

wwPDB X-ray Structure Validation Summary Report (i)

Apr 10, 2025 - 12:50 pm BST

PDB ID	:	$9\mathrm{G3L} \ / \ \mathrm{pdb} \ 00009\mathrm{g3l}$
Title	:	LecB from PA01 in complex with synthetic beta - fucosylamide
Authors	:	Antonini, G.; Varrot, A.
Deposited on	:	2024-07-12
Resolution	:	1.74 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 (i) 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 (1)) were used in the production of this report:

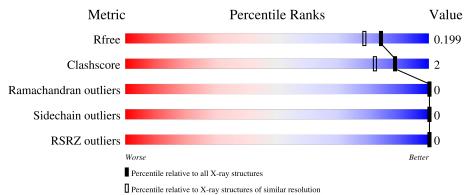
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.42

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure: $X\text{-}RAY \, DIFFRACTION$

The reported resolution of this entry is 1.74 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	$egin{array}{c} { m Whole \ archive} \ (\#{ m Entries}) \end{array}$	${f Similar\ resolution}\ (\#{ m Entries,\ resolution\ range}({ m \AA}))$
R _{free}	164625	1043 (1.74-1.74)
Clashscore	180529	1119 (1.74-1.74)
Ramachandran outliers	177936	1112 (1.74-1.74)
Sidechain outliers	177891	1112 (1.74-1.74)
RSRZ outliers	164620	1043 (1.74-1.74)

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	А	114	97%	•
1	В	114	96%	•
1	С	114	96%	•••
1	D	114	95%	•••



2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 4001 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.

Mol	Chain	Residues		Ato	ms		ZeroOcc	AltConf	Trace	
1	٨	А	114	Total	С	Ν	Ο	0	1	0
1	Л	114	835	512	145	178	0	I	0	
1	В	114	Total	С	Ν	Ο	0	0	0	
	D	114	827	508	143	176	0	0	0	
1	С	114	Total	С	Ν	Ο	0	2	0	
	U	114	841	518	145	178	0	2	0	
1	Л	114	Total	С	Ν	Ο	0	0	0	
		114	827	508	143	176		U	0	

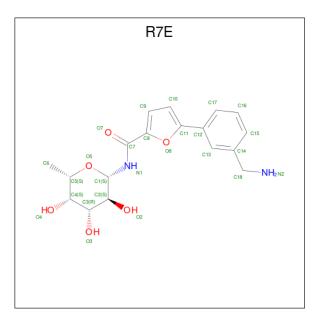
• Molecule 1 is a protein called Fucose-binding lectin PA-IIL.

• Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	А	2	Total Ca 2 2	0	0
2	В	2	Total Ca 2 2	0	0
2	С	2	Total Ca 2 2	0	0
2	D	2	Total Ca 2 2	0	0

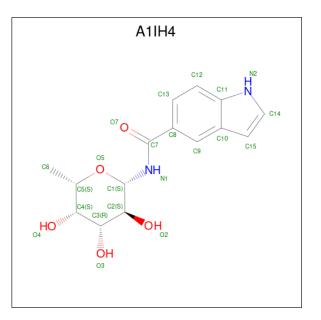
• Molecule 3 is 5-[3-(aminomethyl)phenyl]- {N}-[(2 {S},3 {S},4 {R},5 {S},6 {S})-6-methyl-3,4,5-tris(oxidanyl)oxan-2-yl]furan-2-carboxamide (CCD ID: R7E) (formula: $C_{18}H_{22}N_2O_6$) (labeled as "Ligand of Interest" by depositor).





Mo	ol	Chain	Residues	Atoms				ZeroOcc	AltConf
3		А	1	Total 26	C 18	N 2	O 6	0	0

• Molecule 4 is beta-L-fucopyranosyl-1H-indole-6-carboxamide (CCD ID: A1IH4) (formula: $C_{15}H_{18}N_2O_5$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	А	ton	ns	ZeroOcc	AltConf
4	В	1	Total 22			0	0
4	С	1	Total 22			0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	D	1	Total 22	C 15	-	O 5	0	0

• Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	А	146	Total O 153 153	0	7
5	В	126	Total O 132 132	0	6
5	С	127	Total O 130 130	0	3
5	D	152	Total O 156 156	0	4



