



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 17, 2020 – 09:15 AM GMT

PDB ID : 6TH2  
Title : Crystal structure of Mycobacterium smegmatis CoaB in complex with CTP  
Authors : Mendes, V.; Blaszczyk, M.; Bryant, O.; Cory-Wright, J.; Blundell, T.L.  
Deposited on : 2019-11-18  
Resolution : 1.84 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](mailto: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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.14.6  
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) : 2.14.6

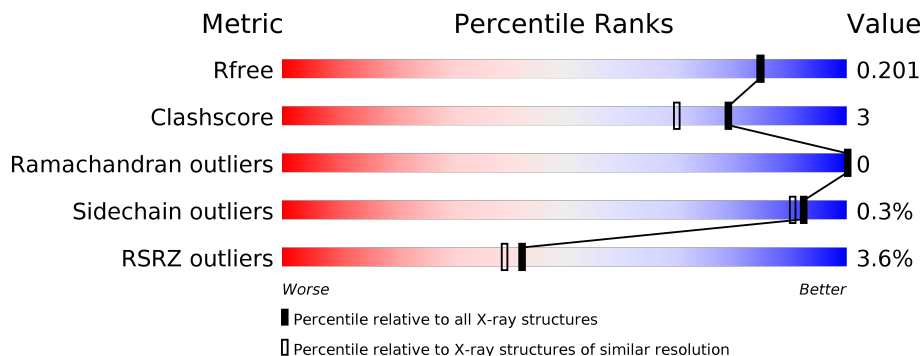
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.84 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	4003 (1.86-1.82)
Clashscore	141614	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)
RSRZ outliers	127900	3957 (1.86-1.82)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	237	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 89%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">3%      89%      • 10%</p>
1	B	237	<div style="display: flex; align-items: center;"> <div style="width: 0%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 91%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 3%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">%      91%      5% •</p>
1	C	237	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 81%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 12%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">3%      81%      6% 12%</p>
1	D	237	<div style="display: flex; align-items: center;"> <div style="width: 6%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 89%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 7%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 0%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">6%      89%      7% •</p>

## 2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 7087 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 Coenzyme A biosynthesis bifunctional protein CoaBC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	214	Total 1524	C 943	N 284	O 291	S 6	0	0	0
1	B	229	Total 1655	C 1023	N 311	O 315	S 6	0	0	0
1	C	208	Total 1479	C 916	N 274	O 283	S 6	0	0	0
1	D	229	Total 1624	C 1006	N 304	O 308	S 6	0	0	0

There are 32 discrepancies between the modelled and reference sequences:

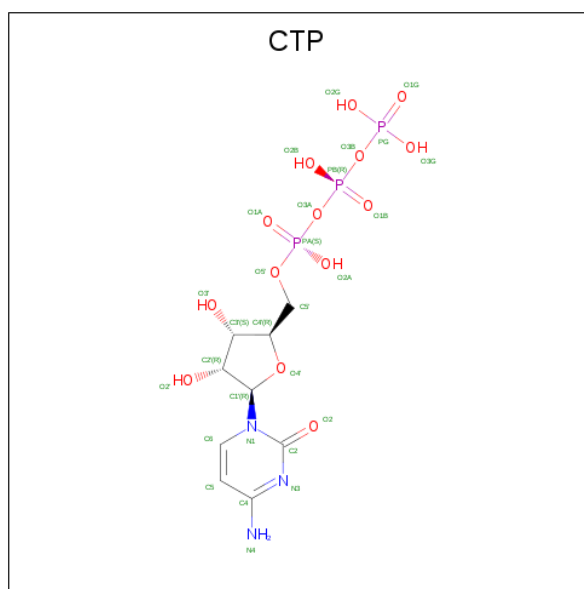
Chain	Residue	Modelled	Actual	Comment	Reference
A	178	MET	-	initiating methionine	UNP A0QWT2
A	179	ALA	-	expression tag	UNP A0QWT2
A	180	HIS	-	expression tag	UNP A0QWT2
A	181	HIS	-	expression tag	UNP A0QWT2
A	182	HIS	-	expression tag	UNP A0QWT2
A	183	HIS	-	expression tag	UNP A0QWT2
A	184	HIS	-	expression tag	UNP A0QWT2
A	185	HIS	-	expression tag	UNP A0QWT2
B	178	MET	-	initiating methionine	UNP A0QWT2
B	179	ALA	-	expression tag	UNP A0QWT2
B	180	HIS	-	expression tag	UNP A0QWT2
B	181	HIS	-	expression tag	UNP A0QWT2
B	182	HIS	-	expression tag	UNP A0QWT2
B	183	HIS	-	expression tag	UNP A0QWT2
B	184	HIS	-	expression tag	UNP A0QWT2
B	185	HIS	-	expression tag	UNP A0QWT2
C	178	MET	-	initiating methionine	UNP A0QWT2
C	179	ALA	-	expression tag	UNP A0QWT2
C	180	HIS	-	expression tag	UNP A0QWT2
C	181	HIS	-	expression tag	UNP A0QWT2
C	182	HIS	-	expression tag	UNP A0QWT2

*Continued on next page...*

Continued from previous page...

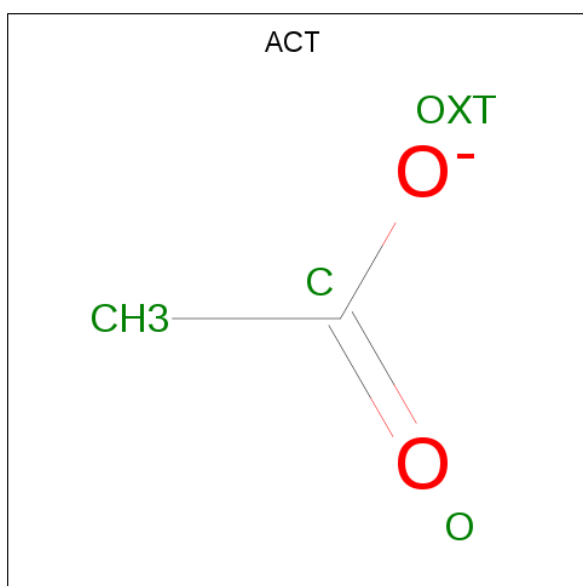
Chain	Residue	Modelled	Actual	Comment	Reference
C	183	HIS	-	expression tag	UNP A0QWT2
C	184	HIS	-	expression tag	UNP A0QWT2
C	185	HIS	-	expression tag	UNP A0QWT2
D	178	MET	-	initiating methionine	UNP A0QWT2
D	179	ALA	-	expression tag	UNP A0QWT2
D	180	HIS	-	expression tag	UNP A0QWT2
D	181	HIS	-	expression tag	UNP A0QWT2
D	182	HIS	-	expression tag	UNP A0QWT2
D	183	HIS	-	expression tag	UNP A0QWT2
D	184	HIS	-	expression tag	UNP A0QWT2
D	185	HIS	-	expression tag	UNP A0QWT2

