Full wwPDB X-ray Structure Validation Report ⓘ

Nov 28, 2023 – 07:31 pm GMT

PDB ID	:	1E2K
Title	:	Kinetics and crystal structure of the wild-type and the engineered Y101F mutant of Herpes simplex virus type 1 thymidine kinase interacting with (North)-methanocarba-thymidine
Authors	:	Vogt, J.; Scapozza, L.; Schulz, G.E.
Deposited on	:	2000-05-23
Resolution	:	1.70 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36
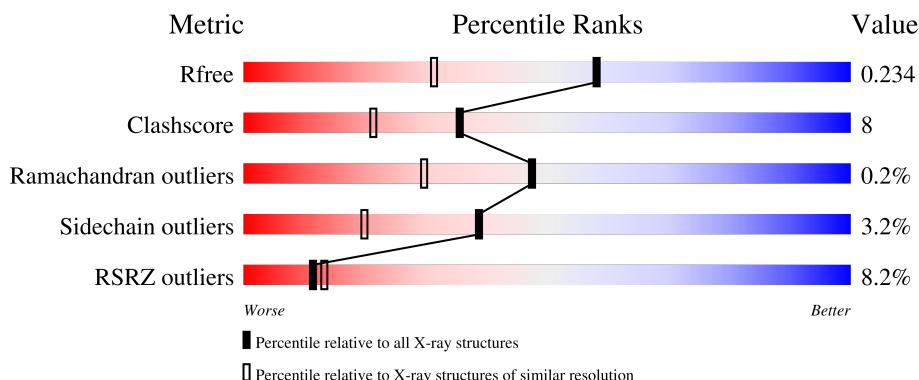
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION
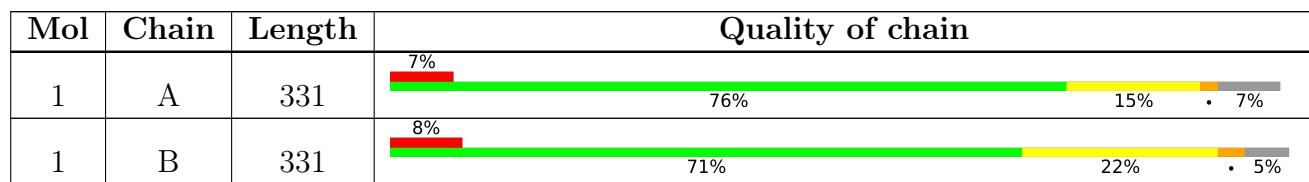
The reported resolution of this entry is 1.70 Å.

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	Percentile Ranks	Value
Rfree		0.234
Clashscore		8
Ramachandran outliers		0.2%
Sidechain outliers		3.2%
RSRZ outliers		8.2%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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

Mol	Chain	Length	Quality of chain
1	A	331	7% / 76% 15% · 7%
1	B	331	8% / 71% 22% · 5%

2 Entry composition (i)
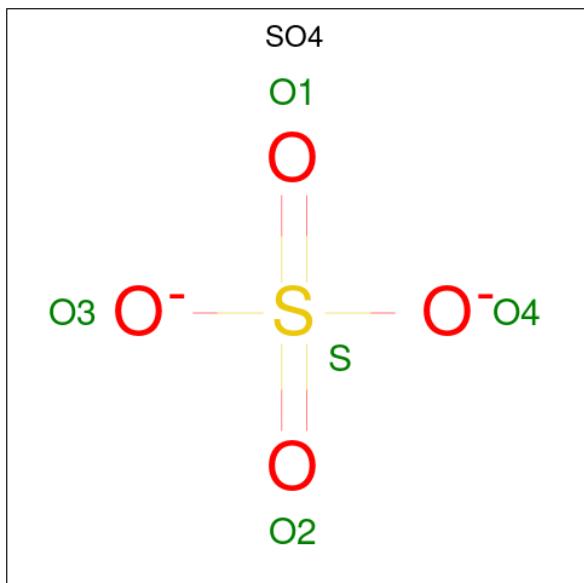
There are 4 unique types of molecules in this entry. The entry contains 5169 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 THYMIDINE KINASE.
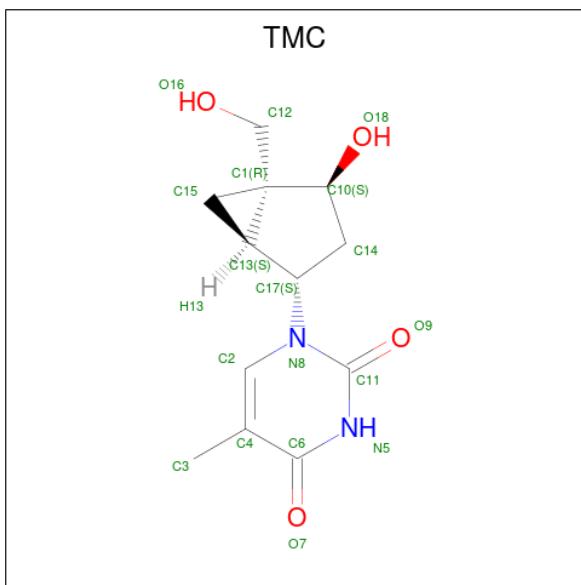
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	308	Total	C	N	O	S	0	0	0
			2350	1498	410	426	16			
1	B	316	Total	C	N	O	S	0	0	0
			2409	1534	421	438	16			

