



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 06:04 AM UTC

PDB ID : 6X1E / pdb_00006x1e
Title : Tubulin-RB3_SLD-TTL in complex with compound 5l
Authors : White, S.W.; Yun, M.
Deposited on : 2020-05-18
Resolution : 2.90 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

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

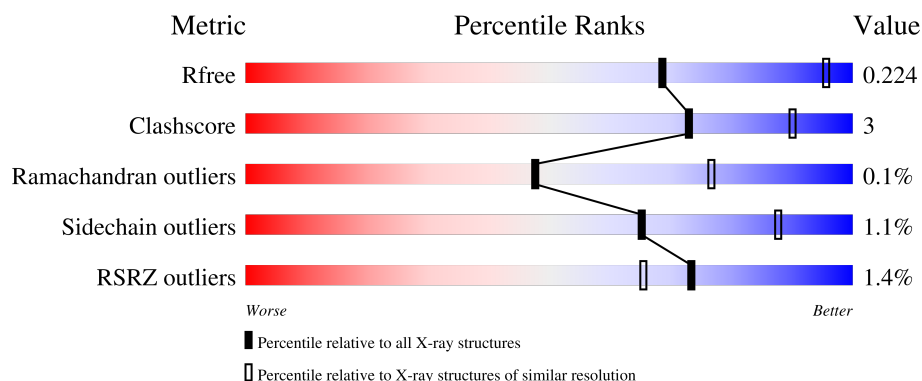
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

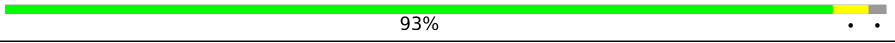
The reported resolution of this entry is 2.90 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	450	
1	C	450	
2	B	445	
2	D	445	
3	E	143	

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Mol	Chain	Length	Quality of chain
4	F	384	4% 76% 9% 15%

2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 17543 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	437	Total	C	N	O	S	0	0	0
			3416	2163	581	650	22			
1	C	440	Total	C	N	O	S	0	1	0
			3443	2179	585	657	22			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	427	Total	C	N	O	S	0	0	0
			3361	2110	576	649	26			
2	D	421	Total	C	N	O	S	0	0	0
			3303	2077	562	638	26			

- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	121	Total	C	N	O	S	0	2	0
			1012	626	183	197	6			

There are 2 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

- Molecule 4 is a protein called Tubulin Tyrosine Ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	F	327	Total	C	N	O	S	0	2	0
			2667	1717	460	476	14			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	379	HIS	-	expression tag	UNP E1BQ43
F	380	HIS	-	expression tag	UNP E1BQ43
F	381	HIS	-	expression tag	UNP E1BQ43
F	382	HIS	-	expression tag	UNP E1BQ43
F	383	HIS	-	expression tag	UNP E1BQ43
F	384	HIS	-	expression tag	UNP E1BQ43

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



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

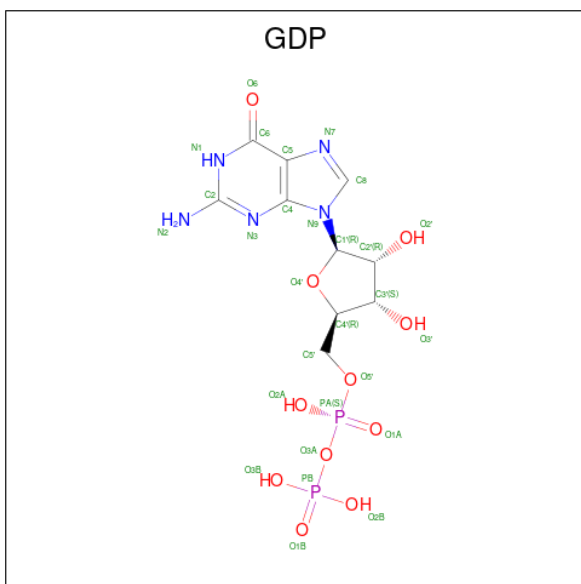
- Molecule 6 is CALCIUM ION (CCD ID: CA) (formula: Ca).

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

- Molecule 7 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Mg 1 1	0	0
7	B	1	Total Mg 1 1	0	0
7	C	1	Total Mg 1 1	0	0
7	D	1	Total Mg 1 1	0	0
7	F	1	Total Mg 1 1	0	0

- Molecule 8 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).



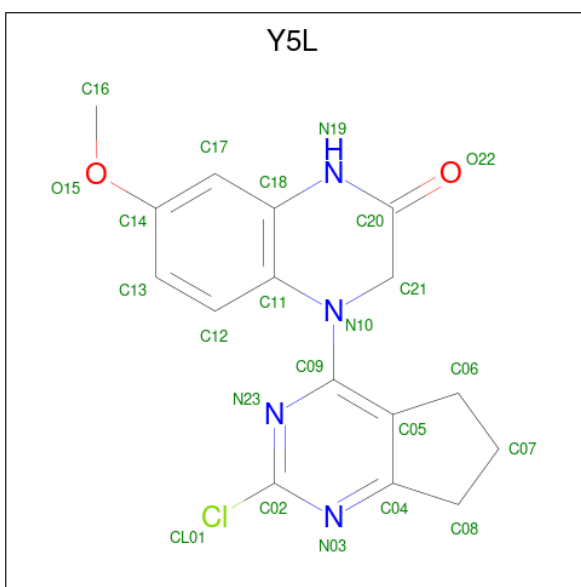
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	B	1	Total 28	C 10	N 5	O 11	P 2	0	0

- Molecule 9 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
9	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 10 is 4-(2-chloro-6,7-dihydro-5H-cyclopenta[d]pyrimidin-4-yl)-7-methoxy-3,4-dihydroquinoxalin-2(1H)-one (CCD ID: Y5L) (formula: C₁₆H₁₅ClN₄O₂) (labeled as "Ligand of Interest" by depositor).



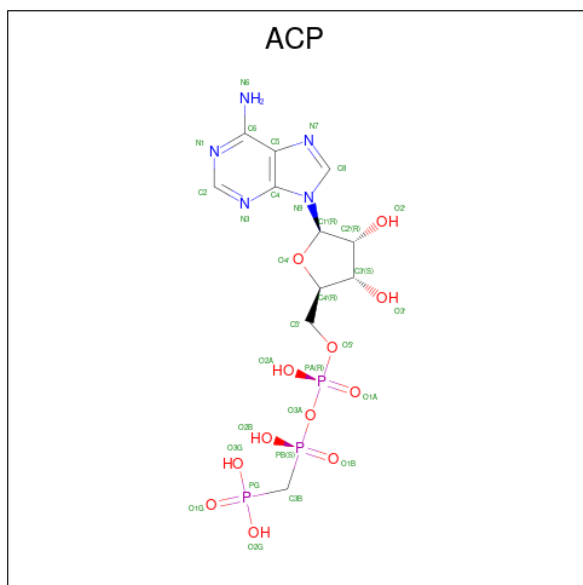
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
10	B	1	Total	C	Cl	N	O	0	0
			23	16	1	4	2		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
10	D	1	Total	C	Cl	N	O	
			23	16	1	4	2	
							0	0

- Molecule 11 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (CCD ID: ACP) (formula: $C_{11}H_{18}N_5O_{12}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
11	F	1	Total	C	N	O	P		
			31	11	5	12	3		
								0	0

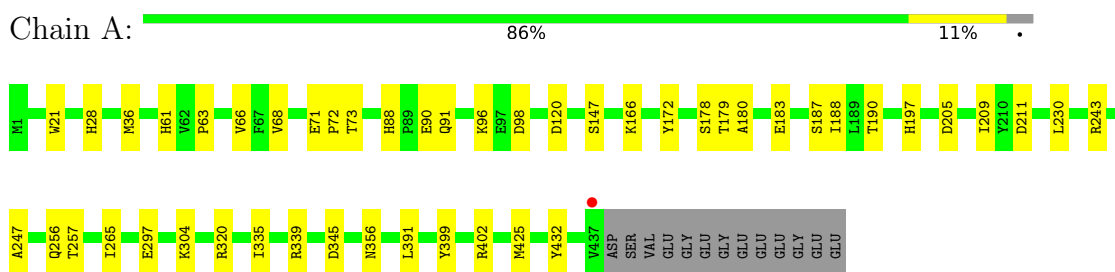
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	20	Total	O		
			20	20		
					0	0
12	B	27	Total	O		
			27	27		
					0	0
12	C	46	Total	O		
			46	46		
					0	0
12	D	6	Total	O		
			6	6		
					0	0
12	E	4	Total	O		
			4	4		
					0	0
12	F	6	Total	O		
			6	6		
					0	0

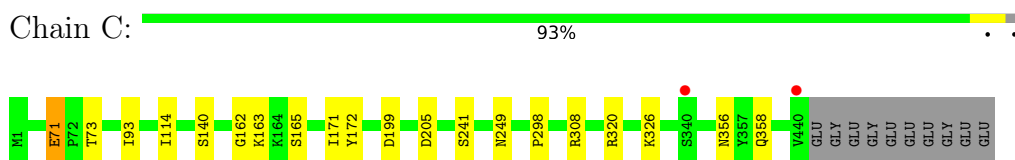
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