- Molecule 2 is CYTIDINE-5'-TRIPHOSPHATE (three-letter code: CTP) (formula:  $C_9H_{16}N_3O_{14}P_3$ ).



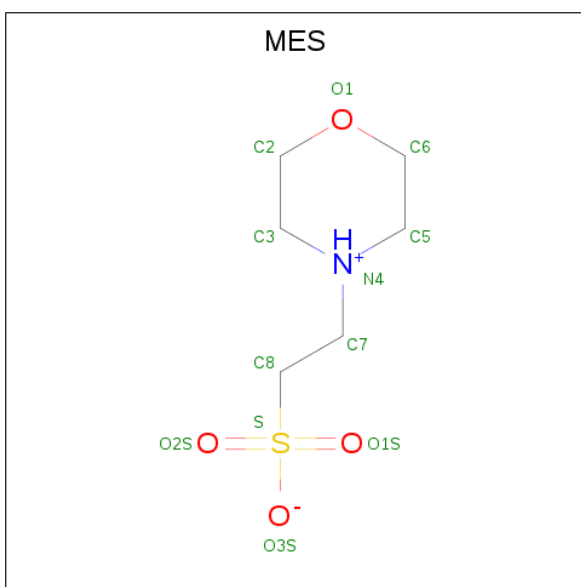
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total Ca 1 1	0	0
3	A	1	Total Ca 1 1	0	0
3	D	1	Total Ca 1 1	0	0
3	C	1	Total Ca 1 1	0	0

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula:  $C_2H_3O_2$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	C	1	Total C O 4 2 2	0	0
4	C	1	Total C O 4 2 2	0	0
4	D	1	Total C O 4 2 2	0	0

- Molecule 5 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula:  $C_6H_{13}NO_4S$ ).



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

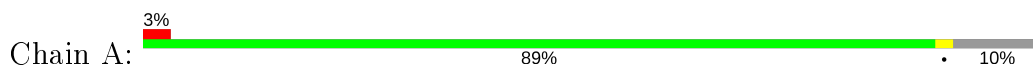
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	A	161	Total 161	O 161	0	0
6	B	164	Total 164	O 164	0	0
6	C	158	Total 158	O 158	0	0
6	D	134	Total 134	O 134	0	0

### 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.

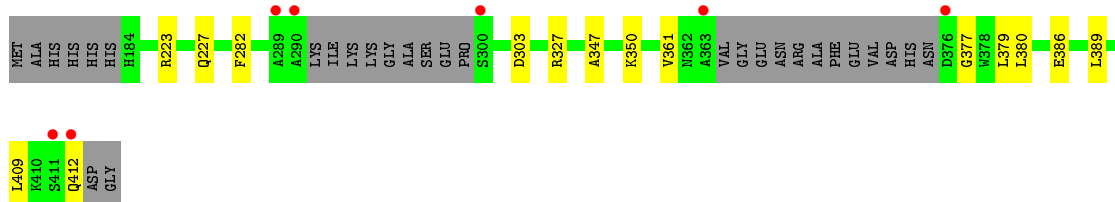
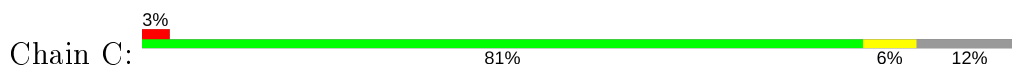
- Molecule 1: Coenzyme A biosynthesis bifunctional protein CoaBC



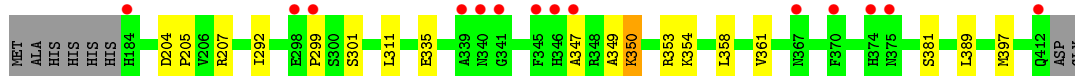
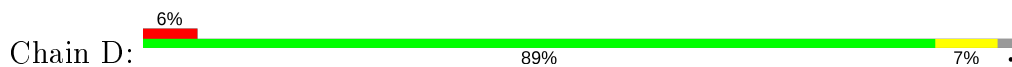
- Molecule 1: Coenzyme A biosynthesis bifunctional protein CoaBC



- Molecule 1: Coenzyme A biosynthesis bifunctional protein CoaBC



- Molecule 1: Coenzyme A biosynthesis bifunctional protein CoaBC



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	76.50Å 76.84Å 149.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.95 – 1.84 68.30 – 1.84	Depositor EDS
% Data completeness (in resolution range)	99.2 (50.95-1.84) 99.2 (68.30-1.84)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.07 (at 1.84Å)	Xtrriage
Refinement program	PHENIX 1.16	Depositor
R, $R_{free}$	0.176 , 0.202 0.178 , 0.201	Depositor DCC
$R_{free}$ test set	3852 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	29.4	Xtrriage
Anisotropy	0.220	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 45.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.029 for k,h,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7087	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.00% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CA, CTP, MES, ACT

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	0.47	0/1540	0.61	0/2089
1	B	0.52	0/1677	0.62	0/2273
1	C	0.37	0/1495	0.60	0/2027
1	D	0.46	0/1646	0.60	0/2235
All	All	0.46	0/6358	0.61	0/8624

