



wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 14, 2023 – 01:58 AM JST

PDB ID : 5YSN
Title : Ethanolamine ammonia-lyase, AdoCbl/substrate-free
Authors : Shibata, N.
Deposited on : 2017-11-14
Resolution : 2.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 1.8.5 (274361), 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

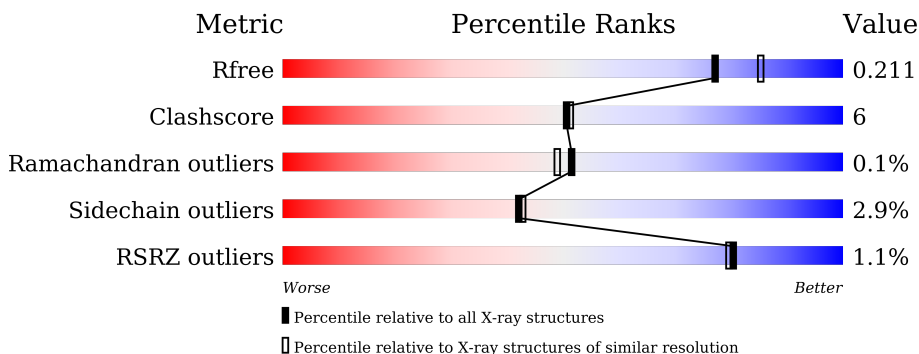
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	453	
1	C	453	
2	B	295	
2	D	295	

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 12142 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.

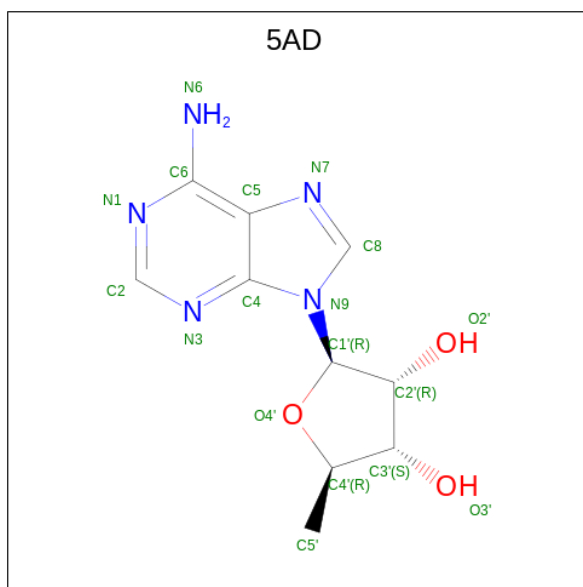
- Molecule 1 is a protein called Ethanolamine ammonia-lyase heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	453	Total	C	N	O	S	0	9	0
			3515	2204	604	685	22			
1	C	453	Total	C	N	O	S	0	6	0
			3493	2190	597	684	22			

- Molecule 2 is a protein called Ethanolamine ammonia-lyase light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	252	Total	C	N	O	S	0	2	0
			1927	1204	350	363	10			
2	D	252	Total	C	N	O	S	0	3	0
			1938	1211	354	363	10			

- Molecule 3 is 5'-DEOXYADENOSINE (three-letter code: 5AD) (formula: C₁₀H₁₃N₅O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			18	10	5	3		
3	C	1	Total	C	N	O	0	0
			18	10	5	3		

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



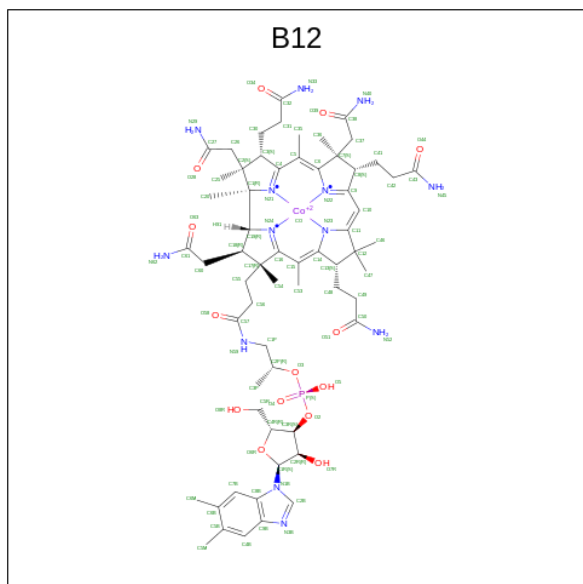
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	C	1	Total	C	O	0	0
			6	3	3		
4	C	1	Total	C	O	0	0
			6	3	3		
4	C	1	Total	C	O	0	0
			6	3	3		
4	C	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	C	1	Total	C	O	0	0
			6	3	3		