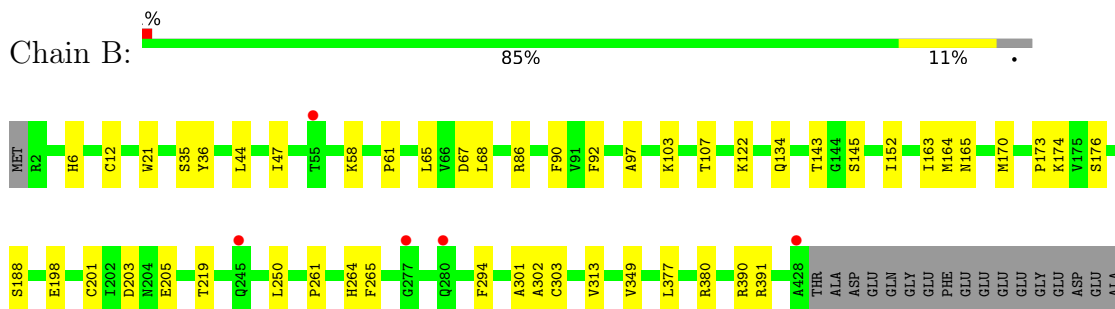
- Molecule 1: Tubulin alpha-1B chain



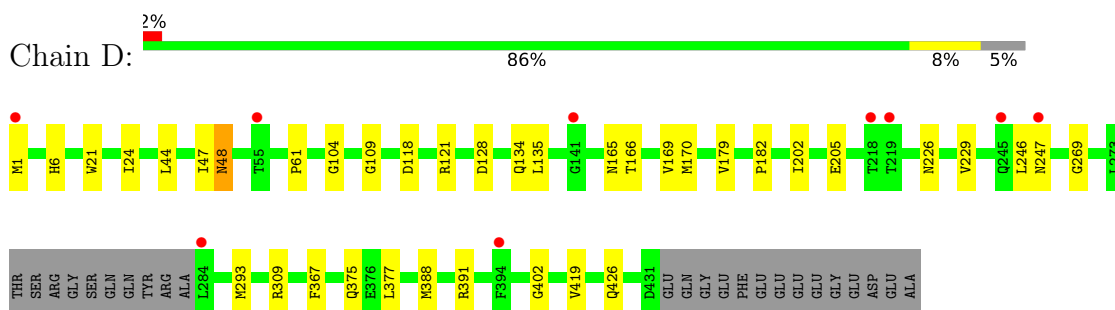
- Molecule 1: Tubulin alpha-1B chain



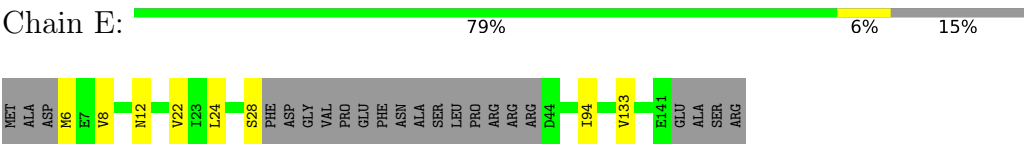
- Molecule 2: Tubulin beta-2B chain



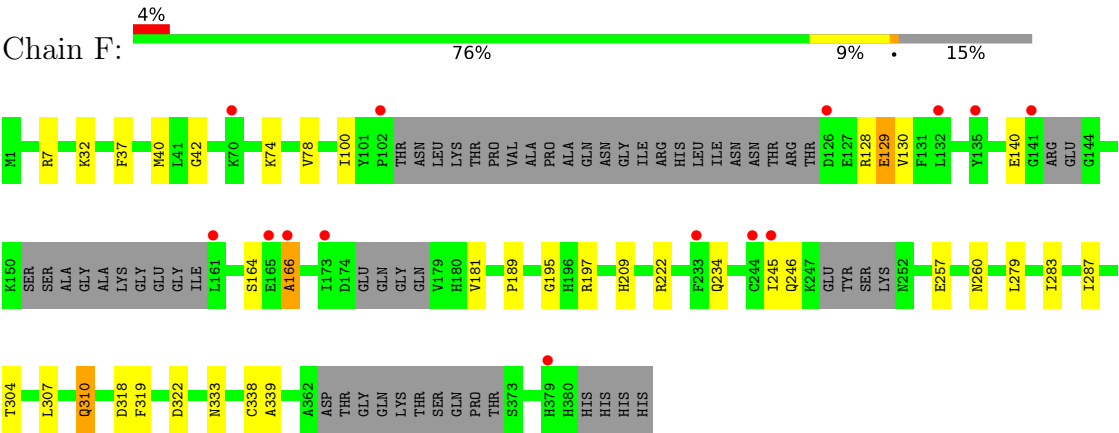
- Molecule 2: Tubulin beta-2B chain



● Molecule 3: Stathmin-4



● Molecule 4: Tubulin Tyrosine Ligase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	105.36Å 157.74Å 182.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.91 – 2.90 49.91 – 2.90	Depositor EDS
% Data completeness (in resolution range)	98.8 (49.91-2.90) 93.7 (49.91-2.90)	Depositor EDS
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.52 (at 2.91Å)	Xtriage
Refinement program	PHENIX 1.14_3260	Depositor
R, R_{free}	0.170 , 0.224 0.170 , 0.224	Depositor DCC
R_{free} test set	2000 reflections (2.98%)	wwPDB-VP
Wilson B-factor (Å ²)	47.0	Xtriage
Anisotropy	0.024	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 44.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	17543	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.65% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: Y5L, MES, GTP, MG, CA, ACP, GDP

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	0.13	0/3494	0.30	0/4743
1	C	0.13	0/3524	0.31	0/4785
2	B	0.12	0/3436	0.30	0/4654
2	D	0.11	0/3376	0.28	0/4574
3	E	0.11	0/1027	0.26	0/1362
4	F	0.13	0/2732	0.34	0/3689
All	All	0.12	0/17589	0.30	0/23807

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 [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	3416	0	3330	24	0
1	C	3443	0	3356	14	0
2	B	3361	0	3238	28	0
2	D	3303	0	3174	23	0
3	E	1012	0	1034	6	0
4	F	2667	0	2627	21	0
5	A	32	0	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	32	0	12	0	0
5	D	32	0	12	1	0
6	A	1	0	0	0	0
6	C	1	0	0	0	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
7	C	1	0	0	0	0
7	D	1	0	0	0	0
7	F	1	0	0	0	0
8	B	28	0	12	1	0
9	B	24	0	24	2	0
10	B	23	0	0	0	0
10	D	23	0	0	0	0
11	F	31	0	13	1	0
12	A	20	0	0	0	0
12	B	27	0	0	0	0
12	C	46	0	0	0	0
12	D	6	0	0	0	0
12	E	4	0	0	0	0
12	F	6	0	0	0	0
All	All	17543	0	16844	111	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 3.

