Full wwPDB X-ray Structure Validation Report ⓘ

Sep 20, 2023 – 07:09 pm BST

PDB ID	:	7YZ1
Title	:	Molecular snapshots of drug release from tubulin: 1 millisecond after photoactivation.
Authors	:	Wranik, M.; Weinert, T.; Standfuss, J.
Deposited on	:	2022-02-18
Resolution	:	2.20 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:

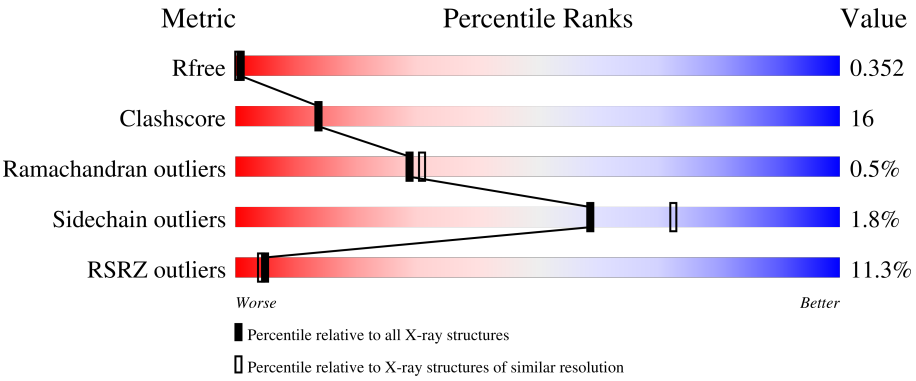
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.20 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	451	5% 73% 23% .
2	B	445	19% 60% 34% . .
3	F	169	6% 63% 28% 8%

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 8292 atoms, of which 18 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
			Total	C	N	O	S			
1	A	437	3423	2170	582	648	23	0	4	0

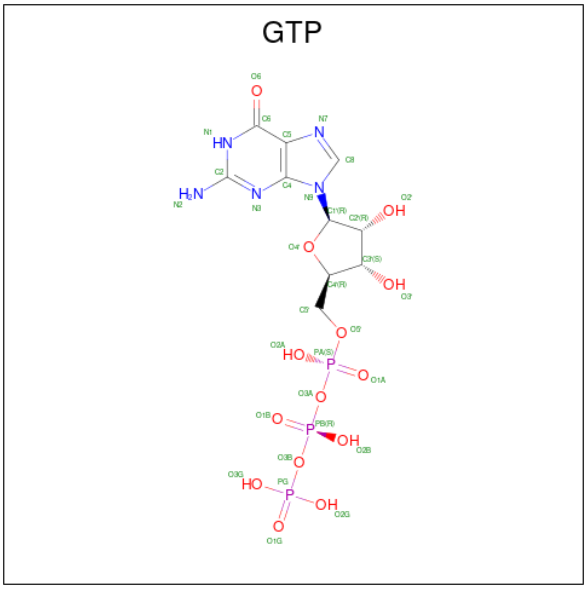
- Molecule 2 is a protein called Tubulin beta-2B chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	426	3358	2111	570	649	28	5	5	0

- Molecule 3 is a protein called Designed Ankyrin Repeat Protein (DARPIN) D1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	F	155	1154	727	198	226	3	0	0	0

- 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		

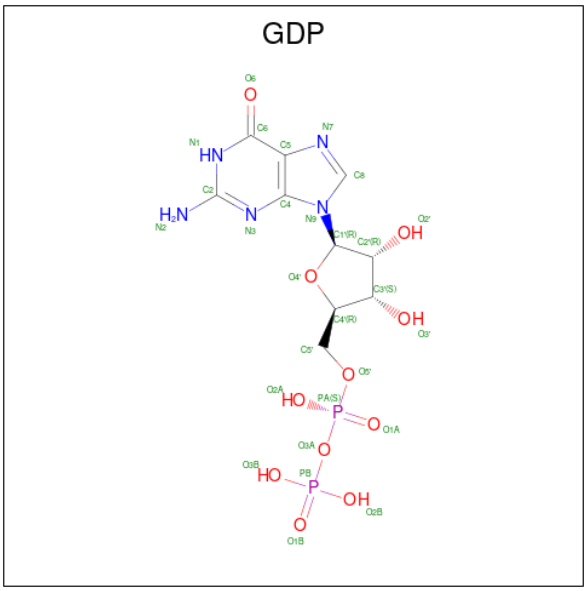
- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 6 is CALCIUM ION (three-letter code: CA) (formula: Ca).

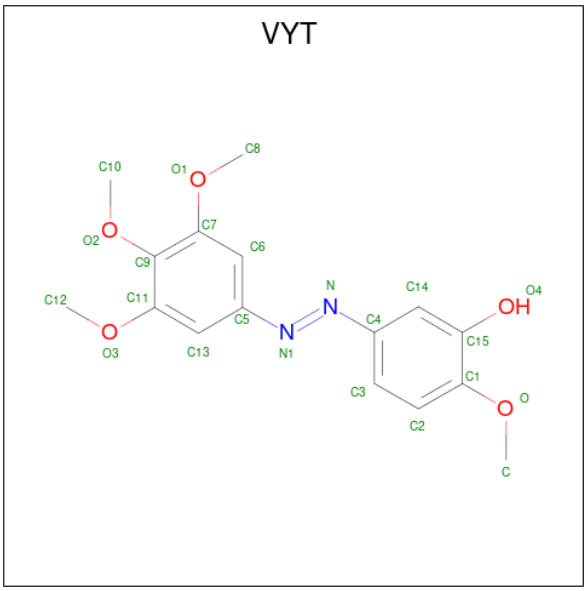
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Ca	0	0
			1	1		

- Molecule 7 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: 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		

- Molecule 8 is Azo-Combretastatin A4 (trans) (three-letter code: VYT) (formula: $C_{16}H_{18}N_2O_5$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	B	1	Total	C	H	N	O	18	0
			41	16	18	2	5		

