Full wwPDB X-ray Structure Validation Report (i)

Dec 2, 2024 – 10:57 AM EST

PDB ID	:	2BTO
Title	:	Structure of BtubA from Prosthecobacter dejongeii
Authors	:	Schlieper, D.; Lowe, J.
Deposited on	:	2005-06-04
Resolution	:	2.50 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 (i) 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 (i)) were used in the production of this report:

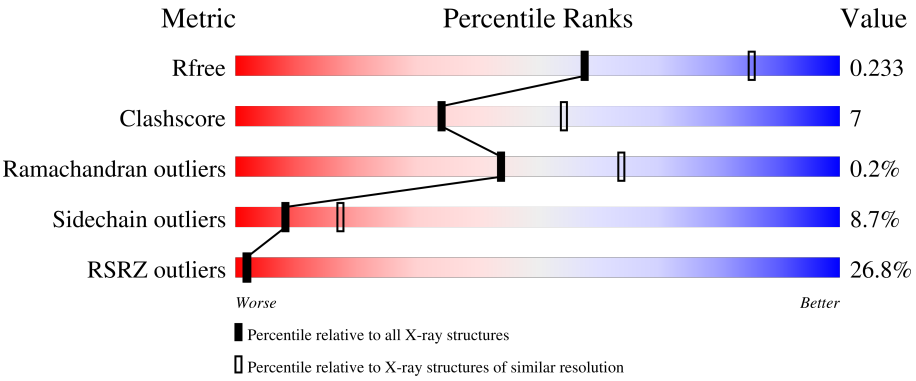
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 2.50 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}	164625	5504 (2.50-2.50)
Clashscore	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (2.50-2.50)

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%

Mol	Chain	Length	Quality of chain
1	A	473	5% 70% 16% • 13%
1	B	473	28% 70% 17% • 11%
2	T	108	88% 75% 16% 5% 5%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 7451 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 BTUBA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	413	Total	C	N	O	S	0	0	0
			3156	2012	531	597	16			
1	B	423	Total	C	N	O	S	0	0	0
			3230	2055	544	614	17			

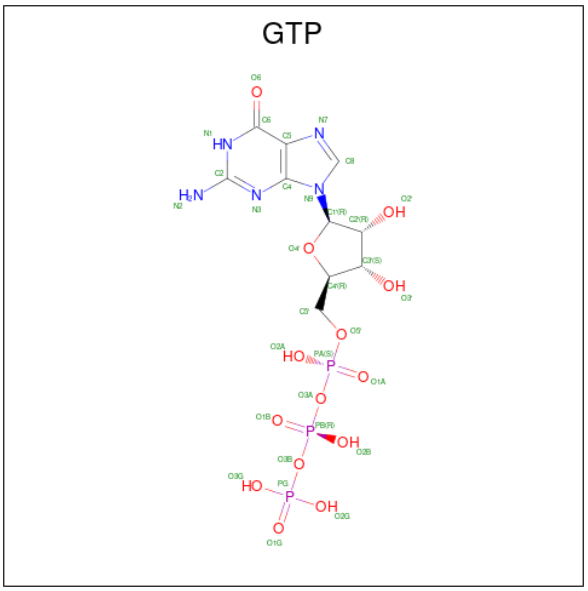
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	255	SER	THR	conflict	UNP Q8GCC5
B	255	SER	THR	conflict	UNP Q8GCC5

- Molecule 2 is a protein called THIOREDOXIN 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	T	103	Total	C	N	O	S	0	0	0
			785	506	126	150	3			

- Molecule 3 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).



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

- Molecule 4 is water.

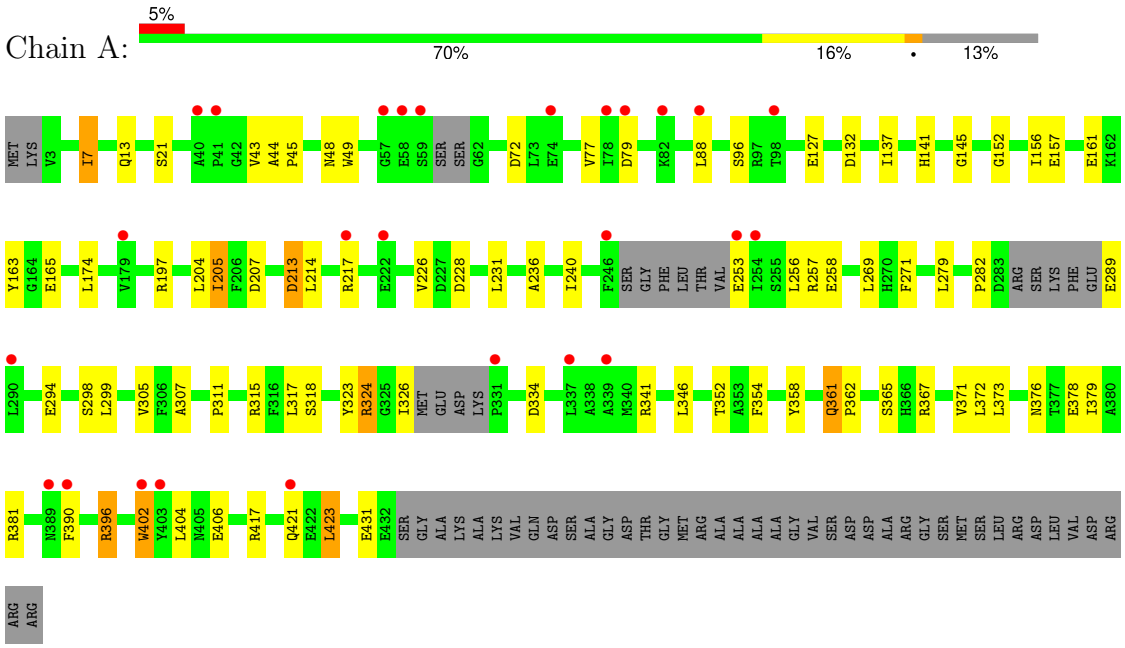
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	108	Total	O	0	0
			108	108		
4	B	93	Total	O	0	0
			93	93		
4	T	15	Total	O	0	0
			15	15		

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. 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. 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.

