Full wwPDB X-ray Structure Validation Report ⓘ

Oct 15, 2023 – 02:25 AM EDT

PDB ID	:	7TTE
Title	:	Tubulin-RB3_SLD in complex with compound 12j
Authors	:	White, S.W.; Yun, M.
Deposited on	:	2022-02-01
Resolution	:	2.70 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:

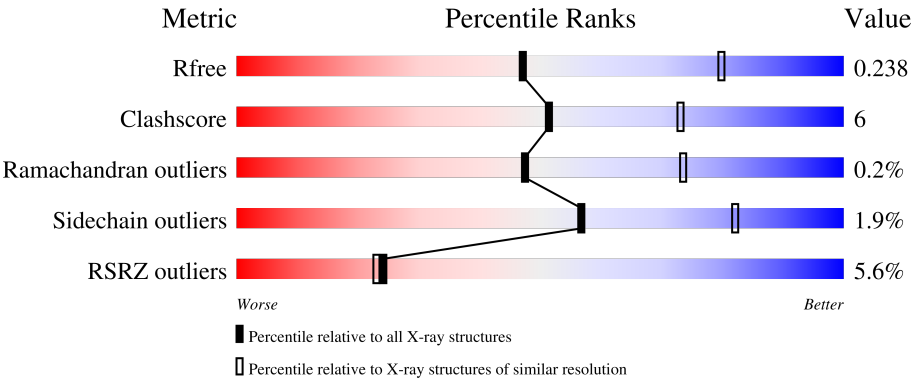
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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}	130704	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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 <=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	438	5% 81% 15%
1	C	438	4% 82% 16%
2	B	433	8% 80% 17%
2	D	433	2% 83% 16%
3	E	143	14% 79% 7% 14%

2 Entry composition (i)

There are 9 unique types of molecules in this entry. The entry contains 14586 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-1B chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	424	Total	C	N	O	S	0	0	0
			3319	2103	564	630	22			
1	C	427	Total	C	N	O	S	0	0	0
			3343	2118	568	635	22			

- Molecule 2 is a protein called Tubulin beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	425	Total	C	N	O	S	0	0	0
			3329	2088	569	645	27			
2	D	431	Total	C	N	O	S	0	0	0
			3379	2121	576	655	27			

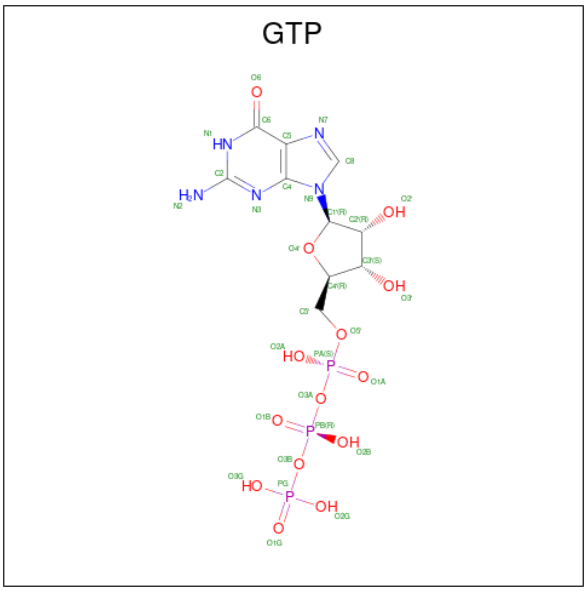
- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	123	Total	C	N	O	S	0	0	0
			1010	626	184	197	3			

There are 4 discrepancies between the modelled and reference sequences:

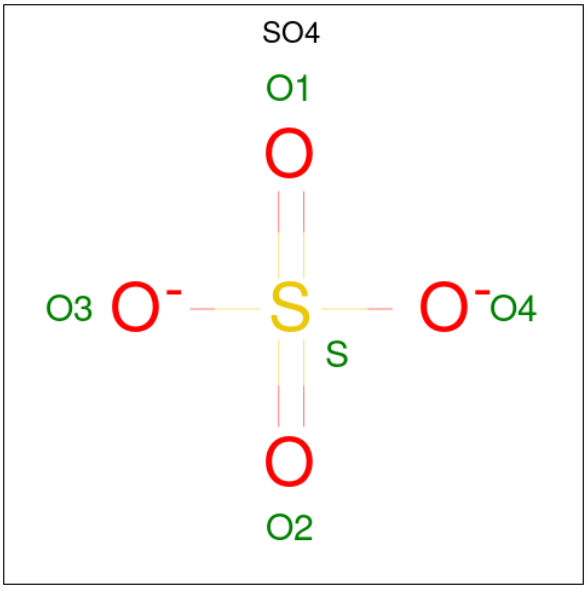
Chain	Residue	Modelled	Actual	Comment	Reference
E	3	MET	-	initiating methionine	UNP P63043
E	4	ALA	-	expression tag	UNP P63043
E	14	ALA	CYS	engineered mutation	UNP P63043
E	20	TRP	PHE	engineered mutation	UNP P63043

- Molecule 4 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: 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		
4	D	1	Total	C	N	O	P	0	0
			32	10	5	14	3		

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		

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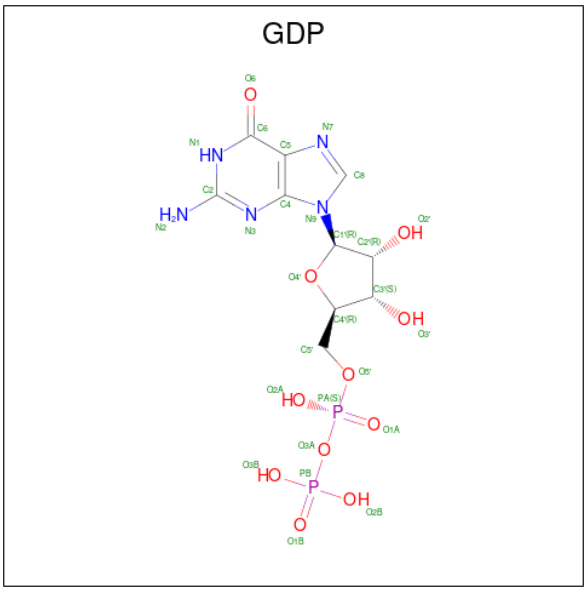
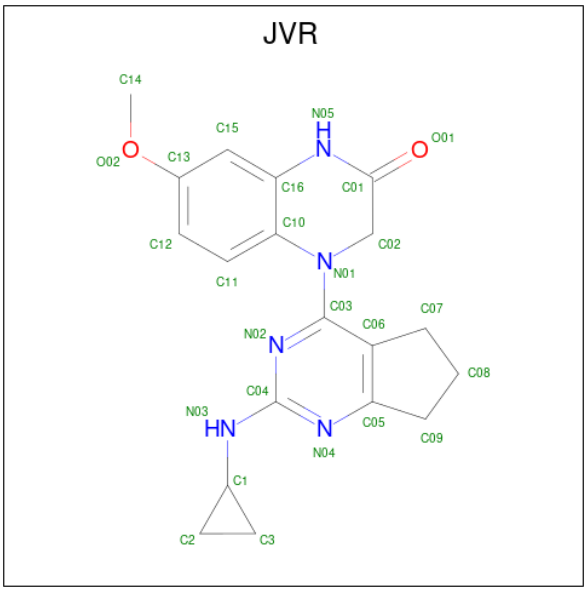
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total O S 5 4 1	0	0
5	D	1	Total O S 5 4 1	0	0
5	D	1	Total O S 5 4 1	0	0

- Molecule 6 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).



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

- Molecule 7 is 4-[2-(cyclopropylamino)-6,7-dihydro-5H-cyclopenta[d]pyrimidin-4-yl]-7-methoxy-3,4-dihydroquinoxalin-2(1H)-one (three-letter code: JVR) (formula: $C_{19}H_{21}N_5O_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total C N O 23 16 5 2	0	0
7	D	1	Total C N O 26 19 5 2	0	0

- Molecule 8 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

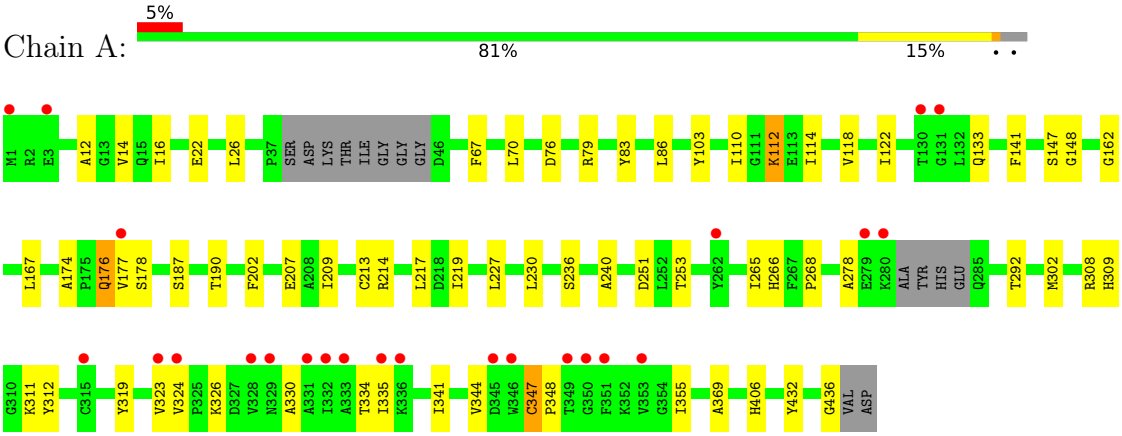
- Molecule 9 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total O 1 1	0	0
9	B	2	Total O 2 2	0	0
9	C	6	Total O 6 6	0	0
9	D	3	Total O 3 3	0	0

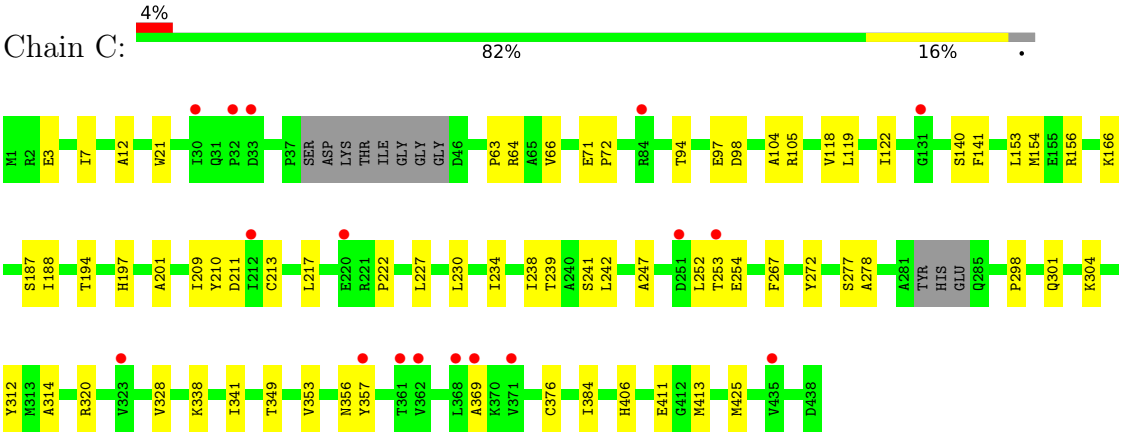
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry 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.