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

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

- Molecule 3 is 1-[4-HYDROXY-5-(HYDROXYMETHYL)BICYCLO[3.1.0]HEX-2-YL]-5-ME THYLPYRIMIDINE-2,4(1H,3H)-DIONE (three-letter code: TMC) (formula: $C_{12}H_{16}N_2O_4$).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			18	12	2	4		
3	B	1	Total	C	N	O	0	0
			18	12	2	4		
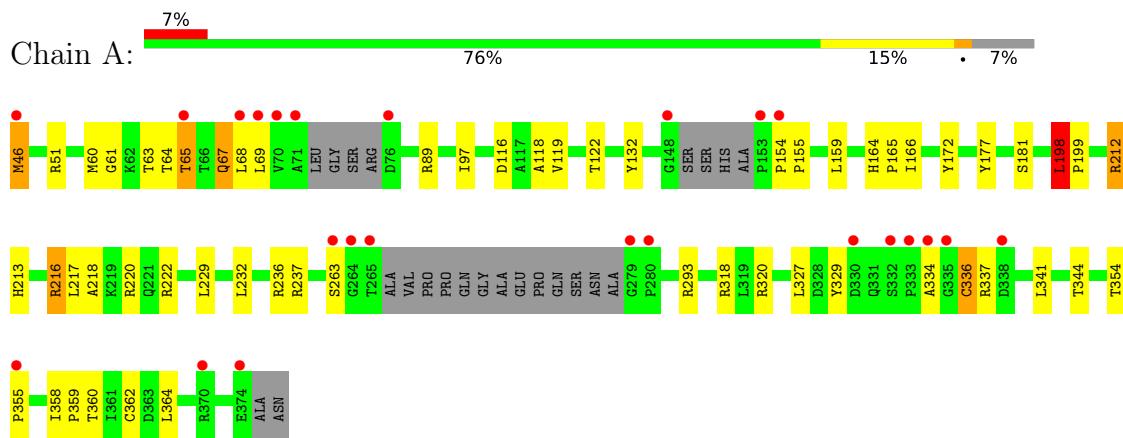
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	180	Total	O	0	0
			180	180		
4	B	184	Total	O	0	0
			184	184		
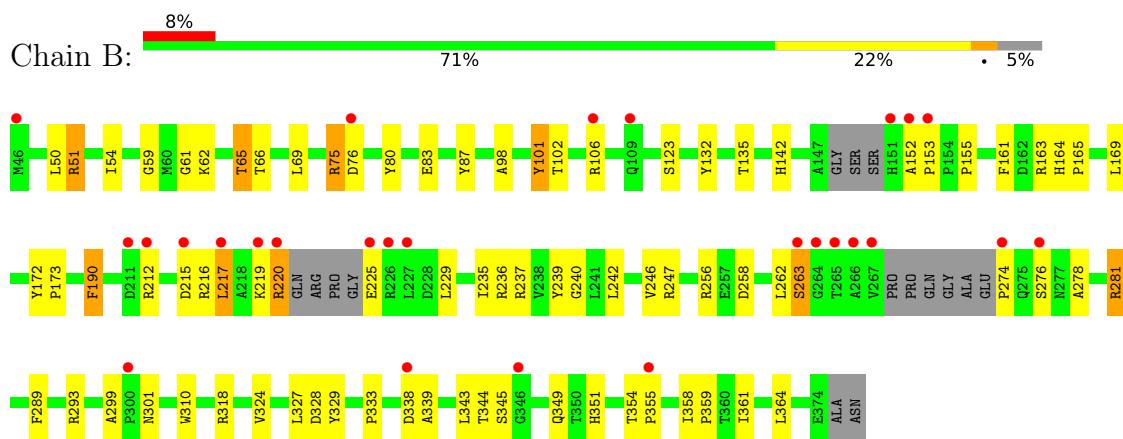
3 Residue-property plots ⓘ

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: THYMIDINE KINASE

Chain A:

- Molecule 1: THYMIDINE KINASE

Chain B:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	114.00Å 117.70Å 108.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.70 24.96 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.0 (20.00-1.70) 99.5 (24.96-1.70)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$< I/\sigma(I) >$ [1]	2.01 (at 1.70Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.209 , 0.252 0.197 , 0.234	Depositor DCC
R_{free} test set	3989 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å^2)	25.1	Xtriage
Anisotropy	0.445	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 44.6	EDS
L-test for twinning [2]	$< |L| > = 0.50, < L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.024 for -k,-h,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	5169	wwPDB-VP
Average B, all atoms (Å^2)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.26% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5   Model quality (i)

5.1   Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, TMC

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	0.84	0/2404	1.49	26/3279 (0.8%)
1	B	0.82	0/2464	1.55	34/3363 (1.0%)
All	All	0.83	0/4868	1.52	60/6642 (0.9%)

There are no bond length outliers.

