



Full wwPDB EM Validation Report ⓘ

Nov 27, 2022 – 02:15 AM EST

PDB ID : 5T0J
EMDB ID : EMD-8337
Title : Structural basis for dynamic regulation of the human 26S proteasome
Authors : Chen, S.; Wu, J.; Lu, Y.; Ma, Y.B.; Lee, B.H.; Yu, Z.; Ouyang, Q.; Finley, D.;
Kirschner, M.W.; Mao, Y.
Deposited on : 2016-08-16
Resolution : 8.00 Å(reported)

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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>.

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

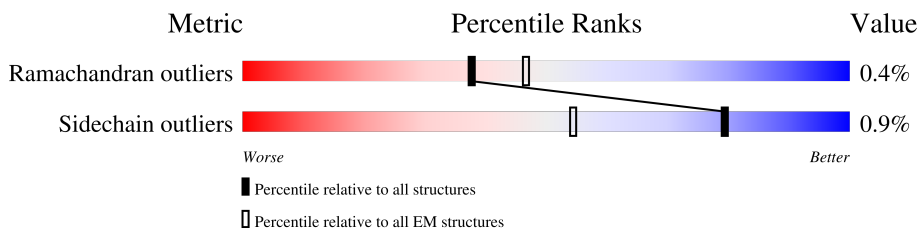
EMDB validation analysis : 0.0.1.dev43
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.2

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 8.00 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.



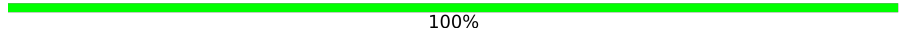
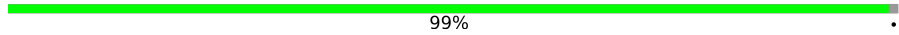








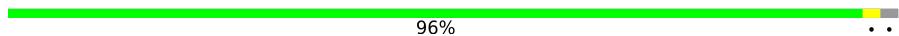




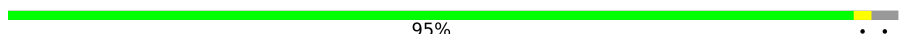

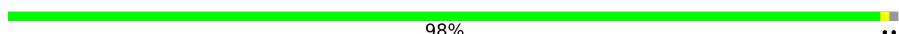




Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	f	749	91% 7%
2	G	245	96% ..
3	H	233	98% .
4	I	260	95% ..
5	J	247	95% ..
6	K	240	94% . 5%
7	L	268	89% 11%
8	M	254	94% 6%
9	N	238	80% 20%
10	O	276	80% 20%

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Mol	Chain	Length	Quality of chain
11	P	204	 100%
12	Q	201	 99%
13	R	262	 77% 23%
14	S	240	 89% 11%
15	T	263	 82% 18%
16	A	433	 82% 17%
17	B	440	 77% 21%
18	D	418	 89% 9%
19	E	403	 86% 12%
20	F	439	 82% 17%
21	C	398	 96%
22	U	953	 84% 15%
23	V	533	 89% 10%
24	W	456	 98%
25	X	422	 57% 43%
26	Y	389	 95%
27	Z	324	 87% 12%
28	a	376	 98%
29	b	377	 51% 49%
30	c	309	 87% 10%
31	d	349	 72% 26%
32	e	70	 54% 43%

2 Entry composition

There are 34 unique types of molecules in this entry. The entry contains 76674 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 26S proteasome non-ATPase regulatory subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	f	694	5331	3364	899	1027	41	0	0

- Molecule 2 is a protein called Proteasome subunit alpha type-6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	G	240	1826	1160	305	348	13	0	0

- Molecule 3 is a protein called Proteasome subunit alpha type-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	H	232	1708	1081	289	333	5	0	0

- Molecule 4 is a protein called Proteasome subunit alpha type-4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	I	250	1912	1204	329	371	8	0	0

- Molecule 5 is a protein called Proteasome subunit alpha type-7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	J	239	1704	1056	308	335	5	0	0

- Molecule 6 is a protein called Proteasome subunit alpha type-5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	K	228	1722	1080	284	348	10	0	0

- Molecule 7 is a protein called Proteasome subunit alpha type-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	L	238	1850	1159	334	346	11	0	0

- Molecule 8 is a protein called Proteasome subunit alpha type-3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	M	240	1856	1178	314	353	11	0	0

- Molecule 9 is a protein called Proteasome subunit beta type-6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	N	191	1430	893	245	280	12	0	0

- Molecule 10 is a protein called Proteasome subunit beta type-7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	O	220	1643	1033	280	318	12	0	0

- Molecule 11 is a protein called Proteasome subunit beta type-3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	P	204	1585	1010	262	294	19	0	0

- Molecule 12 is a protein called Proteasome subunit beta type-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	Q	199	1570	1006	265	290	9	0	0

- Molecule 13 is a protein called Proteasome subunit beta type-5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	R	201	1548	974	273	292	9	0	0

- Molecule 14 is a protein called Proteasome subunit beta type-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	S	213	1641	1036	282	313	10	0	0

- Molecule 15 is a protein called Proteasome subunit beta type-4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	T	215	1667	1052	285	318	12	0	0

- Molecule 16 is a protein called 26S protease regulatory subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	A	361	2835	1788	501	528	18	0	0

- Molecule 17 is a protein called 26S protease regulatory subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	B	348	2717	1708	460	537	12	0	0

- Molecule 18 is a protein called 26S protease regulatory subunit 6B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	D	380	3040	1923	524	580	13	0	0

- Molecule 19 is a protein called 26S protease regulatory subunit 10B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	E	353	2790	1755	494	525	16	0	0

- Molecule 20 is a protein called 26S protease regulatory subunit 6A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	F	366	2863	1802	496	549	16	0	0

- Molecule 21 is a protein called 26S protease regulatory subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	C	392	3078	1932	551	577	18	0	0

- Molecule 22 is a protein called 26S proteasome non-ATPase regulatory subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	U	806	6287	3990	1075	1178	44	0	0

- Molecule 23 is a protein called 26S proteasome non-ATPase regulatory subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	V	480	3852	2444	684	710	14	0	0

- Molecule 24 is a protein called 26S proteasome non-ATPase regulatory subunit 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	W	456	3703	2339	635	704	25	0	0