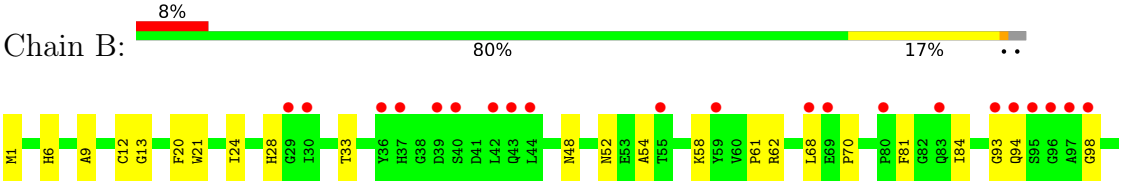
• Molecule 1: Tubulin alpha-1B chain

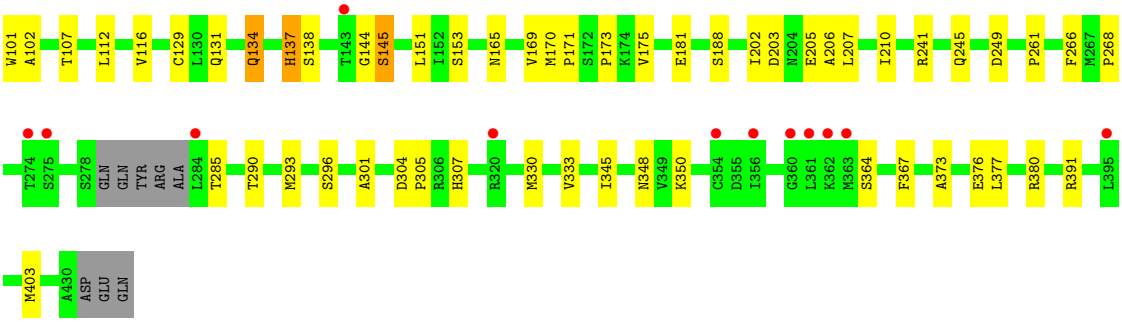


• Molecule 1: Tubulin alpha-1B chain

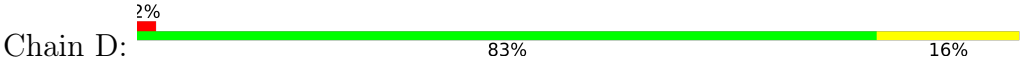


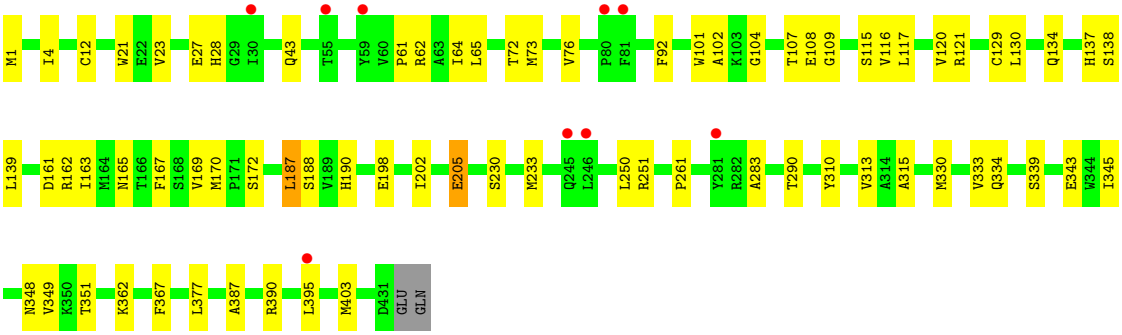
• Molecule 2: Tubulin beta chain



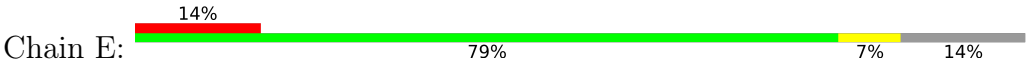


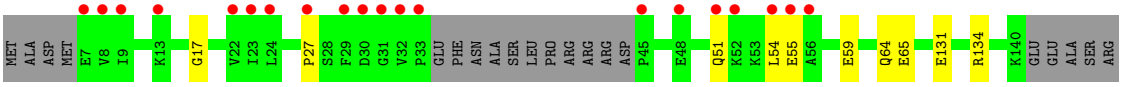
• Molecule 2: Tubulin beta chain





• Molecule 3: Stathmin-4





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	66.06Å 127.42Å 251.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.12 – 2.70 46.81 – 2.70	Depositor EDS
% Data completeness (in resolution range)	95.2 (45.12-2.70) 87.6 (46.81-2.70)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.92 (at 2.69Å)	Xtriage
Refinement program	PHENIX 1.14_3260	Depositor
R, R_{free}	0.171 , 0.239 0.173 , 0.238	Depositor DCC
R_{free} test set	2000 reflections (3.53%)	wwPDB-VP
Wilson B-factor (Å^2)	74.9	Xtriage
Anisotropy	0.642	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 63.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	14586	wwPDB-VP
Average B, all atoms (Å^2)	97.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.36% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: GDP, GTP, MG, SO4, JVR

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	0.41	0/3393	0.56	0/4605
1	C	0.41	0/3417	0.54	0/4637
2	B	0.41	0/3401	0.57	0/4606
2	D	0.46	0/3454	0.59	0/4680
3	E	0.37	0/1021	0.47	0/1357
All	All	0.42	0/14686	0.56	0/19885

There are no bond length outliers.

There are no bond angle outliers.

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	3319	0	3233	42	0
1	C	3343	0	3262	38	0
2	B	3329	0	3211	43	0
2	D	3379	0	3249	39	0
3	E	1010	0	1019	6	0
4	A	32	0	12	0	0
4	C	32	0	12	1	0
4	D	32	0	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	5	0	0	0	0
5	B	5	0	0	0	0
5	D	10	0	0	0	0
6	B	28	0	12	1	0
7	B	23	0	0	0	0
7	D	26	0	0	0	0
8	C	1	0	0	0	0
9	A	1	0	0	0	0
9	B	2	0	0	0	0
9	C	6	0	0	0	0
9	D	3	0	0	0	0
All	All	14586	0	14022	160	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 6.

