



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 01:49 PM UTC

PDB ID : 3RYI / pdb_00003ryi
Title : GDP-Tubulin: rb3 stathmin-like domain complex
Authors : Nawrotek, A.; Knossow, M.; Gigant, B.
Deposited on : 2011-05-11
Resolution : 2.40 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

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:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

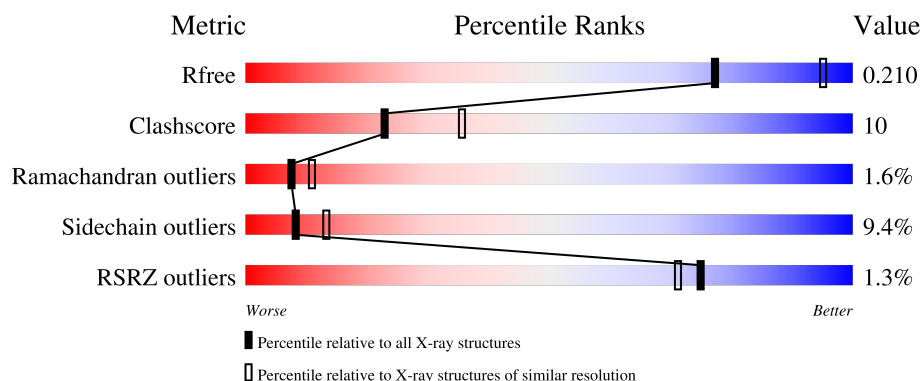
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	451	<div> <div></div> <div>76% 15% . .</div> </div>
1	C	451	<div> <div>%</div> <div>75% 16% . 5%</div> </div>
2	B	445	<div> <div>2%</div> <div>71% 21% . .</div> </div>
2	D	445	<div> <div>%</div> <div>73% 19% . .</div> </div>
3	E	143	<div> <div>3%</div> <div>64% 28% . . 5%</div> </div>

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 15541 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Tubulin alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	433	Total	C	N	O	S	0	1	0
			3389	2144	575	647	23			
1	C	429	Total	C	N	O	S	0	2	0
			3333	2112	565	633	23			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	232	SER	GLY	SEE REMARK 999	UNP D0VWZ0
A	340	SER	THR	SEE REMARK 999	UNP D0VWZ0
C	232	SER	GLY	SEE REMARK 999	UNP D0VWZ0
C	340	SER	THR	SEE REMARK 999	UNP D0VWZ0

- Molecule 2 is a protein called Tubulin beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	431	Total	C	N	O	S	0	7	0
			3428	2155	582	664	27			
2	D	431	Total	C	N	O	S	0	10	0
			3449	2163	588	672	26			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	317	THR	ALA	SEE REMARK 999	UNP D0VWY9
B	318	ILE	VAL	SEE REMARK 999	UNP D0VWY9
B	335	ILE	VAL	SEE REMARK 999	UNP D0VWY9
B	375	SER	ALA	SEE REMARK 999	UNP D0VWY9
D	317	THR	ALA	SEE REMARK 999	UNP D0VWY9
D	318	ILE	VAL	SEE REMARK 999	UNP D0VWY9
D	335	ILE	VAL	SEE REMARK 999	UNP D0VWY9
D	375	SER	ALA	SEE REMARK 999	UNP D0VWY9

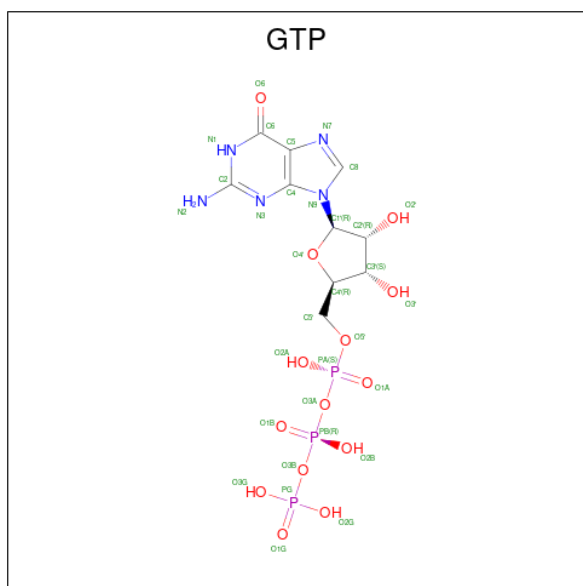
- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	136	Total	C	N	O	S	0	1	0
			1101	680	199	218	4			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	3	ACE	-	SEE REMARK 999	UNP P63043
E	4	ALA	-	SEE REMARK 999	UNP P63043
E	14	ALA	CYS	engineered mutation	UNP P63043
E	20	TRP	PHE	engineered mutation	UNP P63043

- Molecule 4 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			32	10	5	14	3		
4	C	1	Total	C	N	O	P	0	0
			32	10	5	14	3		

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Mg	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	1	Total	Mg	0	0
			1	1		

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



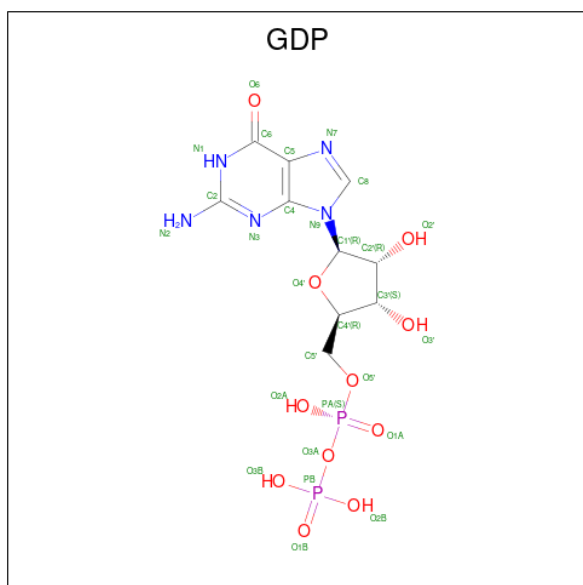
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	A	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	C	1	Total	O	S	0	0
			5	4	1		
6	C	1	Total	O	S	0	0
			5	4	1		
6	C	1	Total	O	S	0	0
			5	4	1		
6	D	1	Total	O	S	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	D	1	Total	O	S	0	0
			5	4	1		
6	E	1	Total	O	S	0	0
			5	4	1		

- Molecule 7 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	B	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
7	D	1	Total	C	N	O	P	0	0
			28	10	5	11	2		

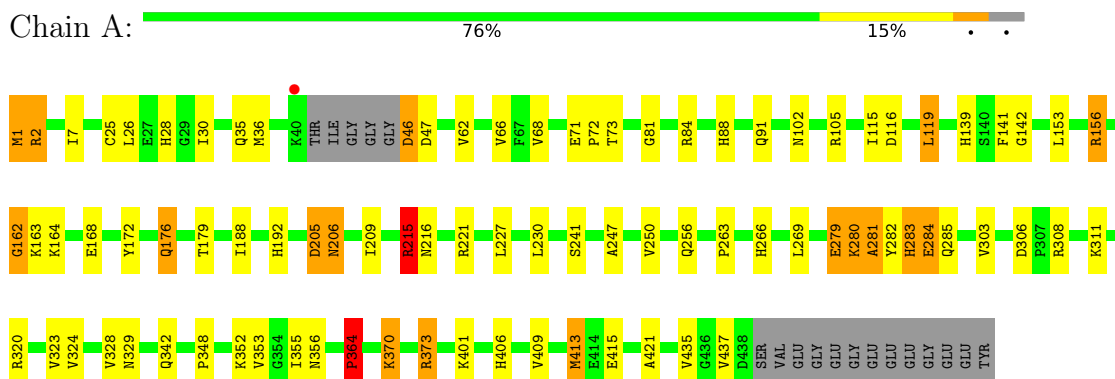
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	192	Total	O	0	0
			192	192		
8	B	128	Total	O	0	0
			128	128		
8	C	143	Total	O	0	0
			143	143		
8	D	161	Total	O	0	0
			161	161		
8	E	35	Total	O	0	0
			35	35		