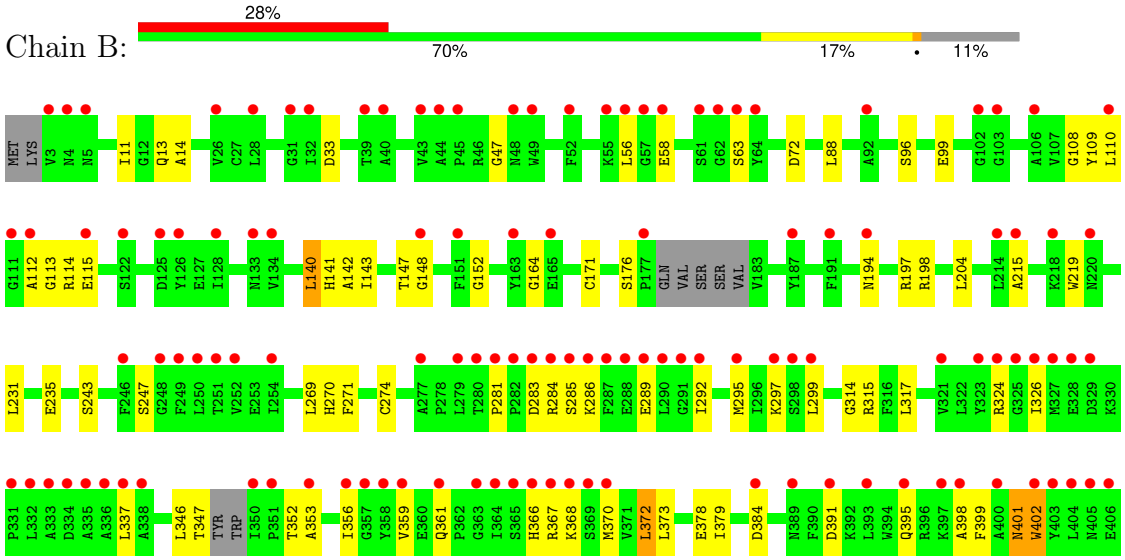
• Molecule 1: TUBULIN BTUBA

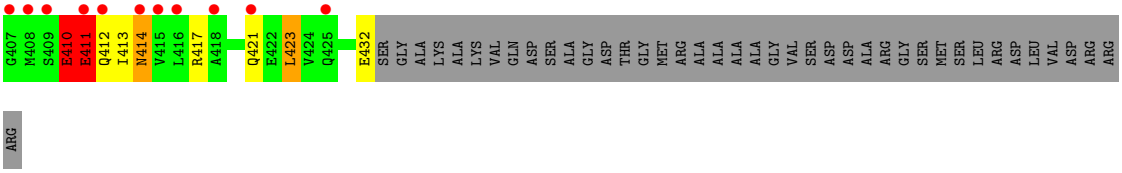
Chain A:



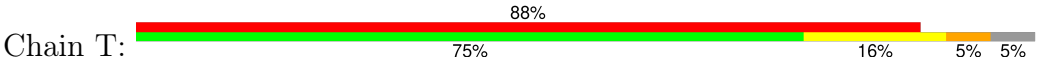
• Molecule 1: TUBULIN BTUBA

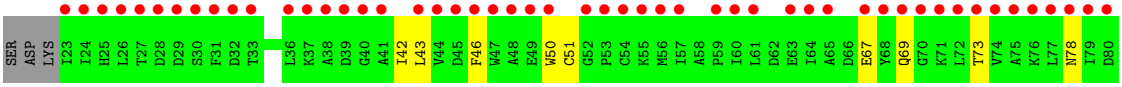
Chain B:

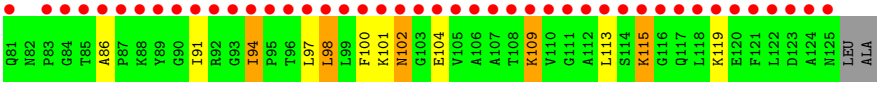




• Molecule 2: THIOREDOXIN 1







4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α, β, γ	180.54Å 180.54Å 84.23Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 2.50 50.00 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.9 (50.00-2.50) 99.9 (50.00-2.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.79 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.200 , 0.235 0.198 , 0.233	Depositor DCC
R_{free} test set	2733 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å^2)	44.5	Xtriage
Anisotropy	0.449	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 67.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.025 for -h,-k,l	Xtriage
F_o,F_c correlation	0.90	EDS
Total number of atoms	7451	wwPDB-VP
Average B, all atoms (Å^2)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.03% 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: 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	0.50	0/3219	0.64	0/4372
1	B	1.26	6/3294 (0.2%)	0.66	2/4471 (0.0%)
2	T	0.68	2/800 (0.2%)	0.54	0/1086
All	All	0.94	8/7313 (0.1%)	0.64	2/9929 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	2

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	410	GLU	CD-OE1	50.64	1.81	1.25
1	B	411	GLU	CD-OE2	26.13	1.54	1.25
1	B	411	GLU	CD-OE1	23.18	1.51	1.25
1	B	411	GLU	CB-CG	18.88	1.88	1.52
2	T	67	GLU	CD-OE2	13.83	1.40	1.25
1	B	414	ASN	CG-OD1	11.65	1.49	1.24
1	B	410	GLU	CD-OE2	-10.39	1.14	1.25
2	T	67	GLU	CD-OE1	7.33	1.33	1.25

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	411	GLU	OE1-CD-OE2	-11.20	109.86	123.30
1	B	410	GLU	CG-CD-OE2	-5.63	107.05	118.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	410	GLU	Sidechain
1	B	411	GLU	Sidechain

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3156	0	3143	44	0
1	B	3230	0	3221	55	0
2	T	785	0	790	13	0
3	A	32	0	12	3	0
3	B	32	0	12	1	0
4	A	108	0	0	10	0
4	B	93	0	0	5	0
4	T	15	0	0	2	0
All	All	7451	0	7178	108	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 7.