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	1524	0	1511	4	0
1	B	1655	0	1649	9	0
1	C	1479	0	1472	12	0
1	D	1624	0	1597	13	0
2	A	29	0	12	0	0
2	B	29	0	12	0	0
2	C	29	0	12	0	0
2	D	29	0	12	0	0
3	A	1	0	0	0	0

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	4	0	3	0	0
4	B	4	0	3	0	0
4	C	8	0	6	0	0
4	D	4	0	3	0	0
5	A	12	0	12	0	0
5	B	12	0	12	0	0
5	C	12	0	12	1	0
5	D	12	0	12	0	0
6	A	161	0	0	3	0
6	B	164	0	0	2	0
6	C	158	0	0	0	0
6	D	134	0	0	0	0
All	All	7087	0	6340	36	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

All (36) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:380:LEU:HD22	1:C:386:GLU:HG2	1.71	0.72
1:D:350:LYS:HE2	1:D:353:ARG:HH21	1.64	0.63
1:A:353:ARG:NH2	6:A:602:HOH:O	2.31	0.62
1:D:311:LEU:HD23	1:D:354:LYS:HD2	1.84	0.60
1:B:368:ARG:HG2	1:B:371:GLU:OE2	2.04	0.57
1:D:335:GLU:OE2	1:D:350:LYS:NZ	2.39	0.56
1:B:349:ALA:HB1	1:B:353:ARG:NH1	2.20	0.56
1:D:389:LEU:HD13	1:D:397:MET:SD	2.47	0.55
1:A:301:SER:OG	1:B:303:ASP:OD2	2.22	0.54
1:C:303:ASP:OD2	1:D:301:SER:OG	2.27	0.51
1:D:349:ALA:O	1:D:353:ARG:HB2	2.11	0.51
1:C:361:VAL:O	1:C:377:GLY:HA3	2.13	0.47
1:C:223:ARG:O	1:C:227:GLN:HB2	2.16	0.46
1:C:327:ARG:HB3	1:C:412:GLN:HE22	1.81	0.46
1:C:282:PHE:CE1	1:D:299:PRO:HB3	2.51	0.45
1:D:358:LEU:HD23	1:D:381:SER:HA	1.99	0.45
1:B:349:ALA:HB1	1:B:353:ARG:HH11	1.82	0.43
1:C:409:LEU:HD23	1:C:412:GLN:HE21	1.82	0.43

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:291:LYS:NZ	6:B:612:HOH:O	2.52	0.43
1:B:380:LEU:HD22	1:B:386:GLU:HG2	2.01	0.43
1:D:207:ARG:HH12	1:D:292:ILE:HD12	1.83	0.42
1:B:358:LEU:HD12	1:B:380:LEU:O	2.19	0.42
5:C:505:MES:H81	5:C:505:MES:H31	1.86	0.42
1:D:347:ALA:HB1	1:D:361:VAL:HG21	2.01	0.42
1:C:347:ALA:HB1	1:C:361:VAL:HG21	2.01	0.42
1:D:207:ARG:NH1	1:D:292:ILE:HD12	2.34	0.42
1:B:347:ALA:HB1	1:B:361:VAL:HG21	2.01	0.41
1:C:409:LEU:HA	1:C:412:GLN:HE21	1.86	0.41
1:A:306:ARG:HG3	6:A:723:HOH:O	2.21	0.41
1:D:350:LYS:HB2	1:D:350:LYS:HE3	1.36	0.41
1:A:340:ASN:ND2	6:A:614:HOH:O	2.54	0.41
1:D:204:ASP:HB2	1:D:205:PRO:CD	2.50	0.41
1:C:389:LEU:HD23	1:C:389:LEU:HA	1.91	0.41
1:B:400:ARG:NH1	6:B:615:HOH:O	2.54	0.41
1:C:379:LEU:HG	1:C:389:LEU:HG	2.02	0.40
1:C:350:LYS:HB2	1:C:350:LYS:HE3	1.71	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	208/237 (88%)	204 (98%)	4 (2%)	0	100	100
1	B	227/237 (96%)	224 (99%)	3 (1%)	0	100	100
1	C	202/237 (85%)	198 (98%)	4 (2%)	0	100	100
1	D	227/237 (96%)	223 (98%)	4 (2%)	0	100	100
All	All	864/948 (91%)	849 (98%)	15 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	147/173 (85%)	147 (100%)	0	100	100
1	B	162/173 (94%)	161 (99%)	1 (1%)	86	82
1	C	143/173 (83%)	143 (100%)	0	100	100
1	D	154/173 (89%)	153 (99%)	1 (1%)	86	82
All	All	606/692 (88%)	604 (100%)	2 (0%)	92	90

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	381	SER
1	D	350	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	238	ASN
1	C	362	ASN
1	C	412	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

Of 17 ligands modelled in this entry, 4 are monoatomic - leaving 13 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
2	CTP	A	501	3	23,30,30	0.78	0	30,47,47	1.30	5 (16%)
4	ACT	C	504	-	1,3,3	6.37	1 (100%)	0,3,3	0.00	-
5	MES	C	505	-	12,12,12	2.29	1 (8%)	14,16,16	1.97	4 (28%)
4	ACT	C	503	-	1,3,3	7.81	1 (100%)	0,3,3	0.00	-
4	ACT	A	503	-	1,3,3	4.84	1 (100%)	0,3,3	0.00	-
4	ACT	D	503	-	1,3,3	6.20	1 (100%)	0,3,3	0.00	-
2	CTP	D	501	3	23,30,30	0.75	0	30,47,47	1.14	3 (10%)
2	CTP	B	501	3	23,30,30	0.77	0	30,47,47	1.34	4 (13%)
4	ACT	B	503	-	1,3,3	6.10	1 (100%)	0,3,3	0.00	-
5	MES	D	504	-	12,12,12	1.94	1 (8%)	14,16,16	2.72	6 (42%)
5	MES	A	504	-	12,12,12	2.10	1 (8%)	14,16,16	2.14	5 (35%)
5	MES	B	504	-	12,12,12	1.99	1 (8%)	14,16,16	1.72	2 (14%)
2	CTP	C	501	3	23,30,30	0.88	1 (4%)	30,47,47	1.28	4 (13%)

