



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 24, 2021 – 01:09 pm GMT

PDB ID : 6TH4
Title : Tubulin-inhibitor complex
Authors : Varela, P.F.; Gigant, B.
Deposited on : 2019-11-18
Resolution : 2.12 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.4 (270009), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.23.2
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.2

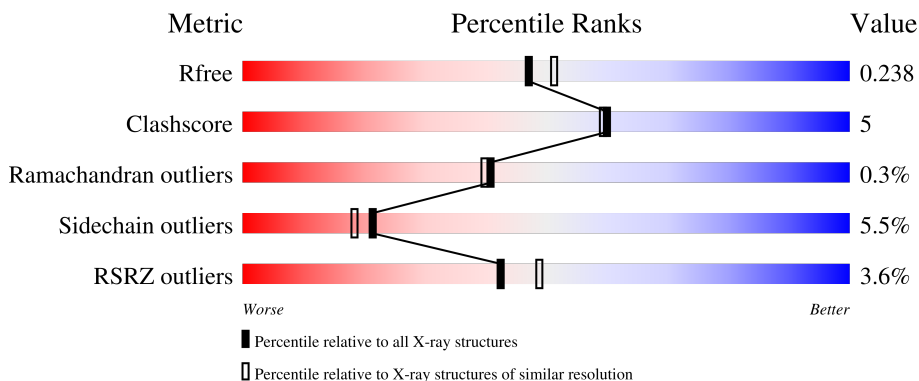
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.12 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	6241 (2.14-2.10)
Clashscore	141614	6778 (2.14-2.10)
Ramachandran outliers	138981	6705 (2.14-2.10)
Sidechain outliers	138945	6706 (2.14-2.10)
RSRZ outliers	127900	6112 (2.14-2.10)

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	 5% (red), 85% (green), 9% (yellow), 5% (grey)
1	C	451	 2% (red), 84% (green), 11% (yellow), 3% (grey)
2	B	445	 4% (red), 77% (green), 17% (yellow), 2% (grey)
2	D	445	 2% (red), 84% (green), 12% (yellow), 2% (grey)
3	E	143	 8% (red), 77% (green), 10% (yellow), 5% (grey)

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	SO4	C	502	-	-	-	X

2 Entry composition i

There are 9 unique types of molecules in this entry. The entry contains 14923 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 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	428	Total	C	N	O	S	0	0	0
			3345	2118	566	639	22			
1	C	434	Total	C	N	O	S	0	0	0
			3390	2145	577	646	22			

- Molecule 2 is a protein called Tubulin beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	428	Total	C	N	O	S	0	7	0
			3411	2141	584	659	27			
2	D	429	Total	C	N	O	S	0	5	0
			3401	2132	581	661	27			

- Molecule 3 is a protein called Stathmin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	E	128	Total	C	N	O	S	0	0	0
			1052	651	189	208	4			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	3	ACE	-	acetylation	UNP P63043
E	4	ALA	SER	conflict	UNP P63043
E	14	ALA	CYS	engineered mutation	UNP P63043
E	20	TRP	PHE	engineered mutation	UNP P63043

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

- Molecule 5 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: 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 (three-letter code: MG) (formula: Mg).

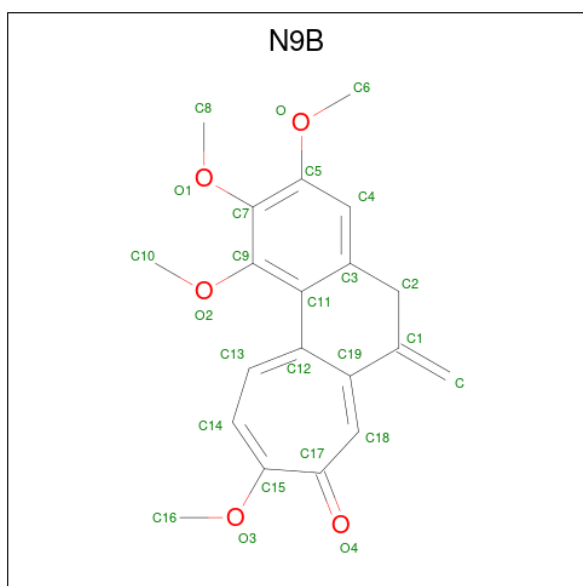
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Mg	0	0
			1	1		
6	D	1	Total	Mg	0	0
			1	1		

- Molecule 7 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula: C₁₀H₁₅N₅O₁₁P₂).



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

- Molecule 8 is 1,2,3,9-tetramethoxy-6-methylidene-5 {H}-cyclohepta[a]naphthalen-8-one (three-letter code: N9B) (formula: C₂₀H₂₀O₅) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
			Total	C			O
8	B	1	25	20	5	0	1

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	D	1	Total	C	O	0	0
			25	20	5		