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: Fucose-binding lectin PA-IIL







4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants	51.02Å 80.16 Å 52.43 Å	Depositor
a, b, c, α , β , γ	90.00° 109.61° 90.00°	Depositor
Resolution (Å)	49.39 - 1.74	Depositor
Resolution (A)	49.39 - 1.74	EDS
% Data completeness	$99.1 \ (49.39 \text{-} 1.74)$	Depositor
(in resolution range)	$99.2 \ (49.39-1.74)$	EDS
R _{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) > 1$	$1.32 (at 1.74 \text{\AA})$	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.147 , 0.188	Depositor
II, IIfree	0.161 , 0.199	DCC
R_{free} test set	2087 reflections $(5.11%)$	wwPDB-VP
Wilson B-factor $(Å^2)$	12.5	Xtriage
Anisotropy	1.007	Xtriage
Bulk solvent $k_{sol}(e/Å^3)$, $B_{sol}(Å^2)$	0.34 , 57.0	EDS
L-test for $twinning^2$	$< L >=0.50, < L^2>=0.33$	Xtriage
Estimated twinning fraction	0.024 for l,-k,h	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4001	wwPDB-VP
Average B, all atoms $(Å^2)$	14.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 11.92% of the height of the origin peak. No significant pseudotranslation is detected.

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.



¹Intensities estimated from amplitudes.

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, A1IH4, R7E

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	Bo	nd lengths	Bond angles		
IVIOI	Chain	RMSZ	# Z > 5	RMSZ	# Z > 5	
1	А	0.66	0/845	0.88	0/1157	
1	В	0.70	0/837	0.86	0/1146	
1	С	0.72	1/851~(0.1%)	0.88	0/1166	
1	D	0.68	0/837	0.95	1/1146~(0.1%)	
All	All	0.69	1/3370~(0.0%)	0.90	1/4615~(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	А	0	1
1	С	0	1
1	D	0	2
All	All	0	4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	С	86	GLU	CD-OE2	7.00	1.33	1.25

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	D	13	ARG	CD-NE-CZ	5.50	131.30	123.60

There are no chirality outliers.

All (4) planarity outliers are listed below:



Mol	Chain	Res	Type	Group
1	А	72	ARG	Sidechain
1	С	72	ARG	Sidechain
1	D	13	ARG	Sidechain
1	D	72	ARG	Sidechain

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	А	835	0	805	1	0
1	В	827	0	800	3	0
1	С	841	0	816	6	0
1	D	827	0	800	5	0
2	А	2	0	0	0	0
2	В	2	0	0	0	0
2	С	2	0	0	0	0
2	D	2	0	0	0	0
3	А	26	0	0	0	0
4	В	22	0	0	0	0
4	С	22	0	0	0	0
4	D	22	0	0	0	0
5	А	153	0	0	0	1
5	В	132	0	0	1	0
5	С	130	0	0	0	0
5	D	156	0	0	1	1
All	All	4001	0	3221	12	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 2.

The worst 5 of 12 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:81[B]:VAL:HG21	1:D:81:VAL:HG21	1.43	0.98
1:C:81[B]:VAL:HG21	1:D:81:VAL:CG2	2.22	0.67
1:B:72:ARG:NE	5:B:301:HOH:O	2.34	0.61
1:C:72:ARG:HG2	1:C:72:ARG:HH11	1.69	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:81[B]:VAL:CG2	1:D:81:VAL:HG21	2.30	0.48