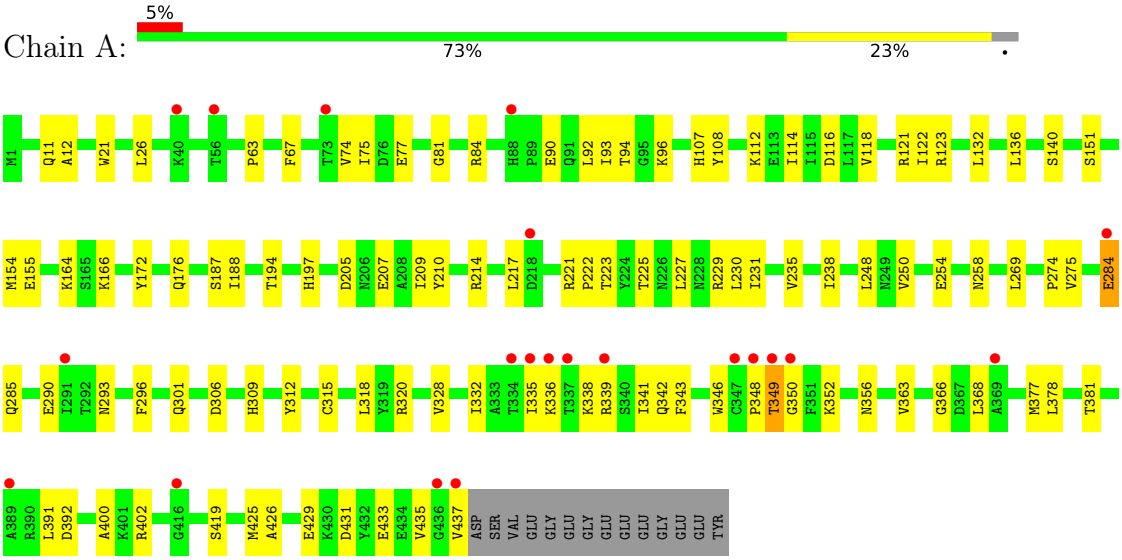
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	135	Total	O	0	0
			135	135		
9	B	78	Total	O	0	0
			78	78		
9	F	41	Total	O	0	0
			41	41		

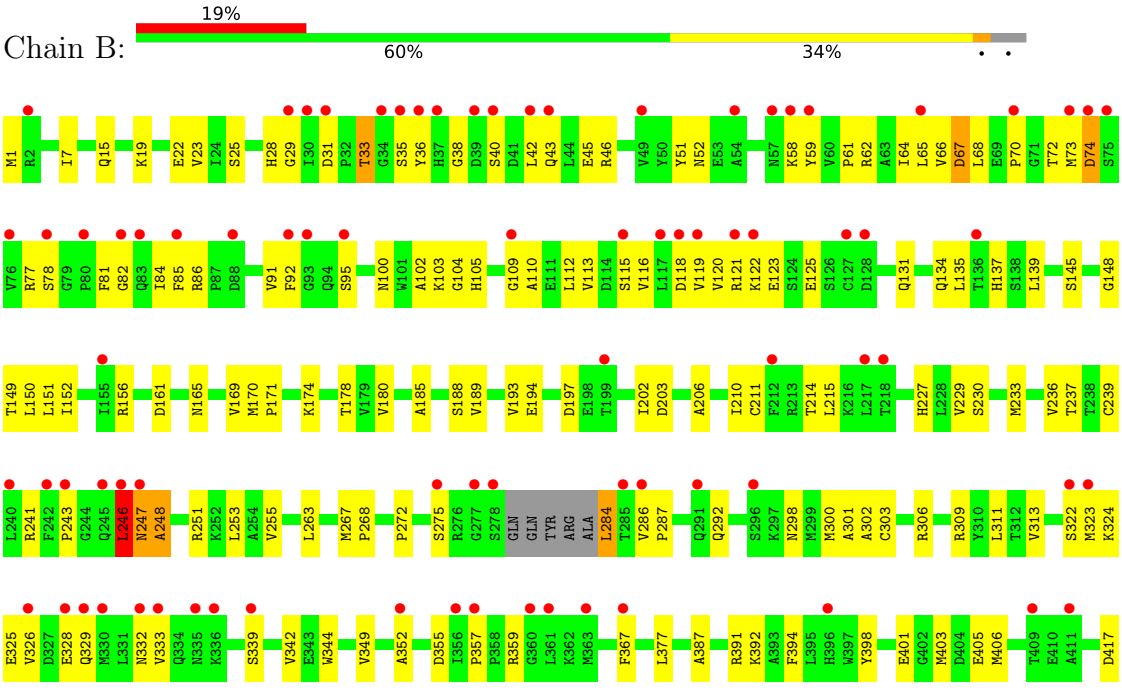
3 Residue-property plots (i)

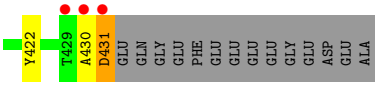
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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



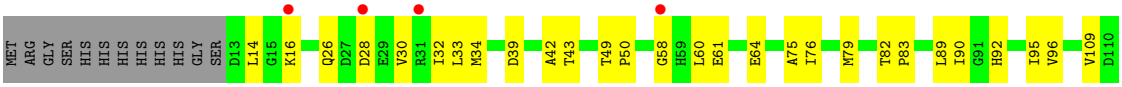
• Molecule 2: Tubulin beta-2B chain

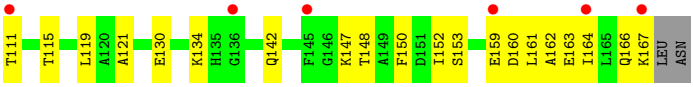




• Molecule 3: Designed Ankyrin Repeat Protein (DARPIN) D1

Chain F:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	74.53Å 92.58Å 83.99Å 90.00° 96.71° 90.00°	Depositor
Resolution (Å)	9.49 – 2.20 9.49 – 2.20	Depositor EDS
% Data completeness (in resolution range)	93.5 (9.49-2.20) 93.5 (9.49-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.71 (at 2.21Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.302 , 0.352 0.302 , 0.352	Depositor DCC
R_{free} test set	1841 reflections (3.47%)	wwPDB-VP
Wilson B-factor (Å^2)	26.4	Xtriage
Anisotropy	0.260	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 75.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.54$, $< L^2 > = 0.39$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	8292	wwPDB-VP
Average B, all atoms (Å^2)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.83% 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, VYT, MG, CA

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	0.31	0/3513	0.52	0/4772
2	B	0.28	0/3450	0.51	1/4671 (0.0%)
3	F	0.27	0/1170	0.47	0/1590
All	All	0.29	0/8133	0.51	1/11033 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	246	LEU	N-CA-C	-6.39	93.74	111.00

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	3423	0	3340	82	0
2	B	3358	0	3231	137	0
3	F	1154	0	1156	36	0
4	A	32	0	12	0	0
5	A	1	0	0	0	0
6	A	1	0	0	0	0
7	B	28	0	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	B	23	18	0	7	0
9	A	135	0	0	14	0
9	B	78	0	0	14	0
9	F	41	0	0	2	0
All	All	8274	18	7751	250	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 16.