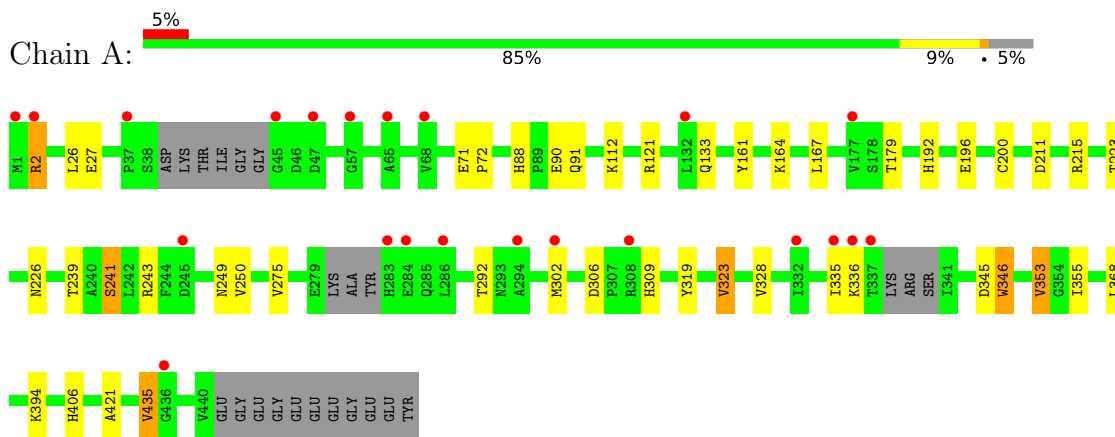
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	17	Total	O	0	0
			17	17		
9	B	19	Total	O	0	0
			19	19		
9	C	49	Total	O	0	0
			49	49		
9	D	29	Total	O	0	0
			29	29		
9	E	3	Total	O	0	0
			3	3		

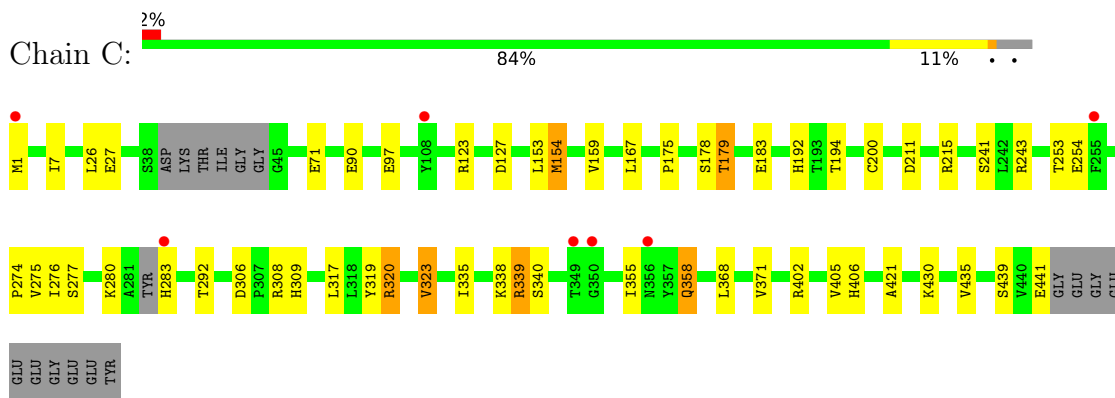
3 Residue-property plots [i](#)

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

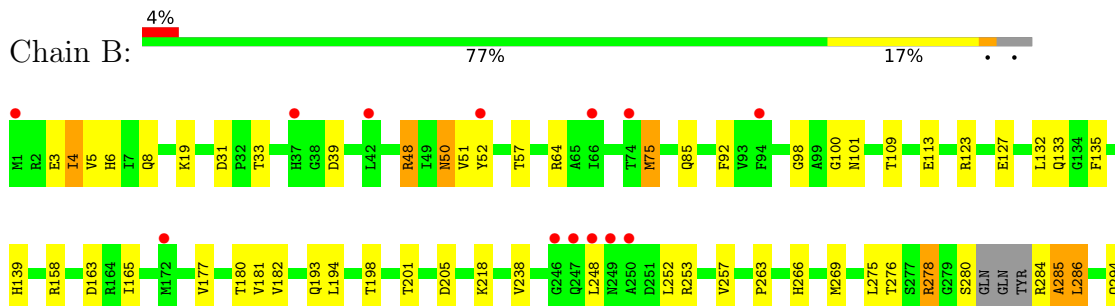
- Molecule 1: Tubulin alpha chain

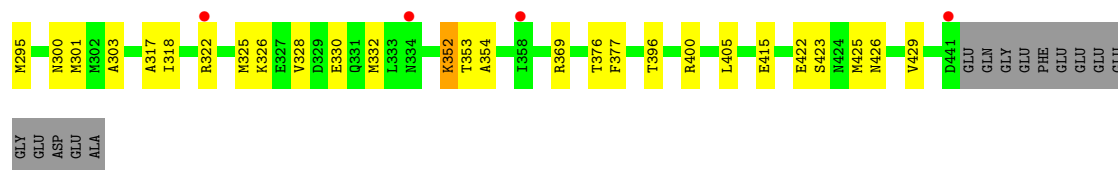


- Molecule 1: Tubulin alpha chain

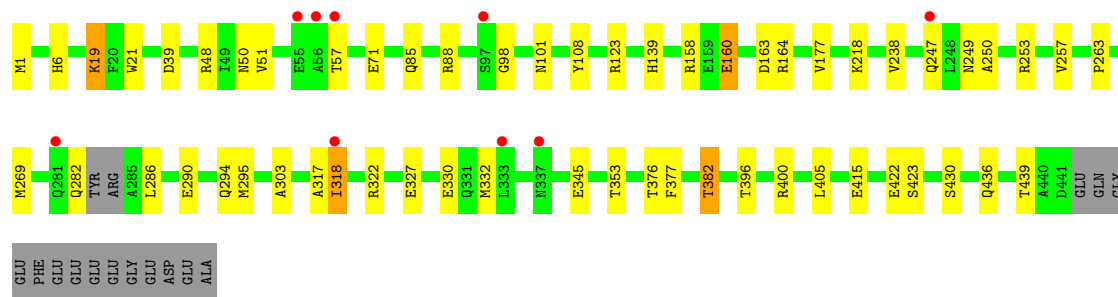
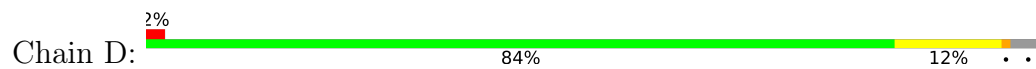