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:A:415:HOH:O	5:D:421:HOH:O[1_454]	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	Perce	entiles
1	А	113/114~(99%)	110 (97%)	3~(3%)	0	100	100
1	В	112/114~(98%)	108 (96%)	4 (4%)	0	100	100
1	С	114/114~(100%)	112 (98%)	2(2%)	0	100	100
1	D	112/114 (98%)	109 (97%)	3~(3%)	0	100	100
All	All	451/456~(99%)	439~(97%)	12 (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	А	94/93~(101%)	94 (100%)	0	100 100
1	В	93/93~(100%)	93 (100%)	0	100 100
1	С	95/93~(102%)	95~(100%)	0	100 100
1	D	93/93~(100%)	93 (100%)	0	100 100
All	All	375/372~(101%)	375 (100%)	0	100 100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	В	64	GLN
1	D	70	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 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	Mol Type Chain		ain Res Link		Bond lengths			Bond angles		
10101	Type	Chain	Chain Res		Counts	RMSZ	# Z >2	Counts	RMSZ	# Z > 2
4	A1IH4	D	202	2	22,24,24	1.25	3 (13%)	30,35,35	1.29	4 (13%)
3	R7E	А	202	2	24,28,28	0.88	1 (4%)	31,40,40	1.28	1 (3%)
4	A1IH4	С	202	2	22,24,24	1.68	5 (22%)	30,35,35	1.29	4 (13%)
4	A1IH4	В	202	2	22,24,24	1.69	6 (27%)	30,35,35	1.08	3 (10%)

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	A1IH4	D	202	2	-	0/8/28/28	0/3/3/3
3	R7E	А	202	2	-	0/9/34/34	0/3/3/3
4	A1IH4	С	202	2	-	0/8/28/28	0/3/3/3
4	A1IH4	В	202	2	-	0/8/28/28	0/3/3/3

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	С	202	A1IH4	C12-C11	-4.05	1.34	1.41
3	А	202	R7E	C8-C7	-3.71	1.44	1.49
4	С	202	A1IH4	C9-C8	3.57	1.43	1.37
4	В	202	A1IH4	C7-N1	3.55	1.41	1.34
4	С	202	A1IH4	O5-C1	3.27	1.48	1.43

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
3	А	202	R7E	C10-C11-C12	5.51	133.92	128.77
4	D	202	A1IH4	C3-C2-C1	-3.34	105.09	109.94
4	С	202	A1IH4	C13-C12-C11	-3.18	116.83	120.84
4	С	202	A1IH4	C8-C9-C10	-2.88	116.79	121.24
4	В	202	A1IH4	C3-C2-C1	-2.83	105.82	109.94

There are no chirality outliers.

There are no torsion outliers.

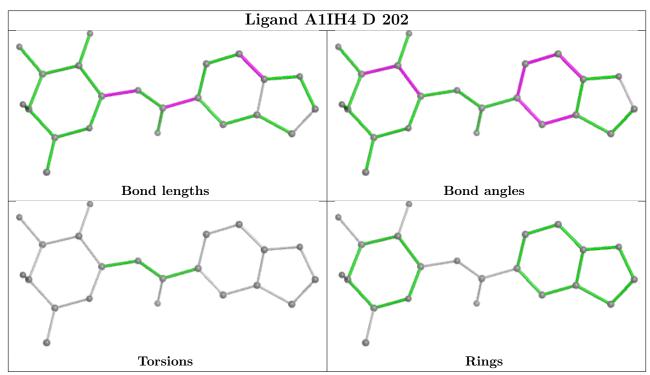
There are no ring outliers.

No monomer is involved in short contacts.

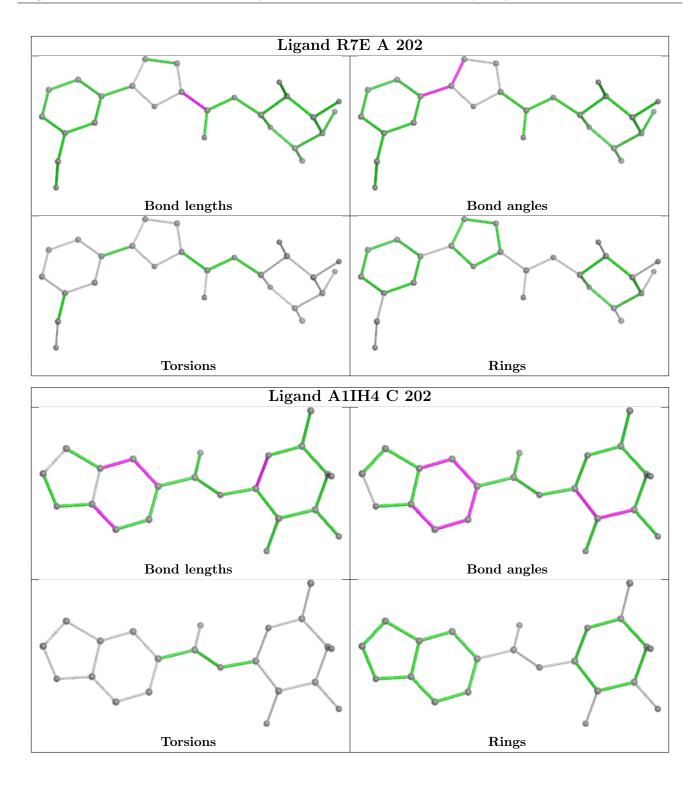
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,