All (250) 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)
2:B:398:TYR:HB3	2:B:403:MET:HE3	1.33	1.06
2:B:64:ILE:HD13	2:B:119:VAL:HG13	1.51	0.92
2:B:102:ALA:HB2	2:B:403:MET:HE1	1.55	0.89
2:B:102:ALA:HB2	2:B:403:MET:CE	2.01	0.89
1:A:75:ILE:HD12	1:A:94:THR:HG22	1.59	0.85
2:B:211:CYS:HA	2:B:215:LEU:HB2	1.56	0.84
2:B:253:LEU:HD13	8:B:502:VYT:C6	2.08	0.83
2:B:145:SER:HG	2:B:188:SER:HG	1.04	0.81
2:B:246:LEU:HD12	2:B:352:ALA:HB3	1.63	0.79
2:B:430:ALA:O	2:B:431:ASP:HB2	1.82	0.79
1:A:392:ASP:OD2	9:A:601:HOH:O	2.01	0.79
2:B:161:ASP:O	2:B:251:ARG:NH2	2.16	0.78
2:B:25:SER:HG	2:B:51:TYR:HH	1.19	0.77
2:B:268:PRO:HG2	2:B:300:MET:HB2	1.67	0.77
2:B:398:TYR:CB	2:B:403:MET:HE3	2.15	0.75
1:A:93:ILE:HD11	1:A:121:ARG:HG3	1.69	0.74
1:A:132:LEU:O	1:A:164:LYS:NZ	2.16	0.73
2:B:417:ASP:OD2	9:B:601:HOH:O	2.06	0.72
1:A:166:LYS:HE2	1:A:197:HIS:O	1.89	0.72
2:B:246:LEU:HD12	2:B:352:ALA:CB	2.19	0.72
1:A:93:ILE:HG22	1:A:114:ILE:HD11	1.70	0.71
2:B:31:ASP:OD1	2:B:33:THR:HG22	1.89	0.71
2:B:68:LEU:HD23	2:B:112:LEU:HD22	1.72	0.71
2:B:272:PRO:HG3	2:B:284:LEU:HD21	1.73	0.71
1:A:217:LEU:HD21	1:A:275:VAL:HG12	1.74	0.70
2:B:185:ALA:O	2:B:189:VAL:HG23	1.93	0.69
2:B:246:LEU:CD1	2:B:352:ALA:HB3	2.22	0.69
2:B:194:GLU:OE1	9:B:602:HOH:O	2.10	0.68
1:A:26:LEU:HD12	1:A:363:VAL:HG12	1.74	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:359:ARG:O	9:B:603:HOH:O	2.11	0.67
2:B:246:LEU:HD21	8:B:502:VYT:C6	2.25	0.67
2:B:1:MET:HE1	2:B:131:GLN:HB2	1.76	0.67
2:B:324:LYS:O	2:B:328:GLU:HG3	1.95	0.66
3:F:147:LYS:HB3	3:F:152:ILE:CD1	2.26	0.66
2:B:197:ASP:OD1	9:B:604:HOH:O	2.14	0.66
2:B:134:GLN:HA	2:B:165:ASN:O	1.95	0.66
2:B:398:TYR:HB3	2:B:403:MET:CE	2.20	0.65
2:B:82:GLY:O	9:B:605:HOH:O	2.15	0.65
2:B:116:VAL:HG11	2:B:151:LEU:CD2	2.28	0.64
1:A:346:TRP:HZ2	1:A:435:VAL:HG13	1.63	0.64
1:A:275:VAL:HG13	1:A:368:LEU:CD2	2.28	0.64
2:B:42:LEU:HD22	2:B:243:PRO:HG2	1.79	0.64
2:B:68:LEU:HB3	2:B:95:SER:O	1.97	0.64
2:B:85:PHE:HB2	9:B:605:HOH:O	1.98	0.63
1:A:402:ARG:NH1	9:A:609:HOH:O	2.31	0.63
2:B:102:ALA:HB2	2:B:403:MET:HE2	1.79	0.63
2:B:189:VAL:O	2:B:193:VAL:HG23	1.99	0.63
1:A:402:ARG:NH2	9:A:612:HOH:O	2.32	0.63
1:A:332:ILE:O	1:A:336:LYS:HG3	1.99	0.63
2:B:116:VAL:O	2:B:120:VAL:HG23	1.99	0.63
2:B:174:LYS:HE3	3:F:160:ASP:OD2	1.99	0.62
1:A:258:ASN:OD1	1:A:352:LYS:HE2	1.98	0.62
2:B:239:CYS:SG	2:B:246:LEU:HD22	2.40	0.62
2:B:19:LYS:O	2:B:23:VAL:HG23	2.00	0.61
1:A:274:PRO:HA	9:A:604:HOH:O	2.00	0.61
3:F:166:GLN:NE2	9:F:205:HOH:O	2.31	0.61
1:A:21:TRP:CZ3	1:A:63:PRO:HB3	2.36	0.61
3:F:150:PHE:O	3:F:153:SER:OG	2.16	0.61
1:A:172:TYR:HB3	1:A:205:ASP:HA	1.82	0.61
1:A:309:HIS:O	9:A:603:HOH:O	2.16	0.60
1:A:223:THR:O	1:A:227:LEU:HG	2.01	0.60
1:A:96:LYS:O	9:A:602:HOH:O	2.15	0.60
2:B:73:MET:SD	2:B:77:ARG:NH1	2.75	0.60
1:A:275:VAL:HG13	1:A:368:LEU:HD21	1.82	0.60
2:B:148:GLY:O	2:B:152:ILE:HG13	2.02	0.60
3:F:28:ASP:O	3:F:32:ILE:HG12	2.02	0.59
1:A:335:ILE:HA	1:A:338:LYS:HG2	1.84	0.59
2:B:19:LYS:HG2	9:B:624:HOH:O	2.01	0.59
1:A:188:ILE:HG23	1:A:425:MET:HG3	1.83	0.59
2:B:121:ARG:O	2:B:125:GLU:HG2	2.02	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:147:LYS:HB3	3:F:152:ILE:HD11	1.85	0.59
3:F:109:VAL:HG22	3:F:115:THR:HG22	1.84	0.59
1:A:107:HIS:HD1	1:A:151:SER:HG	1.51	0.58
2:B:66:VAL:HA	2:B:91:VAL:O	2.03	0.58
2:B:355:ASP:O	2:B:357:PRO:HD3	2.03	0.58
9:B:655:HOH:O	3:F:79:MET:HG3	2.03	0.58
2:B:86:ARG:NH1	2:B:123:GLU:OE2	2.36	0.58
2:B:81:PHE:O	2:B:84:ILE:HG22	2.04	0.57
2:B:52:ASN:O	2:B:59:TYR:HA	2.04	0.57
1:A:293:ASN:HD21	1:A:338:LYS:NZ	2.03	0.57
2:B:171:PRO:HG3	2:B:185:ALA:HB2	1.86	0.57
2:B:203:ASP:HB3	2:B:301:ALA:HA	1.86	0.57
2:B:391:ARG:NH2	3:F:119:LEU:HD21	2.20	0.57