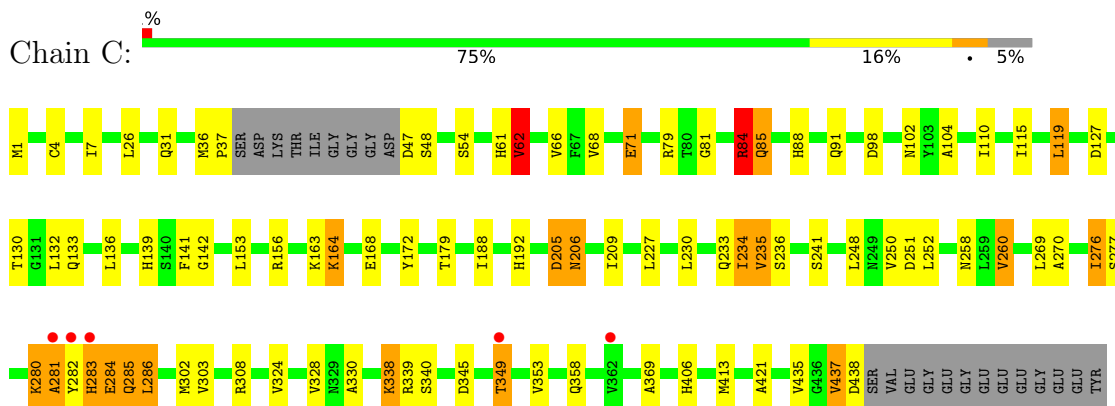
3 Residue-property plots

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

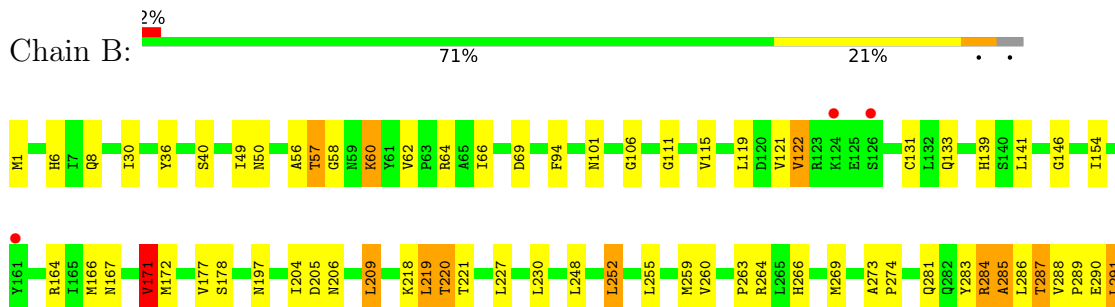
• Molecule 1: Tubulin alpha chain

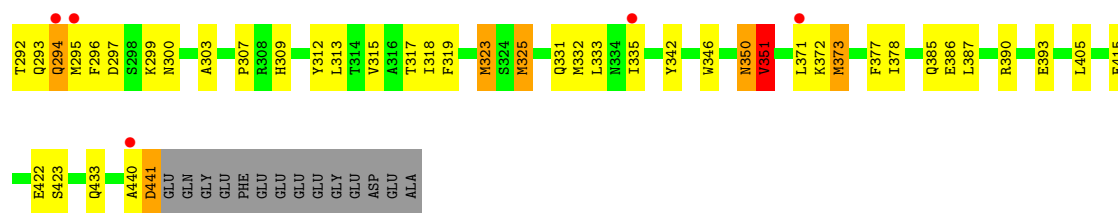


• Molecule 1: Tubulin alpha chain

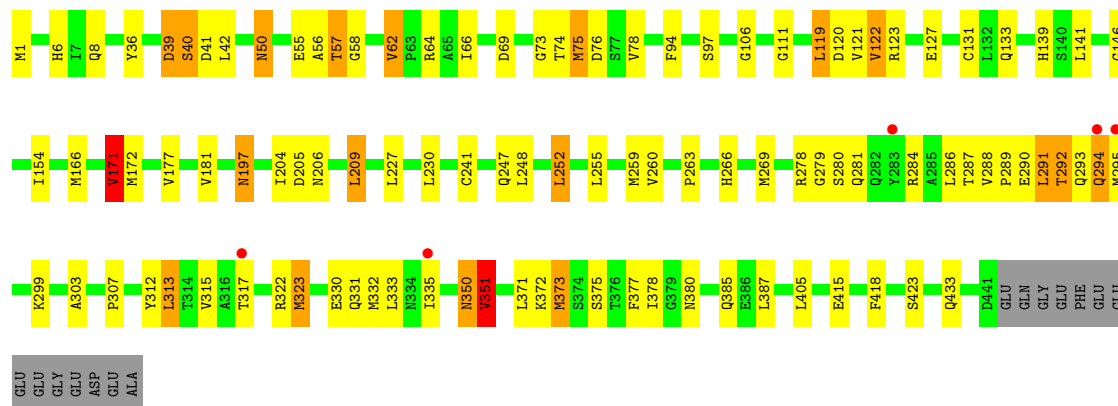
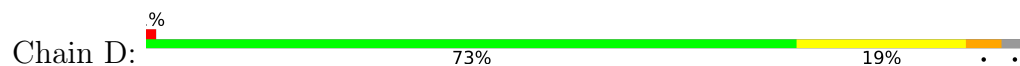


• Molecule 2: Tubulin beta chain

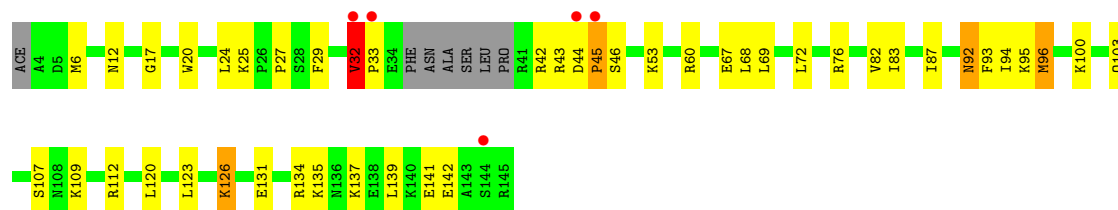




● Molecule 2: Tubulin beta chain



● Molecule 3: Stathmin-4



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	65.72Å 127.60Å 250.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.59 – 2.40 46.59 – 2.40	Depositor EDS
% Data completeness (in resolution range)	(Not available) (46.59-2.40) 97.9 (46.59-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.91 (at 2.39Å)	Xtriage
Refinement program	BUSTER 2.8.0	Depositor
R, R_{free}	0.167 , 0.201 0.177 , 0.210	Depositor DCC
R_{free} test set	4075 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	47.6	Xtriage
Anisotropy	0.677	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 65.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	15541	wwPDB-VP
Average B, all atoms (Å ²)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.23% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, GDP, MG, GTP

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	0.79	1/3464 (0.0%)	1.33	17/4702 (0.4%)
1	C	0.82	0/3413	1.35	21/4636 (0.5%)
2	B	0.79	0/3515	1.32	9/4761 (0.2%)
2	D	0.78	1/3531 (0.0%)	1.32	13/4782 (0.3%)
3	E	0.85	1/1116 (0.1%)	1.53	11/1488 (0.7%)
All	All	0.80	3/15039 (0.0%)	1.35	71/20369 (0.3%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	75	MET	SD-CE	-6.89	1.62	1.79
1	A	413	MET	SD-CE	-6.77	1.62	1.79
3	E	32	VAL	CA-C	5.76	1.58	1.52

All (71) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	142	GLY	N-CA-C	8.85	123.19	112.49
1	A	142	GLY	N-CA-C	8.82	123.16	112.49
1	C	48	SER	N-CA-C	8.54	121.66	111.33
1	C	260	VAL	N-CA-C	8.35	116.53	107.60
1	C	84	ARG	N-CA-C	-7.91	98.58	110.28
2	D	97	SER	N-CA-C	7.57	119.22	110.97
2	D	58	GLY	N-CA-C	-7.40	101.83	111.52
2	D	122	VAL	N-CA-CB	6.94	121.00	110.58
1	A	437	VAL	N-CA-C	6.94	117.95	112.12
3	E	109	LYS	CA-C-N	6.86	129.36	120.44
3	E	109	LYS	C-N-CA	6.86	129.36	120.44
2	B	171	VAL	N-CA-CB	6.70	118.64	111.00
2	D	171	VAL	N-CA-CB	6.52	118.44	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	352	LYS	N-CA-C	-6.50	98.14	108.73
1	C	205	ASP	CA-CB-CG	6.48	119.08	112.60
2	B	197	ASN	N-CA-C	6.25	121.84	113.72
2	D	197	ASN	N-CA-C	6.22	121.81	113.72
2	D	120	ASP	CA-CB-CG	6.20	118.80	112.60
1	A	162	GLY	CA-C-N	6.18	129.03	120.63
1	A	162	GLY	C-N-CA	6.18	129.03	120.63
1	A	205	ASP	CA-CB-CG	5.92	118.52	112.60
1	C	141	PHE	CA-C-N	5.92	126.39	119.94
1	C	141	PHE	C-N-CA	5.92	126.39	119.94
1	C	235	VAL	N-CA-CB	5.82	118.46	110.54
2	B	115	VAL	N-CA-C	5.76	116.41	110.36
1	C	110	ILE	CA-C-N	5.75	126.37	119.98
1	C	110	ILE	C-N-CA	5.75	126.37	119.98
1	A	81	GLY	CA-C-N	5.71	127.93	120.28
1	A	81	GLY	C-N-CA	5.71	127.93	120.28
3	E	17	GLY	N-CA-C	5.67	119.03	110.18
1	A	102	ASN	CA-CB-CG	5.66	118.26	112.60
1	A	364	PRO	N-CA-C	5.59	124.00	112.47
2	B	171	VAL	CB-CA-C	5.58	117.71	110.96
1	C	47	ASP	CA-C-N	5.58	128.03	120.38
1	C	47	ASP	C-N-CA	5.58	128.03	120.38
1	A	415	GLU	CA-C-N	5.52	127.04	120.14
1	A	415	GLU	C-N-CA	5.52	127.04	120.14
1	A	141	PHE	CA-C-N	5.50	125.93	119.94
1	A	141	PHE	C-N-CA	5.50	125.93	119.94
2	D	205	ASP	CA-CB-CG	5.48	118.08	112.60
2	D	351	VAL	N-CA-CB	5.46	118.35	111.46
2	B	351	VAL	N-CA-CB	5.40	118.26	111.46
2	D	171	VAL	CB-CA-C	5.37	117.45	110.96
2	B	205	ASP	CA-CB-CG	5.33	117.94	112.60
2	B	122	VAL	N-CA-CB	5.32	120.41	110.77
1	C	115	ILE	N-CA-C	5.30	115.51	110.42
1	C	260	VAL	CB-CA-C	5.28	117.25	111.18
3	E	131	GLU	CA-C-N	5.20	127.51	120.44
3	E	131	GLU	C-N-CA	5.20	127.51	120.44
1	C	102	ASN	CA-CB-CG	5.19	117.79	112.60
1	C	81	GLY	CA-C-N	5.18	127.22	120.28
1	C	81	GLY	C-N-CA	5.18	127.22	120.28
2	D	281	GLN	CA-C-N	5.16	130.98	121.70
2	D	281	GLN	C-N-CA	5.16	130.98	121.70
1	C	338	LYS	CA-C-N	5.16	127.91	120.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	338	LYS	C-N-CA	5.16	127.91	120.38
2	B	287	THR	CA-C-N	5.15	124.45	120.33
2	B	287	THR	C-N-CA	5.15	124.45	120.33
3	E	60	ARG	CA-C-N	5.10	127.07	120.44
3	E	60	ARG	C-N-CA	5.10	127.07	120.44
1	A	115	ILE	N-CA-C	5.09	115.31	110.42
2	D	76	ASP	N-CA-C	-5.08	105.44	111.69
3	E	43	ARG	CA-C-N	5.07	130.82	121.70
3	E	43	ARG	C-N-CA	5.07	130.82	121.70
1	A	1	MET	CA-C-N	5.06	131.20	121.54
1	A	1	MET	C-N-CA	5.06	131.20	121.54
1	C	62	VAL	N-CA-C	5.05	113.49	107.73
1	C	251	ASP	CA-CB-CG	5.03	117.63	112.60
3	E	103	GLN	CA-C-N	5.03	127.28	120.44
3	E	103	GLN	C-N-CA	5.03	127.28	120.44
2	D	313	LEU	N-CA-C	-5.01	105.28	111.40

There are no chirality outliers.

There are no planarity outliers.

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	3389	0	3292	74	0
1	C	3333	0	3236	63	0
2	B	3428	0	3279	96	0
2	D	3449	0	3304	65	0
3	E	1101	0	1083	21	0
4	A	32	0	12	1	0
4	C	32	0	12	1	0
5	A	1	0	0	0	0
5	C	1	0	0	0	0
6	A	25	0	0	0	0
6	B	5	0	0	0	0
6	C	15	0	0	0	0
6	D	10	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	E	5	0	0	0	0
7	B	28	0	12	2	0
7	D	28	0	12	2	0
8	A	192	0	0	3	0
8	B	128	0	0	5	0
8	C	143	0	0	5	0
8	D	161	0	0	2	0
8	E	35	0	0	2	0
All	All	15541	0	14242	302	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 10.