All (60) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	320	ARG	NE-CZ-NH2	-15.95	112.33	120.30
1	A	320	ARG	NE-CZ-NH1	15.37	127.98	120.30
1	B	132	TYR	CB-CG-CD1	14.77	129.86	121.00
1	B	132	TYR	CB-CG-CD2	-13.91	112.65	121.00
1	B	281	ARG	CD-NE-CZ	12.99	141.79	123.60
1	A	212	ARG	CG-CD-NE	12.09	137.19	111.80
1	B	256	ARG	NE-CZ-NH1	12.09	126.35	120.30
1	B	256	ARG	NE-CZ-NH2	-11.86	114.37	120.30
1	A	132	TYR	CB-CG-CD2	-11.09	114.35	121.00
1	A	237	ARG	NE-CZ-NH2	-10.26	115.17	120.30
1	B	281	ARG	NE-CZ-NH2	-10.15	115.23	120.30
1	B	318	ARG	NE-CZ-NH1	9.67	125.14	120.30
1	B	328	ASP	CB-CG-OD2	-9.66	109.60	118.30
1	A	236	ARG	NE-CZ-NH1	9.57	125.08	120.30
1	B	236	ARG	NE-CZ-NH1	9.35	124.97	120.30
1	B	328	ASP	CB-CG-OD1	9.25	126.63	118.30
1	A	212	ARG	CD-NE-CZ	9.15	136.41	123.60
1	B	338	ASP	CA-CB-CG	9.11	133.44	113.40
1	B	212	ARG	CD-NE-CZ	8.98	136.17	123.60
1	B	51	ARG	NE-CZ-NH2	-8.89	115.86	120.30
1	B	212	ARG	NE-CZ-NH1	8.19	124.40	120.30
1	A	89	ARG	NE-CZ-NH2	-7.96	116.32	120.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	87	TYR	CB-CG-CD1	-7.89	116.27	121.00
1	A	51	ARG	CD-NE-CZ	7.82	134.55	123.60
1	B	237	ARG	CD-NE-CZ	7.68	134.35	123.60
1	A	222	ARG	CD-NE-CZ	7.66	134.33	123.60
1	A	172	TYR	CB-CG-CD2	-7.64	116.42	121.00
1	B	237	ARG	NE-CZ-NH1	7.57	124.09	120.30
1	B	239	TYR	CB-CG-CD1	-7.28	116.63	121.00
1	B	281	ARG	NE-CZ-NH1	7.15	123.88	120.30
1	A	51	ARG	NE-CZ-NH2	-7.10	116.75	120.30
1	A	237	ARG	NE-CZ-NH1	6.97	123.78	120.30
1	A	132	TYR	CB-CG-CD1	6.80	125.08	121.00
1	A	177	TYR	CB-CG-CD2	-6.79	116.93	121.00
1	B	247	ARG	NE-CZ-NH2	6.77	123.68	120.30
1	B	163	ARG	NE-CZ-NH2	-6.61	117.00	120.30
1	B	80	TYR	CB-CG-CD2	6.52	124.91	121.00
1	B	98	ALA	CB-CA-C	6.43	119.75	110.10
1	B	289	PHE	CB-CG-CD1	-6.39	116.33	120.80
1	B	87	TYR	CB-CG-CD2	6.32	124.79	121.00
1	A	318	ARG	NE-CZ-NH1	6.26	123.43	120.30
1	B	80	TYR	CB-CG-CD1	-6.13	117.32	121.00
1	A	216	ARG	NE-CZ-NH2	-5.72	117.44	120.30
1	B	51	ARG	NH1-CZ-NH2	5.71	125.68	119.40
1	A	212	ARG	NE-CZ-NH1	5.60	123.10	120.30
1	A	320	ARG	CD-NE-CZ	-5.56	115.82	123.60
1	A	89	ARG	NE-CZ-NH1	5.51	123.05	120.30
1	A	212	ARG	CA-CB-CG	5.48	125.45	113.40
1	B	101	TYR	CB-CG-CD1	-5.46	117.72	121.00
1	A	65	THR	CA-CB-CG2	-5.34	104.92	112.40
1	A	218	ALA	CB-CA-C	5.33	118.10	110.10
1	B	247	ARG	NH1-CZ-NH2	-5.32	113.55	119.40
1	B	161	PHE	CB-CG-CD2	-5.28	117.11	120.80
1	B	242	LEU	CA-C-N	5.21	128.67	117.20
1	A	236	ARG	NE-CZ-NH2	-5.18	117.71	120.30
1	A	336	CYS	CA-CB-SG	5.16	123.29	114.00
1	A	198	LEU	CA-CB-CG	5.13	127.09	115.30
1	B	239	TYR	CB-CG-CD2	5.08	124.05	121.00
1	B	83	GLU	CA-CB-CG	5.05	124.52	113.40
1	B	190	PHE	CB-CG-CD2	-5.02	117.29	120.80