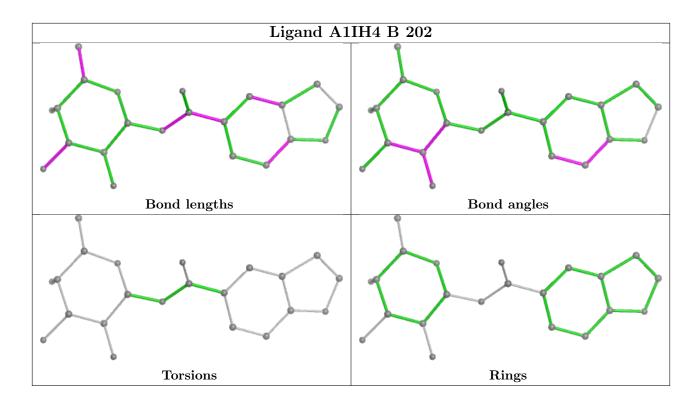
bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 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.











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^{th} 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		2Z>2	$OWAB(Å^2)$	$\mathbf{Q}{<}0.9$
1	А	114/114~(100%)	-0.56	0	100	100	8, 11, 17, 28	1 (0%)
1	В	114/114~(100%)	-0.56	0	100	100	8, 11, 17, 21	2 (1%)
1	\mathbf{C}	114/114~(100%)	-0.45	0	100	100	5, 12, 21, 29	5 (4%)
1	D	114/114 (100%)	-0.48	0	100	100	8, 12, 18, 27	1 (0%)
All	All	456/456~(100%)	-0.51	0	100	100	5, 12, 18, 29	9 (1%)

There are no RSRZ outliers to report.

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^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	$B-factors(Å^2)$	Q < 0.9
4	A1IH4	В	202	22/22	0.96	0.06	$9,\!13,\!17,\!18$	0
4	A1IH4	D	202	22/22	0.96	0.07	9,14,24,30	0
4	A1IH4	С	202	22/22	0.97	0.06	10,16,28,30	0
3	R7E	А	202	26/26	0.97	0.05	$11,\!13,\!16,\!17$	0