All (302) 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)
1:C:340:SER:HB2	8:C:609:HOH:O	1.42	1.18
1:C:281:ALA:HB1	1:C:282:TYR:C	1.68	1.18
1:A:46:ASP:N	1:A:47:ASP:HA	1.52	1.18
3:E:92:ASN:OD1	3:E:96:MET:HE1	1.52	1.09
1:C:281:ALA:HB1	1:C:282:TYR:CB	1.82	1.09
1:A:283:HIS:CB	1:A:284:GLU:OE2	2.02	1.08
1:A:119:LEU:HD21	1:A:156:ARG:HG2	1.38	1.05
2:D:241:CYS:HB2	8:D:647:HOH:O	1.53	1.04
1:A:71:GLU:OE2	1:A:73:THR:HB	1.60	1.01
2:B:317:THR:HG21	2:B:332:MET:HE2	1.40	1.00
1:C:281:ALA:HB1	1:C:282:TYR:CA	1.91	1.00
2:B:294[B]:GLN:HE21	2:B:294[B]:GLN:N	1.60	0.99
1:A:215:ARG:HD3	1:A:216:ASN:OD1	1.65	0.96
2:D:295[A]:MET:HG3	2:D:377[A]:PHE:HB2	1.45	0.96
8:A:461:HOH:O	2:B:440:ALA:HB1	1.67	0.94
2:B:219:LEU:O	2:B:220:THR:HG23	1.65	0.94
1:C:281:ALA:CB	1:C:282:TYR:CB	2.48	0.91
1:A:206:ASN:HD21	4:A:600:GTP:HN22	1.19	0.90
1:C:281:ALA:CB	1:C:282:TYR:C	2.45	0.90
1:A:284:GLU:CB	1:A:285:GLN:HA	2.01	0.89
2:B:346:TRP:HB3	2:B:440:ALA:HB3	1.55	0.89
1:C:206:ASN:HD21	4:C:600:GTP:HN22	1.21	0.87
1:C:286:LEU:H	1:C:286:LEU:HD12	1.38	0.87
2:D:206:ASN:HD21	7:D:600:GDP:HN22	1.18	0.87
1:A:71:GLU:HG2	1:A:72:PRO:HD2	1.56	0.87