All (160) 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:119:LEU:HD11	1:C:156:ARG:HB3	1.64	0.79
2:B:170:MET:HG2	2:B:377:LEU:HD11	1.64	0.77
2:B:52:ASN:OD1	2:B:62:ARG:NH1	2.22	0.73
1:A:319:TYR:HB3	1:A:323:VAL:HG11	1.70	0.72
1:A:308:ARG:HG3	1:A:309:HIS:HD2	1.55	0.71
2:B:54:ALA:HB3	2:B:58:LYS:HB2	1.73	0.70
2:B:48:ASN:O	2:B:62:ARG:NH2	2.26	0.68
1:C:71:GLU:HB2	1:C:98:ASP:HB3	1.77	0.67
1:C:105:ARG:HG3	1:C:411:GLU:HG3	1.78	0.66
2:D:73:MET:HG3	2:D:92:PHE:HB3	1.81	0.63
2:B:1:MET:N	2:B:129:CYS:SG	2.72	0.61
1:C:278:ALA:HA	1:C:369:ALA:HB2	1.81	0.61
1:C:166:LYS:HE2	1:C:197:HIS:O	2.00	0.61
1:A:76:ASP:HA	1:A:79:ARG:HG2	1.83	0.60
1:C:328:VAL:HG11	1:C:353:VAL:HG11	1.83	0.60
2:D:64:ILE:HD13	2:D:120:VAL:HG22	1.83	0.60
2:D:163:ILE:HG21	2:D:250:LEU:HB3	1.85	0.59
1:C:320:ARG:HA	1:C:356:ASN:O	2.04	0.58
1:C:298:PRO:HA	1:C:301:GLN:HG2	1.86	0.58
2:D:170:MET:HG3	2:D:377:LEU:HD11	1.85	0.57
1:A:112:LYS:HG3	3:E:54:LEU:HB3	1.87	0.57
2:D:310:TYR:CE1	2:D:367:PHE:HZ	2.22	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:345:ILE:HG22	2:D:348:ASN:HB3	1.88	0.56
2:D:161:ASP:O	2:D:251:ARG:NH2	2.38	0.56
1:A:174:ALA:O	1:A:178:SER:HB3	2.06	0.55
2:D:21:TRP:CZ3	2:D:61:PRO:HB3	2.39	0.55
1:A:278:ALA:HA	1:A:369:ALA:HB2	1.88	0.55
1:C:210:TYR:CE1	1:C:222:PRO:HD2	2.42	0.55
1:A:209:ILE:HG23	1:A:230:LEU:HD23	1.88	0.55
2:B:293:MET:HB2	2:B:367:PHE:CE1	2.42	0.55
1:C:21:TRP:CZ3	1:C:63:PRO:HB3	2.42	0.55
1:A:311:LYS:NZ	1:A:436:GLY:O	2.40	0.55
2:D:169:VAL:HA	2:D:202:ILE:O	2.07	0.54
1:A:209:ILE:HG22	1:A:227:LEU:HD22	1.89	0.54
2:D:134:GLN:HA	2:D:165:ASN:O	2.08	0.54
2:D:313:VAL:HB	2:D:349:VAL:HG22	1.90	0.53
1:C:312:TYR:CE2	1:C:341:ILE:HG23	2.44	0.53
2:B:12:CYS:HB2	6:B:501:GDP:C8	2.44	0.52
2:B:296:SER:OG	2:B:305:PRO:HD2	2.09	0.52
1:A:118:VAL:O	1:A:122:ILE:HG13	2.09	0.52
1:C:406:HIS:CG	2:D:261:PRO:HD3	2.45	0.52
1:C:213:CYS:HA	1:C:217:LEU:HD12	1.92	0.51
1:A:266:HIS:O	1:A:268:PRO:HD3	2.10	0.51
2:D:139:LEU:HD22	2:D:188:SER:HB3	1.92	0.51
2:B:70:PRO:HD3	2:B:94:GLN:HA	1.93	0.51
1:C:154:MET:HG3	1:C:194:THR:HG23	1.91	0.51
1:C:98:ASP:HB2	4:C:501:GTP:O2G	2.10	0.51
1:C:72:PRO:HA	1:C:94:THR:HG21	1.92	0.51
1:A:265:ILE:HG23	1:A:432:TYR:CZ	2.46	0.50
2:B:290:THR:HG22	2:B:333:VAL:HG21	1.93	0.50
2:D:172:SER:HB2	2:D:205:GLU:HB2	1.94	0.50
1:A:70:LEU:HD13	1:A:110:ILE:HD13	1.93	0.50
2:B:203:ASP:HB2	2:B:301:ALA:HA	1.94	0.50
2:B:206:ALA:O	2:B:210:ILE:HG13	2.12	0.50
1:A:167:LEU:HD23	1:A:202:PHE:HE2	1.77	0.49
1:C:272:TYR:HD1	1:C:376:CYS:HB2	1.77	0.49
2:B:6:HIS:CD2	2:B:21:TRP:HE1	2.29	0.49
1:C:211:ASP:OD2	1:C:304:LYS:NZ	2.44	0.48
2:B:21:TRP:CZ3	2:B:61:PRO:HB3	2.49	0.48
1:C:12:ALA:HB3	1:C:140:SER:HB3	1.94	0.48
1:A:344:VAL:HG23	1:A:347:CYS:HB2	1.96	0.48
1:A:348:PRO:HB3	3:E:27:PRO:HD3	1.96	0.48
2:B:131:GLN:OE1	2:B:249:ASP:HB2	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:118:VAL:O	1:C:122:ILE:HG13	2.15	0.47
1:A:70:LEU:HD21	1:A:114:ILE:HD13	1.97	0.47
1:A:213:CYS:O	1:A:217:LEU:HB2	2.13	0.47
2:B:68:LEU:HD23	2:B:112:LEU:HD22	1.96	0.47
2:B:373:ALA:O	2:B:376:GLU:HG3	2.14	0.47
2:D:283:ALA:HB2	2:D:362:LYS:HB2	1.97	0.47
2:D:23:VAL:O	2:D:27:GLU:HG3	2.15	0.46
2:B:81:PHE:O	2:B:84:ILE:HG22	2.16	0.46
2:B:391:ARG:HA	2:B:391:ARG:HD2	1.85	0.46
1:C:141:PHE:HB3	1:C:187:SER:OG	2.16	0.46
2:B:290:THR:HG23	2:B:330:MET:SD	2.56	0.46
1:A:355:ILE:O	3:E:17:GLY:HA2	2.16	0.46
1:C:97:GLU:HG3	2:D:1:MET:HG2	1.98	0.46
1:C:234:ILE:O	1:C:238:ILE:HG12	2.16	0.46
1:C:338:LYS:HB2	1:C:341:ILE:HD12	1.98	0.46
1:A:12:ALA:O	1:A:16:ILE:HG13	2.15	0.45
3:E:131:GLU:CD	3:E:134:ARG:HH12	2.19	0.45
1:A:292:THR:HG22	1:A:335:ILE:HD11	1.97	0.45
2:B:116:VAL:HG11	2:B:151:LEU:HD11	1.98	0.45
1:C:71:GLU:HG2	1:C:72:PRO:HD2	1.99	0.45
2:D:102:ALA:HB2	2:D:403:MET:SD	2.57	0.45
2:D:290:THR:HG22	2:D:333:VAL:HG21	1.99	0.45
1:A:83:TYR:HB3	1:A:86:LEU:HD12	1.99	0.45
1:A:133:GLN:HE22	1:A:251:ASP:HA	1.82	0.45
2:B:12:CYS:HB3	2:B:138:SER:HB3	1.99	0.45
2:B:102:ALA:HB2	2:B:403:MET:SD	2.57	0.45
2:B:203:ASP:OD2	2:B:380:ARG:NH2	2.49	0.45
1:C:188:ILE:HG13	1:C:425:MET:HG3	1.99	0.45
2:D:101:TRP:CE2	2:D:187:LEU:HB3	2.51	0.45
2:D:12:CYS:HB3	2:D:138:SER:HB3	1.99	0.44
2:D:104:GLY:O	2:D:109:GLY:HA3	2.17	0.44
1:C:104:ALA:HB2	1:C:413:MET:SD	2.57	0.44
1:C:209:ILE:HG23	1:C:230:LEU:HD23	2.00	0.44
2:B:350:LYS:HA	2:B:350:LYS:HD2	1.74	0.44
1:A:312:TYR:CE2	1:A:341:ILE:HG23	2.52	0.44
1:A:14:VAL:HG13	1:A:67:PHE:HD2	1.83	0.43
2:B:151:LEU:HA	2:B:151:LEU:HD23	1.67	0.43
2:D:330:MET:O	2:D:334:GLN:HG3	2.17	0.43
1:A:22:GLU:O	1:A:26:LEU:HG	2.17	0.43
2:D:116:VAL:O	2:D:120:VAL:HG23	2.18	0.43
1:A:176:GLN:OE1	1:A:207:GLU:HG3	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:167:PHE:CE2	2:D:233:MET:HG2	2.52	0.43
3:E:55:GLU:O	3:E:59:GLU:HG2	2.17	0.43
2:B:173:PRO:HA	1:C:349:THR:HG22	2.00	0.43
2:B:266:PHE:O	2:B:268:PRO:HD3	2.18	0.43
2:B:20:PHE:CZ	2:B:24:ILE:HD13	2.54	0.43
1:C:252:LEU:HD23	1:C:252:LEU:HA	1.83	0.42
1:C:3:GLU:HG2	1:C:64:ARG:CZ	2.49	0.42
3:E:64:GLN:HG3	3:E:65:GLU:N	2.34	0.42
2:B:169:VAL:HA	2:B:202:ILE:O	2.19	0.42
1:C:201:ALA:HB3	1:C:267:PHE:CD1	2.55	0.42
1:A:147:SER:HB2	1:A:190:THR:HB	2.00	0.42
1:A:324:VAL:HG12	1:A:326:LYS:HG2	2.00	0.42
1:C:209:ILE:HG22	1:C:227:LEU:HD22	2.01	0.42
2:B:93:GLY:O	2:B:94:GLN:HG2	2.20	0.42
1:A:177:VAL:HG13	1:A:177:VAL:O	2.20	0.42
2:B:98:GLY:HA2	1:C:254:GLU:HG3	2.02	0.42
2:D:65:LEU:HD12	2:D:65:LEU:N	2.35	0.42
1:A:14:VAL:HG13	1:A:67:PHE:CD2	2.54	0.42
1:C:239:THR:HA	1:C:242:LEU:HD13	2.02	0.41
1:A:308:ARG:HG3	1:A:309:HIS:CD2	2.45	0.41
1:A:103:TYR:CD2	1:A:148:GLY:HA2	2.56	0.41
1:A:330:ALA:O	1:A:334:THR:HG23	2.19	0.41
1:A:209:ILE:HD11	1:A:302:MET:SD	2.61	0.41
1:A:214:ARG:HA	1:A:219:ILE:O	2.21	0.41
1:A:344:VAL:CG2	1:A:347:CYS:HB2	2.49	0.41
2:B:61:PRO:HD3	2:B:84:ILE:HG12	2.02	0.41
2:B:304:ASP:O	2:B:307:HIS:HB2	2.21	0.41
2:B:28:HIS:CE1	2:B:241:ARG:HB3	2.56	0.41
1:C:7:ILE:HG21	1:C:153:LEU:HD21	2.01	0.41
1:C:247:ALA:HB2	1:C:357:TYR:HE1	1.85	0.41
2:D:130:LEU:O	2:D:162:ARG:HD2	2.20	0.41
2:B:9:ALA:O	2:B:13:GLY:HA3	2.21	0.41
2:D:107:THR:OG1	2:D:108:GLU:N	2.51	0.41
1:A:141:PHE:HB3	1:A:187:SER:OG	2.21	0.41
1:A:236:SER:O	1:A:240:ALA:N	2.54	0.41
2:D:72:THR:O	2:D:76:VAL:HG23	2.20	0.41
2:B:134:GLN:HA	2:B:165:ASN:O	2.21	0.41
2:D:315:ALA:HB3	2:D:351:THR:HG22	2.03	0.41
1:A:176:GLN:HE21	1:A:176:GLN:HB3	1.58	0.41
2:B:101:TRP:HD1	2:B:145:SER:OG	2.04	0.41
2:D:1:MET:N	2:D:129:CYS:SG	2.86	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:139:LEU:HD22	2:D:188:SER:CB	2.49	0.41
2:D:165:ASN:HA	2:D:198:GLU:O	2.20	0.41
2:D:395:LEU:HD23	2:D:395:LEU:HA	1.91	0.41
2:B:345:ILE:HG22	2:B:348:ASN:HB3	2.02	0.41
2:D:387:ALA:HA	2:D:390:ARG:NH1	2.35	0.41
2:B:137:HIS:ND1	2:B:144:GLY:O	2.45	0.40
1:C:238:ILE:HG12	1:C:238:ILE:H	1.71	0.40
2:D:21:TRP:CE3	2:D:61:PRO:HB3	2.55	0.40
2:B:171:PRO:HB2	2:B:181:GLU:OE1	2.21	0.40
2:D:28:HIS:HA	2:D:43:GLN:HB3	2.03	0.40
1:A:265:ILE:HG23	1:A:432:TYR:CE1	2.57	0.40
2:B:207:LEU:HD23	2:B:207:LEU:HA	1.93	0.40
2:D:4:ILE:O	2:D:62:ARG:HD2	2.20	0.40
2:D:117:LEU:O	2:D:121:ARG:HG3	2.22	0.40
1:A:406:HIS:CD2	2:B:261:PRO:HD3	2.57	0.40

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 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	418/438 (95%)	401 (96%)	16 (4%)	1 (0%)	47	73
1	C	421/438 (96%)	408 (97%)	12 (3%)	1 (0%)	47	73
2	B	421/433 (97%)	405 (96%)	15 (4%)	1 (0%)	47	73
2	D	429/433 (99%)	416 (97%)	13 (3%)	0	100	100
3	E	119/143 (83%)	118 (99%)	1 (1%)	0	100	100
All	All	1808/1885 (96%)	1748 (97%)	57 (3%)	3 (0%)	47	73

