



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 04:56 AM UTC

PDB ID : 5SBC / pdb_00005sbc
Title : Tubulin-maytansinoid-5a-complex
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J.F.; Pieraccini, S.; Passarella, D.
Deposited on : 2021-07-20
Resolution : 2.32 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

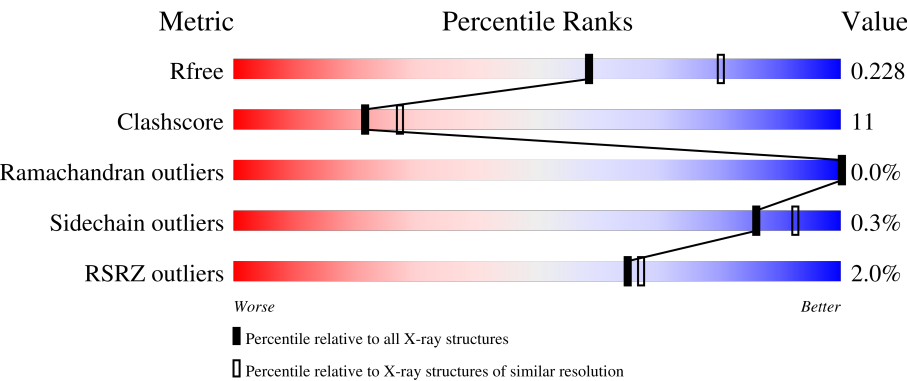
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.32 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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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

Mol	Chain	Length	Quality of chain
1	A	451	0.2% 76% 21% 0.1%
1	C	451	0.2% 79% 18% 0.1%
2	B	445	0.2% 71% 24% 5%
2	D	445	2% 71% 24% 0.1%

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Mol	Chain	Length	Quality of chain
3	E	143	2% 73% 12% 15%
4	F	384	5% 65% 24% 11%

2 Entry composition

There are 14 unique types of molecules in this entry. The entry contains 18401 atoms, of which 13 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	438	Total	C	N	O	S	0	2	0
			3436	2173	584	655	24			
1	C	440	Total	C	N	O	S	0	6	0
			3476	2199	591	663	23			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	423	Total	C	N	O	S	0	1	0
			3345	2102	572	644	27			
2	D	426	Total	C	N	O	S	0	0	0
			3343	2098	570	648	27			

- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	121	Total	C	N	O	S	0	0	0
			1000	617	181	197	5			

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	341	Total	C	N	O	S	0	2	0
			2806	1801	480	510	15			

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		

- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

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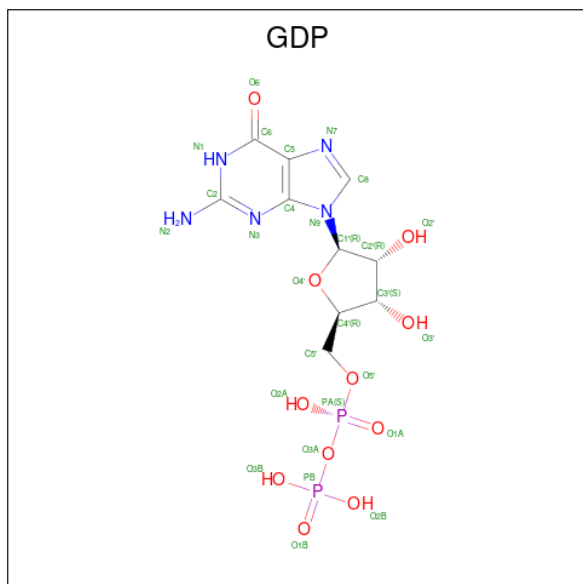
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	F	1	Total	Mg	0	0
			1	1		

- Molecule 7 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	Ca	0	0
			1	1		
7	B	1	Total	Ca	0	0
			1	1		
7	C	1	Total	Ca	0	0
			1	1		
7	E	1	Total	Ca	0	0
			1	1		

- Molecule 8 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: C₁₀H₁₅N₅O₁₁P₂).



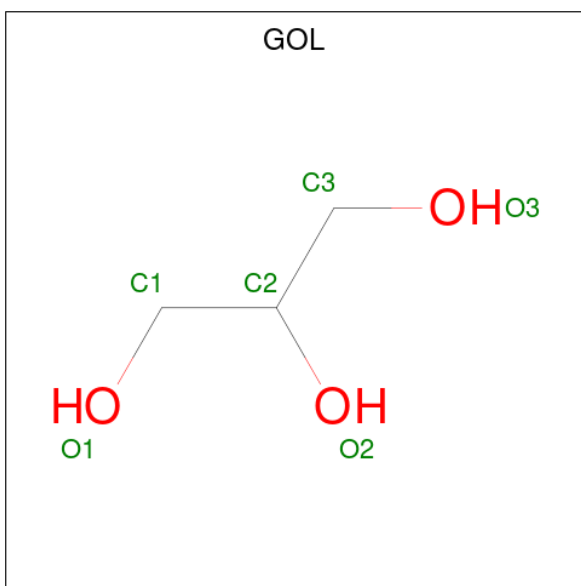
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	B	1	Total 28	C 10	N 5	O 11	P 2	0	0
8	D	1	Total 28	C 10	N 5	O 11	P 2	0	0

- Molecule 9 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: C₆H₁₃NO₄S).



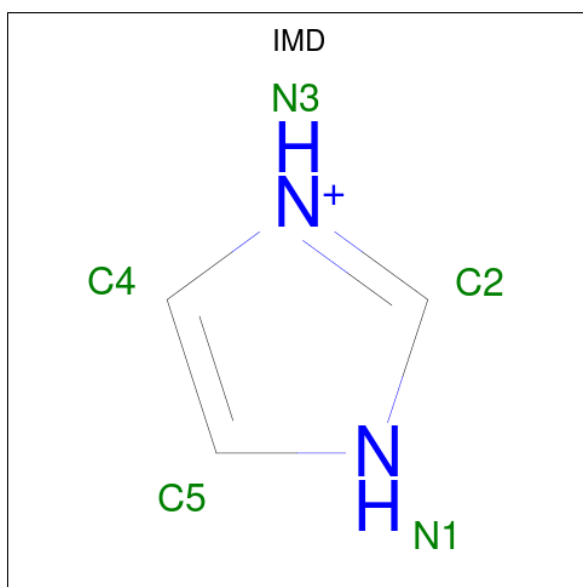
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 10 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



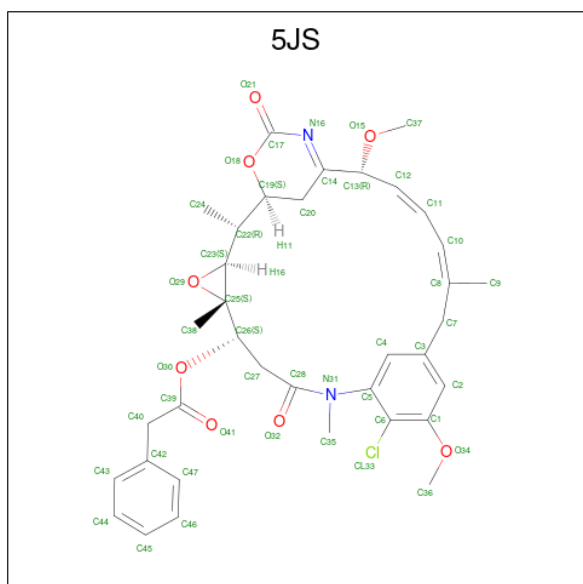
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
10	B	1	Total	C	H	O	0	0
			14	3	8	3		

- Molecule 11 is IMIDAZOLE (CCD ID: IMD) (formula: $C_3H_5N_2$).



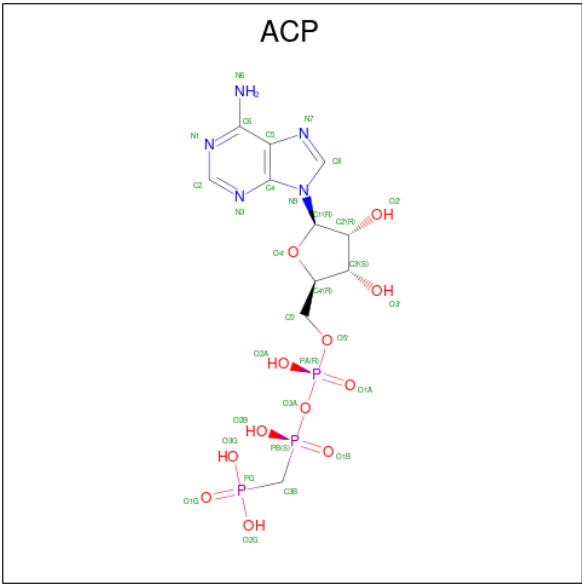
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
11	C	1	Total	C	H	N	0	0
			10	3	5	2		

- Molecule 12 is (1S,2R,3S,5S,6S,16E,18E,20R)-11-chloro-12,20-dimethoxy-2,5,9,16-tetramethyl-8,23-dioxo-4,24-dioxa-9,22-diazatetracyclo[19.3.1.1 10,14 .0 3,5]hexacos-10(26),11,13,16,18,21-hexaen-6-yl phenylacetate (CCD ID: 5JS) (formula: C₃₆H₄₁ClN₂O₈) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
12	D	1	Total	C	Cl	N	O	0	0
			47	36	1	2	8		

- Molecule 13 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (CCD ID: ACP) (formula: C₁₁H₁₈N₅O₁₂P₃).



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

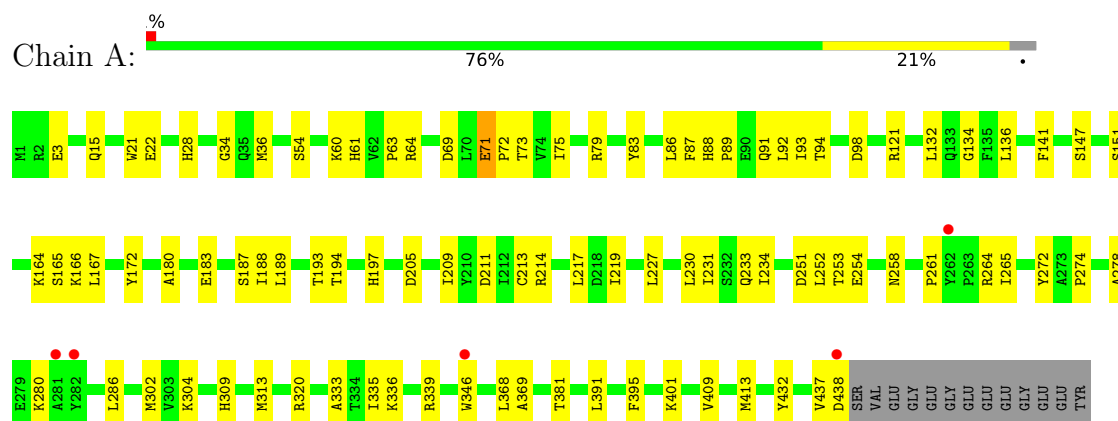
- Molecule 14 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
14	A	147	Total	O	0	0
			147	147		
14	B	169	Total	O	0	0
			169	169		
14	C	289	Total	O	0	0
			289	289		
14	D	79	Total	O	0	0
			79	79		
14	E	26	Total	O	0	0
			26	26		
14	F	42	Total	O	0	0
			42	42		

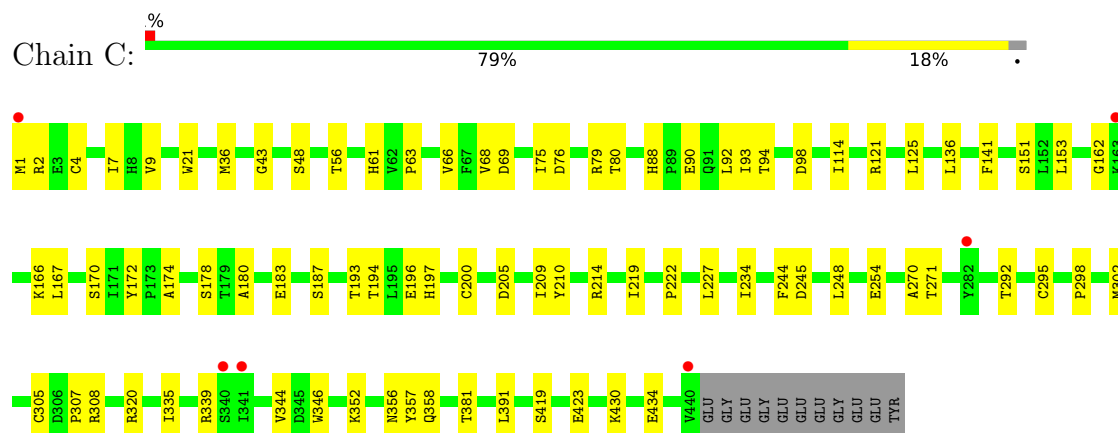
3 Residue-property plots

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.

