



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 13, 2023 – 12:32 AM EDT

PDB ID : 4O6R  
Title : Crystal Structure of a Putative Aldehyde Dehydrogenase from Burkholderia cenocepacia  
Authors : Seattle Structural Genomics Center for Infectious Disease (SSGCID)  
Deposited on : 2013-12-23  
Resolution : 1.90 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](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 types of validation reports are described at

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

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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 : 2.35.1  
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) : 2.35.1

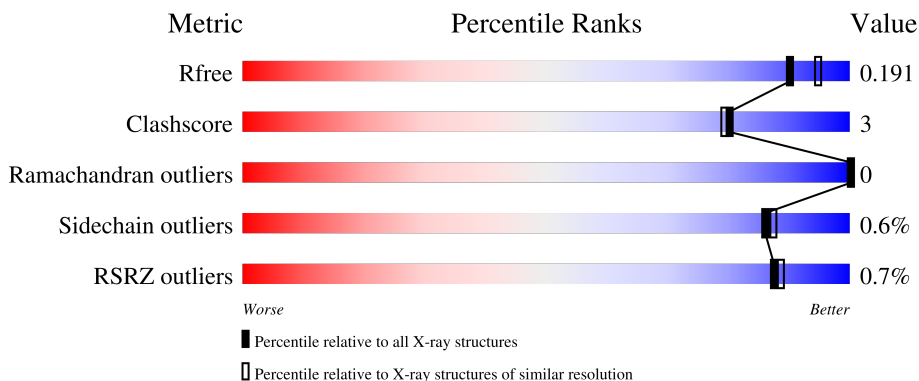
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

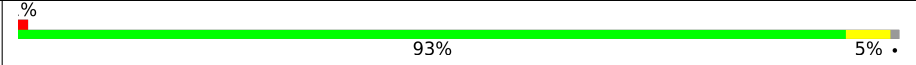
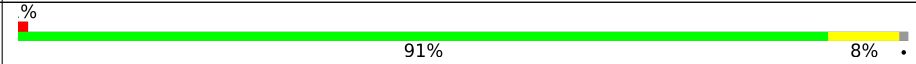
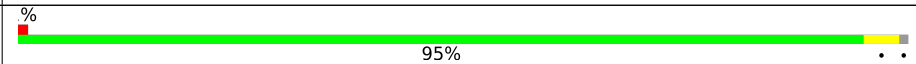
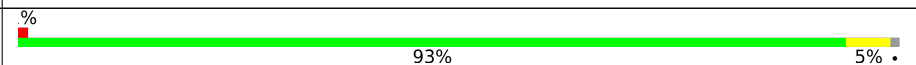
The reported resolution of this entry is 1.90 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	496	 93% 5%
1	B	496	 91% 8%
1	C	496	 95%
1	D	496	 93% 5%

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:

<b>Mol</b>	<b>Type</b>	<b>Chain</b>	<b>Res</b>	<b>Chirality</b>	<b>Geometry</b>	<b>Clashes</b>	<b>Electron density</b>
4	EDO	C	507	-	-	X	-

## 2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 17485 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 Aldehyde Dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	489	3768	2379	670	701	18	0	16	0
1	B	489	3798	2396	680	705	17	0	20	0
1	C	489	3763	2374	670	700	19	0	14	0
1	D	489	3797	2392	680	706	19	0	17	0

There are 32 discrepancies between the modelled and reference sequences:

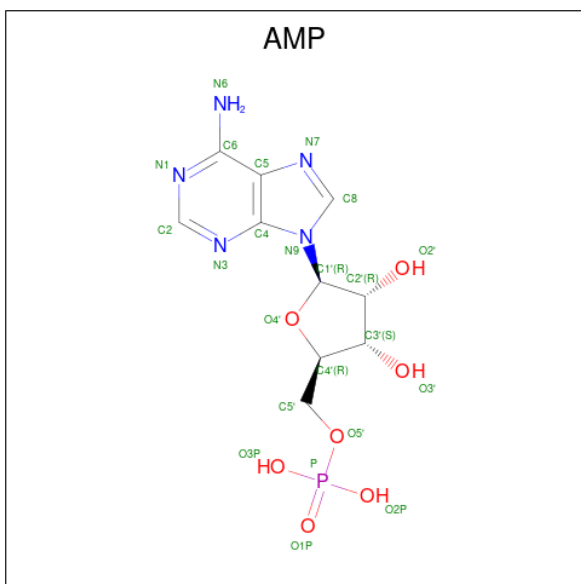
Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	MET	-	expression tag	UNP B4EJX1
A	-6	ALA	-	expression tag	UNP B4EJX1
A	-5	HIS	-	expression tag	UNP B4EJX1
A	-4	HIS	-	expression tag	UNP B4EJX1
A	-3	HIS	-	expression tag	UNP B4EJX1
A	-2	HIS	-	expression tag	UNP B4EJX1
A	-1	HIS	-	expression tag	UNP B4EJX1
A	0	HIS	-	expression tag	UNP B4EJX1
B	-7	MET	-	expression tag	UNP B4EJX1
B	-6	ALA	-	expression tag	UNP B4EJX1
B	-5	HIS	-	expression tag	UNP B4EJX1
B	-4	HIS	-	expression tag	UNP B4EJX1
B	-3	HIS	-	expression tag	UNP B4EJX1
B	-2	HIS	-	expression tag	UNP B4EJX1
B	-1	HIS	-	expression tag	UNP B4EJX1
B	0	HIS	-	expression tag	UNP B4EJX1
C	-7	MET	-	expression tag	UNP B4EJX1
C	-6	ALA	-	expression tag	UNP B4EJX1
C	-5	HIS	-	expression tag	UNP B4EJX1
C	-4	HIS	-	expression tag	UNP B4EJX1
C	-3	HIS	-	expression tag	UNP B4EJX1

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-2	HIS	-	expression tag	UNP B4EJX1
C	-1	HIS	-	expression tag	UNP B4EJX1
C	0	HIS	-	expression tag	UNP B4EJX1
D	-7	MET	-	expression tag	UNP B4EJX1
D	-6	ALA	-	expression tag	UNP B4EJX1
D	-5	HIS	-	expression tag	UNP B4EJX1
D	-4	HIS	-	expression tag	UNP B4EJX1
D	-3	HIS	-	expression tag	UNP B4EJX1
D	-2	HIS	-	expression tag	UNP B4EJX1
D	-1	HIS	-	expression tag	UNP B4EJX1
D	0	HIS	-	expression tag	UNP B4EJX1