All (108) 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:B:411:GLU:CB	1:B:411:GLU:CG	1.88	1.51
1:A:165:GLU:HG2	4:A:2055:HOH:O	1.36	1.21
1:B:410:GLU:CD	1:B:410:GLU:OE1	1.81	1.16
3:A:1433:GTP:PB	4:A:2106:HOH:O	2.22	0.97
1:B:235:GLU:OE1	1:B:366:HIS:HE1	1.67	0.77
1:A:417:ARG:NH1	1:A:421:GLN:OE1	2.17	0.77
1:B:143:ILE:HG22	4:B:2038:HOH:O	1.87	0.74
1:A:152:GLY:O	1:A:156:ILE:HG12	1.90	0.72
1:B:399:PHE:O	1:B:402:TRP:HB2	1.92	0.69
3:A:1433:GTP:O3B	4:A:2106:HOH:O	2.08	0.68
2:T:42:ILE:HG23	2:T:100:PHE:HB2	1.74	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:376:ASN:HD22	1:A:378:GLU:H	1.40	0.68
1:A:376:ASN:ND2	1:A:378:GLU:H	1.91	0.67
1:B:366:HIS:HD2	4:B:2065:HOH:O	1.77	0.67
1:A:324:ARG:HD3	1:A:361:GLN:O	1.98	0.64
1:A:257:ARG:HD2	4:A:2072:HOH:O	2.00	0.62
1:B:411:GLU:CB	1:B:411:GLU:CD	2.66	0.61
1:A:305:VAL:HG11	1:A:311:PRO:HG2	1.81	0.61
1:A:165:GLU:CG	4:A:2055:HOH:O	2.15	0.61
1:B:324:ARG:HG2	4:B:2087:HOH:O	2.00	0.60
1:B:411:GLU:HA	1:B:414:ASN:HD22	1.68	0.59
1:B:295:MET:HG2	1:B:370:MET:HE3	1.85	0.57
1:A:396:ARG:NH2	2:T:50:TRP:HB2	2.20	0.57
1:B:289:GLU:OE1	1:B:367:ARG:HB2	2.05	0.56
1:B:314:GLY:HA3	1:B:378:GLU:HG2	1.87	0.56
1:A:213:ASP:OD1	1:A:217:ARG:CZ	2.54	0.56
1:A:163:TYR:O	1:A:165:GLU:N	2.39	0.55
1:A:271:PHE:CE1	1:A:423:LEU:HD11	2.41	0.55
1:B:315:ARG:HD3	1:B:346:LEU:O	2.07	0.55
1:A:174:LEU:HD11	1:A:205:ILE:HG12	1.88	0.54
1:A:341:ARG:HG3	1:A:354:PHE:CG	2.43	0.54
1:B:281:PRO:HG2	1:B:284:ARG:HD2	1.89	0.54
1:B:47:GLY:HA2	4:B:2056:HOH:O	2.08	0.53
1:A:48:ASN:ND2	1:A:253:GLU:HB3	2.25	0.52
1:B:295:MET:HE1	1:B:368:LYS:HG3	1.91	0.51
1:A:253:GLU:N	4:A:2069:HOH:O	2.43	0.51
1:B:292:ILE:HD13	1:B:368:LYS:HE3	1.92	0.51
1:B:108:GLY:O	1:B:113:GLY:HA3	2.10	0.51
1:A:197:ARG:HG3	1:A:423:LEU:HG	1.93	0.51
1:B:271:PHE:HB3	1:B:379:ILE:CD1	2.41	0.51
1:B:411:GLU:OE2	1:B:411:GLU:HB3	2.12	0.50
1:A:269:LEU:HD13	1:A:317:LEU:HD21	1.95	0.49
1:A:402:TRP:CH2	2:T:86:ALA:HB3	2.47	0.49
1:A:240:ILE:HD12	1:A:373:LEU:HG	1.94	0.49
4:A:2067:HOH:O	1:B:326:ILE:HD11	2.13	0.49
1:A:323:TYR:HD2	1:A:358:TYR:HD1	1.61	0.48
1:B:72:ASP:O	1:B:96:SER:HA	2.12	0.48
1:B:401:ASN:H	1:B:401:ASN:HD22	1.62	0.48
2:T:46:PHE:HE2	2:T:98:LEU:HD22	1.79	0.48
2:T:119:LYS:HD2	4:T:2005:HOH:O	2.12	0.48
1:B:295:MET:HG2	1:B:370:MET:CE	2.43	0.48
1:A:145:GLY:HA3	3:A:1433:GTP:O2B	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:411:GLU:CB	1:B:411:GLU:OE2	2.62	0.47
1:A:381:ARG:HB2	4:A:2096:HOH:O	2.14	0.47
1:B:337:LEU:HD13	1:B:356:ILE:HD12	1.97	0.47
1:A:45:PRO:HG2	1:A:49:TRP:CD1	2.50	0.47
1:B:109:TYR:HD2	1:B:110:LEU:HG	1.80	0.47
1:B:215:ALA:O	1:B:219:TRP:HB2	2.15	0.47
1:A:236:ALA:O	1:A:240:ILE:HG12	2.15	0.46
1:A:317:LEU:O	1:A:352:THR:HG22	2.15	0.46
1:B:14:ALA:HB3	1:B:142:ALA:HB2	1.95	0.46
1:B:324:ARG:HA	1:B:359:VAL:O	2.16	0.46
1:B:58:GLU:HB2	2:T:104:GLU:HG3	1.97	0.46
1:B:140:LEU:HD12	1:B:171:CYS:HB2	1.98	0.46
1:A:44:ALA:HB1	1:A:45:PRO:HD2	1.98	0.45
1:B:269:LEU:HD13	1:B:317:LEU:HD21	1.97	0.45
1:B:391:ASP:O	1:B:395:GLN:HB2	2.16	0.45
2:T:46:PHE:CE2	2:T:98:LEU:HD22	2.52	0.45
1:B:148:GLY:O	1:B:152:GLY:HA3	2.17	0.45
1:A:406:GLU:O	1:A:406:GLU:HG3	2.16	0.45
1:B:271:PHE:HB3	1:B:379:ILE:HD13	1.97	0.45
1:B:295:MET:HE3	1:B:368:LYS:HE2	1.97	0.44
2:T:51:CYS:HB2	2:T:94:ILE:CD1	2.47	0.44
2:T:102:ASN:OD1	2:T:102:ASN:N	2.43	0.44
1:A:79:ASP:OD2	1:B:33:ASP:OD2	2.35	0.44
1:A:72:ASP:O	1:A:96:SER:HA	2.18	0.43
1:A:7:ILE:HD12	1:A:127:GLU:HB3	1.99	0.43
1:B:11:ILE:HG22	1:B:147:THR:HG22	1.99	0.43
2:T:101:LYS:HE2	4:T:2009:HOH:O	2.18	0.43
1:A:324:ARG:HD2	1:A:362:PRO:HA	2.01	0.43
1:A:326:ILE:HA	4:A:2087:HOH:O	2.19	0.43
1:B:286:LYS:O	1:B:367:ARG:NH1	2.51	0.43
1:B:197:ARG:HG3	1:B:423:LEU:HG	2.01	0.43
1:A:289:GLU:OE1	1:A:367:ARG:HD2	2.19	0.42
1:B:274:CYS:HB3	1:B:373:LEU:HD23	2.00	0.42
1:B:292:ILE:HG12	4:B:2077:HOH:O	2.18	0.42
1:A:207:ASP:HB3	1:A:307:ALA:HA	2.01	0.42
1:A:226:VAL:HG12	4:A:2064:HOH:O	2.19	0.42
1:B:14:ALA:CB	1:B:142:ALA:HB2	2.50	0.42
1:A:157:GLU:O	1:A:161:GLU:HG3	2.20	0.42
1:A:228:ASP:OD1	1:B:367:ARG:NH2	2.46	0.42
1:B:292:ILE:HG12	1:B:292:ILE:H	1.73	0.42
2:T:43:LEU:HD11	2:T:97:LEU:HB3	2.00	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:352:THR:HG22	1:B:353:ALA:N	2.36	0.41
1:A:214:LEU:HD22	1:A:279:LEU:HD13	2.03	0.41
1:B:13:GLN:N	3:B:1433:GTP:O1B	2.42	0.41
1:B:411:GLU:CG	1:B:411:GLU:CA	2.85	0.41
1:A:13:GLN:HG3	1:A:77:VAL:HG21	2.02	0.41
2:T:109:LYS:HE2	2:T:113:LEU:HD13	2.02	0.41
1:A:282:PRO:HB2	1:B:289:GLU:HG3	2.02	0.41
1:A:315:ARG:HG3	1:A:431:GLU:HG3	2.03	0.41
1:B:235:GLU:OE1	1:B:366:HIS:CE1	2.58	0.41
1:A:390:PHE:CD2	1:A:390:PHE:C	2.95	0.40
1:B:194:ASN:O	1:B:198:ARG:HG3	2.21	0.40
1:B:274:CYS:HA	1:B:372:LEU:O	2.21	0.40
2:T:115:LYS:O	2:T:119:LYS:HG3	2.21	0.40
1:B:112:ALA:HA	1:B:115:GLU:HG3	2.03	0.40
1:B:197:ARG:HD2	1:B:423:LEU:HB2	2.03	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	403/473 (85%)	389 (96%)	14 (4%)	0	100 100
1	B	417/473 (88%)	399 (96%)	16 (4%)	2 (0%)	25 44
2	T	101/108 (94%)	99 (98%)	2 (2%)	0	100 100
All	All	921/1054 (87%)	887 (96%)	32 (4%)	2 (0%)	44 64