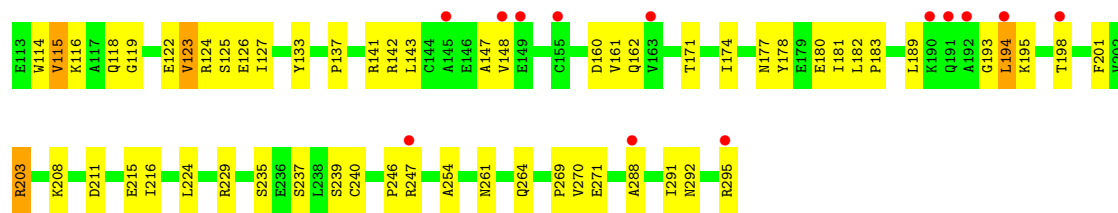
- Molecule 5 is COBALAMIN (three-letter code: B12) (formula: $C_{62}H_{89}CoN_{13}O_{14}P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
5	B	1	Total	C	Co	N	O	P	0	0
			91	62	1	13	14	1		
5	D	1	Total	C	Co	N	O	P	0	0
			91	62	1	13	14	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	400	Total	O	0	0
			400	400		
6	B	135	Total	O	0	0
			135	135		
6	C	370	Total	O	0	0
			370	370		
6	D	80	Total	O	0	0
			80	80		



4 Data and refinement statistics i

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	242.72Å 242.72Å 76.57Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.00 – 2.00 48.22 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.5 (48.00-2.00) 99.5 (48.22-2.00)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.74 (at 2.00Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.163 , 0.192 0.180 , 0.211	Depositor DCC
R_{free} test set	8636 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	23.1	Xtrriage
Anisotropy	0.061	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 37.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.22$	Xtrriage
Estimated twinning fraction	0.069 for h,-h-k,-l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	12142	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.11% 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: GOL, 5AD, B12

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	0.46	0/3596	0.62	1/4868 (0.0%)
1	C	0.46	1/3565 (0.0%)	0.60	0/4827
2	B	0.41	0/1960	0.61	0/2655
2	D	0.41	0/1974	0.58	0/2673
All	All	0.44	1/11095 (0.0%)	0.60	1/15023 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	C	0	1
2	B	0	1
All	All	0	3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	388	CYS	CB-SG	-5.08	1.73	1.81

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	187	ASP	CB-CG-OD1	5.19	122.97	118.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	326	VAL	Peptide
2	B	193	GLY	Peptide
1	C	326	VAL	Peptide

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	3515	0	3497	27	0
1	C	3493	0	3462	28	0
2	B	1927	0	1991	22	0
2	D	1938	0	2007	43	0
3	A	18	0	13	2	0
3	C	18	0	12	0	0
4	A	36	0	48	3	1
4	C	30	0	40	2	0
5	B	91	0	88	7	0
5	D	91	0	88	6	0
6	A	400	0	0	3	0
6	B	135	0	0	2	0
6	C	370	0	0	4	1
6	D	80	0	0	2	0
All	All	12142	0	11246	128	1

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 6.

The worst 5 of 128 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)
2:D:110:VAL:O	2:D:203:ARG:NH2	2.04	0.89
2:B:110:VAL:O	2:B:203:ARG:NH2	2.09	0.85
2:B:180:GLU:HG2	2:B:270:VAL:HG23	1.66	0.77
1:C:269:ARG:HG2	1:C:284:LEU:HD11	1.71	0.72
1:A:420[A]:ASN:OD1	6:A:601:HOH:O	2.08	0.72

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:504:GOL:O1	6:C:854:HOH:O[3_655]	2.16	0.04

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	460/453 (102%)	448 (97%)	11 (2%)	1 (0%)	47	44
1	C	457/453 (101%)	443 (97%)	14 (3%)	0	100	100
2	B	252/295 (85%)	248 (98%)	4 (2%)	0	100	100
2	D	253/295 (86%)	244 (96%)	9 (4%)	0	100	100
All	All	1422/1496 (95%)	1383 (97%)	38 (3%)	1 (0%)	51	49

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	163	PRO

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	379/370 (102%)	370 (98%)	9 (2%)	49	51
1	C	376/370 (102%)	369 (98%)	7 (2%)	57	61
2	B	208/240 (87%)	201 (97%)	7 (3%)	37	36

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	D	209/240 (87%)	198 (95%)	11 (5%)	22	18
All	All	1172/1220 (96%)	1138 (97%)	34 (3%)	42	43

5 of 34 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	203	ARG
2	D	229	ARG
2	D	264[B]	GLN
2	B	194	LEU
2	B	182	LEU

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

Mol	Chain	Res	Type
1	A	171	GLN
2	B	154	GLN
1	C	171	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](#)