- Molecule 2 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: C<sub>10</sub>H<sub>14</sub>N<sub>5</sub>O<sub>7</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
2	B	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
2	C	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
2	D	1	Total	C	N	O	P	0	0
			23	10	5	7	1		

- Molecule 3 is NITRATE ION (three-letter code: NO3) (formula: NO<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total N O 4 1 3	0	0
3	A	1	Total N O 4 1 3	0	0
3	B	1	Total N O 4 1 3	0	0
3	B	1	Total N O 4 1 3	0	0
3	C	1	Total N O 4 1 3	0	0
3	C	1	Total N O 4 1 3	0	0
3	D	1	Total N O 4 1 3	0	0
3	D	1	Total N O 4 1 3	0	0

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



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

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 6 3 3	0	0
5	B	1	Total C O 6 3 3	0	0
5	C	1	Total C O 6 3 3	0	0
5	D	1	Total C O 6 3 3	0	0

- Molecule 6 is water.

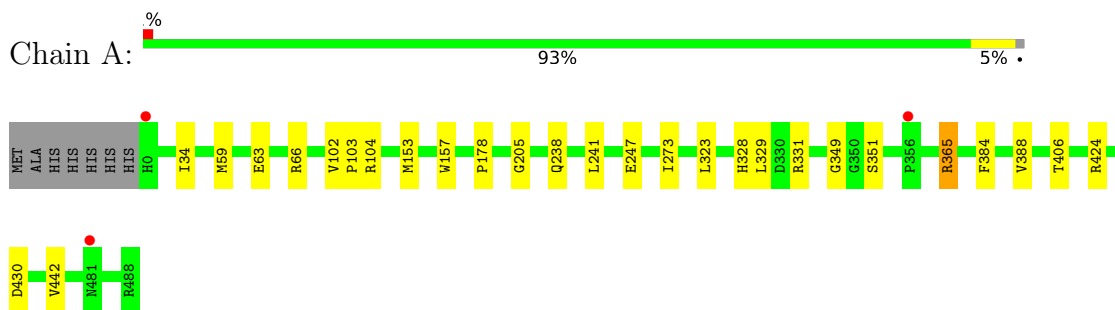
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	536	Total O 540 540	0	4
6	B	547	Total O 549 549	0	2
6	C	541	Total O 549 549	0	7
6	D	537	Total O 537 537	0	0



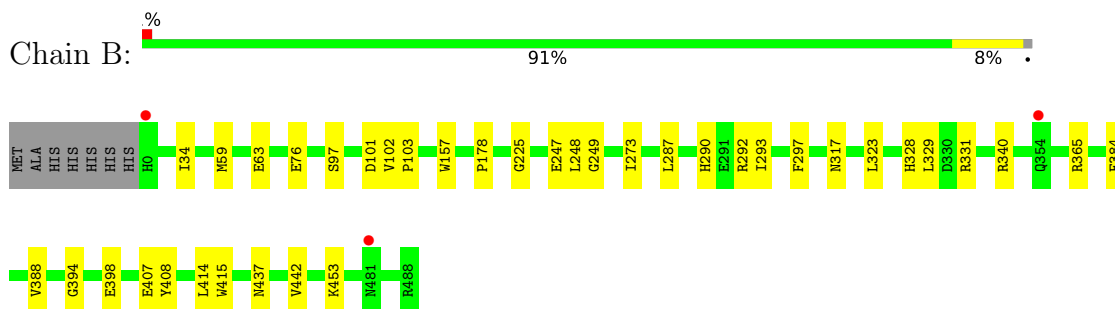
### 3 Residue-property plots [i](#)

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.

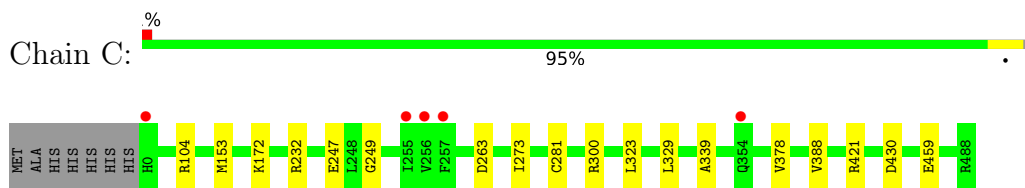
- Molecule 1: Aldehyde Dehydrogenase



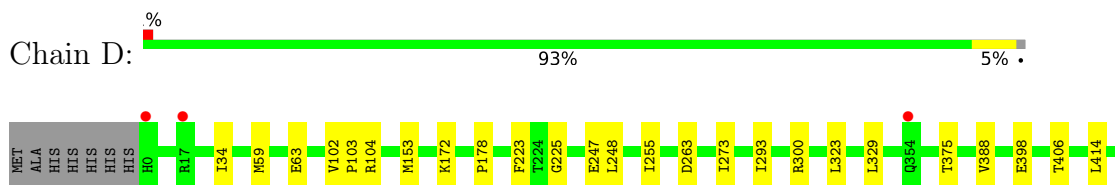
- Molecule 1: Aldehyde Dehydrogenase



- Molecule 1: Aldehyde Dehydrogenase



- Molecule 1: Aldehyde Dehydrogenase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	112.13Å 125.61Å 150.85Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.86 – 1.90 19.86 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.86-1.90) 99.9 (19.86-1.90)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.41 (at 1.90Å)	Xtrriage
Refinement program	REFMAC 5.8.0049	Depositor
R, $R_{free}$	0.151 , 0.182 0.163 , 0.191	Depositor DCC
$R_{free}$ test set	8408 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	13.1	Xtrriage
Anisotropy	0.029	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 55.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	17485	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	14.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 49.64 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.2450e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: AMP, EDO, GOL, NO3