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2350	0	2363	34	0
1	B	2409	0	2424	46	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	18	0	16	1	0
3	B	18	0	16	0	0
4	A	180	0	0	1	0
4	B	184	0	0	8	0
All	All	5169	0	4819	78	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 8.

All (78) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:354:THR:HB	1:B:355:PRO:HD2	1.47	0.96
1:A:212:ARG:NH2	1:A:216:ARG:HH21	1.70	0.87
1:B:65:THR:HG22	4:B:2167:HOH:O	1.81	0.80
1:B:216:ARG:O	1:B:219:LYS:HG3	1.83	0.79
1:B:61:GLY:O	1:B:65:THR:HG23	1.83	0.79
1:A:341:LEU:O	1:A:344:THR:HG22	1.86	0.75
1:B:220:ARG:HE	1:B:225:GLU:HB2	1.57	0.70
1:A:198:LEU:HB3	1:A:199:PRO:HD2	1.75	0.67
1:B:62:LYS:O	1:B:66:THR:HG23	1.95	0.67
1:B:75:ARG:HD2	1:B:75:ARG:H	1.59	0.66
1:B:54:ILE:HG13	1:B:66:THR:HG22	1.76	0.65
1:B:66:THR:HG21	4:B:2016:HOH:O	1.94	0.65
1:B:246:VAL:HG21	1:B:324:VAL:HG21	1.81	0.62
1:B:274:PRO:N	4:B:2129:HOH:O	2.33	0.61
1:A:64:THR:O	1:A:68:LEU:HD23	2.02	0.60
1:A:61:GLY:HA2	1:A:220:ARG:NH1	2.16	0.60
1:A:65:THR:HG21	1:A:336:CYS:HB2	1.84	0.60
1:A:198:LEU:HB3	1:A:199:PRO:CD	2.35	0.57
1:A:327:LEU:HD23	1:A:329:TYR:CZ	2.40	0.57