- Molecule 2: Tubulin beta chain

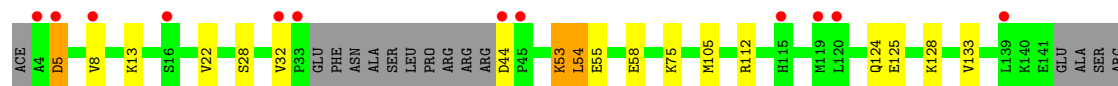
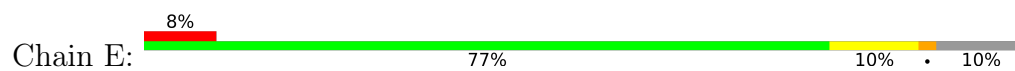




- Molecule 2: Tubulin beta chain



- Molecule 3: Stathmin-4



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	65.12Å 128.30Å 252.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	126.00 – 2.12 126.36 – 2.12	Depositor EDS
% Data completeness (in resolution range)	52.0 (126.00-2.12) 52.0 (126.36-2.12)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.72 (at 2.12Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.192 , 0.226 0.204 , 0.238	Depositor DCC
R_{free} test set	3166 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	50.1	Xtriage
Anisotropy	0.119	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	14923	wwPDB-VP
Average B, all atoms (Å ²)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.25% 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: N9B, GTP, MG, GDP, SO4

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	0.39	0/3419	0.55	0/4641
1	C	0.43	0/3465	0.58	0/4702
2	B	0.42	0/3486	0.57	0/4721
2	D	0.44	0/3478	0.58	0/4711
3	E	0.37	0/1063	0.49	0/1415
All	All	0.42	0/14911	0.56	0/20190

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	3345	0	3247	25	0
1	C	3390	0	3299	25	0
2	B	3411	0	3288	56	0
2	D	3401	0	3274	27	0
3	E	1052	0	1060	10	0
4	A	5	0	0	1	0
4	B	10	0	0	1	0
4	C	10	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	10	0	0	0	0
5	A	32	0	12	0	0
5	C	32	0	12	0	0
6	A	1	0	0	0	0
6	D	1	0	0	0	0
7	B	28	0	12	0	0
7	D	28	0	12	0	0
8	B	25	0	0	0	0
8	D	25	0	0	1	0
9	A	17	0	0	0	0
9	B	19	0	0	0	0
9	C	49	0	0	0	0
9	D	29	0	0	1	0
9	E	3	0	0	0	0
All	All	14923	0	14216	133	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 5.

