Full wwPDB X-ray Structure Validation Report (i)

Mar 4, 2025 – 06:12 pm GMT

PDB ID	:	8S2Y
Title	:	Crystal structure of alcohol oxidase PaAox1 from Picea abies
Authors	:	Kruhler, N.; Haataja, T.; Sandgren, M.
Deposited on	:	2024-02-19
Resolution	:	1.64 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (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 (i)) were used in the production of this report:

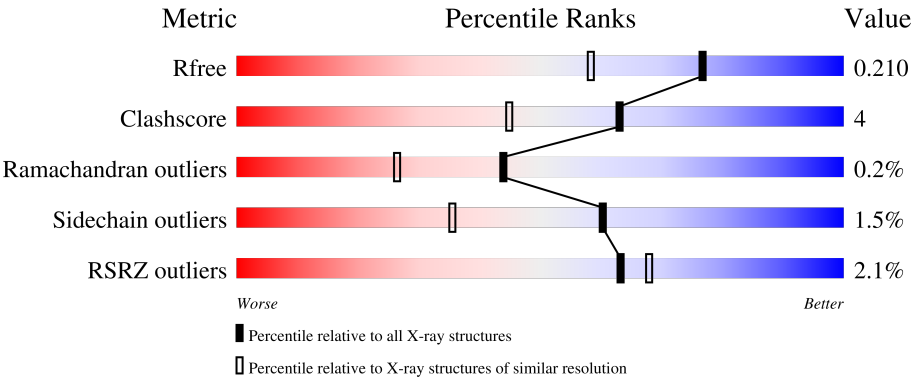
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

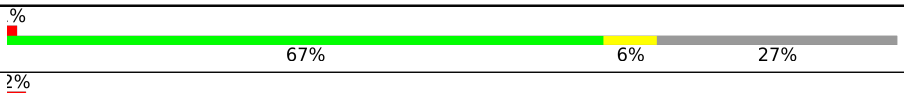
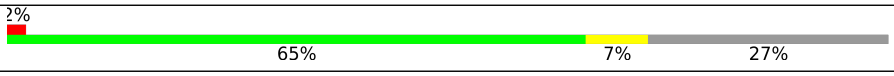
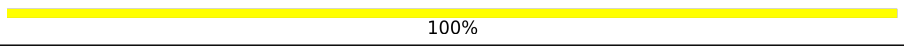
The reported resolution of this entry is 1.64 Å.

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}	164625	1015 (1.64-1.64)
Clashscore	180529	1093 (1.64-1.64)
Ramachandran outliers	177936	1077 (1.64-1.64)
Sidechain outliers	177891	1077 (1.64-1.64)
RSRZ outliers	164620	1015 (1.64-1.64)

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

Mol	Chain	Length	Quality of chain
1	A	659	
1	B	659	
2	C	2	

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 8545 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.

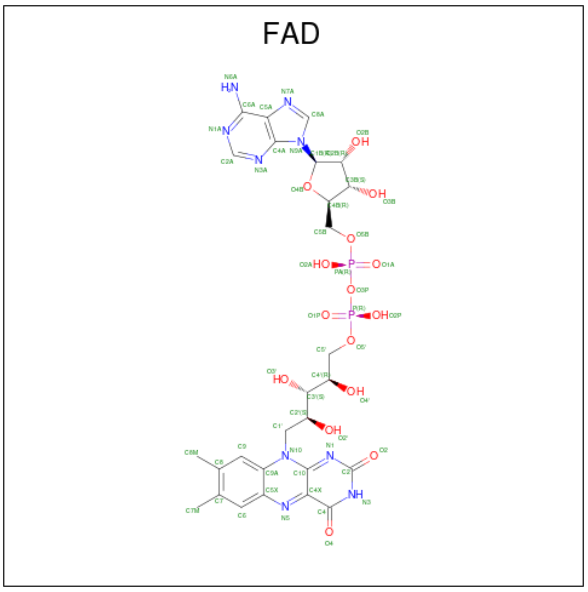
- Molecule 1 is a protein called Glucose-methanol-choline oxidoreductase N-terminal domain-containing protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	483	Total	C	N	O	S	0	8	0
			3797	2387	676	721	13			
1	B	478	Total	C	N	O	S	0	2	0
			3713	2336	658	707	12			

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

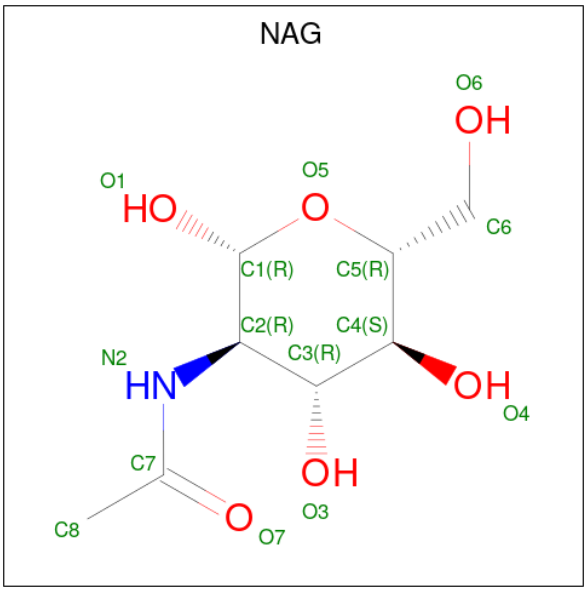
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
3	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			14	8	1	5		

Continued on next page...