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	164	GLY
1	B	398	ALA

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	341/387 (88%)	312 (92%)	29 (8%)	8	18
1	B	350/387 (90%)	321 (92%)	29 (8%)	9	19
2	T	83/87 (95%)	74 (89%)	9 (11%)	5	11
All	All	774/861 (90%)	707 (91%)	67 (9%)	8	17

All (67) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	ILE
1	A	21	SER
1	A	43	VAL
1	A	88	LEU
1	A	132	ASP
1	A	137	ILE
1	A	141	HIS
1	A	204	LEU
1	A	205	ILE
1	A	213	ASP
1	A	231	LEU
1	A	256	LEU
1	A	258	GLU
1	A	294	GLU
1	A	298	SER
1	A	299	LEU
1	A	318	SER
1	A	324	ARG
1	A	334	ASP
1	A	346	LEU
1	A	361	GLN
1	A	365	SER
1	A	371	VAL
1	A	372	LEU
1	A	379	ILE
1	A	396	ARG

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Mol	Chain	Res	Type
1	A	402	TRP
1	A	404	LEU
1	A	423	LEU
1	B	56	LEU
1	B	63	SER
1	B	88	LEU
1	B	99	GLU
1	B	114	ARG
1	B	140	LEU
1	B	141	HIS
1	B	176	SER
1	B	204	LEU
1	B	231	LEU
1	B	243	SER
1	B	247	SER
1	B	270	HIS
1	B	283	ASP
1	B	285	SER
1	B	297	LYS
1	B	299	LEU
1	B	347	THR
1	B	361	GLN
1	B	372	LEU
1	B	384	ASP
1	B	401	ASN
1	B	402	TRP
1	B	412	GLN
1	B	413	ILE
1	B	417	ARG
1	B	421	GLN
1	B	423	LEU
1	B	432	GLU
2	T	69	GLN
2	T	73	THR
2	T	78	ASN
2	T	91	ILE
2	T	94	ILE
2	T	98	LEU
2	T	102	ASN
2	T	109	LYS
2	T	115	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	16	ASN
1	A	48	ASN
1	A	266	GLN
1	A	361	GLN
1	A	376	ASN
1	A	389	ASN
1	A	412	GLN
1	B	266	GLN
1	B	361	GLN
1	B	366	HIS
1	B	389	ASN
1	B	401	ASN
1	B	405	ASN
1	B	414	ASN
1	B	421	GLN
2	T	78	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	GTP	A	1433	-	29,34,34	1.30	4 (13%)	35,54,54	1.49	7 (20%)
3	GTP	B	1433	-	29,34,34	1.25	4 (13%)	35,54,54	1.47	6 (17%)