- Molecule 25 is a protein called 26S proteasome non-ATPase regulatory subunit 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	X	241	1905	1212	320	365	8	0	0

- Molecule 26 is a protein called 26S proteasome non-ATPase regulatory subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	Y	378	3115	1987	533	578	17	0	0

- Molecule 27 is a protein called 26S proteasome non-ATPase regulatory subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	Z	286	2281	1457	392	427	5	0	0

- Molecule 28 is a protein called 26S proteasome non-ATPase regulatory subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	a	373	2995	1911	510	559	15	0	0

- Molecule 29 is a protein called 26S proteasome non-ATPase regulatory subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	b	191	1458	910	261	279	8	0	0

- Molecule 30 is a protein called 26S proteasome non-ATPase regulatory subunit 14.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	c	278	2187	1389	374	406	18	0	0

- Molecule 31 is a protein called 26S proteasome non-ATPase regulatory subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	d	257	2116	1371	346	390	9	0	0

- Molecule 32 is a protein called 26S proteasome complex subunit DSS1.


Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
32	e	40	334	200	55	77	2	0	0

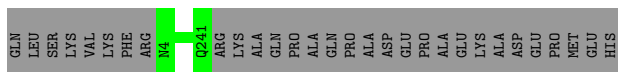
- Molecule 33 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃).

Chain K:  94% • 5%



- Molecule 7: Proteasome subunit alpha type-1

Chain L:  89% 11%




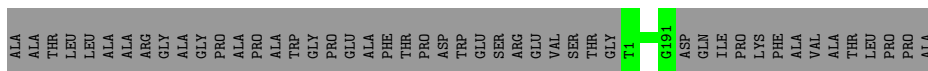
- Molecule 8: Proteasome subunit alpha type-3

Chain M:  94% 6%



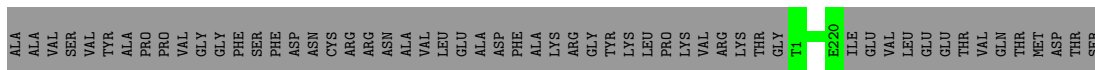
- Molecule 9: Proteasome subunit beta type-6

Chain N:  80% 20%



- Molecule 10: Proteasome subunit beta type-7

Chain O:  80% 20%



- Molecule 11: Proteasome subunit beta type-3

Chain P:  100%


There are no outlier residues recorded for this chain.

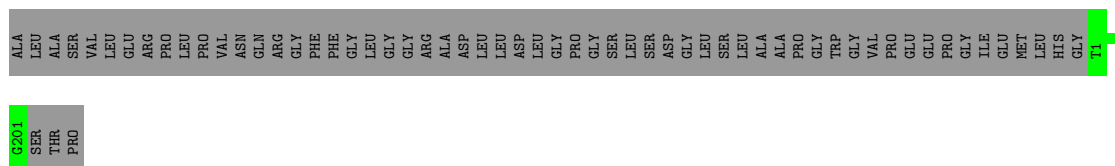
- Molecule 12: Proteasome subunit beta type-2

Chain Q:  99% •

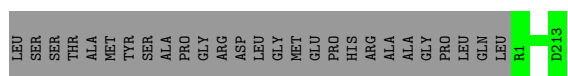
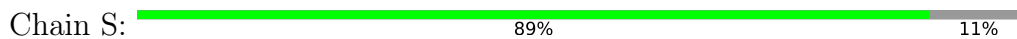


- Molecule 13: Proteasome subunit beta type-5

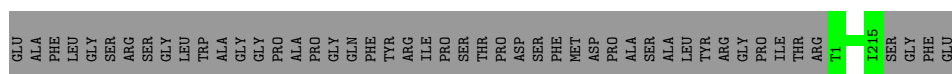
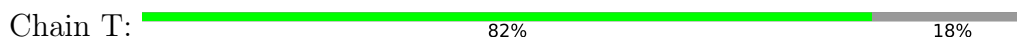
Chain R:  77% 23%



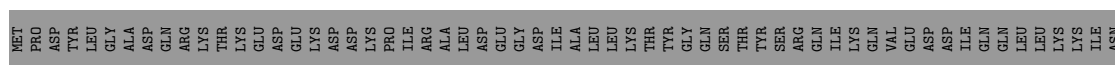
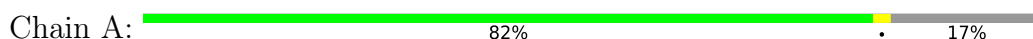
• Molecule 14: Proteasome subunit beta type-1



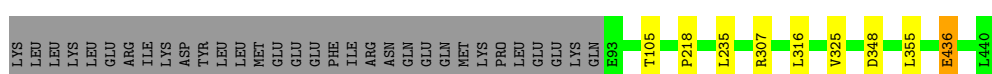
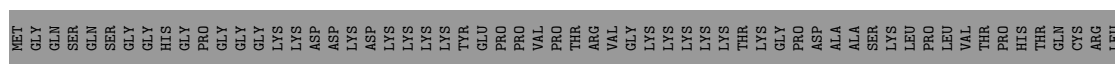
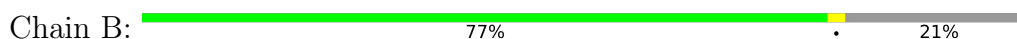
• Molecule 15: Proteasome subunit beta type-4



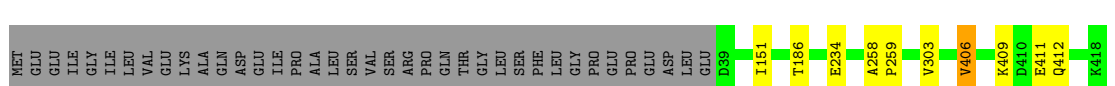
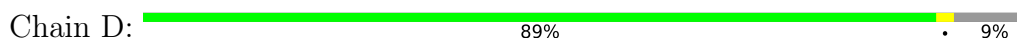
• Molecule 16: 26S protease regulatory subunit 7



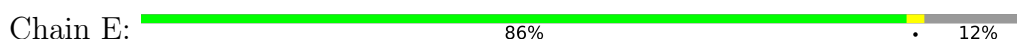
• Molecule 17: 26S protease regulatory subunit 4