All (111) 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:241:SER:HA	1:C:249:ASN:HD21	1.51	0.76
2:D:170:MET:HG3	2:D:377:LEU:HD11	1.73	0.69
4:F:304:THR:O	4:F:310:GLN:NE2	2.25	0.68
2:D:375:GLN:HB2	2:D:419:VAL:HG13	1.78	0.66
2:B:165:ASN:HD22	2:B:198:GLU:HB2	1.62	0.65
4:F:246:GLN:OE1	4:F:260:ASN:ND2	2.31	0.64
4:F:222:ARG:NH1	4:F:318:ASP:OD2	2.32	0.62
2:D:170:MET:HE2	2:D:377:LEU:HD21	1.82	0.61
2:B:86:ARG:HH22	2:B:122:LYS:HE2	1.66	0.61
1:A:345:ASP:HB3	3:E:28:SER:HB3	1.83	0.60
2:B:170:MET:HG3	2:B:377:LEU:HD21	1.85	0.58
2:D:134:GLN:HA	2:D:165:ASN:O	2.04	0.56
2:B:6:HIS:CD2	2:B:21:TRP:HE1	2.24	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:304:THR:HG22	4:F:307:LEU:HD12	1.87	0.56
2:B:173:PRO:HA	2:B:176:SER:HB2	1.89	0.54
1:A:71:GLU:OE1	1:A:73:THR:OG1	2.21	0.53
1:A:187:SER:HB3	1:A:391:LEU:HD21	1.91	0.53
1:A:88:HIS:O	1:A:91:GLN:HG2	2.08	0.53
2:B:219:THR:HG21	1:C:326:LYS:HA	1.91	0.53
4:F:197:ARG:NH1	4:F:257:GLU:OE1	2.42	0.52
2:B:301:ALA:O	2:B:303:CYS:N	2.43	0.52
2:B:134:GLN:HA	2:B:165:ASN:O	2.09	0.51
1:A:209:ILE:HG23	1:A:230:LEU:HD23	1.93	0.50
1:A:399:TYR:O	1:A:402:ARG:NH1	2.44	0.50
2:B:21:TRP:CZ3	2:B:61:PRO:HB3	2.47	0.50
2:B:145:SER:HG	2:B:188:SER:HG	1.59	0.50
1:A:147:SER:HB2	1:A:190:THR:HB	1.93	0.49
1:C:172:TYR:HB3	1:C:205:ASP:HA	1.92	0.49
2:B:203:ASP:OD2	2:B:380:ARG:NH1	2.40	0.49
2:D:135:LEU:HB3	2:D:166:THR:HG22	1.94	0.49
1:C:71:GLU:HG2	1:C:73:THR:H	1.78	0.49
2:D:6:HIS:CD2	2:D:21:TRP:HE1	2.31	0.49
1:A:247:ALA:HB2	3:E:12:ASN:HD22	1.78	0.49
1:C:71:GLU:OE2	2:D:247:ASN:ND2	2.46	0.48
2:B:163:ILE:HG21	2:B:250:LEU:HB3	1.94	0.48
2:B:201:CYS:SG	2:B:265:PHE:HB3	2.54	0.48
4:F:74:LYS:NZ	11:F:402:ACP:O1A	2.47	0.48
1:A:71:GLU:HB2	1:A:98:ASP:HB3	1.95	0.48
2:B:35:SER:OG	2:B:58:LYS:NZ	2.43	0.47
4:F:189:PRO:HA	4:F:322:ASP:HA	1.95	0.47
2:B:44:LEU:HA	2:B:47:ILE:HB	1.95	0.47
2:B:67:ASP:O	2:B:92:PHE:HA	2.15	0.47
4:F:338:CYS:SG	4:F:339:ALA:N	2.86	0.47
1:A:71:GLU:HG2	1:A:72:PRO:HD2	1.96	0.47
4:F:7:ARG:HB2	4:F:42:GLY:HA2	1.96	0.47
4:F:140:GLU:OE1	4:F:140:GLU:N	2.48	0.47
2:D:179:VAL:HB	2:D:388:MET:HE1	1.96	0.46
2:D:202:ILE:HD13	2:D:229:VAL:HG13	1.98	0.46
1:A:28:HIS:HE1	1:A:243:ARG:HD2	1.80	0.46
4:F:78:VAL:HG21	4:F:181:VAL:HG11	1.97	0.46
3:E:6:MET:HE2	3:E:24:LEU:HD22	1.97	0.46
2:B:68:LEU:HD12	2:B:97:ALA:HB2	1.98	0.46
2:D:1:MET:HE3	2:D:128:ASP:HB2	1.98	0.46
1:A:88:HIS:ND1	1:A:90:GLU:HB2	2.31	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:67:ASP:HA	2:B:143:THR:HG21	1.98	0.46
2:D:169:VAL:HA	2:D:202:ILE:O	2.16	0.45
4:F:279:LEU:HD12	4:F:283:ILE:HB	1.98	0.45
2:D:226:ASN:OD1	5:D:501:GTP:N1	2.35	0.45
1:A:178:SER:HB2	1:A:183:GLU:OE1	2.16	0.45
1:A:265:ILE:HG23	1:A:432:TYR:CZ	2.51	0.45
2:B:174:LYS:HD2	2:B:205:GLU:HG3	1.99	0.45
2:D:44:LEU:HA	2:D:47:ILE:HB	1.98	0.45
1:C:140:SER:HA	1:C:171:ILE:HB	2.00	0.44
1:C:165:SER:HA	1:C:199:ASP:OD2	2.17	0.44
2:B:261:PRO:O	2:B:264:HIS:ND1	2.47	0.44
2:B:313:VAL:HB	2:B:349:VAL:HG22	1.98	0.44
4:F:209:HIS:HB2	4:F:310:GLN:CG	2.48	0.44
2:D:402:GLY:C	3:E:133:VAL:HG13	2.43	0.44
2:B:65:LEU:HD22	2:B:90:PHE:CE2	2.52	0.44
1:A:180:ALA:HB3	1:A:183:GLU:HG3	1.99	0.43
2:B:294:PHE:O	9:B:503:MES:H82	2.18	0.43
4:F:195:GLY:HA3	4:F:197:ARG:HD2	2.00	0.43
2:B:12:CYS:HB2	8:B:501:GDP:C8	2.54	0.43
2:D:269:GLY:HA3	2:D:367:PHE:HB3	1.99	0.43
1:A:211:ASP:OD2	1:A:304:LYS:NZ	2.43	0.43
1:A:21:TRP:CZ3	1:A:63:PRO:HB3	2.53	0.43
1:A:96:LYS:HA	1:A:96:LYS:HD3	1.83	0.42
2:B:36:TYR:CE2	2:B:44:LEU:HD11	2.54	0.42
1:C:298:PRO:HG2	1:C:308:ARG:NH2	2.34	0.42
4:F:37:PHE:CZ	4:F:40:MET:HE3	2.54	0.42
1:A:172:TYR:HB3	1:A:205:ASP:HA	2.01	0.42
1:A:335:ILE:HG23	1:A:339:ARG:HD2	2.01	0.42
3:E:8:VAL:HG22	3:E:22:VAL:HG22	2.01	0.42
1:C:249:ASN:ND2	1:C:356:ASN:OD1	2.51	0.42
1:C:162:GLY:HA2	3:E:94:ILE:HD11	2.01	0.42
2:D:309:ARG:NH1	2:D:426:GLN:O	2.51	0.42
2:D:21:TRP:CE3	2:D:24:ILE:HD11	2.55	0.42
2:D:48:ASN:ND2	2:D:48:ASN:H	2.16	0.42
9:B:503:MES:H51	9:B:503:MES:H81	1.88	0.41
1:C:320:ARG:HA	1:C:356:ASN:O	2.19	0.41
4:F:100:ILE:HD12	4:F:128:ARG:HG3	2.02	0.41
2:D:21:TRP:CZ3	2:D:61:PRO:HB3	2.54	0.41
2:D:179:VAL:O	2:D:182:PRO:HD2	2.21	0.41
4:F:197:ARG:HH12	4:F:257:GLU:CD	2.27	0.41
1:A:166:LYS:HE2	1:A:197:HIS:O	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:163:LYS:HD3	1:C:163:LYS:HA	1.84	0.41
2:D:293:MET:CG	2:D:367:PHE:HB2	2.51	0.41
2:B:152:ILE:HG23	2:B:164:MET:HG2	2.03	0.41
2:B:390:ARG:HG3	2:B:391:ARG:HG2	2.03	0.41
1:C:358[A]:GLN:H	1:C:358[A]:GLN:CD	2.28	0.41
2:D:118:ASP:OD1	2:D:121:ARG:NH1	2.42	0.41
1:A:28:HIS:HE1	1:A:243:ARG:HH11	1.69	0.41
1:A:36:MET:HB3	1:A:61:HIS:CE1	2.56	0.41
4:F:287:ILE:HG23	4:F:319:PHE:CE2	2.56	0.40
4:F:32:LYS:HB3	4:F:32:LYS:HE2	1.84	0.40
1:C:93:ILE:HG22	1:C:114:ILE:HD11	2.03	0.40
2:D:104:GLY:O	2:D:109:GLY:HA3	2.21	0.40
4:F:164:SER:O	4:F:166:ALA:N	2.50	0.40
1:A:188:ILE:HG13	1:A:425:MET:HG3	2.02	0.40
2:B:103:LYS:HA	2:B:107:THR:OG1	2.21	0.40
4:F:129:GLU:H	4:F:129:GLU:HG3	1.60	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	435/450 (97%)	427 (98%)	8 (2%)	0	100	100
1	C	439/450 (98%)	433 (99%)	6 (1%)	0	100	100
2	B	425/445 (96%)	416 (98%)	8 (2%)	1 (0%)	43	72
2	D	417/445 (94%)	406 (97%)	11 (3%)	0	100	100
3	E	119/143 (83%)	118 (99%)	1 (1%)	0	100	100
4	F	315/384 (82%)	302 (96%)	12 (4%)	1 (0%)	36	65
All	All	2150/2317 (93%)	2102 (98%)	46 (2%)	2 (0%)	48	77

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	302	ALA
4	F	166	ALA

5.3.2 Protein sidechains ⓘ

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

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	368/378 (97%)	359 (98%)	9 (2%)	43	75
1	C	372/378 (98%)	371 (100%)	1 (0%)	86	96
2	B	369/383 (96%)	369 (100%)	0	100	100
2	D	361/383 (94%)	357 (99%)	4 (1%)	65	88
3	E	111/127 (87%)	111 (100%)	0	100	100
4	F	288/342 (84%)	282 (98%)	6 (2%)	47	77
All	All	1869/1991 (94%)	1849 (99%)	20 (1%)	65	88

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	66	VAL
1	A	68	VAL
1	A	120	ASP
1	A	179	THR
1	A	256	GLN
1	A	257	THR
1	A	297	GLU
1	A	320	ARG
1	A	356	ASN
1	C	71	GLU
2	D	48	ASN
2	D	205	GLU
2	D	246	LEU
2	D	391	ARG
4	F	129	GLU

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Mol	Chain	Res	Type
4	F	130	VAL
4	F	234	GLN
4	F	245	ILE
4	F	310	GLN
4	F	333	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (29) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	HIS
1	A	176	GLN
1	A	300	ASN
1	A	301	GLN
1	A	309	HIS
1	A	372	GLN
1	A	393	HIS
2	B	15	GLN
2	B	165	ASN
2	B	329	GLN
2	B	347	ASN
2	B	426	GLN
1	C	31	GLN
1	C	249	ASN
1	C	256	GLN
1	C	356	ASN
1	C	393	HIS
2	D	15	GLN
2	D	37	HIS
2	D	48	ASN
2	D	245	GLN
2	D	292	GLN
3	E	12	ASN
3	E	51	GLN
4	F	183	GLN
4	F	232	ASN
4	F	243	HIS
4	F	252	ASN
4	F	310	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 7 are monoatomic - leaving 9 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	$\# Z > 2$
8	GDP	B	501	7	29,30,30	1.17	2 (6%)	45,47,47	1.69	5 (11%)
9	MES	B	503	-	12,12,12	2.38	1 (8%)	15,16,16	1.85	2 (13%)
5	GTP	C	501	7	33,34,34	0.89	1 (3%)	50,54,54	1.53	8 (16%)
11	ACP	F	402	7	31,33,33	1.97	6 (19%)	47,52,52	1.71	7 (14%)
9	MES	B	502	-	12,12,12	2.30	1 (8%)	15,16,16	1.69	1 (6%)
5	GTP	A	501	7	33,34,34	1.00	3 (9%)	50,54,54	1.57	8 (16%)
5	GTP	D	501	7	33,34,34	1.05	3 (9%)	50,54,54	1.56	8 (16%)
10	Y5L	D	503	-	26,26,26	2.88	10 (38%)	34,38,38	2.43	12 (35%)
10	Y5L	B	505	-	26,26,26	2.93	11 (42%)	34,38,38	2.30	13 (38%)

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
8	GDP	B	501	7	-	3/16/32/32	0/3/3/3
9	MES	B	503	-	-	4/6/14/14	0/1/1/1
5	GTP	C	501	7	-	7/22/38/38	0/3/3/3
11	ACP	F	402	7	-	5/19/38/38	0/3/3/3
9	MES	B	502	-	-	4/6/14/14	0/1/1/1
5	GTP	A	501	7	-	7/22/38/38	0/3/3/3
5	GTP	D	501	7	-	7/22/38/38	0/3/3/3
10	Y5L	D	503	-	-	2/5/24/24	0/4/4/4
10	Y5L	B	505	-	-	2/5/24/24	0/4/4/4