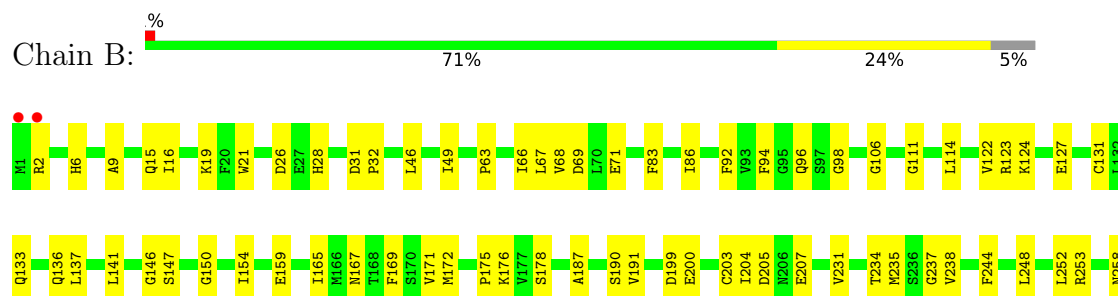
• Molecule 1: Tubulin alpha-1B chain

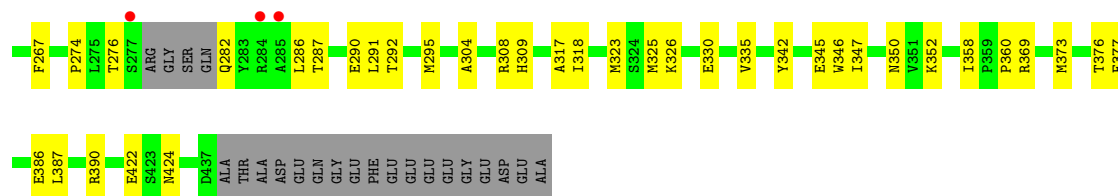


• Molecule 1: Tubulin alpha-1B chain

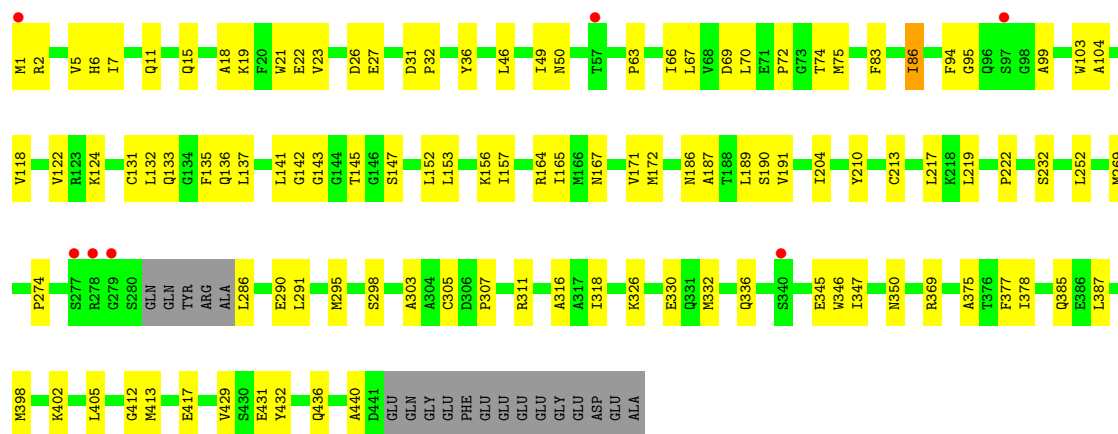


• Molecule 2: Tubulin beta-2B chain

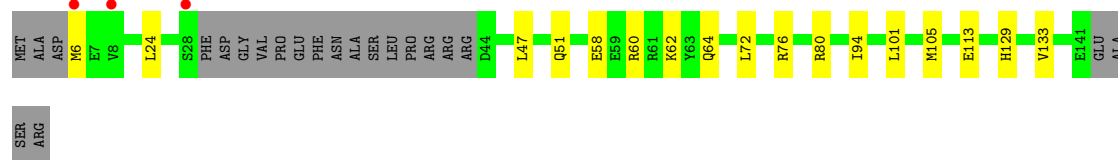
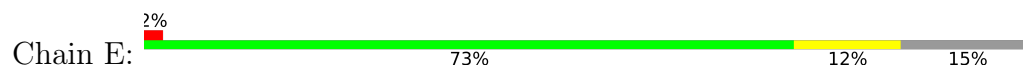




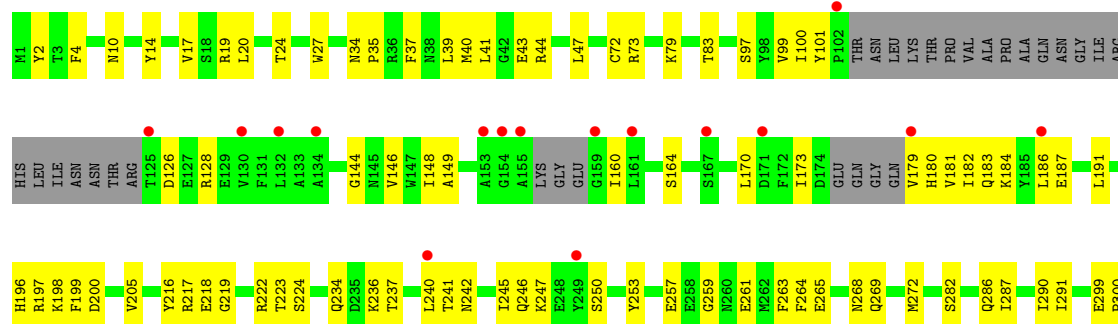
• Molecule 2: Tubulin beta-2B chain

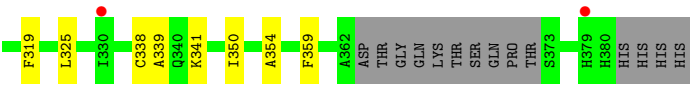


• Molecule 3: Stathmin-4



• 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	104.91Å 157.91Å 181.46Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.02 – 2.32 48.02 – 2.32	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.02-2.32) 100.0 (48.02-2.32)	Depositor EDS
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.49 (at 2.32Å)	Xtriage
Refinement program	PHENIX 1.19.1_4122	Depositor
R, R_{free}	0.186 , 0.228 0.187 , 0.228	Depositor DCC
R_{free} test set	6548 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	51.8	Xtriage
Anisotropy	0.201	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 54.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	18401	wwPDB-VP
Average B, all atoms (Å ²)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.58% 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: GTP, MG, ACP, 5JS, CA, IMD, MES, GDP, GOL

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	0.07	0/3514	0.22	0/4770
1	C	0.08	0/3564	0.24	0/4840
2	B	0.07	0/3419	0.22	0/4629
2	D	0.07	0/3416	0.21	0/4626
3	E	0.05	0/1008	0.16	0/1337
4	F	0.07	0/2869	0.24	0/3873
All	All	0.07	0/17790	0.22	0/24075

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	3436	0	3343	72	0
1	C	3476	0	3384	60	0
2	B	3345	0	3227	83	0
2	D	3343	0	3222	87	0
3	E	1000	0	1018	17	0
4	F	2806	0	2775	64	0
5	A	32	0	12	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	32	0	12	1	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
6	F	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	E	1	0	0	0	0
8	B	28	0	12	0	0
8	D	28	0	12	2	0
9	B	12	0	12	3	0
10	B	6	8	8	0	0
11	C	5	5	5	0	0
12	D	47	0	0	0	0
13	F	31	0	14	2	0
14	A	147	0	0	4	0
14	B	169	0	0	8	0
14	C	289	0	0	4	0
14	D	79	0	0	4	0
14	E	26	0	0	2	0
14	F	42	0	0	2	0
All	All	18388	13	17056	375	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 11.