• Molecule 18: 26S protease regulatory subunit 6B



• Molecule 19: 26S protease regulatory subunit 10B



LYS
ASP
LYS
LYS
GLU
GLU
ASP
LYS
LYS

- Molecule 30: 26S proteasome non-ATPase regulatory subunit 14

Chain c: 87% 10%

ASP
ARG
LEU
LEU
ARG
LEU
GLY
GLY
MET
PRO
GLY
LEU
GLY
GLN
PRO
THR
ASP
ALA
PRO
A24
R104
V156
I157
I189
H194
L229
V234
SER
GLU
HIS
CYS
LYS
HIS
ASN
GLU
SER
V244
K273
F309
K310

- Molecule 31: 26S proteasome non-ATPase regulatory subunit 8

Chain d: 72% 26%

PHE
ILE
GLY
ALA
PRO
ARG
ALA
PRO
ARG
GLY
ARG
ARG
ALA
THR
ARG
GLY
LEU
ARG
GLN
VAL
VAL
ALA
PRO
PRO
ALA
ALA
THR
LEU
GLY
SER
THR
SER
ARG
PRO
HIS
PHE
ARG
ALA
SER
VAL
VAL
CYS
ARG
ARG
CYS
ARG
LYS
SER
GLY
LEU
LEU
ALA
SER

ARG
LYS
MET
ALA
ALA
ALA
VAL
GLY
ASN
ALA
ALA
PHE
SER
SER
SER
PRO
ALA
ALA
THR
GLY
P1
Y2
E3
I158
L190
E193
V257

- Molecule 32: 26S proteasome complex subunit DSS1

Chain e: 54% 43%

K1
K4
D9
LEU
GLY
LEU
LEU
GLU
GLU
ASP
ASP
GLU
PHE
GLU
GLU
PHE
PRO
ALA
GLU
ASP
TRP
ALA
GLY
LEU
ASP
GLU
ASP
GLU
ASP
ALA
HIS
VAL
TRP
E40
W43
S70

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	14382	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TECNAI ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	30	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k 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: ZN, 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	f	0.24	0/5413	0.50	1/7317 (0.0%)
2	G	0.24	0/1859	0.45	0/2523
3	H	0.25	0/1743	0.49	0/2372
4	I	0.60	1/1942 (0.1%)	0.59	4/2628 (0.2%)
5	J	3.05	6/1728 (0.3%)	0.48	0/2358
6	K	0.24	0/1747	0.43	0/2364
7	L	0.23	0/1885	0.43	0/2552
8	M	0.23	0/1891	0.40	0/2552
9	N	0.23	0/1454	0.41	0/1967
10	O	0.23	0/1670	0.43	0/2265
11	P	0.23	0/1614	0.40	0/2177
12	Q	0.24	0/1603	0.41	0/2174
13	R	0.23	0/1579	0.39	0/2134
14	S	0.24	0/1671	0.41	0/2253
15	T	0.24	0/1700	0.41	0/2305
16	A	0.25	0/2886	0.50	0/3899
17	B	0.25	0/2756	0.50	0/3721
18	D	0.25	0/3090	0.51	1/4168 (0.0%)
19	E	0.39	1/2835 (0.0%)	0.45	0/3821
20	F	0.26	0/2903	0.50	0/3912
21	C	0.27	1/3117 (0.0%)	0.50	2/4189 (0.0%)
22	U	0.23	0/6396	0.40	0/8646
23	V	1.26	6/3929 (0.2%)	0.50	0/5309
24	W	0.24	0/3751	0.47	2/5042 (0.0%)
25	X	0.23	0/1936	0.41	0/2614
26	Y	0.24	0/3173	0.47	2/4273 (0.0%)
27	Z	0.24	0/2324	0.48	0/3150
28	a	0.23	0/3053	0.42	0/4133
29	b	0.26	0/1478	0.44	0/2001
30	c	0.26	1/2226 (0.0%)	0.46	0/3007
31	d	0.25	0/2162	0.48	0/2919
32	e	3.67	1/338 (0.3%)	0.75	2/450 (0.4%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
All	All	0.64	17/77852 (0.0%)	0.46	14/105195 (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
17	B	0	1
18	D	0	3
23	V	0	1
24	W	0	1
26	Y	0	1
28	a	0	1
31	d	0	1
All	All	0	9

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
32	e	4	LYS	CD-CE	67.17	3.19	1.51
5	J	21	TYR	CD2-CE2	67.11	2.40	1.39
5	J	21	TYR	CD1-CE1	65.88	2.38	1.39
5	J	21	TYR	CE1-CZ	49.34	2.02	1.38
5	J	21	TYR	CE2-CZ	45.57	1.97	1.38
23	V	212	TYR	CD2-CE2	40.57	2.00	1.39
23	V	212	TYR	CD1-CE1	40.40	2.00	1.39
5	J	21	TYR	CG-CD2	36.47	1.86	1.39
5	J	21	TYR	CG-CD1	35.86	1.85	1.39
23	V	212	TYR	CE1-CZ	29.51	1.76	1.38
23	V	212	TYR	CE2-CZ	28.92	1.76	1.38
4	I	14	PRO	CA-C	23.61	2.00	1.52
23	V	212	TYR	CG-CD2	23.07	1.69	1.39
23	V	212	TYR	CG-CD1	22.77	1.68	1.39
19	E	175	PRO	C-N	16.65	1.65	1.34
21	C	242	ALA	C-N	7.00	1.47	1.34
30	c	104	ARG	C-N	5.89	1.45	1.34

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	14	PRO	O-C-N	-15.43	98.01	122.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
32	e	4	LYS	CD-CE-NZ	8.24	130.65	111.70
4	I	14	PRO	CA-C-N	7.71	134.15	117.20
32	e	4	LYS	CG-CD-CE	7.23	133.60	111.90
4	I	14	PRO	N-CA-CB	-7.13	94.75	103.30
1	f	459	GLU	N-CA-C	6.14	127.58	111.00
4	I	14	PRO	N-CA-C	6.01	127.73	112.10
21	C	217	SER	C-N-CA	5.74	136.05	121.70
26	Y	63	TRP	C-N-CA	5.73	136.03	121.70
26	Y	287	LEU	CA-CB-CG	5.41	127.73	115.30
24	W	92	LYS	C-N-CA	5.22	134.76	121.70
24	W	135	LYS	C-N-CA	5.21	134.72	121.70
18	D	409	LYS	C-N-CA	5.19	134.68	121.70
21	C	217	SER	CA-C-N	5.12	128.47	117.20

There are no chirality outliers.