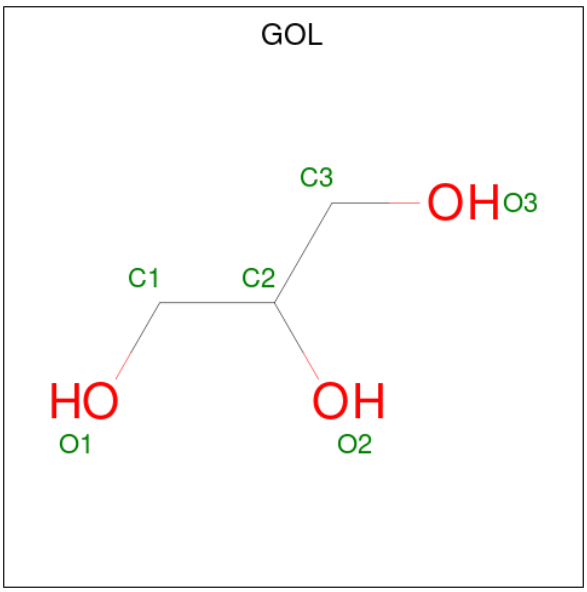
Continued from previous page...

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O 14 8 1 5	0	0
4	A	1	Total C N O 14 8 1 5	0	0
4	A	1	Total C N O 14 8 1 5	0	0
4	A	1	Total C N O 14 8 1 5	0	0
4	A	1	Total C N O 14 8 1 5	0	0
4	B	1	Total C N O 14 8 1 5	0	0
4	B	1	Total C N O 14 8 1 5	0	0
4	B	1	Total C N O 14 8 1 5	0	0

- Molecule 5 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	3	Total Na 3 3	0	0
5	B	1	Total Na 1 1	0	0

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 7 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	1	Total Ca 1 1	0	0

- Molecule 8 is water.

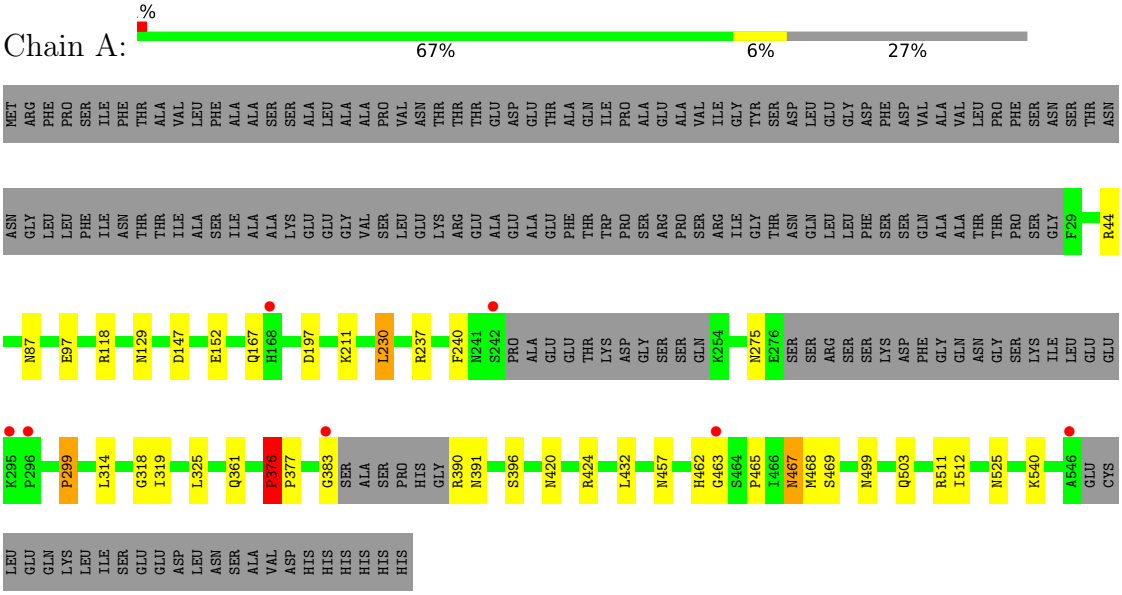
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	432	Total O 432 432	0	0
8	B	332	Total O 332 332	0	0

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.

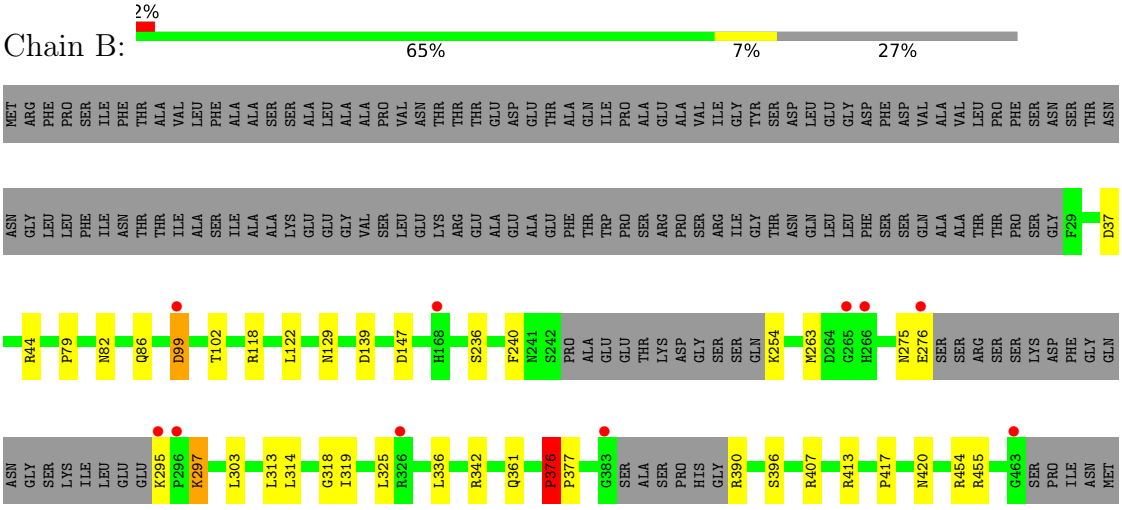
• Molecule 1: Glucose-methanol-choline oxidoreductase N-terminal domain-containing protein