15 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
4	GOL	A	503	-	5,5,5	0.53	0	5,5,5	0.57	0
3	5AD	C	501	-	17,20,20	1.28	3 (17%)	15,30,30	1.77	3 (20%)
4	GOL	A	506	-	5,5,5	0.38	0	5,5,5	0.51	0
4	GOL	A	507	-	5,5,5	0.45	0	5,5,5	0.30	0
4	GOL	A	504	-	5,5,5	0.49	0	5,5,5	0.87	0
4	GOL	C	506	-	5,5,5	0.53	0	5,5,5	0.67	0
4	GOL	C	505	-	5,5,5	0.49	0	5,5,5	0.35	0
4	GOL	C	504	-	5,5,5	0.47	0	5,5,5	0.50	0
5	B12	D	601	-	90,101,101	1.69	9 (10%)	137,166,166	1.37	19 (13%)
4	GOL	C	503	-	5,5,5	0.36	0	5,5,5	0.23	0
4	GOL	C	502	-	5,5,5	0.41	0	5,5,5	0.16	0
4	GOL	A	505	-	5,5,5	0.56	0	5,5,5	0.60	0
5	B12	B	601	-	90,101,101	1.66	9 (10%)	137,166,166	1.28	20 (14%)
3	5AD	A	501	-	17,20,20	1.20	2 (11%)	15,30,30	2.01	4 (26%)
4	GOL	A	502	-	5,5,5	0.41	0	5,5,5	0.39	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
4	GOL	A	503	-	-	2/4/4/4	-
3	5AD	C	501	-	-	0/0/20/20	0/3/3/3
4	GOL	A	506	-	-	0/4/4/4	-
4	GOL	A	507	-	-	0/4/4/4	-
4	GOL	A	504	-	-	0/4/4/4	-
4	GOL	C	506	-	-	2/4/4/4	-
4	GOL	C	505	-	-	2/4/4/4	-
4	GOL	C	504	-	-	2/4/4/4	-
5	B12	D	601	-	-	15/52/223/223	0/3/11/11
4	GOL	C	503	-	-	0/4/4/4	-
4	GOL	C	502	-	-	2/4/4/4	-
4	GOL	A	505	-	-	2/4/4/4	-
5	B12	B	601	-	-	12/52/223/223	0/3/11/11
3	5AD	A	501	-	-	0/0/20/20	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GOL	A	502	-	-	0/4/4/4	-

The worst 5 of 23 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	601	B12	C19-N24	-11.03	1.28	1.48
5	B	601	B12	C19-N24	-10.80	1.28	1.48
5	D	601	B12	C8B-C9B	4.74	1.50	1.40
5	B	601	B12	C8B-C9B	4.46	1.49	1.40
5	D	601	B12	C11-N23	4.08	1.44	1.37

The worst 5 of 46 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	601	B12	C18-C19-N24	5.89	111.27	102.31
3	A	501	5AD	C5'-C4'-C3'	-5.44	109.98	115.70
5	B	601	B12	C18-C19-N24	5.28	110.35	102.31
5	D	601	B12	C13-C14-N23	4.09	114.66	109.10
3	C	501	5AD	C5'-C4'-C3'	-4.05	111.44	115.70

There are no chirality outliers.

5 of 39 torsion outliers are listed below:

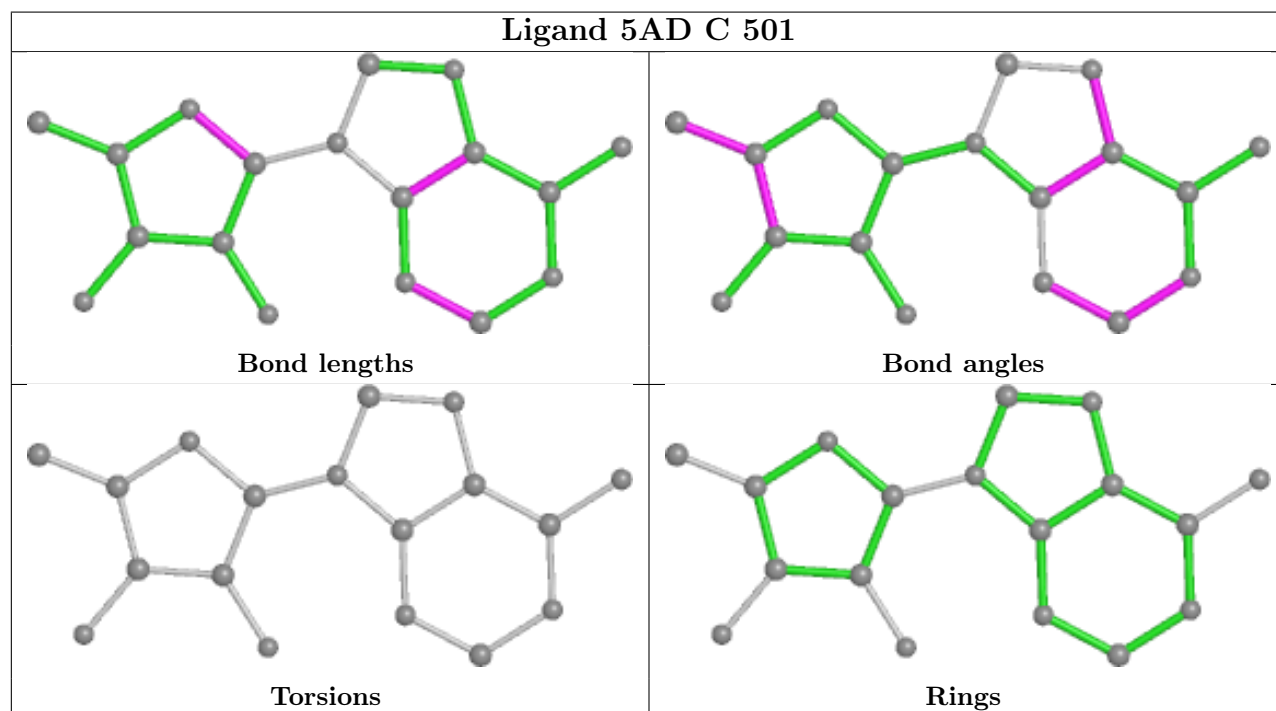
Mol	Chain	Res	Type	Atoms
4	A	503	GOL	O1-C1-C2-C3
4	C	504	GOL	O1-C1-C2-C3
4	C	505	GOL	C1-C2-C3-O3
5	B	601	B12	C1-C2-C26-C27
5	B	601	B12	C25-C2-C26-C27

