WORLDWIDE PDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Oct 26, 2023 – 07:05 PM EDT

PDB ID	:	3NVD
Title	:	Structure of YBBD in complex with pugnac
Authors	:	Diederichs, K.
Deposited on	:	2010-07-08
Resolution	:	1.84 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (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 1.84 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.
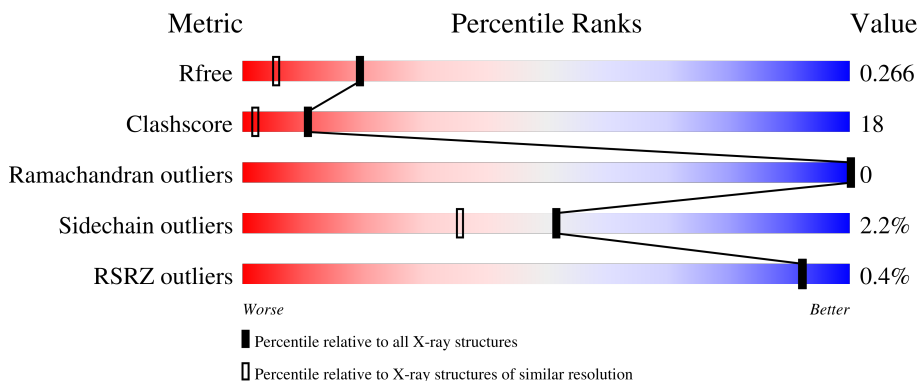
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4003 (1.86-1.82)
Clashscore	141614	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)
RSRZ outliers	127900	3957 (1.86-1.82)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments 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	642	69% · · · 26% · ·
1	B	642	71% · · · 23% · ·

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 20916 atoms, of which 9778 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 Uncharacterized lipoprotein ybbD.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	617	Total 9643	C 3018	H 4877	N 829	O 900	S 19	7	1	0
1	B	617	Total 9643	C 3018	H 4877	N 829	O 900	S 19	5	1	0

- Molecule 2 is O-(2-ACETAMIDO-2-DEOXY D-GLUCOPYRANOSYLIDENE) AMINO-N-PHENYLCARBAMATE (three-letter code: OAN) (formula: $C_{15}H_{19}N_3O_7$).
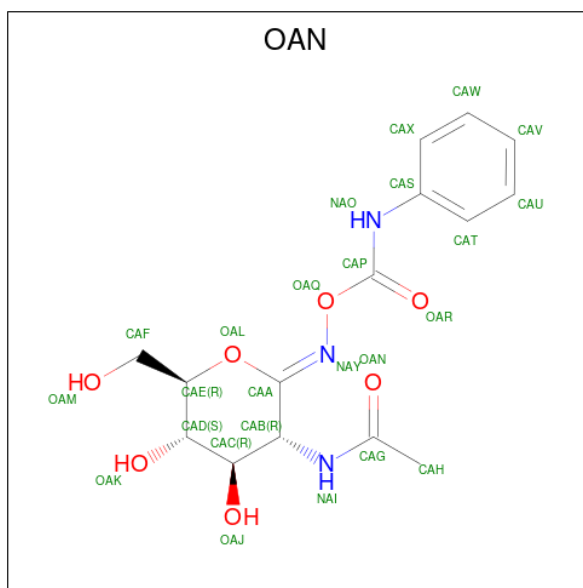
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total 25	C 15	N 3	O 7	0	0
2	B	1	Total 25	C 15	N 3	O 7	0	0

- Molecule 3 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: $C_8H_{18}O_5$).

PG4

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	H	O	0	0
			23	8	12	3		

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

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

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).