All (38) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
10	B	505	Y5L	C20-N19	8.83	1.45	1.35
10	D	503	Y5L	C20-N19	8.40	1.44	1.35
9	B	503	MES	C8-S	-7.99	1.66	1.77
9	B	502	MES	C8-S	-7.69	1.66	1.77
11	F	402	ACP	PB-O3A	6.55	1.65	1.58
10	D	503	Y5L	C09-N10	5.74	1.45	1.37
10	D	503	Y5L	C08-C04	5.55	1.55	1.50
10	B	505	Y5L	C08-C04	5.54	1.55	1.50
10	B	505	Y5L	C18-N19	5.41	1.49	1.39
10	B	505	Y5L	C09-N10	5.37	1.44	1.37
10	D	503	Y5L	C18-N19	5.15	1.48	1.39
11	F	402	ACP	C6-N6	4.22	1.45	1.34
10	D	503	Y5L	C21-C20	3.42	1.55	1.51
10	B	505	Y5L	C21-C20	3.39	1.55	1.51
10	D	503	Y5L	C11-N10	3.18	1.45	1.40
8	B	501	GDP	C5-C4	3.08	1.47	1.38
10	B	505	Y5L	C11-N10	3.02	1.45	1.40
11	F	402	ACP	C5-C4	-2.98	1.33	1.39
11	F	402	ACP	O3'-C3'	-2.82	1.36	1.43
5	D	501	GTP	C2-N3	2.76	1.39	1.33
11	F	402	ACP	C5-N7	-2.73	1.34	1.39
8	B	501	GDP	C6-N1	-2.48	1.34	1.38
10	D	503	Y5L	O22-C20	-2.47	1.18	1.23
10	B	505	Y5L	C21-N10	-2.42	1.42	1.46
10	D	503	Y5L	C21-N10	-2.40	1.42	1.46
10	B	505	Y5L	O22-C20	-2.35	1.18	1.23
10	B	505	Y5L	C18-C11	-2.34	1.38	1.40
11	F	402	ACP	C8-N9	-2.28	1.33	1.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	501	GTP	PA-O3A	2.27	1.62	1.59
5	D	501	GTP	PB-O3A	2.19	1.61	1.59
5	C	501	GTP	C2-N3	2.16	1.38	1.33
10	D	503	Y5L	C18-C11	-2.12	1.38	1.40
5	A	501	GTP	PB-O3A	2.10	1.61	1.59
10	B	505	Y5L	C06-C05	2.08	1.55	1.51
5	A	501	GTP	PA-O3A	2.08	1.61	1.59
10	D	503	Y5L	C06-C05	2.04	1.55	1.51
10	B	505	Y5L	C12-C11	2.04	1.42	1.39
5	A	501	GTP	C2-N3	2.03	1.38	1.33

All (64) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	B	501	GDP	C5-C4-N3	-5.82	119.13	128.39
11	F	402	ACP	N3-C2-N1	-5.28	120.59	128.58
10	B	505	Y5L	C08-C04-N03	5.19	129.99	123.41
11	F	402	ACP	C5-C4-N3	-5.11	119.68	126.72
5	D	501	GTP	C5-C4-N3	-5.07	120.32	128.39
8	B	501	GDP	C2-N3-C4	4.91	120.76	112.30
10	D	503	Y5L	C07-C08-C04	4.89	107.32	103.84
10	D	503	Y5L	C08-C04-N03	4.76	129.44	123.41
9	B	503	MES	C5-N4-C3	4.75	119.07	108.84
5	A	501	GTP	C5-C4-N3	-4.68	120.94	128.39
10	D	503	Y5L	C18-N19-C20	-4.68	118.85	124.45
9	B	502	MES	C5-N4-C3	4.67	118.91	108.84
5	C	501	GTP	C5-C4-N3	-4.67	120.96	128.39
10	D	503	Y5L	N23-C02-N03	-4.66	121.00	129.52
5	A	501	GTP	C2-N3-C4	4.49	120.04	112.30
10	B	505	Y5L	N23-C02-N03	-4.39	121.49	129.52
8	B	501	GDP	N9-C4-N3	4.37	134.69	125.95
5	C	501	GTP	C2-N3-C4	4.36	119.81	112.30
10	B	505	Y5L	C07-C08-C04	4.32	106.92	103.84
5	D	501	GTP	C2-N3-C4	4.20	119.53	112.30
10	D	503	Y5L	C11-N10-C09	4.06	126.69	119.21
10	D	503	Y5L	C02-N23-C09	4.02	122.36	110.98
10	B	505	Y5L	C02-N23-C09	3.83	121.81	110.98
10	B	505	Y5L	C18-N19-C20	-3.81	119.89	124.45
10	B	505	Y5L	C05-C04-N03	-3.71	121.29	125.50
11	F	402	ACP	N9-C8-N7	-3.62	108.80	113.94
10	D	503	Y5L	C05-C04-N03	-3.59	121.42	125.50
8	B	501	GDP	C6-C5-N7	3.43	136.53	130.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	F	402	ACP	C2-N3-C4	3.37	120.06	111.83
5	D	501	GTP	N9-C4-N3	3.25	132.45	125.95
10	B	505	Y5L	CL01-C02-N03	3.22	119.71	115.17
5	D	501	GTP	N9-C8-N7	-3.17	107.51	113.40
10	D	503	Y5L	C07-C06-C05	3.14	107.52	103.57
10	B	505	Y5L	C08-C04-C05	-3.12	108.72	111.25
10	D	503	Y5L	CL01-C02-N23	3.11	119.55	115.17
10	D	503	Y5L	CL01-C02-N03	3.04	119.46	115.17
5	D	501	GTP	C8-N7-C5	3.02	109.63	104.26
11	F	402	ACP	N3-C4-N9	2.93	132.15	127.17
5	C	501	GTP	N9-C4-N3	2.93	131.81	125.95
5	A	501	GTP	N9-C4-N3	2.90	131.75	125.95
5	A	501	GTP	N9-C8-N7	-2.88	108.06	113.40
5	A	501	GTP	C2-N1-C6	-2.85	119.94	125.11
5	C	501	GTP	N9-C8-N7	-2.79	108.22	113.40
5	C	501	GTP	C2-N1-C6	-2.75	120.11	125.11
5	D	501	GTP	C2-N1-C6	-2.65	120.31	125.11
10	B	505	Y5L	C07-C06-C05	2.62	106.86	103.57
10	D	503	Y5L	C08-C04-C05	-2.61	109.14	111.25
5	A	501	GTP	C8-N7-C5	2.60	108.89	104.26
8	B	501	GDP	C4-C5-N7	-2.58	106.58	110.67
10	B	505	Y5L	CL01-C02-N23	2.58	118.81	115.17
5	C	501	GTP	C8-N7-C5	2.53	108.78	104.26
5	A	501	GTP	C5-C6-N1	2.47	119.53	113.25
10	B	505	Y5L	C11-N10-C09	2.45	123.73	119.21
9	B	503	MES	C6-C5-N4	-2.44	106.41	110.12
5	A	501	GTP	O6-C6-C5	-2.44	120.08	126.53
10	D	503	Y5L	C05-C09-N23	-2.41	118.93	122.60
11	F	402	ACP	C5-N7-C8	2.40	107.22	103.45
5	C	501	GTP	C5-C6-N1	2.39	119.34	113.25
10	B	505	Y5L	C21-N10-C11	2.36	117.39	114.97
5	C	501	GTP	O6-C6-C5	-2.29	120.48	126.53
10	B	505	Y5L	C05-C09-N23	-2.16	119.30	122.60
11	F	402	ACP	C5-C4-N9	2.16	108.17	105.81
5	D	501	GTP	O6-C6-C5	-2.09	121.02	126.53
5	D	501	GTP	C4-C5-N7	-2.04	107.43	110.67

There are no chirality outliers.

All (41) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	501	GTP	PB-O3B-PG-O2G

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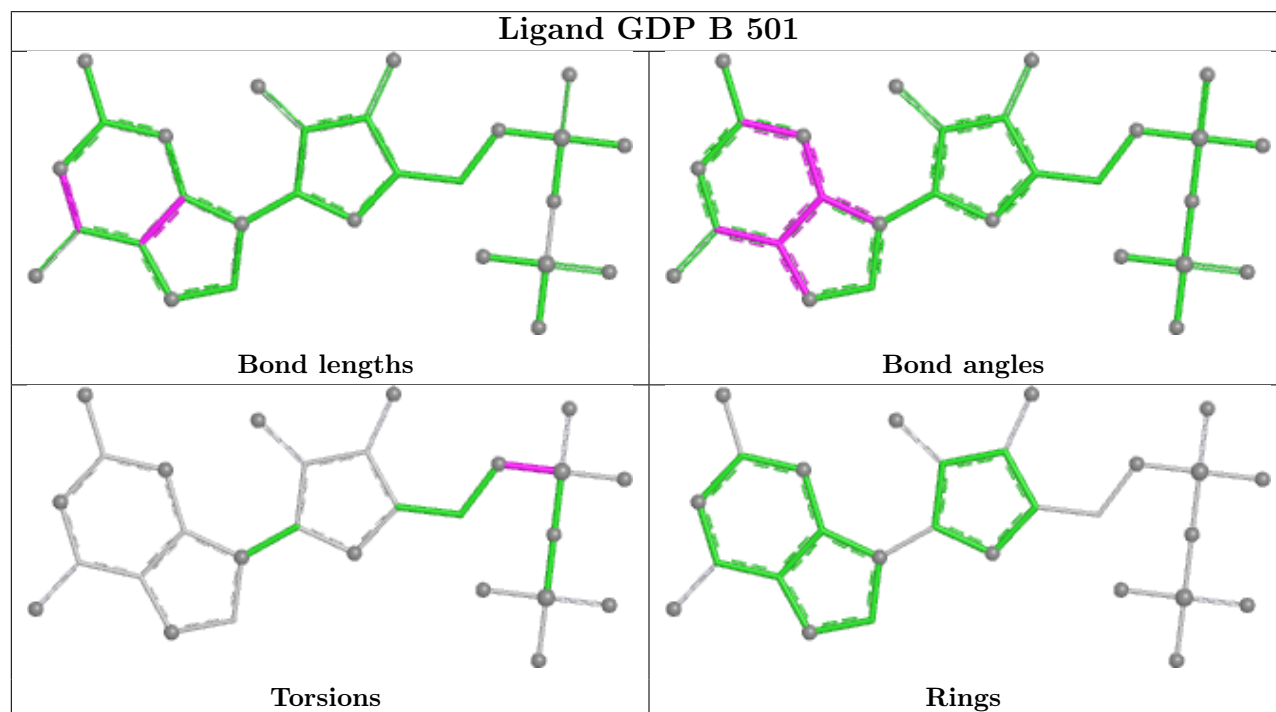
Mol	Chain	Res	Type	Atoms
5	A	501	GTP	C5'-O5'-PA-O3A
5	A	501	GTP	C5'-O5'-PA-O1A
5	A	501	GTP	C5'-O5'-PA-O2A
5	C	501	GTP	PB-O3B-PG-O2G
5	C	501	GTP	PB-O3B-PG-O3G
5	C	501	GTP	C5'-O5'-PA-O3A
5	C	501	GTP	C5'-O5'-PA-O2A
5	D	501	GTP	PB-O3B-PG-O2G
5	D	501	GTP	PB-O3B-PG-O3G
5	D	501	GTP	C5'-O5'-PA-O3A
5	D	501	GTP	C5'-O5'-PA-O1A
5	D	501	GTP	C5'-O5'-PA-O2A
8	B	501	GDP	C5'-O5'-PA-O3A
8	B	501	GDP	C5'-O5'-PA-O1A
8	B	501	GDP	C5'-O5'-PA-O2A
11	F	402	ACP	PB-C3B-PG-O1G
11	F	402	ACP	PB-C3B-PG-O2G
11	F	402	ACP	PB-C3B-PG-O3G
11	F	402	ACP	PG-C3B-PB-O1B
9	B	502	MES	C7-C8-S-O3S
9	B	503	MES	C7-C8-S-O3S
10	B	505	Y5L	N23-C09-N10-C21
10	D	503	Y5L	N23-C09-N10-C21
10	D	503	Y5L	C05-C09-N10-C21
10	B	505	Y5L	C05-C09-N10-C21
9	B	502	MES	C8-C7-N4-C3
9	B	502	MES	C7-C8-S-O1S
9	B	502	MES	C7-C8-S-O2S
9	B	503	MES	C7-C8-S-O1S
9	B	503	MES	C7-C8-S-O2S
5	C	501	GTP	C5'-O5'-PA-O1A
11	F	402	ACP	PG-C3B-PB-O2B
9	B	503	MES	C8-C7-N4-C3
5	D	501	GTP	O4'-C4'-C5'-O5'
5	A	501	GTP	PB-O3B-PG-O3G
5	D	501	GTP	C3'-C4'-C5'-O5'
5	A	501	GTP	PB-O3A-PA-O1A
5	C	501	GTP	PB-O3A-PA-O2A
5	C	501	GTP	PB-O3B-PG-O1G
5	A	501	GTP	PB-O3A-PA-O2A