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:206:ASN:HD21	7:B:600:GDP:HN22	1.16	0.86
1:A:71:GLU:OE2	1:A:73:THR:CB	2.25	0.85
1:C:234:ILE:HD13	1:C:302:MET:CE	2.07	0.84
1:C:234:ILE:HD13	1:C:302:MET:HE2	1.59	0.84
2:D:6:HIS:HE1	2:D:8:GLN:HE21	1.25	0.82
2:D:295[A]:MET:CG	2:D:377[A]:PHE:HB2	2.09	0.81
1:C:281:ALA:CA	1:C:282:TYR:CB	2.58	0.81
1:A:284:GLU:HB2	1:A:285:GLN:HA	1.63	0.80
2:B:292:THR:HB	2:B:335:ILE:HD11	1.62	0.79
1:A:46:ASP:N	1:A:47:ASP:CA	2.34	0.79
2:B:440:ALA:HA	2:B:441:ASP:C	2.09	0.77
1:C:308:ARG:HD2	8:C:609:HOH:O	1.86	0.76
1:A:280:LYS:O	1:A:281:ALA:HB2	1.84	0.75
2:B:294[A]:GLN:O	2:B:296[A]:PHE:N	2.20	0.74
1:A:119:LEU:CD2	1:A:156:ARG:HG2	2.14	0.74
2:B:219:LEU:O	2:B:220:THR:CG2	2.35	0.74
2:D:295[B]:MET:HE1	2:D:332:MET:HE1	1.69	0.74
1:A:401:LYS:NZ	2:B:440:ALA:HB2	2.03	0.74
1:C:281:ALA:CB	1:C:282:TYR:CA	2.66	0.73
1:A:280:LYS:O	1:A:281:ALA:CB	2.34	0.73
1:A:284:GLU:HB3	1:A:285:GLN:CA	2.18	0.73
3:E:92:ASN:OD1	3:E:96:MET:CE	2.34	0.72
2:B:292:THR:HB	2:B:335:ILE:CD1	2.19	0.72
1:A:284:GLU:CB	1:A:285:GLN:CA	2.65	0.72
2:B:56:ALA:HB3	2:B:60:LYS:HG3	1.72	0.72
1:A:329:ASN:HD21	3:E:20:TRP:HE1	1.38	0.72
3:E:92:ASN:O	3:E:96:MET:HE3	1.90	0.71
2:B:292:THR:CB	2:B:335:ILE:HD11	2.21	0.70
1:A:46:ASP:C	1:A:46:ASP:OD1	2.34	0.70
2:B:274:PRO:HB3	2:B:286:LEU:CD2	2.22	0.70
1:C:281:ALA:HA	1:C:282:TYR:CB	2.22	0.69
1:A:71:GLU:HG2	1:A:72:PRO:CD	2.23	0.69
2:B:317:THR:HG21	2:B:332:MET:CE	2.20	0.69
2:B:274:PRO:HB3	2:B:286:LEU:HD22	1.74	0.69
2:D:291:LEU:HG	2:D:375:SER:HB2	1.75	0.69
2:D:263:PRO:O	2:D:266:HIS:HD2	1.75	0.69
2:D:295[A]:MET:HG3	2:D:377[A]:PHE:CB	2.23	0.68
1:C:276:ILE:HG13	1:C:369:ALA:HB3	1.76	0.67
2:B:309:HIS:HD2	2:B:386:GLU:OE1	1.78	0.67
3:E:112:ARG:HD2	8:E:638:HOH:O	1.94	0.67
2:B:287:THR:HG23	2:B:289:PRO:HD2	1.77	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:215:ARG:CD	1:A:216:ASN:OD1	2.41	0.66
2:B:295[B]:MET:HE1	2:B:332:MET:HE1	1.78	0.66
2:B:294[B]:GLN:N	2:B:294[B]:GLN:NE2	2.39	0.66
2:B:30:ILE:HD11	2:B:49:ILE:HD11	1.78	0.65
1:A:279:GLU:CG	1:A:279:GLU:O	2.44	0.65
2:B:263:PRO:O	2:B:266:HIS:HD2	1.79	0.65
2:D:75:MET:CE	2:D:94:PHE:HB3	2.26	0.65
1:C:284:GLU:O	1:C:285:GLN:C	2.40	0.65
2:D:312:TYR:CE2	2:D:377[A]:PHE:HZ	2.14	0.65
2:B:1:MET:N	2:B:131:CYS:SG	2.65	0.64
2:D:332:MET:O	2:D:335:ILE:HG22	1.98	0.63
3:E:92:ASN:O	3:E:96:MET:CE	2.47	0.63
1:C:209:ILE:HD11	1:C:302:MET:HE3	1.80	0.63
2:B:6:HIS:HE1	2:B:8:GLN:HE21	1.47	0.63
1:A:1:MET:O	1:A:2:ARG:HB2	1.99	0.62
2:D:1:MET:N	2:D:131:CYS:SG	2.66	0.62
2:B:312:TYR:CE2	2:B:377[A]:PHE:HZ	2.17	0.62
2:B:293[B]:GLN:C	2:B:294[B]:GLN:HE21	2.08	0.61
2:B:6:HIS:HE1	2:B:8:GLN:HG3	1.65	0.61
2:B:167:ASN:ND2	8:B:590:HOH:O	2.33	0.61
1:C:282:TYR:O	1:C:284:GLU:N	2.34	0.61
2:D:6:HIS:CE1	2:D:8:GLN:HE21	2.13	0.61
1:A:283:HIS:CB	1:A:284:GLU:CD	2.74	0.61
1:C:132:LEU:O	1:C:164:LYS:NZ	2.28	0.61
1:A:263:PRO:O	1:A:266:HIS:HD2	1.85	0.60
2:B:6:HIS:CE1	2:B:8:GLN:HG3	2.35	0.60
1:A:26:LEU:HD21	1:A:364:PRO:HD3	1.84	0.60
2:D:75:MET:HE3	2:D:94:PHE:HB3	1.83	0.60
1:A:279:GLU:O	1:A:279:GLU:HG3	2.00	0.60
2:B:209:LEU:HB3	2:B:227:LEU:HG	1.82	0.60
2:B:66:ILE:HG12	2:B:121:VAL:HG12	1.84	0.60
2:B:219:LEU:O	2:B:220:THR:CB	2.50	0.60
2:D:323:MET:HE3	2:D:373:MET:HE3	1.84	0.60
1:A:119:LEU:HD21	1:A:156:ARG:CG	2.25	0.59
2:B:286:LEU:HA	2:B:290:GLU:OE1	2.02	0.59
2:B:106:GLY:O	2:B:111:GLY:HA3	2.03	0.58
1:C:54:SER:OG	1:C:62:VAL:HG13	2.02	0.58
1:C:282:TYR:C	1:C:284:GLU:H	2.11	0.58
2:D:317:THR:HG22	2:D:377[B]:PHE:HD1	1.68	0.58
3:E:32:VAL:HB	3:E:33:PRO:CD	2.33	0.58
2:B:294[B]:GLN:HE21	2:B:294[B]:GLN:CA	2.17	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:66:ILE:HG12	2:D:121:VAL:HG12	1.86	0.57
2:B:133:GLN:NE2	2:B:252:LEU:H	2.03	0.57
1:C:4[A]:CYS:SG	1:C:136:LEU:HG	2.45	0.57
2:D:56:ALA:HB2	2:D:62:VAL:HG12	1.85	0.57
1:C:281:ALA:CB	1:C:283:HIS:N	2.67	0.57
1:C:88:HIS:HB2	1:C:91:GLN:HE21	1.70	0.57
2:D:286:LEU:HD11	2:D:294[A]:GLN:HE22	1.69	0.57
1:A:88:HIS:HB2	1:A:91:GLN:HE21	1.70	0.56
1:C:282:TYR:C	1:C:284:GLU:N	2.62	0.56
2:D:106:GLY:O	2:D:111:GLY:HA3	2.05	0.56
2:D:133:GLN:NE2	2:D:252:LEU:H	2.04	0.56
3:E:32:VAL:HB	3:E:33:PRO:HD2	1.88	0.56
1:A:47:ASP:OD1	1:A:47:ASP:C	2.49	0.56
2:D:172:MET:HG3	2:D:387:LEU:HD11	1.88	0.55
2:B:323:MET:HE3	2:B:373:MET:HE3	1.88	0.55
1:A:328:VAL:HG11	1:A:353:VAL:HG11	1.87	0.55
2:B:50:ASN:O	2:B:64:ARG:NH2	2.31	0.55
1:C:84:ARG:O	1:C:85:GLN:HB2	2.06	0.55
1:A:156:ARG:CG	1:A:156:ARG:HH11	2.20	0.54
2:B:288:VAL:HG12	2:B:331:GLN:HG3	1.89	0.54
2:B:294[B]:GLN:NE2	2:B:294[B]:GLN:CA	2.70	0.54
1:C:281:ALA:HB3	1:C:283:HIS:N	2.22	0.54
1:A:348:PRO:HB3	3:E:27:PRO:HD3	1.90	0.54
2:B:172:MET:HG3	2:B:387:LEU:HD11	1.89	0.54
2:D:209:LEU:HB3	2:D:227:LEU:HG	1.90	0.54
1:C:36:MET:HG3	1:C:61:HIS:CD2	2.42	0.54
2:D:380:ASN:ND2	8:D:526:HOH:O	2.41	0.54
8:A:461:HOH:O	2:B:440:ALA:CB	2.38	0.53
1:A:116:ASP:OD1	1:A:156:ARG:NH2	2.41	0.53
2:B:346:TRP:HB3	2:B:440:ALA:CB	2.36	0.53
3:E:44:ASP:N	3:E:45:PRO:HA	2.22	0.53
2:B:296[B]:PHE:CE1	2:B:342:TYR:HB2	2.44	0.53
2:B:297[A]:ASP:HB3	2:B:300:ASN:HD22	1.74	0.53
1:C:209:ILE:HG23	1:C:230:LEU:HD23	1.90	0.52
2:B:101:ASN:HD22	1:C:258:ASN:HD21	1.57	0.52
1:A:209:ILE:HG23	1:A:230:LEU:HD23	1.92	0.52
2:B:164:ARG:NH1	8:B:650:HOH:O	2.41	0.52
2:D:69:ASP:HB2	2:D:75:MET:HE2	1.92	0.52
2:B:101:ASN:HA	8:B:603:HOH:O	2.09	0.52
2:B:56:ALA:HB3	2:B:60:LYS:CG	2.38	0.52
1:A:88:HIS:H	1:A:91:GLN:NE2	2.08	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:178:SER:OG	1:C:349:THR:HG21	2.10	0.52
2:D:350:ASN:HD22	2:D:350:ASN:H	1.58	0.51
2:B:315:VAL:HB	2:B:351:VAL:HB	1.93	0.51
1:C:88:HIS:H	1:C:91:GLN:NE2	2.09	0.51
2:D:75:MET:HE1	2:D:94:PHE:HB3	1.92	0.51
2:D:287:THR:N	2:D:290:GLU:OE1	2.24	0.51
1:A:284:GLU:HB3	1:A:285:GLN:C	2.35	0.51
2:D:288:VAL:N	2:D:289:PRO:HD2	2.25	0.51
2:D:39:ASP:O	2:D:40:SER:C	2.53	0.51
2:D:50:ASN:O	2:D:64:ARG:NH2	2.33	0.51
1:A:215:ARG:HD3	1:A:216:ASN:CG	2.34	0.51
2:B:350:ASN:H	2:B:350:ASN:HD22	1.59	0.51
1:A:311:LYS:HG2	1:A:342:GLN:HG2	1.93	0.50
2:B:6:HIS:CE1	2:B:8:GLN:HE21	2.28	0.50
1:A:215:ARG:HD3	1:A:216:ASN:N	2.25	0.50
2:B:284:ARG:O	2:B:285:ALA:HB2	2.11	0.50
2:D:119:LEU:O	2:D:123:ARG:HG3	2.11	0.50
2:D:315:VAL:HB	2:D:351:VAL:HB	1.93	0.50
2:B:335:ILE:HG13	8:B:618:HOH:O	2.10	0.50
1:C:209:ILE:HD11	1:C:302:MET:CE	2.40	0.50
1:A:401:LYS:HZ1	2:B:440:ALA:HB2	1.76	0.50
2:B:269:MET:HE1	2:B:307:PRO:HB3	1.93	0.50
1:A:329:ASN:HD21	3:E:20:TRP:NE1	2.06	0.49
2:B:206:ASN:HD21	7:B:600:GDP:N2	1.98	0.49
2:D:197:ASN:HD21	3:E:126:LYS:HE3	1.76	0.49
2:B:264:ARG:HH11	2:B:264:ARG:HB3	1.78	0.49
2:D:139:HIS:HD2	2:D:146:GLY:O	1.96	0.49
2:D:288:VAL:O	2:D:292:THR:CG2	2.60	0.49
2:B:293[A]:GLN:O	2:B:294[A]:GLN:C	2.53	0.49
2:B:139:HIS:HD2	2:B:146:GLY:O	1.96	0.49
2:B:164:ARG:HD2	8:B:650:HOH:O	2.13	0.49
2:D:269:MET:HE1	2:D:307:PRO:HB3	1.94	0.49
2:D:269:MET:HG3	2:D:303:ALA:HB3	1.95	0.48
1:A:279:GLU:O	1:A:279:GLU:OE2	2.31	0.48
1:C:345:ASP:OD2	1:C:438:ASP:HB3	2.13	0.48
1:A:241:SER:HB2	8:A:560:HOH:O	2.12	0.48
2:B:287:THR:CG2	2:B:289:PRO:HD2	2.43	0.48
2:D:36:TYR:OH	2:D:39:ASP:O	2.31	0.48
1:A:71:GLU:OE2	1:A:73:THR:OG1	2.31	0.48
1:A:323:VAL:CG2	1:A:373:ARG:HG3	2.43	0.48
1:A:323:VAL:HG22	1:A:373:ARG:HG3	1.96	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1:MET:N	1:C:130:THR:OG1	2.46	0.48
1:A:156:ARG:HH11	1:A:156:ARG:HG3	1.78	0.48
2:B:171:VAL:HA	2:B:204:ILE:O	2.14	0.48
2:B:274:PRO:HB3	2:B:286:LEU:HD21	1.94	0.48
1:A:401:LYS:HZ3	2:B:440:ALA:HB2	1.77	0.48
2:D:171:VAL:HA	2:D:204:ILE:O	2.14	0.47
2:B:133:GLN:HE22	2:B:252:LEU:H	1.62	0.47
1:C:88:HIS:H	1:C:91:GLN:HE21	1.63	0.47
1:A:282:TYR:O	1:A:283:HIS:O	2.31	0.47
2:D:292:THR:HG21	2:D:331:GLN:HB3	1.97	0.47
1:A:172:TYR:HB3	1:A:205:ASP:HA	1.96	0.47
1:A:281:ALA:O	1:A:282:TYR:C	2.58	0.47
2:B:269:MET:HG3	2:B:303:ALA:HB3	1.97	0.47
1:A:88:HIS:H	1:A:91:GLN:HE21	1.63	0.47
1:C:79:ARG:HD3	8:C:525:HOH:O	2.15	0.47
2:B:292:THR:HA	2:B:295[A]:MET:HE2	1.97	0.47
2:B:294[A]:GLN:O	2:B:295[A]:MET:C	2.58	0.47
1:C:406:HIS:CG	2:D:263:PRO:HD3	2.50	0.47
1:A:176:GLN:H	1:A:176:GLN:NE2	2.13	0.47
2:D:206:ASN:HD21	7:D:600:GDP:N2	2.00	0.47
2:D:286:LEU:HD11	2:D:294[A]:GLN:NE2	2.29	0.46
2:D:312:TYR:CE2	2:D:377[A]:PHE:CZ	3.00	0.46
1:C:233:GLN:NE2	8:C:575:HOH:O	2.48	0.46
3:E:27:PRO:HB2	3:E:29:PHE:O	2.15	0.46
3:E:96:MET:HE3	3:E:96:MET:HB2	1.83	0.46
2:B:390:ARG:O	2:B:393:GLU:HG2	2.15	0.46
2:D:74:THR:O	2:D:78:VAL:HG23	2.15	0.46
1:A:62:VAL:HG11	1:A:88:HIS:HD2	1.80	0.46
1:C:31:GLN:NE2	1:C:37:PRO:HG3	2.30	0.46
1:A:247:ALA:HB1	3:E:12:ASN:HB2	1.96	0.46
1:C:172:TYR:HB3	1:C:205:ASP:HA	1.97	0.46
2:D:405:LEU:HD21	2:D:415:GLU:HG2	1.98	0.45
2:B:56:ALA:CB	2:B:60:LYS:HE2	2.46	0.45
1:C:119:LEU:HD21	1:C:156:ARG:HB3	1.98	0.45
1:A:156:ARG:CG	1:A:156:ARG:NH1	2.78	0.45
2:B:219:LEU:O	2:B:220:THR:OG1	2.32	0.45
2:B:264:ARG:HH11	2:B:264:ARG:CB	2.29	0.45
1:C:284:GLU:O	1:C:286:LEU:N	2.50	0.45
1:C:283:HIS:O	1:C:284:GLU:CB	2.65	0.45
2:D:288:VAL:O	2:D:292:THR:HG22	2.17	0.45
1:A:139:HIS:HE1	1:A:168:GLU:OE1	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:GLN:H	1:A:176:GLN:HE21	1.65	0.44
2:B:385:GLN:HE22	2:B:433:GLN:HE21	1.65	0.44
2:D:133:GLN:HE22	2:D:252:LEU:H	1.63	0.44
2:D:292:THR:HA	2:D:295[A]:MET:HE2	1.98	0.44
2:B:292:THR:HG22	2:B:319:PHE:HZ	1.82	0.44
1:C:192:HIS:CG	1:C:421:ALA:HA	2.53	0.44
1:A:47:ASP:OD1	1:A:47:ASP:O	2.34	0.44
2:B:285:ALA:O	2:B:286:LEU:HB2	2.17	0.44
2:D:69:ASP:O	2:D:94:PHE:HA	2.18	0.44
1:C:139:HIS:HE1	1:C:168:GLU:OE1	1.99	0.44
2:D:69:ASP:CB	2:D:75:MET:HE2	2.48	0.44
2:D:317:THR:HG21	2:D:332:MET:HE1	1.99	0.44
1:A:355:ILE:HD11	3:E:20:TRP:HH2	1.82	0.44
1:C:205:ASP:HB3	1:C:303:VAL:HA	2.00	0.44
2:B:221:THR:HG21	1:C:330:ALA:HB2	2.00	0.44
2:B:295[A]:MET:CG	2:B:377[A]:PHE:HB2	2.48	0.44
2:D:415:GLU:O	2:D:418:PHE:HB2	2.17	0.44
2:B:36:TYR:OH	2:B:40:SER:O	2.35	0.43
2:B:273:ALA:CB	2:B:294[B]:GLN:HG3	2.48	0.43
2:D:56:ALA:O	2:D:57:THR:C	2.60	0.43
2:D:385:GLN:HE22	2:D:433:GLN:HE21	1.64	0.43
3:E:112:ARG:CD	8:E:638:HOH:O	2.62	0.43
2:B:318:ILE:HD11	2:B:378:ILE:HD12	2.00	0.43
2:B:295[A]:MET:HG3	2:B:377[A]:PHE:HB2	1.99	0.43
2:D:278:ARG:C	2:D:280:SER:H	2.26	0.43
2:D:286:LEU:HD22	2:D:290:GLU:HB3	2.00	0.43
2:D:154:ILE:HG23	2:D:166:MET:HG2	2.00	0.43
1:A:370:LYS:H	1:A:370:LYS:HD3	1.84	0.43
2:B:292:THR:HG22	2:B:319:PHE:CZ	2.54	0.43
1:C:438:ASP:C	8:C:655:HOH:O	2.61	0.43
2:B:30:ILE:CD1	2:B:49:ILE:HD11	2.48	0.43
1:C:163:LYS:NZ	3:E:93:PHE:HB2	2.33	0.43
1:A:71:GLU:HG2	1:A:72:PRO:N	2.34	0.42
2:B:69:ASP:O	2:B:94:PHE:HA	2.19	0.42
1:C:163:LYS:HZ2	3:E:93:PHE:HB2	1.83	0.42
2:D:295[B]:MET:HE2	2:D:295[B]:MET:HB2	1.64	0.42
1:C:328:VAL:HG11	1:C:353:VAL:HG11	2.01	0.42
3:E:92:ASN:CG	3:E:96:MET:HE1	2.36	0.42
1:A:323:VAL:HG22	1:A:373:ARG:CG	2.50	0.42
2:B:154:ILE:HG23	2:B:166:MET:HG2	2.02	0.42
2:D:123:ARG:O	2:D:127:GLU:HG2	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:209:ILE:CD1	1:C:302:MET:CE	2.98	0.42
2:D:40:SER:O	2:D:42:LEU:N	2.52	0.42
1:C:104:ALA:HB2	1:C:413:MET:SD	2.60	0.42
1:A:25:CYS:HB3	1:A:30:ILE:O	2.20	0.41
1:A:28:HIS:O	1:A:36:MET:HE3	2.20	0.41
2:B:259:MET:HE2	2:B:378:ILE:HG22	2.02	0.41
1:C:7:ILE:HG23	1:C:66:VAL:HG13	2.03	0.41
2:D:259:MET:HE2	2:D:378:ILE:HG22	2.02	0.41
1:A:221:ARG:HG2	2:B:325:MET:HB3	2.02	0.41
1:C:234:ILE:HD13	1:C:302:MET:HE1	1.97	0.41
1:C:280:LYS:O	1:C:281:ALA:O	2.39	0.41
2:B:291:LEU:O	2:B:295[A]:MET:HB3	2.21	0.41
1:C:286:LEU:H	1:C:286:LEU:CD1	2.17	0.41
2:B:405:LEU:HD21	2:B:415:GLU:HG2	2.02	0.41
1:A:282:TYR:C	1:A:283:HIS:O	2.63	0.41
1:A:192:HIS:CG	1:A:421:ALA:HA	2.56	0.41
1:A:409:VAL:HA	1:A:413:MET:O	2.21	0.41
2:B:288:VAL:HB	2:B:289:PRO:HD3	2.02	0.41
2:B:295[B]:MET:HE2	2:B:315:VAL:HG11	2.03	0.41
1:C:62:VAL:HG21	1:C:88:HIS:HD2	1.86	0.41
1:C:437:VAL:HG23	1:C:438:ASP:N	2.35	0.41
2:D:39:ASP:HB2	2:D:40:SER:H	1.75	0.41
1:C:71:GLU:HB2	1:C:98:ASP:HB3	2.02	0.41
1:C:133:GLN:HE22	1:C:252:LEU:H	1.68	0.41
3:E:83:ILE:O	3:E:87:ILE:HG12	2.21	0.41
1:A:205:ASP:HB3	1:A:303:VAL:HA	2.03	0.40
1:C:270:ALA:O	1:C:302:MET:HG2	2.21	0.40
1:A:7:ILE:HG23	1:A:66:VAL:HG13	2.04	0.40
1:A:306:ASP:OD1	1:A:308:ARG:HB2	2.20	0.40
2:B:293[A]:GLN:O	2:B:294[A]:GLN:O	2.40	0.40
1:A:406:HIS:CG	2:B:263:PRO:HD3	2.56	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	430/451 (95%)	404 (94%)	19 (4%)	7 (2%)	7	11
1	C	427/451 (95%)	407 (95%)	14 (3%)	6 (1%)	9	13
2	B	436/445 (98%)	415 (95%)	14 (3%)	7 (2%)	7	11
2	D	439/445 (99%)	420 (96%)	14 (3%)	5 (1%)	11	18
3	E	133/143 (93%)	121 (91%)	8 (6%)	4 (3%)	3	3
All	All	1865/1935 (96%)	1767 (95%)	69 (4%)	29 (2%)	7	11