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	162	GLY
1	C	314	ALA
2	B	175	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 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	358/369 (97%)	354 (99%)	4 (1%)	73	90
1	C	361/369 (98%)	356 (99%)	5 (1%)	67	86
2	B	366/374 (98%)	355 (97%)	11 (3%)	41	70
2	D	370/374 (99%)	362 (98%)	8 (2%)	52	79
3	E	107/126 (85%)	106 (99%)	1 (1%)	78	92
All	All	1562/1612 (97%)	1533 (98%)	29 (2%)	57	82

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	LYS
1	A	176	GLN
1	A	253	THR
1	A	347	CYS
2	B	33	THR
2	B	107	THR
2	B	134	GLN
2	B	137	HIS
2	B	145	SER
2	B	153	SER
2	B	188	SER
2	B	205	GLU
2	B	245	GLN
2	B	285	THR
2	B	364	SER
1	C	66	VAL
1	C	241	SER

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Mol	Chain	Res	Type
1	C	253	THR
1	C	277	SER
1	C	384	ILE
2	D	115	SER
2	D	137	HIS
2	D	187	LEU
2	D	190	HIS
2	D	205	GLU
2	D	230	SER
2	D	339	SER
2	D	343	GLU
3	E	51	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	GLN
1	A	31	GLN
1	A	406	HIS
1	C	61	HIS
2	D	15	GLN
2	D	195	ASN
2	D	375	GLN
3	E	108	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)

Of 11 ligands modelled in this entry, 1 is monoatomic - leaving 10 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	$\#\|Z\| > 2$
5	SO4	A	502	-	4,4,4	0.16	0	6,6,6	0.72	0
4	GTP	C	501	8	26,34,34	1.25	2 (7%)	32,54,54	1.40	3 (9%)
4	GTP	D	501	-	26,34,34	1.22	3 (11%)	32,54,54	1.33	4 (12%)
4	GTP	A	501	-	26,34,34	1.22	2 (7%)	32,54,54	1.29	4 (12%)
5	SO4	D	503	-	4,4,4	0.12	0	6,6,6	0.51	0
7	JVR	B	502	-	26,26,30	1.39	5 (19%)	33,38,44	1.89	5 (15%)
7	JVR	D	502	-	30,30,30	1.25	3 (10%)	38,44,44	1.88	12 (31%)
6	GDP	B	501	-	24,30,30	1.45	5 (20%)	30,47,47	1.42	4 (13%)
5	SO4	D	504	-	4,4,4	0.19	0	6,6,6	0.50	0
5	SO4	B	503	-	4,4,4	0.14	0	6,6,6	0.42	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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GTP	D	501	-	-	9/18/38/38	0/3/3/3
4	GTP	C	501	8	-	6/18/38/38	0/3/3/3
4	GTP	A	501	-	-	3/18/38/38	0/3/3/3
7	JVR	B	502	-	-	2/5/24/30	0/4/4/5
7	JVR	D	502	-	-	4/9/30/30	0/5/5/5
6	GDP	B	501	-	-	4/12/32/32	0/3/3/3

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	D	502	JVR	C04-N03	3.54	1.39	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	502	JVR	C03-N01	3.35	1.42	1.37
7	B	502	JVR	C04-N03	3.34	1.40	1.33
6	B	501	GDP	PB-O1B	3.19	1.60	1.50
4	A	501	GTP	O4'-C1'	3.11	1.45	1.41
7	D	502	JVR	C01-N05	2.92	1.38	1.35
4	A	501	GTP	C8-N7	-2.74	1.30	1.35
4	C	501	GTP	C8-N7	-2.72	1.30	1.35
4	D	501	GTP	C8-N7	-2.65	1.30	1.35
7	B	502	JVR	C10-N01	2.63	1.44	1.40
6	B	501	GDP	C5-C6	-2.52	1.42	1.47
6	B	501	GDP	C8-N7	-2.51	1.30	1.35
7	D	502	JVR	C03-N01	2.49	1.40	1.37
4	D	501	GTP	O4'-C1'	2.47	1.44	1.41
6	B	501	GDP	PA-O1A	2.46	1.59	1.50
4	C	501	GTP	C5-C6	-2.38	1.42	1.47
6	B	501	GDP	O4'-C1'	2.13	1.44	1.41
7	B	502	JVR	C02-C01	2.10	1.53	1.51
4	D	501	GTP	C6-N1	-2.02	1.34	1.37
7	B	502	JVR	C02-N01	2.02	1.49	1.46

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	D	502	JVR	C08-C09-C05	-5.20	100.14	103.93
7	B	502	JVR	O01-C01-N05	-5.07	116.96	121.43
7	B	502	JVR	C08-C09-C05	-4.46	100.67	103.93
4	D	501	GTP	C8-N7-C5	4.32	111.21	102.99
4	A	501	GTP	C8-N7-C5	4.03	110.67	102.99
6	B	501	GDP	C8-N7-C5	4.00	110.61	102.99
4	C	501	GTP	C8-N7-C5	3.81	110.26	102.99
7	D	502	JVR	C09-C05-C06	3.69	113.74	111.09
7	D	502	JVR	O01-C01-N05	-3.66	118.20	121.43
7	B	502	JVR	C14-O02-C13	3.45	124.99	117.51
7	B	502	JVR	C06-C05-N04	-3.07	122.44	125.80
7	D	502	JVR	C14-O02-C13	3.06	124.16	117.51
7	D	502	JVR	C06-C05-N04	-3.03	122.48	125.80
4	C	501	GTP	C5-C6-N1	3.02	119.29	113.95
7	D	502	JVR	C3-C1-N03	-2.77	113.81	118.52
4	D	501	GTP	O4'-C1'-C2'	-2.77	102.88	106.93
4	C	501	GTP	C2-N1-C6	-2.73	120.08	125.10
7	D	502	JVR	C01-C02-N01	-2.71	107.52	113.13
7	D	502	JVR	N02-C03-N01	-2.62	113.50	116.26

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	D	502	JVR	C2-C1-N03	-2.61	114.08	118.52
6	B	501	GDP	C2-N1-C6	-2.60	120.31	125.10
4	A	501	GTP	C5-C6-N1	2.57	118.50	113.95
4	D	501	GTP	O6-C6-N1	-2.49	117.70	120.65
4	A	501	GTP	O3G-PG-O3B	2.45	112.85	104.64
4	A	501	GTP	C2-N1-C6	-2.43	120.63	125.10
6	B	501	GDP	C5-C6-N1	2.39	118.18	113.95
7	D	502	JVR	C02-C01-N05	2.37	119.08	116.13
7	D	502	JVR	C16-N05-C01	-2.31	121.63	124.49
7	D	502	JVR	C06-C03-N02	-2.30	119.06	122.61
7	B	502	JVR	N03-C04-N02	2.08	120.48	117.25
4	D	501	GTP	O2G-PG-O3B	2.03	111.45	104.64
6	B	501	GDP	O5'-C5'-C4'	-2.02	102.03	108.99

There are no chirality outliers.

All (28) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	501	GTP	PB-O3B-PG-O3G
4	C	501	GTP	C5'-O5'-PA-O1A
4	C	501	GTP	C5'-O5'-PA-O2A
4	D	501	GTP	PB-O3B-PG-O2G
4	D	501	GTP	C5'-O5'-PA-O1A
4	D	501	GTP	C5'-O5'-PA-O2A
6	B	501	GDP	C5'-O5'-PA-O1A
7	B	502	JVR	C06-C03-N01-C02
7	B	502	JVR	N02-C03-N01-C02
4	A	501	GTP	C3'-C4'-C5'-O5'
4	D	501	GTP	C3'-C4'-C5'-O5'
4	C	501	GTP	C5'-O5'-PA-O3A
4	D	501	GTP	C5'-O5'-PA-O3A
6	B	501	GDP	C5'-O5'-PA-O3A
6	B	501	GDP	C5'-O5'-PA-O2A
7	D	502	JVR	N02-C03-N01-C02
7	D	502	JVR	C06-C03-N01-C02
6	B	501	GDP	PB-O3A-PA-O2A
4	A	501	GTP	O4'-C4'-C5'-O5'
4	D	501	GTP	O4'-C4'-C5'-O5'
7	D	502	JVR	C15-C13-O02-C14
4	C	501	GTP	PB-O3B-PG-O1G
4	D	501	GTP	PB-O3B-PG-O1G
7	D	502	JVR	C12-C13-O02-C14

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Mol	Chain	Res	Type	Atoms
4	C	501	GTP	PB-O3B-PG-O2G
4	D	501	GTP	PB-O3B-PG-O3G
4	A	501	GTP	PG-O3B-PB-O2B
4	D	501	GTP	PA-O3A-PB-O2B

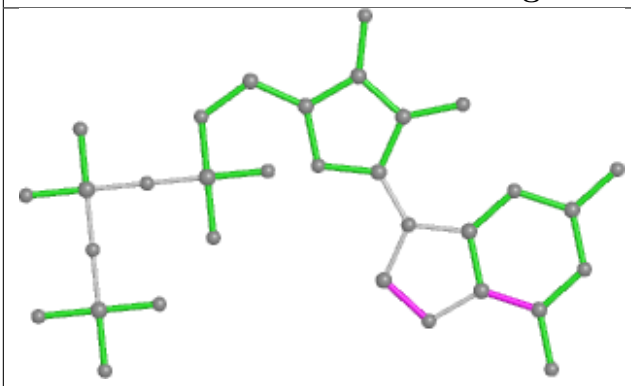
There are no ring outliers.

2 monomers are involved in 2 short contacts:

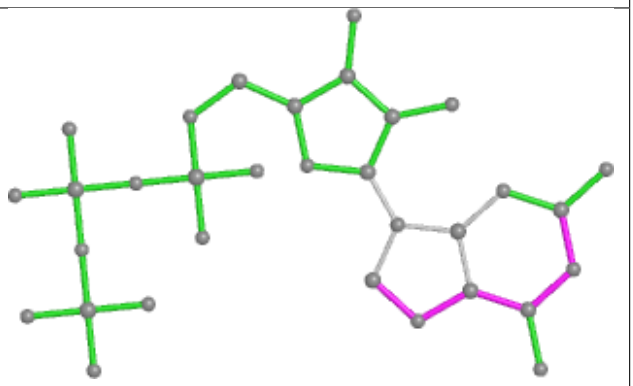
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	501	GTP	1	0
6	B	501	GDP	1	0

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 then 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.