ACT
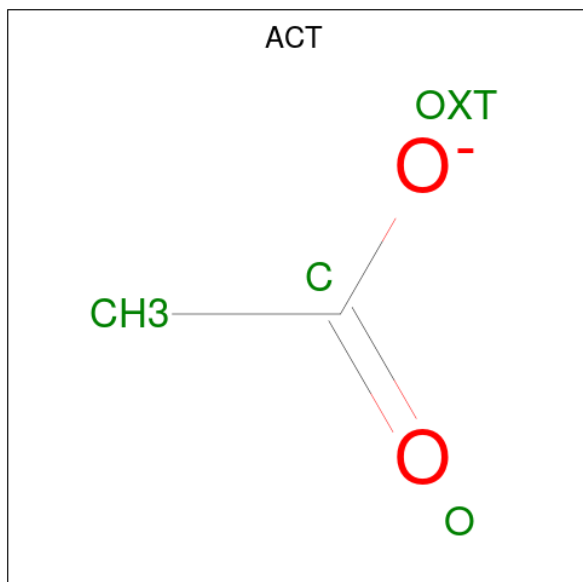
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total 7	C 2	H 3	O 2	0	0
5	A	1	Total 7	C 2	H 3	O 2	0	0
5	B	1	Total 7	C 2	H 3	O 2	0	0
5	B	1	Total 7	C 2	H 3	O 2	0	0

• Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	769	Total 769	O 769	0	0
6	B	758	Total 758	O 758	0	0

3 Residue-property plots ⓘ

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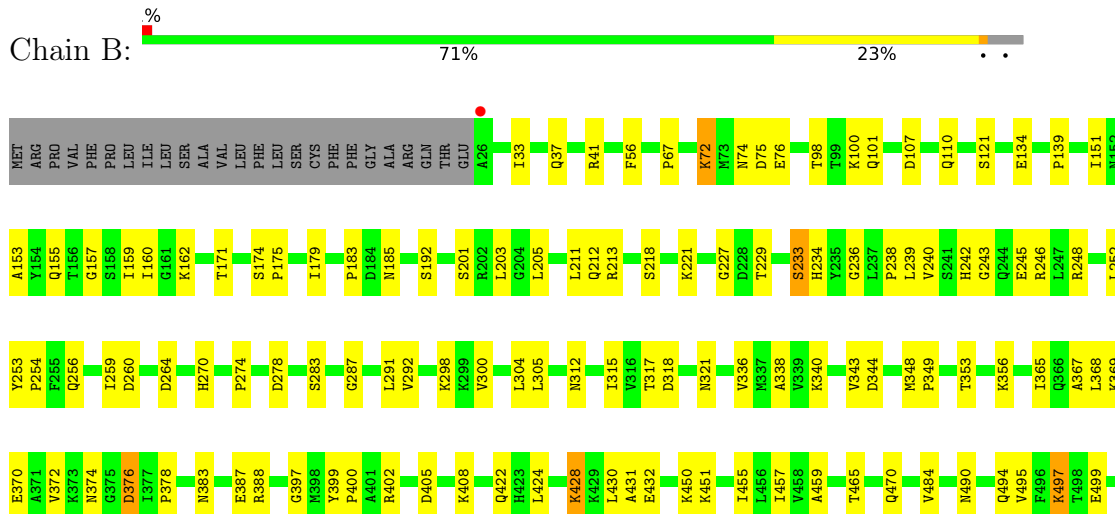, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: Uncharacterized lipoprotein ybbD