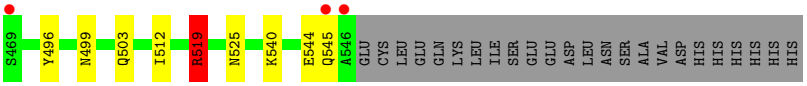
Chain A:



• Molecule 1: Glucose-methanol-choline oxidoreductase N-terminal domain-containing protein

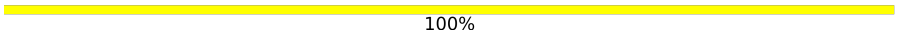
Chain B:





• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	63.10Å 99.27Å 87.96Å 90.00° 100.25° 90.00°	Depositor
Resolution (Å)	65.24 – 1.64 65.24 – 1.64	Depositor EDS
% Data completeness (in resolution range)	94.3 (65.24-1.64) 94.3 (65.24-1.64)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.06 (at 1.64Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.185 , 0.210 0.185 , 0.210	Depositor DCC
R_{free} test set	6243 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å^2)	23.5	Xtriage
Anisotropy	0.107	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 41.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	8545	wwPDB-VP
Average B, all atoms (Å^2)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.32% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CA, GOL, NA, NAG, FAD

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	0.52	0/3894	0.89	6/5286 (0.1%)
1	B	0.50	0/3799	0.90	6/5156 (0.1%)
All	All	0.51	0/7693	0.90	12/10442 (0.1%)

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	B	0	1
All	All	0	2

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	99	ASP	CB-CA-C	-10.89	88.62	110.40
1	A	230	LEU	CB-CG-CD2	8.82	125.99	111.00
1	A	424	ARG	NE-CZ-NH2	-7.84	116.38	120.30
1	A	376	PRO	N-CA-CB	-7.21	94.64	103.30
1	B	376	PRO	N-CA-CB	-7.14	94.73	103.30
1	B	44	ARG	N-CA-CB	-6.18	99.47	110.60
1	A	44	ARG	N-CA-CB	-5.92	99.94	110.60
1	B	254	LYS	CA-CB-CG	5.82	126.21	113.40
1	A	299	PRO	N-CD-CG	-5.61	94.78	103.20
1	B	455	ARG	NE-CZ-NH1	5.33	122.96	120.30
1	B	545	GLN	CB-CA-C	-5.30	99.79	110.40
1	A	97	GLU	CG-CD-OE1	-5.21	107.88	118.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	511	ARG	Sidechain
1	B	519	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	A	3797	0	3689	27	0
1	B	3713	0	3594	33	0
2	C	28	0	25	0	0
3	A	53	0	31	5	0
3	B	53	0	31	5	0
4	A	84	0	78	2	0
4	B	42	0	39	0	0
5	A	3	0	0	0	0
5	B	1	0	0	0	0
6	B	6	0	8	0	0
7	B	1	0	0	0	0
8	A	432	0	0	4	0
8	B	332	0	0	7	0
All	All	8545	0	7495	59	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 4.

All (59) 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:A:167:GLN:HG3	8:A:1060:HOH:O	1.65	0.96
1:B:263:MET:HE2	8:B:1018:HOH:O	1.76	0.85
1:B:129:ASN:HB2	3:B:602:FAD:C5X	2.10	0.82
1:A:129:ASN:HB2	3:A:601:FAD:C5X	2.09	0.82
1:B:544:GLU:OE2	8:B:701:HOH:O	2.04	0.74
1:B:129:ASN:HB2	3:B:602:FAD:N5	2.04	0.72