All (9) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
17	B	436	GLU	Peptide
18	D	258	ALA	Peptide
18	D	406	VAL	Peptide
18	D	412	GLN	Peptide
23	V	319	HIS	Peptide
24	W	416	GLN	Peptide
26	Y	357	ASN	Peptide
28	a	286	ALA	Peptide
31	d	3	GLU	Peptide

5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

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	f	686/749 (92%)	575 (84%)	107 (16%)	4 (1%)	25	66
2	G	238/245 (97%)	221 (93%)	15 (6%)	2 (1%)	19	60
3	H	230/233 (99%)	200 (87%)	28 (12%)	2 (1%)	17	57
4	I	248/260 (95%)	223 (90%)	25 (10%)	0	100	100
5	J	237/247 (96%)	214 (90%)	21 (9%)	2 (1%)	19	60
6	K	224/240 (93%)	196 (88%)	27 (12%)	1 (0%)	34	72
7	L	236/268 (88%)	221 (94%)	15 (6%)	0	100	100
8	M	238/254 (94%)	221 (93%)	17 (7%)	0	100	100
9	N	189/238 (79%)	179 (95%)	10 (5%)	0	100	100
10	O	218/276 (79%)	207 (95%)	11 (5%)	0	100	100
11	P	202/204 (99%)	187 (93%)	15 (7%)	0	100	100
12	Q	197/201 (98%)	183 (93%)	14 (7%)	0	100	100
13	R	199/262 (76%)	185 (93%)	14 (7%)	0	100	100
14	S	211/240 (88%)	199 (94%)	12 (6%)	0	100	100
15	T	213/263 (81%)	202 (95%)	11 (5%)	0	100	100
16	A	359/433 (83%)	307 (86%)	51 (14%)	1 (0%)	41	77
17	B	344/440 (78%)	304 (88%)	38 (11%)	2 (1%)	25	66
18	D	378/418 (90%)	323 (85%)	51 (14%)	4 (1%)	14	52
19	E	351/403 (87%)	317 (90%)	34 (10%)	0	100	100
20	F	362/439 (82%)	327 (90%)	34 (9%)	1 (0%)	41	77
21	C	390/398 (98%)	344 (88%)	42 (11%)	4 (1%)	15	55
22	U	798/953 (84%)	738 (92%)	59 (7%)	1 (0%)	51	86
23	V	478/533 (90%)	421 (88%)	57 (12%)	0	100	100
24	W	454/456 (100%)	407 (90%)	44 (10%)	3 (1%)	22	63
25	X	239/422 (57%)	213 (89%)	26 (11%)	0	100	100
26	Y	376/389 (97%)	332 (88%)	42 (11%)	2 (0%)	29	69
27	Z	284/324 (88%)	253 (89%)	30 (11%)	1 (0%)	34	72
28	a	371/376 (99%)	331 (89%)	38 (10%)	2 (0%)	29	69
29	b	189/377 (50%)	175 (93%)	14 (7%)	0	100	100
30	c	274/309 (89%)	246 (90%)	25 (9%)	3 (1%)	14	52

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
31	d	255/349 (73%)	229 (90%)	26 (10%)	0	100	100
32	e	36/70 (51%)	31 (86%)	5 (14%)	0	100	100
All	All	9704/11269 (86%)	8711 (90%)	958 (10%)	35 (0%)	38	72

All (35) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	f	62	ILE
1	f	447	VAL
2	G	111	VAL
22	U	364	VAL
24	W	68	VAL
24	W	136	ILE
26	Y	350	VAL
1	f	131	VAL
30	c	157	ILE
1	f	281	ILE
5	J	199	VAL
21	C	298	ILE
28	a	340	VAL
3	H	127	VAL
6	K	12	VAL
18	D	151	ILE
21	C	68	GLU
21	C	219	LEU
24	W	138	VAL
26	Y	67	VAL
27	Z	144	VAL
30	c	156	VAL
17	B	218	PRO
18	D	411	GLU
18	D	406	VAL
18	D	259	PRO
28	a	336	VAL
30	c	189	ILE
2	G	170	VAL
3	H	20	VAL
21	C	251	ILE
16	A	206	ILE
17	B	325	VAL
20	F	326	VAL

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Mol	Chain	Res	Type
5	J	98	VAL

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	f	582/628 (93%)	572 (98%)	10 (2%)	60	78
2	G	193/209 (92%)	189 (98%)	4 (2%)	53	72
3	H	164/190 (86%)	162 (99%)	2 (1%)	71	83
4	I	193/220 (88%)	191 (99%)	2 (1%)	76	86
5	J	152/210 (72%)	151 (99%)	1 (1%)	84	90
6	K	186/202 (92%)	184 (99%)	2 (1%)	73	84
7	L	198/229 (86%)	198 (100%)	0	100	100
8	M	192/211 (91%)	192 (100%)	0	100	100
9	N	148/180 (82%)	148 (100%)	0	100	100
10	O	177/227 (78%)	177 (100%)	0	100	100
11	P	172/173 (99%)	172 (100%)	0	100	100
12	Q	164/171 (96%)	164 (100%)	0	100	100
13	R	153/201 (76%)	153 (100%)	0	100	100
14	S	174/198 (88%)	174 (100%)	0	100	100
15	T	175/214 (82%)	175 (100%)	0	100	100
16	A	308/372 (83%)	302 (98%)	6 (2%)	57	75
17	B	304/385 (79%)	297 (98%)	7 (2%)	50	70
18	D	333/366 (91%)	330 (99%)	3 (1%)	78	87
19	E	308/353 (87%)	302 (98%)	6 (2%)	57	75
20	F	312/379 (82%)	309 (99%)	3 (1%)	76	86
21	C	340/346 (98%)	336 (99%)	4 (1%)	71	83
22	U	685/816 (84%)	681 (99%)	4 (1%)	86	92
23	V	414/459 (90%)	412 (100%)	2 (0%)	88	93