- Molecule 1: Uncharacterized lipoprotein ybbD

K502 Q503 V504 K505 E506 S514 Y515 V516 V517 D520 P521 V522 V523 I528 S533 D534 W538 A539 F542 Q552 H553 N564 E572 G582 Y586 A587 N595 I596 V600 G605 K608 P609 K610 P623 N635 I636 K637 T638 G639 R640 P641 L642
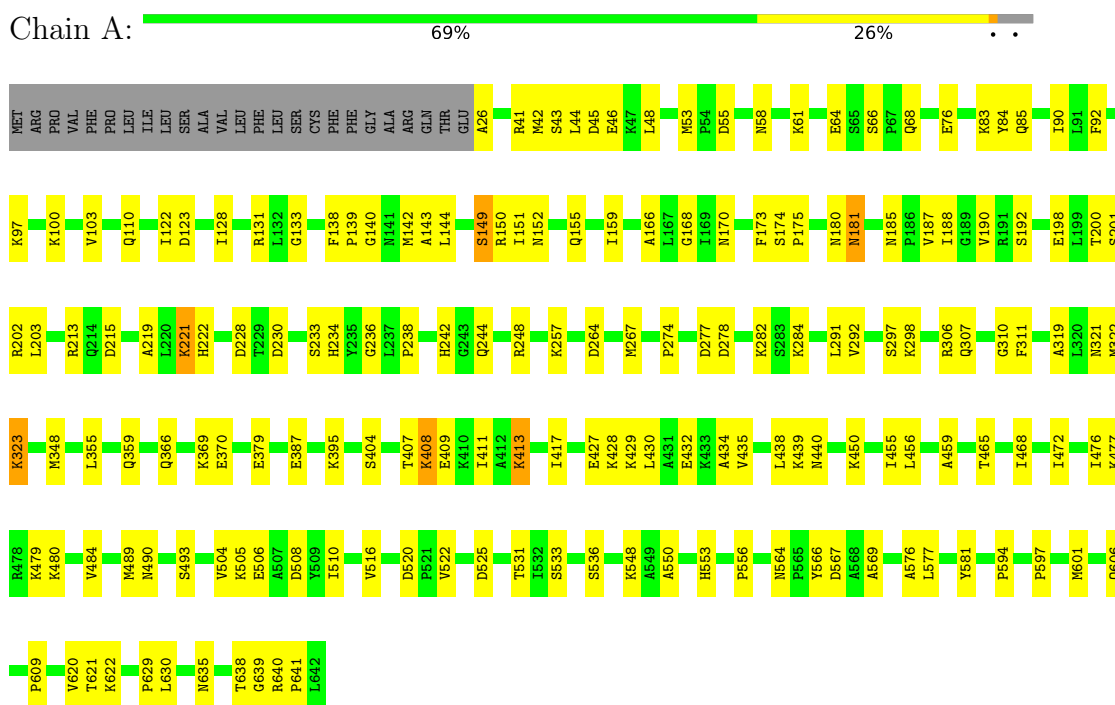
4   Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	58.47Å 73.21Å 83.79Å 79.83° 69.45° 88.22°	Depositor
Resolution (Å)	48.55 – 1.84 48.55 – 1.84	Depositor EDS
% Data completeness (in resolution range)	93.6 (48.55-1.84) 85.8 (48.55-1.84)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.24 (at 1.83Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.1_357)	Depositor
R, R_{free}	0.187 , 0.246 0.203 , 0.266	Depositor DCC
R_{free} test set	5235 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	17.7	Xtriage
Anisotropy	0.169	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 37.0	EDS
L-test for twinning[2]	$< |L| > = 0.44, < L^2 > = 0.27$	Xtriage
Estimated twinning fraction	0.187 for h,-k,h-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	20916	wwPDB-VP
Average B, all atoms (Å^2)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.59% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: ACT, NA, PG4, OAN

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	0.76	0/4853	0.77	1/6552 (0.0%)
1	B	0.74	0/4853	0.78	1/6552 (0.0%)
All	All	0.75	0/9706	0.77	2/13104 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	41	ARG	NE-CZ-NH1	6.79	123.70	120.30
1	B	278	ASP	CB-CG-OD1	5.17	122.95	118.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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	4766	4877	4888	182	2
1	B	4766	4877	4888	170	2
2	A	25	0	18	7	0
2	B	25	0	18	5	0
3	A	11	12	12	5	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	8	6	6	1	0
5	B	8	6	6	0	0
6	A	769	0	0	105	6
6	B	758	0	0	103	7
All	All	11138	9778	9836	356	9

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 18.