All (375) 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)
3:E:6:MET:HE2	3:E:24:LEU:HD21	1.48	0.94
4:F:10:ASN:HB2	4:F:44:ARG:HH22	1.40	0.84
2:D:172:MET:HG3	2:D:387:LEU:HD11	1.61	0.82
1:A:71:GLU:OE2	1:A:73:THR:OG1	2.01	0.79
2:B:176:LYS:HD2	2:B:207:GLU:HG3	1.65	0.78
1:C:339:ARG:O	14:C:601:HOH:O	2.01	0.78
2:D:1:MET:HA	2:D:1:MET:HE2	1.66	0.78
2:D:347:ILE:HG22	2:D:350:ASN:HB3	1.67	0.75
3:E:58:GLU:HG2	3:E:62:LYS:HE3	1.68	0.75
1:A:335:ILE:HG23	1:A:339:ARG:HG3	1.69	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:6:MET:HG2	3:E:24:LEU:HD23	1.70	0.74
2:B:83:PHE:O	2:B:86:ILE:HG22	1.89	0.73
3:E:113:GLU:OE1	14:E:301:HOH:O	2.07	0.73
1:A:34:GLY:HA3	1:A:60:LYS:HG3	1.72	0.72
2:D:11:GLN:HA	2:D:74:THR:HG21	1.71	0.72
2:B:2:ARG:HB3	2:B:133:GLN:CG	2.20	0.71
1:A:336:LYS:HG2	3:E:24:LEU:HD13	1.72	0.70
2:D:83:PHE:HD2	2:D:86:ILE:HD12	1.55	0.70
1:C:335:ILE:HG23	1:C:339:ARG:HG3	1.75	0.68
2:D:32:PRO:O	2:D:86:ILE:HG13	1.93	0.68
1:C:209:ILE:HD11	1:C:302:MET:HE3	1.74	0.68
1:C:93:ILE:HD11	1:C:121:ARG:HG3	1.76	0.67
2:B:424:ASN:HB3	14:B:601:HOH:O	1.94	0.67
2:D:136:GLN:HA	2:D:167:ASN:O	1.93	0.67
2:B:136:GLN:HA	2:B:167:ASN:O	1.94	0.66
4:F:200:ASP:OD1	4:F:222:ARG:HB2	1.96	0.66
2:D:345:GLU:HG2	2:D:440:ALA:HB2	1.77	0.66
2:D:147:SER:HB2	2:D:190:SER:OG	1.95	0.65
2:B:276:THR:HG21	2:B:282:GLN:HA	1.78	0.65
2:D:145:THR:N	8:D:501:GDP:O2B	2.28	0.65
2:D:402:LYS:HB3	2:D:405:LEU:HD12	1.78	0.65
4:F:237:THR:O	4:F:246:GLN:NE2	2.26	0.65
1:A:309:HIS:HB3	14:A:722:HOH:O	1.97	0.64
2:D:2:ARG:HB3	2:D:133:GLN:CG	2.28	0.64
4:F:205:VAL:HG21	4:F:291:ILE:HD13	1.80	0.64
2:D:432:TYR:OH	14:D:601:HOH:O	2.12	0.63
1:C:298:PRO:HG2	1:C:308:ARG:NH2	2.13	0.63
2:B:16:ILE:HD13	2:B:231:VAL:HG11	1.79	0.63
2:B:253[A]:ARG:NH1	9:B:504:MES:O3S	2.31	0.63
2:D:143:GLY:HA3	8:D:501:GDP:O3A	1.98	0.63
2:D:75:MET:SD	2:D:94:PHE:HB3	2.39	0.63
3:E:80:ARG:NH1	14:E:302:HOH:O	2.32	0.63
1:C:76:ASP:O	1:C:80:THR:HG22	1.99	0.62
1:C:4[A]:CYS:SG	1:C:136:LEU:HG	2.40	0.62
1:C:93:ILE:HG22	1:C:114:ILE:HD11	1.81	0.62
1:A:214:ARG:HG2	1:A:219:ILE:O	2.00	0.62
2:B:96:GLN:HB3	1:C:1:MET:HE2	1.81	0.62
1:C:162:GLY:HA2	3:E:94:ILE:HD11	1.82	0.61
1:C:320:ARG:HA	1:C:356:ASN:O	2.00	0.61
2:D:31:ASP:O	2:D:86:ILE:HD11	2.00	0.61
1:A:83:TYR:HB3	1:A:86:LEU:HD12	1.82	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:172:TYR:HB3	1:C:205:ASP:HA	1.83	0.61
1:C:209:ILE:HG22	1:C:227:LEU:HD22	1.83	0.61
2:D:431:GLU:OE1	14:D:602:HOH:O	2.17	0.60
1:A:79:ARG:HG2	1:A:92:LEU:HD12	1.82	0.60
4:F:149:ALA:HB2	4:F:182:ILE:HG12	1.83	0.60
1:C:271:THR:HG21	1:C:295:CYS:O	2.01	0.60
1:C:48:SER:OG	1:C:245:ASP:HB2	2.02	0.60
4:F:79:LYS:O	4:F:83:THR:OG1	2.15	0.59
4:F:241:THR:OG1	13:F:401:ACP:O3'	2.19	0.59
1:C:167:LEU:HD13	14:C:823:HOH:O	2.03	0.59
2:D:171:VAL:HA	2:D:204:ILE:O	2.02	0.59
1:A:209:ILE:HG23	1:A:230:LEU:HD23	1.83	0.59
2:D:332:MET:O	2:D:336:GLN:HG3	2.03	0.59
2:D:11:GLN:O	2:D:15:GLN:HG2	2.03	0.58
1:A:21:TRP:CZ3	1:A:63:PRO:HB3	2.38	0.58
2:D:2:ARG:NH2	14:D:604:HOH:O	2.36	0.58
2:D:269:MET:HG3	2:D:303:ALA:HB3	1.85	0.58
1:C:21:TRP:CZ3	1:C:63:PRO:HB3	2.39	0.58
3:E:6:MET:HG2	3:E:24:LEU:CD2	2.33	0.58
2:B:69:ASP:O	2:B:94:PHE:HA	2.03	0.58
1:A:172:TYR:HB3	1:A:205:ASP:HA	1.86	0.58
1:C:209:ILE:HD11	1:C:302:MET:CE	2.33	0.58
1:C:430:LYS:HE2	1:C:434:GLU:OE2	2.04	0.58
1:A:166:LYS:HE2	1:A:197:HIS:O	2.04	0.58
2:D:210:TYR:CD2	2:D:222:PRO:HG2	2.39	0.57
4:F:217:ARG:HG3	4:F:218:GLU:HG2	1.87	0.57
2:B:141:LEU:HD12	2:B:172:MET:SD	2.44	0.57
4:F:20:LEU:O	4:F:24:THR:HG23	2.04	0.57
4:F:37:PHE:CZ	4:F:40:MET:HE3	2.40	0.57
4:F:219:GLY:HA3	4:F:264:PHE:CZ	2.39	0.57
1:A:36:MET:HB3	1:A:61:HIS:CE1	2.40	0.57
2:B:21:TRP:CZ3	2:B:63:PRO:HB3	2.40	0.56
2:B:390:ARG:NE	14:B:603:HOH:O	2.38	0.56
1:C:270:ALA:O	1:C:302:MET:HG2	2.04	0.56
1:C:292:THR:HG22	1:C:335:ILE:HD12	1.87	0.56
4:F:223:THR:OG1	4:F:257:GLU:OE2	2.20	0.56
4:F:259:GLY:O	4:F:261:GLU:HG3	2.05	0.56
4:F:2:TYR:CE1	4:F:359:PHE:HB3	2.40	0.56
1:C:292:THR:HG22	1:C:335:ILE:CD1	2.35	0.56
1:A:75:ILE:HD12	1:A:94:THR:HG22	1.87	0.56
2:B:71:GLU:HB3	14:B:648:HOH:O	2.05	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:187:ALA:O	2:B:191:VAL:HG23	2.05	0.56
1:A:335:ILE:HG23	1:A:339:ARG:CG	2.35	0.56
2:B:199:ASP:OD1	9:B:504:MES:H62	2.05	0.56
2:B:422:GLU:HG3	14:B:604:HOH:O	2.05	0.56
2:D:295:MET:CG	2:D:377:PHE:HB2	2.35	0.56
2:B:204:ILE:HD13	2:B:231:VAL:HG13	1.87	0.56
1:A:187:SER:HB3	1:A:391:LEU:HD21	1.87	0.56
2:D:152:LEU:O	2:D:156:LYS:HG2	2.04	0.56
2:B:203:CYS:SG	2:B:267:PHE:HB3	2.45	0.56
1:C:254:GLU:HG2	1:C:352:LYS:HE2	1.87	0.56
4:F:149:ALA:O	4:F:160:ILE:HG23	2.06	0.56
1:C:335:ILE:HG23	1:C:339:ARG:CG	2.36	0.55
1:A:28:HIS:O	1:A:36:MET:HE3	2.06	0.55
2:B:28:HIS:HB3	2:B:49:ILE:HD13	1.88	0.55
2:B:124:LYS:HD3	2:B:124:LYS:C	2.32	0.55
1:A:22:GLU:HG3	1:A:83:TYR:CE2	2.41	0.55
1:C:180:ALA:O	1:C:183:GLU:HG3	2.07	0.55
2:D:286:LEU:HD12	2:D:290:GLU:OE1	2.06	0.55
3:E:72:LEU:O	3:E:76:ARG:HG2	2.06	0.55
2:B:123:ARG:O	2:B:127:GLU:HG3	2.07	0.54
2:D:21:TRP:CZ3	2:D:63:PRO:HB3	2.41	0.54
2:B:274:PRO:HB3	2:B:286:LEU:HD22	1.88	0.54
4:F:14:TYR:HB3	4:F:41:LEU:HD13	1.90	0.54
2:B:2:ARG:HB3	2:B:133:GLN:HG2	1.88	0.54
2:B:326:LYS:O	2:B:330:GLU:HG3	2.08	0.53
2:D:70:LEU:HD12	2:D:99:ALA:HB2	1.89	0.53
4:F:128:ARG:NH1	4:F:170:LEU:HD13	2.23	0.53
4:F:287:ILE:HG23	4:F:319:PHE:CE2	2.44	0.53
4:F:240:LEU:HD23	4:F:245:ILE:CD1	2.39	0.53
1:A:401:LYS:HG3	2:B:346:TRP:CE3	2.43	0.53
2:D:385:GLN:HB2	2:D:429:VAL:HG13	1.91	0.52
2:B:234:THR:O	2:B:238:VAL:HG13	2.09	0.52
1:A:69:ASP:O	1:A:94:THR:HA	2.09	0.52
1:A:333:ALA:N	3:E:6:MET:HE1	2.24	0.52
2:B:172:MET:HG3	2:B:387:LEU:HD11	1.91	0.52
4:F:2:TYR:CZ	4:F:359:PHE:HB3	2.45	0.52
2:B:292:THR:HG22	2:B:335:VAL:HG21	1.90	0.52
4:F:198:LYS:HG2	4:F:199:PHE:H	1.74	0.52
4:F:265:GLU:O	14:F:501:HOH:O	2.19	0.52
2:D:22:GLU:HG2	2:D:83:PHE:CD1	2.45	0.52
1:C:151:SER:HB2	1:C:193:THR:CG2	2.40	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:19:LYS:O	2:D:23:VAL:HG23	2.10	0.52
3:E:101:LEU:O	3:E:105:MET:HG2	2.09	0.52
2:D:141:LEU:HA	2:D:147:SER:HB3	1.91	0.51
2:B:165:ILE:HG21	2:B:252:LEU:HB3	1.92	0.51
2:B:323:MET:HB3	2:B:373:MET:CE	2.40	0.51
2:D:210:TYR:CE2	2:D:222:PRO:HG2	2.45	0.51
1:A:98:ASP:HB2	5:A:501:GTP:O2G	2.09	0.51
1:C:36:MET:HB3	1:C:61:HIS:CE1	2.46	0.51
4:F:191:LEU:HD12	4:F:196:HIS:CE1	2.46	0.51
1:C:419:SER:O	1:C:423:GLU:HG3	2.11	0.51
2:B:286:LEU:HD12	2:B:290:GLU:OE1	2.11	0.50
2:D:6:HIS:CD2	2:D:21:TRP:HE1	2.29	0.50
14:B:721:HOH:O	1:C:2:ARG:HD2	2.11	0.50
4:F:197:ARG:HB2	4:F:224:SER:O	2.11	0.50
3:E:60:ARG:O	3:E:64:GLN:HG3	2.11	0.50
2:D:26:ASP:OD2	2:D:369:ARG:HD2	2.11	0.50
1:C:88[A]:HIS:CE1	1:C:90:GLU:HG3	2.47	0.50
2:D:1:MET:O	2:D:131:CYS:HB3	2.11	0.50
2:D:36:TYR:CD1	2:D:46:LEU:HD21	2.46	0.50
2:B:159:GLU:HB2	3:E:72:LEU:HD13	1.92	0.50
2:D:412:GLY:C	3:E:133:VAL:HG13	2.37	0.50
1:A:211:ASP:OD2	1:A:304:LYS:NZ	2.28	0.50
2:B:96:GLN:CB	1:C:1:MET:HE2	2.42	0.50
3:E:129:HIS:O	3:E:133:VAL:HG23	2.11	0.50
2:B:147:SER:HG	2:B:190:SER:HG	1.58	0.50
1:A:217:LEU:HD21	1:A:368:LEU:HD23	1.93	0.49
2:B:2:ARG:NE	2:B:133:GLN:HG2	2.26	0.49
4:F:148:ILE:HD11	4:F:160:ILE:HG21	1.94	0.49
1:A:187:SER:CB	1:A:391:LEU:HD21	2.42	0.49
2:D:274:PRO:HB3	2:D:286:LEU:CD2	2.42	0.49
1:A:264:ARG:NH1	14:A:601:HOH:O	2.29	0.49
1:A:227:LEU:O	1:A:231:ILE:HG13	2.12	0.49
2:B:295:MET:CG	2:B:377:PHE:HB2	2.42	0.49
4:F:268:ASN:HB3	14:F:501:HOH:O	2.12	0.49
1:A:234:ILE:HD12	1:A:272:TYR:HB2	1.95	0.49
2:D:318:ILE:N	2:D:318:ILE:HD12	2.28	0.49
4:F:100:ILE:HG23	4:F:128:ARG:HG3	1.94	0.49
4:F:100:ILE:HD12	4:F:128:ARG:HA	1.94	0.49
2:B:347:ILE:HG22	2:B:350:ASN:HB3	1.94	0.49
2:D:63:PRO:CD	2:D:86:ILE:HG23	2.42	0.49
4:F:216:TYR:CE2	4:F:218:GLU:HB2	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:323:MET:HE2	2:B:373:MET:HE2	1.95	0.49
4:F:263:PHE:CZ	4:F:341:LYS:HE2	2.47	0.49
2:B:6:HIS:CD2	2:B:21:TRP:HE1	2.29	0.49
2:B:19:LYS:HE3	14:B:725:HOH:O	2.12	0.49
2:B:323:MET:HB3	2:B:373:MET:HE1	1.95	0.49
2:B:286:LEU:HD23	2:B:291:LEU:HD23	1.95	0.48
2:D:165:ILE:HG21	2:D:252:LEU:HB3	1.94	0.48
2:D:345:GLU:CG	2:D:440:ALA:HB2	2.43	0.48
4:F:205:VAL:CG2	4:F:291:ILE:HD13	2.43	0.48
2:B:231:VAL:O	2:B:235:MET:HG3	2.12	0.48
4:F:43:GLU:OE1	4:F:43:GLU:N	2.33	0.48
4:F:287:ILE:HG23	4:F:319:PHE:CZ	2.49	0.48
1:C:344:VAL:HG21	1:C:346:TRP:CE2	2.48	0.48
2:B:205:ASP:OD2	2:B:390:ARG:NH1	2.45	0.48
2:B:244:PHE:CE1	2:B:358:ILE:HD12	2.49	0.48
2:B:308:ARG:HA	2:B:342:TYR:CE1	2.49	0.48