All (133) 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:124:GLN:HB3	3:E:128:LYS:HZ2	1.35	0.92
2:B:248[B]:LEU:HD13	2:B:352:LYS:HG2	1.55	0.86
2:B:248[B]:LEU:CD1	2:B:352:LYS:HG2	2.05	0.84
2:D:382:THR:HG21	2:D:436:GLN:HB2	1.60	0.84
2:B:332:MET:HG3	2:B:353:THR:HG21	1.61	0.82
2:D:332:MET:HG3	2:D:353:THR:HG21	1.61	0.81
2:B:5:VAL:HG23	2:B:135:PHE:CD2	2.20	0.76
2:D:48:ARG:O	2:D:51:VAL:HG12	1.87	0.74
3:E:124:GLN:HB3	3:E:128:LYS:NZ	2.02	0.74
1:C:27:GLU:OE1	1:C:243:ARG:NH2	2.20	0.73
2:B:295:MET:HG2	2:B:377:PHE:HB2	1.74	0.69
2:B:284:ARG:HG3	2:B:285:ALA:H	1.58	0.68
2:B:123:ARG:O	2:B:127:GLU:HG2	1.93	0.68
2:D:317:ALA:HB3	2:D:353:THR:HG22	1.75	0.66
2:D:327:GLU:HA	2:D:330:GLU:HG2	1.79	0.65
1:A:306:ASP:OD2	1:A:309:HIS:ND1	2.29	0.65
2:B:133:GLN:HE22	2:B:252:LEU:H	1.43	0.65
2:D:295:MET:HG2	2:D:377:PHE:HB2	1.79	0.65
1:C:306:ASP:OD2	1:C:309:HIS:ND1	2.29	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:286:LEU:HD12	2:D:290:GLU:OE1	1.96	0.64
2:D:250:ALA:HB1	8:D:505:N9B:C6	2.27	0.64
1:C:97:GLU:HG3	2:D:1:MET:HG2	1.80	0.64
2:D:123:ARG:NH1	2:D:160:GLU:OE1	2.30	0.64
2:D:382:THR:HG21	2:D:436:GLN:CB	2.26	0.64
3:E:8:VAL:HG12	3:E:22:VAL:HG22	1.78	0.64
2:D:286:LEU:HD21	2:D:294:GLN:OE1	1.98	0.63
2:D:396:THR:HG22	2:D:422:GLU:OE1	1.98	0.63
2:B:396:THR:HG22	2:B:422:GLU:OE1	1.99	0.62
2:B:425:MET:O	2:B:429:VAL:HG13	1.99	0.62
1:A:328:VAL:HG11	1:A:353:VAL:HG21	1.81	0.62
2:B:5:VAL:CG2	2:B:135:PHE:CD2	2.83	0.62
2:B:278:ARG:NH2	4:B:502:SO4:O3	2.31	0.62
2:B:325:MET:HA	2:B:328:VAL:HG12	1.81	0.61
3:E:53:LYS:HE3	3:E:54:LEU:HD13	1.83	0.61
2:B:317:ALA:HB3	2:B:353:THR:HG22	1.84	0.60
1:C:211:ASP:O	1:C:215:ARG:HG3	2.01	0.60
1:C:167:LEU:HG	1:C:200:CYS:HB3	1.84	0.60
1:A:27:GLU:OE1	1:A:243:ARG:NH2	2.35	0.59
2:B:31:ASP:OD1	2:B:33:THR:HG22	2.01	0.59
2:B:198:THR:HG21	2:B:201:THR:OG1	2.03	0.58
1:A:319:TYR:HB3	1:A:323:VAL:HG11	1.85	0.58
2:B:194:LEU:O	2:B:198:THR:HG22	2.03	0.58
2:B:352:LYS:HA	2:B:352:LYS:HE3	1.84	0.58
1:A:346:TRP:HH2	1:A:435:VAL:HG22	1.67	0.58
1:C:154:MET:HG2	1:C:194:THR:HG23	1.85	0.58
2:B:133:GLN:NE2	2:B:252:LEU:H	2.03	0.57
2:B:269:MET:HG3	2:B:303:ALA:HB3	1.88	0.55
2:D:295:MET:CG	2:D:377:PHE:HB2	2.37	0.55
1:C:319:TYR:HB3	1:C:323:VAL:HG11	1.87	0.55
1:A:223:THR:HG22	1:A:226:ASN:OD1	2.09	0.53
1:A:161:TYR:HB3	1:A:164:LYS:HD2	1.91	0.53
1:C:406:HIS:CG	2:D:263:PRO:HD3	2.44	0.52
2:D:269:MET:HG3	2:D:303:ALA:HB3	1.90	0.52
2:D:382:THR:CG2	2:D:436:GLN:OE1	2.58	0.52
2:B:253:ARG:O	2:B:257:VAL:HG13	2.10	0.52
2:D:253:ARG:O	2:D:257:VAL:HG13	2.09	0.52
2:D:382:THR:CG2	2:D:436:GLN:HB2	2.37	0.52
2:B:325:MET:HA	2:B:328:VAL:CG1	2.39	0.52
2:B:5:VAL:HG21	2:B:135:PHE:CE2	2.45	0.52
2:B:51:VAL:HG23	2:B:52:TYR:CD2	2.45	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:211:ASP:O	1:A:215:ARG:HG3	2.10	0.51
1:C:277:SER:HB3	1:C:280:LYS:HG3	1.93	0.51
1:C:179:THR:HG22	1:C:183:GLU:OE2	2.11	0.51
1:A:241:SER:HB2	1:A:249:ASN:O	2.10	0.51
2:B:198:THR:CG2	2:B:266:HIS:NE2	2.74	0.51
2:D:108:TYR:CD1	3:E:133:VAL:HG21	2.46	0.50
1:A:346:TRP:CH2	1:A:435:VAL:HG22	2.45	0.50
2:B:198:THR:HG23	2:B:266:HIS:CD2	2.47	0.50
1:A:2:ARG:HH12	1:A:250:VAL:HG13	1.77	0.50
1:C:323:VAL:HG13	1:C:355:ILE:HG23	1.94	0.50
1:C:402:ARG:O	1:C:405:VAL:HG22	2.12	0.50
2:B:50:ASN:O	2:B:64:ARG:NH1	2.44	0.49
2:B:101:ASN:HB3	2:B:180:THR:HG21	1.95	0.49
2:B:4:ILE:HG22	2:B:133:GLN:HG3	1.94	0.49
2:B:400:ARG:HD2	1:C:439:SER:HB3	1.95	0.49
1:A:2:ARG:HB2	1:A:133:GLN:CG	2.42	0.49
2:B:3:GLU:HG2	2:B:64:ARG:NH2	2.27	0.49
2:D:163:ASP:HB2	9:D:626:HOH:O	2.13	0.49
2:B:5:VAL:HG22	2:B:132:LEU:HD11	1.94	0.49
2:B:198:THR:HG22	2:B:266:HIS:NE2	2.27	0.49
1:A:88:HIS:O	1:A:91:GLN:HG2	2.13	0.48
2:B:318:ILE:HG23	2:B:376:THR:HB	1.96	0.47
2:B:248[B]:LEU:HD23	2:B:354:ALA:HB2	1.95	0.47
2:B:269:MET:HG2	2:B:301:MET:HE2	1.95	0.47
1:A:275:VAL:HG13	1:A:368:LEU:HD21	1.97	0.47
1:A:239:THR:OG1	1:A:243:ARG:NH1	2.48	0.46
1:C:339:ARG:NH2	1:C:340:SER:OG	2.48	0.46
2:B:276:THR:HB	2:B:280:SER:OG	2.14	0.46
2:B:205:ASP:HB2	2:B:303:ALA:HA	1.97	0.46
2:B:48:ARG:O	2:B:51:VAL:HG22	2.15	0.46
2:D:177[A]:VAL:HG22	2:D:177[A]:VAL:O	2.16	0.45
2:D:108:TYR:CG	3:E:133:VAL:HG21	2.51	0.45
2:B:284:ARG:HG3	2:B:285:ALA:N	2.30	0.45
1:C:276:ILE:HG21	1:C:283:HIS:NE2	2.32	0.45
2:B:100:GLY:HA2	1:C:254:GLU:HG3	1.98	0.45
2:B:181:VAL:HG23	2:B:182:VAL:HG13	1.98	0.45
2:B:193:GLN:HE22	3:E:75:LYS:HE3	1.81	0.45
1:C:275:VAL:HG13	1:C:368:LEU:HD21	1.99	0.45
1:C:320:ARG:HD3	1:C:358:GLN:O	2.17	0.45
1:A:336:LYS:NZ	3:E:5:ASP:HB3	2.32	0.44
1:C:276:ILE:HG23	1:C:280:LYS:HD2	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:71:GLU:HG2	1:A:72:PRO:HD2	2.00	0.44
1:C:292:THR:HG22	1:C:335:ILE:HD11	1.99	0.44
2:B:75:MET:HG3	2:B:92:PHE:HD2	1.82	0.44
1:A:345:ASP:HB2	3:E:28:SER:HB2	2.00	0.44
1:A:394:LYS:NZ	4:A:501:SO4:O4	2.47	0.44
1:A:223:THR:HG23	1:A:226:ASN:H	1.83	0.43
2:B:133:GLN:NE2	2:B:252:LEU:HG	2.33	0.43
2:B:405:LEU:HD21	2:B:415:GLU:HG3	1.99	0.43
1:C:192:HIS:CG	1:C:421:ALA:HA	2.54	0.43
1:A:167:LEU:HG	1:A:200:CYS:HB3	2.01	0.42
2:B:5:VAL:CG2	2:B:135:PHE:CE2	3.02	0.42
2:D:318:ILE:HG23	2:D:376:THR:HB	2.02	0.42
1:C:317:LEU:HB3	1:C:319:TYR:CE1	2.54	0.42
1:A:406:HIS:CG	2:B:263:PRO:HD3	2.55	0.42
2:B:275:LEU:HD11	2:B:300:ASN:HA	2.01	0.42
2:B:163:ASP:O	2:B:253:ARG:NH2	2.53	0.42
2:B:109:THR:O	2:B:113:GLU:HG3	2.20	0.42
2:B:6:HIS:HE1	2:B:8:GLN:HB3	1.85	0.42
2:B:369:ARG:HD2	2:B:369:ARG:HA	1.89	0.42
2:B:426:ASN:O	2:B:429:VAL:HG22	2.20	0.41
1:C:175:PRO:HA	1:C:179:THR:OG1	2.19	0.41
1:C:274:PRO:HG2	1:C:371:VAL:HG11	2.03	0.41
1:A:192:HIS:CG	1:A:421:ALA:HA	2.55	0.41
1:A:292:THR:HG22	1:A:335:ILE:HD11	2.03	0.41
3:E:125:GLU:HA	3:E:128:LYS:HD2	2.01	0.41
2:B:326:LYS:HE2	2:B:330:GLU:OE2	2.21	0.41
2:D:6:HIS:CD2	2:D:21:TRP:HE1	2.38	0.41
2:D:405:LEU:HD21	2:D:415:GLU:HG3	2.03	0.40
2:B:165:ILE:HG21	2:B:252:LEU:HB3	2.02	0.40
1:C:7:ILE:HG21	1:C:153:LEU:HD21	2.04	0.40
1:A:323:VAL:HG13	1:A:355:ILE:HG23	2.03	0.40
2:D:19:LYS:HD2	2:D:19:LYS:HA	1.84	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	420/451 (93%)	409 (97%)	11 (3%)	0	100	100
1	C	428/451 (95%)	418 (98%)	9 (2%)	1 (0%)	47	48
2	B	431/445 (97%)	422 (98%)	6 (1%)	3 (1%)	22	17
2	D	430/445 (97%)	422 (98%)	7 (2%)	1 (0%)	47	48
3	E	124/143 (87%)	122 (98%)	2 (2%)	0	100	100
All	All	1833/1935 (95%)	1793 (98%)	35 (2%)	5 (0%)	41	40