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
2	CTP	A	501	3	-	7/20/38/38	0/2/2/2
5	MES	C	505	-	-	1/6/14/14	0/1/1/1
2	CTP	D	501	3	-	7/20/38/38	0/2/2/2
2	CTP	B	501	3	-	7/20/38/38	0/2/2/2
5	MES	D	504	-	-	3/6/14/14	0/1/1/1
5	MES	A	504	-	-	4/6/14/14	0/1/1/1
5	MES	B	504	-	-	1/6/14/14	0/1/1/1

*Continued on next page...*

*Continued from previous page...*

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	CTP	C	501	3	-	6/20/38/38	0/2/2/2

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	503	ACT	CH3-C	7.81	1.58	1.48
5	C	505	MES	C8-S	-7.65	1.66	1.77
5	A	504	MES	C8-S	-6.87	1.67	1.77
5	B	504	MES	C8-S	-6.57	1.68	1.77
5	D	504	MES	C8-S	-6.39	1.68	1.77
4	C	504	ACT	CH3-C	6.37	1.56	1.48
4	D	503	ACT	CH3-C	6.20	1.56	1.48
4	B	503	ACT	CH3-C	6.10	1.56	1.48
4	A	503	ACT	CH3-C	4.84	1.54	1.48
2	C	501	CTP	C6-N1	2.19	1.38	1.35

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	504	MES	O1S-S-C8	5.76	113.86	106.92
5	C	505	MES	C5-N4-C3	5.05	120.20	108.83
5	B	504	MES	C5-N4-C3	4.90	119.86	108.83
5	D	504	MES	C5-N4-C3	4.88	119.80	108.83
5	A	504	MES	C5-N4-C3	4.53	119.03	108.83
2	C	501	CTP	C2-N3-C4	4.37	120.78	116.34
2	A	501	CTP	C2-N3-C4	4.08	120.48	116.34
5	D	504	MES	C6-C5-N4	-3.91	104.17	110.10
5	A	504	MES	O2S-S-C8	3.51	111.15	106.92
2	B	501	CTP	C2-N3-C4	3.44	119.83	116.34
5	D	504	MES	C7-N4-C5	3.36	119.82	111.23
5	A	504	MES	O3S-S-C8	3.12	110.81	105.77
2	D	501	CTP	C2-N3-C4	3.00	119.38	116.34
2	B	501	CTP	PB-O3B-PG	-2.90	122.89	132.83
2	B	501	CTP	PB-O3A-PA	-2.82	123.15	132.83
5	C	505	MES	C7-N4-C3	2.80	118.38	111.23
2	B	501	CTP	C5'-C4'-C3'	-2.73	104.96	115.18
5	A	504	MES	C7-N4-C5	2.68	118.08	111.23
5	D	504	MES	C7-N4-C3	2.63	117.95	111.23
5	B	504	MES	O2S-S-C8	2.45	109.86	106.92
2	C	501	CTP	C5'-C4'-C3'	-2.35	106.38	115.18
2	D	501	CTP	N4-C4-N3	2.33	120.18	116.49
5	A	504	MES	C7-N4-C3	2.29	117.10	111.23

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	505	MES	O1S-S-C8	2.27	109.64	106.92
2	D	501	CTP	PB-O3B-PG	-2.23	125.18	132.83
2	A	501	CTP	C5'-C4'-C3'	-2.22	106.87	115.18
5	D	504	MES	O3S-S-C8	2.21	109.35	105.77
2	C	501	CTP	PB-O3B-PG	-2.12	125.54	132.83
5	C	505	MES	O2S-S-C8	2.11	109.46	106.92
2	A	501	CTP	C5-C4-N3	-2.11	119.29	121.72
2	A	501	CTP	PB-O3B-PG	-2.09	125.65	132.83
2	C	501	CTP	PB-O3A-PA	-2.08	125.67	132.83
2	A	501	CTP	PB-O3A-PA	-2.08	125.69	132.83

There are no chirality outliers.

All (36) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	505	MES	C8-C7-N4-C3
2	D	501	CTP	C5'-O5'-PA-O1A
2	D	501	CTP	C5'-O5'-PA-O2A
5	A	504	MES	C7-C8-S-O1S
5	A	504	MES	C7-C8-S-O3S
2	C	501	CTP	PB-O3B-PG-O2G
2	B	501	CTP	C3'-C4'-C5'-O5'
5	D	504	MES	C8-C7-N4-C3
5	A	504	MES	C8-C7-N4-C5
5	B	504	MES	C8-C7-N4-C5
2	B	501	CTP	PB-O3B-PG-O1G
2	B	501	CTP	PB-O3B-PG-O2G
2	C	501	CTP	PB-O3B-PG-O3G
2	A	501	CTP	PB-O3A-PA-O1A
2	C	501	CTP	PB-O3A-PA-O2A
5	D	504	MES	C7-C8-S-O2S
5	A	504	MES	C7-C8-S-O2S
2	A	501	CTP	C3'-C4'-C5'-O5'
2	D	501	CTP	PA-O3A-PB-O2B
2	B	501	CTP	PB-O3A-PA-O1A
2	B	501	CTP	PB-O3A-PA-O2A
2	C	501	CTP	C3'-C4'-C5'-O5'
2	A	501	CTP	PG-O3B-PB-O1B
2	D	501	CTP	PG-O3B-PB-O1B
2	B	501	CTP	PA-O3A-PB-O2B
2	B	501	CTP	O4'-C4'-C5'-O5'
2	A	501	CTP	PB-O3B-PG-O1G

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms
2	C	501	CTP	PB-O3B-PG-O1G
2	A	501	CTP	PB-O3B-PG-O2G
2	A	501	CTP	PB-O3B-PG-O3G
2	D	501	CTP	C5'-O5'-PA-O3A
2	D	501	CTP	PB-O3A-PA-O1A
2	D	501	CTP	PA-O3A-PB-O1B
2	C	501	CTP	PB-O3A-PA-O1A
2	A	501	CTP	C5'-O5'-PA-O1A
5	D	504	MES	C7-C8-S-O3S