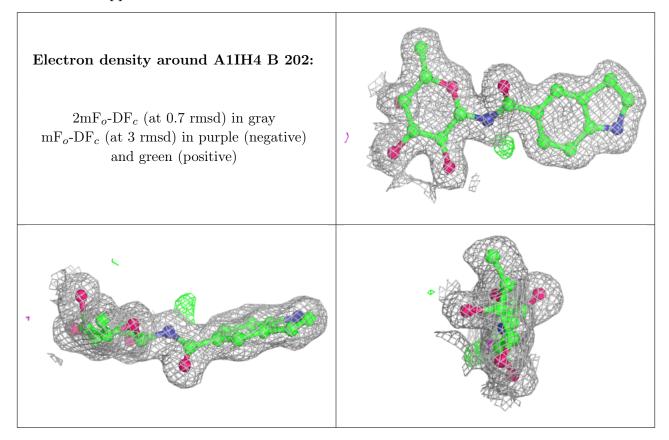
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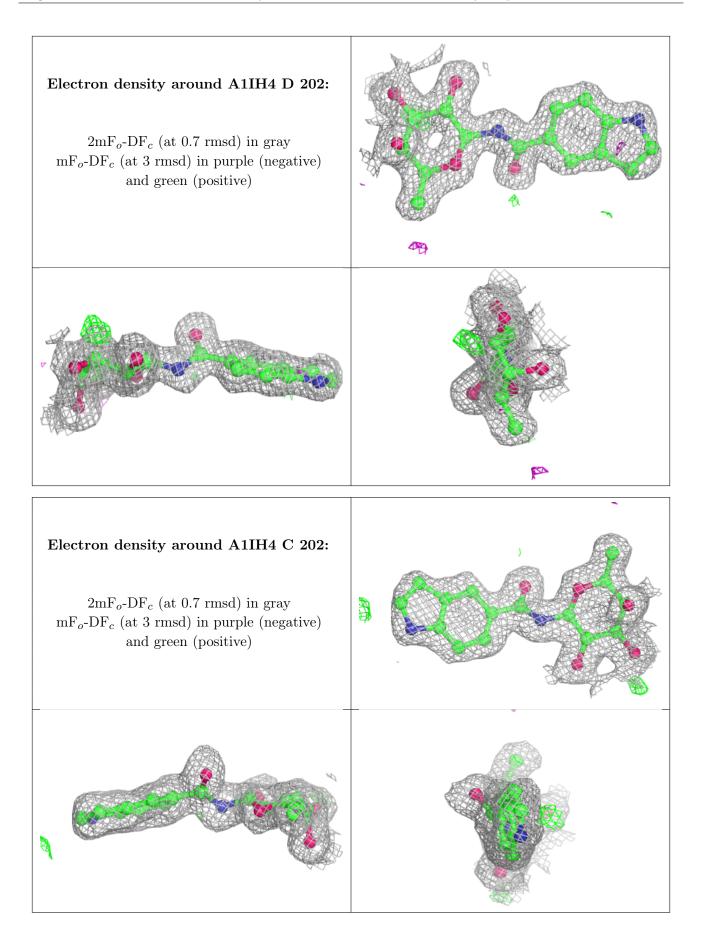
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	CA	С	200	1/1	0.99	0.02	$13,\!13,\!13,\!13$	0
2	CA	С	201	1/1	0.99	0.02	12,12,12,12	0
2	CA	D	200	1/1	1.00	0.02	10,10,10,10	0
2	CA	D	201	1/1	1.00	0.02	11,11,11,11	0
2	CA	В	200	1/1	1.00	0.02	10,10,10,10	0
2	CA	В	201	1/1	1.00	0.01	10,10,10,10	0
2	CA	А	200	1/1	1.00	0.02	10,10,10,10	0
2	CA	А	201	1/1	1.00	0.02	9,9,9,9	0

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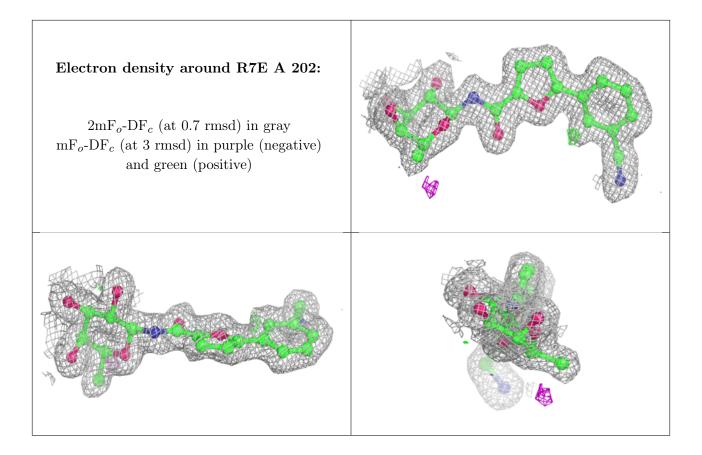
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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



