

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	187	Total	C	N	O	S	0	0
			1617	1032	299	282	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		

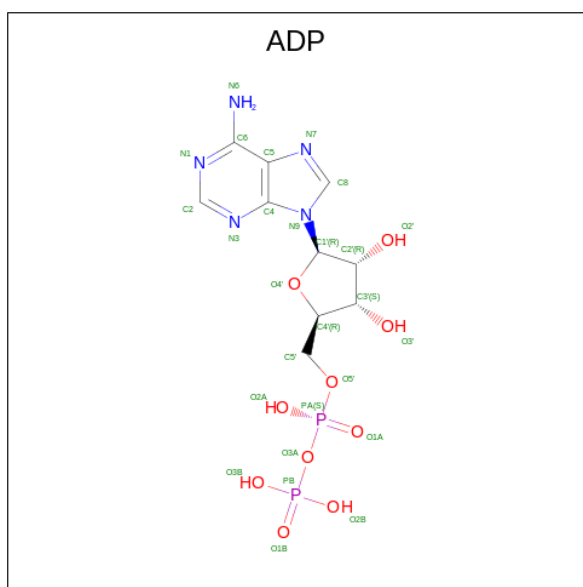
- Molecule 15 is a DNA chain called DNA (137-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
15	X	137	Total	C	N	O	P	0	0
			2829	1338	537	818	136		

- Molecule 16 is a DNA chain called DNA (137-MER).

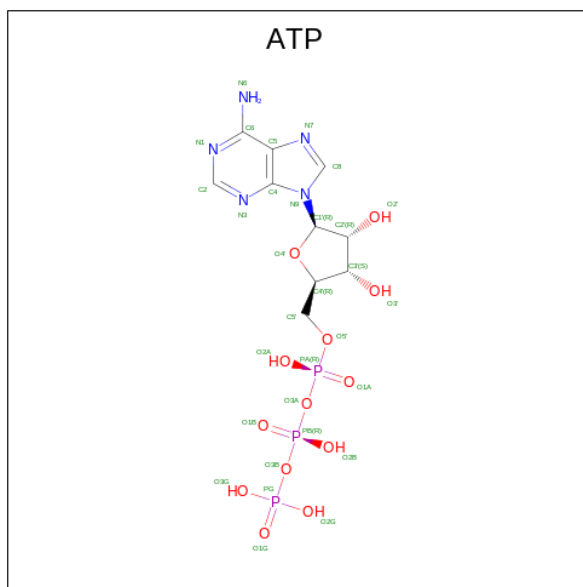
Mol	Chain	Residues	Atoms					AltConf	Trace
16	Y	137	Total	C	N	O	P	0	0
			2785	1323	501	824	137		

- Molecule 17 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
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:  $C_{10}H_{16}N_5O_{13}P_3$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
18	T	1	31	10	5	13	3	0
18	U	1	31	10	5	13	3	0