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
3	GTP	A	1433	-	-	3/18/38/38	0/3/3/3
3	GTP	B	1433	-	-	5/18/38/38	0/3/3/3

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1433	GTP	C5-C6	-3.82	1.39	1.47
3	A	1433	GTP	C5-C6	-3.77	1.40	1.47
3	A	1433	GTP	PA-O3A	3.00	1.62	1.59
3	B	1433	GTP	PB-O3B	2.60	1.62	1.59
3	B	1433	GTP	C2-N3	2.20	1.38	1.33
3	B	1433	GTP	PA-O3A	2.06	1.61	1.59
3	A	1433	GTP	O4'-C1'	2.05	1.43	1.40
3	A	1433	GTP	C2-N3	2.04	1.38	1.33

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	1433	GTP	C8-N7-C5	3.72	108.89	102.55
3	B	1433	GTP	O2B-PB-O3A	3.39	116.43	107.27
3	A	1433	GTP	C8-N7-C5	3.34	108.24	102.55
3	A	1433	GTP	C5-C6-N1	2.60	119.04	114.07
3	B	1433	GTP	C5-C6-N1	2.59	119.02	114.07
3	A	1433	GTP	O3G-PG-O3B	2.44	112.83	104.64
3	B	1433	GTP	C2-N1-C6	-2.40	120.72	125.11
3	B	1433	GTP	O2B-PB-O3B	2.33	113.56	107.27
3	A	1433	GTP	O4'-C1'-N9	-2.32	105.67	108.75
3	B	1433	GTP	O4'-C1'-N9	-2.30	105.69	108.75
3	A	1433	GTP	C2-N1-C6	-2.24	121.00	125.11
3	A	1433	GTP	C4'-O4'-C1'	2.12	111.86	109.92
3	A	1433	GTP	O2B-PB-O1B	-2.11	102.62	112.44

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1433	GTP	C5'-O5'-PA-O1A
3	B	1433	GTP	C5'-O5'-PA-O3A
3	B	1433	GTP	C5'-O5'-PA-O1A
3	A	1433	GTP	C5'-O5'-PA-O2A
3	B	1433	GTP	C5'-O5'-PA-O2A
3	A	1433	GTP	PB-O3A-PA-O1A
3	B	1433	GTP	PB-O3A-PA-O1A
3	B	1433	GTP	PB-O3A-PA-O2A

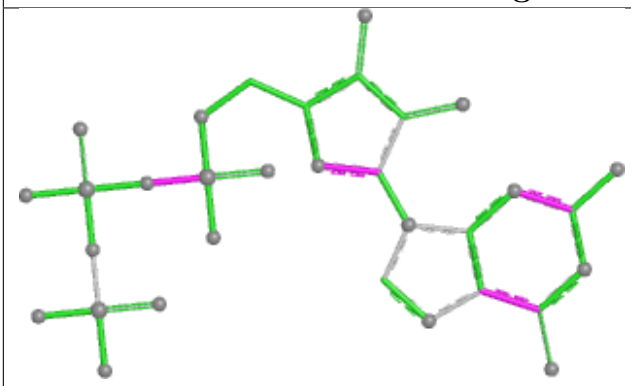
There are no ring outliers.

2 monomers are involved in 4 short contacts:

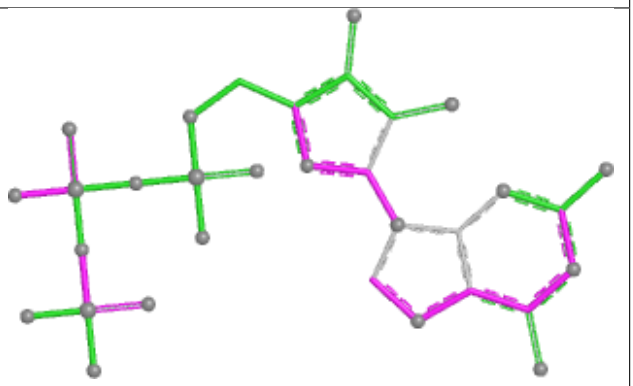
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1433	GTP	3	0
3	B	1433	GTP	1	0

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 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.