4:F:269:GLN:HA	4:F:272:MET:HE2	1.96	0.48
1:A:180:ALA:O	1:A:183:GLU:HG3	2.14	0.48
2:B:317:ALA:C	2:B:318:ILE:HD12	2.39	0.48
2:D:387:LEU:HD23	2:D:387:LEU:C	2.38	0.48
4:F:286:GLN:O	4:F:290:ILE:HG13	2.14	0.48
1:A:93:ILE:HD11	1:A:121:ARG:HG3	1.95	0.47
1:C:196:GLU:HG2	14:C:684:HOH:O	2.13	0.47
4:F:101:TYR:N	4:F:126:ASP:OD1	2.42	0.47
2:B:286:LEU:HD23	2:B:291:LEU:CD2	2.44	0.47
2:D:67:LEU:N	2:D:67:LEU:HD12	2.29	0.47
1:A:274:PRO:HB3	1:A:286:LEU:HD12	1.95	0.47
1:A:409:VAL:HA	1:A:413:MET:O	2.14	0.47
2:B:248:LEU:CD2	2:B:352:LYS:HB3	2.44	0.47
1:C:141:PHE:CE1	1:C:170:SER:HB3	2.49	0.47
2:D:23:VAL:HG21	2:D:232:SER:HB2	1.95	0.47
4:F:10:ASN:HB2	4:F:44:ARG:NH2	2.21	0.47
4:F:246:GLN:O	4:F:250:SER:HB3	2.14	0.47
2:B:15:GLN:O	2:B:19:LYS:HG2	2.14	0.47
1:C:21:TRP:CE3	1:C:63:PRO:HB3	2.50	0.47
1:A:21:TRP:CE3	1:A:63:PRO:HB3	2.50	0.47
2:B:304:ALA:N	14:B:612:HOH:O	2.48	0.47
1:C:88[A]:HIS:HE1	1:C:90:GLU:HG3	1.80	0.47
1:C:187:SER:HB3	1:C:391:LEU:HD21	1.97	0.47
4:F:2:TYR:HB2	4:F:27:TRP:CD2	2.50	0.47
4:F:191:LEU:HA	4:F:197:ARG:O	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:23:VAL:O	2:D:27:GLU:HG3	2.15	0.47
2:D:311:ARG:NH1	2:D:436:GLN:O	2.48	0.47
1:A:71:GLU:HG2	1:A:72:PRO:N	2.30	0.46
2:D:103:TRP:CE3	2:D:189:LEU:HD13	2.50	0.46
4:F:282:SER:HB2	4:F:325:LEU:HD13	1.96	0.46
2:B:26:ASP:OD2	2:B:369:ARG:HD2	2.15	0.46
1:A:75:ILE:HB	1:A:94:THR:CG2	2.46	0.46
2:B:237:GLY:HA3	2:B:376:THR:OG1	2.15	0.46
2:D:124:LYS:C	2:D:124:LYS:HD3	2.40	0.46
1:A:251:ASP:OD1	1:A:253:THR:HB	2.15	0.46
4:F:34:ASN:OD1	4:F:35:PRO:HD2	2.16	0.46
4:F:149:ALA:CB	4:F:182:ILE:HG12	2.44	0.46
2:B:71:GLU:HG3	2:B:98:GLY:HA2	1.97	0.46
2:B:248:LEU:HD21	2:B:352:LYS:HB3	1.97	0.46
1:C:210:TYR:CZ	1:C:222:PRO:HD2	2.50	0.46
4:F:101:TYR:CD2	4:F:179:VAL:HG22	2.51	0.46
1:A:134:GLY:HA3	1:A:165:SER:O	2.16	0.46
1:A:265:ILE:HG23	1:A:432:TYR:CE1	2.51	0.46
2:B:66:ILE:HD12	2:B:122:VAL:HG22	1.98	0.46
1:C:9:VAL:HG22	1:C:68[B]:VAL:CG2	2.46	0.46
2:D:2:ARG:HB3	2:D:133:GLN:HG2	1.98	0.46
3:E:6:MET:HE2	3:E:24:LEU:CD2	2.31	0.46
2:D:2:ARG:HB3	2:D:133:GLN:HG3	1.97	0.46
2:D:213:CYS:HA	2:D:217:LEU:HB2	1.97	0.46
1:A:71:GLU:HG2	1:A:72:PRO:HD2	1.97	0.46
1:A:278:ALA:HA	1:A:369:ALA:HB2	1.97	0.46
2:D:7:ILE:O	2:D:137:LEU:HA	2.15	0.46
2:D:295:MET:SD	2:D:375:ALA:HB1	2.56	0.46
1:C:244:PHE:CD1	1:C:358:GLN:HG2	2.51	0.45
1:A:79:ARG:HG2	1:A:92:LEU:CD1	2.46	0.45
2:D:18:ALA:O	2:D:22:GLU:HG3	2.15	0.45
1:A:54:SER:O	1:A:61:HIS:HA	2.16	0.45
1:A:209:ILE:HD11	1:A:302:MET:SD	2.56	0.45
2:D:7:ILE:O	2:D:137:LEU:HD12	2.17	0.45
4:F:173:ILE:HD13	4:F:180:HIS:HB2	1.98	0.45
1:A:189:LEU:CD2	1:A:413:MET:HE1	2.47	0.45
2:D:143:GLY:O	2:D:147:SER:OG	2.25	0.45
2:B:46:LEU:HA	2:B:49:ILE:HB	1.99	0.45
1:A:254:GLU:HG2	1:A:258:ASN:ND2	2.32	0.45
2:B:137:LEU:HD23	2:B:154:ILE:HD11	1.97	0.45
2:B:199:ASP:C	2:B:200:GLU:HG3	2.41	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:213:CYS:HB3	2:D:219:LEU:HD12	1.98	0.45
2:D:316:ALA:HB3	2:D:378:ILE:HB	1.99	0.45
2:D:346:TRP:CE3	2:D:347:ILE:HG13	2.52	0.45
4:F:236:LYS:HB3	4:F:240:LEU:HD13	1.99	0.45
2:D:46:LEU:HA	2:D:49:ILE:HB	1.99	0.45
4:F:146:VAL:HG22	4:F:164:SER:HB3	1.99	0.45
1:A:3:GLU:HG2	1:A:64:ARG:CZ	2.47	0.45
2:B:21:TRP:CE3	2:B:63:PRO:HB3	2.52	0.45
2:B:387:LEU:C	2:B:387:LEU:HD23	2.42	0.44
4:F:216:TYR:CZ	4:F:218:GLU:HB2	2.52	0.44
1:A:166:LYS:C	1:A:167:LEU:HD12	2.41	0.44
2:D:118:VAL:O	2:D:122:VAL:HG23	2.17	0.44
4:F:72:CYS:O	4:F:73:ARG:HD2	2.17	0.44
4:F:19:ARG:HD2	4:F:19:ARG:C	2.43	0.44
2:D:104:ALA:HB2	2:D:413:MET:SD	2.58	0.44
4:F:217:ARG:HG3	4:F:218:GLU:N	2.33	0.44
2:D:72:PRO:HD3	2:D:95:GLY:O	2.17	0.44
1:A:15:GLN:NE2	5:A:501:GTP:O6	2.50	0.44
1:A:88:HIS:CE1	1:A:91:GLN:HG3	2.53	0.44
2:B:31:ASP:HB2	2:B:32:PRO:HD2	2.00	0.44
1:A:136:LEU:HD21	1:A:252:LEU:HD21	1.99	0.43
1:C:43:GLY:HA2	1:C:56:THR:O	2.18	0.43
2:D:69:ASP:O	2:D:94:PHE:HA	2.19	0.43
2:D:142:GLY:O	2:D:186:ASN:ND2	2.49	0.43
2:B:171:VAL:HA	2:B:204:ILE:O	2.19	0.43
1:A:233:GLN:HG3	1:A:368:LEU:CD1	2.48	0.43
2:D:153:LEU:O	2:D:157:ILE:HG13	2.19	0.43
4:F:299:GLU:HB3	4:F:300:PRO:HD3	2.00	0.43
1:A:188:ILE:HD12	1:A:395:PHE:HB2	2.01	0.43
1:A:346:TRP:CD1	1:A:346:TRP:H	2.36	0.43
1:A:75:ILE:HB	1:A:94:THR:HG21	2.00	0.43
1:C:66:VAL:HG12	1:C:68[B]:VAL:HG13	2.01	0.43
2:B:67:LEU:N	2:B:67:LEU:HD12	2.34	0.43
3:E:47:LEU:HD11	3:E:51:GLN:HE21	1.83	0.43
4:F:199:PHE:HB3	4:F:223:THR:HG22	2.01	0.43
2:B:31:ASP:HB2	2:B:32:PRO:CD	2.49	0.43
2:B:169:PHE:HE2	2:B:238:VAL:HG21	1.84	0.43
1:C:98:ASP:HB2	5:C:501:GTP:O2G	2.18	0.43
4:F:247:LYS:HE3	4:F:253:TYR:CE2	2.53	0.43
1:A:320:ARG:HD2	14:A:671:HOH:O	2.19	0.42
2:D:132:LEU:O	2:D:164:ARG:NH1	2.51	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:274:PRO:HB3	2:D:286:LEU:HD22	2.00	0.42
2:D:303:ALA:O	2:D:305:CYS:N	2.52	0.42
1:A:88:HIS:HB2	1:A:89:PRO:HD2	2.01	0.42
2:B:2:ARG:HD2	2:B:131:CYS:SG	2.59	0.42
2:D:398:MET:HE2	2:D:398:MET:HB3	1.92	0.42
1:C:48:SER:HB2	14:C:712:HOH:O	2.18	0.42
1:C:75:ILE:HD12	1:C:94:THR:HG22	2.02	0.42
2:D:32:PRO:C	2:D:86:ILE:HG13	2.44	0.42
4:F:338:CYS:SG	4:F:339:ALA:N	2.92	0.42
1:A:71:GLU:HG2	1:A:72:PRO:CD	2.49	0.42
2:B:345:GLU:H	2:B:345:GLU:CD	2.26	0.42
1:A:132:LEU:O	1:A:164:LYS:NZ	2.52	0.42
1:A:151:SER:HB2	1:A:193:THR:OG1	2.20	0.42
2:D:187:ALA:O	2:D:191:VAL:HG23	2.20	0.42
4:F:144:GLY:O	4:F:184:LYS:HE2	2.20	0.42
4:F:350:ILE:O	4:F:354:ALA:HB3	2.19	0.42
4:F:99:VAL:HG22	4:F:181:VAL:HG12	2.00	0.42
2:B:2:ARG:HA	2:B:131:CYS:O	2.20	0.42
1:A:437:VAL:HG12	1:A:438:ASP:N	2.34	0.42
1:C:194:THR:O	1:C:194:THR:HG22	2.19	0.42
4:F:242:ASN:ND2	13:F:401:ACP:H3B1	2.35	0.42
1:C:167:LEU:HG	1:C:200:CYS:HB3	2.01	0.42
1:A:280:LYS:HE2	1:A:280:LYS:HB3	1.88	0.41
2:B:295:MET:HG3	2:B:377:PHE:HB2	2.02	0.41
2:D:1:MET:HG3	2:D:50:ASN:HD22	1.84	0.41
1:C:166:LYS:HE2	1:C:197:HIS:O	2.20	0.41
2:D:298:SER:HB3	2:D:307:PRO:HD2	2.02	0.41
1:A:391:LEU:HD12	1:A:391:LEU:HA	1.94	0.41
1:C:305:CYS:O	1:C:307:PRO:HD3	2.20	0.41
2:D:295:MET:HG2	2:D:377:PHE:HB2	2.00	0.41
4:F:97:SER:HA	4:F:183:GLN:HA	2.02	0.41
2:B:67:LEU:HD22	2:B:92:PHE:CE2	2.55	0.41
1:C:234:ILE:HD12	1:C:234:ILE:N	2.35	0.41
2:D:2:ARG:HB2	2:D:133:GLN:HE21	1.84	0.41
4:F:4:PHE:HA	4:F:39:LEU:O	2.20	0.41
2:B:106:GLY:O	2:B:111:GLY:HA3	2.20	0.41
9:B:504:MES:H82	9:B:504:MES:H51	1.85	0.41
1:C:234:ILE:HG12	1:C:302:MET:SD	2.61	0.41
1:C:391:LEU:HD12	1:C:391:LEU:HA	1.90	0.41
2:D:291:LEU:HG	2:D:375:ALA:HB2	2.03	0.41
2:D:413:MET:HE3	2:D:417:GLU:CD	2.45	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:14:TYR:HA	4:F:17:VAL:HB	2.03	0.41
2:D:347:ILE:CG2	2:D:350:ASN:HB3	2.45	0.41
1:A:87:PHE:HA	1:A:91:GLN:OE1	2.21	0.41
1:A:213:CYS:O	1:A:217:LEU:HB2	2.21	0.41
1:A:141:PHE:O	1:A:147:SER:HB3	2.20	0.41
1:A:180:ALA:HA	2:B:258:ASN:OD1	2.21	0.41
2:B:114:LEU:O	2:B:114:LEU:HG	2.20	0.41
1:C:7:ILE:HG21	1:C:153:LEU:HD21	2.03	0.41
1:C:174:ALA:O	1:C:178:SER:HB3	2.20	0.41
2:D:326:LYS:O	2:D:330:GLU:HG3	2.21	0.41
2:B:287:THR:OG1	2:B:290:GLU:HG3	2.21	0.41
1:C:69:ASP:O	1:C:94:THR:HA	2.21	0.41
2:D:142:GLY:N	14:D:605:HOH:O	2.44	0.41
2:B:175:PRO:HA	2:B:178:SER:HB2	2.03	0.40
2:B:318:ILE:HD12	2:B:318:ILE:N	2.36	0.40
1:C:151:SER:HB2	1:C:193:THR:HG21	2.03	0.40
2:D:63:PRO:HD3	2:D:86:ILE:HG23	2.02	0.40
1:A:265:ILE:HG21	1:A:313:MET:HE1	2.03	0.40
2:B:309:HIS:ND1	2:B:386:GLU:OE2	2.49	0.40
1:C:66:VAL:HG23	1:C:125:LEU:CD1	2.51	0.40
4:F:47:LEU:C	4:F:47:LEU:HD23	2.45	0.40
4:F:184:LYS:NZ	4:F:187:GLU:HG3	2.36	0.40
1:A:265:ILE:HG23	1:A:432:TYR:CZ	2.56	0.40
1:A:335:ILE:CG2	1:A:339:ARG:HG3	2.45	0.40
2:B:360:PRO:HG3	14:B:707:HOH:O	2.21	0.40
1:A:75:ILE:CG2	1:A:92:LEU:HB3	2.51	0.40
1:A:194:THR:O	1:A:194:THR:HG22	2.21	0.40
1:A:261:PRO:HD2	14:A:650:HOH:O	2.21	0.40
2:B:325:MET:HE3	2:B:325:MET:HB2	1.98	0.40
1:C:79:ARG:HG2	1:C:92:LEU:HD12	2.04	0.40
1:C:214:ARG:HG2	1:C:219:ILE:O	2.22	0.40
1:C:248:LEU:HD12	1:C:357:TYR:OH	2.21	0.40
2:D:1:MET:HE2	2:D:1:MET:CA	2.42	0.40
2:D:5:VAL:HB	2:D:135:PHE:CD2	2.57	0.40
2:D:66:ILE:CD1	2:D:122:VAL:HG22	2.51	0.40
2:B:9:ALA:HA	2:B:68:VAL:O	2.21	0.40
2:B:146:GLY:O	2:B:150:GLY:HA3	2.22	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	438/451 (97%)	424 (97%)	14 (3%)	0	100	100
1	C	444/451 (98%)	434 (98%)	10 (2%)	0	100	100
2	B	420/445 (94%)	411 (98%)	9 (2%)	0	100	100
2	D	422/445 (95%)	416 (99%)	6 (1%)	0	100	100
3	E	117/143 (82%)	117 (100%)	0	0	100	100
4	F	333/384 (87%)	326 (98%)	6 (2%)	1 (0%)	36	45
All	All	2174/2319 (94%)	2128 (98%)	45 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	F	186	LEU