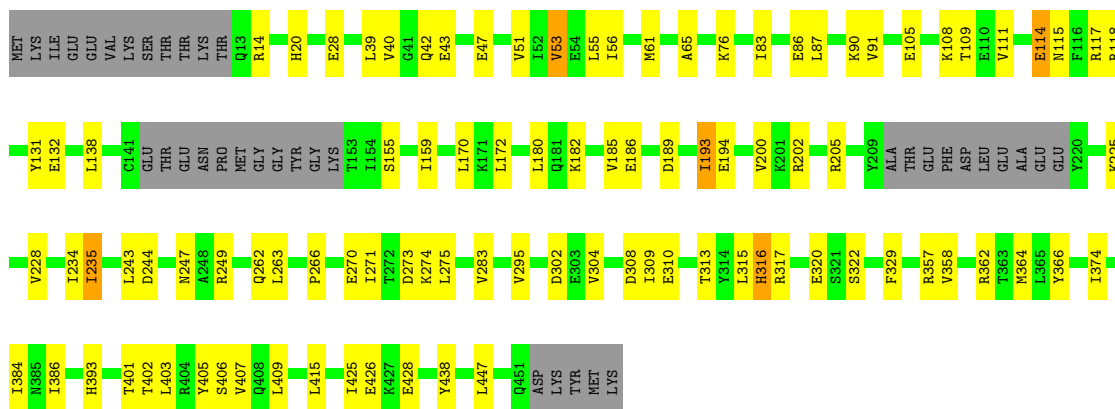







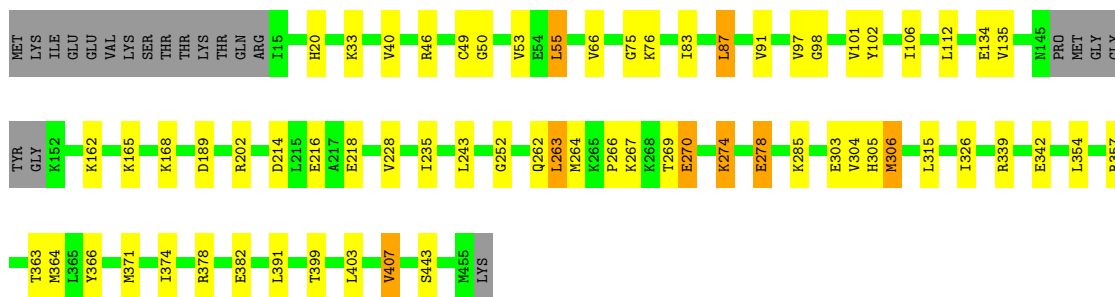


Chain M:  70% 20% 8%



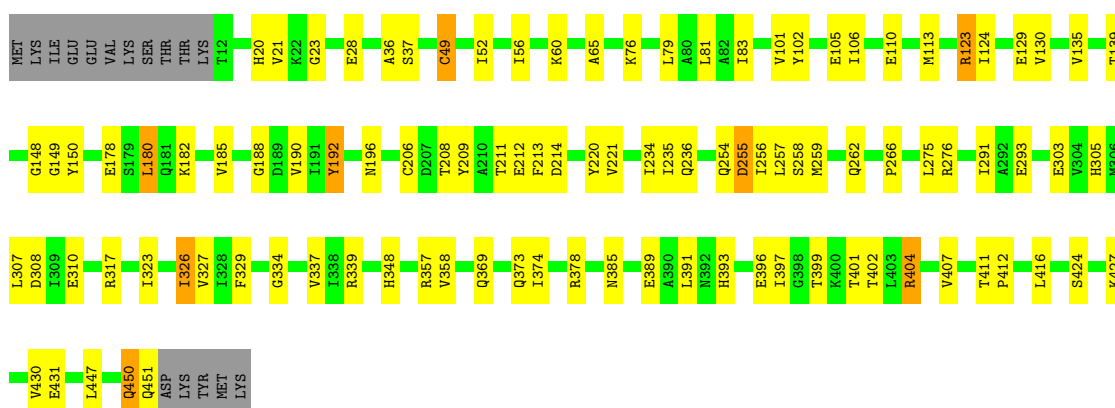
• Molecule 9: RuvB-like 1

Chain O:  81% 13% 5%



• Molecule 9: RuvB-like 1

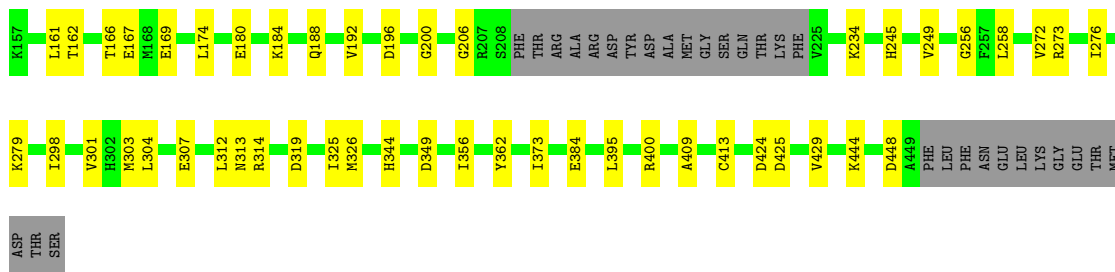
Chain Q:  74% 21% 5%



• Molecule 10: RuvB-like 2

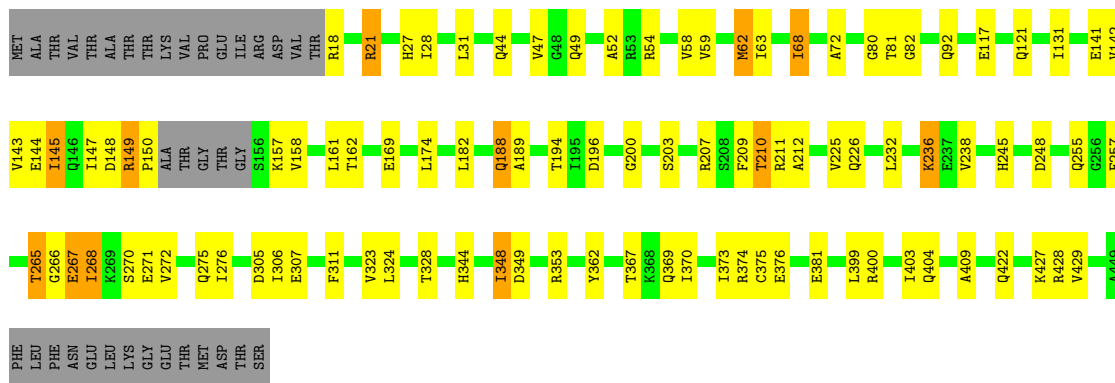
Chain N:  74% 15% 11%





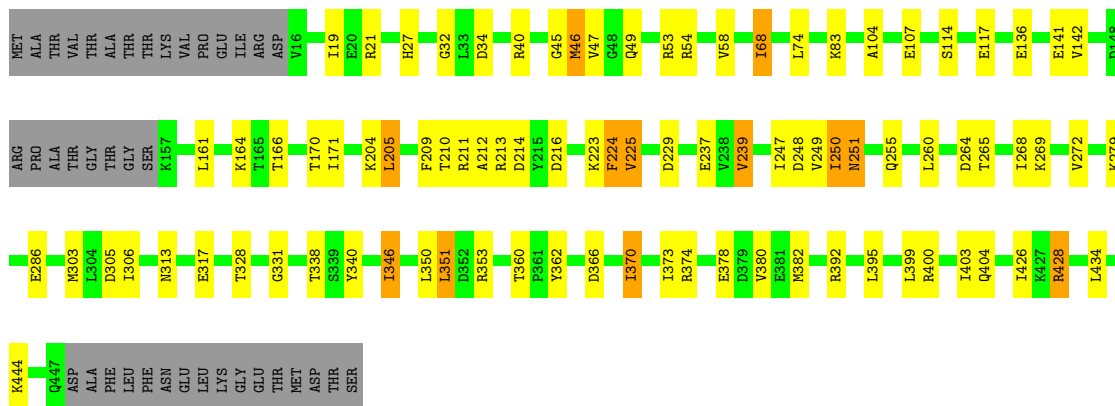
• Molecule 10: RuvB-like 2

Chain P:  71% 18% 8%



• Molecule 10: RuvB-like 2

Chain R:  72% 17% 8%



• Molecule 11: Actin, cytoplasmic 1, N-terminally processed

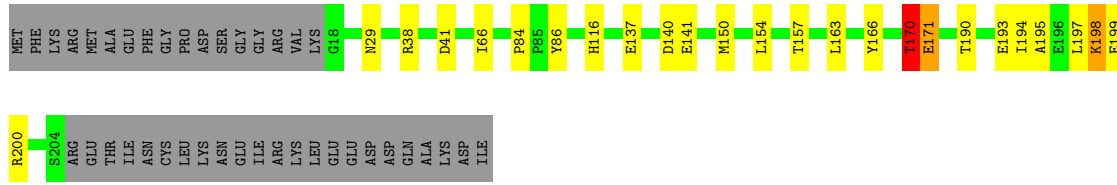
Chain S:  94% 6%



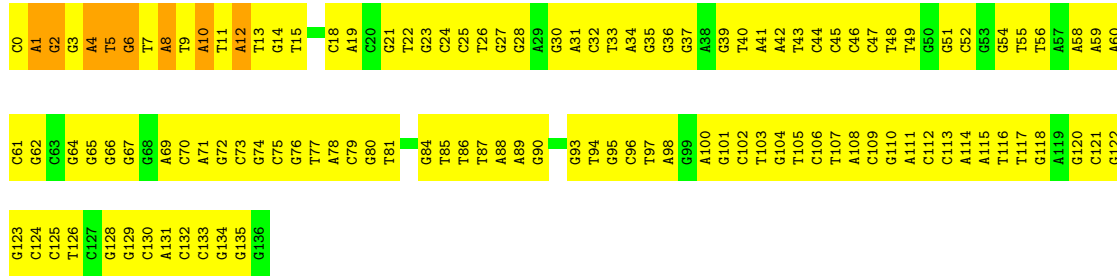
• Molecule 11: Actin, cytoplasmic 1, N-terminally processed



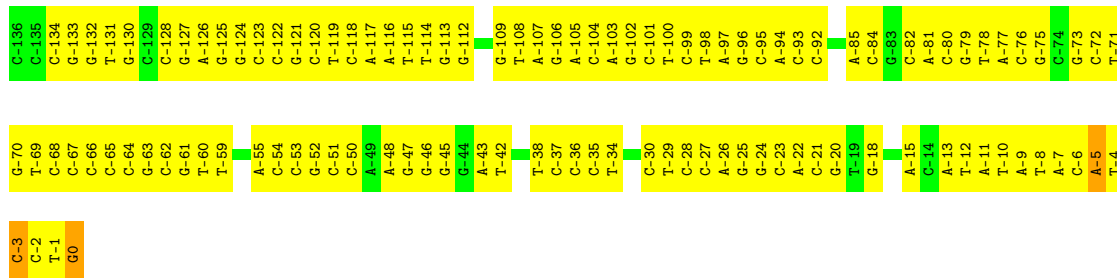
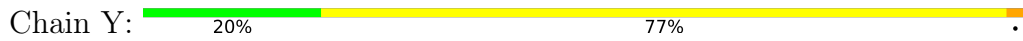




● Molecule 15: DNA (137-MER)



● Molecule 16: DNA (137-MER)



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	1092654	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: ATP, ADP

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	0.24	0/843	0.39	0/1136
1	E	0.24	0/818	0.39	0/1104
2	B	0.24	0/766	0.38	0/1026
2	F	0.27	0/747	0.40	0/1004
3	C	0.24	0/789	0.38	0/1057
3	G	0.23	0/813	0.37	0/1090
4	D	0.24	0/653	0.42	0/873
4	H	0.24	0/645	0.42	0/862
5	I	0.25	0/6675	0.41	1/9019 (0.0%)
6	J	0.31	0/1347	0.51	1/1818 (0.1%)
7	K	0.24	0/3283	0.42	0/4445
8	L	0.25	0/909	0.42	0/1227
9	M	0.24	0/3253	0.43	1/4382 (0.0%)
9	O	0.24	0/3382	0.42	0/4559
9	Q	0.24	0/3413	0.42	0/4603
10	N	0.23	0/3217	0.42	0/4328
10	P	0.25	0/3324	0.43	0/4477
10	R	0.24	0/3329	0.42	0/4479
11	S	0.24	0/2988	0.40	0/4045
11	U	0.24	0/2863	0.42	0/3882
12	T	0.24	0/3217	0.40	0/4362
13	V	0.24	0/1661	0.41	0/2234
14	W	0.37	1/1578 (0.1%)	0.53	0/2128