3:F:79:MET:O	3:F:111:THR:HG22	2.05	0.57
3:F:26:GLN:O	3:F:30:VAL:HG23	2.05	0.56
2:B:116:VAL:HG11	2:B:151:LEU:HD22	1.88	0.56
2:B:36:TYR:OH	2:B:40:SER:O	2.23	0.56
2:B:246:LEU:CD2	8:B:502:VYT:C7	2.83	0.56
3:F:16:LYS:HE2	3:F:16:LYS:HA	1.86	0.56
2:B:202:ILE:HD13	2:B:229:VAL:HG13	1.88	0.56
2:B:7:ILE:O	2:B:135:LEU:HD12	2.05	0.56
2:B:31:ASP:OD2	2:B:35:SER:HB2	2.05	0.56
2:B:193:VAL:O	9:B:606:HOH:O	2.18	0.56
2:B:78:SER:HB3	9:B:667:HOH:O	2.06	0.55
3:F:162:ALA:O	3:F:166:GLN:HG3	2.06	0.55
2:B:139:LEU:HD12	2:B:170:MET:SD	2.47	0.55
2:B:110:ALA:O	2:B:113:VAL:HG12	2.07	0.55
1:A:221:ARG:CZ	2:B:323:MET:HG2	2.38	0.55
3:F:39:ASP:HB2	9:F:232:HOH:O	2.07	0.54
3:F:164:ILE:O	3:F:167:LYS:HG3	2.07	0.54
1:A:93:ILE:CG2	1:A:114:ILE:HD11	2.38	0.54
1:A:154:MET:HG3	1:A:194:THR:HG23	1.89	0.54
1:A:221:ARG:NE	2:B:323:MET:HG2	2.23	0.54
1:A:151:SER:O	1:A:155:GLU:HG3	2.07	0.54
1:A:320:ARG:HA	1:A:356:ASN:O	2.08	0.54
2:B:29:GLY:O	2:B:36:TYR:HA	2.08	0.54
2:B:246:LEU:HD23	8:B:502:VYT:C9	2.38	0.54
1:A:312:TYR:CE2	1:A:341:ILE:HG23	2.43	0.53
1:A:108:TYR:O	1:A:112:LYS:HB2	2.08	0.53
1:A:328:VAL:O	1:A:332:ILE:HG12	2.09	0.53
1:A:225:THR:O	1:A:229[A]:ARG:HG2	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:67:PHE:HB2	1:A:92:LEU:HD23	1.90	0.53
2:B:398:TYR:CD2	2:B:403:MET:HE3	2.43	0.53
3:F:43:THR:HG22	3:F:49:THR:HG22	1.91	0.53
2:B:227:HIS:NE2	2:B:275:SER:O	2.42	0.52
3:F:89:LEU:HB2	3:F:119:LEU:HD13	1.91	0.52
2:B:25:SER:OG	2:B:51:TYR:OH	2.01	0.52
2:B:116:VAL:HG11	2:B:151:LEU:HD21	1.91	0.52
2:B:72:THR:HB	2:B:92:PHE:HE2	1.74	0.52
2:B:311:LEU:HD23	2:B:342:VAL:HG11	1.92	0.52
1:A:238:ILE:HG12	1:A:378:LEU:HD21	1.91	0.52
1:A:419:SER:HB3	9:A:640:HOH:O	2.09	0.52
2:B:156:ARG:NH2	2:B:197:ASP:OD2	2.42	0.52
1:A:426:ALA:HA	9:A:622:HOH:O	2.10	0.52
2:B:246:LEU:HD23	8:B:502:VYT:C7	2.40	0.52
1:A:81:GLY:O	1:A:84:ARG:HD3	2.11	0.51
2:B:169:VAL:HA	2:B:202:ILE:O	2.10	0.51
3:F:130:GLU:O	3:F:134:LYS:HG3	2.10	0.51
1:A:123:ARG:O	1:A:123:ARG:HD3	2.11	0.51
3:F:58:GLY:HA2	3:F:95:ILE:CD1	2.41	0.51
2:B:284:LEU:HD12	2:B:284:LEU:O	2.11	0.51
2:B:1:MET:CE	2:B:131:GLN:HB2	2.40	0.51
1:A:250:VAL:HG22	1:A:254:GLU:OE1	2.11	0.50
3:F:42:ALA:O	3:F:50:PRO:HD3	2.10	0.50
1:A:217:LEU:HD21	1:A:275:VAL:CG1	2.41	0.50
3:F:121:ALA:HB1	3:F:161:LEU:HD21	1.93	0.50
2:B:23:VAL:HG21	2:B:230:SER:HB2	1.94	0.50
2:B:65:LEU:N	2:B:65:LEU:HD12	2.26	0.50
2:B:7:ILE:O	2:B:135:LEU:HA	2.11	0.50
2:B:38:GLY:HA3	2:B:43:GLN:OE1	2.12	0.50
2:B:392:LYS:HE3	2:B:405:GLU:OE2	2.12	0.50
1:A:342:GLN:HG2	9:A:667:HOH:O	2.12	0.50
2:B:206:ALA:O	2:B:210:ILE:HG13	2.12	0.49
1:A:187:SER:HB3	1:A:391:LEU:HD21	1.93	0.49
3:F:142:GLN:HA	3:F:147:LYS:O	2.12	0.49
1:A:90:GLU:OE1	1:A:90:GLU:N	2.32	0.49
2:B:112:LEU:O	2:B:112:LEU:HG	2.12	0.49
1:A:11:GLN:HG3	1:A:74:VAL:HG21	1.95	0.48
2:B:66:VAL:O	2:B:67:ASP:HB2	2.13	0.48
2:B:251:ARG:O	2:B:255:VAL:HG23	2.12	0.48
2:B:58:LYS:HG2	2:B:59:TYR:H	1.77	0.48
2:B:239:CYS:SG	2:B:246:LEU:HB3	2.53	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:61:GLU:OE1	3:F:61:GLU:N	2.45	0.48
1:A:275:VAL:N	9:A:604:HOH:O	2.17	0.48
3:F:130:GLU:OE2	3:F:164:ILE:HD12	2.13	0.48
2:B:74:ASP:N	2:B:74:ASP:OD1	2.46	0.48
1:A:318:LEU:HD13	9:A:642:HOH:O	2.14	0.47
1:A:136:LEU:HD12	1:A:136:LEU:N	2.29	0.47
2:B:236:VAL:HG23	2:B:237:THR:HG23	1.95	0.47
2:B:247:ASN:O	2:B:248:ALA:HB2	2.14	0.47
3:F:14:LEU:HD22	3:F:33:LEU:HD22	1.97	0.47
2:B:246:LEU:CD2	8:B:502:VYT:C6	2.91	0.47
3:F:147:LYS:HB3	3:F:152:ILE:HD12	1.95	0.47
1:A:336:LYS:NZ	1:A:336:LYS:HB3	2.30	0.47
2:B:387:ALA:O	2:B:391:ARG:HD3	2.15	0.47
2:B:349:VAL:HB	9:B:620:HOH:O	2.14	0.46
2:B:263:LEU:HD22	2:B:422:TYR:CE1	2.50	0.46
1:A:231:ILE:O	1:A:235:VAL:HG23	2.15	0.46