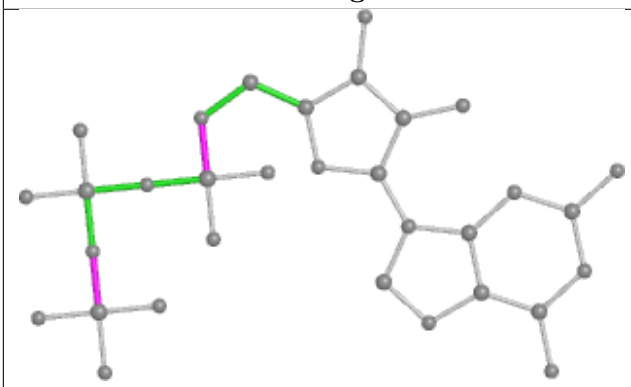
Ligand GTP C 501



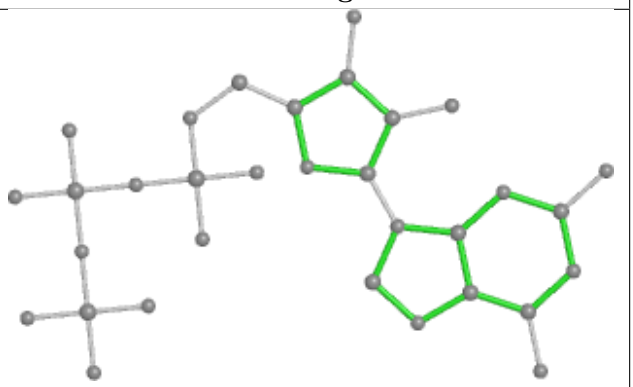
Bond lengths



Bond angles

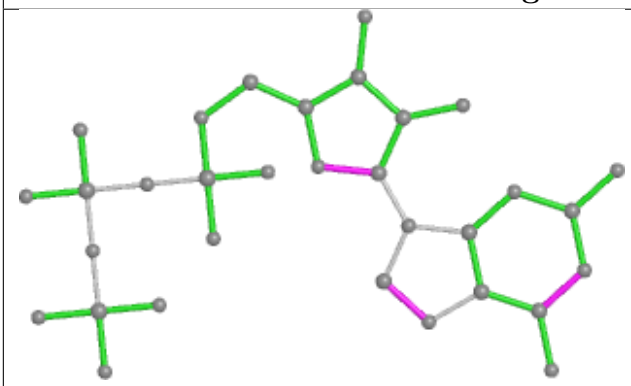


Torsions

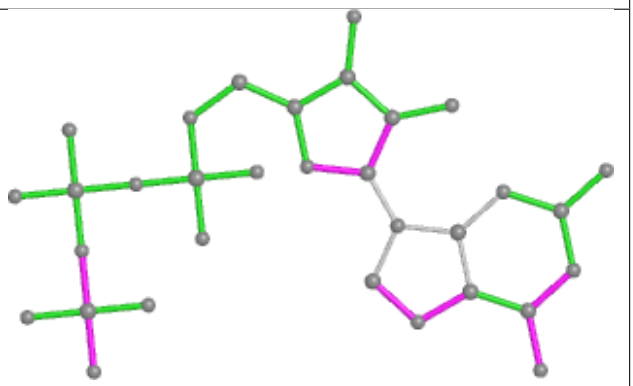


Rings

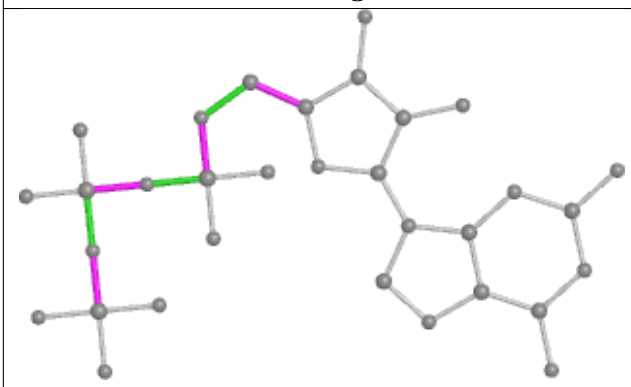
Ligand GTP D 501



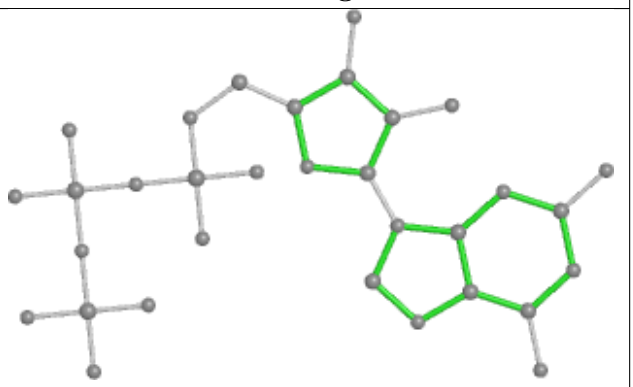
Bond lengths



Bond angles

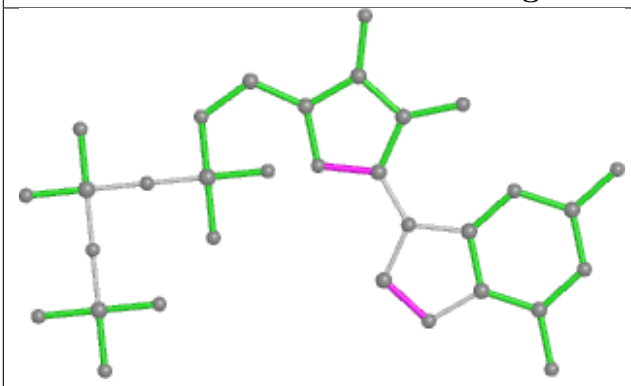


Torsions

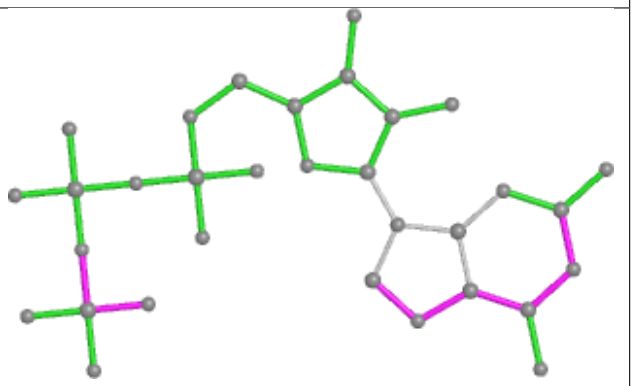


Rings

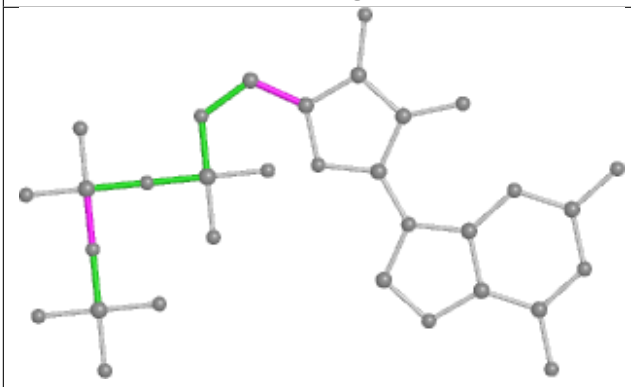
Ligand GTP A 501



Bond lengths



Bond angles



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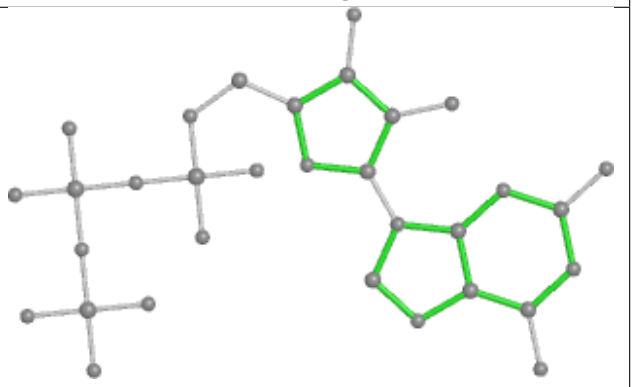
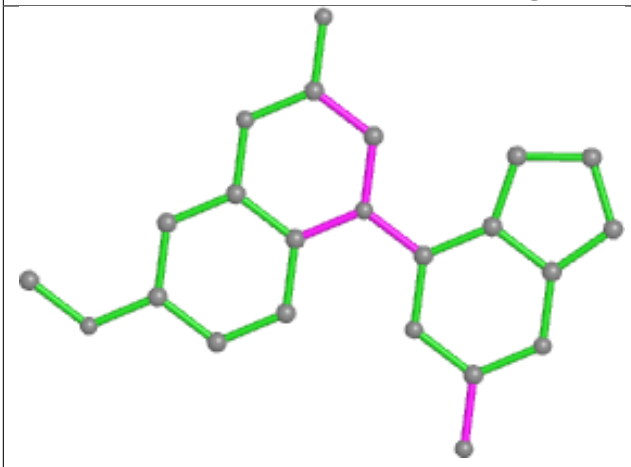
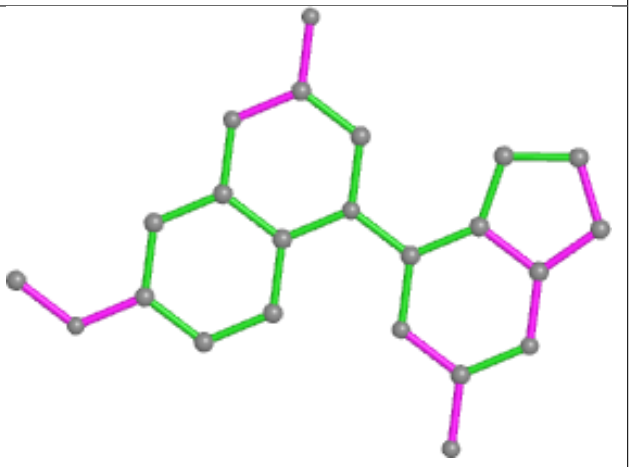