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	286	LEU
2	B	98	GLY
2	B	285	ALA
1	C	178	SER
2	D	98	GLY

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	362/379 (96%)	349 (96%)	13 (4%)	35	35
1	C	366/379 (97%)	346 (94%)	20 (6%)	21	18
2	B	374/383 (98%)	355 (95%)	19 (5%)	24	21
2	D	375/383 (98%)	350 (93%)	25 (7%)	16	13
3	E	113/125 (90%)	103 (91%)	10 (9%)	10	6
All	All	1590/1649 (96%)	1503 (94%)	87 (6%)	21	18

All (87) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	ARG
1	A	26	LEU
1	A	90	GLU
1	A	112	LYS
1	A	121	ARG
1	A	179	THR
1	A	196	GLU
1	A	241	SER
1	A	302	MET
1	A	323	VAL
1	A	346	TRP
1	A	353	VAL
1	A	435	VAL
2	B	4	ILE
2	B	19	LYS
2	B	39	ASP
2	B	48	ARG
2	B	50	ASN
2	B	57	THR
2	B	75	MET
2	B	85	GLN
2	B	139	HIS
2	B	158	ARG
2	B	177	VAL
2	B	218	LYS
2	B	238	VAL
2	B	278	ARG
2	B	286	LEU
2	B	294	GLN
2	B	322	ARG
2	B	352	LYS
2	B	423	SER
1	C	1	MET
1	C	26	LEU
1	C	71	GLU
1	C	90	GLU
1	C	123	ARG
1	C	127	ASP
1	C	154	MET
1	C	159	VAL
1	C	179	THR
1	C	241	SER
1	C	253	THR