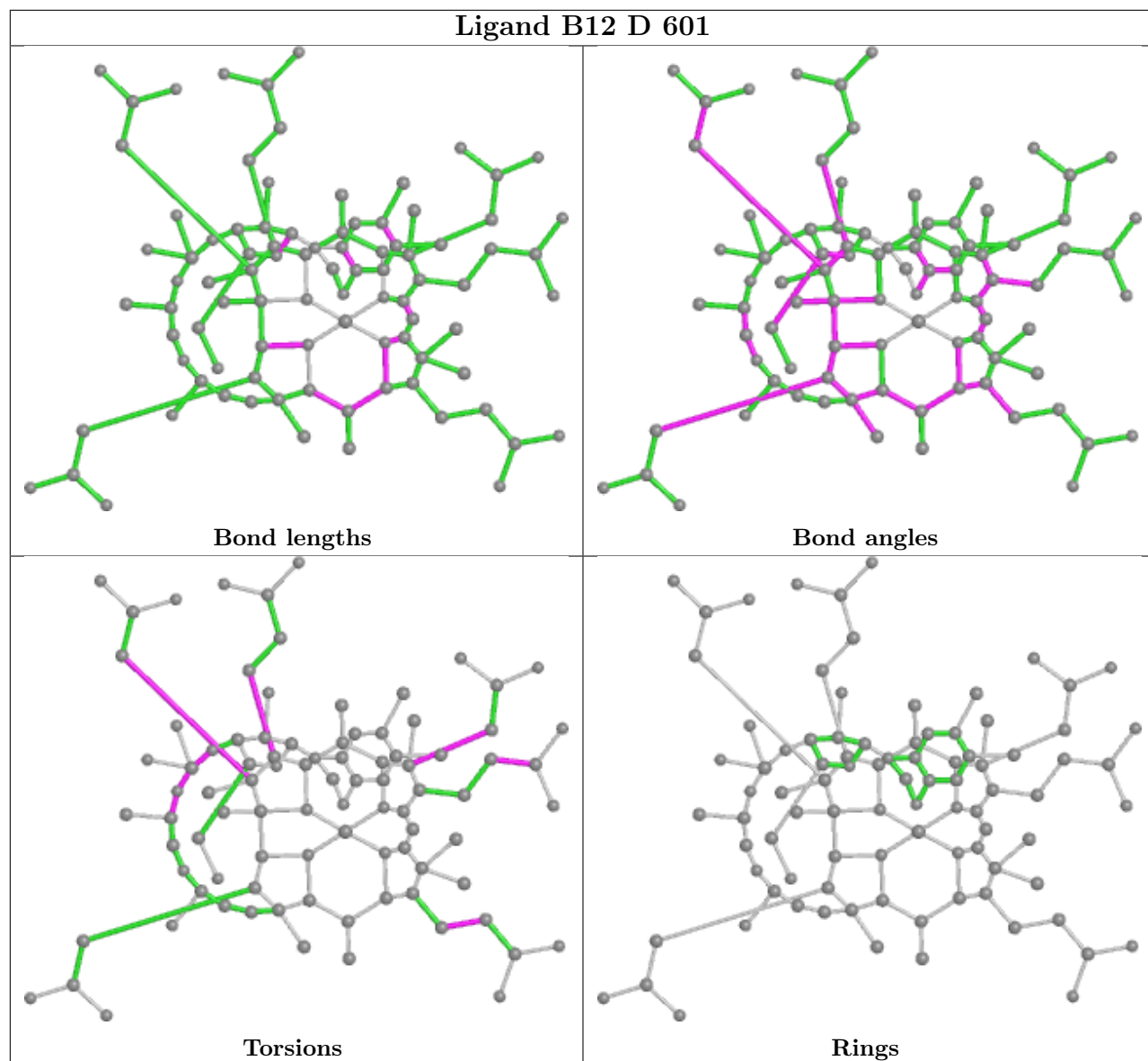
There are no ring outliers.