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	371/379 (98%)	369 (100%)	2 (0%)	81	89
1	C	377/379 (100%)	376 (100%)	1 (0%)	86	92
2	B	368/383 (96%)	368 (100%)	0	100	100
2	D	368/383 (96%)	367 (100%)	1 (0%)	86	92
3	E	109/127 (86%)	109 (100%)	0	100	100
4	F	307/342 (90%)	306 (100%)	1 (0%)	86	92

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1900/1993 (95%)	1895 (100%)	5 (0%)	86 92

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	71	GLU
1	A	381	THR
1	C	381	THR
2	D	86	ILE
4	F	234	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	GLN
1	A	88	HIS
1	A	301	GLN
1	A	393	HIS
2	B	96	GLN
2	B	331	GLN
2	B	349	ASN
1	C	101	ASN
1	C	133	GLN
1	C	309	HIS
2	D	8	GLN
2	D	11	GLN
2	D	37	HIS
2	D	50	ASN
2	D	136	GLN
3	E	51	GLN
3	E	90	ASN
4	F	183	GLN
4	F	196	HIS
4	F	252	ASN
4	F	333	ASN
4	F	348	GLN

5.3.3 RNA ⓘ

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 18 ligands modelled in this entry, 9 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	D	501	6	29,30,30	1.17	3 (10%)	45,47,47	1.74	6 (13%)
9	MES	B	504	-	12,12,12	2.28	1 (8%)	15,16,16	1.85	4 (26%)
13	ACP	F	401	6	31,33,33	2.16	11 (35%)	47,52,52	1.82	10 (21%)
10	GOL	B	505	-	5,5,5	0.86	0	5,5,5	0.95	0
5	GTP	A	501	6	33,34,34	1.00	3 (9%)	50,54,54	1.53	8 (16%)
5	GTP	C	501	6	33,34,34	0.97	3 (9%)	50,54,54	1.51	8 (16%)
8	GDP	B	501	6	29,30,30	1.19	3 (10%)	45,47,47	1.70	6 (13%)
12	5JS	D	503	-	50,51,51	2.67	7 (14%)	54,74,74	2.14	15 (27%)
11	IMD	C	504	-	5,5,5	0.64	0	5,5,5	0.44	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
8	GDP	D	501	6	-	3/16/32/32	0/3/3/3
9	MES	B	504	-	-	4/6/14/14	0/1/1/1
13	ACP	F	401	6	-	7/19/38/38	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
10	GOL	B	505	-	-	4/4/4/4	-
5	GTP	A	501	6	-	6/22/38/38	0/3/3/3
5	GTP	C	501	6	-	8/22/38/38	0/3/3/3
8	GDP	B	501	6	-	3/16/32/32	0/3/3/3
12	5JS	D	503	-	-	14/48/72/72	0/3/5/5
11	IMD	C	504	-	-	-	0/1/1/1

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
12	D	503	5JS	C20-C14	-13.38	1.34	1.50
12	D	503	5JS	C14-N16	9.68	1.44	1.28
9	B	504	MES	C8-S	-7.62	1.66	1.77
13	F	401	ACP	PG-O1G	5.62	1.61	1.50
13	F	401	ACP	C5-C4	4.65	1.47	1.39
13	F	401	ACP	PB-O1B	4.16	1.61	1.51
12	D	503	5JS	O29-C23	-3.91	1.40	1.45
12	D	503	5JS	C17-N16	3.85	1.41	1.33
12	D	503	5JS	C25-C23	3.71	1.52	1.47
13	F	401	ACP	PB-O3A	3.44	1.62	1.58
13	F	401	ACP	PB-O2B	-3.32	1.48	1.56
8	D	501	GDP	C5-C4	3.11	1.47	1.38
8	B	501	GDP	C5-C4	3.05	1.47	1.38
13	F	401	ACP	PG-O2G	-2.96	1.48	1.55
13	F	401	ACP	PG-O3G	2.81	1.61	1.55
12	D	503	5JS	C5-N31	-2.74	1.40	1.44
13	F	401	ACP	C5-C6	2.69	1.48	1.41
13	F	401	ACP	PA-O3A	2.61	1.62	1.59
8	B	501	GDP	C6-N1	-2.51	1.34	1.38
8	D	501	GDP	C6-N1	-2.38	1.34	1.38
13	F	401	ACP	C5-N7	-2.33	1.34	1.39
5	A	501	GTP	PB-O3B	2.31	1.62	1.59
8	B	501	GDP	PA-O3A	2.22	1.61	1.59
5	A	501	GTP	PA-O3A	2.16	1.61	1.59
5	C	501	GTP	C2-N3	2.14	1.38	1.33
13	F	401	ACP	C8-N7	2.14	1.35	1.31
5	A	501	GTP	C2-N3	2.11	1.38	1.33
12	D	503	5JS	C27-C26	2.05	1.55	1.52
8	D	501	GDP	C5-N7	-2.05	1.35	1.39
5	C	501	GTP	PA-O3A	2.05	1.61	1.59
5	C	501	GTP	PB-O3B	2.04	1.61	1.59

All (57) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	D	503	5JS	C25-O29-C23	6.71	64.62	60.81
12	D	503	5JS	O30-C26-C27	6.12	116.92	105.09
13	F	401	ACP	C5-C4-N3	-6.05	118.39	126.72
8	D	501	GDP	C5-C4-N3	-5.96	118.91	128.39
8	B	501	GDP	C5-C4-N3	-5.90	119.00	128.39
12	D	503	5JS	O29-C25-C23	-4.98	56.23	59.38
8	D	501	GDP	C2-N3-C4	4.98	120.87	112.30
8	B	501	GDP	C2-N3-C4	4.97	120.86	112.30
13	F	401	ACP	N3-C4-N9	4.90	135.50	127.17
5	A	501	GTP	C5-C4-N3	-4.82	120.72	128.39
12	D	503	5JS	O30-C26-C25	4.80	116.32	105.48
5	C	501	GTP	C5-C4-N3	-4.73	120.86	128.39
5	A	501	GTP	C2-N3-C4	4.55	120.14	112.30
5	C	501	GTP	C2-N3-C4	4.45	119.96	112.30
8	B	501	GDP	N9-C4-N3	4.38	134.71	125.95
8	D	501	GDP	N9-C4-N3	4.38	134.71	125.95
9	B	504	MES	C5-N4-C3	3.95	117.35	108.84
12	D	503	5JS	C19-C20-C14	3.85	122.68	111.97
12	D	503	5JS	C26-O30-C39	3.74	124.86	118.03
13	F	401	ACP	C2-N3-C4	3.71	120.89	111.83
12	D	503	5JS	C20-C14-C13	3.69	126.38	116.56
8	B	501	GDP	C6-C5-N7	3.34	136.36	130.29
8	D	501	GDP	C6-C5-N7	3.33	136.34	130.29
13	F	401	ACP	C4-C5-N7	-3.30	106.81	110.58
12	D	503	5JS	O18-C19-C22	3.15	111.73	105.68
13	F	401	ACP	N3-C2-N1	-3.07	123.94	128.58
5	C	501	GTP	N9-C4-N3	3.04	132.03	125.95
5	A	501	GTP	N9-C4-N3	3.01	131.97	125.95
9	B	504	MES	C6-C5-N4	-2.88	105.75	110.12
5	A	501	GTP	C2-N1-C6	-2.82	120.00	125.11
12	D	503	5JS	C11-C10-C8	-2.79	123.76	127.69
9	B	504	MES	O1S-S-C8	2.75	110.88	106.73
5	C	501	GTP	N9-C8-N7	-2.73	108.33	113.40
5	A	501	GTP	N9-C8-N7	-2.71	108.38	113.40
5	C	501	GTP	C2-N1-C6	-2.71	120.20	125.11
13	F	401	ACP	C3'-C2'-C1'	2.60	106.38	101.46
8	D	501	GDP	C4-C5-N7	-2.59	106.57	110.67
13	F	401	ACP	C4-N9-C8	2.55	108.41	105.74
8	B	501	GDP	C4-C5-N7	-2.53	106.66	110.67
5	C	501	GTP	C8-N7-C5	2.53	108.76	104.26
5	A	501	GTP	C8-N7-C5	2.49	108.70	104.26
12	D	503	5JS	O30-C39-C40	2.49	115.76	110.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	D	503	5JS	C5-C6-CL33	2.48	122.40	120.07
13	F	401	ACP	C5-N7-C8	2.45	107.30	103.45
5	A	501	GTP	C5-C6-N1	2.43	119.43	113.25
12	D	503	5JS	O34-C1-C6	2.43	118.10	115.44
5	C	501	GTP	C5-C6-N1	2.42	119.41	113.25
13	F	401	ACP	PB-O3A-PA	-2.40	124.54	132.37
5	A	501	GTP	O6-C6-C5	-2.33	120.38	126.53
5	C	501	GTP	O6-C6-C5	-2.29	120.49	126.53
13	F	401	ACP	C2'-C1'-N9	-2.14	107.97	113.30
12	D	503	5JS	C4-C5-C6	-2.14	119.94	122.54
12	D	503	5JS	O34-C1-C2	-2.11	120.44	124.08
8	D	501	GDP	O6-C6-C5	-2.10	121.00	126.53
8	B	501	GDP	O6-C6-C5	-2.08	121.04	126.53
9	B	504	MES	C7-N4-C5	2.05	116.70	111.24
12	D	503	5JS	O18-C19-C20	2.00	113.23	109.63

There are no chirality outliers.