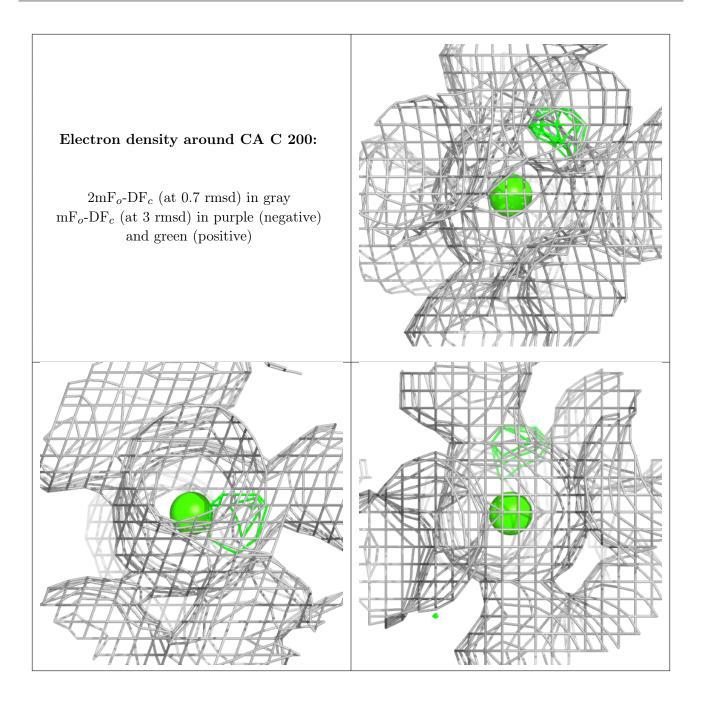




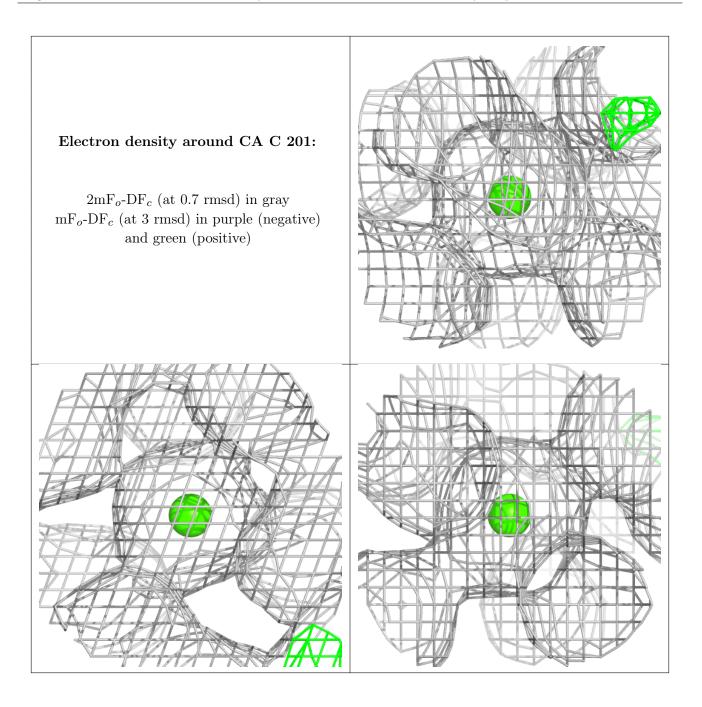




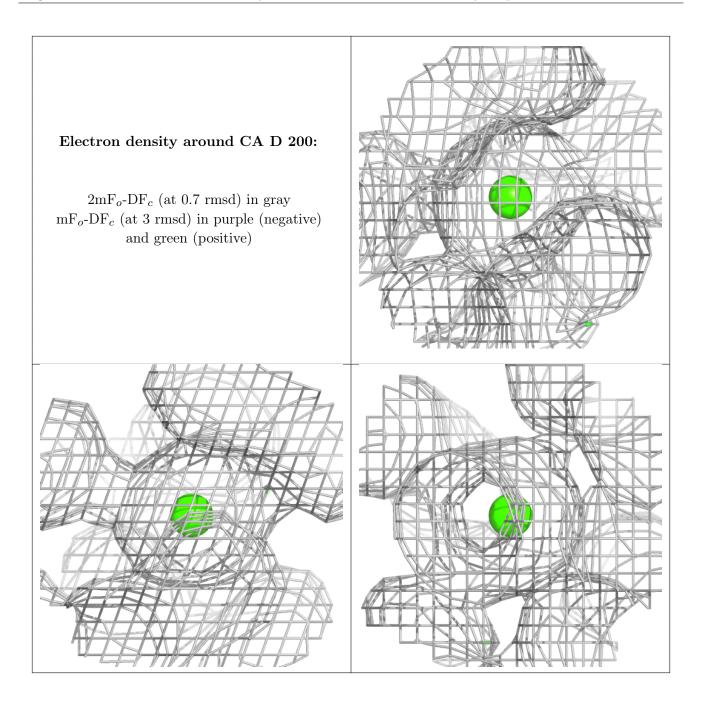