Rings

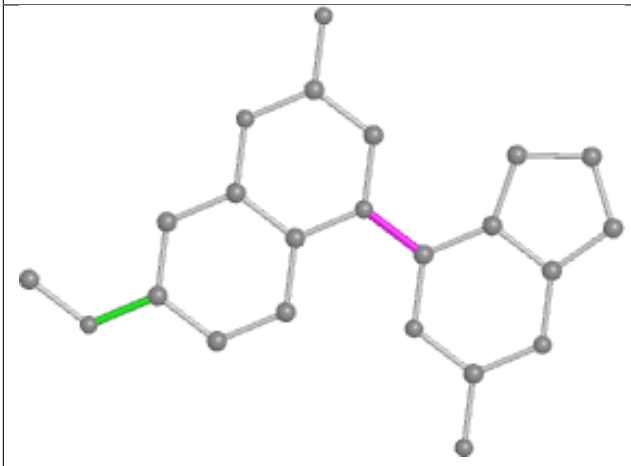
Ligand JVR B 502



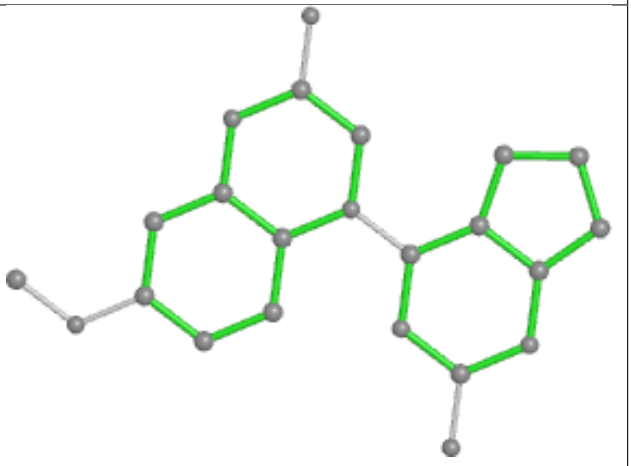
Bond lengths



Bond angles

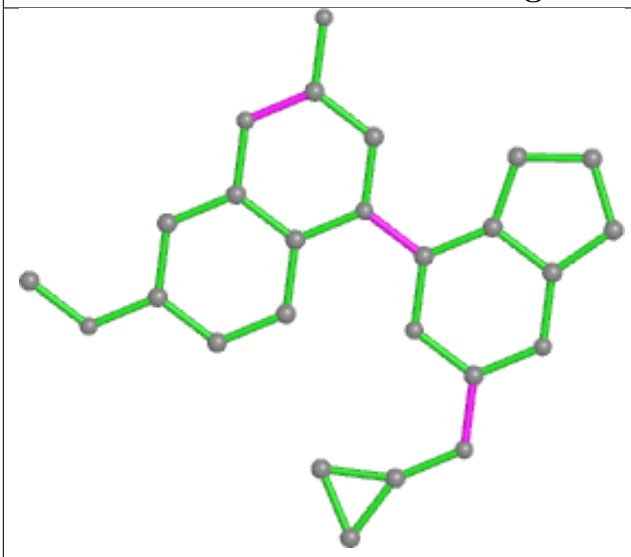


Torsions

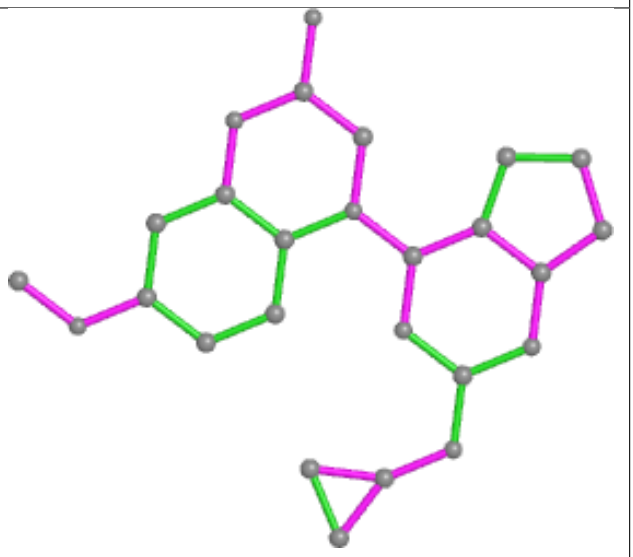


Rings

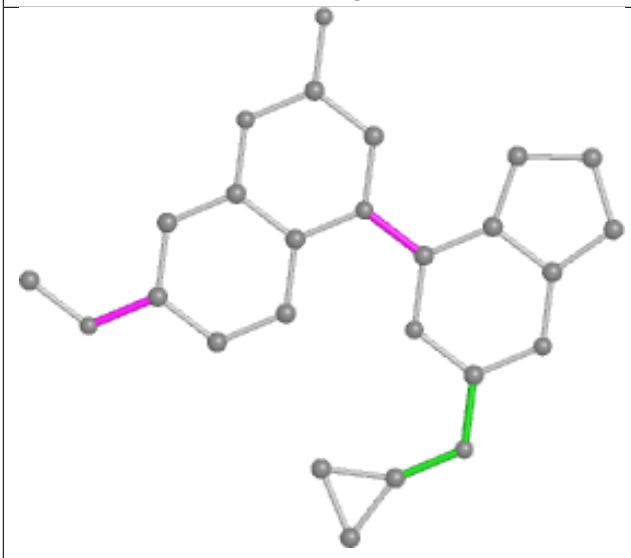
Ligand JVR D 502



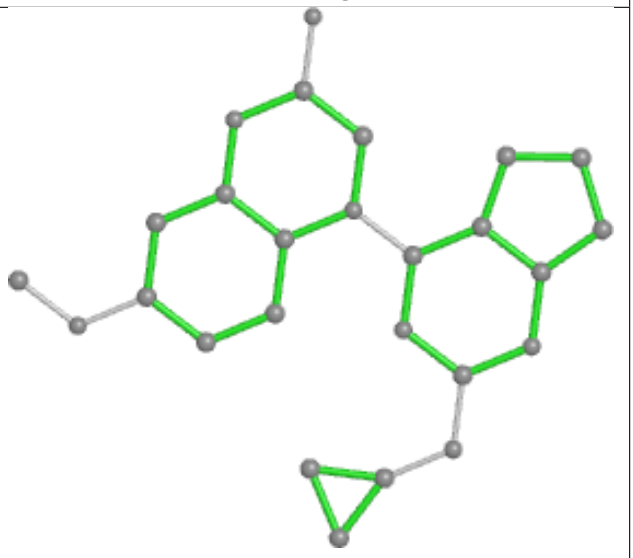
Bond lengths



Bond angles

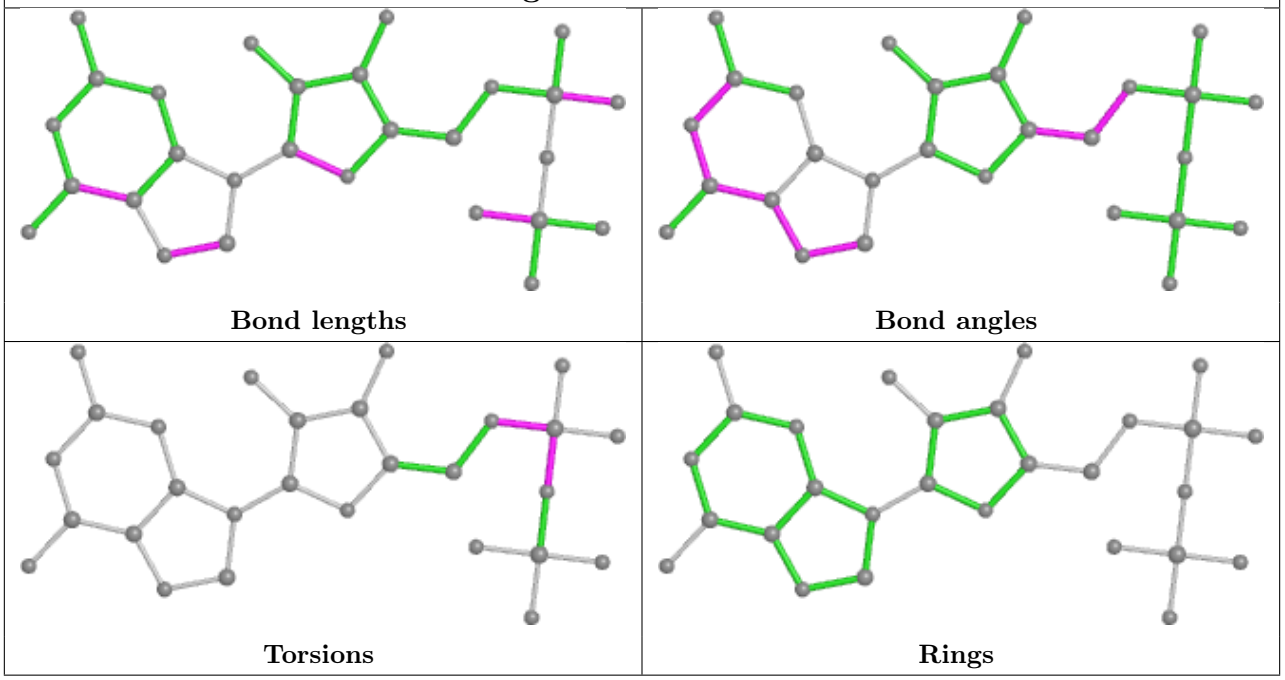


Torsions



Rings

Ligand GDP B 501



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, 95^{th} 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	424/438 (96%)	0.25	24 (5%) 23 22	62, 100, 145, 181	0
1	C	427/438 (97%)	0.20	17 (3%) 38 37	61, 92, 136, 162	0
2	B	425/433 (98%)	0.38	33 (7%) 13 11	61, 90, 144, 183	0
2	D	431/433 (99%)	0.13	9 (2%) 63 65	54, 81, 134, 179	0
3	E	123/143 (86%)	0.66	20 (16%) 1 1	84, 109, 150, 173	0
All	All	1830/1885 (97%)	0.27	103 (5%) 24 23	54, 94, 143, 183	0

All (103) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	MET	7.8
2	B	95	SER	5.3
2	B	42	LEU	5.0
3	E	9	ILE	4.4
2	B	363	MET	4.4
3	E	29	PHE	4.2
1	A	346	TRP	4.1
3	E	52	LYS	4.0
3	E	30	ASP	3.9
3	E	22	VAL	3.8
3	E	33	PRO	3.8
2	B	69	GLU	3.7
2	B	36	TYR	3.7
2	B	360	GLY	3.7
2	B	30	ILE	3.6
3	E	8	VAL	3.5
2	B	361	LEU	3.5
2	D	281	TYR	3.5
2	B	55	THR	3.5
3	E	24	LEU	3.5