All (29) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2	ARG
1	A	281	ALA
2	B	60	LYS
2	B	220	THR
2	B	284	ARG
1	C	280	LYS
1	C	281	ALA
1	C	285	GLN
2	D	41	ASP
3	E	32	VAL
1	A	162	GLY
1	A	164	LYS
1	A	283	HIS
2	B	58	GLY
2	B	281	GLN
2	B	285	ALA
1	C	283	HIS
1	C	284	GLU
2	D	40	SER
3	E	6	MET
1	A	215	ARG
1	C	85	GLN
3	E	42	ARG
2	B	57	THR
2	D	57	THR
2	D	73	GLY
2	D	279	GLY
1	A	364	PRO
3	E	45	PRO

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	365/379 (96%)	338 (93%)	27 (7%)	13	22
1	C	357/379 (94%)	326 (91%)	31 (9%)	9	16
2	B	375/385 (97%)	343 (92%)	32 (8%)	10	16
2	D	379/385 (98%)	343 (90%)	36 (10%)	8	13
3	E	114/125 (91%)	89 (78%)	25 (22%)	1	1
All	All	1590/1653 (96%)	1439 (90%)	151 (10%)	8	13

All (151) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	35	GLN
1	A	46	ASP
1	A	68	VAL
1	A	84	ARG
1	A	105	ARG
1	A	119	LEU
1	A	153	LEU
1	A	156	ARG
1	A	163	LYS
1	A	176	GLN
1	A	179	THR
1	A	188	ILE
1	A	206	ASN
1	A	215	ARG
1	A	227	LEU
1	A	250	VAL
1	A	256	GLN
1	A	269	LEU
1	A	279	GLU
1	A	280	LYS
1	A	284	GLU
1	A	320	ARG
1	A	324	VAL

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Mol	Chain	Res	Type
1	A	356	ASN
1	A	370	LYS
1	A	373	ARG
1	A	435	VAL
2	B	57	THR
2	B	62	VAL
2	B	119	LEU
2	B	122	VAL
2	B	141	LEU
2	B	171	VAL
2	B	177	VAL
2	B	209	LEU
2	B	218	LYS
2	B	219	LEU
2	B	230	LEU
2	B	248	LEU
2	B	252	LEU
2	B	255	LEU
2	B	260	VAL
2	B	283	TYR
2	B	291	LEU
2	B	294[A]	GLN
2	B	294[B]	GLN
2	B	299	LYS
2	B	313	LEU
2	B	323	MET
2	B	325	MET
2	B	333	LEU
2	B	350	ASN
2	B	351	VAL
2	B	371	LEU
2	B	372	LYS
2	B	373	MET
2	B	422	GLU
2	B	423	SER
2	B	441	ASP
1	C	26	LEU
1	C	62	VAL
1	C	68	VAL
1	C	71	GLU
1	C	84	ARG
1	C	119	LEU

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Mol	Chain	Res	Type
1	C	127	ASP
1	C	153	LEU
1	C	164	LYS
1	C	179	THR
1	C	188	ILE
1	C	206	ASN
1	C	227	LEU
1	C	234	ILE
1	C	235	VAL
1	C	236	SER
1	C	241	SER
1	C	248	LEU
1	C	250	VAL
1	C	260	VAL
1	C	269	LEU
1	C	276	ILE
1	C	277	SER
1	C	286	LEU
1	C	324	VAL
1	C	338	LYS
1	C	339	ARG
1	C	349	THR
1	C	358	GLN
1	C	435	VAL
1	C	437	VAL
2	D	39	ASP
2	D	50	ASN
2	D	55	GLU
2	D	62	VAL
2	D	119	LEU
2	D	122	VAL
2	D	141	LEU
2	D	171	VAL
2	D	177	VAL
2	D	181	VAL
2	D	209	LEU
2	D	230	LEU
2	D	247	GLN
2	D	248	LEU
2	D	252	LEU
2	D	255	LEU
2	D	260	VAL

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Mol	Chain	Res	Type
2	D	284	ARG
2	D	291	LEU
2	D	292	THR
2	D	293[A]	GLN
2	D	293[B]	GLN
2	D	294[A]	GLN
2	D	294[B]	GLN
2	D	299	LYS
2	D	313	LEU
2	D	322	ARG
2	D	323	MET
2	D	330	GLU
2	D	333	LEU
2	D	350	ASN
2	D	351	VAL
2	D	371	LEU
2	D	372	LYS
2	D	373	MET
2	D	423	SER
3	E	24	LEU
3	E	25	LYS
3	E	46	SER
3	E	53	LYS
3	E	67	GLU
3	E	68	LEU
3	E	69	LEU
3	E	72	LEU
3	E	76	ARG
3	E	82	VAL
3	E	92	ASN
3	E	94	ILE
3	E	95	LYS
3	E	96	MET
3	E	100	LYS
3	E	107	SER
3	E	120	LEU
3	E	123	LEU
3	E	126	LYS
3	E	134	ARG
3	E	135	LYS
3	E	137	LYS
3	E	139	LEU

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Mol	Chain	Res	Type
3	E	141	GLU
3	E	142	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (71) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	8	HIS
1	A	11	GLN
1	A	35	GLN
1	A	88	HIS
1	A	91	GLN
1	A	139	HIS
1	A	176	GLN
1	A	206	ASN
1	A	249	ASN
1	A	256	GLN
1	A	258	ASN
1	A	266	HIS
1	A	301	GLN
1	A	329	ASN
1	A	356	ASN
1	A	380	ASN
1	A	393	HIS
2	B	6	HIS
2	B	8	GLN
2	B	14	ASN
2	B	43	GLN
2	B	50	ASN
2	B	101	ASN
2	B	133	GLN
2	B	139	HIS
2	B	206	ASN
2	B	229	HIS
2	B	266	HIS
2	B	300	ASN
2	B	309	HIS
2	B	350	ASN
2	B	380	ASN
2	B	433	GLN
2	B	436	GLN
1	C	8	HIS
1	C	11	GLN