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	0.56	0/3873	0.74	4/5270 (0.1%)
1	B	0.56	0/3918	0.72	0/5327
1	C	0.54	0/3865	0.73	1/5256 (0.0%)
1	D	0.56	0/3902	0.73	2/5303 (0.0%)
All	All	0.56	0/15558	0.73	7/21156 (0.0%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	424	ARG	NE-CZ-NH1	6.37	123.48	120.30
1	D	424	ARG	NE-CZ-NH2	-6.33	117.13	120.30
1	A	238	GLN	CB-CA-C	-5.57	99.27	110.40
1	C	421	ARG	NE-CZ-NH1	5.33	122.97	120.30
1	A	365[A]	ARG	NE-CZ-NH1	-5.11	117.75	120.30
1	A	365[B]	ARG	NE-CZ-NH1	-5.11	117.75	120.30
1	A	424	ARG	NE-CZ-NH1	5.04	122.82	120.30

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	3768	0	3722	21	0
1	B	3798	0	3768	24	0
1	C	3763	0	3718	17	0
1	D	3797	0	3758	15	0
2	A	23	0	12	1	0
2	B	23	0	12	0	0
2	C	23	0	12	5	0
2	D	23	0	12	2	0
3	A	8	0	0	0	0
3	B	8	0	0	0	0
3	C	8	0	0	0	0
3	D	8	0	0	0	0
4	A	4	0	6	0	0
4	C	16	0	24	5	0
4	D	16	0	24	2	0
5	A	6	0	8	0	0
5	B	6	0	8	0	0
5	C	6	0	8	2	0
5	D	6	0	8	1	0
6	A	540	0	0	6	0
6	B	549	0	0	4	0
6	C	549	0	0	8	0
6	D	537	0	0	6	0
All	All	17485	0	15100	83	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 (83) 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:232[B]:ARG:HH11	2:C:502:AMP:N6	1.20	1.35
1:C:232[B]:ARG:NH1	2:C:502:AMP:HN61	1.46	1.12
1:A:153[B]:MET:HE1	6:A:1092:HOH:O	1.47	1.10
1:C:232[B]:ARG:NH1	2:C:502:AMP:N6	2.01	1.07
1:A:153[B]:MET:CE	6:A:1092:HOH:O	2.04	1.02
1:A:365[B]:ARG:HD3	6:A:784:HOH:O	1.75	0.86
5:D:508:GOL:H31	6:D:1137:HOH:O	1.81	0.81
1:C:281[A]:CYS:SG	6:C:958:HOH:O	2.23	0.74
1:B:365[B]:ARG:HD3	6:B:845:HOH:O	1.88	0.74
1:C:232[B]:ARG:HH11	2:C:502:AMP:HN61	0.73	0.72
1:C:104:ARG:HH21	4:C:507:EDO:H21	1.57	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:430:ASP:OD1	6:A:1122:HOH:O	2.15	0.65
4:D:507:EDO:H11	6:D:917:HOH:O	1.96	0.65
1:C:459:GLU:OE2	6:C:832:HOH:O	2.15	0.64
1:B:407:GLU:OE1	1:B:453:LYS:NZ	2.32	0.62
1:C:323:LEU:HD12	1:C:329:LEU:HA	1.80	0.62
1:A:104:ARG:HD3	1:A:153[A]:MET:SD	2.39	0.61
1:D:406:THR:O	6:D:916:HOH:O	2.16	0.61
1:A:351:SER:OG	1:A:365[A]:ARG:NH1	2.36	0.58
1:B:340[A]:ARG:NH1	6:B:967:HOH:O	2.14	0.57
1:C:249[B]:GLY:HA2	6:C:958:HOH:O	2.03	0.57
1:D:323:LEU:HD12	1:D:329:LEU:HA	1.87	0.57
1:D:375:THR:HG23	4:D:505:EDO:H11	1.86	0.56
1:B:292[A]:ARG:HA	1:B:292[A]:ARG:HE	1.72	0.55
1:C:104:ARG:HH21	4:C:507:EDO:C2	2.19	0.55
1:C:430:ASP:OD1	6:C:1041:HOH:O	2.18	0.55
1:D:104:ARG:HD3	1:D:153[B]:MET:SD	2.48	0.54
1:B:323:LEU:HD12	1:B:329:LEU:HA	1.89	0.54
1:D:223:PHE:HZ	2:D:502:AMP:O2P	1.90	0.54
1:D:34:ILE:HD13	1:D:178:PRO:HG3	1.90	0.53
1:A:323:LEU:HD12	1:A:329:LEU:HA	1.90	0.53
1:D:398[B]:GLU:HG3	6:D:1119:HOH:O	2.08	0.53
1:B:290:HIS:CE1	1:B:292[A]:ARG:HG2	2.46	0.51
1:A:406:THR:O	6:A:807:HOH:O	2.19	0.51
1:B:34:ILE:HD13	1:B:178:PRO:HG3	1.93	0.50
1:C:263[A]:ASP:OD1	1:C:300:ARG:NH2	2.43	0.50
1:B:328:HIS:NE2	1:B:384:PHE:O	2.39	0.49
1:A:241[B]:LEU:N	1:A:241[B]:LEU:HD22	2.28	0.48
1:D:263[A]:ASP:OD1	1:D:300:ARG:NH2	2.43	0.48
1:C:104:ARG:NH2	4:C:507:EDO:H21	2.28	0.47
4:C:507:EDO:H11	6:C:927:HOH:O	2.13	0.47
1:B:394[B]:GLY:N	1:B:398[B]:GLU:OE1	2.40	0.47
1:B:225:GLY:O	1:B:248[A]:LEU:HA	2.15	0.47
1:A:66:ARG:NH2	1:B:76:GLU:OE1	2.49	0.46
1:A:34:ILE:HD13	1:A:178:PRO:HG3	1.97	0.46
1:B:317:ASN:ND2	6:B:1047:HOH:O	2.41	0.45
1:A:59:MET:HG2	1:A:63[A]:GLU:HB2	1.97	0.45
1:B:102:VAL:HB	1:B:103:PRO:HD3	1.99	0.45
2:C:502:AMP:H3'	6:C:895:HOH:O	2.16	0.45
1:B:290:HIS:HE1	1:B:292[A]:ARG:HG2	1.80	0.45
1:A:157:TRP:CZ2	1:A:442[B]:VAL:HG11	2.52	0.45
1:B:249[A]:GLY:HA3	1:B:408:TYR:CE1	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:59:MET:HG2	1:D:63[A]:GLU:HB2	1.99	0.44
1:C:339:ALA:HB2	1:C:378:VAL:HG11	1.99	0.44
1:B:97:SER:HA	1:B:101:ASP:HB2	1.99	0.44
1:D:273:ILE:HG12	1:D:388:VAL:HB	1.98	0.44
1:B:157:TRP:CZ2	1:B:442[B]:VAL:HG11	2.53	0.44
2:D:502:AMP:N6	6:D:1114:HOH:O	2.50	0.44
1:C:273:ILE:HG12	1:C:388:VAL:HB	2.01	0.43
1:D:63[A]:GLU:OE1	6:D:1097:HOH:O	2.21	0.43
1:D:293:ILE:C	1:D:293:ILE:HD12	2.39	0.43
1:A:273:ILE:HG12	1:A:388:VAL:HB	2.01	0.43
1:A:349:GLY:HA2	1:A:365[A]:ARG:HE	1.84	0.43
1:A:104:ARG:HH11	1:A:153[B]:MET:HE1	1.84	0.42
4:C:507:EDO:C1	6:C:927:HOH:O	2.67	0.42
1:B:365[A]:ARG:NH2	6:B:971:HOH:O	2.51	0.42
1:C:300:ARG:NH2	5:C:508:GOL:O1	2.46	0.42
1:B:293:ILE:HD12	1:B:293:ILE:C	2.40	0.42
1:A:153[B]:MET:HE2	6:A:1092:HOH:O	1.99	0.42
1:B:59:MET:HG2	1:B:63[B]:GLU:HB2	2.02	0.42
1:A:328:HIS:CE1	1:A:384:PHE:HB3	2.55	0.41
1:B:287:LEU:HD21	1:B:297:PHE:CE1	2.55	0.41
1:B:328:HIS:CE1	1:B:384:PHE:HB3	2.56	0.41
1:A:102:VAL:HB	1:A:103:PRO:HD3	2.01	0.41
1:A:328:HIS:HE1	1:A:384:PHE:HB3	1.84	0.41
1:D:225:GLY:O	1:D:248[A]:LEU:HA	2.20	0.41
1:B:415:TRP:CE3	1:B:437:ASN:HA	2.56	0.41
1:A:205:GLY:HA3	2:A:501:AMP:C8	2.56	0.40
1:B:273:ILE:HG12	1:B:388:VAL:HB	2.03	0.40
5:C:508:GOL:H11	6:C:1141:HOH:O	2.22	0.40
1:C:104:ARG:HD3	1:C:153[B]:MET:SD	2.61	0.40
1:D:102:VAL:HB	1:D:103:PRO:HD3	2.03	0.40
1:D:255:ILE:O	1:D:414:LEU:HA	2.21	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	503/496 (101%)	487 (97%)	16 (3%)	0	100	100
1	B	507/496 (102%)	495 (98%)	12 (2%)	0	100	100
1	C	501/496 (101%)	488 (97%)	13 (3%)	0	100	100
1	D	504/496 (102%)	491 (97%)	13 (3%)	0	100	100
All	All	2015/1984 (102%)	1961 (97%)	54 (3%)	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	385/381 (101%)	382 (99%)	3 (1%)	81	82
1	B	390/381 (102%)	386 (99%)	4 (1%)	76	76
1	C	385/381 (101%)	382 (99%)	3 (1%)	81	82
1	D	390/381 (102%)	387 (99%)	3 (1%)	81	82
All	All	1550/1524 (102%)	1537 (99%)	13 (1%)	86	82