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:334:ALA:HB1	1:A:337:ARG:NH2	2.19	0.56
1:A:65:THR:HG21	1:A:336:CYS:CB	2.36	0.56
1:B:102:THR:O	1:B:106:ARG:HG3	2.06	0.56
1:B:339:ALA:O	1:B:343:LEU:HD23	2.06	0.56
1:B:262:LEU:O	1:B:263:SER:C	2.45	0.55
1:A:97:ILE:HD13	3:A:500:TMC:H152	1.89	0.55
1:A:164:HIS:CG	1:A:165:PRO:HD2	2.42	0.54
1:A:358:ILE:HB	1:A:359:PRO:HD3	1.90	0.54
1:B:293:ARG:HD3	4:B:2145:HOH:O	2.07	0.54
1:A:65:THR:CG2	1:A:336:CYS:HB2	2.38	0.53
1:B:217:LEU:O	1:B:219:LYS:N	2.39	0.53
1:B:358:ILE:HB	1:B:359:PRO:HD3	1.90	0.52
1:A:213:HIS:CE1	1:A:232:LEU:HD11	2.44	0.52
1:B:354:THR:HB	1:B:355:PRO:CD	2.29	0.51
1:B:50:LEU:HD21	1:B:344:THR:HG23	1.93	0.50
1:B:54:ILE:HG13	1:B:66:THR:CG2	2.41	0.50
1:B:69:LEU:HD13	1:B:69:LEU:O	2.12	0.49
1:A:122:THR:HB	1:B:123:SER:OG	2.12	0.49
1:A:60:MET:HG2	1:A:329:TYR:CD2	2.48	0.49
1:B:75:ARG:HD2	1:B:75:ARG:N	2.27	0.48
1:A:164:HIS:ND1	1:A:166:ILE:HG12	2.28	0.48
1:A:63:THR:HG22	1:A:67:GLN:HE22	1.79	0.48
1:A:364:LEU:HD22	1:B:310:TRP:CZ2	2.49	0.48
1:A:63:THR:HG22	1:A:67:GLN:NE2	2.28	0.48
1:B:258:ASP:OD2	1:B:281:ARG:NH2	2.47	0.48
1:B:276:SER:HB2	1:B:324:VAL:HB	1.96	0.48
1:B:69:LEU:HD13	1:B:69:LEU:C	2.34	0.48
1:B:345:SER:HB2	4:B:2173:HOH:O	2.12	0.48
1:B:152:ALA:HB1	1:B:153:PRO:HD2	1.94	0.47
1:B:351:HIS:HB3	4:B:2001:HOH:O	2.13	0.47
1:B:164:HIS:CG	1:B:165:PRO:HD2	2.49	0.47
1:A:263:SER:HB2	4:A:2132:HOH:O	2.14	0.47
1:B:169:LEU:O	1:B:190:PHE:HB3	2.15	0.46
1:B:155:PRO:HD3	1:B:349:GLN:NE2	2.31	0.46
1:A:46:MET:HA	1:A:46:MET:CE	2.46	0.46
1:A:217:LEU:HD22	1:A:232:LEU:HD22	1.98	0.46
1:B:59:GLY:HA3	1:B:217:LEU:HD11	1.98	0.45
1:B:333:PRO:HA	4:B:2167:HOH:O	2.16	0.45
1:A:263:SER:HG	1:A:293:ARG:HE	1.61	0.45
1:B:235:ILE:HD12	1:B:235:ILE:HA	1.92	0.43
1:B:278:ALA:HB3	4:B:2131:HOH:O	2.17	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:212:ARG:HH22	1:A:216:ARG:HH21	1.57	0.43
1:A:154:PRO:HA	1:A:155:PRO:HD3	1.75	0.43
1:B:172:TYR:N	1:B:173:PRO:CD	2.82	0.43
1:B:59:GLY:HA3	1:B:217:LEU:CD1	2.49	0.43
1:B:327:LEU:HD23	1:B:329:TYR:CZ	2.53	0.42
1:A:118:ALA:HA	1:A:181:SER:O	2.20	0.42
1:A:116:ASP:O	1:A:119:VAL:HG22	2.20	0.42
1:A:220:ARG:HH11	1:A:220:ARG:HG3	1.85	0.41
1:B:240:GLY:HA2	1:B:274:PRO:HG2	2.03	0.41
1:A:341:LEU:HD12	1:A:341:LEU:HA	1.92	0.41
1:B:101:TYR:OH	1:B:225:GLU:OE2	2.31	0.41
1:B:152:ALA:HB1	1:B:153:PRO:CD	2.50	0.41
1:B:299:ALA:HB3	1:B:301:ASN:OD1	2.21	0.41
1:A:212:ARG:NH2	1:A:216:ARG:NH2	2.53	0.41
1:B:135:THR:HG23	1:B:364:LEU:HD11	2.03	0.41
1:A:354:THR:HB	1:A:355:PRO:CD	2.51	0.40
1:B:142:HIS:HB3	1:B:361:ILE:HD11	2.03	0.40
1:A:164:HIS:CD2	1:A:165:PRO:HD2	2.57	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	300/331 (91%)	292 (97%)	8 (3%)	0	100	100
1	B	308/331 (93%)	300 (97%)	7 (2%)	1 (0%)	41	24
All	All	608/662 (92%)	592 (97%)	15 (2%)	1 (0%)	47	30

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	263	SER

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	247/264 (94%)	239 (97%)	8 (3%)	39	20
1	B	254/264 (96%)	246 (97%)	8 (3%)	40	21
All	All	501/528 (95%)	485 (97%)	16 (3%)	39	20

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

Mol	Chain	Res	Type
1	A	46	MET
1	A	67	GLN
1	A	69	LEU
1	A	159	LEU
1	A	198	LEU
1	A	229	LEU
1	A	360	THR
1	A	362	CYS
1	B	51	ARG
1	B	65	THR
1	B	75	ARG
1	B	76	ASP
1	B	215	ASP
1	B	217	LEU
1	B	220	ARG
1	B	229	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	67	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
3	TMC	A	500	-	15,20,20	1.55	2 (13%)	14,32,32	3.89	7 (50%)
2	SO4	A	400	-	4,4,4	0.72	0	6,6,6	0.37	0
3	TMC	B	500	-	15,20,20	1.52	1 (6%)	14,32,32	4.90	5 (35%)
2	SO4	B	400	-	4,4,4	0.77	0	6,6,6	0.54	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
3	TMC	A	500	-	-	3/3/29/29	0/3/3/3
3	TMC	B	500	-	-	1/3/29/29	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	500	TMC	C6-N5	4.18	1.40	1.33
3	A	500	TMC	C6-N5	3.62	1.39	1.33
3	A	500	TMC	C11-N5	2.42	1.43	1.38

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	500	TMC	C11-N5-C6	14.73	127.58	115.14
3	A	500	TMC	C11-N5-C6	11.07	124.49	115.14
3	B	500	TMC	C14-C17-N8	-8.37	102.20	113.39
3	A	500	TMC	C14-C17-N8	-5.72	105.74	113.39
3	B	500	TMC	C14-C10-C1	4.09	109.41	103.22
3	A	500	TMC	C1-C13-C17	-3.84	105.39	108.39
3	B	500	TMC	C1-C13-C17	-3.84	105.40	108.39
3	A	500	TMC	C14-C10-C1	3.36	108.31	103.22
3	A	500	TMC	O18-C10-C14	3.01	118.44	111.28
3	A	500	TMC	C1-C15-C13	2.97	61.43	59.95
3	B	500	TMC	O16-C12-C1	-2.83	105.94	112.30
3	A	500	TMC	C10-C14-C17	2.28	107.69	104.20