The worst 5 of 356 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:46:GLU:HB2	6:A:1492:HOH:O	1.41	1.20
1:A:152:ASN:HA	6:A:1305:HOH:O	1.64	0.97
1:A:348:MET:SD	6:A:1140:HOH:O	2.22	0.96
1:A:144:LEU:HG	6:A:1400:HOH:O	1.69	0.93
1:A:55:ASP:HB3	6:A:1140:HOH:O	1.71	0.91

The worst 5 of 9 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)
6:A:1227:HOH:O	6:A:1228:HOH:O[1_455]	1.92	0.28
6:A:1038:HOH:O	6:B:987:HOH:O[1_556]	2.06	0.14
1:A:151:ILE:HG21	6:B:1429:HOH:O[1_655]	1.48	0.12
6:A:975:HOH:O	6:B:1194:HOH:O[1_556]	2.10	0.10
6:A:985:HOH:O	6:B:741:HOH:O[1_556]	2.10	0.10

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	616/642 (96%)	592 (96%)	24 (4%)	0	100	100
1	B	616/642 (96%)	584 (95%)	32 (5%)	0	100	100
All	All	1232/1284 (96%)	1176 (96%)	56 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	520/541 (96%)	508 (98%)	12 (2%)	50	34
1	B	520/541 (96%)	509 (98%)	11 (2%)	53	38
All	All	1040/1082 (96%)	1017 (98%)	23 (2%)	52	36

5 of 23 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	221	LYS
1	B	376	ASP
1	B	246	ARG
1	B	428	LYS
1	A	413	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	214	GLN
1	B	312	ASN
1	B	625	ASN
1	B	366	GLN
1	A	422	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 9 ligands modelled in this entry, 2 are monoatomic - leaving 7 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	$\#|Z| > 2$
5	ACT	A	644	-	3,3,3	0.87	0	3,3,3	0.86	0
2	OAN	A	646	-	24,26,26	4.61	12 (50%)	24,35,35	1.61	4 (16%)
3	PG4	A	647	-	10,10,12	0.74	0	9,9,11	1.39	1 (11%)
5	ACT	B	645	-	3,3,3	0.71	0	3,3,3	1.30	0
5	ACT	B	644	-	3,3,3	0.70	0	3,3,3	1.35	0
2	OAN	B	646	-	24,26,26	4.62	17 (70%)	24,35,35	1.97	8 (33%)
5	ACT	A	645	-	3,3,3	0.67	0	3,3,3	1.32	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
2	OAN	A	646	-	-	8/12/35/35	0/2/2/2
2	OAN	B	646	-	-	4/12/35/35	0/2/2/2

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WORLDWIDE wwPDB PROTEIN DATA BANK

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PG4	A	647	-	-	4/8/8/10	-

The worst 5 of 29 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	646	OAN	CAX-CAS	9.57	1.55	1.39
2	A	646	OAN	CAX-CAS	9.38	1.55	1.39
2	B	646	OAN	CAT-CAS	8.78	1.54	1.39
2	A	646	OAN	CAT-CAS	8.69	1.53	1.39
2	A	646	OAN	CAW-CAX	7.30	1.54	1.38

The worst 5 of 13 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	646	OAN	CAS-NAO-CAP	-5.00	118.14	126.36
2	B	646	OAN	CAS-NAO-CAP	-4.65	118.72	126.36
2	B	646	OAN	OAK-CAD-CAC	-3.68	101.84	110.35
2	A	646	OAN	OAR-CAP-NAO	-3.36	118.80	126.11
2	B	646	OAN	CAF-CAE-CAD	-3.34	105.18	113.00

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	646	OAN	OAR-CAP-OAQ-NAY
2	A	646	OAN	NAO-CAP-OAQ-NAY
2	A	646	OAN	OAQ-CAP-NAO-CAS
2	A	646	OAN	OAR-CAP-NAO-CAS
2	B	646	OAN	OAR-CAP-OAQ-NAY

There are no ring outliers.