There are no ring outliers.

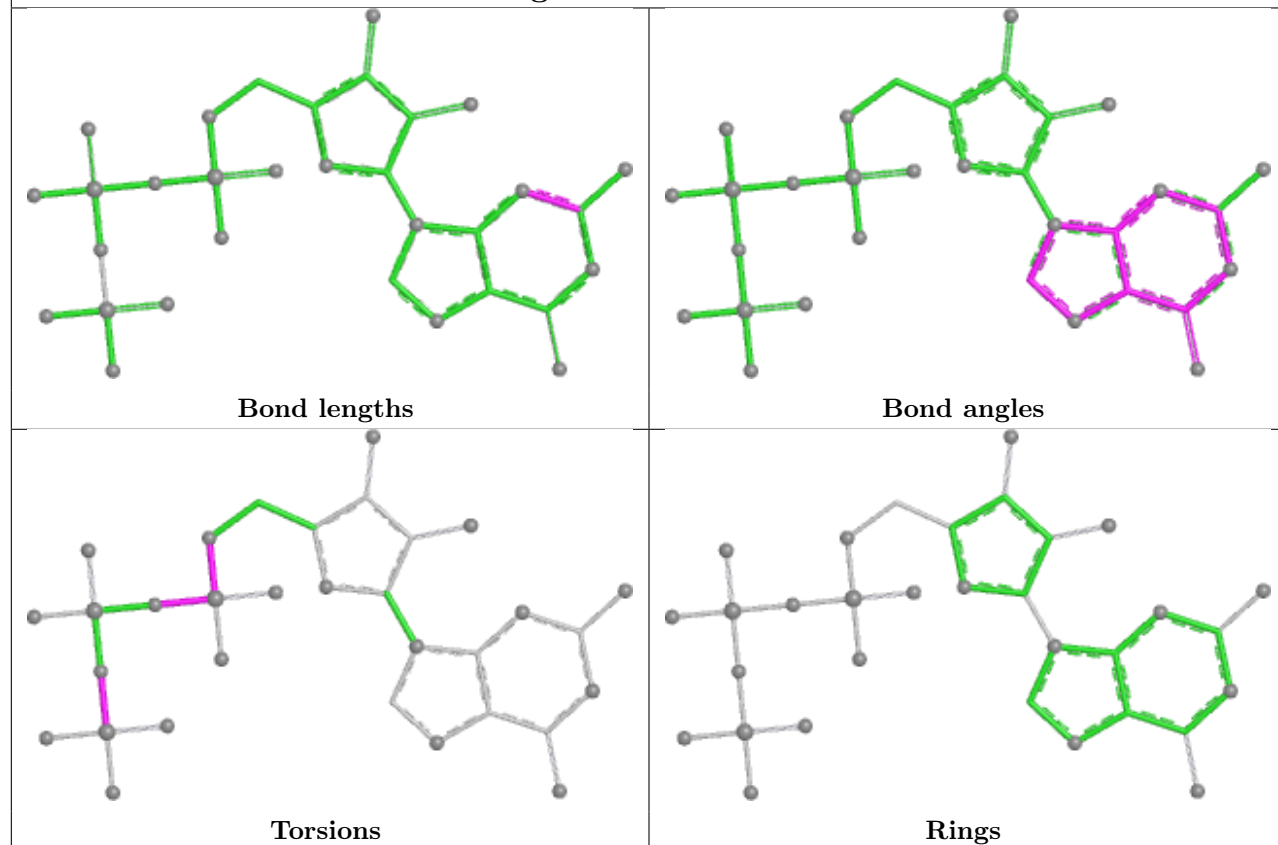
4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	501	GDP	1	0
9	B	503	MES	2	0
11	F	402	ACP	1	0
5	D	501	GTP	1	0

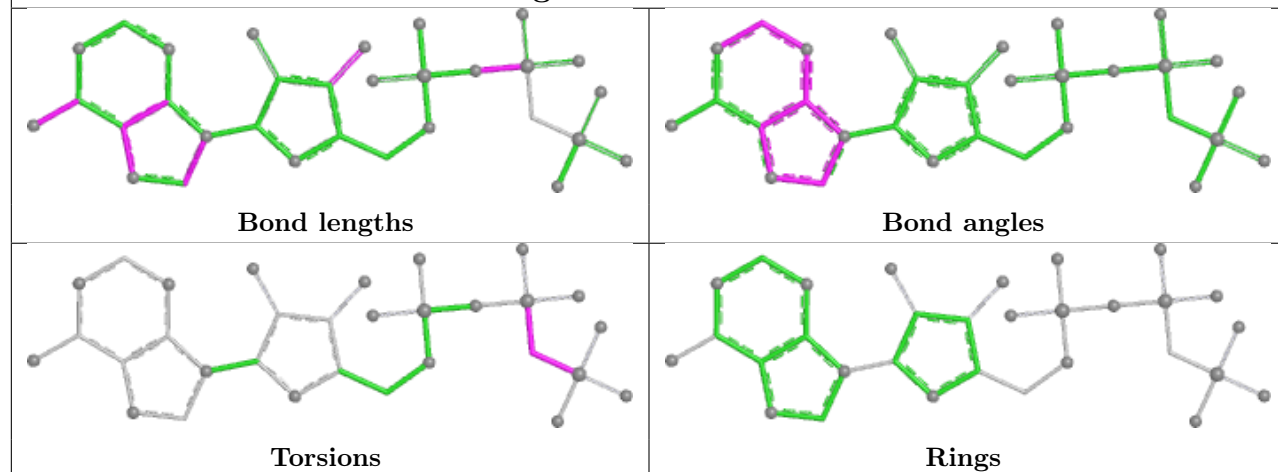
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