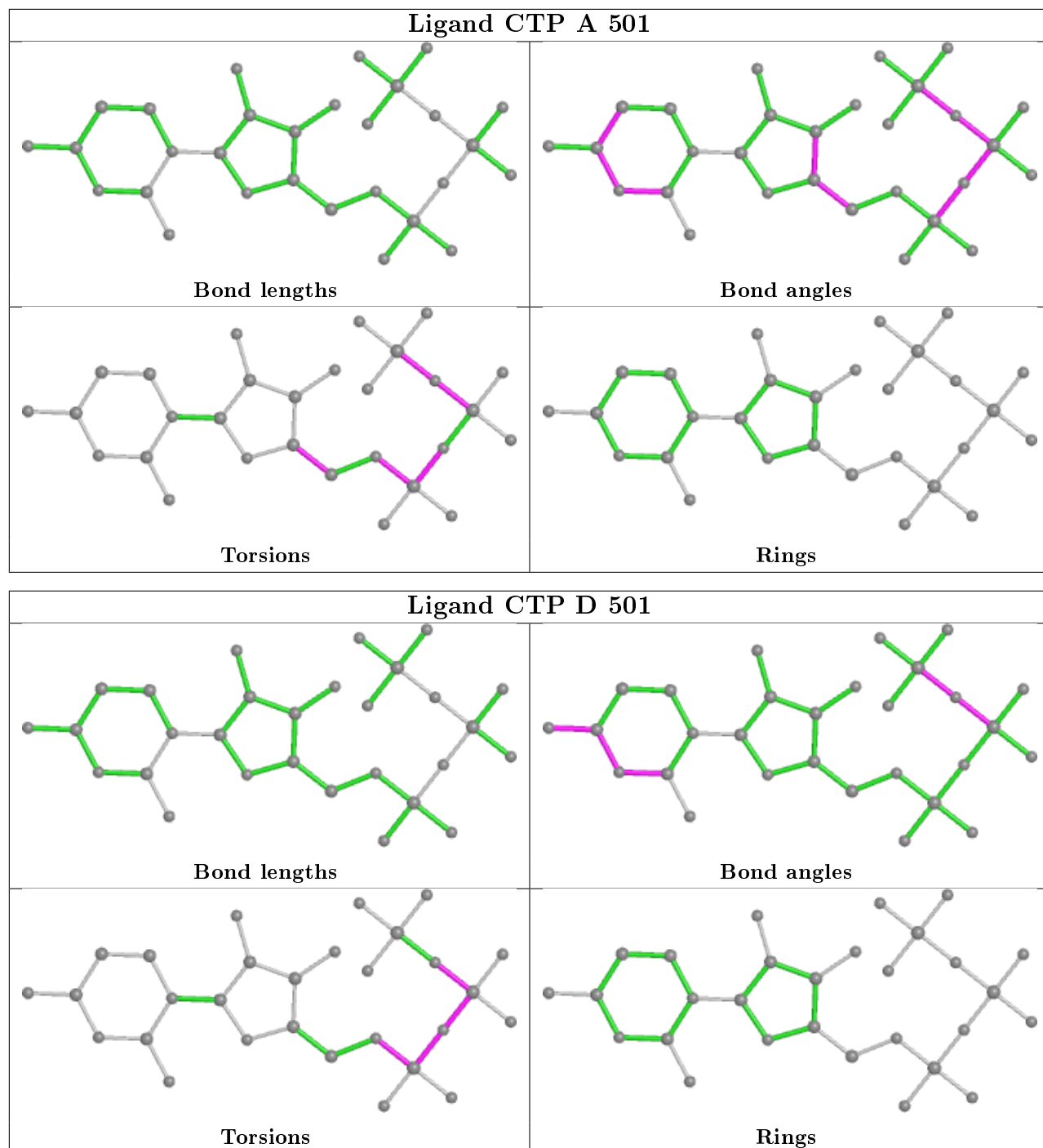
There are no ring outliers.

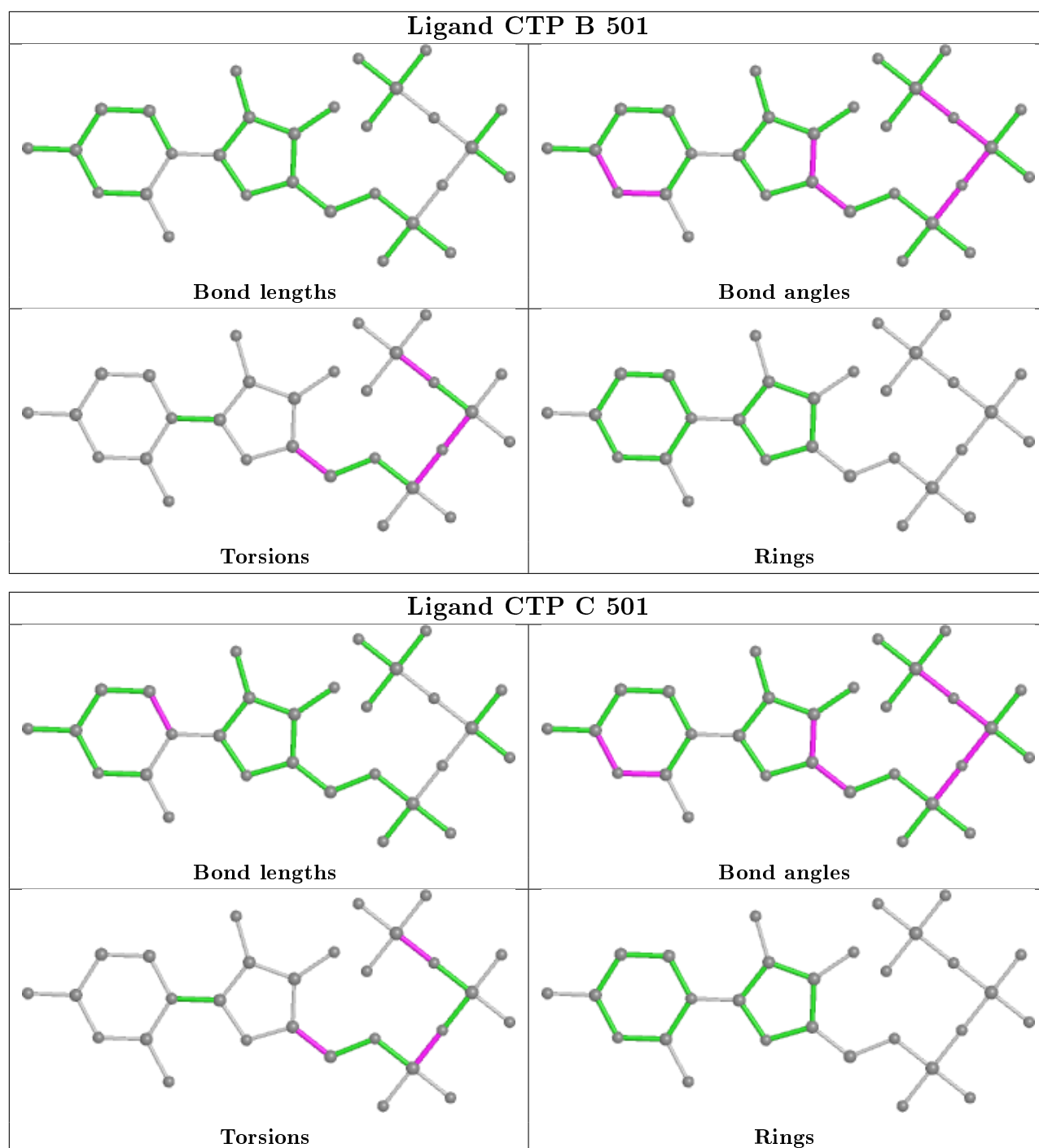
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	505	MES	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.







## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	214/237 (90%)	0.16	8 (3%) 41 38	19, 29, 64, 94	0
1	B	229/237 (96%)	0.10	3 (1%) 77 77	21, 33, 67, 89	0
1	C	208/237 (87%)	0.15	7 (3%) 45 41	20, 31, 64, 94	0
1	D	229/237 (96%)	0.31	14 (6%) 21 19	20, 35, 77, 123	0
All	All	880/948 (92%)	0.18	32 (3%) 42 39	19, 32, 69, 123	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	339	ALA	6.4
1	D	340	ASN	6.1
1	D	345	PHE	5.8
1	D	184	HIS	5.7
1	C	363	ALA	5.2
1	A	292	ILE	4.7
1	D	341	GLY	4.1
1	C	290	ALA	4.0
1	A	291	LYS	3.8
1	C	289	ALA	3.7
1	A	184	HIS	3.7
1	D	298	GLU	3.7
1	C	300	SER	3.4
1	A	364	VAL	3.3
1	B	384	GLY	3.3
1	C	412	GLN	3.0
1	B	297	SER	2.8
1	D	412	GLN	2.6
1	D	374	HIS	2.5
1	A	300	SER	2.5
1	D	347	ALA	2.5

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	D	370	PHE	2.5
1	D	299	PRO	2.4
1	B	184	HIS	2.4
1	C	411	SER	2.4
1	A	289	ALA	2.4
1	D	375	ASN	2.4
1	C	376	ASP	2.3
1	A	290	ALA	2.3
1	D	367	ASN	2.2
1	D	346	HIS	2.0
1	A	363	ALA	2.0

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

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

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> 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.

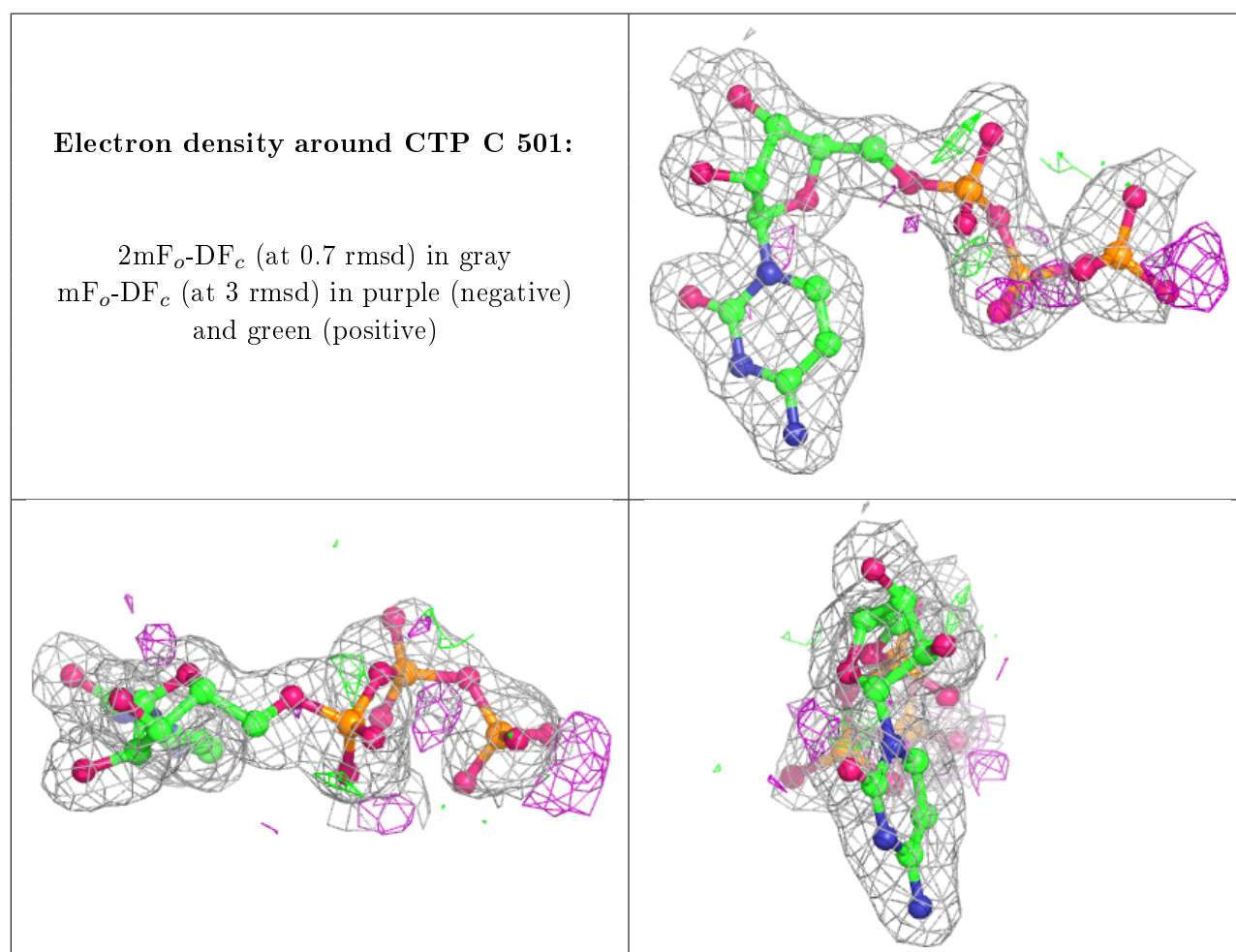
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	MES	C	505	12/12	0.80	0.32	69,75,81,81	0
5	MES	A	504	12/12	0.81	0.22	49,55,59,62	0
4	ACT	D	503	4/4	0.89	0.14	29,30,30,31	0
2	CTP	C	501	29/29	0.91	0.15	18,24,65,72	0
2	CTP	D	501	29/29	0.92	0.15	23,30,119,122	0
2	CTP	A	501	29/29	0.93	0.14	17,22,58,59	0
4	ACT	C	503	4/4	0.94	0.13	24,29,31,33	0
2	CTP	B	501	29/29	0.94	0.12	22,29,78,85	0
4	ACT	C	504	4/4	0.95	0.10	23,27,30,33	0
4	ACT	B	503	4/4	0.95	0.09	29,33,33,34	0
3	CA	B	502	1/1	0.95	0.06	49,49,49,49	0
4	ACT	A	503	4/4	0.95	0.09	22,24,28,29	0