4 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	644	ACT	1	0
2	A	646	OAN	7	0
3	A	647	PG4	5	0
2	B	646	OAN	5	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 OAN A 646

Bond lengths

Bond angles

Torsions

Rings

Ligand OAN B 646

Bond lengths

Bond angles

Torsions

Rings
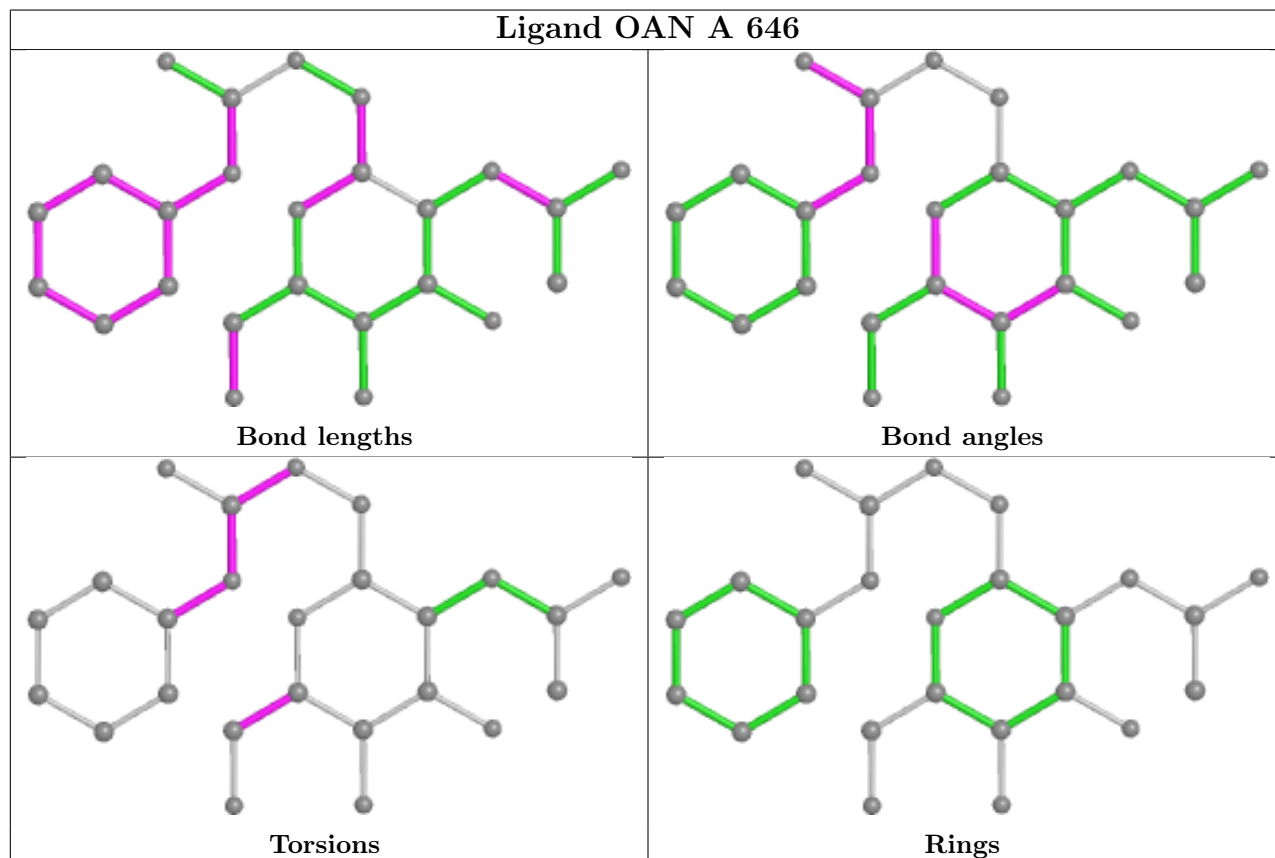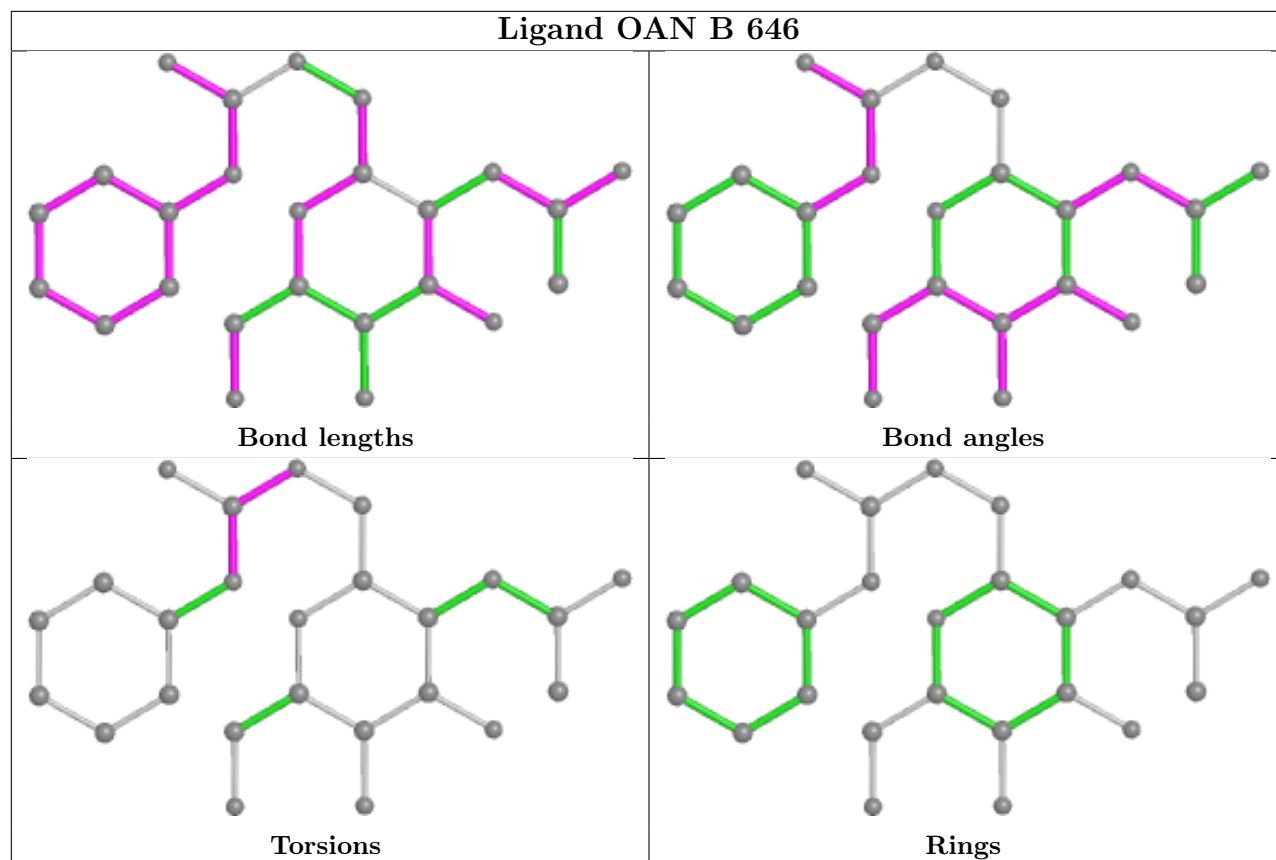
5.7 Other polymers ⓘ