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
24	W	416/416 (100%)	412 (99%)	4 (1%)	76	86
25	X	208/362 (58%)	207 (100%)	1 (0%)	88	93
26	Y	334/344 (97%)	332 (99%)	2 (1%)	86	92
27	Z	257/295 (87%)	255 (99%)	2 (1%)	81	89
28	a	333/336 (99%)	331 (99%)	2 (1%)	86	92
29	b	167/312 (54%)	167 (100%)	0	100	100
30	c	243/267 (91%)	239 (98%)	4 (2%)	62	79
31	d	231/293 (79%)	228 (99%)	3 (1%)	69	81
32	e	38/63 (60%)	37 (97%)	1 (3%)	46	66
All	All	8254/9627 (86%)	8179 (99%)	75 (1%)	79	87

All (75) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	f	15	ASP
1	f	33	VAL
1	f	301	ASP
1	f	334	ASN
1	f	339	LEU
1	f	342	LEU
1	f	371	CYS
1	f	391	LEU
1	f	526	THR
1	f	659	LEU
2	G	22	LEU
2	G	34	GLN
2	G	111	VAL
2	G	159	TYR
3	H	13	PHE
3	H	182	LEU
4	I	34	CYS
4	I	107	CYS
5	J	3	TYR
6	K	36	THR
6	K	42	THR
16	A	94	GLN
16	A	125	LEU
16	A	153	LEU
16	A	316	LYS

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Mol	Chain	Res	Type
16	A	331	LEU
16	A	344	SER
17	B	105	THR
17	B	235	LEU
17	B	307	ARG
17	B	316	LEU
17	B	348	ASP
17	B	355	LEU
17	B	436	GLU
18	D	186	THR
18	D	234	GLU
18	D	303	VAL
19	E	65	THR
19	E	87	LEU
19	E	104	THR
19	E	265	ASP
19	E	269	THR
19	E	358	ASP
20	F	88	TYR
20	F	270	ASP
20	F	427	VAL
21	C	109	THR
21	C	138	MET
21	C	298	ILE
21	C	311	ILE
22	U	336	GLU
22	U	479	LEU
22	U	554	LEU
22	U	895	PRO
23	V	224	LEU
23	V	255	LEU
24	W	250	ILE
24	W	371	THR
24	W	417	ARG
24	W	444	HIS
25	X	331	LEU
26	Y	315	THR
26	Y	352	GLU
27	Z	176	LEU
27	Z	186	THR
28	a	28	LEU
28	a	158	LEU

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Mol	Chain	Res	Type
30	c	194	HIS
30	c	229	LEU
30	c	273	LYS
30	c	309	PHE
31	d	158	ILE
31	d	190	LEU
31	d	193	GLU
32	e	43	TRP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (74) such sidechains are listed below:

Mol	Chain	Res	Type
1	f	246	HIS
1	f	269	GLN
1	f	293	ASN
1	f	491	GLN
1	f	565	ASN
2	G	53	GLN
2	G	100	ASN
4	I	95	GLN
4	I	109	GLN
4	I	119	GLN
6	K	23	GLN
6	K	97	GLN
6	K	164	GLN
7	L	166	GLN
7	L	190	HIS
9	N	187	GLN
11	P	33	GLN
12	Q	8	GLN
12	Q	99	HIS
13	R	29	GLN
13	R	85	ASN
15	T	2	GLN
15	T	69	GLN
16	A	414	ASN
17	B	157	HIS
17	B	314	ASN
18	D	57	GLN
18	D	137	ASN
18	D	286	GLN
18	D	301	GLN

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Mol	Chain	Res	Type
18	D	302	ASN
18	D	304	ASN
18	D	376	ASN
19	E	190	GLN
19	E	316	HIS
20	F	194	GLN
21	C	50	ASN
21	C	129	ASN
21	C	205	HIS
21	C	270	GLN
21	C	278	ASN
21	C	288	ASN
22	U	189	GLN
22	U	345	ASN
22	U	389	ASN
22	U	421	GLN
22	U	698	GLN
22	U	756	HIS
23	V	62	HIS
23	V	299	GLN
23	V	326	GLN
23	V	427	GLN
23	V	459	GLN
23	V	477	HIS
23	V	487	HIS
24	W	155	GLN
24	W	235	GLN
24	W	362	ASN
24	W	430	GLN
25	X	406	ASN
26	Y	136	HIS
26	Y	363	ASN
26	Y	378	ASN
27	Z	44	GLN
27	Z	102	HIS
27	Z	223	ASN
27	Z	224	HIS
28	a	23	HIS
28	a	257	GLN
28	a	273	GLN
28	a	290	GLN
28	a	337	GLN

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Mol	Chain	Res	Type
30	c	115	HIS
32	e	6	GLN

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](#)

Of 5 ligands modelled in this entry, 1 is monoatomic - leaving 4 for Mogul analysis.

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
33	ATP	D	501	-	26,33,33	0.92	1 (3%)	31,52,52	1.52	5 (16%)
33	ATP	F	501	-	26,33,33	0.94	1 (3%)	31,52,52	1.61	5 (16%)
33	ATP	A	501	-	26,33,33	0.92	1 (3%)	31,52,52	1.58	5 (16%)
33	ATP	E	401	-	26,33,33	0.93	1 (3%)	31,52,52	1.59	5 (16%)

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
33	ATP	D	501	-	-	2/18/38/38	0/3/3/3
33	ATP	F	501	-	-	4/18/38/38	0/3/3/3
33	ATP	A	501	-	-	1/18/38/38	0/3/3/3
33	ATP	E	401	-	-	2/18/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
33	F	501	ATP	C5-C4	2.50	1.47	1.40
33	E	401	ATP	C5-C4	2.50	1.47	1.40
33	A	501	ATP	C5-C4	2.48	1.47	1.40
33	D	501	ATP	C5-C4	2.45	1.47	1.40

