



# Full wwPDB X-ray Structure Validation Report ⓘ

Apr 27, 2024 – 12:15 pm BST

PDB ID : 1UZN  
Title : MabA from Mycobacterium tuberculosis  
Authors : Cohen-Gonsaud, M.; Ducasse, S.; Quemard, A.; Labesse, G.  
Deposited on : 2004-03-14  
Resolution : 1.91 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36.2  
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) : 2.36.2

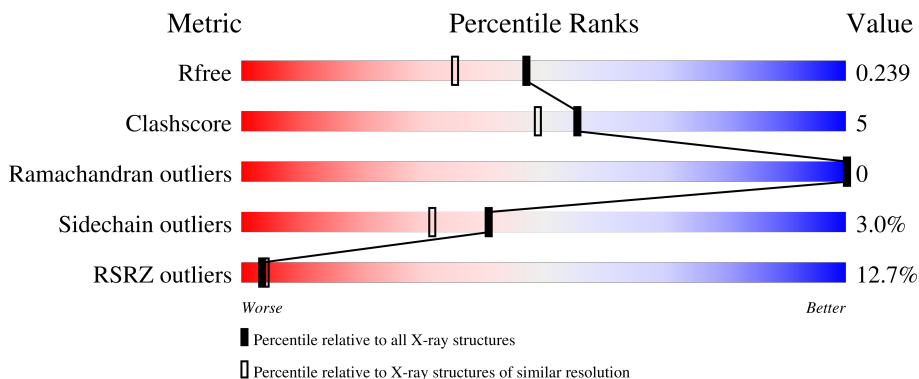
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.91 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	7937 (1.94-1.90)
Clashscore	141614	8644 (1.94-1.90)
Ramachandran outliers	138981	8530 (1.94-1.90)
Sidechain outliers	138945	8530 (1.94-1.90)
RSRZ outliers	127900	7793 (1.94-1.90)

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

Mol	Chain	Length	Quality of chain
1	A	247	 13% 83% 13% 9%
1	B	247	 11% 83% 9% 9%

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3653 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 3-OXOACYL-[ACYL-CARRIER PROTEIN] REDUCTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	239	1733	1080	316	329	8	0	0	0
1	B	226	1615	1014	290	305	6	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	60	VAL	CYS	engineered mutation	UNP Q48930
B	60	VAL	CYS	engineered mutation	UNP Q48930
A	144	LEU	SER	engineered mutation	UNP Q48930
B	144	LEU	SER	engineered mutation	UNP Q48930

- Molecule 2 is CESIUM ION (three-letter code: CS) (formula: Cs).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Cs	0	0
			2	2		
2	B	2	Total	Cs	0	0
			2	2		

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: C<sub>21</sub>H<sub>28</sub>N<sub>7</sub>O<sub>17</sub>P<sub>3</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	30	10	5	12	3	0	0

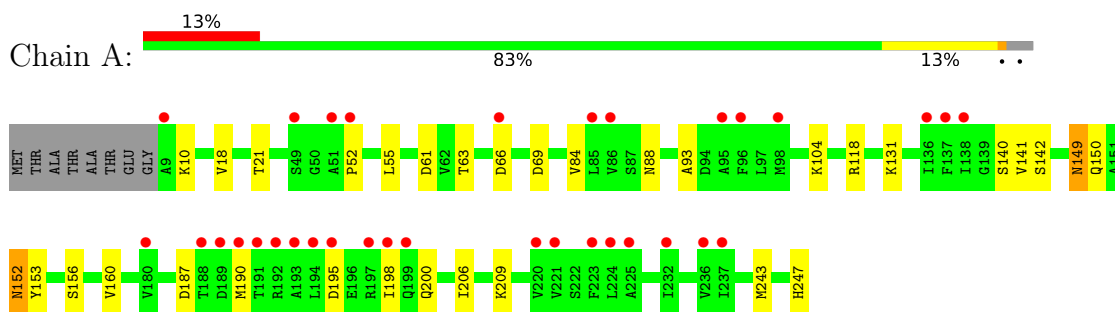
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	139	Total	O	0	0
			139	139		
4	B	132	Total	O	0	0
			132	132		

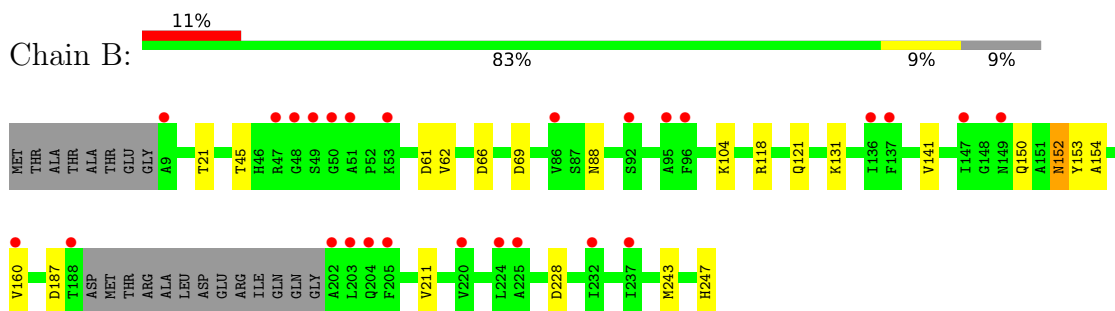
### 3 Residue-property plots [i](#)

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: 3-OXOACYL-[ACYL-CARRIER PROTEIN] REDUCTASE