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, 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(Å²)	Q<0.9
1	A	617/642 (96%)	-0.24	0	100	100	8, 18, 38, 55	1 (0%)
1	B	617/642 (96%)	-0.21	5 (0%)	86	86	9, 20, 40, 81	1 (0%)
All	All	1234/1284 (96%)	-0.23	5 (0%)	92	92	8, 19, 39, 81	2 (0%)

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	533	SER	2.9
1	B	26	ALA	2.7
1	B	642	LEU	2.5
1	B	587	ALA	2.3
1	B	640	ARG	2.2

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

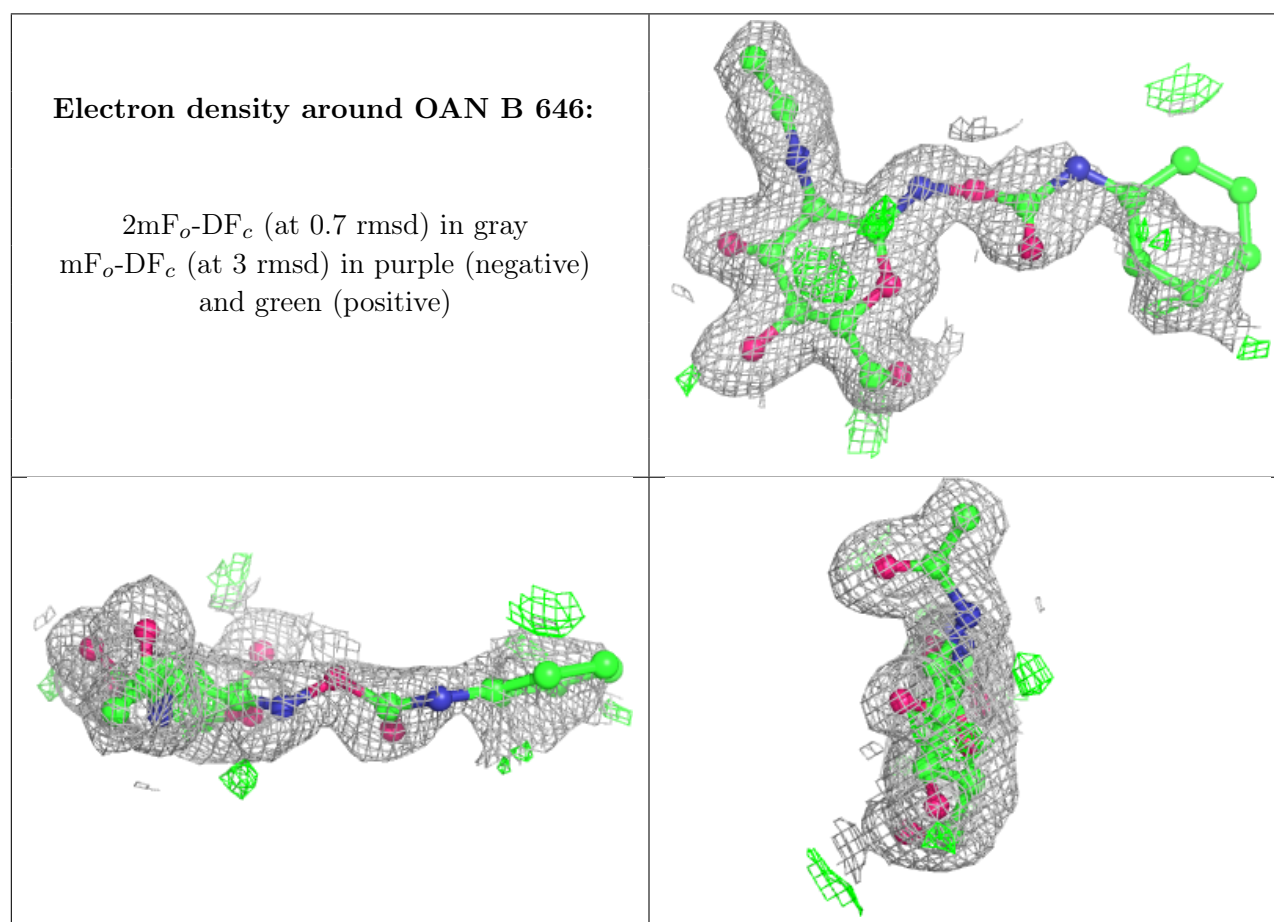There are no non-standard protein/DNA/RNA residues in this entry.