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Mol	Chain	Res	Type
1	C	308	ARG
1	C	320	ARG
1	C	323	VAL
1	C	338	LYS
1	C	339	ARG
1	C	358	GLN
1	C	430	LYS
1	C	435	VAL
1	C	441	GLU
2	D	19	LYS
2	D	39	ASP
2	D	50	ASN
2	D	57	THR
2	D	71	GLU
2	D	85	GLN
2	D	88	ARG
2	D	101	ASN
2	D	139	HIS
2	D	158	ARG
2	D	160	GLU
2	D	164	ARG
2	D	218	LYS
2	D	238	VAL
2	D	247	GLN
2	D	249	ASN
2	D	282	GLN
2	D	318	ILE
2	D	322	ARG
2	D	345	GLU
2	D	382	THR
2	D	400	ARG
2	D	423	SER
2	D	430	SER
2	D	439	THR
3	E	5	ASP
3	E	13	LYS
3	E	32	VAL
3	E	44	ASP
3	E	53	LYS
3	E	54	LEU
3	E	55	GLU
3	E	58	GLU

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Mol	Chain	Res	Type
3	E	105	MET
3	E	112	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	293	ASN
2	B	133	GLN
2	B	193	GLN
1	C	101	ASN
1	C	293	ASN
2	D	8	GLN
2	D	136	GLN
2	D	193	GLN
2	D	281	GLN
2	D	331	GLN
2	D	339	ASN
2	D	433	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 15 ligands modelled in this entry, 2 are monoatomic - leaving 13 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

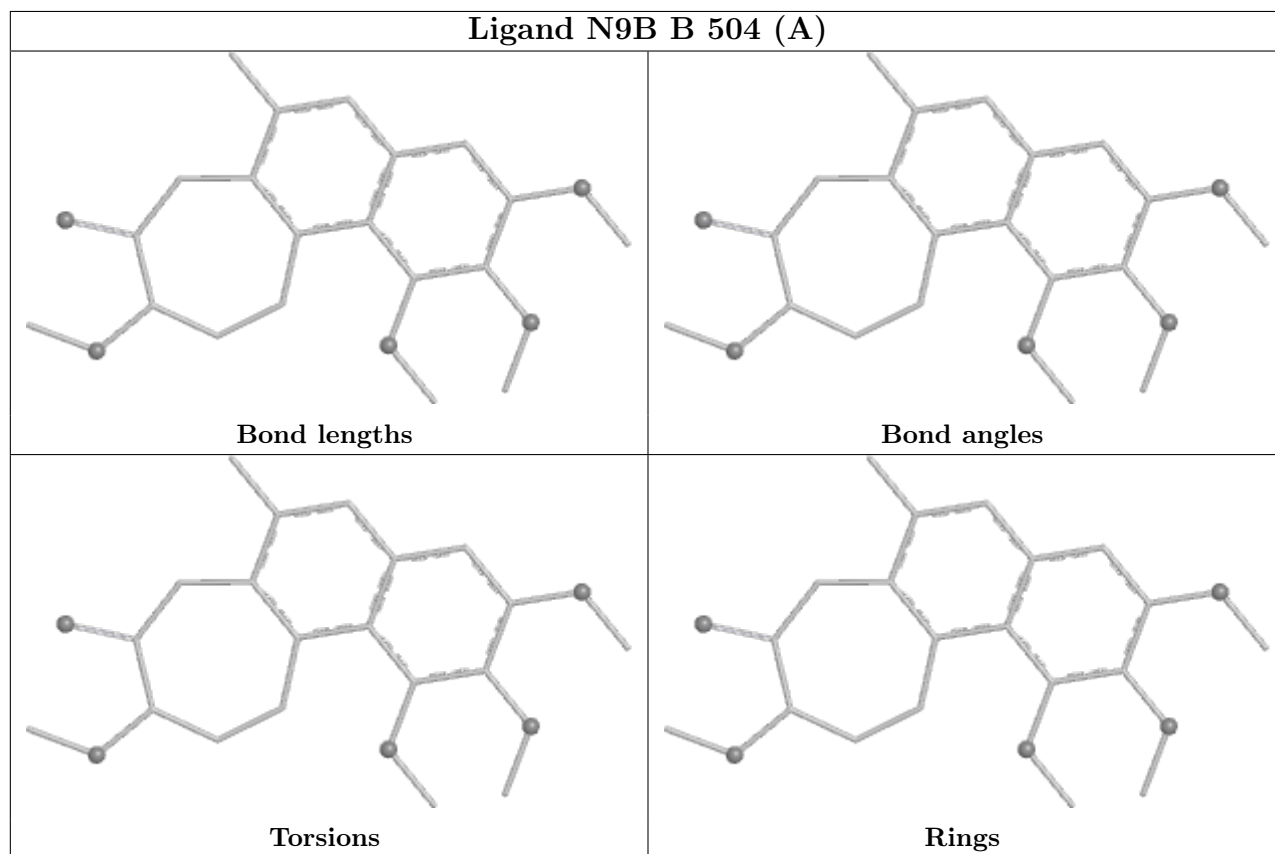
There are no chirality outliers.