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	247[A]	GLU
1	A	247[B]	GLU
1	A	331	ARG
1	B	247[A]	GLU
1	B	247[B]	GLU
1	B	331	ARG
1	B	414	LEU
1	C	172	LYS
1	C	247[A]	GLU
1	C	247[B]	GLU

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Mol	Chain	Res	Type
1	D	172	LYS
1	D	247[A]	GLU
1	D	247[B]	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	481	ASN
1	D	481	ASN

### 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](#)

25 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	NO3	A	502	-	1,3,3	0.03	0	0,3,3	-	-
5	GOL	D	508	-	5,5,5	0.40	0	5,5,5	0.87	0
4	EDO	D	506	-	3,3,3	0.63	0	2,2,2	0.06	0
3	NO3	B	504	-	1,3,3	0.23	0	0,3,3	-	-

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	NO3	C	503	-	1,3,3	0.31	0	0,3,3	-	-
3	NO3	B	502	-	1,3,3	0.22	0	0,3,3	-	-
4	EDO	D	505	-	3,3,3	0.67	0	2,2,2	0.17	0
5	GOL	C	508	-	5,5,5	0.43	0	5,5,5	0.61	0
4	EDO	C	506	-	3,3,3	0.68	0	2,2,2	0.22	0
4	EDO	D	504	-	3,3,3	0.50	0	2,2,2	0.16	0
5	GOL	B	503	-	5,5,5	0.44	0	5,5,5	0.42	0
4	EDO	A	503	-	3,3,3	0.69	0	2,2,2	0.32	0
2	AMP	A	501	-	22,25,25	1.19	2 (9%)	25,38,38	1.73	5 (20%)
4	EDO	C	505	-	3,3,3	0.74	0	2,2,2	0.11	0
2	AMP	D	502	-	22,25,25	1.07	1 (4%)	25,38,38	1.35	3 (12%)
3	NO3	A	505	-	1,3,3	0.14	0	0,3,3	-	-
3	NO3	D	503	-	1,3,3	0.00	0	0,3,3	-	-
4	EDO	C	507	-	3,3,3	0.44	0	2,2,2	0.26	0
3	NO3	C	501	-	1,3,3	0.31	0	0,3,3	-	-
5	GOL	A	504	-	5,5,5	0.48	0	5,5,5	0.40	0
2	AMP	B	501	-	22,25,25	1.21	2 (9%)	25,38,38	1.66	5 (20%)
4	EDO	C	504	-	3,3,3	0.51	0	2,2,2	0.19	0
3	NO3	D	501	-	1,3,3	0.29	0	0,3,3	-	-
2	AMP	C	502	-	22,25,25	1.00	1 (4%)	25,38,38	1.17	2 (8%)
4	EDO	D	507	-	3,3,3	0.68	0	2,2,2	0.36	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
5	GOL	D	508	-	-	2/4/4/4	-
4	EDO	A	503	-	-	1/1/1/1	-
2	AMP	A	501	-	-	1/6/26/26	0/3/3/3
4	EDO	C	505	-	-	1/1/1/1	-
2	AMP	D	502	-	-	5/6/26/26	0/3/3/3
4	EDO	D	506	-	-	1/1/1/1	-
5	GOL	A	504	-	-	0/4/4/4	-
5	GOL	C	508	-	-	1/4/4/4	-
2	AMP	B	501	-	-	2/6/26/26	0/3/3/3
4	EDO	C	507	-	-	1/1/1/1	-
4	EDO	C	504	-	-	0/1/1/1	-
4	EDO	C	506	-	-	1/1/1/1	-
4	EDO	D	504	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	GOL	B	503	-	-	0/4/4/4	-
4	EDO	D	505	-	-	1/1/1/1	-
2	AMP	C	502	-	-	2/6/26/26	0/3/3/3
4	EDO	D	507	-	-	1/1/1/1	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	AMP	C5-C4	2.80	1.48	1.40
2	B	501	AMP	C5-C4	2.64	1.47	1.40
2	C	502	AMP	C5-C4	2.42	1.47	1.40
2	D	502	AMP	C5-C4	2.35	1.47	1.40
2	B	501	AMP	C2-N3	2.27	1.35	1.32
2	A	501	AMP	C2-N3	2.21	1.35	1.32