All (49) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	501	GTP	PB-O3B-PG-O2G
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	C5'-O5'-PA-O3A
5	C	501	GTP	C5'-O5'-PA-O1A
5	C	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
8	D	501	GDP	C5'-O5'-PA-O3A
8	D	501	GDP	C5'-O5'-PA-O1A
8	D	501	GDP	C5'-O5'-PA-O2A
9	B	504	MES	C8-C7-N4-C5
9	B	504	MES	C7-C8-S-O1S
9	B	504	MES	C7-C8-S-O2S
9	B	504	MES	C7-C8-S-O3S
10	B	505	GOL	O1-C1-C2-C3
12	D	503	5JS	C11-C12-C13-C14
12	D	503	5JS	C14-C13-O15-C37
12	D	503	5JS	C6-C1-O34-C36
12	D	503	5JS	C20-C19-C22-C24

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Mol	Chain	Res	Type	Atoms
12	D	503	5JS	O18-C19-C22-C24
12	D	503	5JS	C38-C25-C26-O30
12	D	503	5JS	C25-C26-O30-C39
12	D	503	5JS	C40-C39-O30-C26
13	F	401	ACP	PG-C3B-PB-O1B
13	F	401	ACP	PG-C3B-PB-O2B
13	F	401	ACP	PG-C3B-PB-O3A
12	D	503	5JS	O41-C39-O30-C26
13	F	401	ACP	O4'-C4'-C5'-O5'
12	D	503	5JS	C2-C1-O34-C36
12	D	503	5JS	C27-C26-O30-C39
10	B	505	GOL	C1-C2-C3-O3
10	B	505	GOL	O2-C2-C3-O3
13	F	401	ACP	C3'-C4'-C5'-O5'
12	D	503	5JS	O18-C19-C22-C23
5	C	501	GTP	PB-O3B-PG-O1G
5	C	501	GTP	PB-O3A-PA-O2A
10	B	505	GOL	O1-C1-C2-O2
12	D	503	5JS	O30-C26-C27-C28
12	D	503	5JS	C20-C19-C22-C23
5	C	501	GTP	C4'-C5'-O5'-PA
5	C	501	GTP	PB-O3B-PG-O2G
5	C	501	GTP	PB-O3B-PG-O3G
13	F	401	ACP	PB-C3B-PG-O1G
13	F	401	ACP	PB-O3A-PA-O2A
5	A	501	GTP	PB-O3A-PA-O1A
5	A	501	GTP	PB-O3A-PA-O2A

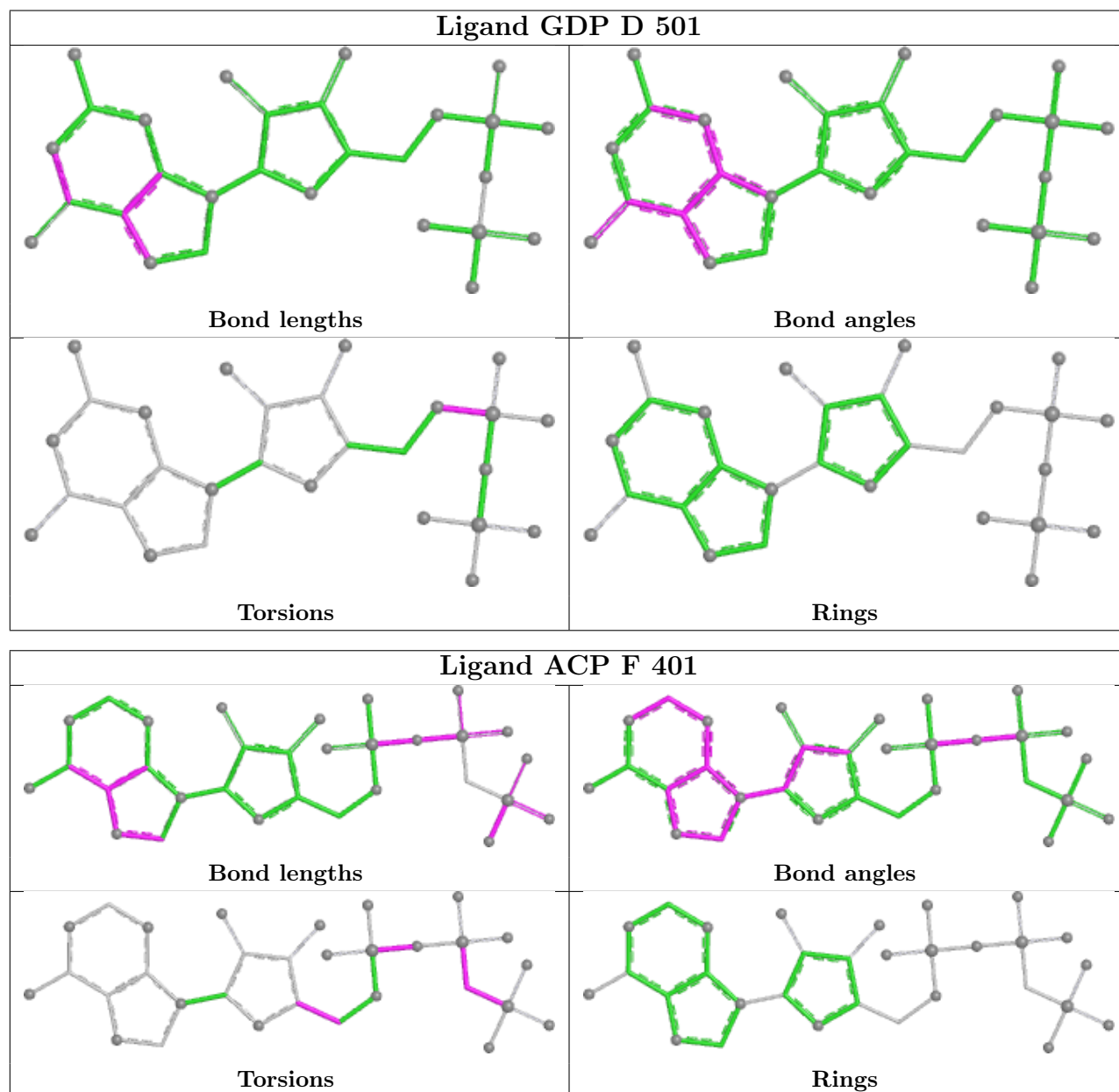
There are no ring outliers.

5 monomers are involved in 10 short contacts:

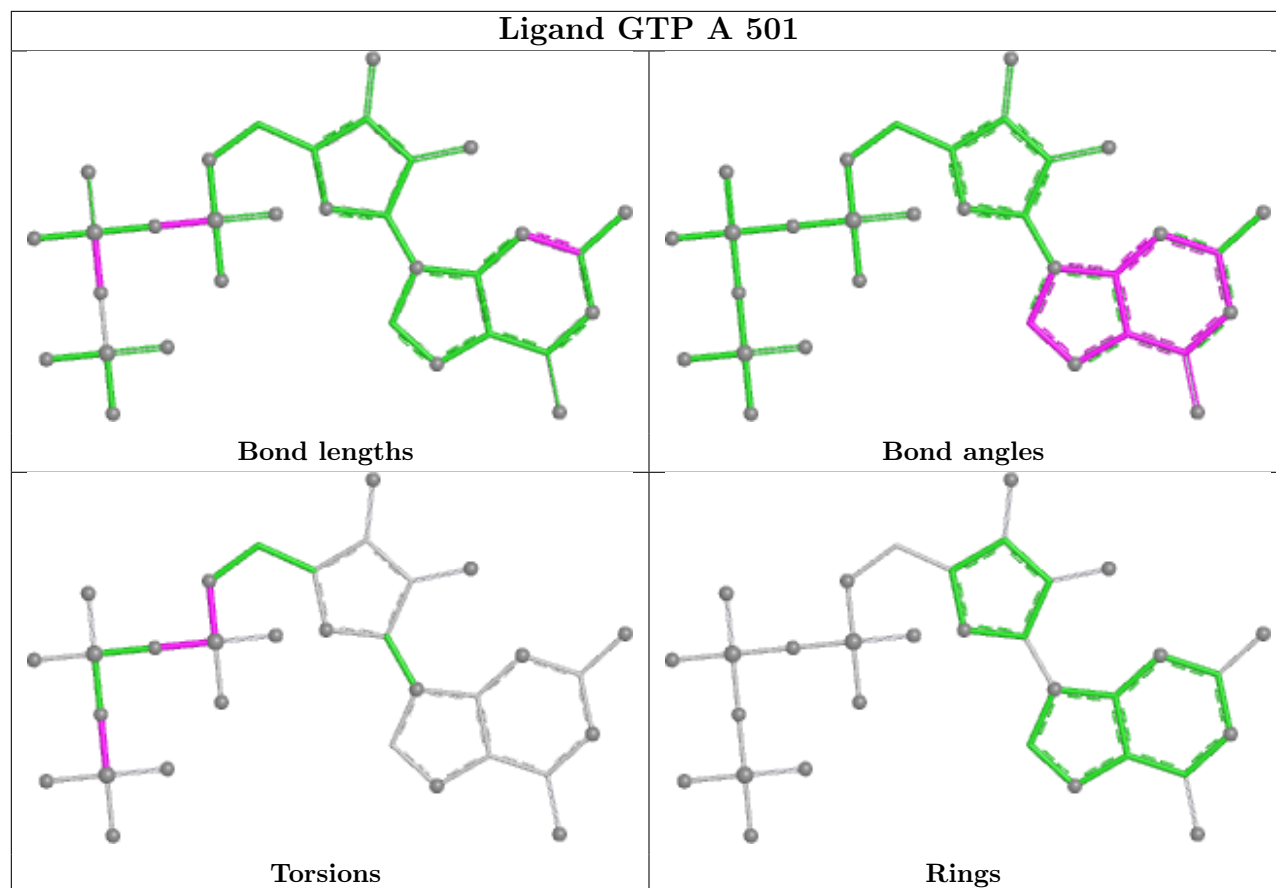
Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	D	501	GDP	2	0
9	B	504	MES	3	0
13	F	401	ACP	2	0
5	A	501	GTP	2	0
5	C	501	GTP	1	0