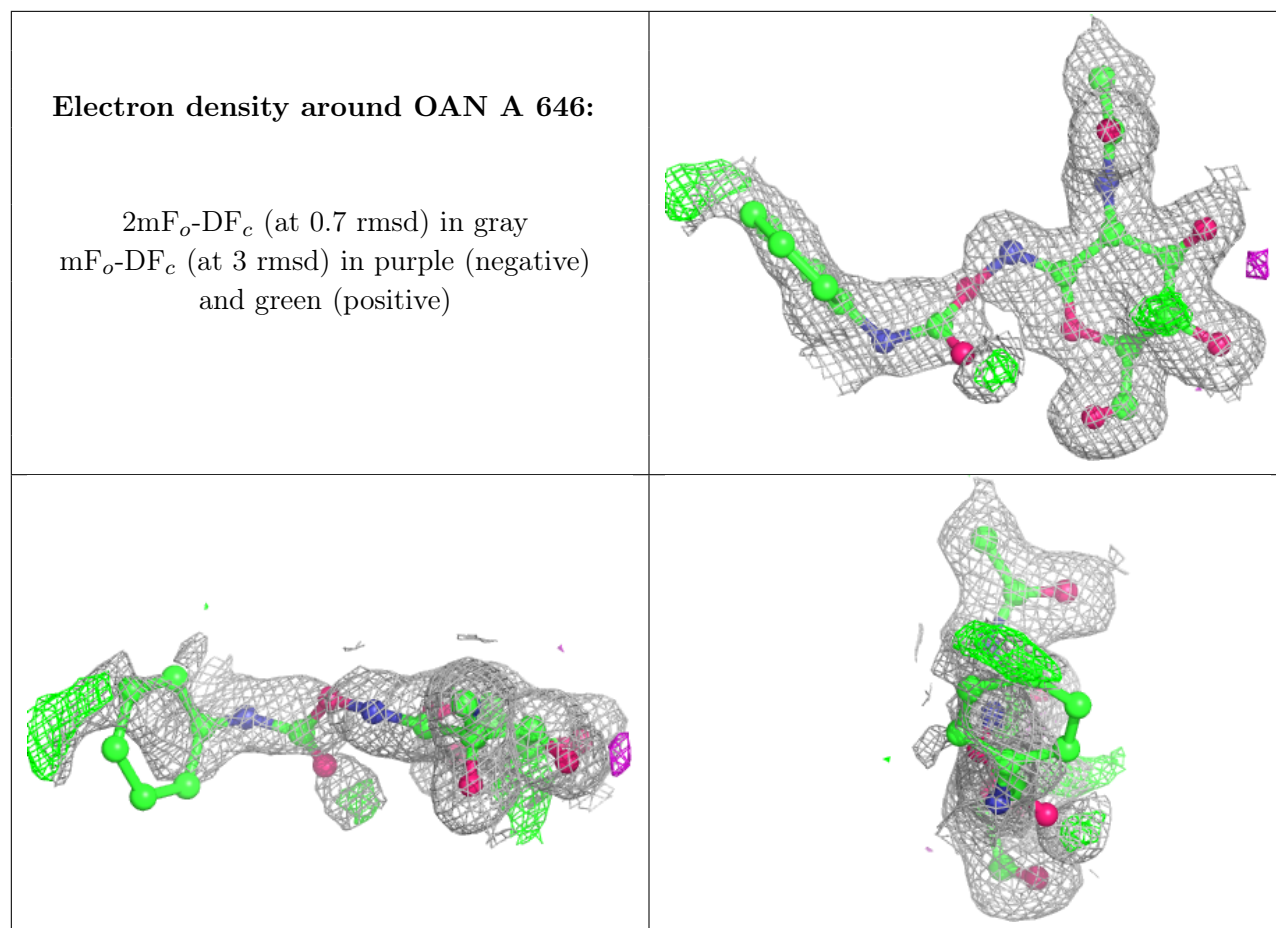## 6.3　Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4　Ligands ⓘ

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.

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	PG4	A	647	11/13	0.87	0.14	20,34,59,61	0
5	ACT	B	644	4/4	0.88	0.15	35,37,44,44	0
5	ACT	A	645	4/4	0.92	0.15	33,37,41,46	0
5	ACT	B	645	4/4	0.94	0.11	34,38,46,46	0
2	OAN	B	646	25/25	0.95	0.15	5,13,59,62	0
2	OAN	A	646	25/25	0.95	0.14	6,14,64,68	0
5	ACT	A	644	4/4	0.95	0.11	19,30,36,39	0
4	NA	A	643	1/1	0.99	0.06	20,20,20,20	0
4	NA	B	643	1/1	0.99	0.05	19,19,19,19	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 OAN B 646:

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

Electron density around OAN A 646:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.