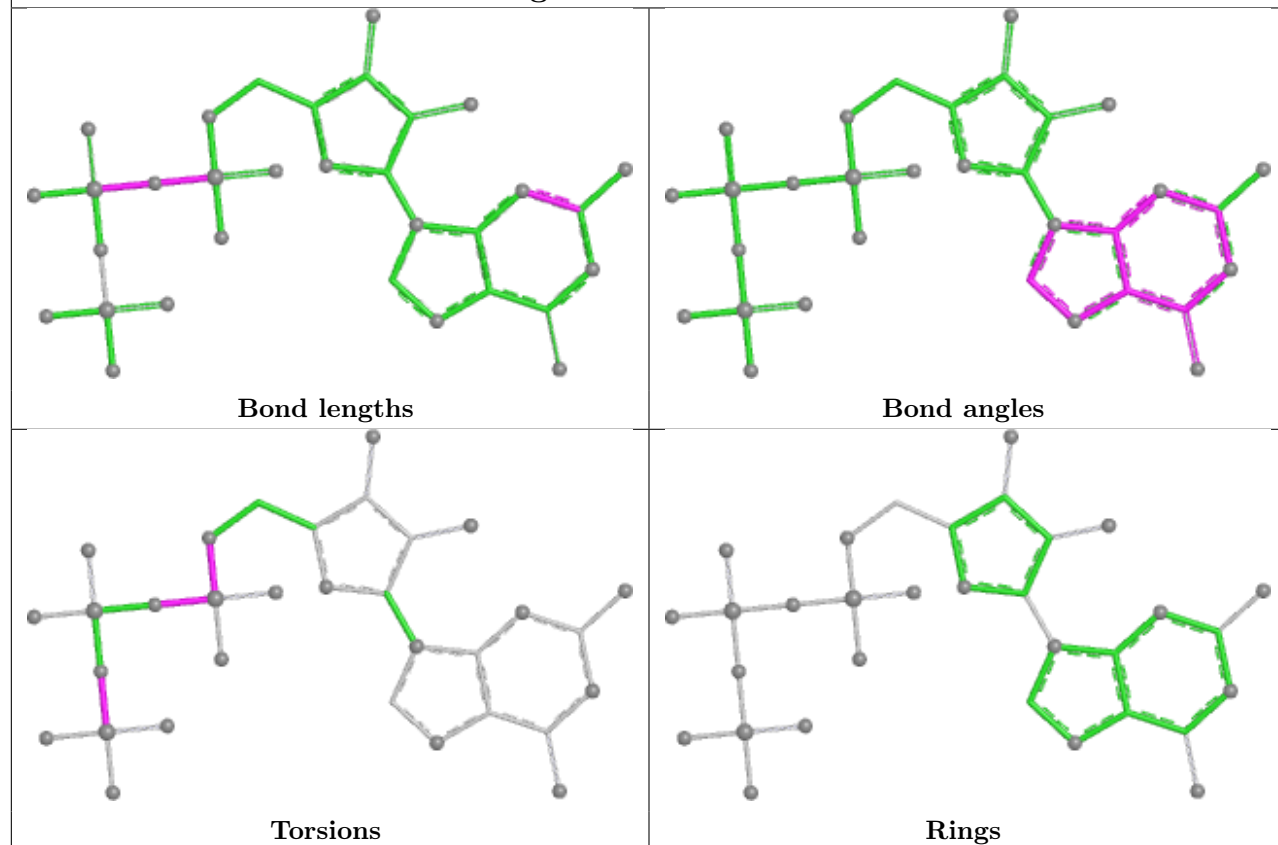
Ligand GTP C 501



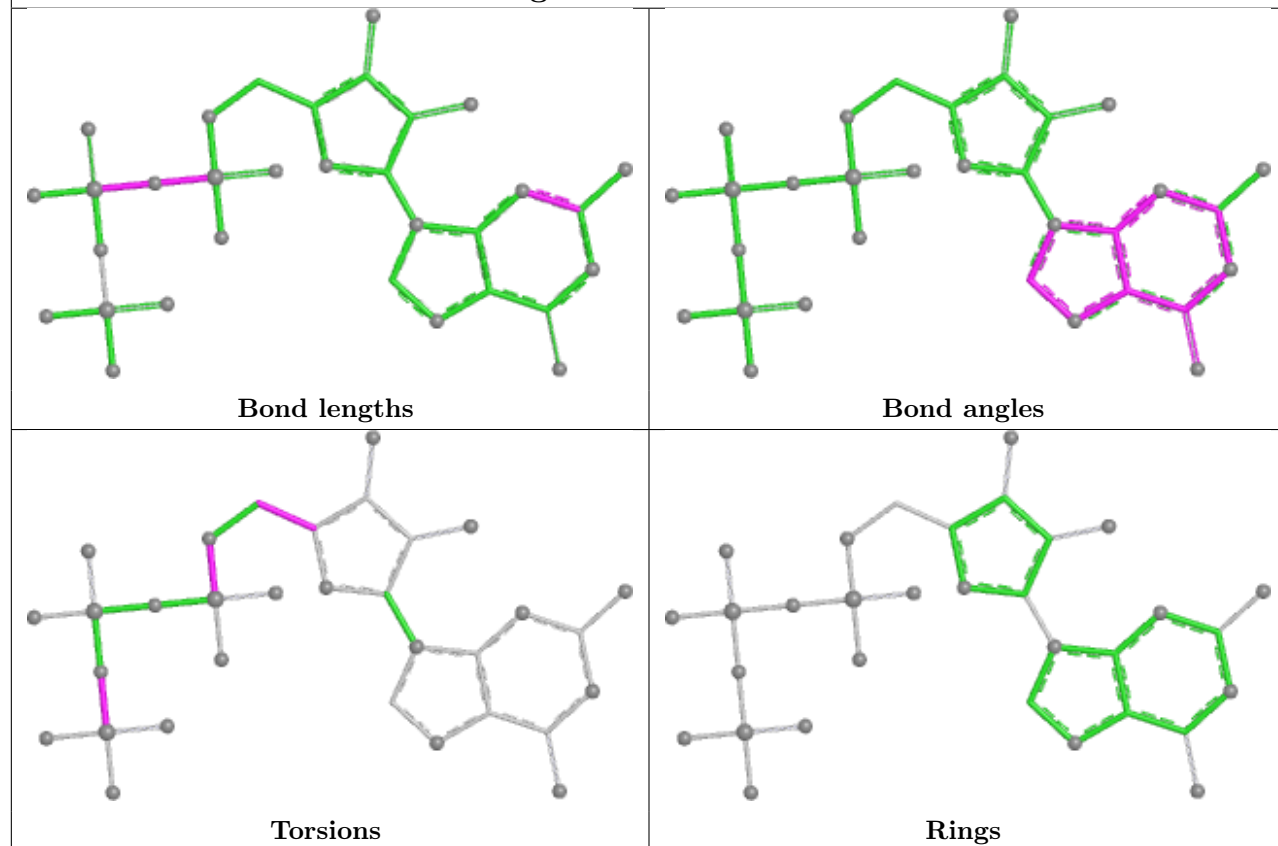
Ligand ACP F 402



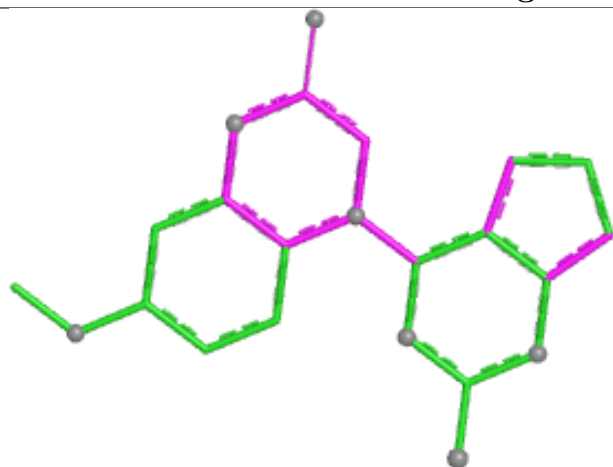
Ligand GTP A 501



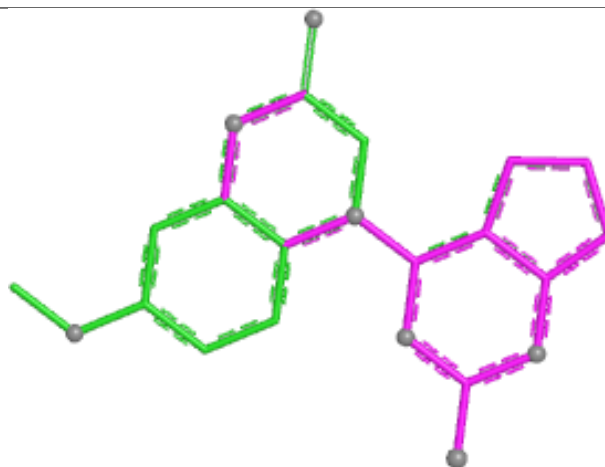
Ligand GTP D 501



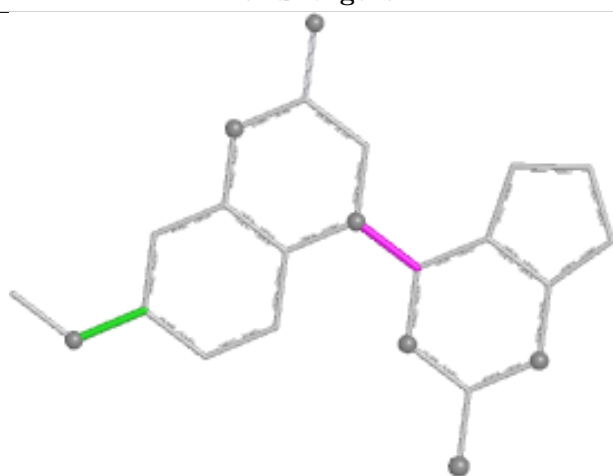
Ligand Y5L D 503



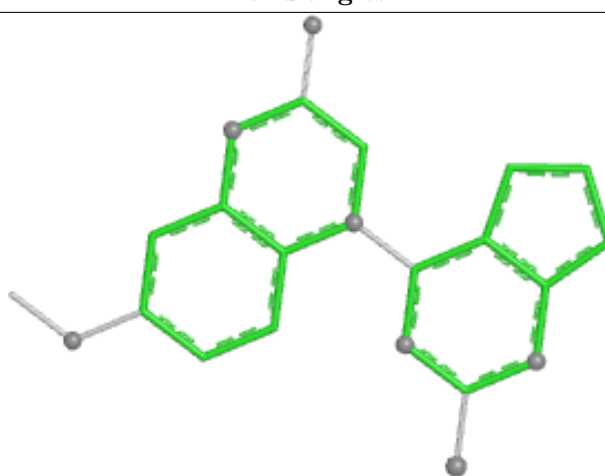
Bond lengths



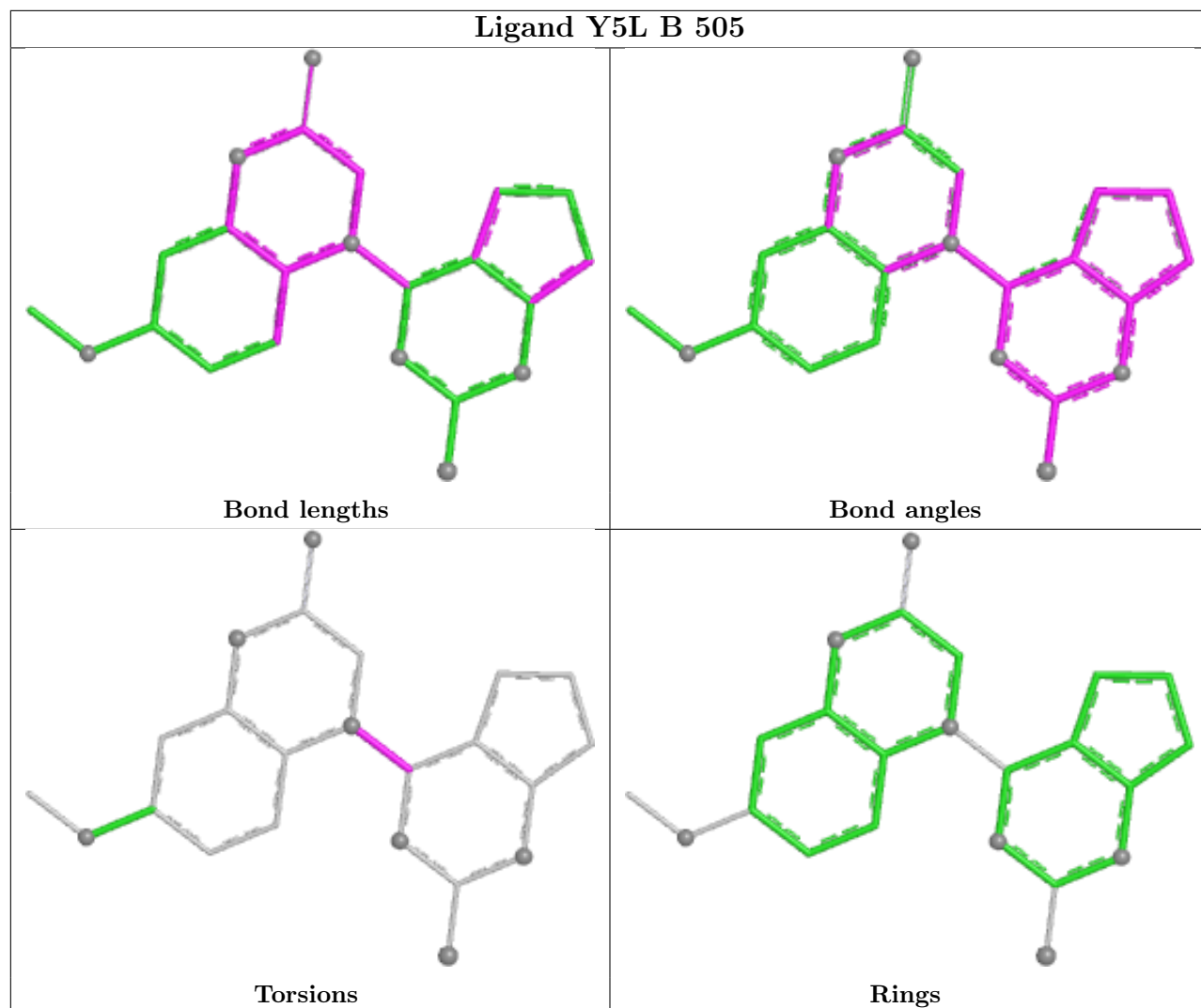
Bond angles



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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	437/450 (97%)	-0.47	1 (0%) 91 89	27, 45, 77, 99	0
1	C	440/450 (97%)	-0.64	2 (0%) 87 83	18, 34, 65, 108	1 (0%)
2	B	427/445 (95%)	-0.42	5 (1%) 76 69	21, 43, 84, 153	0
2	D	421/445 (94%)	0.10	9 (2%) 63 54	32, 69, 112, 138	0
3	E	121/143 (84%)	-0.12	0 100 100	28, 63, 103, 123	2 (1%)
4	F	327/384 (85%)	0.10	14 (4%) 40 31	28, 75, 134, 156	2 (0%)
All	All	2173/2317 (93%)	-0.28	31 (1%) 73 65	18, 51, 109, 156	5 (0%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	437	VAL	4.7
4	F	161	LEU	4.6
1	C	340	SER	3.9
4	F	165	GLU	3.4
2	D	141	GLY	3.2
2	D	1	MET	3.2
2	D	247	ASN	3.2
2	D	219	THR	3.2
2	D	245	GLN	3.1
2	D	284	LEU	3.0
2	B	428	ALA	2.9
4	F	245	ILE	2.7
4	F	135	TYR	2.6
2	B	55	THR	2.5
4	F	70[A]	LYS	2.5
2	B	245	GLN	2.3
1	C	440	VAL	2.3
4	F	166	ALA	2.3
4	F	126	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
2	B	277	GLY	2.2
2	D	394	PHE	2.2
4	F	233	PHE	2.2
2	D	218	THR	2.2
2	B	280	GLN	2.1
4	F	132	LEU	2.1