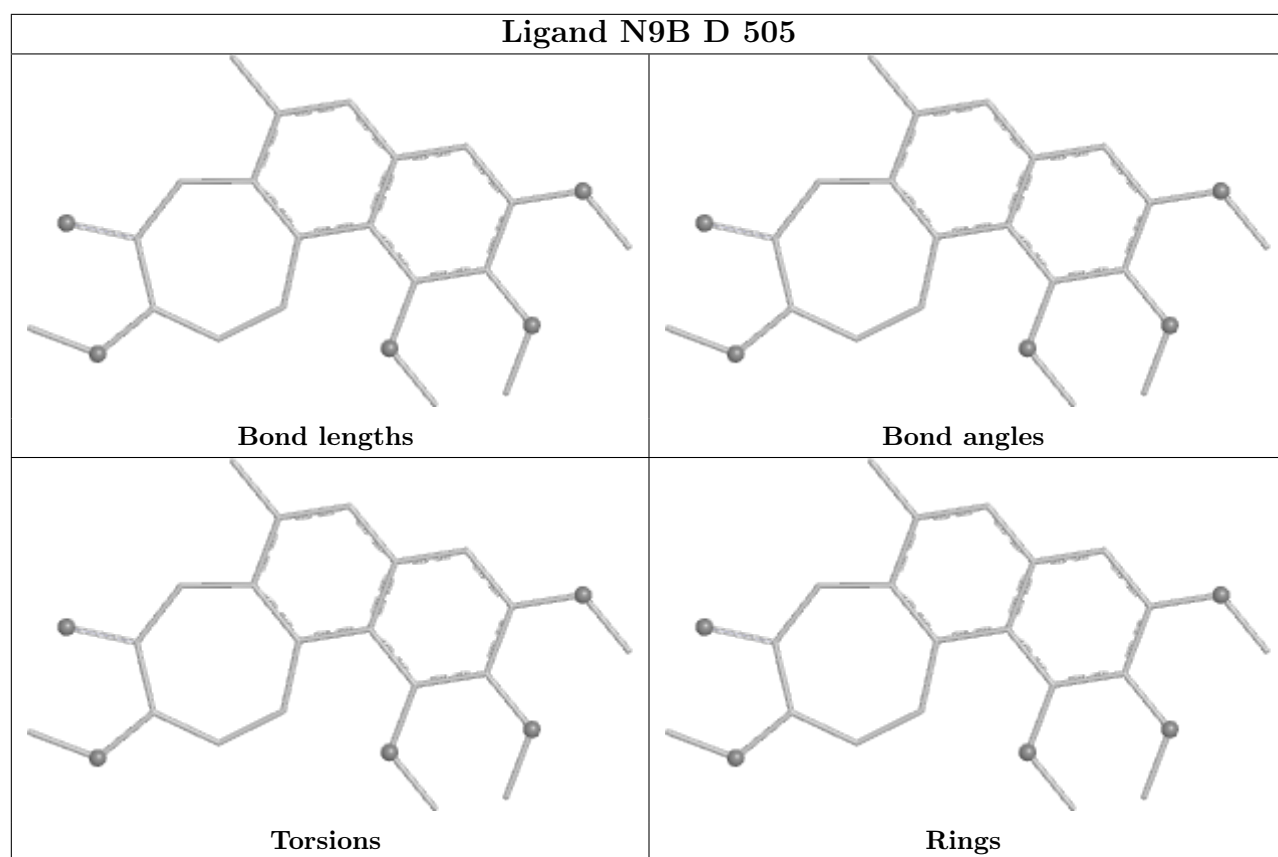
There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.





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	428/451 (94%)	0.48	22 (5%) 28 33	41, 73, 106, 135	0
1	C	434/451 (96%)	0.20	7 (1%) 72 76	37, 57, 82, 99	0
2	B	428/445 (96%)	0.38	17 (3%) 38 44	39, 64, 112, 135	0
2	D	429/445 (96%)	0.27	9 (2%) 63 68	31, 52, 87, 102	0
3	E	128/143 (89%)	0.71	12 (9%) 8 10	63, 88, 126, 132	0
All	All	1847/1935 (95%)	0.36	67 (3%) 42 49	31, 64, 104, 135	0

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	335	ILE	7.2
3	E	33	PRO	6.6
1	A	45	GLY	6.6
1	A	336	LYS	5.9
2	D	56	ALA	5.5
1	A	1	MET	5.4
3	E	44	ASP	5.2
2	B	248[A]	LEU	4.9
2	D	57	THR	4.7
1	C	349	THR	4.5
2	B	249[A]	ASN	4.1
3	E	4	ALA	4.0
1	A	286	LEU	3.9
1	A	283	HIS	3.5
2	B	94	PHE	3.4
2	B	441	ASP	3.3
3	E	45	PRO	3.3
2	B	1	MET	3.2
2	B	250[A]	ALA	3.2
1	A	308	ARG	3.2