15	X	0.62	7/3179 (0.2%)	0.85	3/4911 (0.1%)
16	Y	0.59	2/3118 (0.1%)	0.84	1/4804 (0.0%)
All	All	0.31	10/56810 (0.0%)	0.49	7/77855 (0.0%)

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
2	F	0	1
5	I	0	2
6	J	0	2
9	Q	0	1
11	U	0	1
14	W	0	1
All	All	0	8

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	X	12	DA	C1'-N9	-7.16	1.37	1.47
16	Y	0	DG	C1'-N9	-6.97	1.37	1.47
15	X	6	DG	C1'-N9	-6.81	1.37	1.47
15	X	8	DA	C1'-N9	-6.60	1.38	1.47
15	X	2	DG	C1'-N9	-6.59	1.38	1.47

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	Y	-3	DC	P-O3'-C3'	-10.46	107.14	119.70
15	X	5	DT	P-O3'-C3'	-9.41	108.41	119.70
6	J	283	PRO	CA-N-CD	-8.45	99.68	111.50
15	X	8	DA	P-O3'-C3'	-8.20	109.86	119.70
5	I	667	TRP	N-CA-C	-7.08	91.89	111.00

There are no chirality outliers.

5 of 8 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	F	28	ARG	Sidechain
5	I	163	ARG	Sidechain
5	I	167	ARG	Sidechain
6	J	260	ARG	Sidechain
6	J	263	ARG	Sidechain

## 5.2 Too-close contacts [i](#)

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	833	0	890	40	0
1	E	808	0	864	24	0
2	B	755	0	780	55	0
2	F	736	0	755	24	0
3	C	779	0	816	27	0
3	G	801	0	839	22	0
4	D	646	0	687	14	0
4	H	638	0	676	23	0
5	I	6519	0	6602	168	0
6	J	1316	0	1330	54	0
7	K	3209	0	3132	63	0
8	L	893	0	880	15	0
9	M	3213	0	3331	80	0
9	O	3339	0	3425	48	0
9	Q	3368	0	3452	75	0
10	N	3185	0	3271	55	0
10	P	3287	0	3335	89	0
10	R	3293	0	3373	76	0
11	S	2925	0	2891	15	0
11	U	2802	0	2760	85	0
12	T	3146	0	3086	37	0
13	V	1617	0	1584	57	0
14	W	1542	0	1556	27	0
15	X	2829	0	1537	290	0
16	Y	2785	0	1538	289	0
17	M	27	0	12	13	0
17	N	27	0	12	11	0
17	O	27	0	12	12	0
17	P	27	0	12	27	0
17	Q	27	0	12	18	0
17	R	27	0	11	17	0
18	T	31	0	12	6	0
18	U	31	0	12	25	0
All	All	55488	0	53485	1381	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 13.