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	500	TMC	C10-C1-C12-O16
3	A	500	TMC	C15-C1-C12-O16
3	B	500	TMC	C10-C1-C12-O16
3	A	500	TMC	C13-C1-C12-O16
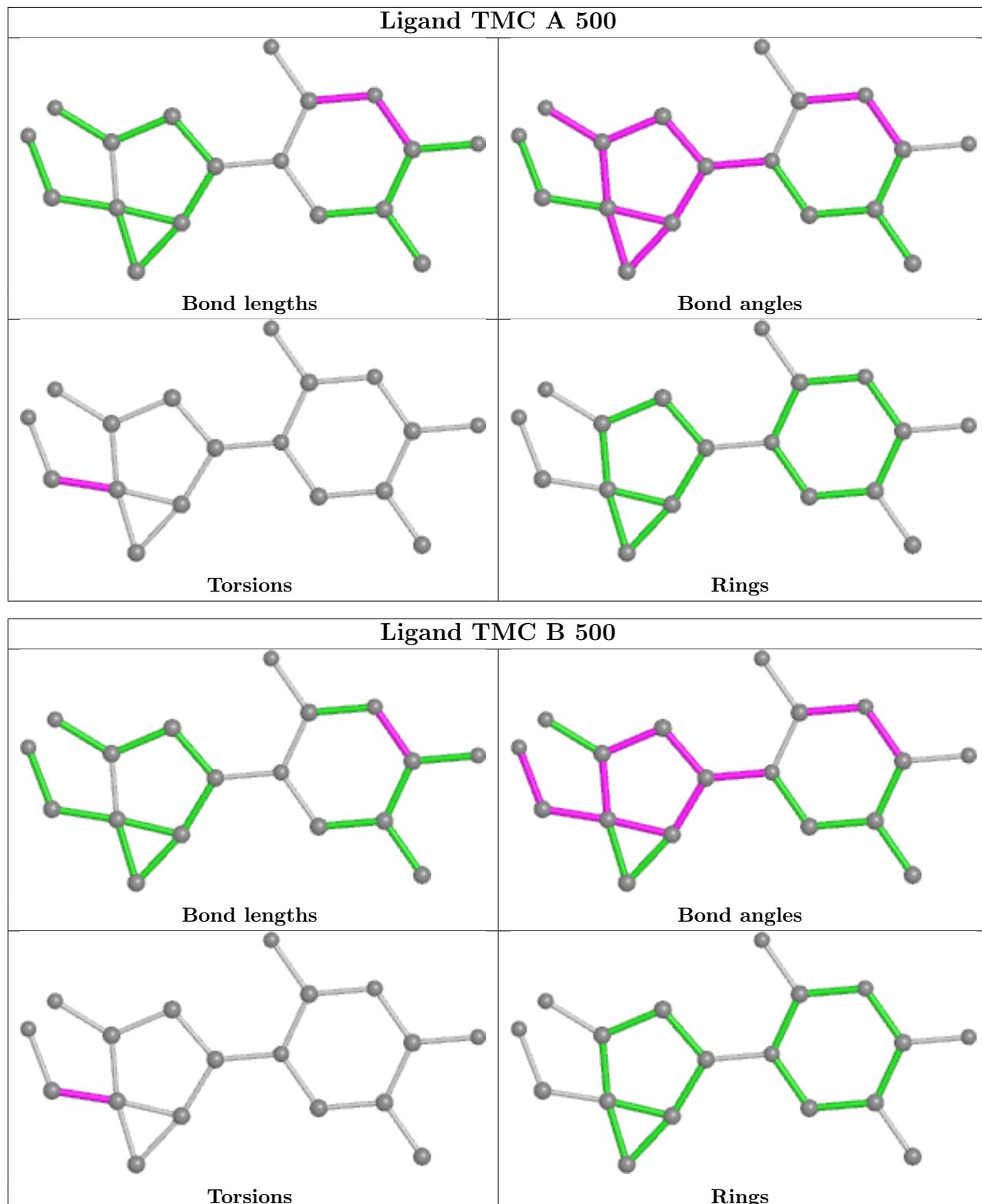
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	500	TMC	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring

in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand TMC A 500

Bond lengths — Bond angles — Torsions — Rings

Ligand TMC B 500

Bond lengths — Bond angles — Torsions — Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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(Å²)	Q<0.9
1	A	308/331 (93%)	0.36	24 (7%)	13	15	18, 27, 61, 112	0
1	B	316/331 (95%)	0.36	27 (8%)	10	12	17, 27, 65, 115	0
All	All	624/662 (94%)	0.36	51 (8%)	11	13	17, 27, 64, 115	0