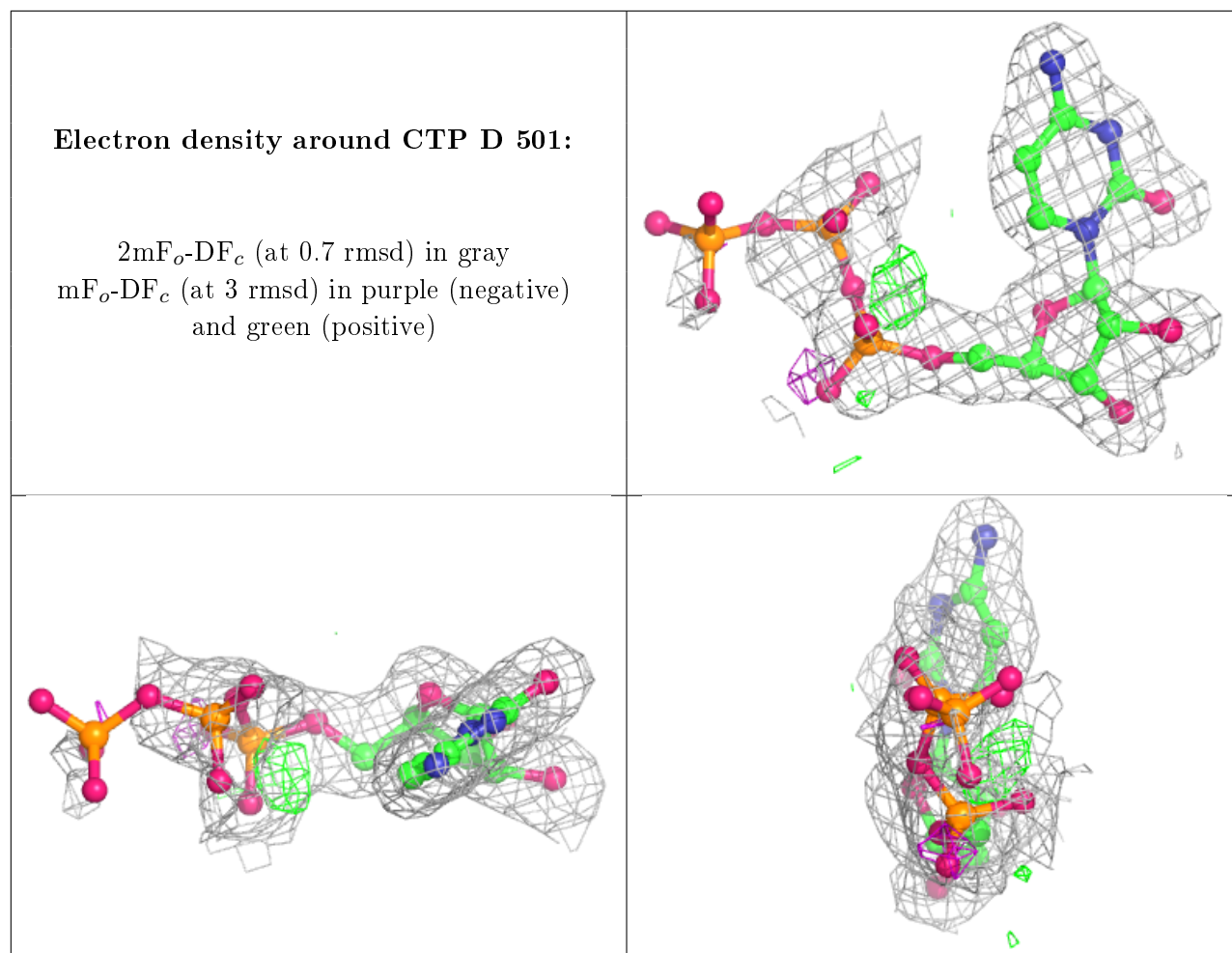
*Continued on next page...*

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	MES	D	504	12/12	0.96	0.14	30,39,49,53	0
5	MES	B	504	12/12	0.97	0.13	26,33,40,40	0
3	CA	D	502	1/1	0.98	0.06	65,65,65,65	0
3	CA	A	502	1/1	0.99	0.06	29,29,29,29	0
3	CA	C	502	1/1	1.00	0.07	31,31,31,31	0