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	AMP	P-O5'-C5'	4.68	131.19	118.30
2	B	501	AMP	P-O5'-C5'	4.28	130.07	118.30
2	B	501	AMP	C4-C5-N7	-3.91	105.32	109.40
2	A	501	AMP	C4-C5-N7	-3.67	105.57	109.40
2	B	501	AMP	N3-C2-N1	-3.46	123.27	128.68
2	C	502	AMP	N3-C2-N1	-3.41	123.35	128.68
2	D	502	AMP	C4-C5-N7	-3.27	105.99	109.40
2	A	501	AMP	N3-C2-N1	-3.18	123.71	128.68
2	D	502	AMP	N3-C2-N1	-3.09	123.84	128.68
2	A	501	AMP	O4'-C1'-C2'	-2.60	103.12	106.93
2	C	502	AMP	C4-C5-N7	-2.44	106.86	109.40
2	A	501	AMP	O3P-P-O2P	2.32	116.51	107.64
2	D	502	AMP	O3P-P-O1P	2.24	119.45	110.68
2	B	501	AMP	C1'-N9-C4	-2.03	123.08	126.64
2	B	501	AMP	O4'-C1'-C2'	-2.01	104.00	106.93

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	AMP	C5'-O5'-P-O2P
2	D	502	AMP	C5'-O5'-P-O2P
2	D	502	AMP	C5'-O5'-P-O3P

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Mol	Chain	Res	Type	Atoms
2	D	502	AMP	O4'-C4'-C5'-O5'
2	B	501	AMP	O4'-C4'-C5'-O5'
2	C	502	AMP	O4'-C4'-C5'-O5'
2	D	502	AMP	C3'-C4'-C5'-O5'
4	D	507	EDO	O1-C1-C2-O2
5	D	508	GOL	O1-C1-C2-C3
2	B	501	AMP	C3'-C4'-C5'-O5'
2	C	502	AMP	C3'-C4'-C5'-O5'
4	A	503	EDO	O1-C1-C2-O2
4	C	505	EDO	O1-C1-C2-O2
4	D	506	EDO	O1-C1-C2-O2
5	D	508	GOL	O1-C1-C2-O2
4	D	505	EDO	O1-C1-C2-O2
2	D	502	AMP	C5'-O5'-P-O1P
4	C	506	EDO	O1-C1-C2-O2
5	C	508	GOL	O1-C1-C2-C3
4	C	507	EDO	O1-C1-C2-O2

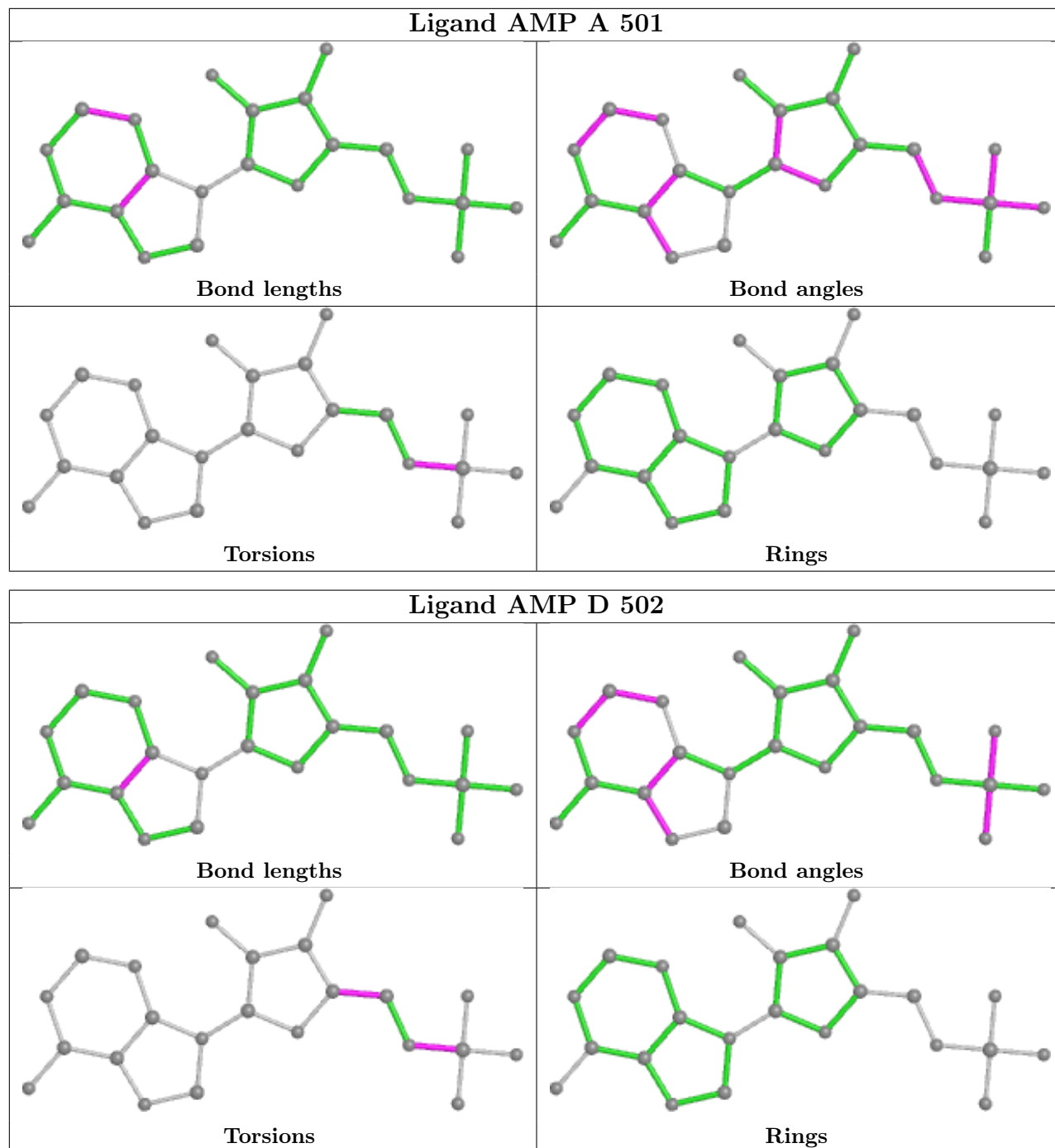
There are no ring outliers.