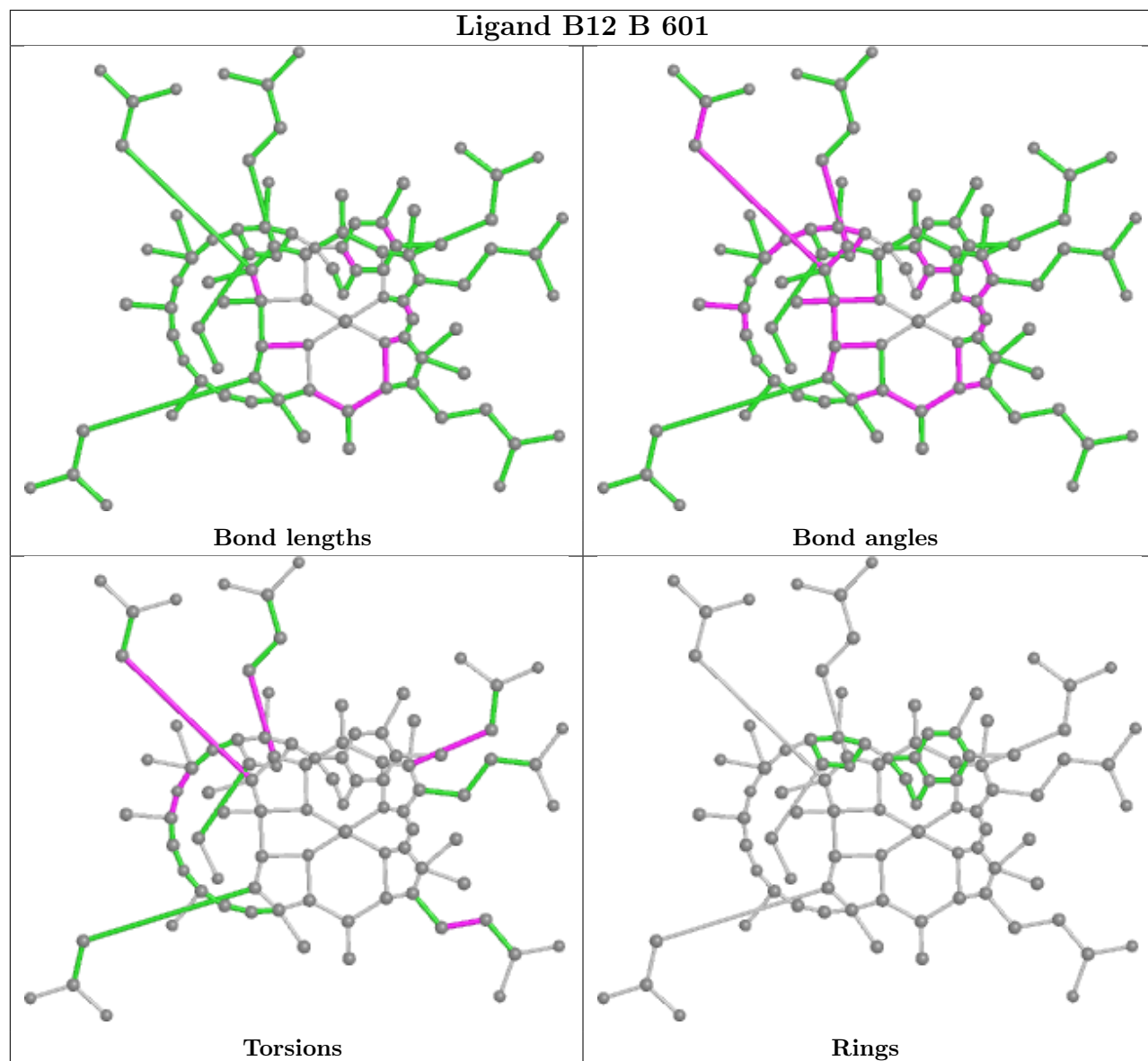
7 monomers are involved in 21 short contacts:

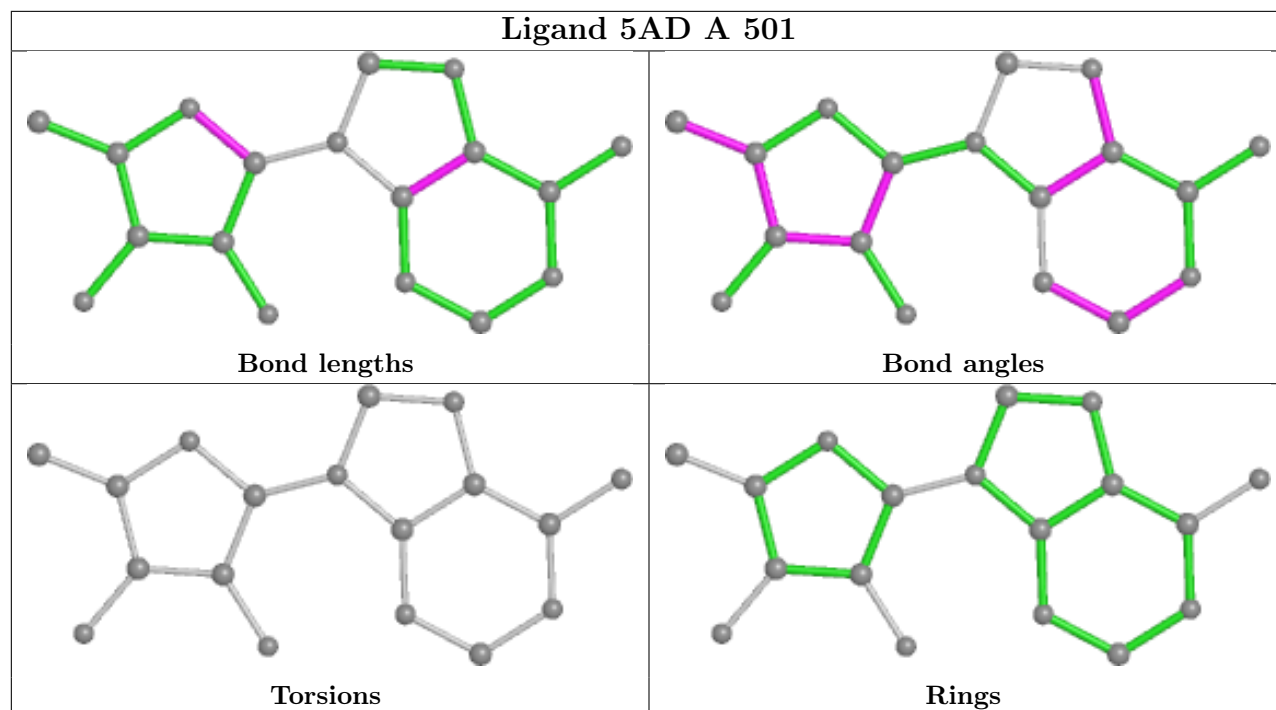
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	506	GOL	3	0
4	A	504	GOL	0	1
4	C	504	GOL	1	0
5	D	601	B12	6	0
4	C	502	GOL	1	0
5	B	601	B12	7	0
3	A	501	5AD	2	0