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Mol	Chain	Res	Type	RSRZ
1	C	255	PHE	3.2
1	C	108	TYR	3.1
1	A	2	ARG	3.0
2	B	42	LEU	2.9
2	B	37	HIS	2.9
2	D	247	GLN	2.9
1	A	47	ASP	2.9
1	A	245	ASP	2.9
1	A	332	ILE	2.7
3	E	119	MET	2.6
1	A	337	THR	2.6
1	A	284	GLU	2.5
2	B	247[A]	GLN	2.5
1	C	350	GLY	2.5
2	D	333	LEU	2.5
3	E	139	LEU	2.4
2	B	358	ILE	2.4
1	A	436	GLY	2.3
3	E	8	VAL	2.3
2	D	97	SER	2.3
2	B	74	THR	2.3
3	E	16	SER	2.3
2	D	318	ILE	2.3
2	D	55	GLU	2.3
3	E	115	HIS	2.3
3	E	32	VAL	2.2
2	B	334	ASN	2.2
1	C	283	HIS	2.2
1	A	177	VAL	2.2
2	B	246[A]	GLY	2.2
2	B	172	MET	2.2
2	B	52	TYR	2.2
2	B	322	ARG	2.2
1	C	1	MET	2.1
3	E	5	ASP	2.1
1	C	356	ASN	2.1
2	B	66	ILE	2.1
1	A	302	MET	2.1
1	A	65	ALA	2.1
1	A	37	PRO	2.1
1	A	132	LEU	2.1
2	D	281	GLN	2.0

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Mol	Chain	Res	Type	RSRZ
3	E	120	LEU	2.0
1	A	68	VAL	2.0
2	D	337	ASN	2.0
1	A	294	ALA	2.0
1	A	57	GLY	2.0

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

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

6.3 Carbohydrates [\(i\)](#)

There are no monosaccharides in this entry.

6.4 Ligands [\(i\)](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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.

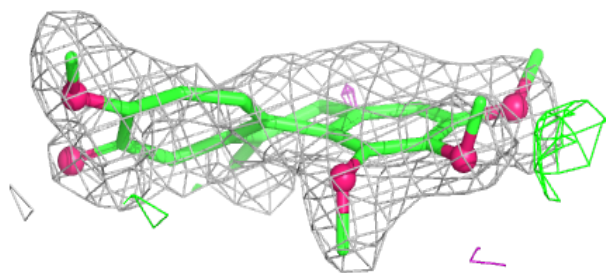
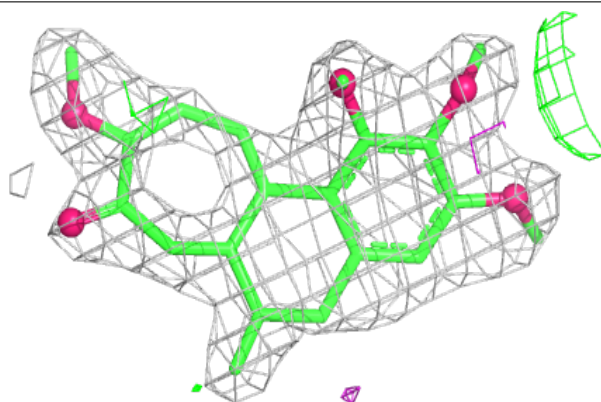
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	SO4	D	503	5/5	0.64	0.38	157,157,157,157	0
4	SO4	B	501	5/5	0.66	0.17	144,145,145,145	0
4	SO4	C	502	5/5	0.68	0.66	172,172,172,172	0
4	SO4	C	501	5/5	0.85	0.20	150,151,151,151	0
4	SO4	A	501	5/5	0.87	0.23	124,124,124,124	0
8	N9B	B	504[A]	25/25	0.87	0.19	44,46,47,47	25
4	SO4	D	502	5/5	0.89	0.12	118,118,118,118	0
8	N9B	D	505	25/25	0.94	0.14	50,51,52,53	0
4	SO4	B	502	5/5	0.95	0.12	98,98,98,98	0
5	GTP	A	502	32/32	0.98	0.12	47,48,49,49	0
7	GDP	B	503	28/28	0.98	0.12	51,52,53,53	0
5	GTP	C	503	32/32	0.99	0.12	43,45,45,45	0
7	GDP	D	504	28/28	0.99	0.13	40,41,43,43	0
6	MG	A	503	1/1	0.99	0.06	50,50,50,50	0
6	MG	D	501	1/1	0.99	0.09	46,46,46,46	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.

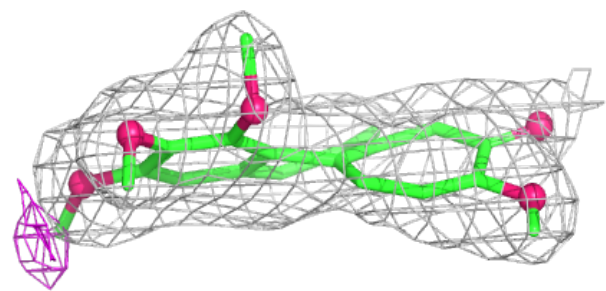
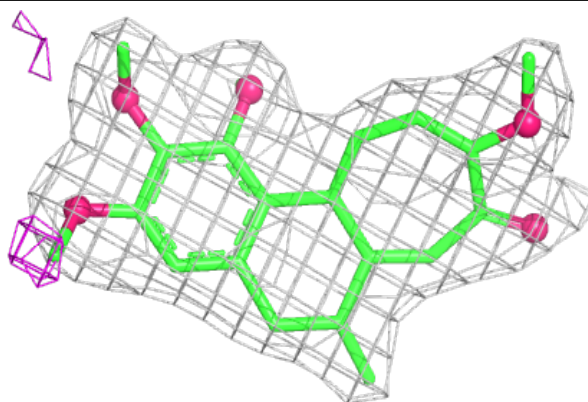
Electron density around N9B B 504 (A):

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



Electron density around N9B D 505:

$2mF_o-DF_c$ (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.