The worst 5 of 1381 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:711:GLY:H	15:X:135:DG:P	1.29	1.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:43:ARG:NE	16:Y:-34:DT:H5''	1.20	1.51
2:B:30:ARG:HH11	16:Y:-24:DG:C4'	1.31	1.44
2:B:89:ARG:HE	13:V:63:SER:CB	1.33	1.39
15:X:27:DG:N2	16:Y:-26:DA:H2	0.91	1.38

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	106/130 (82%)	104 (98%)	2 (2%)	0	100	100
1	E	103/130 (79%)	100 (97%)	3 (3%)	0	100	100
2	B	94/126 (75%)	93 (99%)	1 (1%)	0	100	100
2	F	92/126 (73%)	87 (95%)	5 (5%)	0	100	100
3	C	93/136 (68%)	92 (99%)	1 (1%)	0	100	100
3	G	95/136 (70%)	95 (100%)	0	0	100	100
4	D	79/103 (77%)	79 (100%)	0	0	100	100
4	H	78/103 (76%)	76 (97%)	2 (3%)	0	100	100
5	I	782/3230 (24%)	742 (95%)	38 (5%)	2 (0%)	41	74
6	J	154/364 (42%)	129 (84%)	24 (16%)	1 (1%)	25	64
7	K	392/396 (99%)	359 (92%)	32 (8%)	1 (0%)	41	74
8	L	109/154 (71%)	105 (96%)	4 (4%)	0	100	100
9	M	412/456 (90%)	399 (97%)	13 (3%)	0	100	100
9	O	431/456 (94%)	412 (96%)	19 (4%)	0	100	100
9	Q	438/456 (96%)	416 (95%)	19 (4%)	3 (1%)	22	61
10	N	405/463 (88%)	396 (98%)	9 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
10	P	423/463 (91%)	402 (95%)	20 (5%)	1 (0%)	47	79
10	R	420/463 (91%)	393 (94%)	25 (6%)	2 (0%)	29	67
11	S	373/375 (100%)	369 (99%)	4 (1%)	0	100	100
11	U	355/375 (95%)	311 (88%)	43 (12%)	1 (0%)	41	74
12	T	399/429 (93%)	389 (98%)	9 (2%)	1 (0%)	41	74
13	V	183/467 (39%)	174 (95%)	9 (5%)	0	100	100
14	W	185/227 (82%)	182 (98%)	2 (1%)	1 (0%)	29	67
All	All	6201/9764 (64%)	5904 (95%)	284 (5%)	13 (0%)	50	79

5 of 13 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
10	R	224	PHE
5	I	670	HIS
7	K	86	VAL
9	Q	256	ILE
6	J	283	PRO

### 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	84/99 (85%)	78 (93%)	6 (7%)	14	47
1	E	82/99 (83%)	77 (94%)	5 (6%)	18	54
2	B	83/106 (78%)	80 (96%)	3 (4%)	35	69
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%)	65 (98%)	1 (2%)	65	85
4	H	65/79 (82%)	64 (98%)	1 (2%)	65	85
5	I	710/2721 (26%)	670 (94%)	40 (6%)	21	57

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
6	J	144/312 (46%)	127 (88%)	17 (12%)	5	23
7	K	359/361 (99%)	334 (93%)	25 (7%)	15	48
8	L	98/133 (74%)	95 (97%)	3 (3%)	40	72
9	M	353/387 (91%)	342 (97%)	11 (3%)	40	72
9	O	364/387 (94%)	346 (95%)	18 (5%)	25	61
9	Q	366/387 (95%)	342 (93%)	24 (7%)	16	51
10	N	347/390 (89%)	338 (97%)	9 (3%)	46	76
10	P	352/390 (90%)	328 (93%)	24 (7%)	16	49
10	R	358/390 (92%)	342 (96%)	16 (4%)	27	63
11	S	318/318 (100%)	318 (100%)	0	100	100
11	U	305/318 (96%)	280 (92%)	25 (8%)	11	41
12	T	346/364 (95%)	337 (97%)	9 (3%)	46	76
13	V	168/400 (42%)	155 (92%)	13 (8%)	13	44
14	W	168/203 (83%)	164 (98%)	4 (2%)	49	77
All	All	5384/8251 (65%)	5118 (95%)	266 (5%)	29	61

5 of 266 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
11	U	123	MET
11	U	253	GLU
13	V	251	LEU
7	K	279	GLU
7	K	193	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 42 such sidechains are listed below:

Mol	Chain	Res	Type
10	P	44	GLN
9	Q	393	HIS
10	P	121	GLN
9	Q	196	ASN
12	T	73	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](#)

8 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
17	ADP	Q	501	9	24,29,29	0.93	1 (4%)	29,45,45	1.48	4 (13%)
17	ADP	N	501	-	24,29,29	0.95	1 (4%)	29,45,45	1.49	4 (13%)
17	ADP	P	501	-	24,29,29	0.94	1 (4%)	29,45,45	1.46	4 (13%)
18	ATP	U	401	-	26,33,33	0.88	1 (3%)	31,52,52	1.97	5 (16%)
17	ADP	M	501	-	24,29,29	0.98	1 (4%)	29,45,45	1.39	4 (13%)
17	ADP	O	501	-	24,29,29	0.92	1 (4%)	29,45,45	1.54	4 (13%)
18	ATP	T	501	-	26,33,33	0.99	1 (3%)	31,52,52	1.85	5 (16%)
17	ADP	R	501	10	24,29,29	0.96	1 (4%)	29,45,45	1.47	4 (13%)

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
17	ADP	Q	501	9	-	4/12/32/32	0/3/3/3
17	ADP	N	501	-	-	5/12/32/32	0/3/3/3
17	ADP	P	501	-	-	7/12/32/32	0/3/3/3
18	ATP	U	401	-	-	6/18/38/38	0/3/3/3
17	ADP	M	501	-	-	4/12/32/32	0/3/3/3
17	ADP	O	501	-	-	3/12/32/32	0/3/3/3
18	ATP	T	501	-	-	5/18/38/38	0/3/3/3
17	ADP	R	501	10	-	3/12/32/32	0/3/3/3