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Mol	Chain	Res	Type
1	C	31	GLN
1	C	50	ASN
1	C	88	HIS
1	C	91	GLN
1	C	107	HIS
1	C	133	GLN
1	C	139	HIS
1	C	197	HIS
1	C	206	ASN
1	C	233	GLN
1	C	300	ASN
1	C	301	GLN
1	C	329	ASN
1	C	358	GLN
1	C	380	ASN
2	D	6	HIS
2	D	8	GLN
2	D	14	ASN
2	D	15	GLN
2	D	91	ASN
2	D	101	ASN
2	D	133	GLN
2	D	139	HIS
2	D	197	ASN
2	D	206	ASN
2	D	266	HIS
2	D	300	ASN
2	D	331	GLN
2	D	349	ASN
2	D	350	ASN
2	D	380	ASN
2	D	433	GLN
3	E	51	GLN
3	E	78	HIS
3	E	111	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 18 ligands modelled in this entry, 2 are monoatomic - leaving 16 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$
6	SO4	D	457	-	4,4,4	0.34	0	6,6,6	0.14	0
4	GTP	A	600	5	33,34,34	1.22	4 (12%)	50,54,54	1.51	5 (10%)
6	SO4	A	452	-	4,4,4	0.27	0	6,6,6	0.13	0
6	SO4	C	452	-	4,4,4	0.23	0	6,6,6	0.10	0
6	SO4	B	456	-	4,4,4	0.26	0	6,6,6	0.22	0
6	SO4	A	456	-	4,4,4	0.24	0	6,6,6	0.11	0
7	GDP	B	600	-	29,30,30	1.06	1 (3%)	45,47,47	1.65	5 (11%)
6	SO4	A	455	-	4,4,4	0.27	0	6,6,6	0.11	0
6	SO4	C	454	-	4,4,4	0.23	0	6,6,6	0.08	0
7	GDP	D	600	-	29,30,30	1.05	2 (6%)	45,47,47	1.57	8 (17%)
6	SO4	A	454	-	4,4,4	0.29	0	6,6,6	0.19	0
4	GTP	C	600	5	33,34,34	1.37	4 (12%)	50,54,54	1.55	6 (12%)
6	SO4	A	453	-	4,4,4	0.30	0	6,6,6	0.12	0
6	SO4	C	453	-	4,4,4	0.29	0	6,6,6	0.12	0
6	SO4	D	456	-	4,4,4	0.30	0	6,6,6	0.11	0
6	SO4	E	146	-	4,4,4	0.22	0	6,6,6	0.12	0

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	GDP	B	600	-	-	5/16/32/32	0/3/3/3
4	GTP	C	600	5	-	7/22/38/38	0/3/3/3
4	GTP	A	600	5	-	6/22/38/38	0/3/3/3
7	GDP	D	600	-	-	5/16/32/32	0/3/3/3

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	600	GTP	PB-O3B	4.42	1.64	1.59
7	B	600	GDP	PA-O3A	3.93	1.63	1.59
4	A	600	GTP	PB-O3B	3.16	1.62	1.59
4	A	600	GTP	PA-O3A	2.93	1.62	1.59
4	C	600	GTP	PA-O3A	2.26	1.61	1.59
4	A	600	GTP	C5-C4	2.25	1.44	1.38
7	D	600	GDP	PB-O2B	2.25	1.63	1.54
4	A	600	GTP	PA-O5'	2.24	1.68	1.59
4	C	600	GTP	PA-O2A	2.17	1.65	1.55
7	D	600	GDP	C6-N1	-2.13	1.34	1.38
4	C	600	GTP	C5-C4	2.10	1.44	1.38

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	600	GDP	C2-N3-C4	4.68	120.37	112.30
7	B	600	GDP	C5-C4-N3	-4.57	121.12	128.39
4	C	600	GTP	C2-N3-C4	4.42	119.92	112.30
4	A	600	GTP	C2-N3-C4	4.17	119.47	112.30
7	D	600	GDP	C5-C4-N3	-4.12	121.83	128.39
4	C	600	GTP	C5-C4-N3	-3.97	122.06	128.39
7	D	600	GDP	C2-N3-C4	3.79	118.83	112.30
4	A	600	GTP	C5-C4-N3	-3.74	122.44	128.39
7	B	600	GDP	N9-C4-N3	3.68	133.30	125.95
4	A	600	GTP	O2B-PB-O3A	3.60	117.00	107.27
4	C	600	GTP	N9-C4-N3	3.47	132.90	125.95
4	C	600	GTP	O2B-PB-O3A	3.45	116.61	107.27
7	D	600	GDP	N9-C4-N3	3.45	132.85	125.95
4	A	600	GTP	N9-C4-N3	3.40	132.76	125.95
4	A	600	GTP	C6-C5-N7	2.91	135.58	130.29
7	B	600	GDP	C6-C5-N7	2.79	135.37	130.29
4	C	600	GTP	C6-C5-N7	2.72	135.25	130.29
7	D	600	GDP	O2B-PB-O3A	2.43	112.78	104.64
7	D	600	GDP	O3B-PB-O2B	-2.41	98.78	107.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	D	600	GDP	O4'-C1'-N9	-2.30	103.15	108.36
7	D	600	GDP	O4'-C1'-C2'	-2.20	101.91	106.62
7	B	600	GDP	O3B-PB-O2B	2.18	115.98	107.80
4	C	600	GTP	C8-N7-C5	2.14	108.08	104.26
7	D	600	GDP	C2-N1-C6	-2.05	121.40	125.11

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	600	GTP	C5'-O5'-PA-O3A
4	A	600	GTP	C5'-O5'-PA-O1A
4	A	600	GTP	C5'-O5'-PA-O2A
4	C	600	GTP	C5'-O5'-PA-O3A
4	C	600	GTP	C5'-O5'-PA-O1A
4	C	600	GTP	C5'-O5'-PA-O2A
7	B	600	GDP	C5'-O5'-PA-O3A
7	B	600	GDP	C5'-O5'-PA-O1A
7	D	600	GDP	C5'-O5'-PA-O3A
7	D	600	GDP	C5'-O5'-PA-O1A
4	C	600	GTP	PB-O3B-PG-O3G
7	B	600	GDP	C5'-O5'-PA-O2A
7	D	600	GDP	C5'-O5'-PA-O2A
4	A	600	GTP	PB-O3A-PA-O2A
4	C	600	GTP	PB-O3A-PA-O2A
7	B	600	GDP	PB-O3A-PA-O2A
4	A	600	GTP	PB-O3B-PG-O1G
4	C	600	GTP	PB-O3B-PG-O1G
4	A	600	GTP	PB-O3B-PG-O3G
7	B	600	GDP	PB-O3A-PA-O1A
7	D	600	GDP	PB-O3A-PA-O1A
7	D	600	GDP	PB-O3A-PA-O2A
4	C	600	GTP	PB-O3A-PA-O1A

There are no ring outliers.

4 monomers are involved in 6 short contacts:

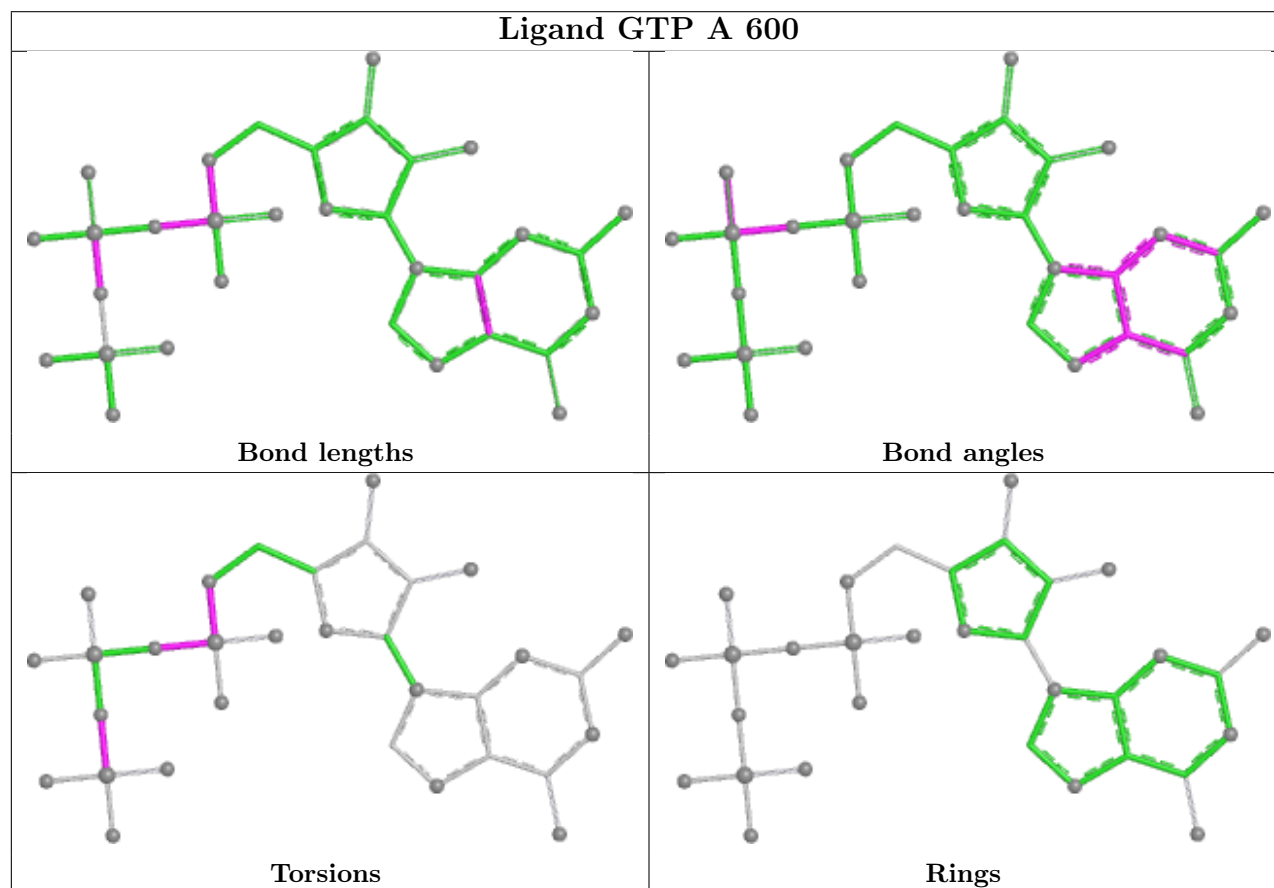
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	600	GTP	1	0
7	B	600	GDP	2	0
7	D	600	GDP	2	0