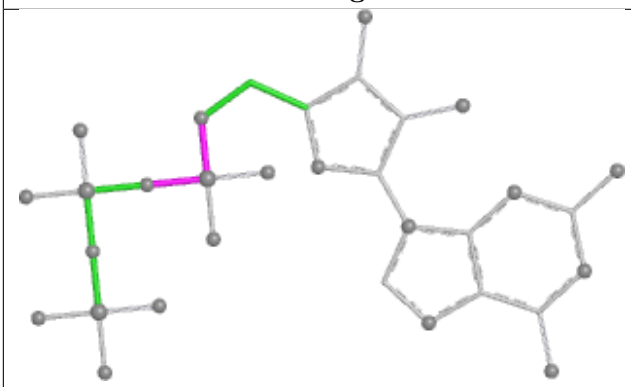
Ligand GTP A 1433



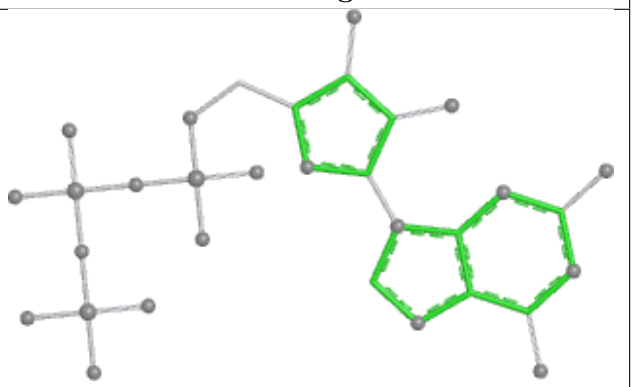
Bond lengths



Bond angles

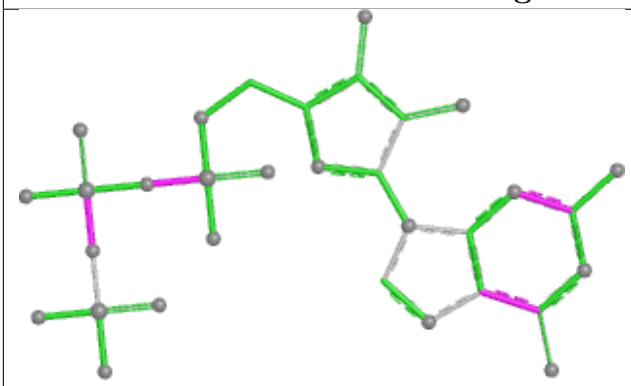


Torsions

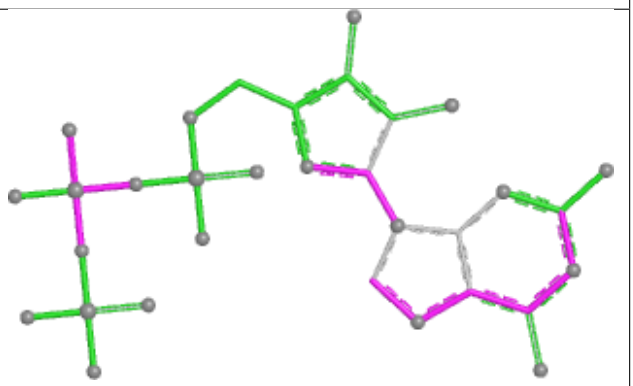


Rings

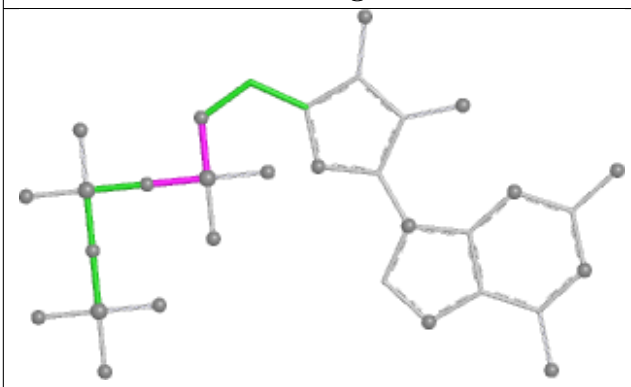
Ligand GTP B 1433



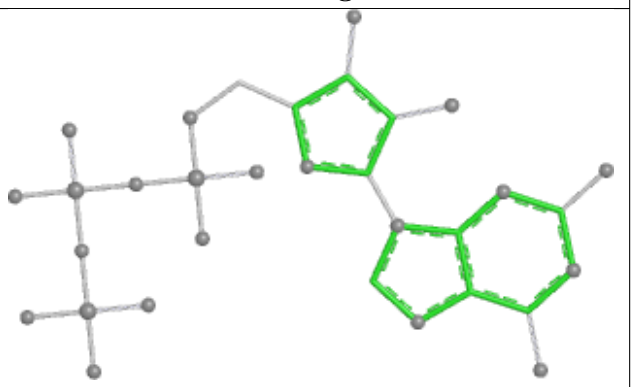
Bond lengths



Bond angles



Torsions



Rings

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

Warning: The R factor obtained from EDS is 0.279, which does not match the depositor's R factor of 0.2. Please interpret the results in this section carefully.

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	413/473 (87%)	0.68	26 (6%) 27 25	42, 51, 63, 76	0
1	B	423/473 (89%)	1.56	131 (30%) 1 1	39, 51, 66, 78	0
2	T	103/108 (95%)	3.70	95 (92%) 0 0	66, 71, 77, 78	0
All	All	939/1054 (89%)	1.41	252 (26%) 2 2	39, 52, 73, 78	0

All (252) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	T	101	LYS	6.8
2	T	72	LEU	6.8
2	T	23	ILE	6.8
2	T	92	ARG	6.4
2	T	91	ILE	6.2
2	T	125	ASN	6.1
2	T	102	ASN	6.1
2	T	120	GLU	5.7
2	T	56	MET	5.7
2	T	90	GLY	5.7
1	B	287	PHE	5.6
2	T	124	ALA	5.3
2	T	89	TYR	5.3
2	T	113	LEU	5.3
2	T	93	GLY	5.2
2	T	109	LYS	5.2
2	T	110	VAL	5.1
1	B	290	LEU	5.1
1	B	326	ILE	5.1
1	B	291	GLY	5.0

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Mol	Chain	Res	Type	RSRZ
2	T	70	GLY	5.0
2	T	123	ASP	4.8
2	T	71	LYS	4.8
2	T	24	ILE	4.8
2	T	106	ALA	4.8
2	T	118	LEU	4.7
1	B	335	ALA	4.7
1	B	407	GLY	4.6
2	T	38	ALA	4.6
2	T	68	TYR	4.5
2	T	108	THR	4.5
1	B	411	GLU	4.5
2	T	37	LYS	4.5
2	T	122	LEU	4.4
1	B	333	ALA	4.4
2	T	100	PHE	4.4
2	T	105	VAL	4.4
2	T	63	GLU	4.4
2	T	107	ALA	4.4
2	T	88	LYS	4.4
2	T	117	GLN	4.4
2	T	40	GLY	4.3
2	T	116	GLY	4.3
2	T	121	PHE	4.2
1	B	250	LEU	4.2
1	B	61	SER	4.2
2	T	119	LYS	4.2
2	T	53	PRO	4.1
1	B	39	THR	4.1
2	T	112	ALA	4.1
1	B	414	ASN	4.1
2	T	77	LEU	4.0
2	T	115	LYS	4.0
1	B	416	LEU	4.0
1	B	285	SER	4.0
1	B	398	ALA	3.9
2	T	94	ILE	3.9
1	B	55	LYS	3.9
2	T	85	THR	3.9
2	T	86	ALA	3.8
1	B	40	ALA	3.8
2	T	46	PHE	3.8