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
18	T	501	ATP	C2'-C1'	-2.72	1.49	1.53
17	M	501	ADP	C5-C4	2.45	1.47	1.40
17	N	501	ADP	C5-C4	2.37	1.47	1.40
17	R	501	ADP	C5-C4	2.36	1.47	1.40
17	P	501	ADP	C5-C4	2.35	1.47	1.40

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
18	U	401	ATP	PA-O3A-PB	-5.73	113.16	132.83
18	U	401	ATP	PB-O3B-PG	-5.54	113.82	132.83
18	T	501	ATP	PA-O3A-PB	-5.39	114.34	132.83
18	T	501	ATP	PB-O3B-PG	-4.80	116.37	132.83
17	O	501	ADP	PA-O3A-PB	-3.92	119.37	132.83

There are no chirality outliers.

5 of 37 torsion outliers are listed below:

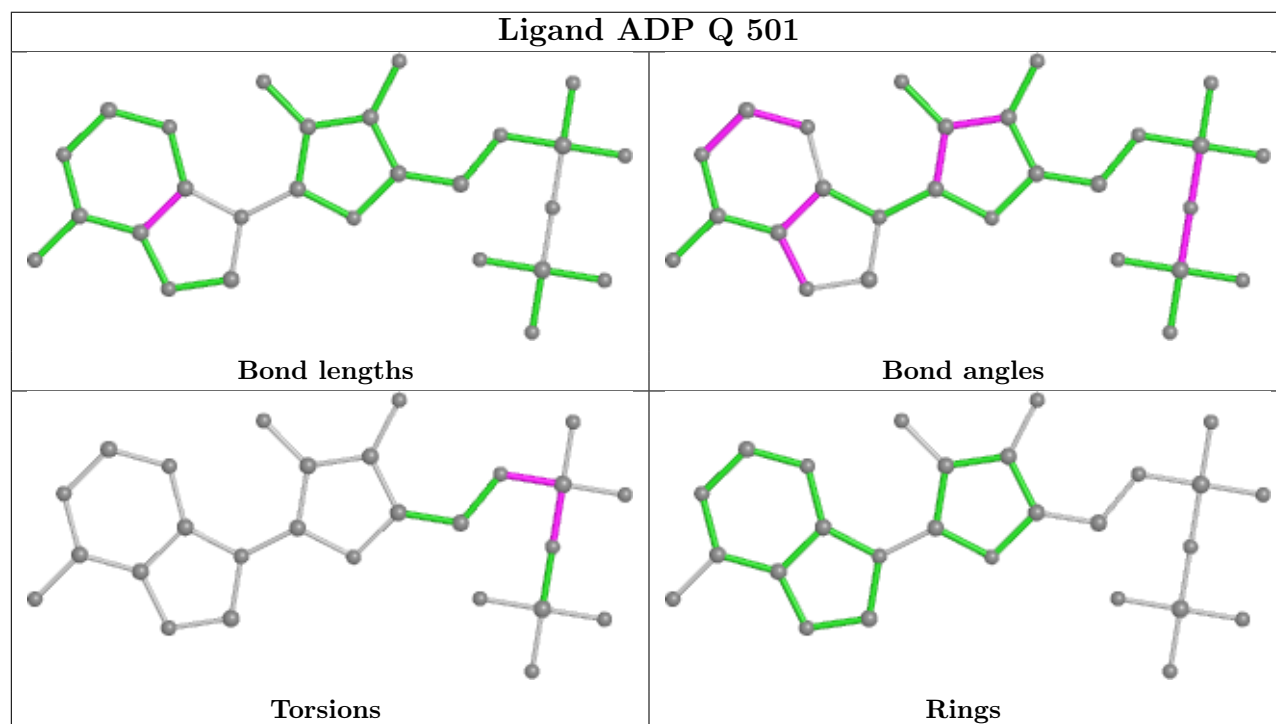
Mol	Chain	Res	Type	Atoms
17	M	501	ADP	PA-O3A-PB-O2B
17	N	501	ADP	PA-O3A-PB-O2B
17	N	501	ADP	C5'-O5'-PA-O1A
17	N	501	ADP	C5'-O5'-PA-O2A
17	O	501	ADP	C5'-O5'-PA-O1A