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Mol	Chain	Res	Type	RSRZ
2	B	37	HIS	3.5
3	E	23	ILE	3.5
1	A	351	PHE	3.4
2	D	81	PHE	3.4
3	E	32	VAL	3.4
2	B	59	TYR	3.2
3	E	31	GLY	3.1
1	A	349	THR	3.1
1	C	368	LEU	3.1
1	C	323	VAL	3.0
1	A	353	VAL	3.0
1	C	371	VAL	2.9
3	E	27	PRO	2.9
2	B	356	ILE	2.9
1	C	362	VAL	2.9
1	C	32	PRO	2.8
1	A	350	GLY	2.8
3	E	45	PRO	2.8
2	D	55	THR	2.8
1	A	130	THR	2.8
2	B	96	GLY	2.7
2	B	320	ARG	2.7
1	A	331	ALA	2.7
3	E	7	GLU	2.7
2	B	43	GLN	2.7
1	A	279	GLU	2.7
3	E	54	LEU	2.7
2	B	94	GLN	2.6
3	E	51	GLN	2.6
2	B	275	SER	2.6
1	C	251	ASP	2.6
1	A	315	CYS	2.6
2	B	68	LEU	2.6
1	A	335	ILE	2.5
2	B	39	ASP	2.5
2	B	83	GLN	2.5
1	A	332	ILE	2.5
1	A	280	LYS	2.5
1	C	369	ALA	2.4
2	B	395	LEU	2.4
2	B	40	SER	2.4
1	C	361	THR	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	262	TYR	2.4
2	B	354	CYS	2.4
3	E	48	GLU	2.4
2	B	80	PRO	2.4
1	C	435	VAL	2.4
1	C	253	THR	2.3
1	A	131	GLY	2.3
2	D	245	GLN	2.3
1	C	33	ASP	2.3
1	A	333	ALA	2.3
3	E	13	LYS	2.3
1	A	324	VAL	2.3
1	C	84	ARG	2.3
2	B	98	GLY	2.3
1	A	3	GLU	2.3
2	B	143	THR	2.3
1	C	220	GLU	2.2
1	A	345	ASP	2.2
2	B	284	LEU	2.2
2	B	97	ALA	2.2
3	E	56	ALA	2.2
2	D	30	ILE	2.2
2	D	395	LEU	2.2
1	A	328	VAL	2.2
2	D	80	PRO	2.2
2	B	274	THR	2.2
1	A	177	VAL	2.1
2	B	362	LYS	2.1
1	A	323	VAL	2.1
1	C	212	ILE	2.1
3	E	55	GLU	2.1
1	C	357	TYR	2.1
2	B	93	GLY	2.1
1	C	30	ILE	2.1
1	A	336	LYS	2.1
2	D	246	LEU	2.0
2	D	59	TYR	2.0
1	C	131	GLY	2.0
1	A	329	ASN	2.0
2	B	44	LEU	2.0
2	B	29	GLY	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 monosaccharides in this entry.

6.4 Ligands (i)

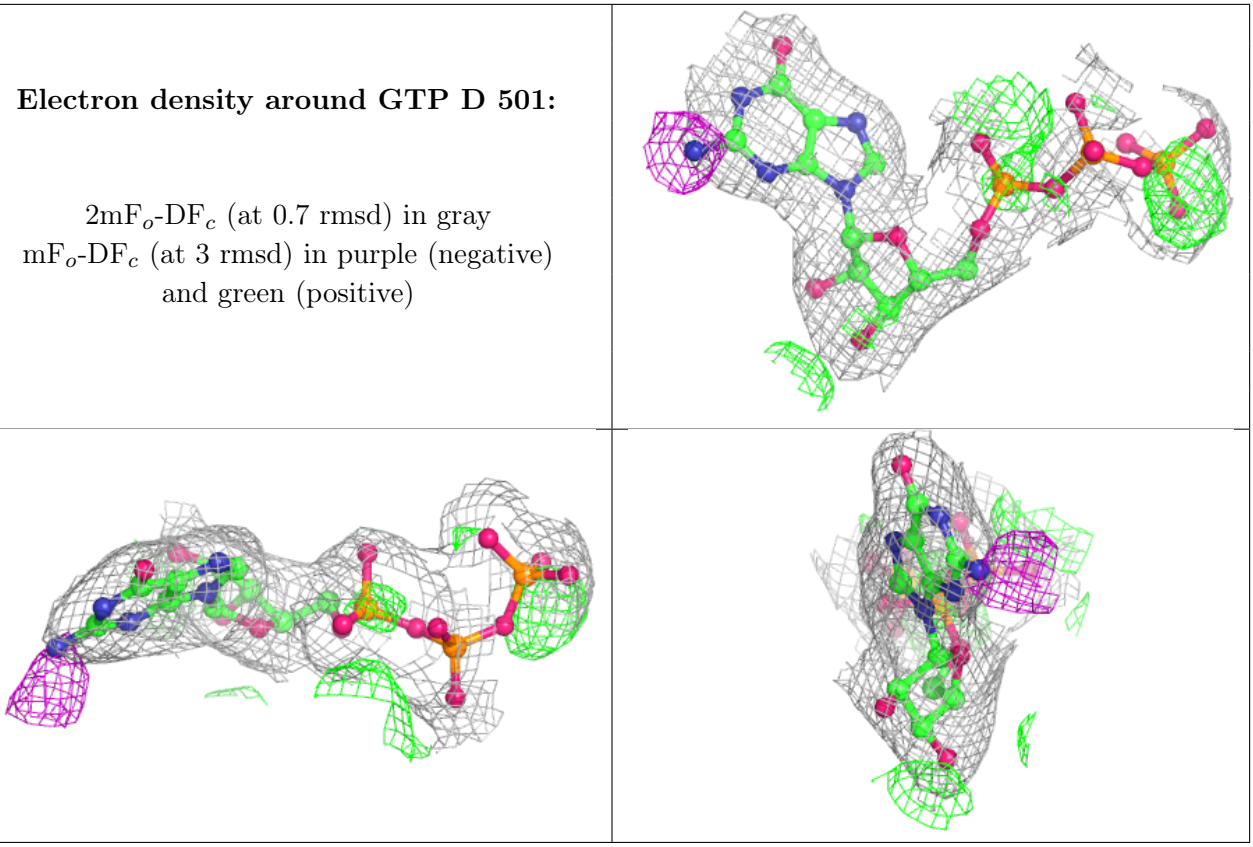
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	SO4	A	502	5/5	0.90	0.25	163,168,174,175	0
4	GTP	D	501	32/32	0.93	0.17	56,71,156,170	0
5	SO4	D	503	5/5	0.93	0.10	122,139,140,141	0
6	GDP	B	501	28/28	0.93	0.27	65,77,107,129	0
5	SO4	D	504	5/5	0.94	0.12	96,116,127,137	0
5	SO4	B	503	5/5	0.95	0.16	153,153,155,156	0
7	JVR	B	502	23/26	0.95	0.23	79,94,103,109	0
4	GTP	C	501	32/32	0.97	0.23	69,78,89,102	0
4	GTP	A	501	32/32	0.98	0.22	64,76,88,100	0
7	JVR	D	502	26/26	0.98	0.28	66,83,116,119	0
8	MG	C	502	1/1	0.98	0.19	87,87,87,87	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.

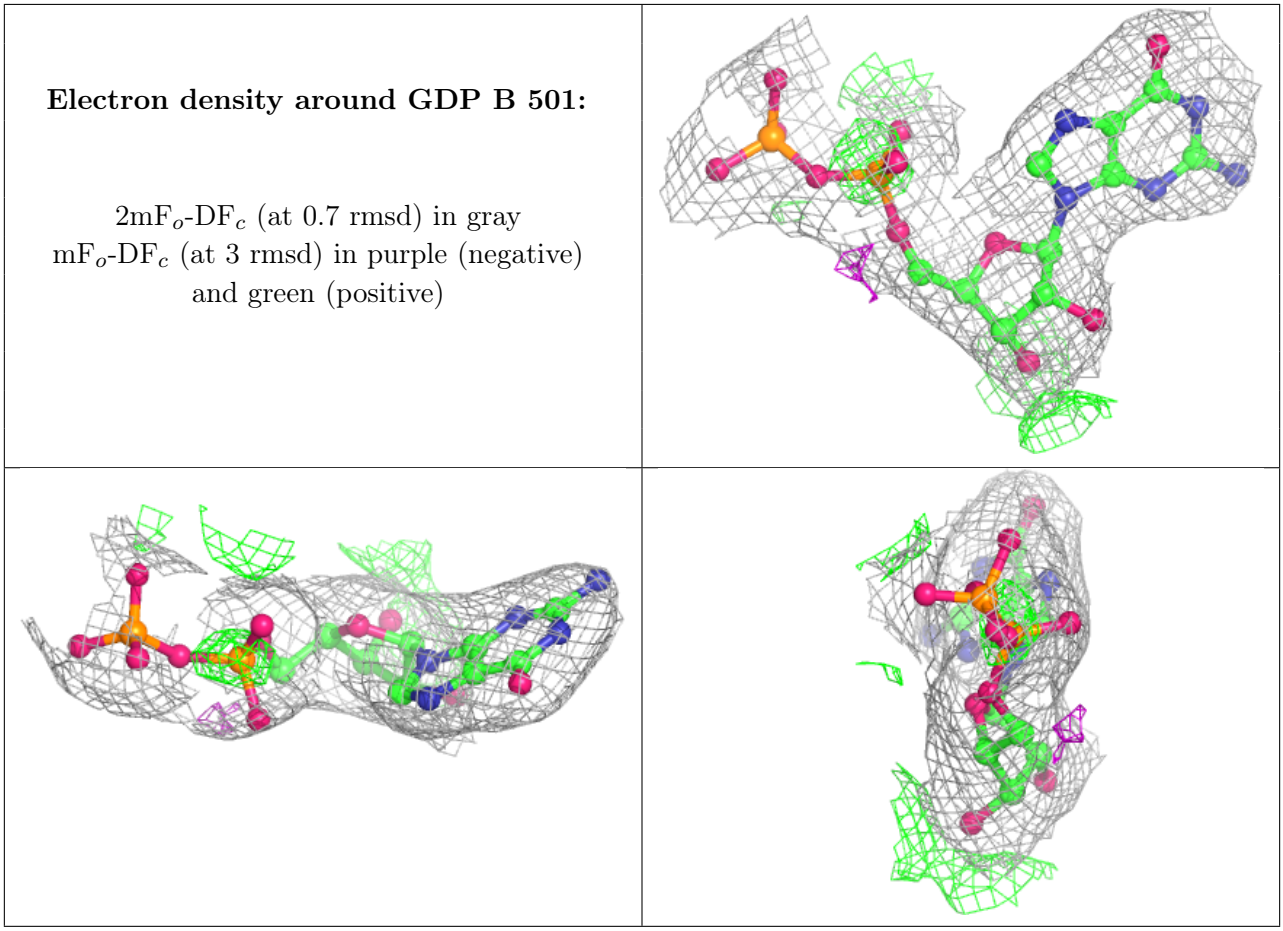
Electron density around GTP D 501:

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



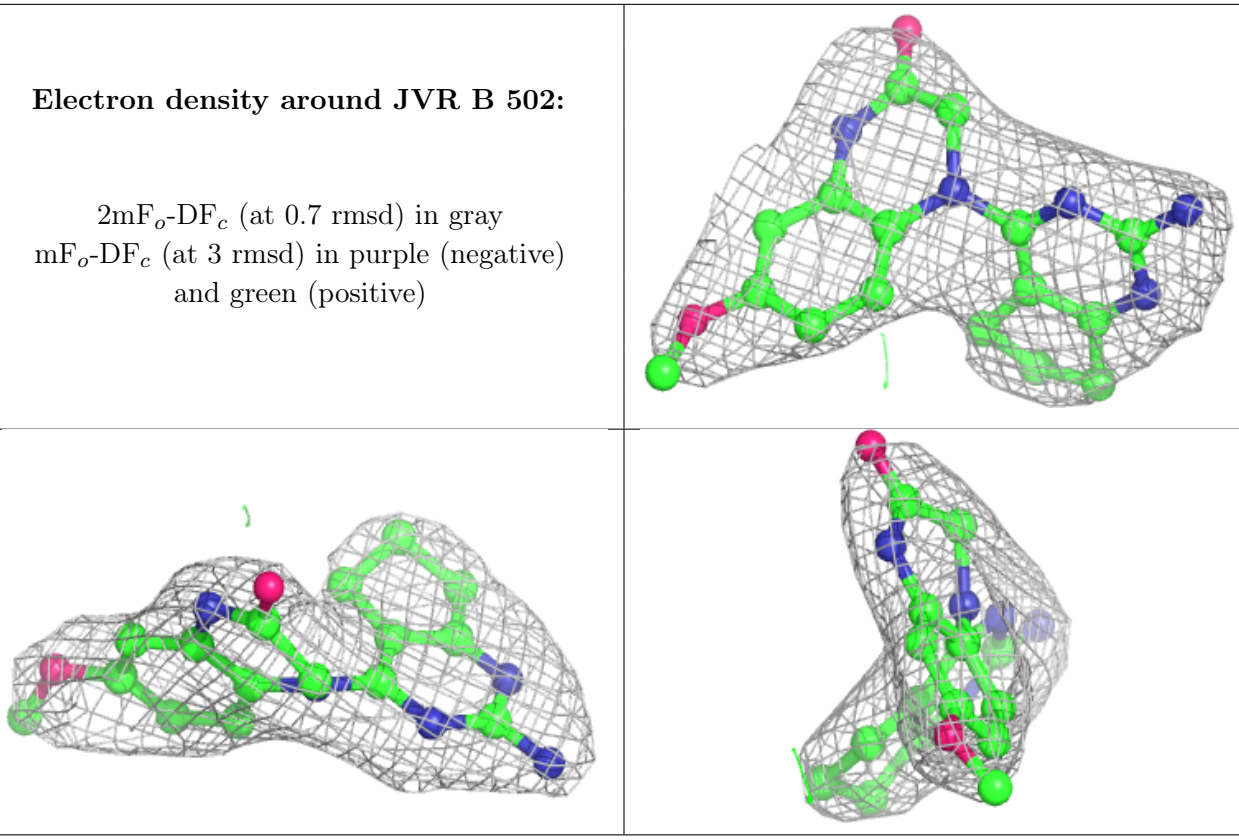
Electron density around GDP B 501:

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



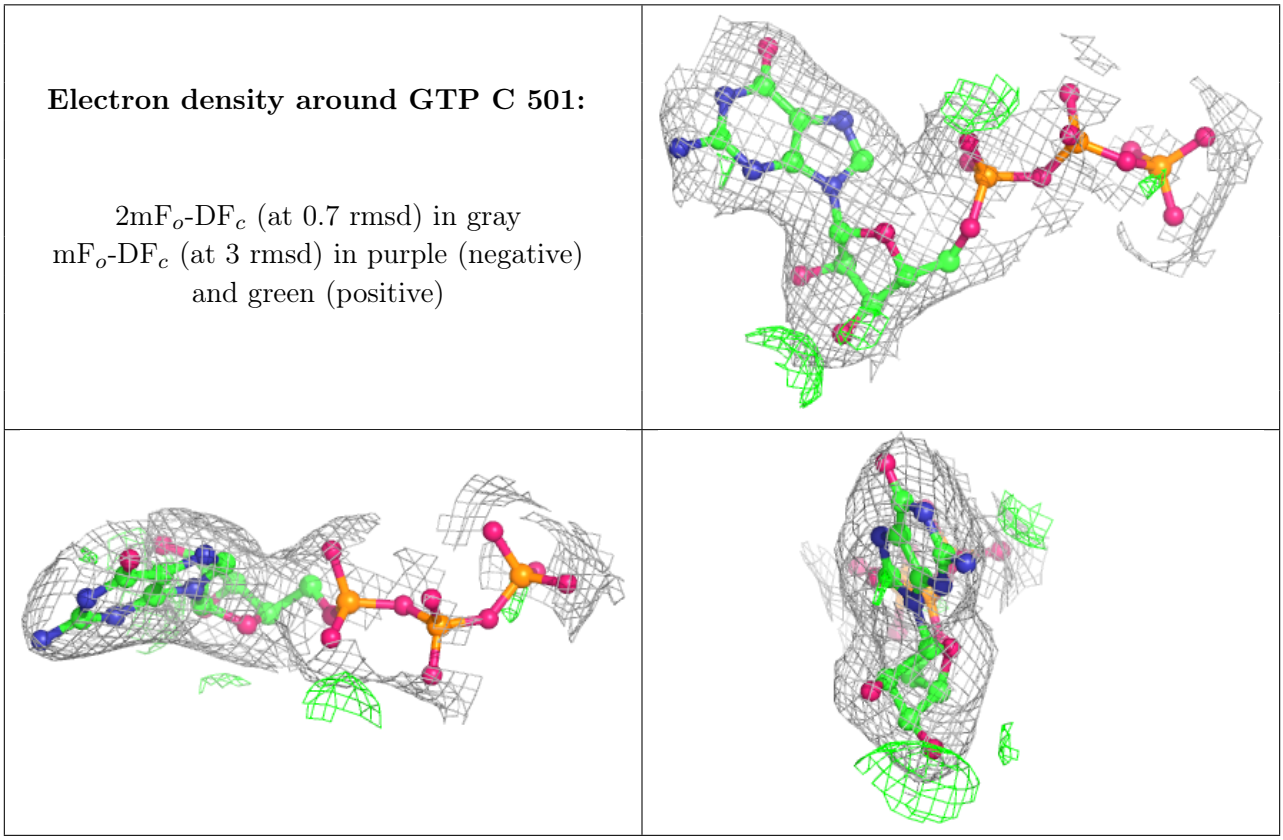
Electron density around JVR B 502:

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



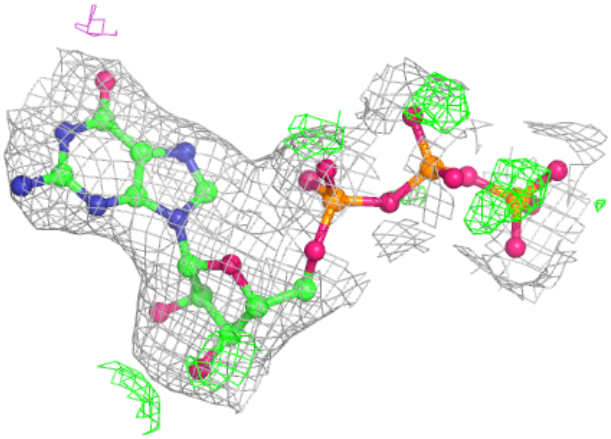
Electron density around GTP C 501:

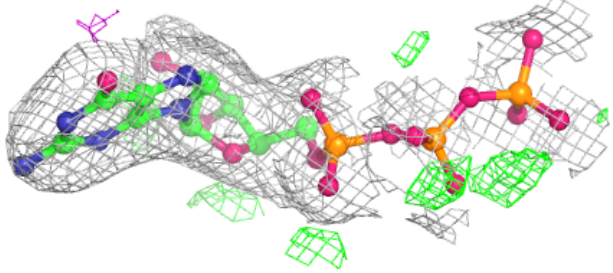
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

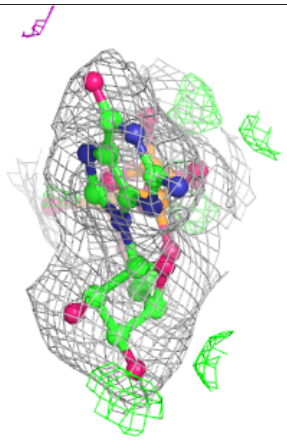


Electron density around GTP A 501:

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

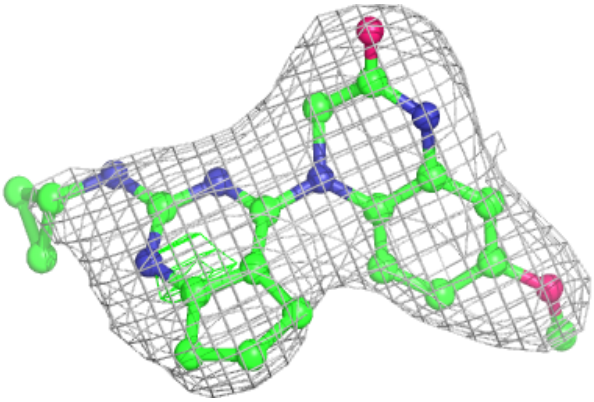


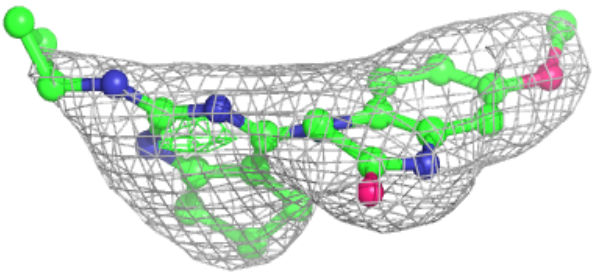


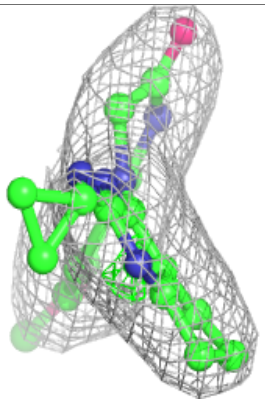


Electron density around JVR D 502:

$2mF_o$-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.