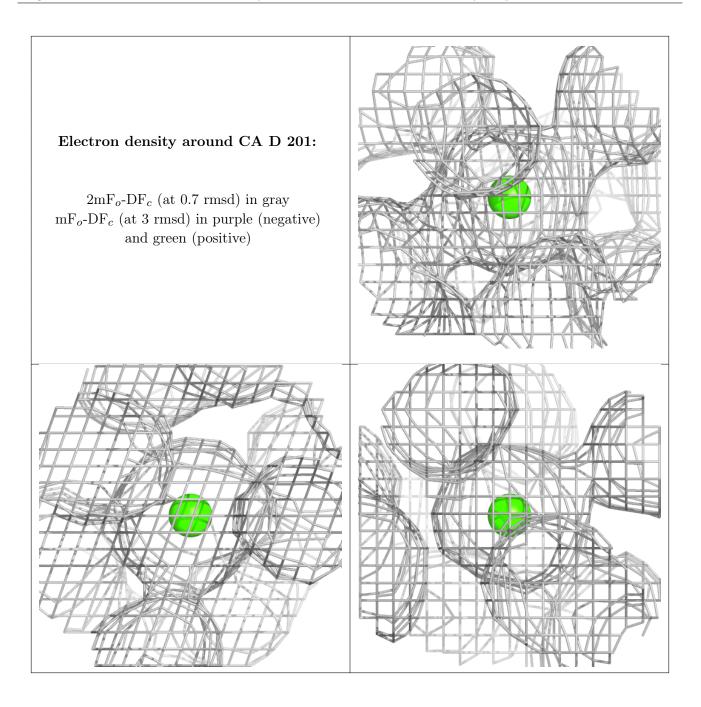




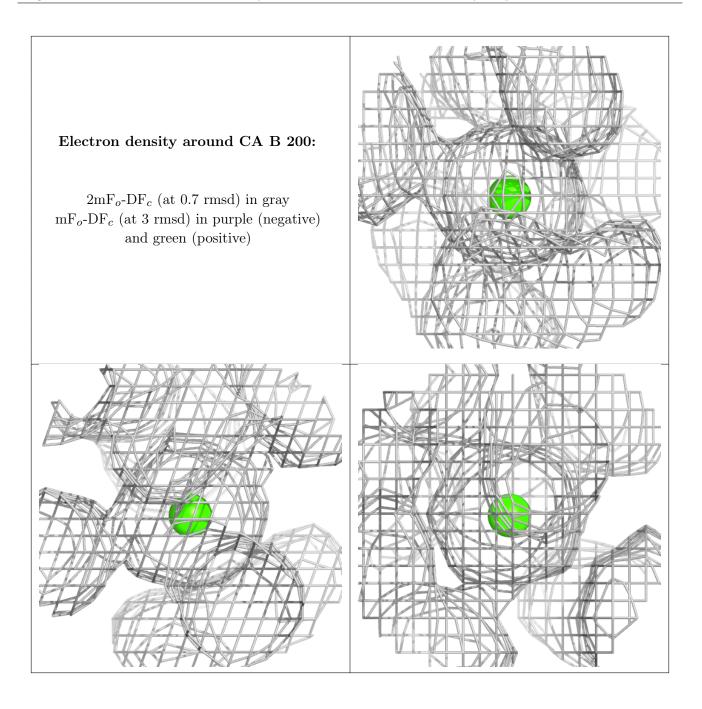




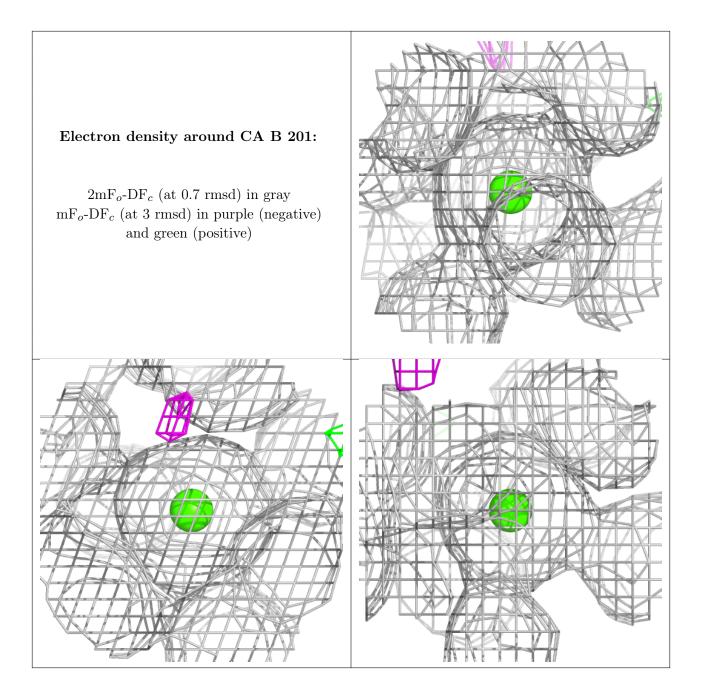