1:A:429:GLU:HG3	9:A:601:HOH:O	2.15	0.46
2:B:28:HIS:CE1	2:B:241:ARG:HB3	2.50	0.46
3:F:16:LYS:HE2	3:F:16:LYS:CA	2.45	0.46
2:B:398:TYR:HD2	2:B:403:MET:HE3	1.79	0.46
2:B:309:ARG:NH1	2:B:339:SER:O	2.48	0.46
1:A:269:LEU:HD21	1:A:301:GLN:CD	2.36	0.46
2:B:62:ARG:HG3	2:B:123:GLU:OE1	2.15	0.46
2:B:178:THR:HG22	2:B:180:VAL:HG22	1.97	0.46
2:B:286:VAL:HB	2:B:287:PRO:HD3	1.98	0.46
1:A:229[B]:ARG:CD	1:A:366:GLY:HA2	2.46	0.46
2:B:84:ILE:HG13	2:B:84:ILE:O	2.17	0.46
2:B:272:PRO:HG3	2:B:284:LEU:CD2	2.45	0.46
1:A:209:ILE:HG23	1:A:230:LEU:HD23	1.99	0.45
2:B:22:GLU:HG2	2:B:81:PHE:CD1	2.50	0.45
2:B:28:HIS:NE2	2:B:241:ARG:HB3	2.31	0.45
2:B:170:MET:HG3	2:B:377:LEU:HD11	1.98	0.45
1:A:343:PHE:CD1	1:A:349:THR:HG23	2.51	0.45
1:A:12:ALA:CB	1:A:140:SER:HB3	2.47	0.45
2:B:210:ILE:O	2:B:214:THR:HB	2.16	0.45
3:F:60:LEU:O	3:F:64:GLU:HG3	2.16	0.45
2:B:325:GLU:O	2:B:329:GLN:HG2	2.17	0.45
3:F:75:ALA:O	3:F:83:PRO:HD3	2.16	0.45
2:B:332:ASN:HB2	9:B:628:HOH:O	2.16	0.44
1:A:21:TRP:CE3	1:A:63:PRO:HB3	2.51	0.44
1:A:296:PHE:O	1:A:339:ARG:NH2	2.50	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:306:ASP:HB3	1:A:309:HIS:CE1	2.52	0.44
2:B:206:ALA:HB2	2:B:302:ALA:N	2.32	0.44
2:B:313:VAL:HG13	2:B:367:PHE:CE1	2.53	0.44
1:A:210:TYR:CE2	1:A:214:ARG:HD3	2.53	0.44
1:A:391:LEU:HD12	1:A:391:LEU:HA	1.85	0.44
3:F:58:GLY:HA2	3:F:95:ILE:HD12	1.99	0.44
1:A:75:ILE:CD1	1:A:94:THR:HG22	2.39	0.44
2:B:322:SER:O	2:B:326:VAL:HG23	2.18	0.43
2:B:344:TRP:HB3	2:B:430:ALA:HB2	2.00	0.43
2:B:116:VAL:O	2:B:119:VAL:HG12	2.19	0.43
2:B:272:PRO:HB3	2:B:284:LEU:HD22	1.98	0.43
2:B:398:TYR:HD2	2:B:403:MET:CE	2.31	0.43
3:F:30:VAL:O	3:F:34:MET:HG3	2.18	0.43
1:A:12:ALA:HB3	1:A:140:SER:HB3	2.00	0.43
2:B:309:ARG:NH2	9:B:619:HOH:O	2.40	0.43
2:B:61:PRO:HD2	2:B:84:ILE:O	2.18	0.43
1:A:176:GLN:HE22	1:A:207:GLU:CD	2.21	0.43
1:A:296:PHE:HB2	1:A:339:ARG:NH1	2.34	0.43
1:A:284:GLU:OE1	1:A:285:GLN:N	2.52	0.43
1:A:348:PRO:O	1:A:350:GLY:N	2.51	0.43
2:B:105:HIS:O	2:B:150:LEU:HD22	2.19	0.43
1:A:315[A]:CYS:SG	1:A:377:MET:SD	3.17	0.43
2:B:70:PRO:O	2:B:73:MET:HB3	2.19	0.43
2:B:103:LYS:NZ	2:B:401:GLU:OE2	2.49	0.43
2:B:178:THR:CG2	2:B:180:VAL:HG22	2.49	0.43
2:B:391:ARG:N	2:B:391:ARG:HD2	2.34	0.42
2:B:292:GLN:HG2	2:B:298:ASN:ND2	2.34	0.42
2:B:394:PHE:CE2	3:F:90:ILE:HD12	2.54	0.42
1:A:338:LYS:O	1:A:338:LYS:HG3	2.17	0.42
2:B:377:LEU:C	2:B:377:LEU:HD23	2.40	0.42
3:F:142:GLN:HG2	3:F:148:THR:HG22	2.02	0.42
1:A:210:TYR:CZ	1:A:222:PRO:HD2	2.55	0.42
2:B:243:PRO:O	9:B:607:HOH:O	2.22	0.42
3:F:92:HIS:O	3:F:96:VAL:HG23	2.19	0.42
2:B:233:MET:O	2:B:237:THR:HG23	2.19	0.42
3:F:76:ILE:HG22	3:F:82:THR:HG22	2.02	0.41
1:A:400:ALA:HA	9:A:609:HOH:O	2.19	0.41
2:B:104:GLY:O	2:B:109:GLY:HA3	2.20	0.41
2:B:267:MET:SD	2:B:303[B]:CYS:SG	3.18	0.41
1:A:107:HIS:ND1	1:A:151:SER:OG	2.43	0.41
1:A:437:VAL:O	1:A:437:VAL:HG13	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:246:LEU:HD21	8:B:502:VYT:C7	2.49	0.41
3:F:159:GLU:O	3:F:163:GLU:HG3	2.20	0.41
2:B:67:ASP:O	2:B:92:PHE:HA	2.19	0.41
1:A:118:VAL:O	1:A:122:ILE:HG13	2.21	0.41
2:B:100:ASN:OD1	2:B:102:ALA:HB3	2.20	0.41
2:B:145:SER:O	2:B:149:THR:HG23	2.19	0.41
1:A:154:MET:HG3	1:A:194:THR:CG2	2.50	0.41
1:A:248:LEU:HD11	1:A:352:LYS:HB3	2.04	0.40
1:A:293:ASN:HA	1:A:335:ILE:CD1	2.51	0.40
1:A:429:GLU:O	1:A:433:GLU:HG3	2.21	0.40
1:A:116:ASP:HB2	9:A:695:HOH:O	2.21	0.40
1:A:431:ASP:O	1:A:435:VAL:HG23	2.20	0.40
2:B:115:SER:O	2:B:118:ASP:HB2	2.20	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	439/451 (97%)	422 (96%)	16 (4%)	1 (0%)	47 55
2	B	427/445 (96%)	405 (95%)	18 (4%)	4 (1%)	17 16
3	F	153/169 (90%)	151 (99%)	2 (1%)	0	100 100
All	All	1019/1065 (96%)	978 (96%)	36 (4%)	5 (0%)	29 31