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Mol	Chain	Res	Type	RSRZ
2	T	87	PRO	3.8
2	T	99	LEU	3.8
1	B	351	PRO	3.7
2	T	65	ALA	3.7
2	T	60	ILE	3.7
1	B	365	SER	3.7
1	B	45	PRO	3.7
1	B	408	MET	3.7
2	T	73	THR	3.6
2	T	103	GLY	3.6
2	T	69	GLN	3.6
1	B	248	GLY	3.6
1	B	289	GLU	3.6
2	T	98	LEU	3.6
2	T	29	ASP	3.5
1	B	282	PRO	3.5
2	T	44	VAL	3.5
1	B	44	ALA	3.5
2	T	74	VAL	3.5
2	T	36	LEU	3.4
2	T	97	LEU	3.4
1	B	64	TYR	3.4
1	B	133	ASN	3.4
1	B	364	ILE	3.4
1	B	356	ILE	3.4
2	T	64	ILE	3.4
1	B	110	LEU	3.3
1	B	111	GLY	3.3
1	B	363	GLY	3.3
1	B	252	VAL	3.3
1	B	367	ARG	3.3
1	B	280	THR	3.3
1	B	218	LYS	3.3
1	B	56	LEU	3.2
2	T	49	GLU	3.2
1	B	102	GLY	3.2
2	T	52	GLY	3.2
2	T	55	LYS	3.2
1	B	359	VAL	3.2
1	B	251	THR	3.2
1	B	43	VAL	3.2
1	B	331	PRO	3.2

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Mol	Chain	Res	Type	RSRZ
2	T	41	ALA	3.1
2	T	33	THR	3.1
1	B	336	ALA	3.1
2	T	32	ASP	3.1
1	B	3	VAL	3.1
2	T	25	HIS	3.1
2	T	61	LEU	3.0
1	B	292	ILE	3.0
1	B	425	GLN	3.0
1	B	125	ASP	3.0
2	T	104	GLU	3.0
2	T	75	ALA	3.0
1	A	403	TYR	3.0
1	B	329	ASP	3.0
1	B	106	ALA	3.0
1	B	404	LEU	3.0
2	T	96	THR	3.0
1	B	32	ILE	2.9
1	B	254	ILE	2.9
1	B	63	SER	2.9
1	A	59	SER	2.9
1	B	249	PHE	2.9
1	B	295	MET	2.9
1	B	134	VAL	2.9
1	B	103	GLY	2.9
1	B	406	GLU	2.9
2	T	27	THR	2.9
1	B	115	GLU	2.8
1	B	112	ALA	2.8
1	B	384	ASP	2.8
1	B	400	ALA	2.8
1	B	31	GLY	2.8
1	B	325	GLY	2.8
1	B	220	ASN	2.8
1	B	246	PHE	2.8
1	B	328	GLU	2.8
2	T	48	ALA	2.8
2	T	79	ILE	2.7
1	A	331	PRO	2.7
2	T	95	PRO	2.7
2	T	84	GLY	2.7
2	T	114	SER	2.7

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Mol	Chain	Res	Type	RSRZ
2	T	80	ASP	2.7
2	T	47	TRP	2.7
2	T	59	PRO	2.7
2	T	31	PHE	2.7
1	B	48	ASN	2.7
2	T	67	GLU	2.7
2	T	26	LEU	2.7
1	B	421	GLN	2.7
1	B	163	TYR	2.6
1	B	298	SER	2.6
1	B	370	MET	2.6
1	A	40	ALA	2.6
1	A	78	ILE	2.6
1	B	358	TYR	2.6
1	B	281	PRO	2.6
1	B	323	TYR	2.6
1	B	327	MET	2.6
2	T	43	LEU	2.5
1	B	369	SER	2.5
1	B	165	GLU	2.5
1	B	368	LYS	2.5
1	B	279	LEU	2.5
1	B	393	LEU	2.5
1	A	179	VAL	2.5
1	B	321	VAL	2.5
1	B	177	PRO	2.5
1	B	412	GLN	2.5
1	B	57	GLY	2.5
1	B	126	TYR	2.5
1	B	52	PHE	2.5
1	B	191	PHE	2.5
1	A	290	LEU	2.5
1	B	277	ALA	2.5
1	B	418	ALA	2.5
1	B	337	LEU	2.4
1	A	402	TRP	2.4
2	T	57	ILE	2.4
2	T	81	GLN	2.4
2	T	111	GLY	2.4
1	B	391	ASP	2.4
1	A	253	GLU	2.4
1	B	151	PHE	2.4

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Mol	Chain	Res	Type	RSRZ
2	T	78	ASN	2.4
1	A	82	LYS	2.4
1	B	415	VAL	2.4
1	B	62	GLY	2.4
1	B	397	LYS	2.3
1	A	339	ALA	2.3
1	B	395	GLN	2.3
1	A	88	LEU	2.3
2	T	28	ASP	2.3
2	T	45	ASP	2.3
1	B	297	LYS	2.3
1	B	361	GLN	2.3
1	B	409	SER	2.3
1	B	366	HIS	2.3
1	B	402	TRP	2.3
1	B	194	ASN	2.3
1	B	403	TYR	2.3
1	B	338	ALA	2.3
1	B	286	LYS	2.3
1	B	4	ASN	2.3
1	A	421	GLN	2.3
1	A	337	LEU	2.2
1	B	5	ASN	2.2
1	A	58	GLU	2.2
1	B	122	SER	2.2
1	A	79	ASP	2.2
1	A	74	GLU	2.2
1	B	26	VAL	2.2
1	B	350	ILE	2.2
1	B	92	ALA	2.2
1	B	332	LEU	2.2
1	B	148	GLY	2.2
1	B	357	GLY	2.2
2	T	50	TRP	2.2
1	B	353	ALA	2.2
1	A	57	GLY	2.2
1	B	324	ARG	2.2
1	B	58	GLU	2.2
1	B	288	GLU	2.2
1	B	49	TRP	2.2
1	B	299	LEU	2.1
1	A	222	GLU	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	283	ASP	2.1
2	T	39	ASP	2.1
1	B	28	LEU	2.1
1	A	389	ASN	2.1
1	B	128	ILE	2.1
1	B	215	ALA	2.1
1	A	41	PRO	2.1
2	T	83	PRO	2.1
2	T	54	CYS	2.1
1	B	214	LEU	2.1
1	B	187	TYR	2.1
1	A	98	THR	2.1
2	T	76	LYS	2.1
2	T	30	SER	2.1
1	B	389	ASN	2.1
1	B	405	ASN	2.1
1	A	217	ARG	2.0
1	A	246	PHE	2.0
1	B	334	ASP	2.0
1	A	390	PHE	2.0
1	A	254	ILE	2.0
1	B	284	ARG	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
3	GTP	B	1433	32/32	0.87	0.15	70,72,75,76	0