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

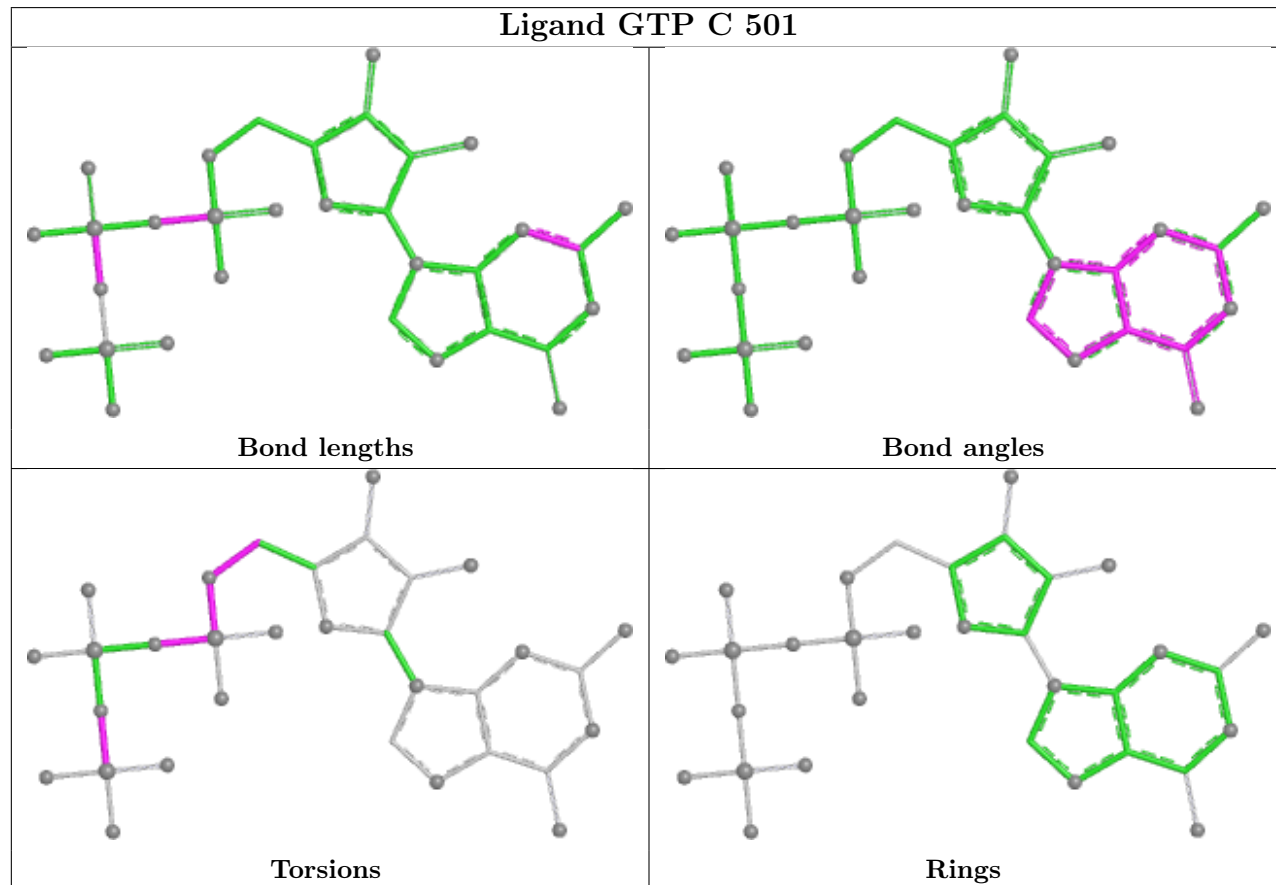
within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question 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.

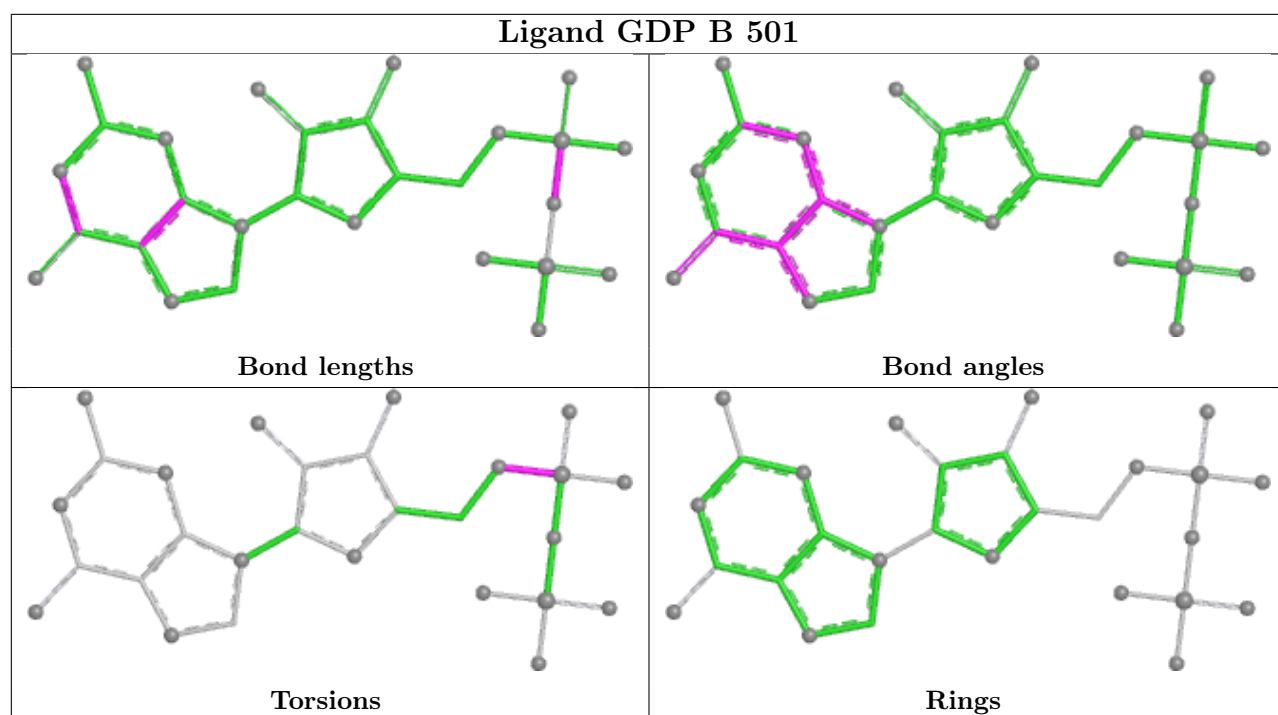


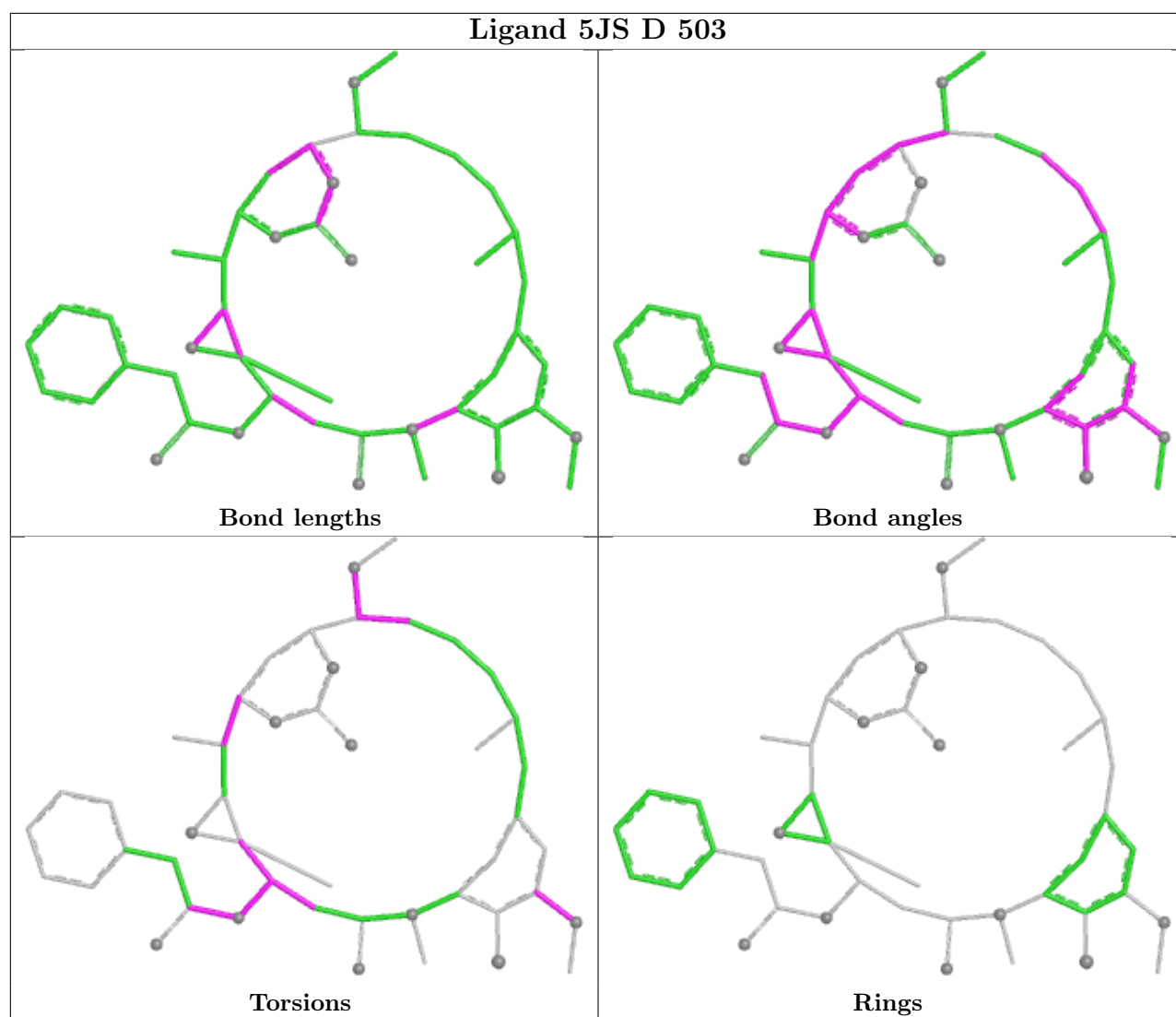
Ligand GTP A 501



Ligand GTP C 501







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	438/451 (97%)	-0.06	5 (1%) 78 79	24, 59, 93, 155	2 (0%)
1	C	440/451 (97%)	-0.29	6 (1%) 73 75	21, 46, 72, 118	6 (1%)
2	B	423/445 (95%)	-0.12	5 (1%) 76 78	24, 54, 90, 141	1 (0%)
2	D	426/445 (95%)	0.20	7 (1%) 70 72	45, 71, 109, 139	0
3	E	121/143 (84%)	0.26	3 (2%) 58 61	51, 73, 112, 131	0
4	F	341/384 (88%)	0.52	18 (5%) 32 34	29, 87, 149, 178	2 (0%)
All	All	2189/2319 (94%)	0.04	44 (2%) 65 67	21, 63, 115, 178	11 (0%)

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	F	155	ALA	6.7
2	B	1	MET	4.1
1	A	262	TYR	4.0
1	C	440	VAL	3.8
4	F	132	LEU	3.6
4	F	159	GLY	3.4
1	A	282	TYR	3.2
4	F	179	VAL	3.0
1	C	340	SER	2.9
4	F	186	LEU	2.8
4	F	153	ALA	2.6
2	D	340	SER	2.6
2	D	1	MET	2.6
4	F	102	PRO	2.5
3	E	28	SER	2.5
2	D	277	SER	2.5
1	C	1	MET	2.4
4	F	167	SER	2.4
1	A	438	ASP	2.4

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Mol	Chain	Res	Type	RSRZ
2	D	279	GLY	2.4
4	F	379	HIS	2.4
4	F	249	TYR	2.3
4	F	134	ALA	2.3
4	F	125	THR	2.3
3	E	8	VAL	2.2
2	B	284	ARG	2.2
4	F	330	ILE	2.2
1	C	163	LYS	2.2
1	A	346	TRP	2.1
4	F	171	ASP	2.1
4	F	154	GLY	2.1
1	A	281	ALA	2.1
2	D	57	THR	2.1
2	B	2	ARG	2.1
2	D	278	ARG	2.1
2	B	277	SER	2.1
4	F	161	LEU	2.1
2	D	97	SER	2.1
1	C	341	ILE	2.1
1	C	282	TYR	2.1
4	F	130	VAL	2.1
2	B	285	ALA	2.0
3	E	6	MET	2.0
4	F	240	LEU	2.0