All (51) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	264	GLY	12.4
1	B	265	THR	9.9
1	A	148	GLY	8.4
1	A	71	ALA	7.9
1	B	152	ALA	6.8
1	B	267	VAL	6.7
1	B	151	HIS	6.5
1	B	263	SER	6.5
1	A	68	LEU	6.2
1	A	76	ASP	6.0
1	B	227	LEU	6.0
1	B	220	ARG	5.2
1	B	300	PRO	5.2
1	B	225	GLU	5.1
1	B	153	PRO	5.1
1	B	266	ALA	4.7
1	A	265	THR	4.5
1	B	226	ARG	4.4
1	B	264	GLY	4.2
1	B	46	MET	4.1
1	A	279	GLY	4.0
1	A	263	SER	3.7
1	A	154	PRO	3.6
1	A	69	LEU	3.3

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	355	PRO	3.2
1	B	219	LYS	3.2
1	A	153	PRO	3.1
1	B	338	ASP	3.0
1	B	274	PRO	2.9
1	A	332	SER	2.6
1	A	374	GLU	2.6
1	A	65	THR	2.6
1	A	46	MET	2.6
1	B	76	ASP	2.6
1	A	334	ALA	2.6
1	B	346	GLY	2.5
1	A	70	VAL	2.5
1	A	370	ARG	2.3
1	A	335	GLY	2.3
1	B	212	ARG	2.3
1	B	106	ARG	2.2
1	B	109	GLN	2.2
1	A	355	PRO	2.1