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
33	F	501	ATP	PA-O3A-PB	-3.86	119.58	132.83
33	A	501	ATP	PA-O3A-PB	-3.75	119.95	132.83
33	E	401	ATP	PB-O3B-PG	-3.73	120.02	132.83
33	F	501	ATP	PB-O3B-PG	-3.61	120.44	132.83
33	E	401	ATP	C3'-C2'-C1'	3.61	106.41	100.98
33	A	501	ATP	PB-O3B-PG	-3.52	120.76	132.83
33	D	501	ATP	PB-O3B-PG	-3.48	120.89	132.83
33	D	501	ATP	PA-O3A-PB	-3.41	121.14	132.83
33	E	401	ATP	PA-O3A-PB	-3.32	121.44	132.83
33	D	501	ATP	N3-C2-N1	-3.27	123.56	128.68
33	F	501	ATP	N3-C2-N1	-3.22	123.65	128.68
33	A	501	ATP	N3-C2-N1	-3.18	123.71	128.68
33	F	501	ATP	C3'-C2'-C1'	3.17	105.75	100.98
33	E	401	ATP	N3-C2-N1	-3.14	123.77	128.68
33	A	501	ATP	C3'-C2'-C1'	3.00	105.49	100.98
33	D	501	ATP	C3'-C2'-C1'	2.95	105.42	100.98
33	A	501	ATP	C4-C5-N7	-2.82	106.46	109.40
33	D	501	ATP	C4-C5-N7	-2.77	106.52	109.40
33	F	501	ATP	C4-C5-N7	-2.75	106.54	109.40
33	E	401	ATP	C4-C5-N7	-2.54	106.75	109.40

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
33	F	501	ATP	C5'-O5'-PA-O1A

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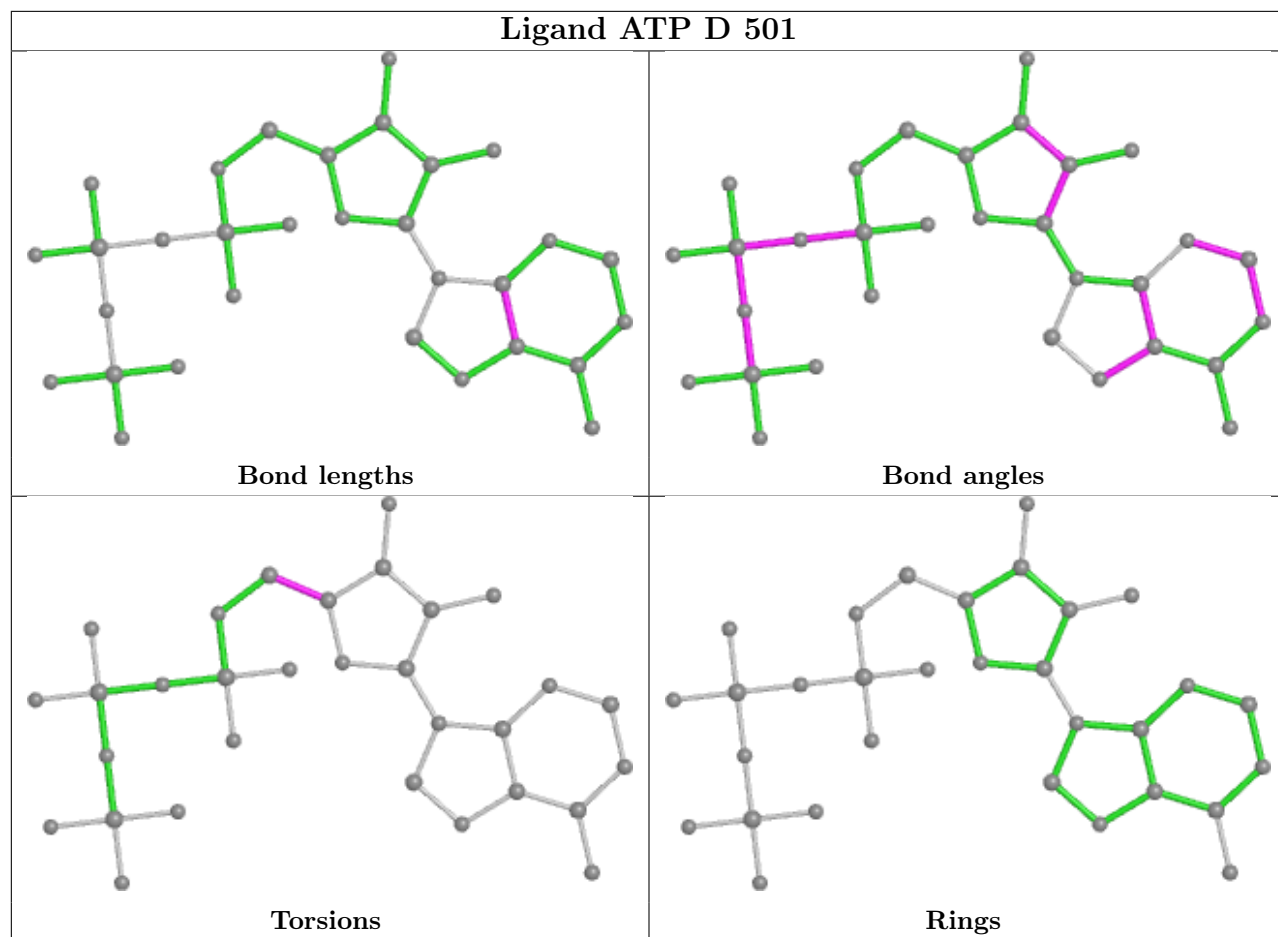
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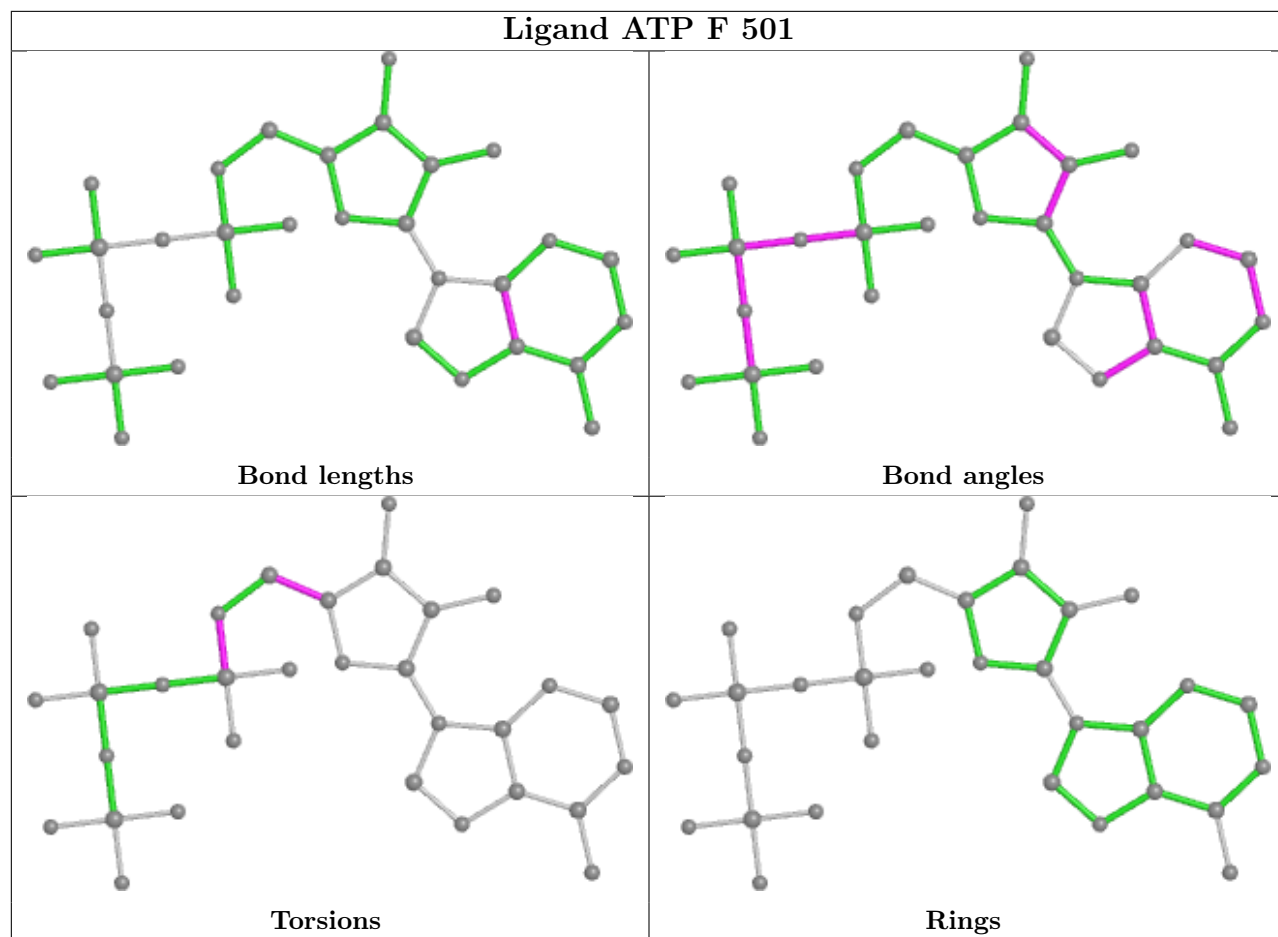
Mol	Chain	Res	Type	Atoms
33	F	501	ATP	C5'-O5'-PA-O3A
33	F	501	ATP	O4'-C4'-C5'-O5'
33	E	401	ATP	PB-O3A-PA-O1A
33	F	501	ATP	C3'-C4'-C5'-O5'
33	D	501	ATP	C3'-C4'-C5'-O5'
33	D	501	ATP	O4'-C4'-C5'-O5'
33	E	401	ATP	PB-O3A-PA-O2A
33	A	501	ATP	C5'-O5'-PA-O1A