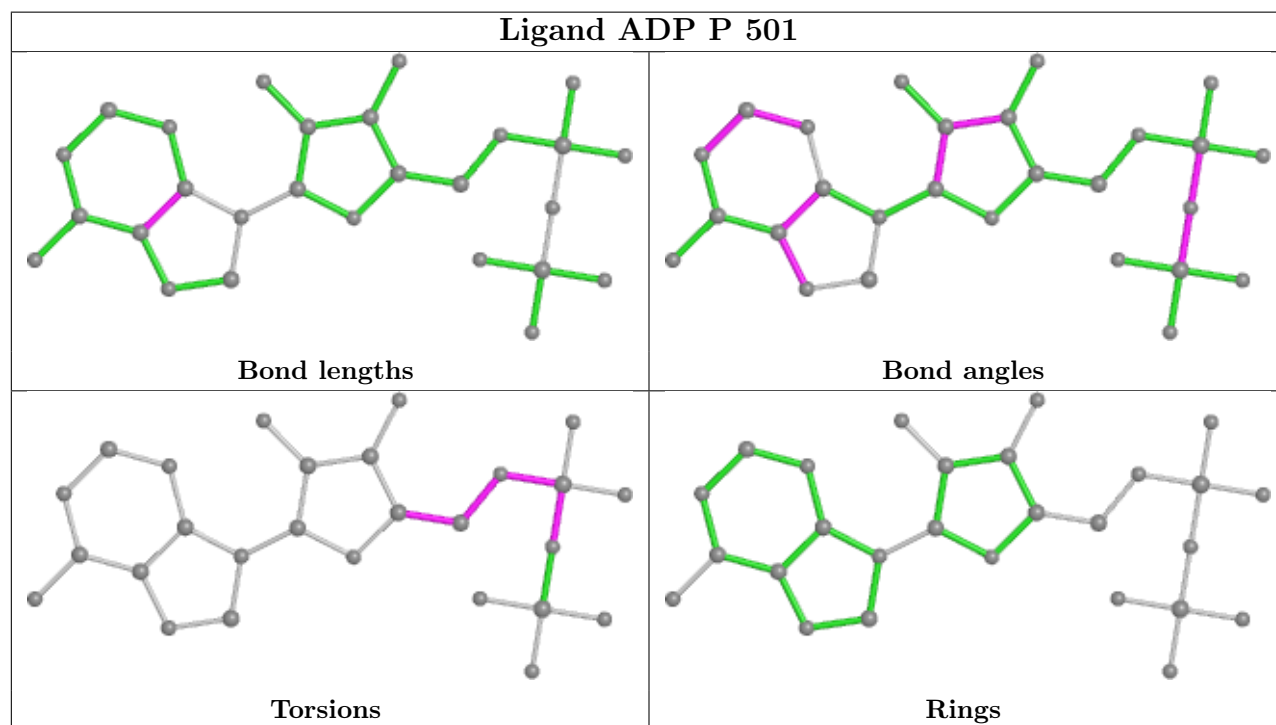
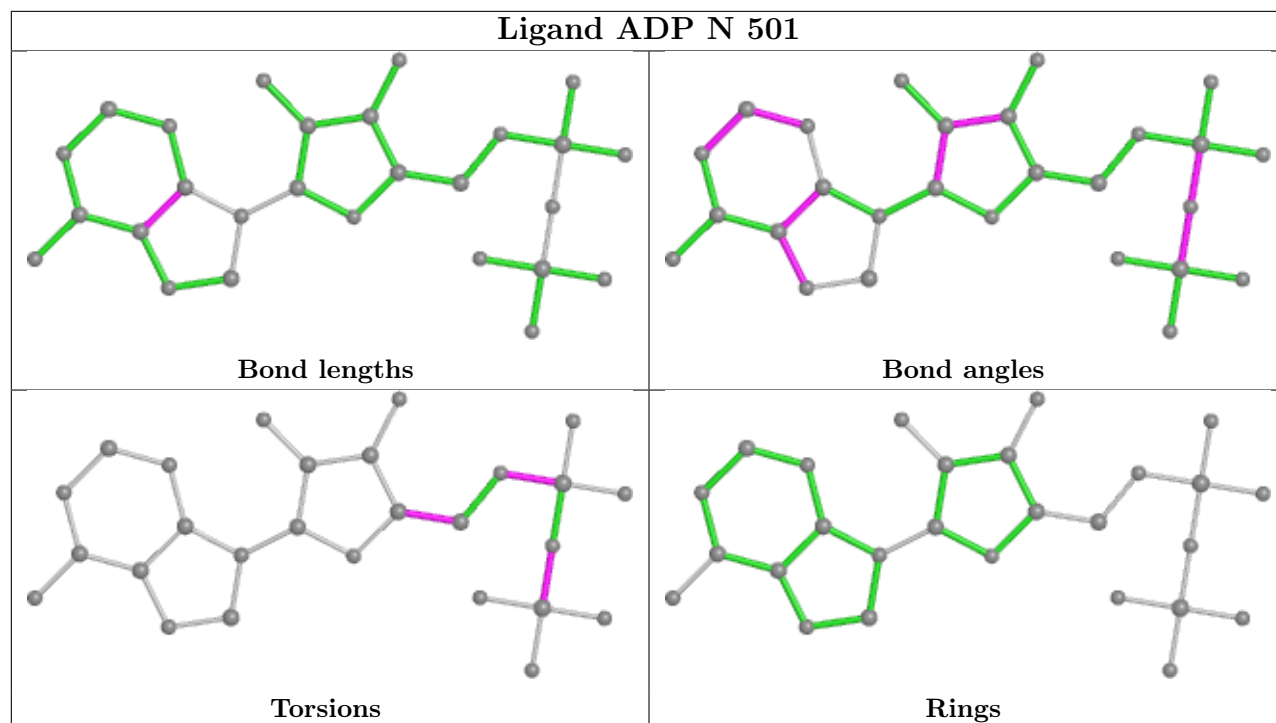
There are no ring outliers.