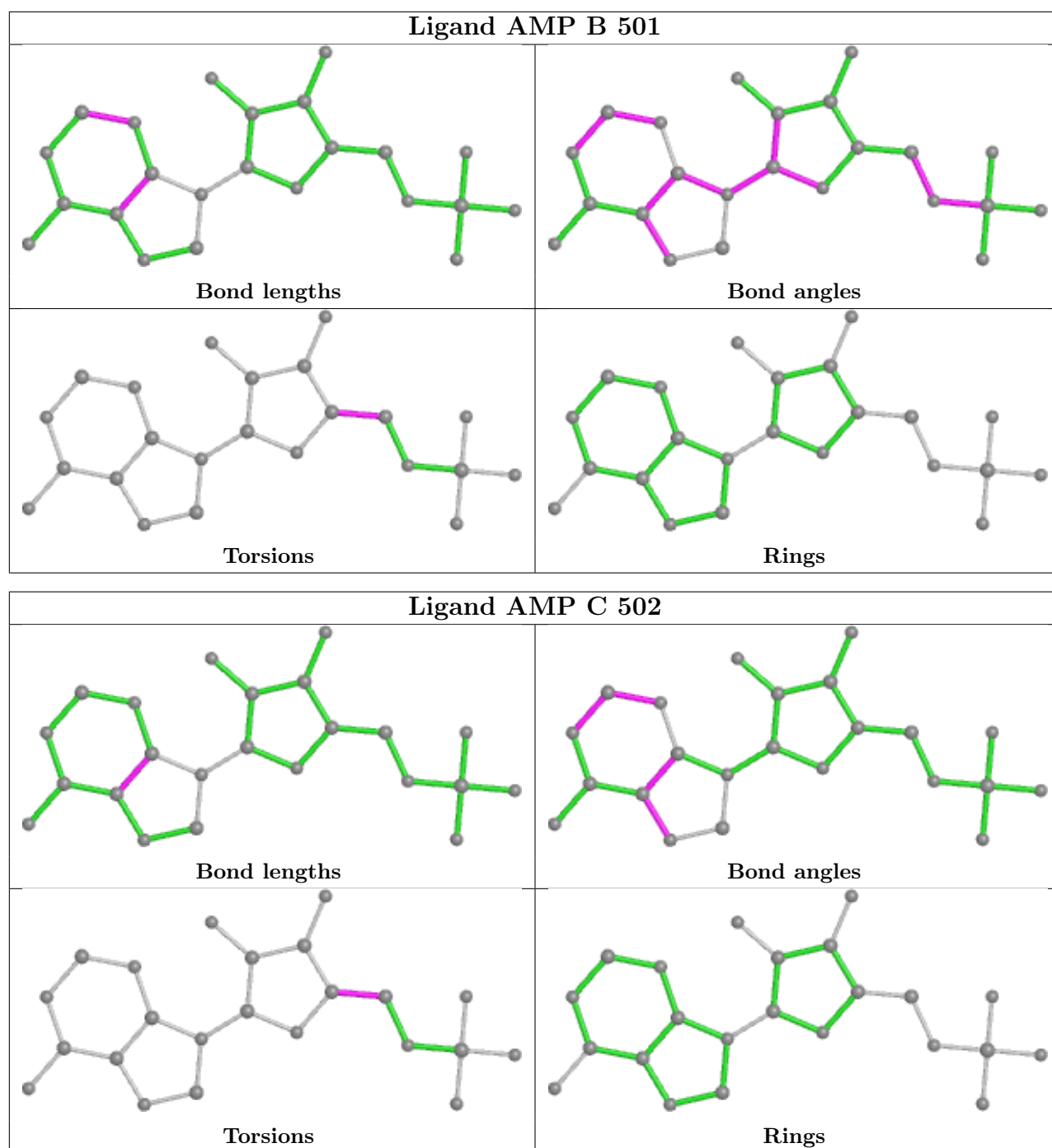
8 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	508	GOL	1	0
4	D	505	EDO	1	0
5	C	508	GOL	2	0
2	A	501	AMP	1	0
2	D	502	AMP	2	0
4	C	507	EDO	5	0
2	C	502	AMP	5	0
4	D	507	EDO	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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	489/496 (98%)	-0.45	3 (0%) 89 90	7, 12, 20, 41	0
1	B	489/496 (98%)	-0.49	3 (0%) 89 90	6, 11, 19, 41	0
1	C	489/496 (98%)	-0.48	5 (1%) 82 84	6, 11, 20, 47	0
1	D	489/496 (98%)	-0.45	3 (0%) 89 90	6, 12, 20, 48	0
All	All	1956/1984 (98%)	-0.47	14 (0%) 87 88	6, 11, 20, 48	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	0	HIS	4.6
1	D	0	HIS	4.5
1	B	0	HIS	4.4
1	D	354	GLN	4.3
1	C	256	VAL	4.2
1	A	0	HIS	3.4
1	C	257	PHE	2.9
1	C	255	ILE	2.9
1	C	354	GLN	2.8
1	A	481	ASN	2.4
1	B	481	ASN	2.4
1	A	356	PRO	2.2
1	D	17	ARG	2.1
1	B	354	GLN	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.