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	247	ASN
2	B	248	ALA
2	B	45	GLU
2	B	67	ASP

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Mol	Chain	Res	Type
1	A	349	THR

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	369/379 (97%)	365 (99%)	4 (1%)	73 85
2	B	370/383 (97%)	358 (97%)	12 (3%)	39 50
3	F	120/132 (91%)	120 (100%)	0	100 100
All	All	859/894 (96%)	843 (98%)	16 (2%)	59 71

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	GLU
1	A	284	GLU
1	A	290	GLU
1	A	381	THR
2	B	33	THR
2	B	46[A]	ARG
2	B	46[B]	ARG
2	B	74	ASP
2	B	122	LYS
2	B	137	HIS
2	B	246	LEU
2	B	284	LEU
2	B	306	ARG
2	B	333	VAL
2	B	406	MET
2	B	431	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	11	GLN
1	A	293	ASN
1	A	342	GLN
2	B	83	GLN
2	B	335	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 5 ligands modelled in this entry, 2 are monoatomic - leaving 3 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	$\#\|Z\| > 2$
7	GDP	B	501	-	24,30,30	0.89	1 (4%)	30,47,47	1.35	5 (16%)
4	GTP	A	501	5	26,34,34	1.18	2 (7%)	32,54,54	1.49	6 (18%)
8	VYT	B	502	-	24,24,24	0.43	0	32,32,32	0.97	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
7	GDP	B	501	-	-	4/12/32/32	0/3/3/3
4	GTP	A	501	5	-	6/18/38/38	0/3/3/3
8	VYT	B	502	-	-	0/13/13/13	0/2/2/2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	501	GTP	C5-C6	-3.90	1.39	1.47
4	A	501	GTP	C2-N3	2.37	1.38	1.33
7	B	501	GDP	C6-N1	-2.04	1.34	1.37

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	501	GTP	PB-O3B-PG	-3.54	120.67	132.83
7	B	501	GDP	PA-O3A-PB	-3.53	120.70	132.83
4	A	501	GTP	C5-C6-N1	3.26	119.72	113.95
4	A	501	GTP	C8-N7-C5	3.08	108.86	102.99
4	A	501	GTP	O3'-C3'-C4'	-2.71	103.21	111.05
4	A	501	GTP	C2-N1-C6	-2.66	120.19	125.10
7	B	501	GDP	C5-C6-N1	2.35	118.10	113.95
7	B	501	GDP	O6-C6-C5	-2.34	119.81	124.37
7	B	501	GDP	C8-N7-C5	2.19	107.16	102.99
7	B	501	GDP	C3'-C2'-C1'	2.04	104.05	100.98
4	A	501	GTP	O6-C6-C5	-2.01	120.45	124.37

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	501	GTP	C5'-O5'-PA-O1A
4	A	501	GTP	C5'-O5'-PA-O2A
7	B	501	GDP	C5'-O5'-PA-O1A
7	B	501	GDP	C5'-O5'-PA-O2A
4	A	501	GTP	PB-O3B-PG-O1G
4	A	501	GTP	PB-O3B-PG-O2G
4	A	501	GTP	PB-O3B-PG-O3G
4	A	501	GTP	C5'-O5'-PA-O3A
7	B	501	GDP	C5'-O5'-PA-O3A
7	B	501	GDP	PB-O3A-PA-O2A

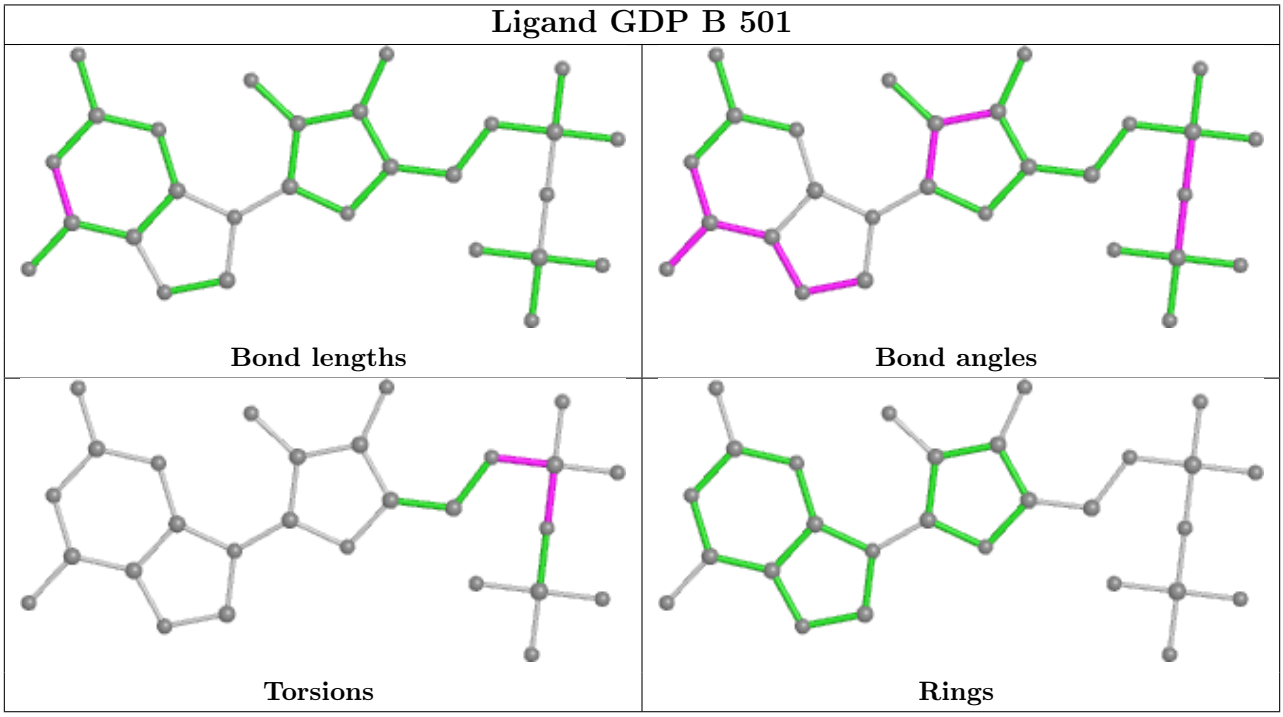
There are no ring outliers.