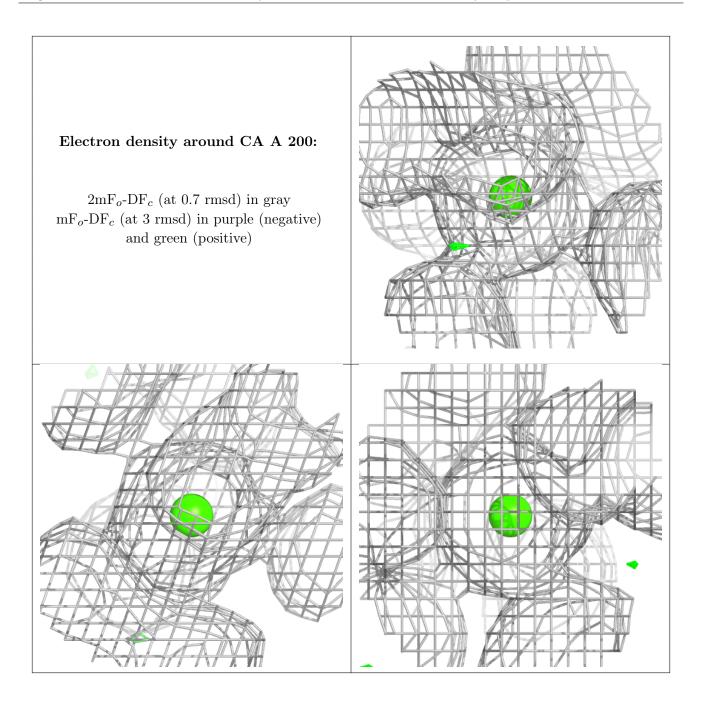




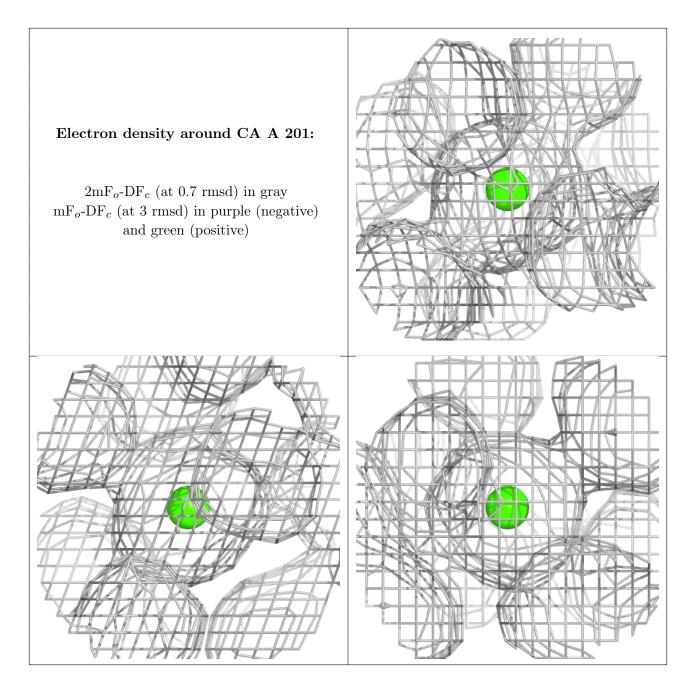












6.5 Other polymers (i)

There are no such residues in this entry.