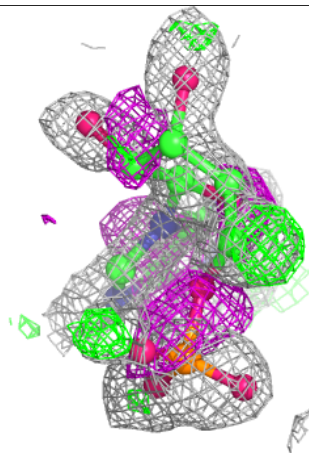
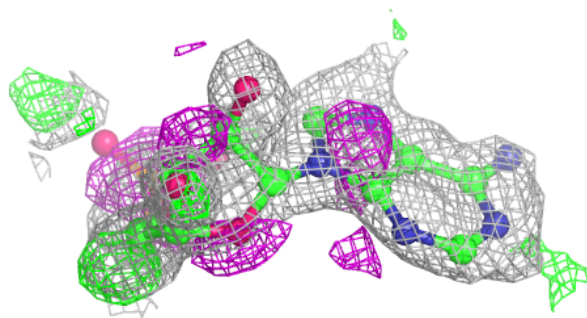
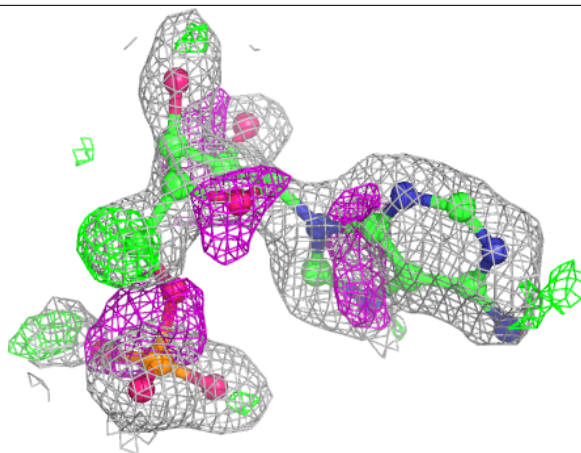
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	AMP	B	501	23/23	0.65	0.29	28,35,48,56	0
2	AMP	C	502	23/23	0.66	0.39	22,27,29,30	23
2	AMP	A	501	23/23	0.69	0.31	29,37,44,51	0
4	EDO	A	503	4/4	0.69	0.24	44,47,47,47	0
2	AMP	D	502	23/23	0.70	0.37	24,27,29,31	23
4	EDO	C	506	4/4	0.73	0.21	45,47,47,47	0
5	GOL	B	503	6/6	0.75	0.23	29,32,32,33	0
4	EDO	D	505	4/4	0.76	0.26	36,36,38,39	0
5	GOL	C	508	6/6	0.80	0.24	27,31,33,35	0
5	GOL	D	508	6/6	0.80	0.21	29,33,34,35	0
5	GOL	A	504	6/6	0.81	0.20	26,28,29,30	0
4	EDO	D	507	4/4	0.81	0.17	24,27,28,28	0
4	EDO	D	506	4/4	0.83	0.17	35,39,40,40	0
4	EDO	C	505	4/4	0.85	0.22	31,31,32,33	0
4	EDO	C	504	4/4	0.87	0.18	29,31,32,32	0
4	EDO	C	507	4/4	0.89	0.11	24,27,27,28	0
4	EDO	D	504	4/4	0.90	0.21	24,26,26,28	0
3	NO3	C	501	4/4	0.93	0.20	23,24,26,29	0
3	NO3	A	505	4/4	0.93	0.21	26,26,28,29	0
3	NO3	B	504	4/4	0.94	0.19	27,28,30,32	0
3	NO3	D	501	4/4	0.95	0.17	25,28,28,30	0
3	NO3	D	503	4/4	0.96	0.13	20,21,21,24	0
3	NO3	A	502	4/4	0.97	0.13	19,21,22,24	0
3	NO3	B	502	4/4	0.97	0.14	18,20,21,23	0
3	NO3	C	503	4/4	0.97	0.13	20,21,23,26	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.



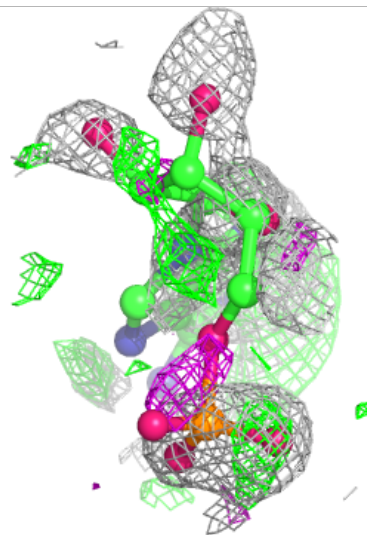
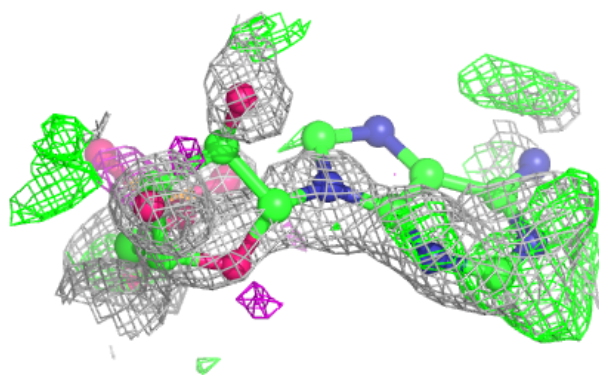
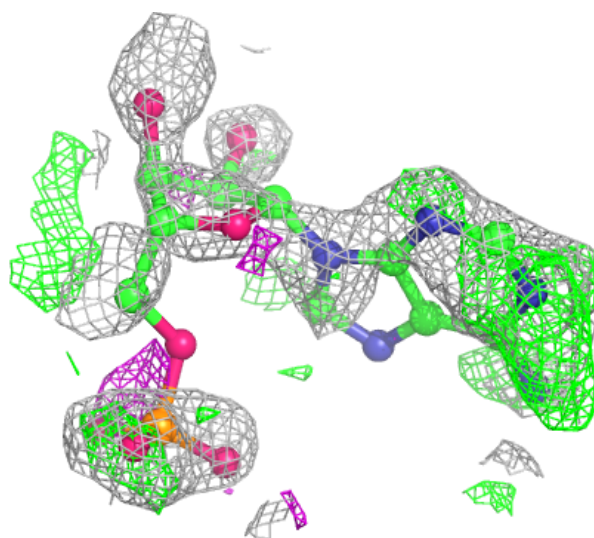
**Electron density around AMP B 501:**