1 monomer is involved in 7 short contacts:

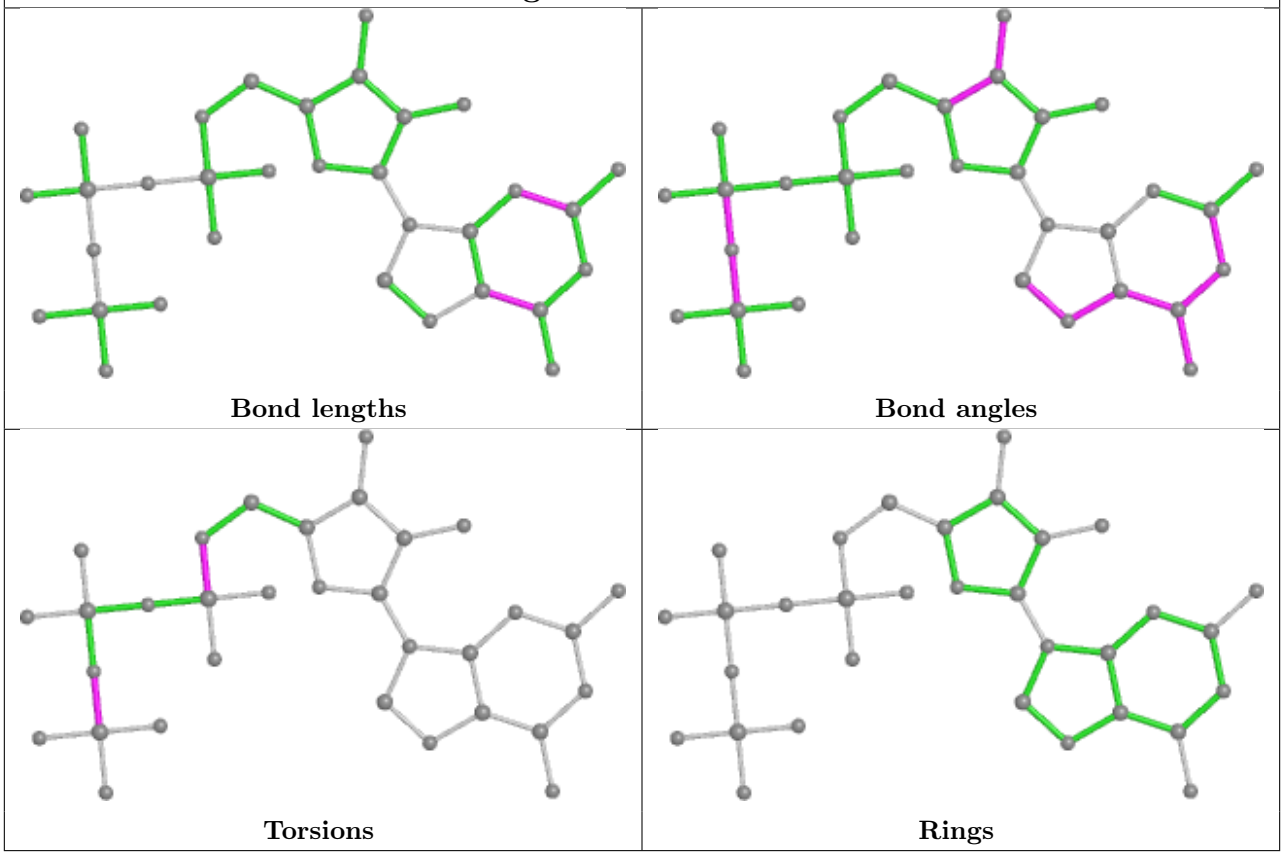
Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	502	VYT	7	0

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 GDP B 501



Ligand GTP A 501



5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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	437/451 (96%)	0.56	21 (4%) 30 29	13, 24, 40, 57	0
2	B	426/445 (95%)	1.24	84 (19%) 1 1	18, 36, 56, 65	0
3	F	155/169 (91%)	0.63	10 (6%) 18 17	18, 26, 38, 46	0
All	All	1018/1065 (95%)	0.86	115 (11%) 5 4	13, 28, 52, 65	0

All (115) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	246	LEU	6.8
2	B	73	MET	6.5
2	B	75	SER	6.0
2	B	277	GLY	5.8
2	B	93	GLY	5.8
1	A	436	GLY	5.4
1	A	334	THR	5.2
2	B	286	VAL	4.8
1	A	437	VAL	4.8
2	B	57	ASN	4.8
2	B	245	GLN	4.8
2	B	58	LYS	4.6
2	B	80	PRO	4.6
2	B	409	THR	4.3
2	B	76	VAL	4.2
1	A	335	ILE	4.0
2	B	115	SER	3.8
2	B	361	LEU	3.7
2	B	360	GLY	3.7
1	A	339	ARG	3.7
1	A	88	HIS	3.7
2	B	121	ARG	3.7
2	B	278	SER	3.6