1	B	276	SER	2.1
1	A	280	PRO	2.1
1	A	333	PRO	2.0
1	A	330	ASP	2.0
1	B	211	ASP	2.0
1	B	217	LEU	2.0
1	A	338	ASP	2.0
1	B	215	ASP	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 monosaccharides in this entry.
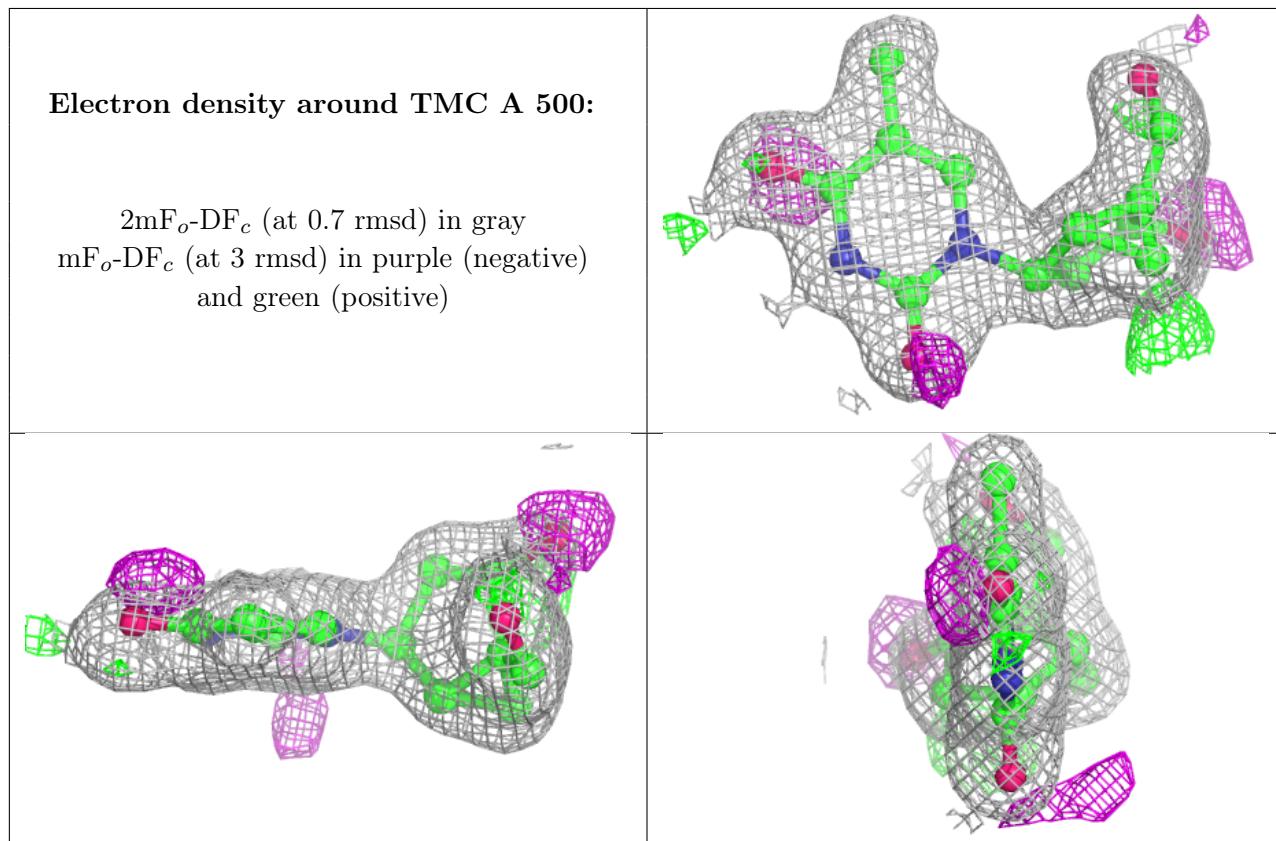
6.4 Ligands ⓘ
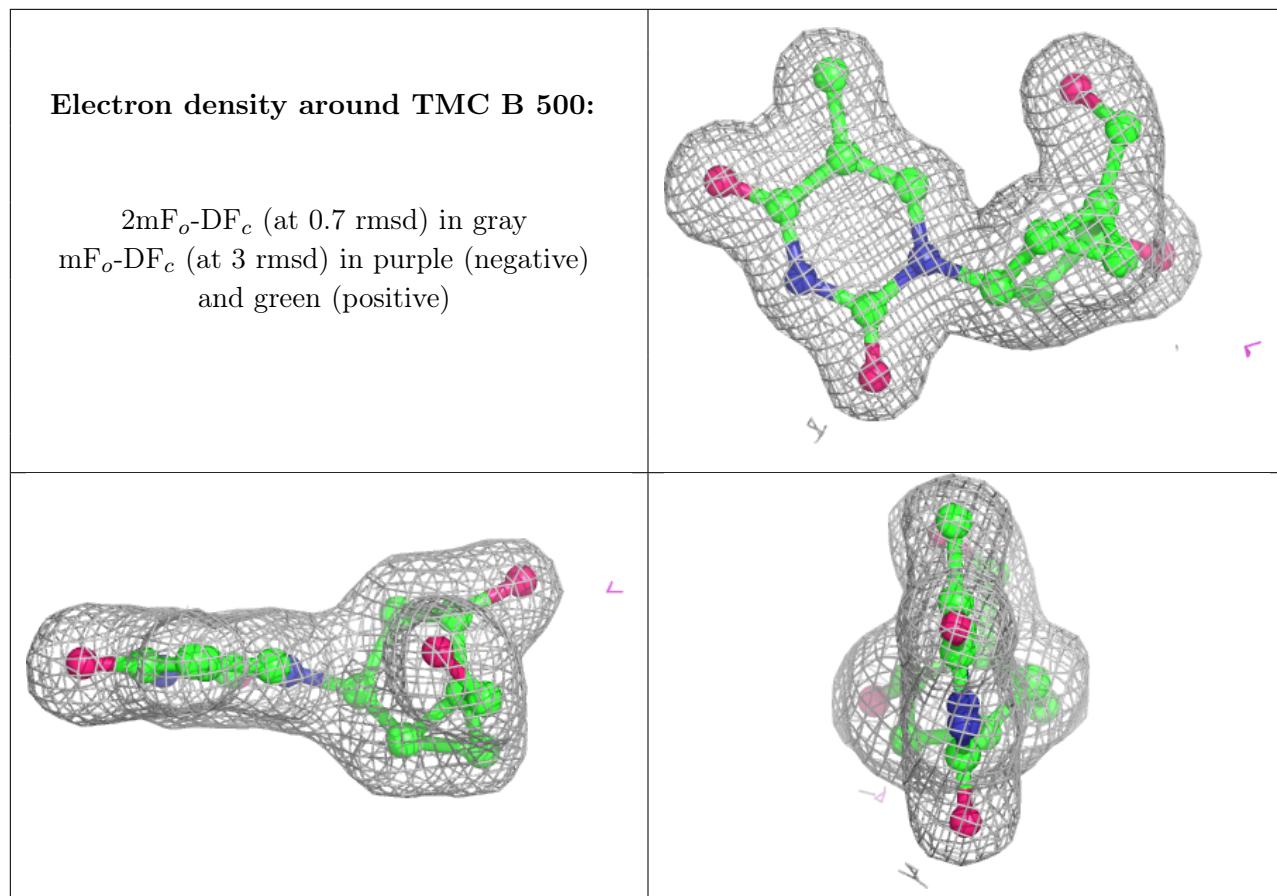
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

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(Å^2)	Q<0.9
3	TMC	A	500	18/18	0.92	0.12	20,23,38,51	0
3	TMC	B	500	18/18	0.96	0.09	18,26,31,34	0
2	SO4	A	400	5/5	0.98	0.07	32,33,38,42	0
2	SO4	B	400	5/5	0.99	0.07	27,27,32,33	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 TMC A 500:

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

Electron density around TMC B 500:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.