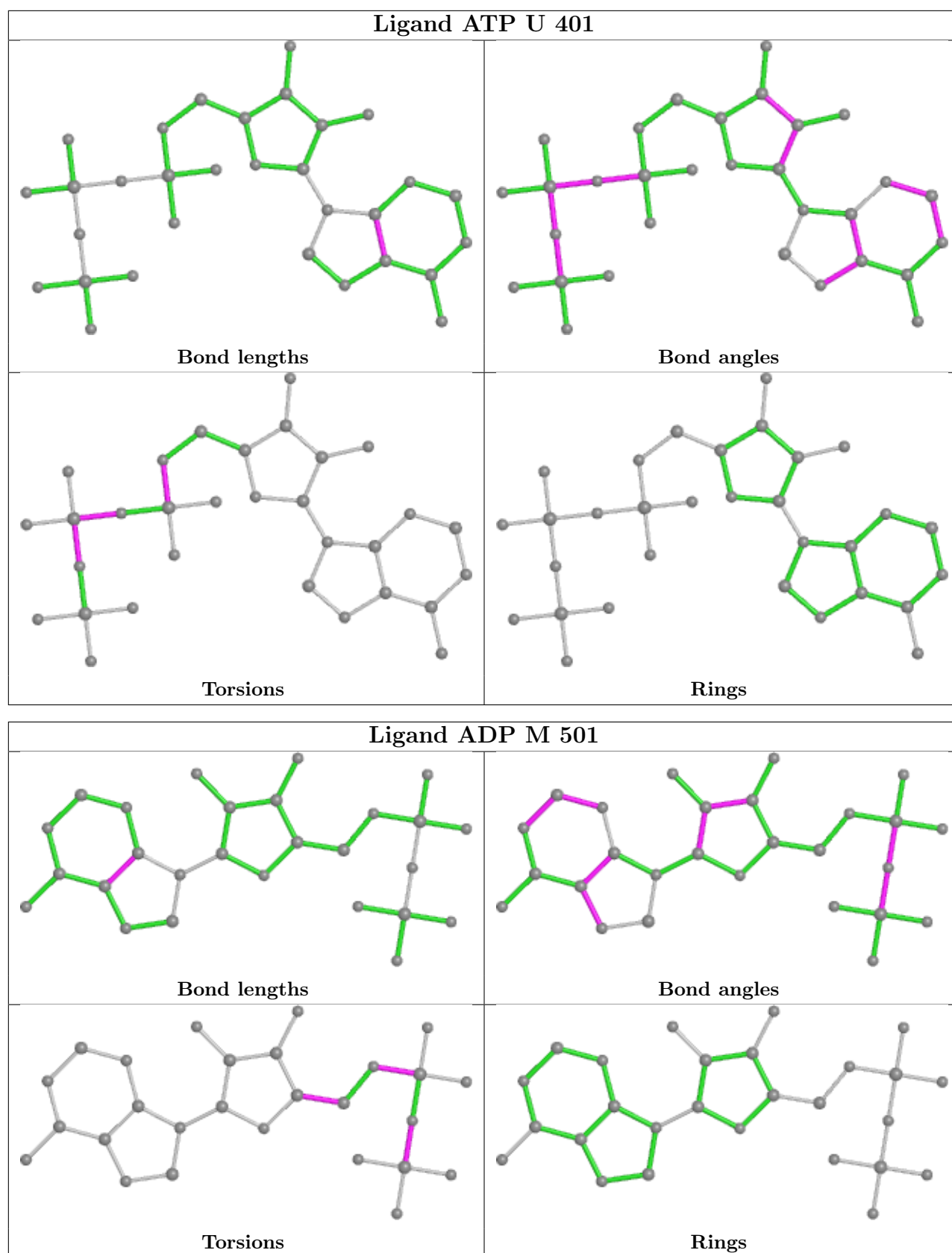
8 monomers are involved in 129 short contacts:

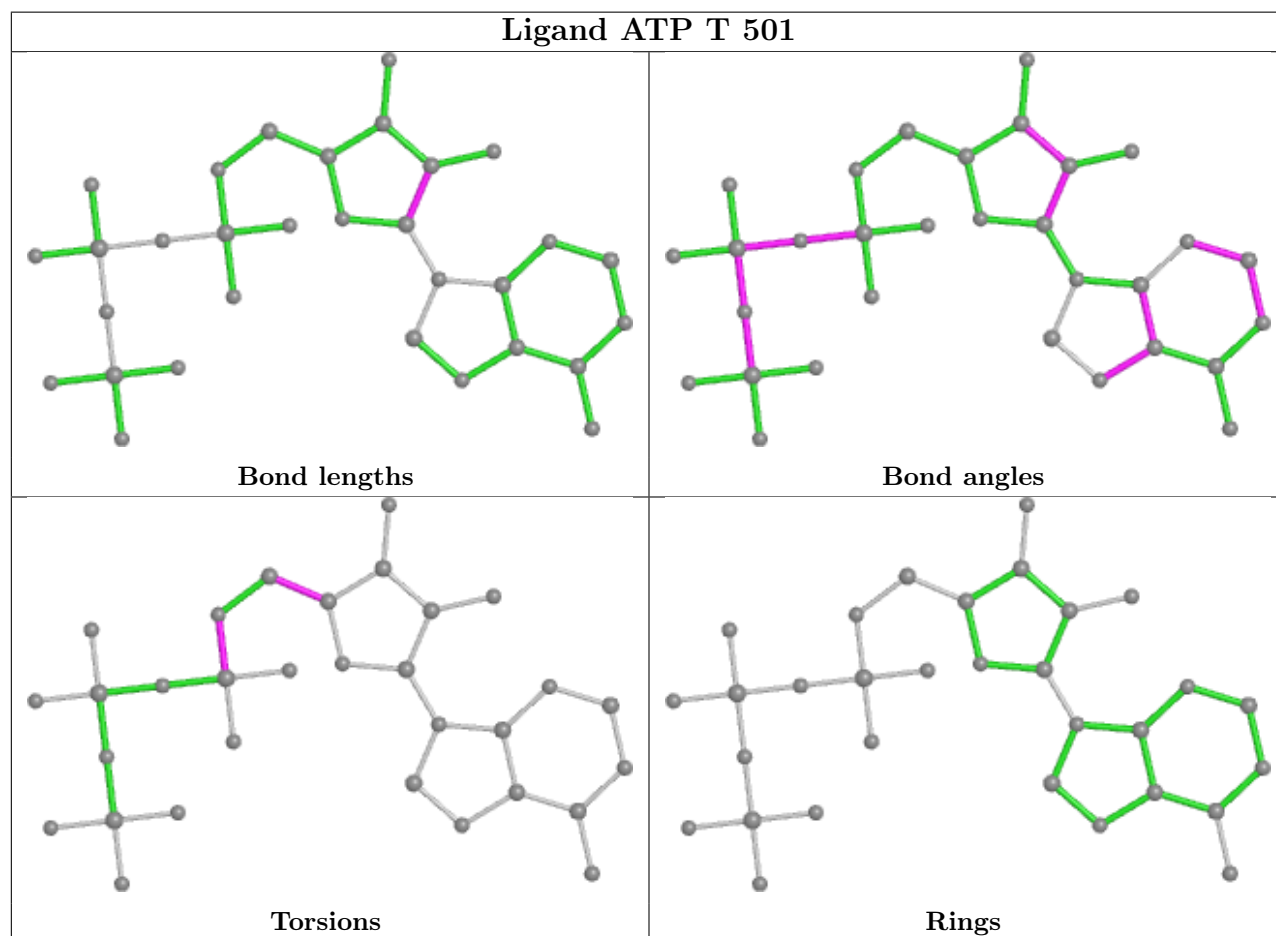
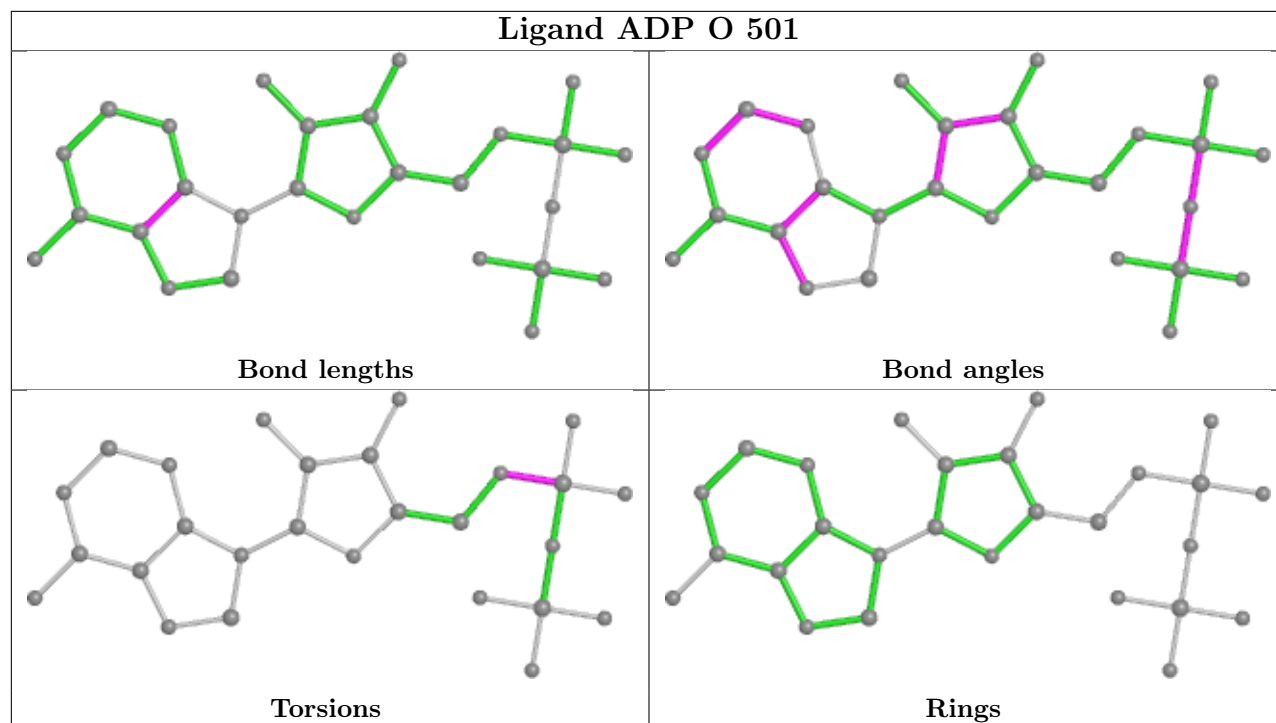
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	Q	501	ADP	18	0
17	N	501	ADP	11	0
17	P	501	ADP	27	0
18	U	401	ATP	25	0
17	M	501	ADP	13	0
17	O	501	ADP	12	0
18	T	501	ATP	6	0
17	R	501	ADP	17	0