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Mol	Chain	Res	Type	RSRZ
2	B	83	GLN	3.6
2	B	36	TYR	3.6
2	B	275	SER	3.5
1	A	337	THR	3.5
2	B	357	PRO	3.5
2	B	92	PHE	3.4
2	B	356	ILE	3.4
2	B	82	GLY	3.4
1	A	347	CYS	3.3
1	A	336	LYS	3.2
2	B	2	ARG	3.2
2	B	42	LEU	3.2
2	B	117	LEU	3.2
2	B	212	PHE	3.2
2	B	247	ASN	3.2
2	B	429	THR	3.2
2	B	39	ASP	3.2
2	B	30	ILE	3.1
2	B	109	GLY	3.1
2	B	35	SER	3.1
1	A	56	THR	3.1
2	B	155	ILE	3.1
2	B	430	ALA	3.1
3	F	31	ARG	3.0
2	B	326	VAL	3.0
2	B	242	PHE	3.0
2	B	218	THR	3.0
2	B	127	CYS	2.9
3	F	145	PHE	2.9
2	B	291	GLN	2.9
2	B	95	SER	2.9
2	B	431	ASP	2.9
1	A	349	THR	2.8
2	B	118	ASP	2.8
1	A	416	GLY	2.8
2	B	31	ASP	2.7
2	B	40	SER	2.7
2	B	54	ALA	2.7
2	B	29	GLY	2.7
2	B	85	PHE	2.7
2	B	363	MET	2.7
2	B	352	ALA	2.6

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Mol	Chain	Res	Type	RSRZ
2	B	411	ALA	2.6
2	B	43	GLN	2.6
2	B	136	THR	2.6
2	B	37	HIS	2.5
2	B	34	GLY	2.5
2	B	243	PRO	2.5
1	A	348	PRO	2.5
2	B	217	LEU	2.5
2	B	74	ASP	2.5
1	A	389	ALA	2.5
2	B	333	VAL	2.4
2	B	88	ASP	2.4
1	A	284	GLU	2.4
2	B	328	GLU	2.4
1	A	40	LYS	2.4
1	A	350	GLY	2.4
2	B	49	VAL	2.4
2	B	199	THR	2.4
2	B	240	LEU	2.3
2	B	323	MET	2.3
2	B	119	VAL	2.3
3	F	16	LYS	2.3
2	B	78	SER	2.3
2	B	296	SER	2.3
1	A	73	THR	2.3
2	B	285	THR	2.2
2	B	128	ASP	2.2
2	B	335	ASN	2.2
3	F	164	ILE	2.2
2	B	336	LYS	2.2
3	F	167	LYS	2.2
2	B	59	TYR	2.2
2	B	70	PRO	2.2
3	F	111	THR	2.2
2	B	65	LEU	2.2
3	F	159	GLU	2.2
1	A	369	ALA	2.2
2	B	122	LYS	2.1
1	A	291	ILE	2.1
2	B	322	SER	2.1
1	A	218	ASP	2.1
2	B	329	GLN	2.1

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Mol	Chain	Res	Type	RSRZ
2	B	367	PHE	2.1
3	F	58	GLY	2.1
2	B	396	HIS	2.1
2	B	339	SER	2.1
3	F	136	GLY	2.1
2	B	332	ASN	2.0
2	B	330	MET	2.0
3	F	28	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 monosaccharides in this entry.

6.4 Ligands (i)

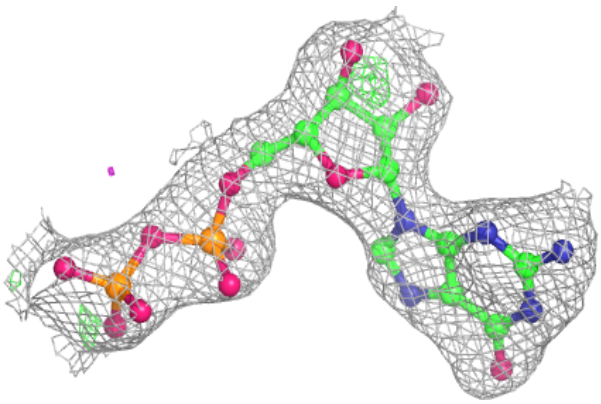
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

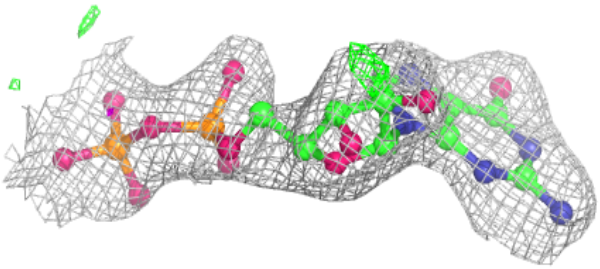
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
8	VYT	B	502	23/23	0.79	0.22	22,40,53,54	18
7	GDP	B	501	28/28	0.92	0.14	25,33,36,37	0
4	GTP	A	501	32/32	0.93	0.14	10,14,17,19	0
6	CA	A	503	1/1	0.93	0.05	29,29,29,29	0
5	MG	A	502	1/1	0.96	0.14	11,11,11,11	0

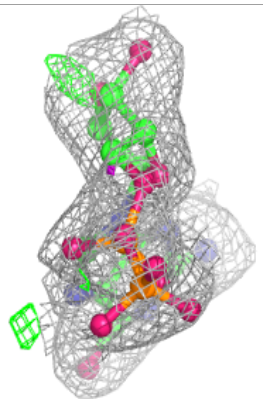
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around 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)

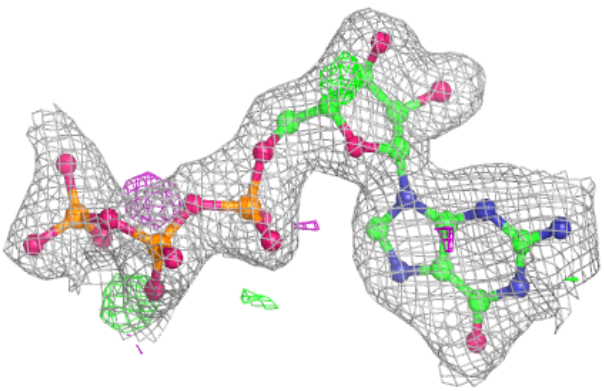


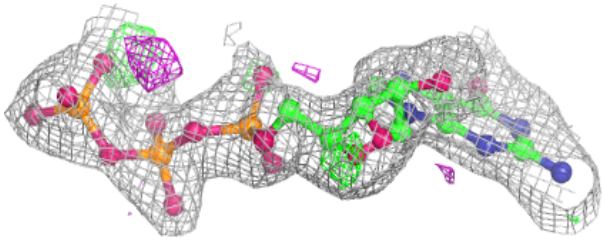


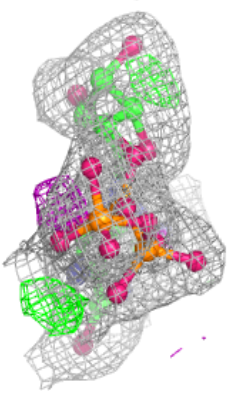


Electron density around GTP A 501:

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







6.5 Other polymers (i)

There are no such residues in this entry.