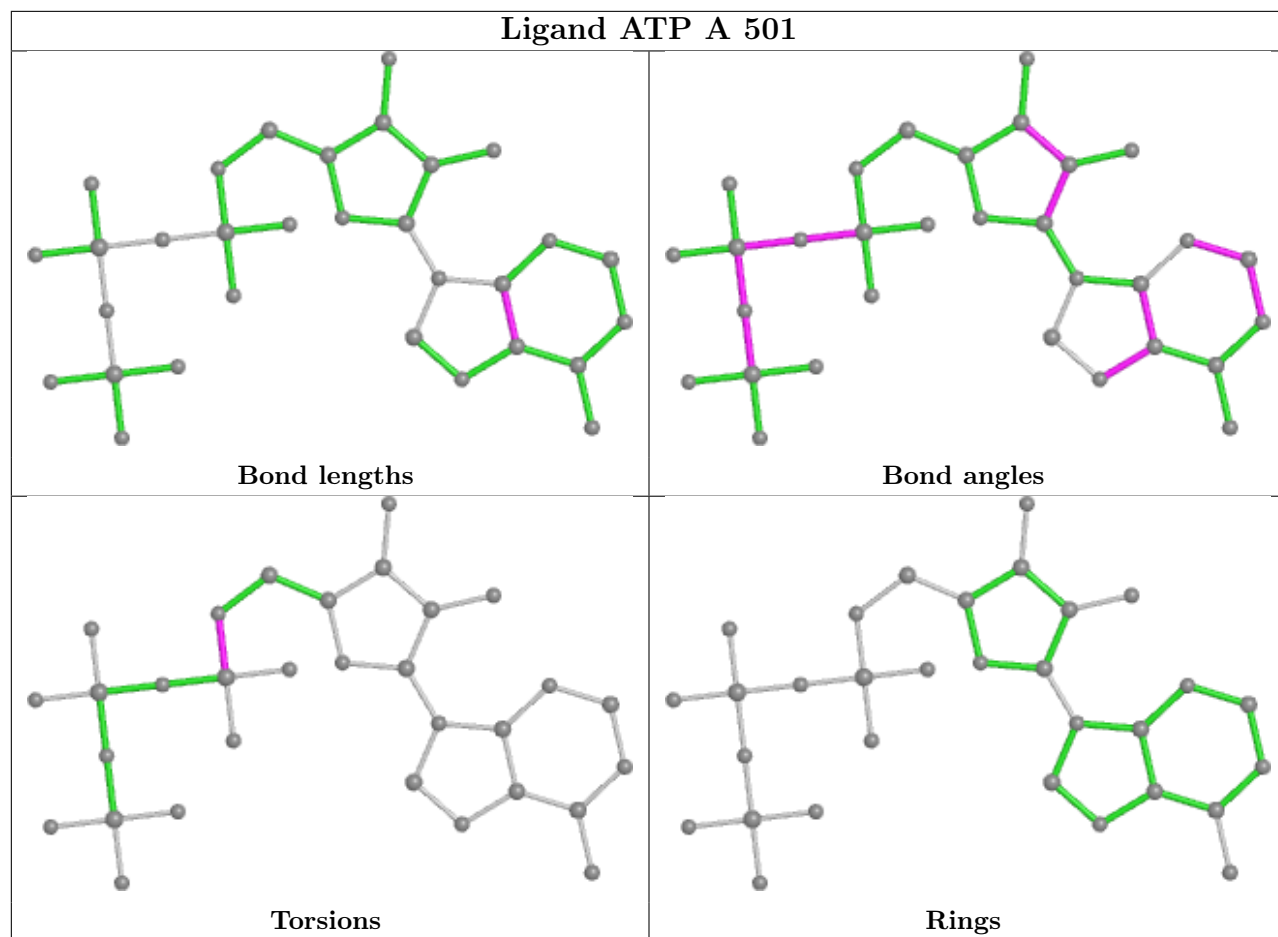
There are no ring outliers.