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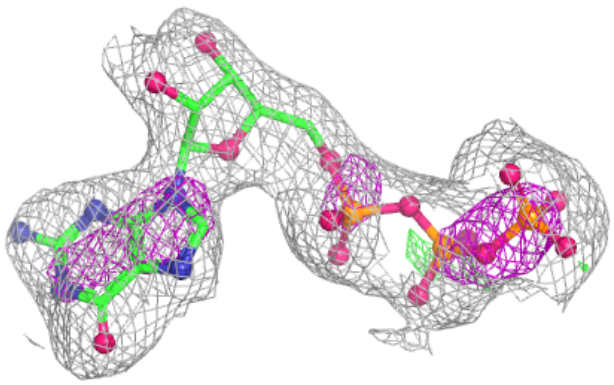
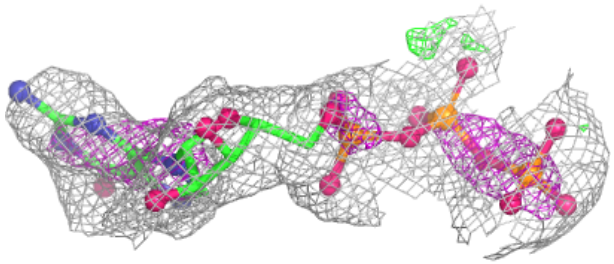
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	GTP	A	1433	32/32	0.90	0.14	48,54,57,58	0

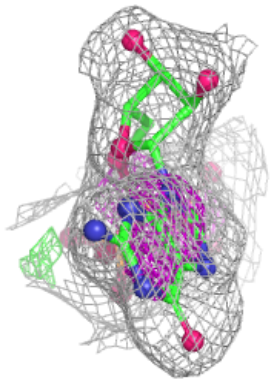
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around GTP B 1433:

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

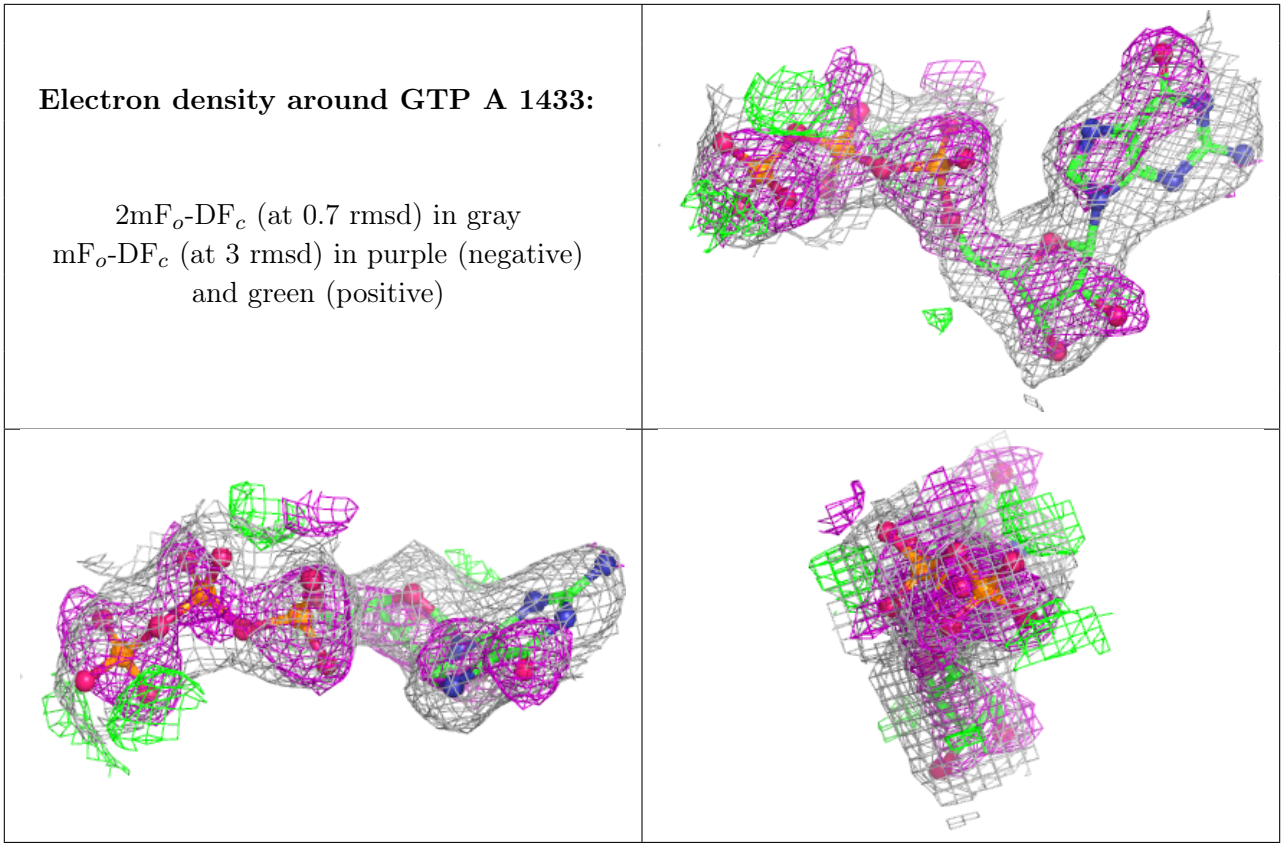






Electron density around GTP A 1433:

$2mF_o$-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

There are no such residues in this entry.