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, 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	453/453 (100%)	-0.77	0 100 100	13, 23, 37, 61	0
1	C	453/453 (100%)	-0.79	0 100 100	13, 24, 41, 60	0
2	B	252/295 (85%)	-0.50	2 (0%) 86 85	17, 44, 65, 96	0
2	D	252/295 (85%)	0.05	13 (5%) 27 26	15, 52, 87, 122	0
All	All	1410/1496 (94%)	-0.58	15 (1%) 80 79	13, 28, 69, 122	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	192	ALA	5.7
2	D	194	LEU	3.5
2	D	145	ALA	3.4
2	D	191	GLN	3.0
2	D	148	VAL	3.0

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](#)

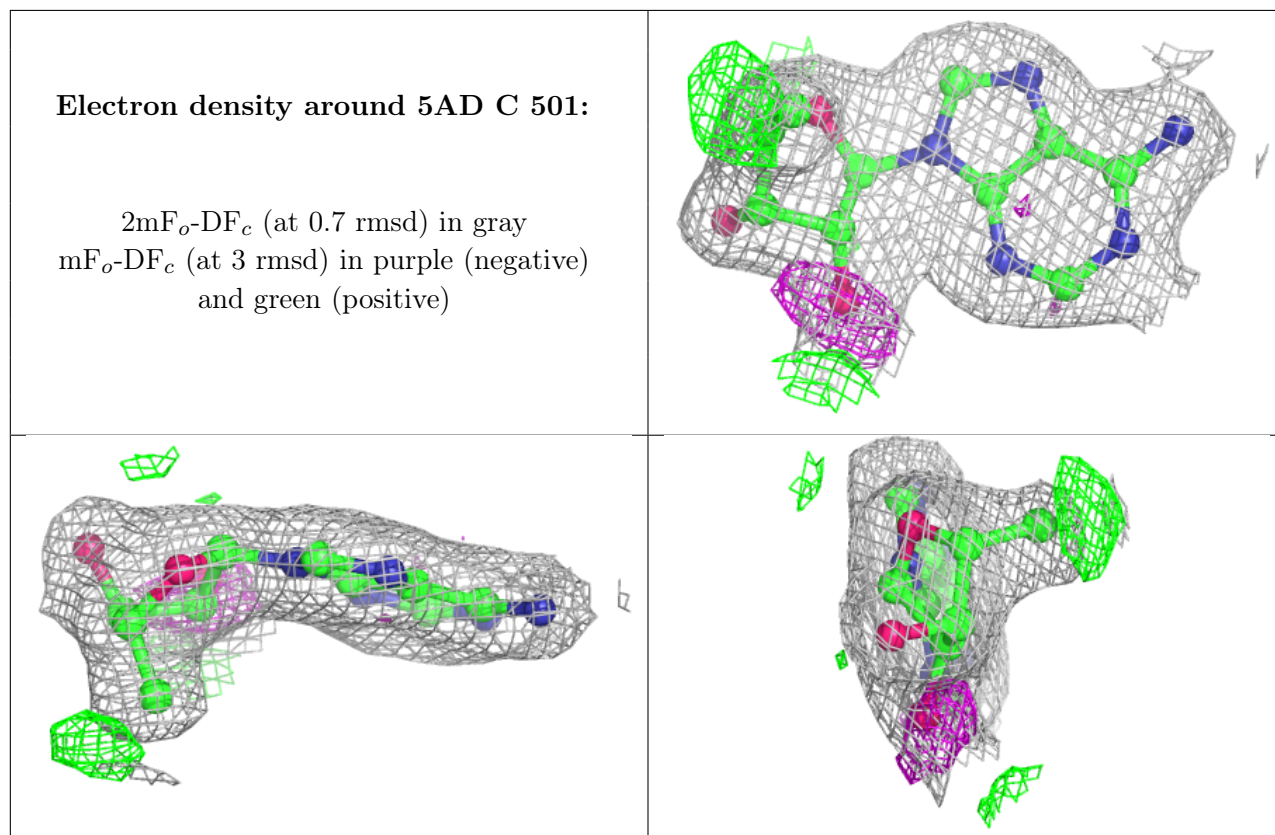
There are no monosaccharides in this entry.