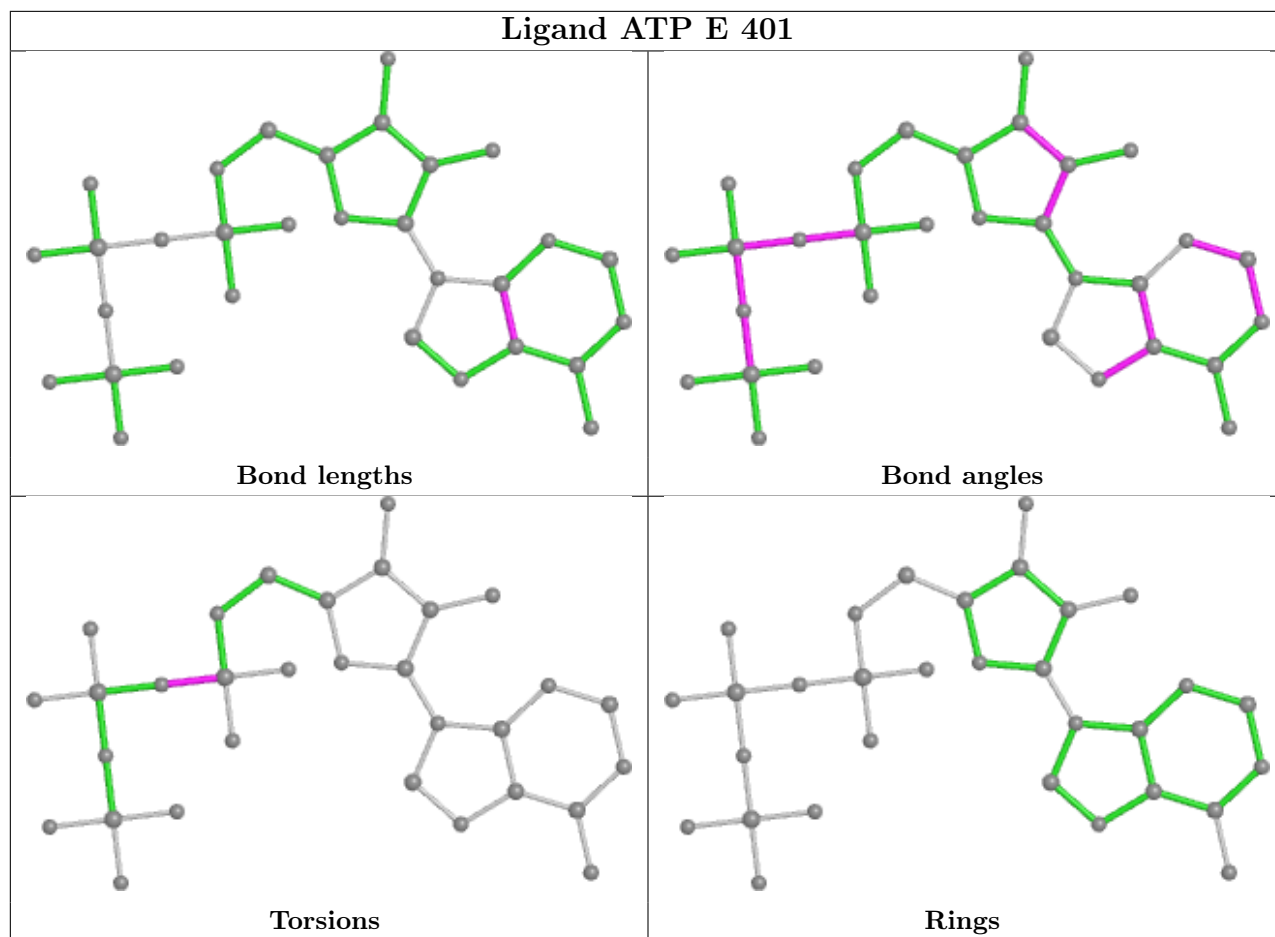
No monomer is involved in short contacts.

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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	f	3
17	B	1
19	E	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	f	110:ALA	C	111:LEU	N	8.87
1	f	79:ASN	C	80:TYR	N	7.82
1	f	348:ASP	C	349:SER	N	6.24

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Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	216:ILE	C	217:LYS	N	4.90
1	E	175:PRO	C	176:PRO	N	1.65

6 Map visualisation

This section contains visualisations of the EMDB entry EMD-8337. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

This section was not generated.

6.2 Central slices

This section was not generated.

6.3 Largest variance slices

This section was not generated.

6.4 Orthogonal surface views

This section was not generated.

6.5 Mask visualisation

This section was not generated. No masks/segmentation were deposited.

7 Map analysis

This section contains the results of statistical analysis of the map.

7.1 Map-value distribution

This section was not generated.

7.2 Volume estimate versus contour level

This section was not generated.

7.3 Rotationally averaged power spectrum

This section was not generated. The rotationally averaged power spectrum had issues being displayed.

8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit

This section was not generated.