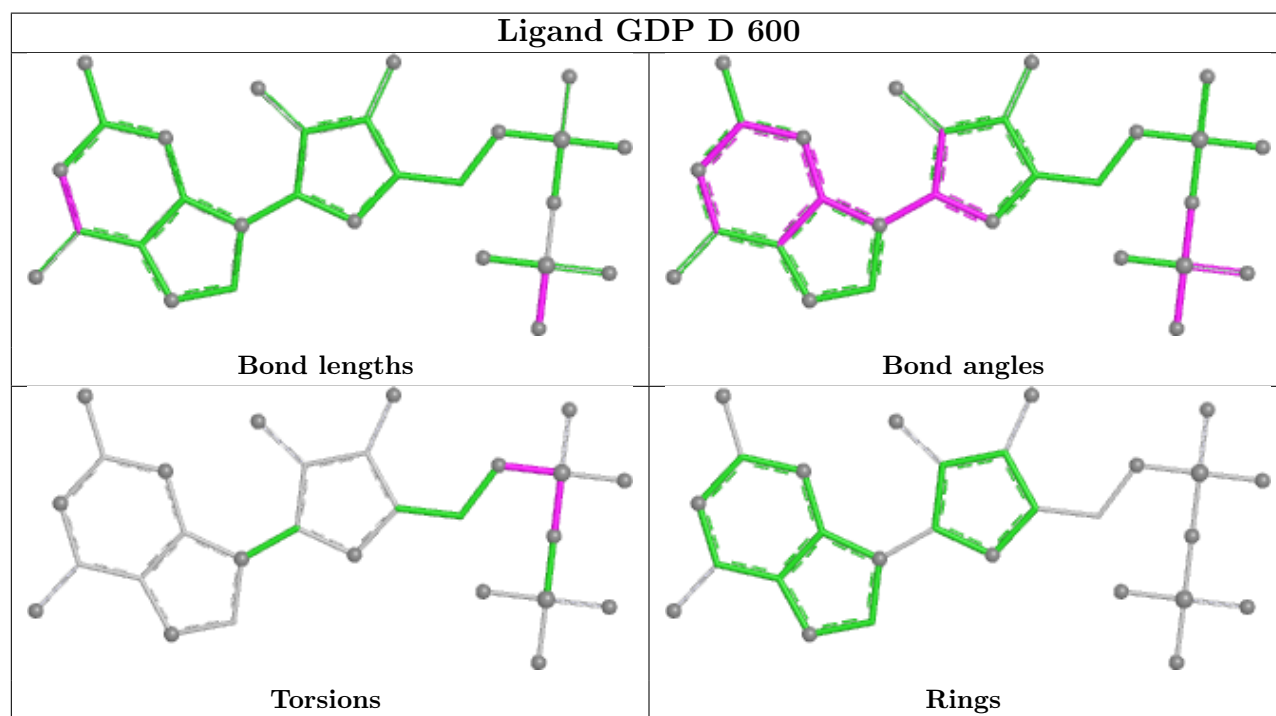
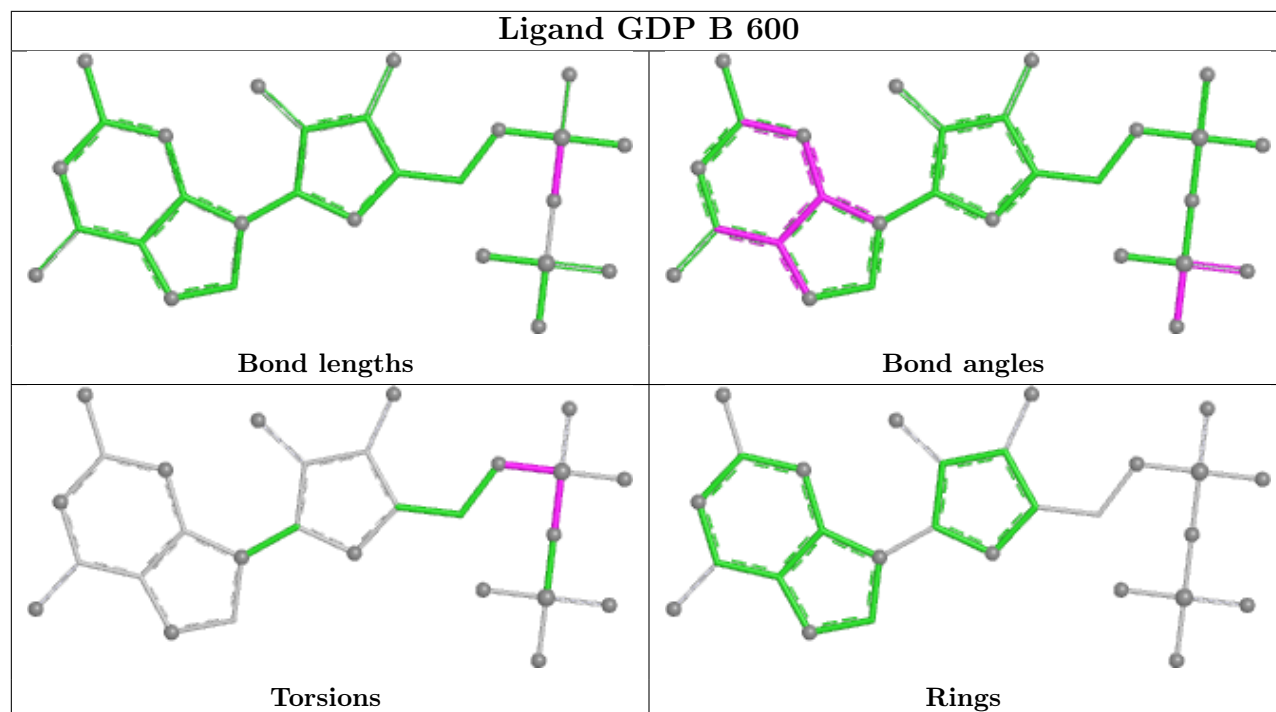
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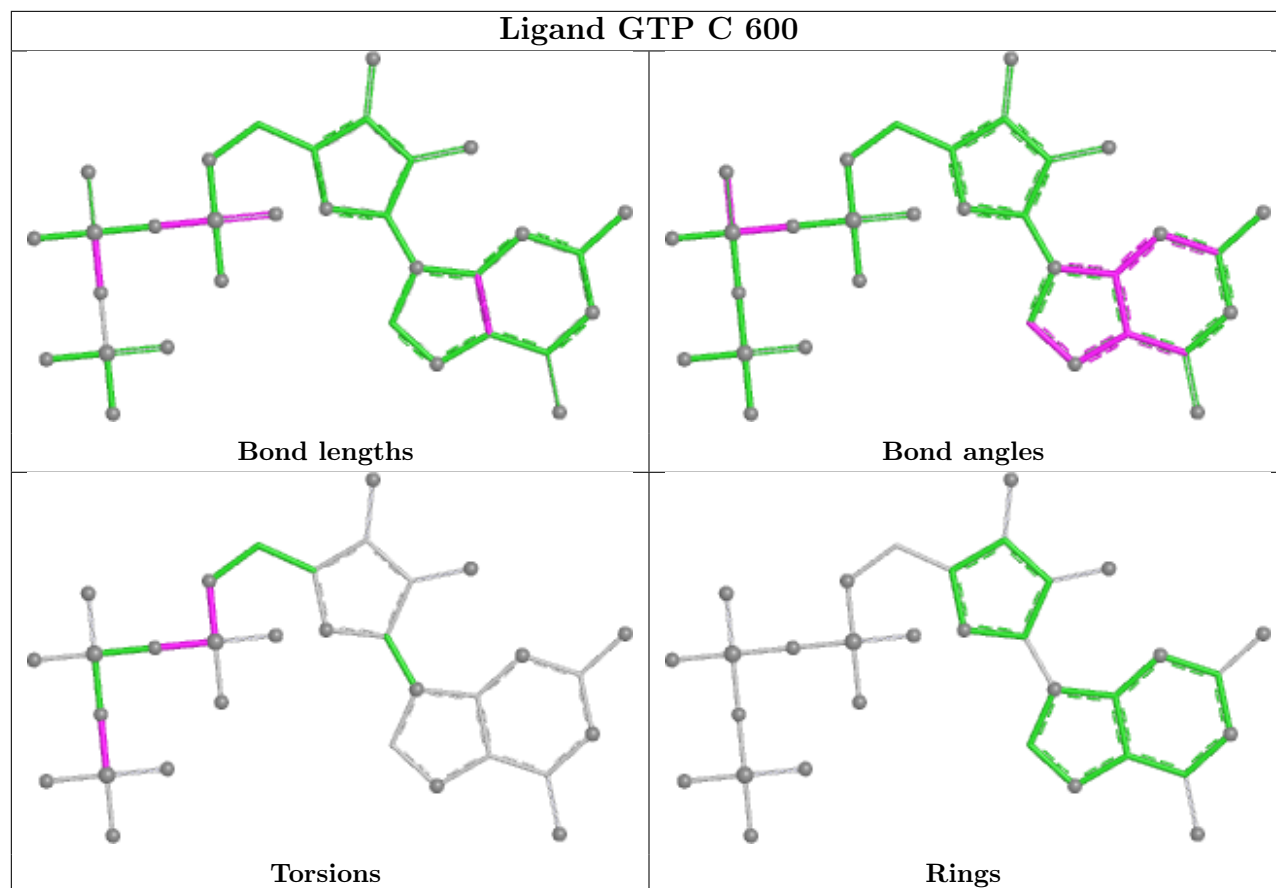
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	600	GTP	1	0

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.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	433/451 (96%)	-0.30	1 (0%) 91 89	24, 60, 91, 133	1 (0%)
1	C	429/451 (95%)	-0.07	5 (1%) 76 73	31, 68, 106, 145	2 (0%)
2	B	431/445 (96%)	-0.15	8 (1%) 66 62	30, 62, 115, 171	8 (1%)
2	D	431/445 (96%)	-0.23	5 (1%) 76 73	26, 54, 99, 138	11 (2%)
3	E	136/143 (95%)	0.15	5 (3%) 45 41	40, 80, 128, 155	1 (0%)
All	All	1860/1935 (96%)	-0.16	24 (1%) 75 71	24, 63, 107, 171	23 (1%)

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	294[A]	GLN	5.3
2	D	294[A]	GLN	4.0
2	B	440	ALA	3.9
1	C	349	THR	3.6
3	E	33	PRO	3.4
1	C	281	ALA	3.3
2	D	283	TYR	3.3
1	C	282	TYR	3.3
2	D	295[A]	MET	3.1
3	E	45	PRO	3.1
1	C	283	HIS	3.0
1	A	40	LYS	2.8
2	B	295[A]	MET	2.6
3	E	32	VAL	2.5
2	B	124	LYS	2.4
2	D	317	THR	2.3
1	C	362	VAL	2.3
3	E	144	SER	2.2
2	B	126	SER	2.2
2	B	371	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
2	B	335	ILE	2.1
2	B	161	TYR	2.1
2	D	335	ILE	2.1
3	E	44	ASP	2.0