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

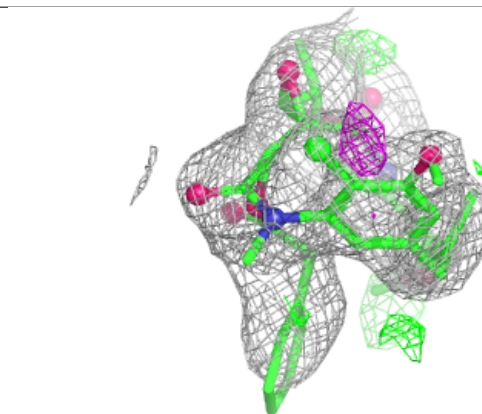
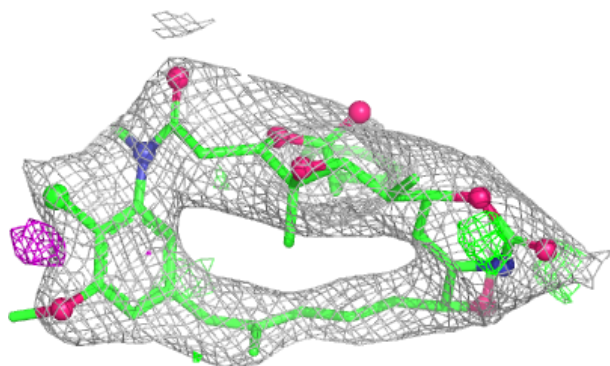
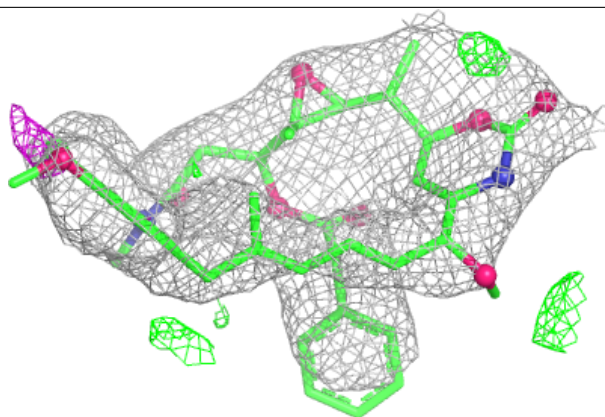
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
12	5JS	D	503	47/47	0.83	0.14	79,94,105,112	0
10	GOL	B	505	6/6	0.85	0.16	68,90,103,108	0
11	IMD	C	504	5/5	0.86	0.16	60,70,81,84	0
7	CA	B	503	1/1	0.90	0.17	99,99,99,99	0
6	MG	F	402	1/1	0.91	0.07	85,85,85,85	0
13	ACP	F	401	31/31	0.91	0.09	85,100,114,124	0
8	GDP	D	501	28/28	0.92	0.10	57,66,85,101	0
7	CA	E	201	1/1	0.93	0.09	99,99,99,99	0
9	MES	B	504	12/12	0.94	0.09	38,50,67,74	0
6	MG	D	502	1/1	0.96	0.06	65,65,65,65	0
5	GTP	A	501	32/32	0.97	0.06	32,41,52,58	0
5	GTP	C	501	32/32	0.98	0.05	33,37,46,49	0
8	GDP	B	501	28/28	0.98	0.06	33,39,47,50	0
7	CA	C	503	1/1	0.99	0.02	62,62,62,62	0
6	MG	B	502	1/1	1.00	0.05	34,34,34,34	0
7	CA	A	503	1/1	1.00	0.01	75,75,75,75	0
6	MG	C	502	1/1	1.00	0.05	38,38,38,38	0
6	MG	A	502	1/1	1.00	0.02	42,42,42,42	0

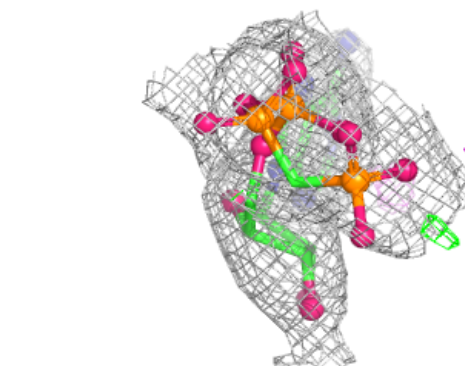
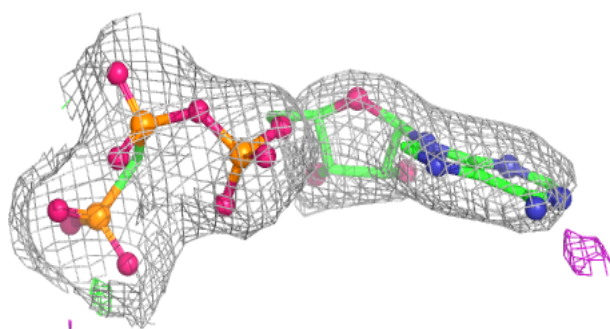
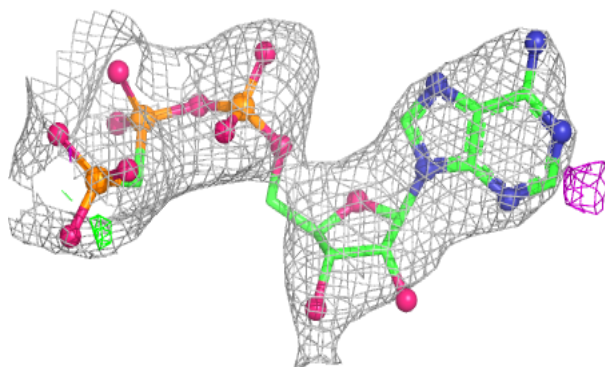
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around 5JS 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)

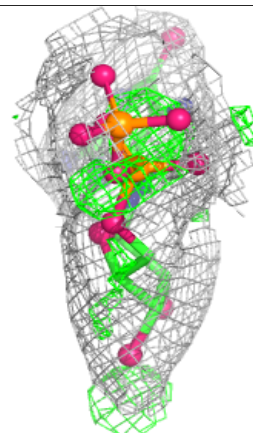
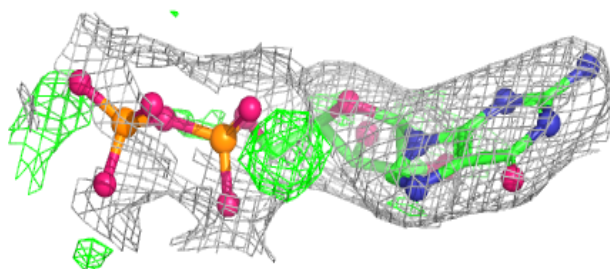
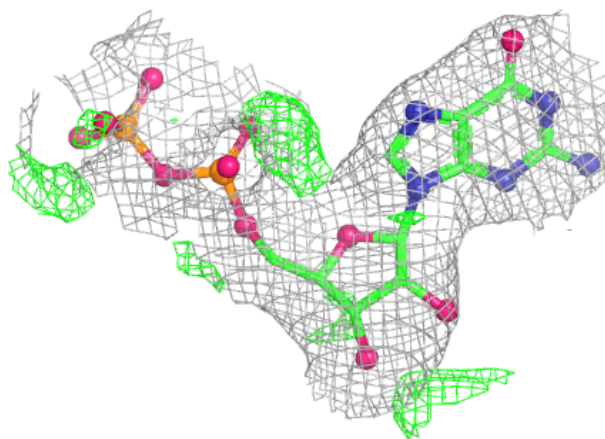
**Electron density around ACP F 401:**

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

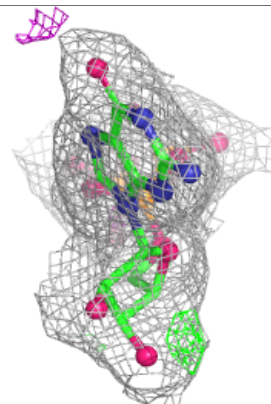
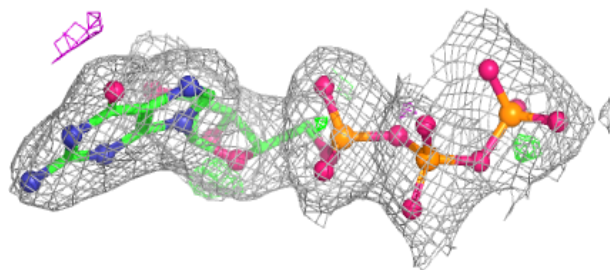
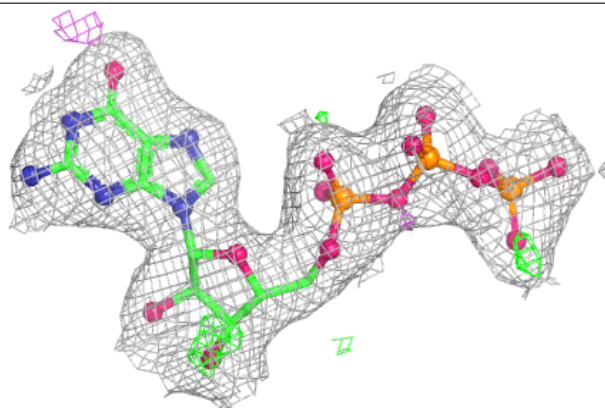


Electron density around GDP D 501:

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

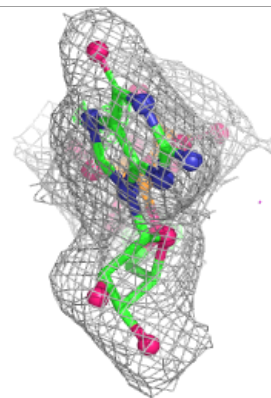
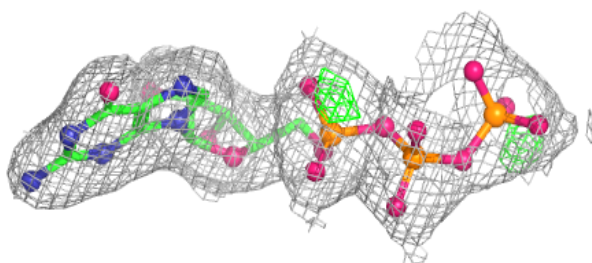
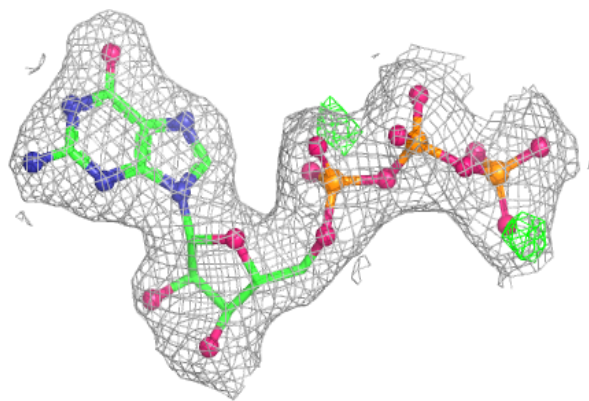
**Electron density around GTP A 501:**

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



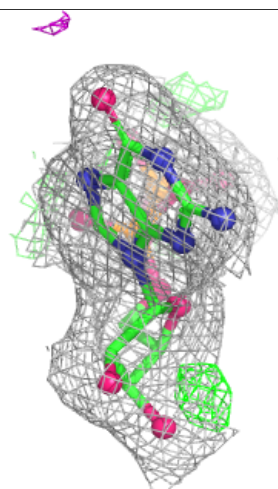
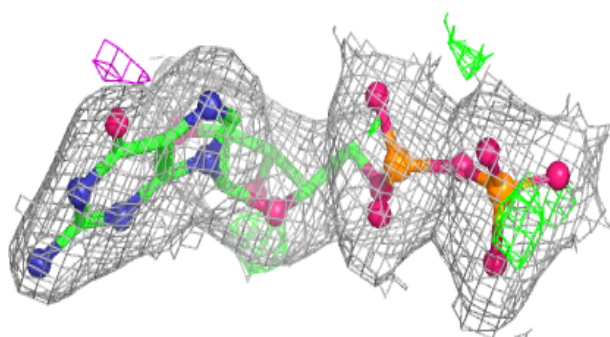
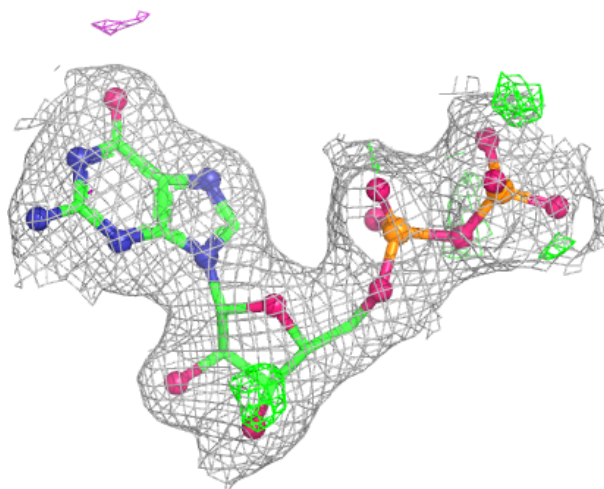
Electron density around GTP C 501:

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



Electron density around 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.