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:499:ASN:HD21	1:B:503:GLN:HE21	1.37	0.72
1:A:499:ASN:HD21	1:A:503:GLN:HE21	1.37	0.70
1:B:454:ARG:NH1	8:B:703:HOH:O	2.24	0.69
1:A:129:ASN:HB2	3:A:601:FAD:N5	2.07	0.68
1:B:519:ARG:NE	8:B:704:HOH:O	2.26	0.68
1:B:99:ASP:OD2	1:B:102:THR:HB	1.94	0.68
1:A:197:ASP:HB3	8:A:1027:HOH:O	1.96	0.66
1:B:342:ARG:HE	1:B:496:TYR:HE2	1.43	0.65
1:B:82:ASN:H	1:B:86:GLN:HE22	1.47	0.63
1:B:118:ARG:HH21	1:B:420:ASN:HD22	1.47	0.62
1:A:467:ASN:HD22	1:A:467:ASN:C	2.07	0.57
1:B:37:ASP:OD1	8:B:702:HOH:O	2.18	0.56
1:A:275:ASN:O	1:A:299:PRO:HG2	2.06	0.55
1:A:147[B]:ASP:OD2	1:A:540:LYS:NZ	2.39	0.54
1:B:275:ASN:O	1:B:276:GLU:HB2	2.08	0.53
1:A:462:HIS:HD2	8:A:1080:HOH:O	1.92	0.53
1:B:407:ARG:NH2	1:B:519:ARG:HD2	2.26	0.51
1:A:118:ARG:HH21	1:A:420:ASN:HD22	1.58	0.50
1:B:314:LEU:HD11	1:B:512:ILE:HD11	1.93	0.50
1:B:129:ASN:HB2	3:B:602:FAD:C4X	2.41	0.50
1:A:129:ASN:CB	3:A:601:FAD:C5X	2.87	0.49
1:A:467:ASN:ND2	1:A:469:SER:H	2.10	0.49
1:A:383:GLY:HA2	1:A:391:ASN:HD22	1.77	0.49
1:B:129:ASN:CB	3:B:602:FAD:C5X	2.88	0.49
1:B:342:ARG:NH2	8:B:704:HOH:O	2.46	0.49
1:A:275:ASN:CG	4:A:602:NAG:C1	2.81	0.49
1:A:129:ASN:HB2	3:A:601:FAD:C4X	2.44	0.48
1:B:147:ASP:OD2	1:B:540:LYS:NZ	2.46	0.48
1:A:87:ASN:HD21	1:A:211:LYS:NZ	2.11	0.48
1:A:467:ASN:HD22	1:A:468:MET:N	2.12	0.48
1:A:240:PHE:CZ	1:A:319:ILE:HD11	2.51	0.46
1:A:463:GLY:O	1:A:465:PRO:HD3	2.16	0.45
1:B:525:ASN:HB3	3:B:602:FAD:C2	2.46	0.44
1:A:275:ASN:ND2	4:A:602:NAG:N2	2.65	0.44
1:B:361:GLN:NE2	1:B:377:PRO:HB3	2.33	0.44
1:A:361:GLN:NE2	1:A:377:PRO:HB3	2.33	0.43
1:A:376:PRO:HA	1:A:396:SER:O	2.18	0.43
1:B:118:ARG:HH21	1:B:420:ASN:ND2	2.13	0.43
1:B:240:PHE:CZ	1:B:319:ILE:HD11	2.54	0.43
1:A:197:ASP:CB	8:A:1027:HOH:O	2.61	0.43
1:A:525:ASN:HB3	3:A:601:FAD:C2	2.48	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:79:PRO:HD3	1:B:122:LEU:HB3	2.00	0.43
1:B:275:ASN:O	1:B:276:GLU:CB	2.67	0.42
1:A:432:LEU:CD1	1:B:139:ASP:HB2	2.49	0.42
1:B:295:LYS:O	1:B:297:LYS:HD2	2.19	0.42
1:B:236[A]:SER:HB3	1:B:417:PRO:HG3	2.00	0.42
1:B:303:LEU:HD22	1:B:313:LEU:HD23	2.00	0.42
1:B:376:PRO:HA	1:B:396:SER:O	2.19	0.42
1:A:318:GLY:HA2	1:A:325:LEU:HD13	2.02	0.42
1:B:413:ARG:NH2	8:B:713:HOH:O	2.52	0.41
1:A:314:LEU:HD11	1:A:512:ILE:HD11	2.03	0.40
1:B:318:GLY:HA2	1:B:325:LEU:HD13	2.04	0.40
1:B:499:ASN:HD21	1:B:503:GLN:NE2	2.12	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	483/659 (73%)	474 (98%)	8 (2%)	1 (0%)	44	26
1	B	470/659 (71%)	460 (98%)	9 (2%)	1 (0%)	44	26
All	All	953/1318 (72%)	934 (98%)	17 (2%)	2 (0%)	44	26

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	376	PRO
1	B	376	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	409/548 (75%)	401 (98%)	8 (2%)	50 22
1	B	398/548 (73%)	393 (99%)	5 (1%)	65 40
All	All	807/1096 (74%)	794 (98%)	13 (2%)	60 32

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

Mol	Chain	Res	Type
1	A	152	GLU
1	A	230	LEU
1	A	237[A]	ARG
1	A	237[B]	ARG
1	A	376	PRO
1	A	390	ARG
1	A	457	ASN
1	A	467	ASN
1	B	297	LYS
1	B	336	LEU
1	B	376	PRO
1	B	390	ARG
1	B	519	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	87	ASN
1	A	271	GLN
1	A	275	ASN
1	A	361	GLN
1	A	368	GLN
1	A	391	ASN
1	A	420	ASN
1	A	457	ASN
1	A	462	HIS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	467	ASN
1	A	503	GLN
1	A	505	ASN
1	B	86	GLN
1	B	189	ASN
1	B	271	GLN
1	B	361	GLN
1	B	391	ASN
1	B	420	ASN
1	B	462	HIS
1	B	503	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)

2 monosaccharides 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	$\#\|Z\| > 2$
2	NAG	C	1	1,2	14,14,15	0.38	0	17,19,21	1.35	1 (5%)
2	NAG	C	2	2	14,14,15	0.39	0	17,19,21	1.18	2 (11%)

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	NAG	C	1	1,2	-	1/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	1	NAG	C1-O5-C5	4.35	118.09	112.19
2	C	2	NAG	C1-C2-N2	3.40	116.29	110.49
2	C	2	NAG	C2-N2-C7	2.25	126.11	122.90

There are no chirality outliers.

All (3) torsion outliers are listed below:

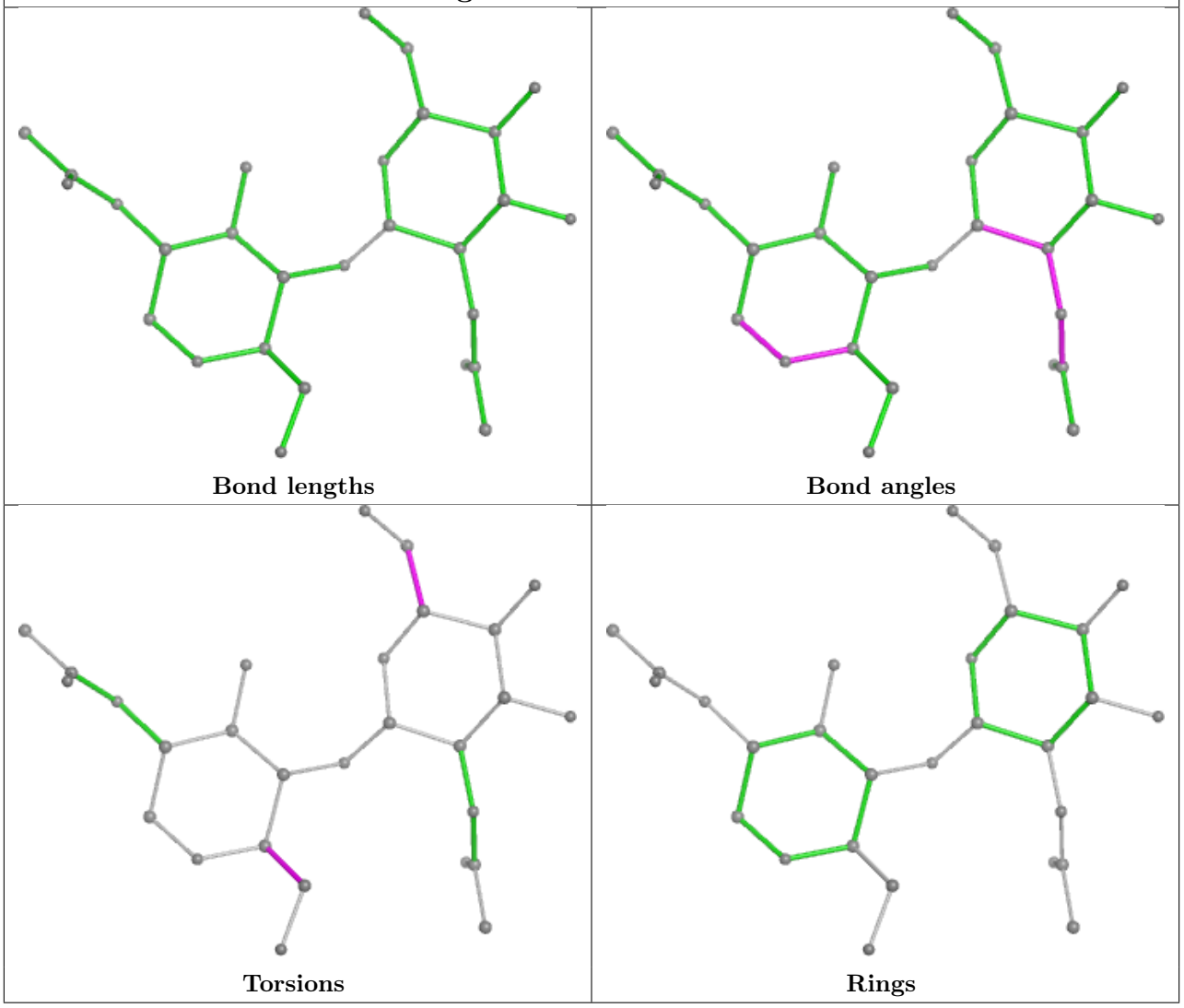
Mol	Chain	Res	Type	Atoms
2	C	2	NAG	C4-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
2	C	1	NAG	O5-C5-C6-O6

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 oligosaccharide.

Oligosaccharide Chain C



5.6 Ligand geometry (i)

Of 17 ligands modelled in this entry, 5 are monoatomic - leaving 12 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	$\#\|Z\| > 2$
4	NAG	B	605	1	14,14,15	0.34	0	17,19,21	1.24	2 (11%)
4	NAG	A	605	1	14,14,15	0.37	0	17,19,21	0.70	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	NAG	A	607	1	14,14,15	0.40	0	17,19,21	1.50	3 (17%)
4	NAG	A	606	-	14,14,15	0.50	0	17,19,21	1.52	2 (11%)
6	GOL	B	601	-	5,5,5	0.14	0	5,5,5	0.37	0
3	FAD	B	602	-	53,58,58	0.78	0	68,89,89	0.87	2 (2%)
4	NAG	A	603	1	14,14,15	0.38	0	17,19,21	0.97	0
4	NAG	A	604	1	14,14,15	0.45	0	17,19,21	2.20	3 (17%)
4	NAG	B	604	1	14,14,15	0.31	0	17,19,21	1.03	2 (11%)
4	NAG	B	606	1	14,14,15	0.42	0	17,19,21	1.01	1 (5%)
3	FAD	A	601	-	53,58,58	0.73	0	68,89,89	0.80	0
4	NAG	A	602	-	14,14,15	0.42	0	17,19,21	0.69	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	NAG	B	605	1	-	2/6/23/26	0/1/1/1
4	NAG	A	605	1	-	0/6/23/26	0/1/1/1
4	NAG	A	607	1	-	4/6/23/26	0/1/1/1
4	NAG	A	606	-	-	3/6/23/26	0/1/1/1
6	GOL	B	601	-	-	2/4/4/4	-
3	FAD	B	602	-	-	2/30/50/50	0/6/6/6
4	NAG	A	603	1	-	0/6/23/26	0/1/1/1
4	NAG	A	604	1	-	3/6/23/26	0/1/1/1
4	NAG	B	604	1	-	0/6/23/26	0/1/1/1
4	NAG	B	606	1	-	4/6/23/26	0/1/1/1
3	FAD	A	601	-	-	1/30/50/50	0/6/6/6
4	NAG	A	602	-	-	1/6/23/26	0/1/1/1

There are no bond length outliers.