4	F	244	CYS	2.1
4	F	379	HIS	2.1
4	F	173	ILE	2.1
4	F	102	PRO	2.0
2	D	55	THR	2.0
4	F	141	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
7	MG	D	502	1/1	0.78	0.10	68,68,68,68	0
7	MG	F	401	1/1	0.82	0.08	97,97,97,97	0
11	ACP	F	402	31/31	0.86	0.11	78,93,124,131	0
5	GTP	D	501	32/32	0.91	0.11	47,63,113,116	0
9	MES	B	503	12/12	0.92	0.12	53,66,73,81	0
6	CA	A	502	1/1	0.95	0.06	72,72,72,72	0
10	Y5L	D	503	23/23	0.96	0.09	26,42,66,101	0
9	MES	B	502	12/12	0.96	0.08	29,48,82,95	0
5	GTP	A	501	32/32	0.97	0.07	19,29,44,50	0
10	Y5L	B	505	23/23	0.97	0.07	21,33,53,70	0
8	GDP	B	501	28/28	0.98	0.06	7,29,39,43	0

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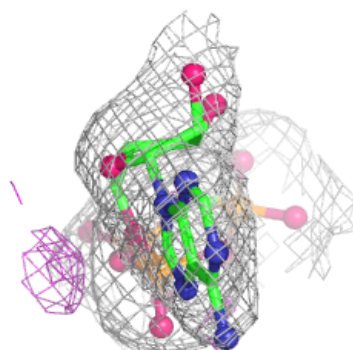
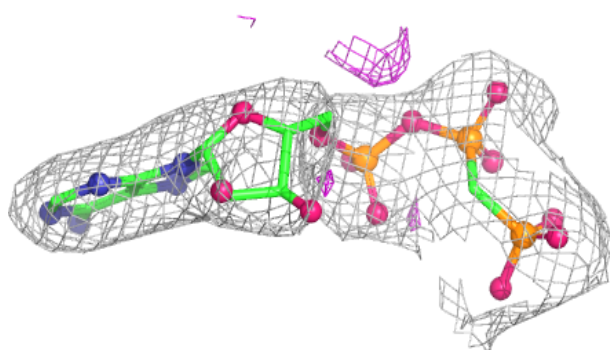
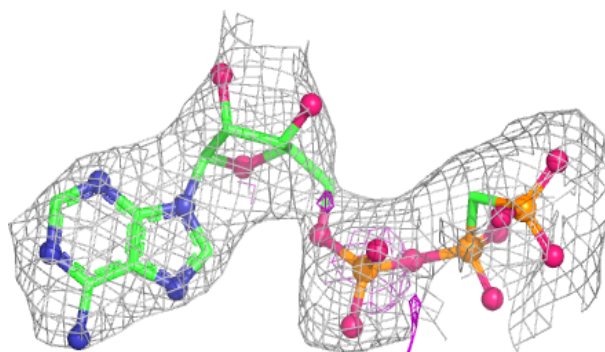
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	GTP	C	501	32/32	0.98	0.06	16,29,40,54	0
7	MG	C	503	1/1	0.99	0.02	30,30,30,30	0
6	CA	C	502	1/1	0.99	0.05	51,51,51,51	0
7	MG	B	504	1/1	0.99	0.07	51,51,51,51	0
7	MG	A	503	1/1	1.00	0.03	28,28,28,28	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.

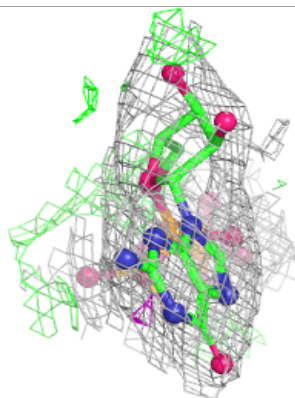
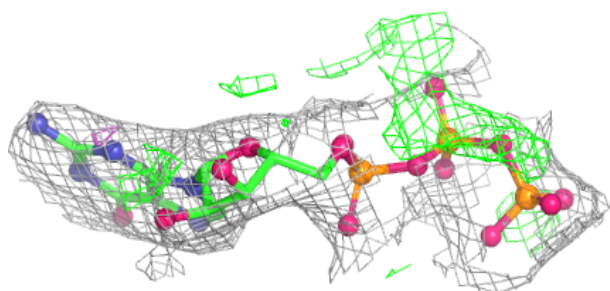
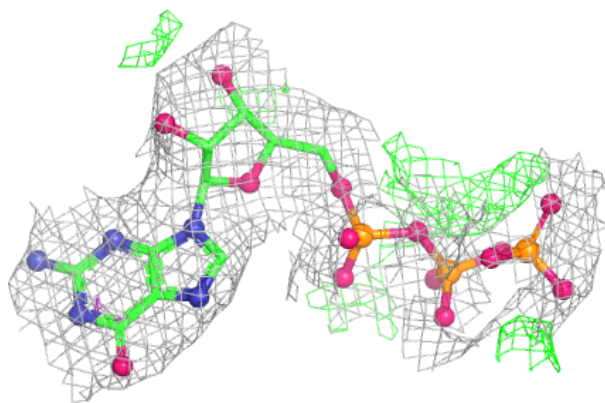
Electron density around ACP F 402:

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

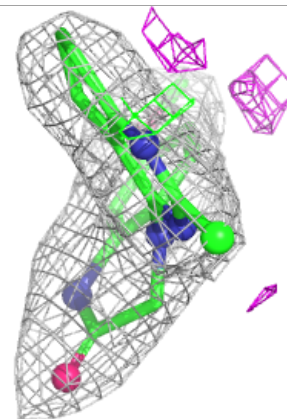
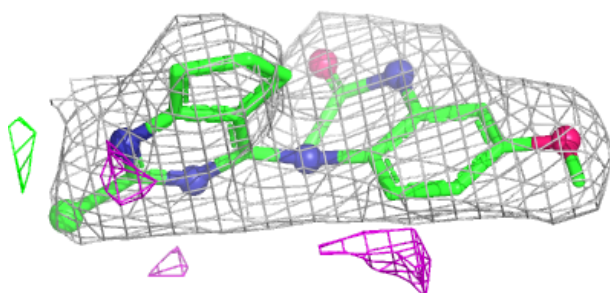
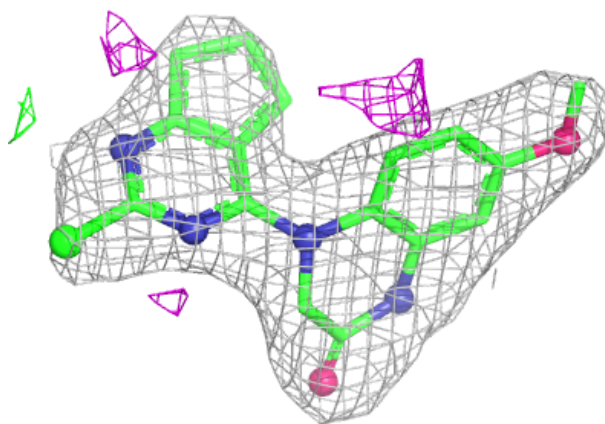