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.

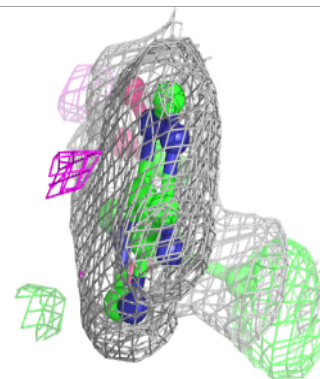
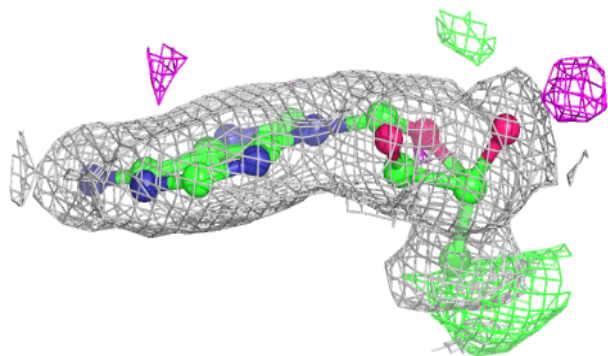
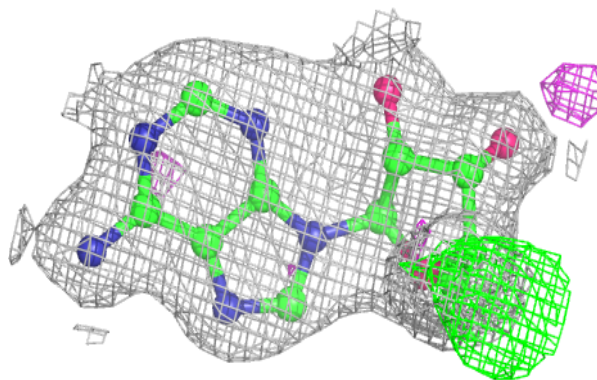
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	GOL	C	504	6/6	0.71	0.24	69,71,71,73	0
4	GOL	A	507	6/6	0.72	0.27	62,69,70,71	0
4	GOL	C	505	6/6	0.81	0.16	39,43,46,48	0
4	GOL	A	506	6/6	0.84	0.23	76,77,78,79	0
4	GOL	A	504	6/6	0.87	0.12	44,49,50,52	0
4	GOL	A	503	6/6	0.91	0.18	27,41,49,54	0
4	GOL	C	502	6/6	0.92	0.12	37,43,46,50	0
3	5AD	C	501	18/18	0.95	0.09	29,32,39,40	0
4	GOL	A	505	6/6	0.96	0.07	26,27,29,29	0
3	5AD	A	501	18/18	0.96	0.07	27,29,33,34	0
4	GOL	C	506	6/6	0.97	0.09	23,30,32,32	0
5	B12	D	601	91/91	0.97	0.09	30,38,44,54	0
4	GOL	A	502	6/6	0.98	0.10	25,28,30,31	0
5	B12	B	601	91/91	0.98	0.08	21,28,35,38	0
4	GOL	C	503	6/6	0.98	0.12	28,31,35,37	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.



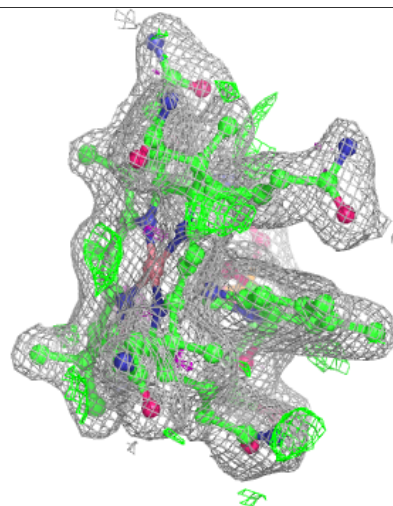
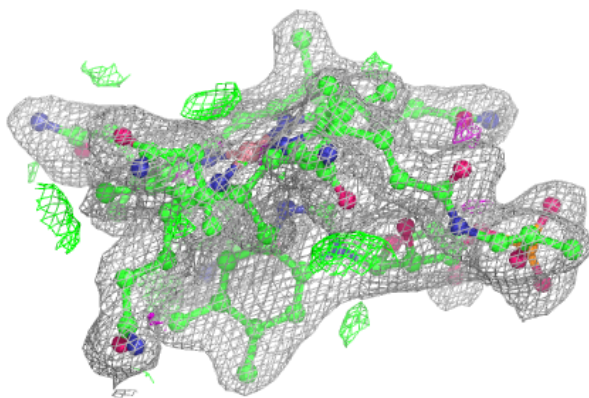
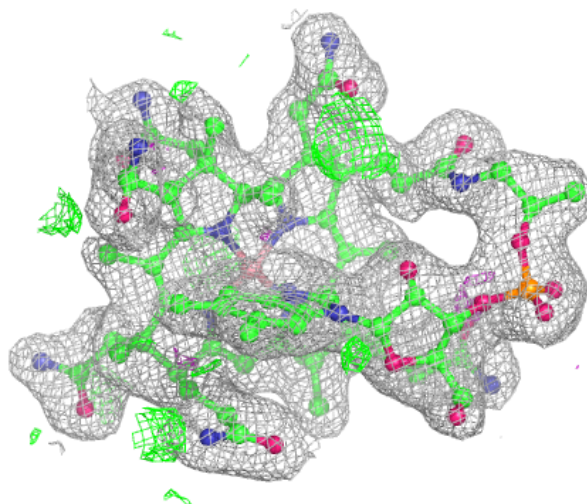
Electron density around 5AD A 501:

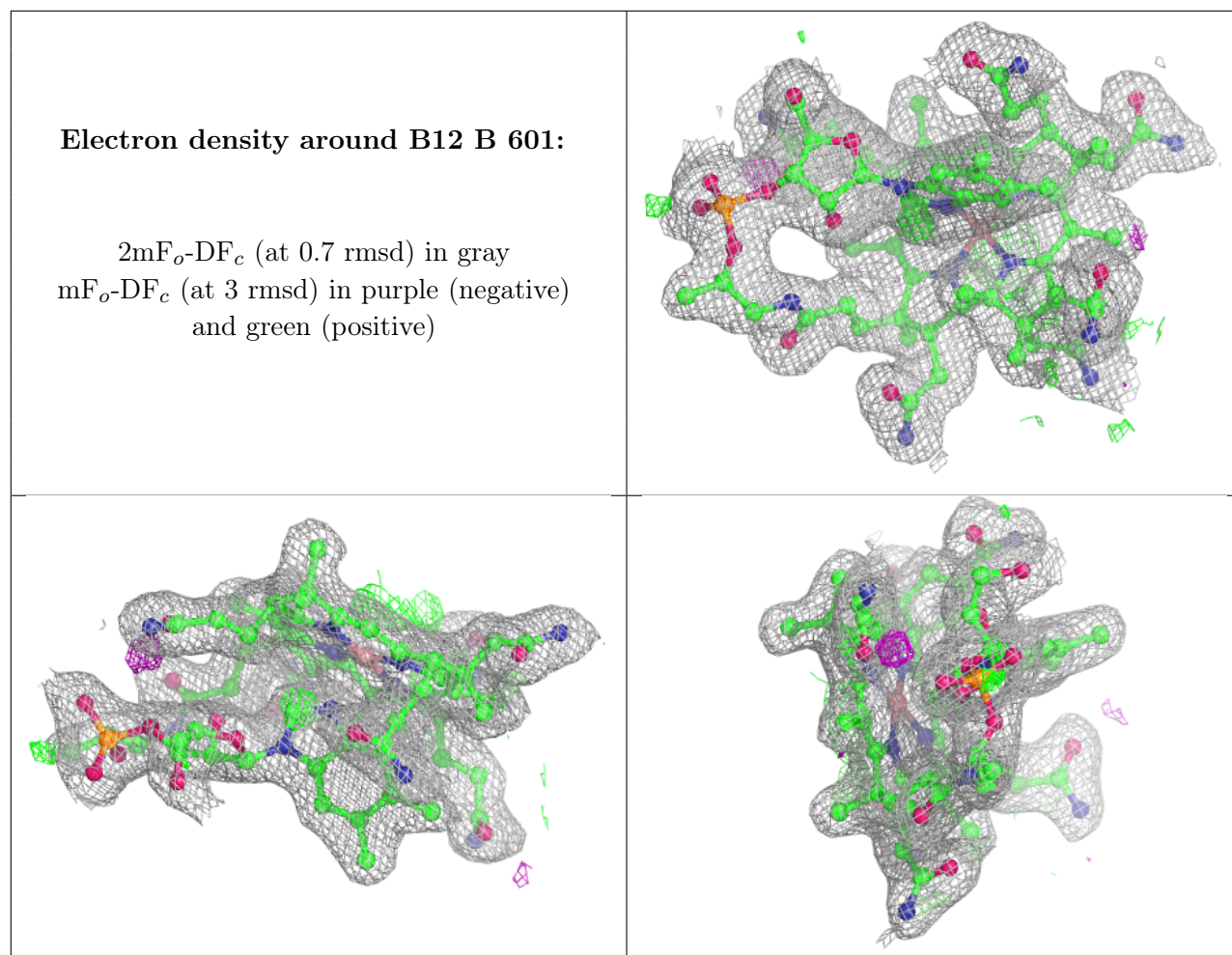
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around B12 D 601:

$2mF_o-DF_c$ (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.