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

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

6.3 Carbohydrates [i](#)

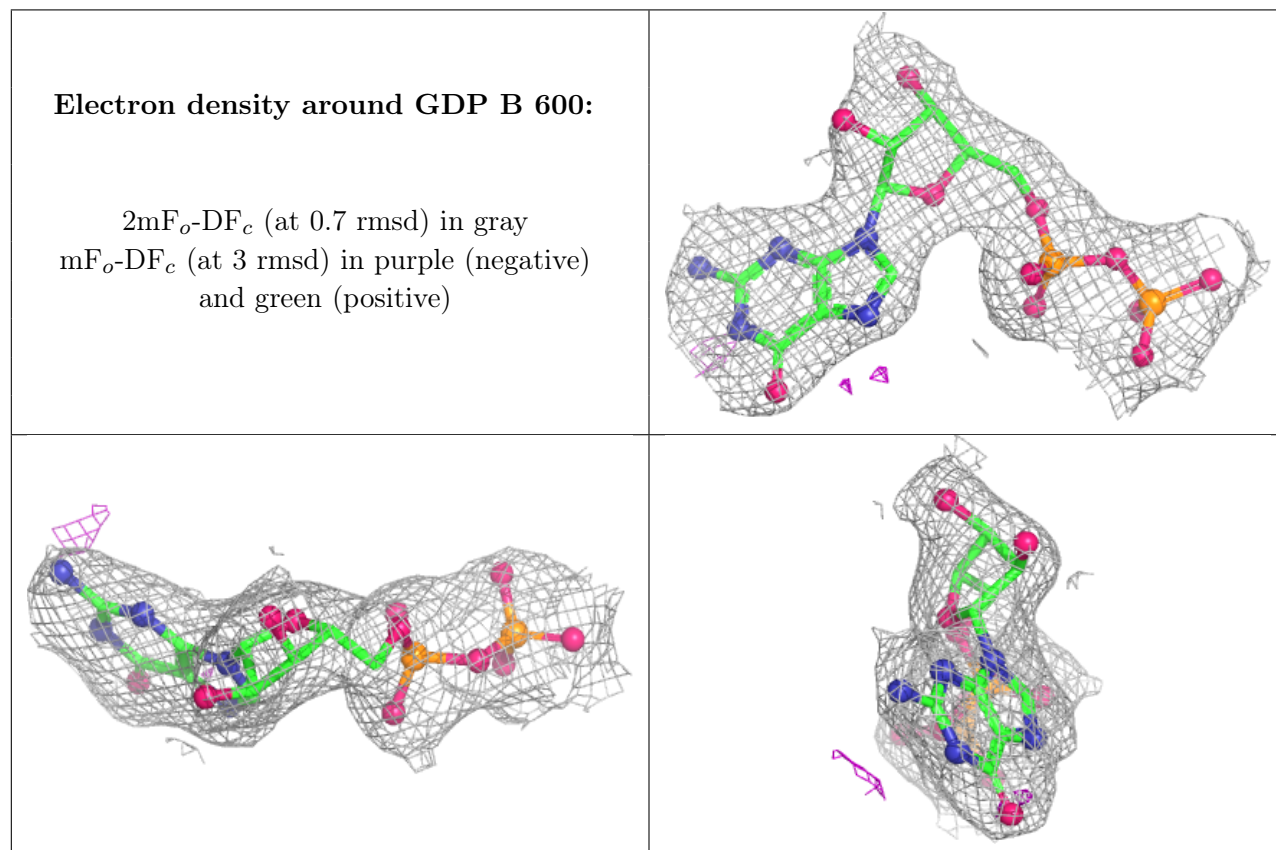
There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

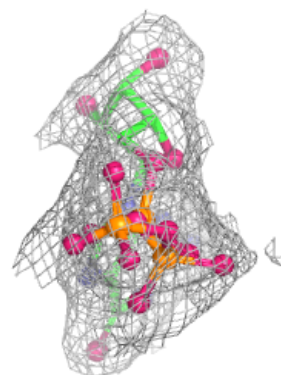
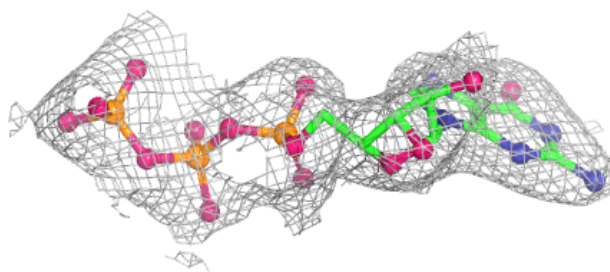
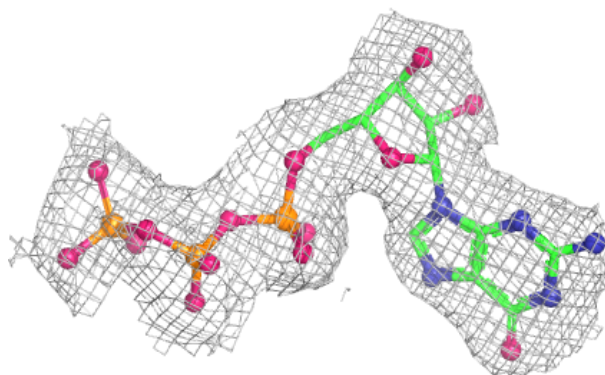
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
6	SO4	A	456	5/5	0.45	0.10	191,196,197,197	0
6	SO4	C	454	5/5	0.69	0.13	208,213,213,214	0
6	SO4	E	146	5/5	0.80	0.08	129,133,134,135	0
6	SO4	D	457	5/5	0.83	0.14	136,140,141,141	0
6	SO4	B	456	5/5	0.84	0.07	115,119,119,120	0
6	SO4	A	455	5/5	0.86	0.12	148,152,154,154	0
6	SO4	C	453	5/5	0.88	0.12	142,146,146,147	0
6	SO4	A	454	5/5	0.91	0.07	99,103,104,104	0
6	SO4	A	453	5/5	0.91	0.12	131,135,136,137	0
6	SO4	C	452	5/5	0.92	0.06	96,100,101,101	0
6	SO4	A	452	5/5	0.95	0.05	90,94,95,96	0
6	SO4	D	456	5/5	0.97	0.05	73,79,79,79	0
7	GDP	B	600	28/28	0.97	0.06	51,53,55,57	0
4	GTP	C	600	32/32	0.98	0.05	49,55,58,60	0
7	GDP	D	600	28/28	0.98	0.04	39,41,46,47	0
4	GTP	A	600	32/32	0.99	0.04	43,46,49,51	0
5	MG	C	601	1/1	0.99	0.02	61,61,61,61	0
5	MG	A	601	1/1	1.00	0.02	54,54,54,54	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

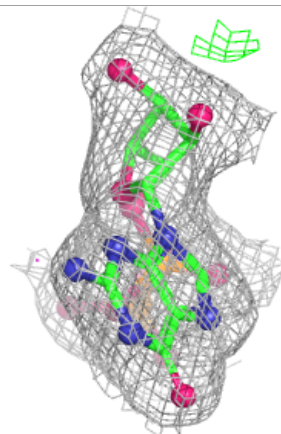
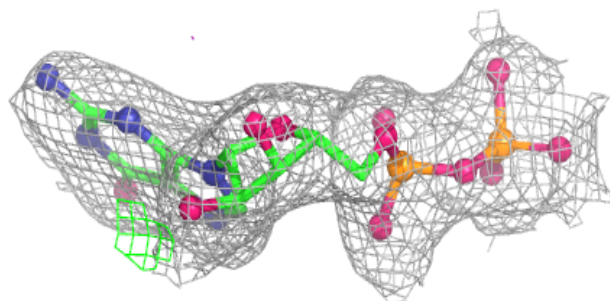
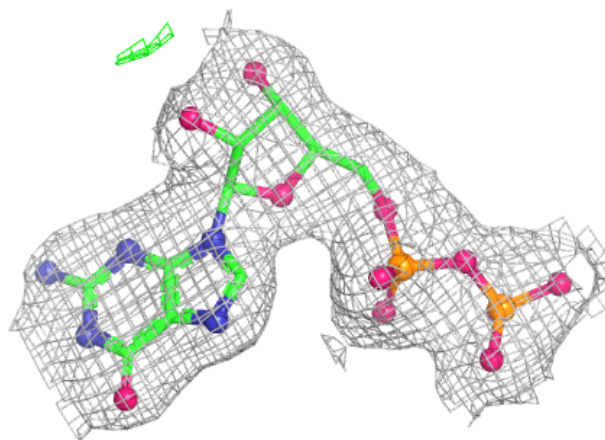


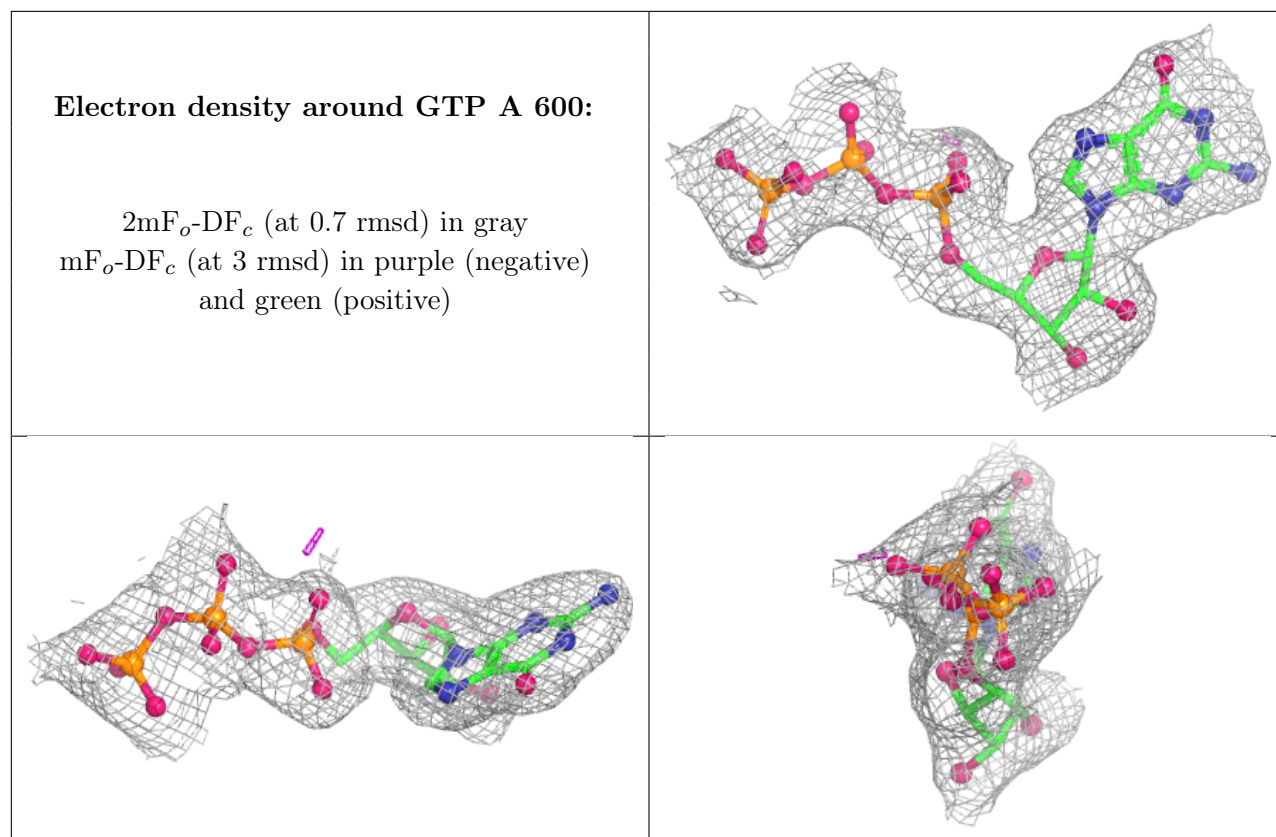
Electron density around GTP C 600:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around GDP D 600:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers [i](#)

There are no such residues in this entry.