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



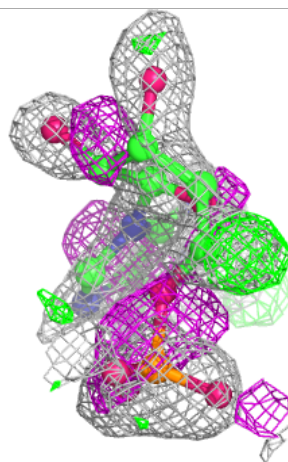
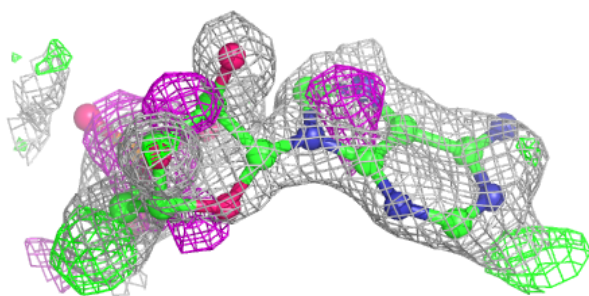
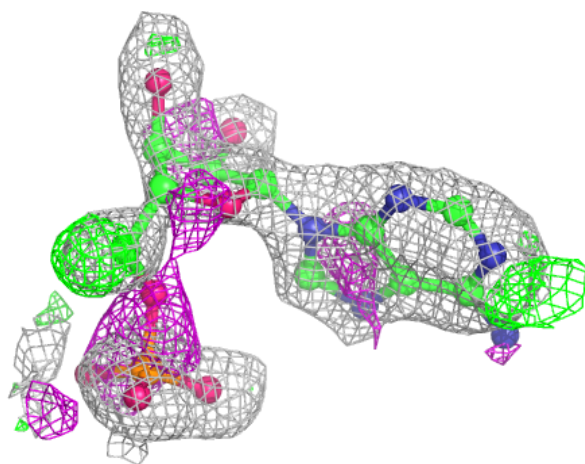
**Electron density around AMP C 502:**

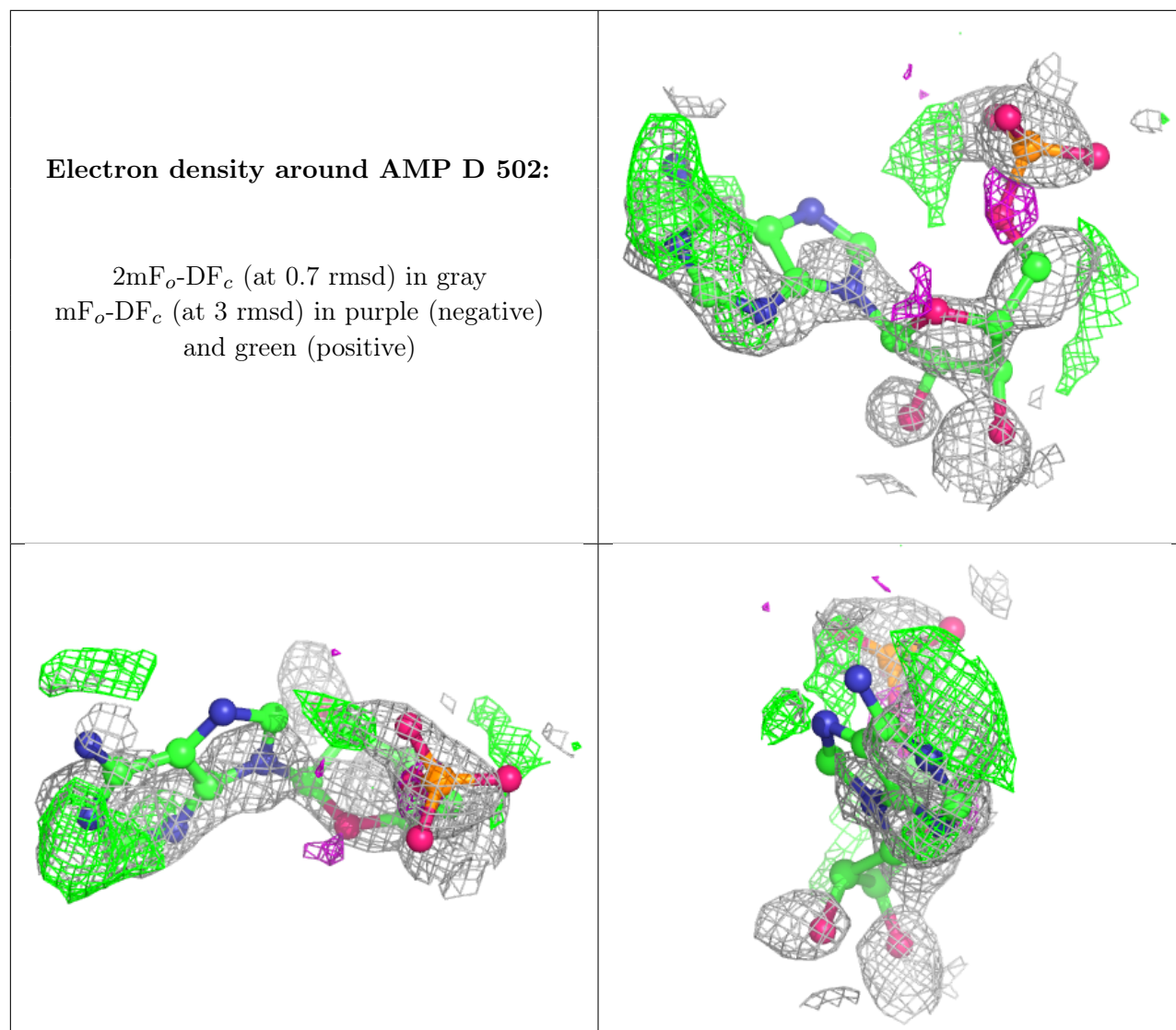
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around AMP 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.