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	604	NAG	C2-N2-C7	6.29	131.87	122.90
4	A	604	NAG	C1-C2-N2	5.40	119.71	110.49
4	A	606	NAG	C2-N2-C7	4.58	129.42	122.90
4	A	607	NAG	C1-O5-C5	4.56	118.36	112.19
4	B	605	NAG	C1-O5-C5	3.49	116.93	112.19

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	607	NAG	O5-C1-C2	3.08	116.14	111.29
4	A	606	NAG	O5-C1-C2	-2.83	106.82	111.29
3	B	602	FAD	O4B-C1B-C2B	-2.64	103.07	106.93
4	B	604	NAG	C1-C2-N2	2.64	114.99	110.49
4	A	607	NAG	C1-C2-N2	2.53	114.81	110.49
4	B	605	NAG	C1-C2-N2	2.38	114.55	110.49
3	B	602	FAD	O2P-P-O1P	2.33	123.78	112.24
4	A	604	NAG	O5-C1-C2	-2.21	107.80	111.29
4	B	606	NAG	C3-C4-C5	2.14	114.06	110.24
4	B	604	NAG	C2-N2-C7	2.01	125.77	122.90

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	606	NAG	C8-C7-N2-C2
4	A	606	NAG	O7-C7-N2-C2
4	A	607	NAG	C8-C7-N2-C2
4	A	607	NAG	O7-C7-N2-C2
4	B	606	NAG	C8-C7-N2-C2
4	B	606	NAG	O7-C7-N2-C2
4	A	604	NAG	O5-C5-C6-O6
4	B	605	NAG	C8-C7-N2-C2
4	B	605	NAG	O7-C7-N2-C2
4	A	604	NAG	C4-C5-C6-O6
4	A	607	NAG	O5-C5-C6-O6
4	A	607	NAG	C4-C5-C6-O6
6	B	601	GOL	C1-C2-C3-O3
6	B	601	GOL	O2-C2-C3-O3
4	B	606	NAG	C4-C5-C6-O6
3	B	602	FAD	PA-O3P-P-O5'
4	A	602	NAG	O5-C5-C6-O6
4	B	606	NAG	O5-C5-C6-O6
4	A	606	NAG	O5-C5-C6-O6
3	A	601	FAD	O4B-C4B-C5B-O5B
3	B	602	FAD	O4B-C4B-C5B-O5B
4	A	604	NAG	C3-C2-N2-C7

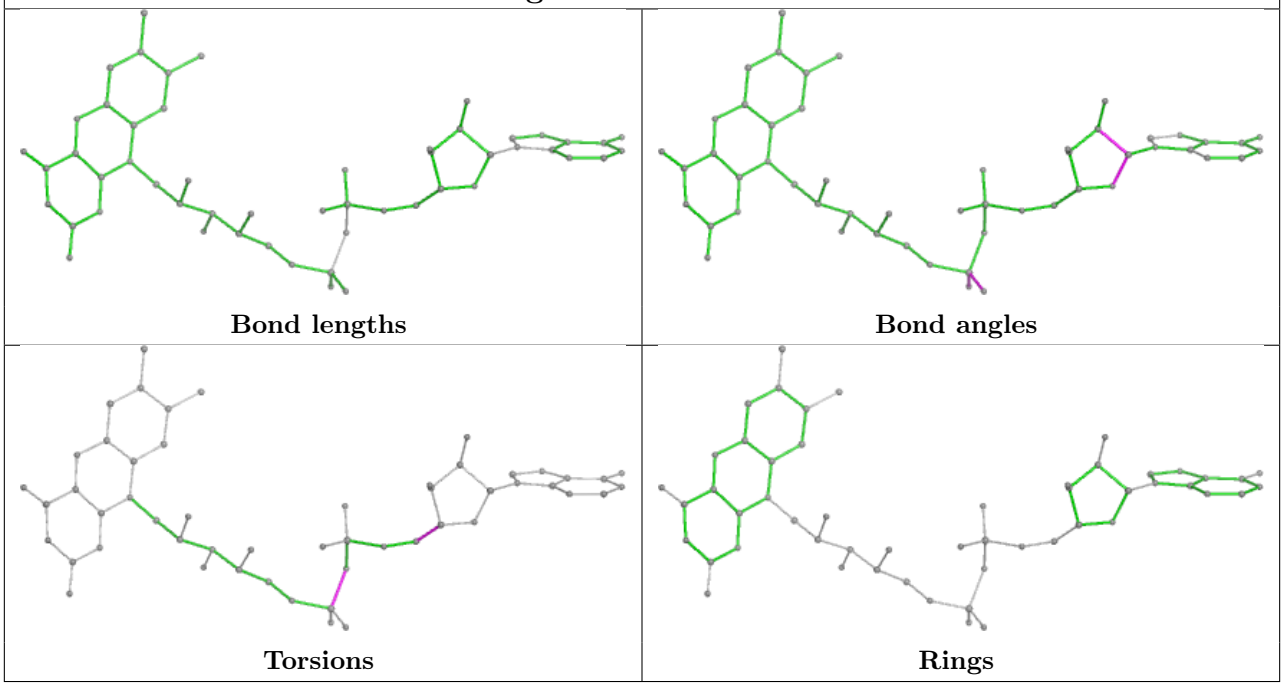
There are no ring outliers.