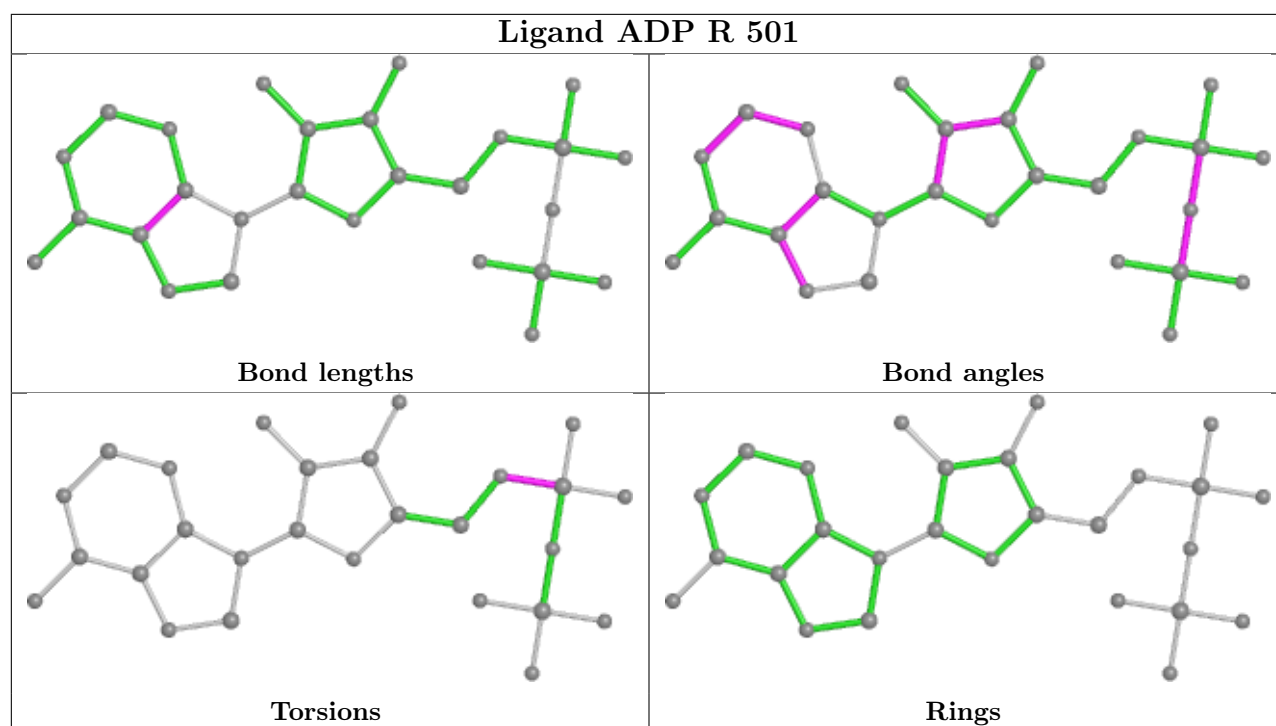
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.