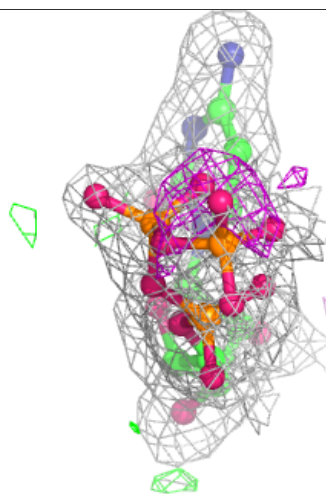
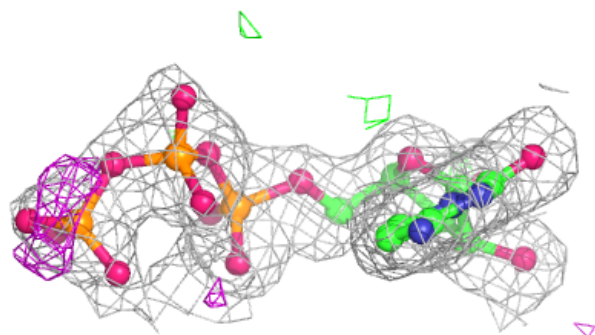
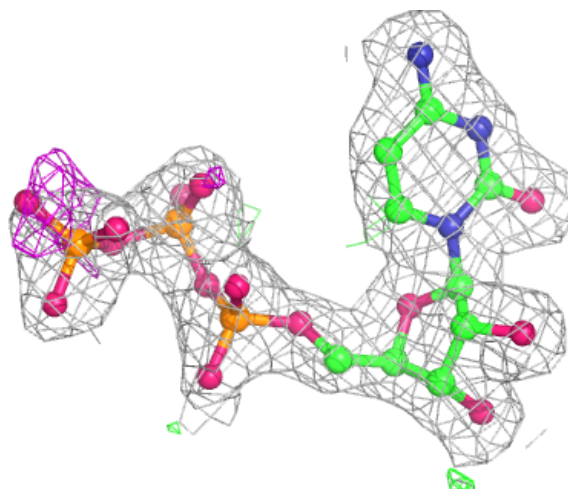
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

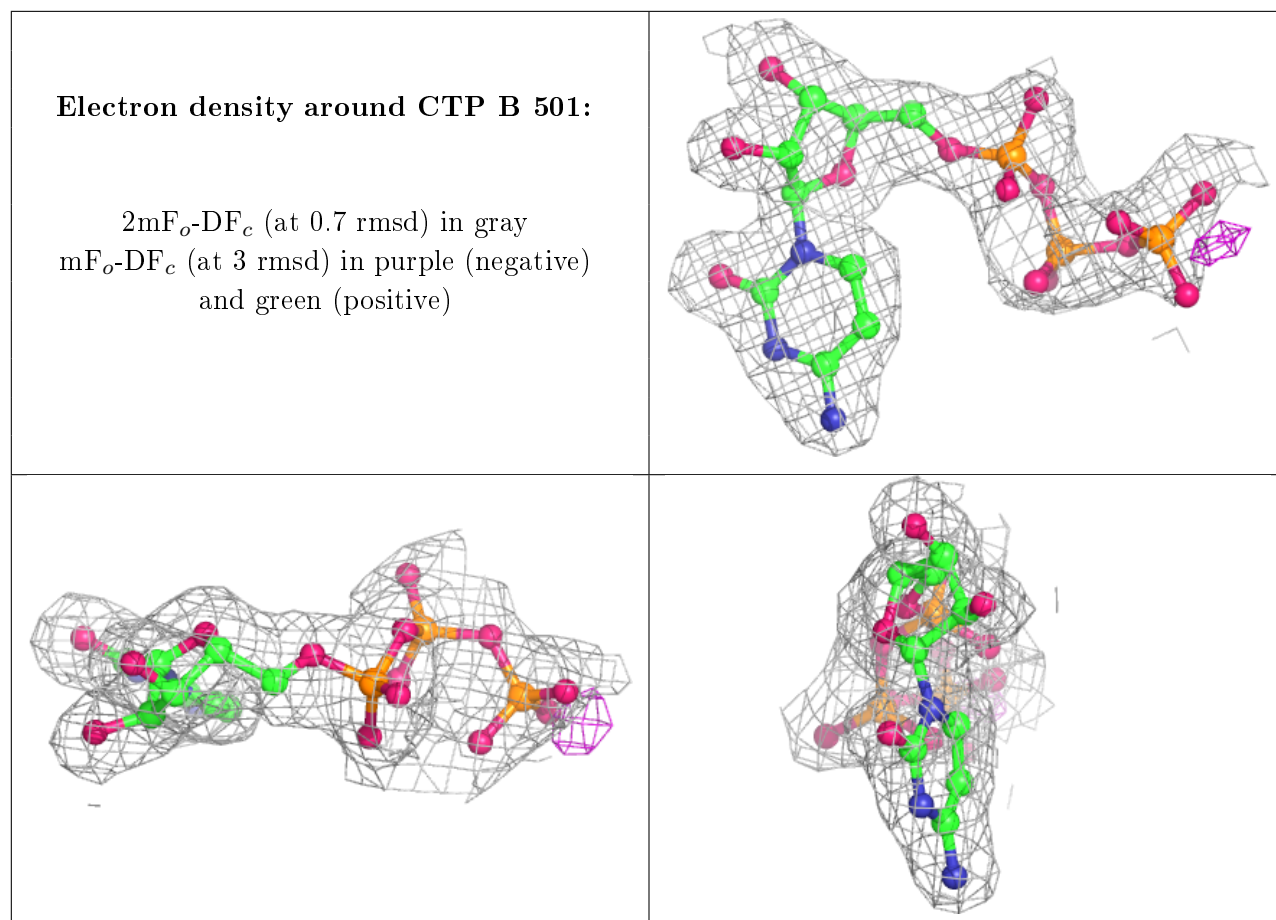




**Electron density around CTP A 501:**

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





## 6.5 Other polymers [i](#)

There are no such residues in this entry.