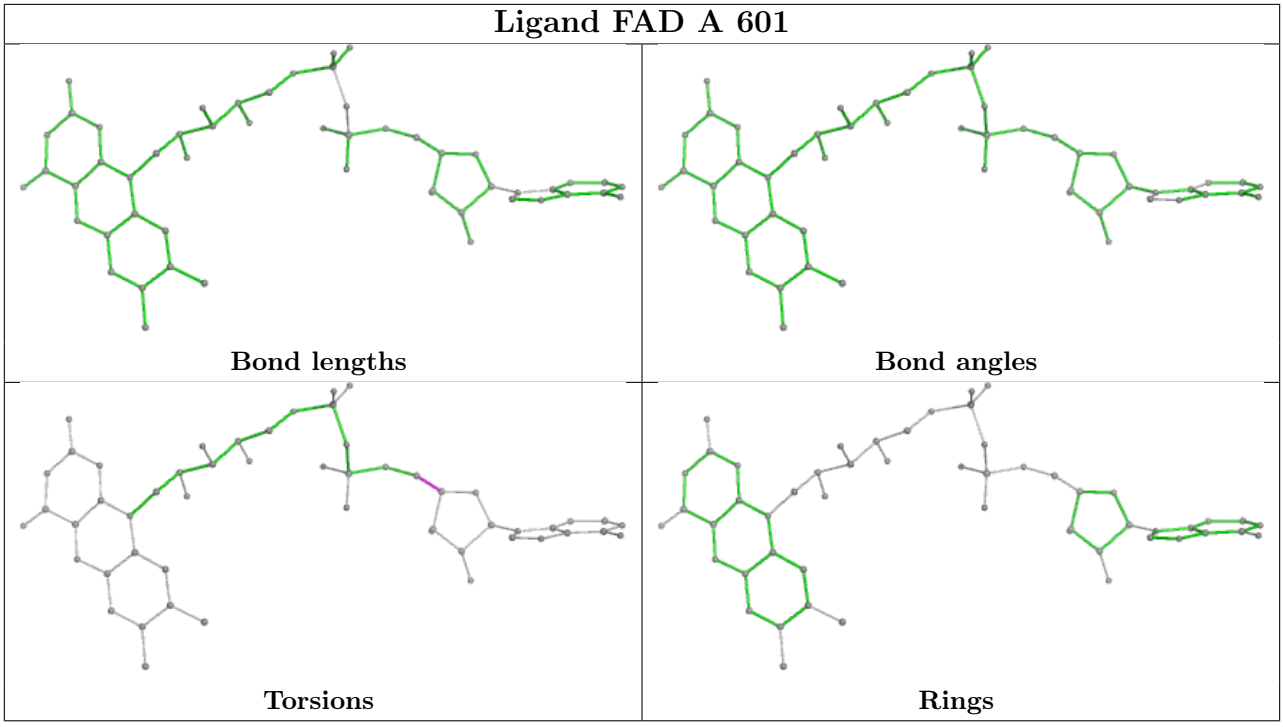
3 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	602	FAD	5	0
3	A	601	FAD	5	0
4	A	602	NAG	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 then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand FAD B 602





5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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			OWAB(Å^2)	Q<0.9
1	A	483/659 (73%)	-0.32	7 (1%)	73	78	9, 22, 45, 90	12 (2%)
1	B	478/659 (72%)	-0.04	13 (2%)	56	59	16, 26, 50, 104	6 (1%)
All	All	961/1318 (72%)	-0.18	20 (2%)	63	68	9, 24, 48, 104	18 (1%)

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	546	ALA	5.4
1	B	295	LYS	3.6
1	A	546	ALA	3.4
1	B	296	PRO	3.4
1	B	168[A]	HIS	3.1
1	B	266	HIS	3.0
1	B	383	GLY	2.8
1	A	295	LYS	2.8
1	A	296	PRO	2.8
1	B	463	GLY	2.7
1	B	469	SER	2.7
1	B	276	GLU	2.6
1	B	99	ASP	2.5
1	A	242	SER	2.3
1	A	463	GLY	2.3
1	B	265	GLY	2.2
1	B	326	ARG	2.2
1	A	383	GLY	2.1
1	B	545	GLN	2.1
1	A	168	HIS	2.0

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

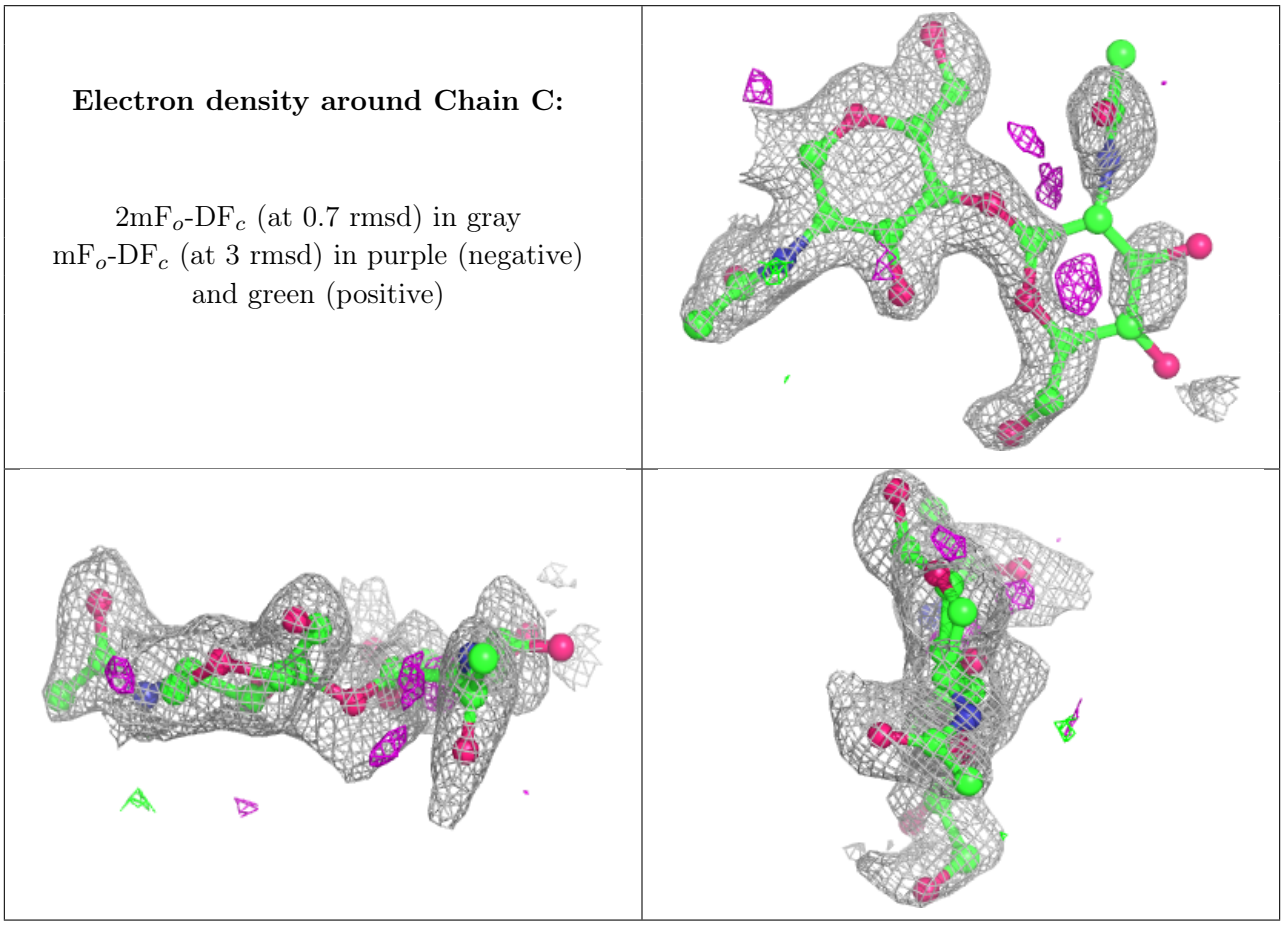
There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates (i)