Electron density around GTP D 501:

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

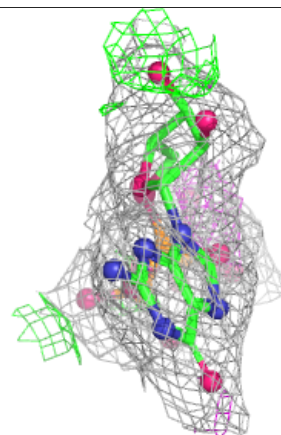
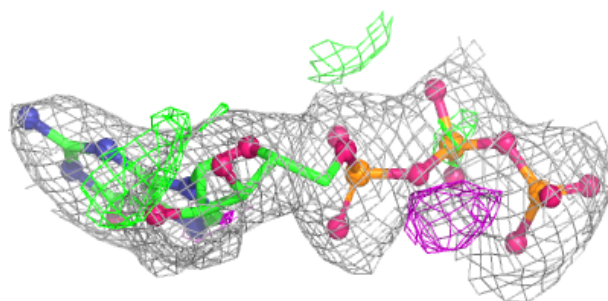
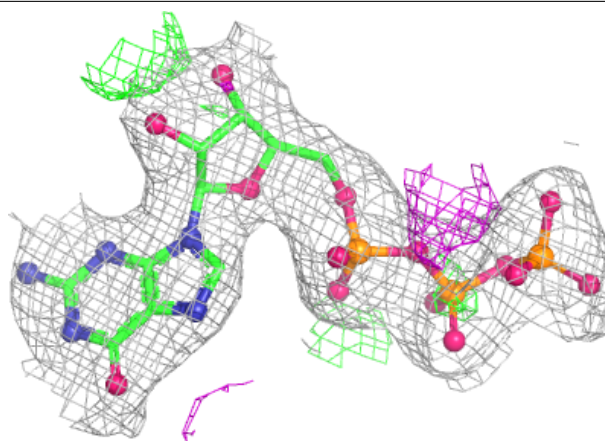
**Electron density around Y5L D 503:**

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



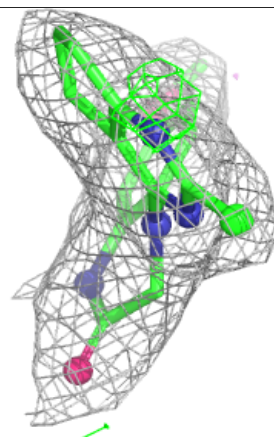
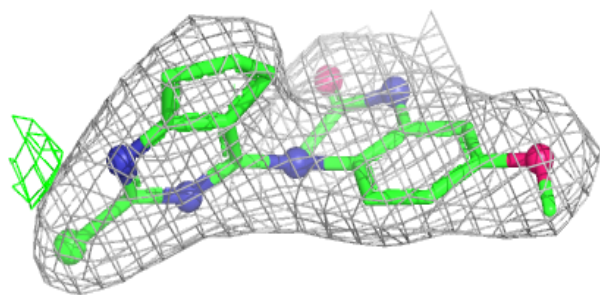
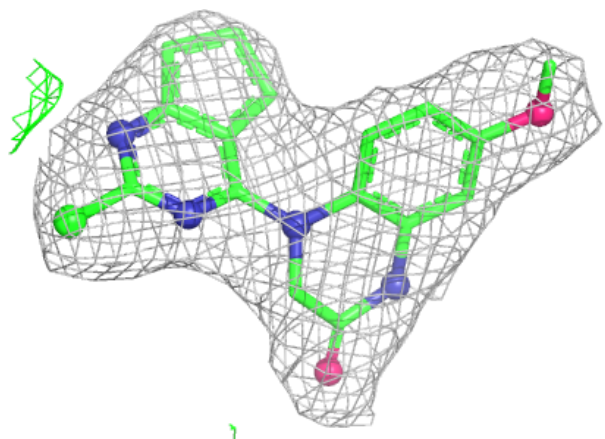
Electron density around GTP A 501:

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



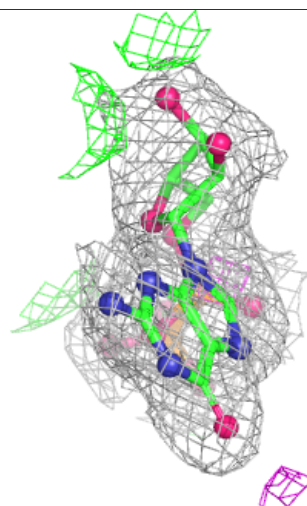
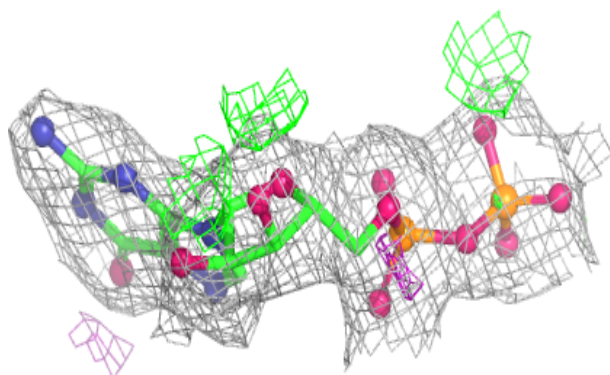
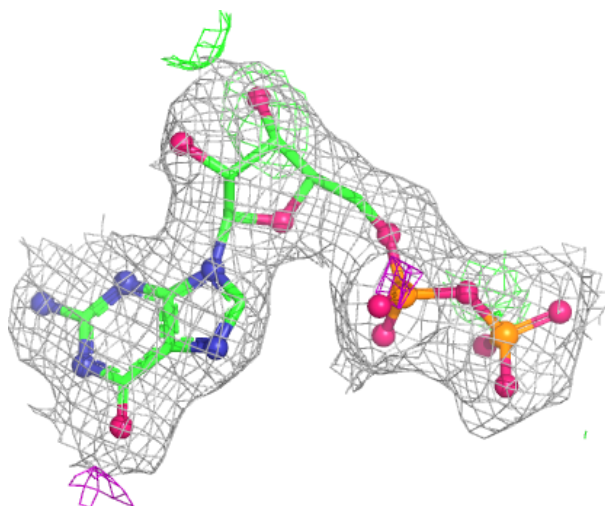
Electron density around Y5L B 505:

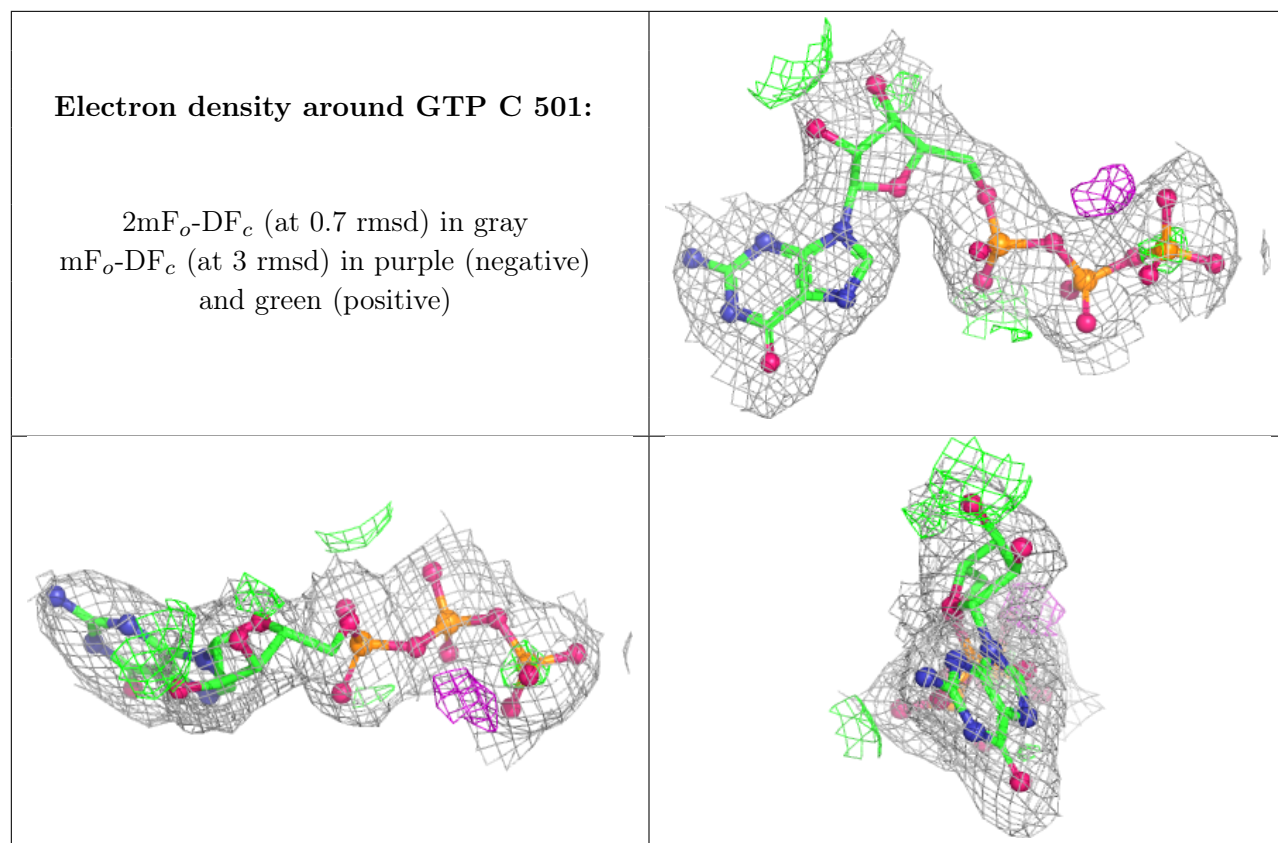
$2mF_o - DF_c$ (at 0.7 rmsd) in gray
 $mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)



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)





6.5 Other polymers [i](#)

There are no such residues in this entry.