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
2	NAG	C	2	14/15	0.60	0.16	55,79,95,98	0
2	NAG	C	1	14/15	0.89	0.10	42,46,54,56	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



6.4 Ligands (i)

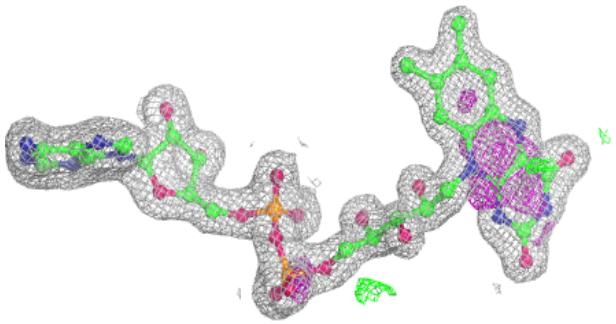
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

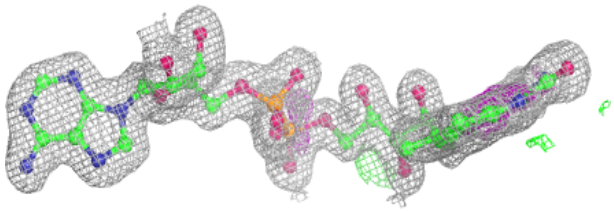
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	NAG	B	604	14/15	0.41	0.17	70,87,98,102	0
4	NAG	A	607	14/15	0.42	0.16	97,110,117,118	0
4	NAG	A	604	14/15	0.49	0.17	76,94,126,127	0
4	NAG	A	606	14/15	0.65	0.17	68,86,100,102	0
4	NAG	B	606	14/15	0.66	0.16	65,77,85,90	0
4	NAG	B	605	14/15	0.72	0.15	59,67,75,75	0
6	GOL	B	601	6/6	0.78	0.16	41,53,60,63	0
4	NAG	A	605	14/15	0.81	0.12	45,53,59,67	0
4	NAG	A	602	14/15	0.87	0.10	36,43,47,48	0
4	NAG	A	603	14/15	0.89	0.10	32,39,46,50	0
5	NA	A	609	1/1	0.96	0.11	32,32,32,32	0
3	FAD	B	602	53/53	0.97	0.07	19,23,29,31	0
3	FAD	A	601	53/53	0.98	0.05	15,19,24,27	0
5	NA	B	603	1/1	0.99	0.06	16,16,16,16	0
5	NA	A	608	1/1	0.99	0.04	22,22,22,22	0
5	NA	A	610	1/1	1.00	0.07	13,13,13,13	0
7	CA	B	607	1/1	1.00	0.02	21,21,21,21	0

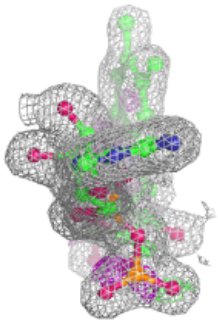
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around FAD B 602:

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

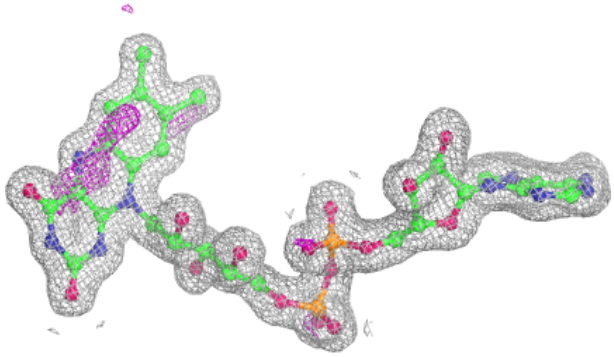


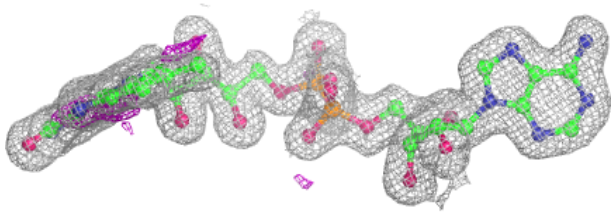


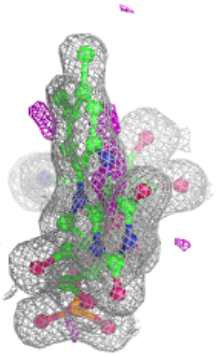


Electron density around FAD A 601:

$2mF_o$-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.