- Molecule 1: 3-OXOACYL-[ACYL-CARRIER PROTEIN] REDUCTASE



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	81.54Å 117.11Å 51.87Å 90.00° 122.62° 90.00°	Depositor
Resolution (Å)	50.00 – 1.91 31.12 – 1.78	Depositor EDS
% Data completeness (in resolution range)	92.9 (50.00-1.91) 90.3 (31.12-1.78)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.50 (at 1.77Å)	Xtrriage
Refinement program	REFMAC 5.1.24	Depositor
R, $R_{free}$	0.185 , 0.227 0.194 , 0.239	Depositor DCC
$R_{free}$ test set	1462 reflections (4.10%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	31.3	Xtrriage
Anisotropy	0.549	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.40 , 50.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	3653	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.99% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NAP, CS

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	0.43	0/1759	0.72	5/2376 (0.2%)
1	B	0.47	0/1640	0.71	4/2219 (0.2%)
All	All	0.45	0/3399	0.71	9/4595 (0.2%)

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	69	ASP	CB-CG-OD2	6.64	124.28	118.30
1	B	66	ASP	CB-CG-OD2	6.07	123.76	118.30
1	A	187	ASP	CB-CG-OD2	5.99	123.69	118.30
1	B	69	ASP	CB-CG-OD2	5.75	123.47	118.30
1	A	195	ASP	CB-CG-OD2	5.74	123.46	118.30
1	B	228	ASP	CB-CG-OD2	5.32	123.09	118.30
1	A	61	ASP	CB-CG-OD2	5.24	123.01	118.30
1	A	66	ASP	CB-CG-OD2	5.13	122.92	118.30
1	B	61	ASP	CB-CG-OD2	5.02	122.82	118.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1733	0	1728	19	0
1	B	1615	0	1600	16	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	30	0	11	0	0
4	A	139	0	0	2	0
4	B	132	0	0	3	0
All	All	3653	0	3339	34	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 5.

All (34) 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:141:VAL:HG11	1:A:243:MET:CE	2.19	0.73
1:B:160:VAL:HG21	4:B:2072:HOH:O	1.93	0.68
1:B:141:VAL:HG11	1:B:243:MET:CE	2.28	0.62
1:B:141:VAL:HG11	1:B:243:MET:HE2	1.81	0.62
1:B:21:THR:O	1:B:88:ASN:HB3	2.03	0.58
1:A:160:VAL:HG21	4:A:2078:HOH:O	2.06	0.56
1:A:247:HIS:CE1	1:B:247:HIS:CE1	2.94	0.55
1:B:150:GLN:HB2	1:B:153:TYR:HB3	1.88	0.55
1:A:149:ASN:HD22	1:A:149:ASN:N	2.03	0.55
1:A:156:SER:O	1:A:160:VAL:HG23	2.07	0.54
1:B:152:ASN:HD22	1:B:152:ASN:N	2.07	0.52
1:A:52:PRO:HG2	1:A:55:LEU:HD12	1.92	0.51
1:A:152:ASN:HD22	1:A:152:ASN:N	2.07	0.51
1:A:206:ILE:O	1:A:209:LYS:HE3	2.10	0.51
1:B:104:LYS:NZ	4:B:2063:HOH:O	2.44	0.50
1:B:154:ALA:HB2	4:B:2085:HOH:O	2.11	0.50
1:A:141:VAL:HG11	1:A:243:MET:HE1	1.94	0.49
1:B:152:ASN:HD22	1:B:152:ASN:H	1.60	0.49
1:B:152:ASN:ND2	1:B:153:TYR:H	2.12	0.47
1:A:152:ASN:ND2	1:A:153:TYR:H	2.13	0.47
1:A:152:ASN:HD22	1:A:153:TYR:H	1.62	0.47
1:A:21:THR:O	1:A:88:ASN:HB3	2.15	0.47
1:A:152:ASN:HD22	1:A:152:ASN:H	1.65	0.45
1:B:62:VAL:O	1:B:118:ARG:HD2	2.17	0.45
1:B:187:ASP:HB2	1:B:211:VAL:HG21	1.99	0.45
1:B:152:ASN:HD22	1:B:153:TYR:H	1.64	0.44
1:A:142:SER:OG	1:A:150:GLN:NE2	2.51	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:140:SER:HB2	4:A:2091:HOH:O	2.19	0.42
1:A:63:THR:HA	1:A:118:ARG:NH1	2.35	0.41
1:A:18:VAL:HG22	1:A:84:VAL:HB	2.01	0.41
1:A:93:ALA:HB1	1:A:104:LYS:HG2	2.03	0.41
1:B:152:ASN:H	1:B:152:ASN:ND2	2.19	0.41
1:A:152:ASN:ND2	1:A:152:ASN:H	2.18	0.40
1:B:21:THR:HA	1:B:45:THR:OG1	2.21	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	237/247 (96%)	228 (96%)	9 (4%)	0	100	100
1	B	222/247 (90%)	212 (96%)	10 (4%)	0	100	100
All	All	459/494 (93%)	440 (96%)	19 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	173/182 (95%)	166 (96%)	7 (4%)	31	21

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	158/182 (87%)	155 (98%)	3 (2%)	57	51
All	All	331/364 (91%)	321 (97%)	10 (3%)	41	31

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	LYS
1	A	131	LYS
1	A	149	ASN
1	A	152	ASN
1	A	190	MET
1	A	198	ILE
1	A	200	GLN
1	B	121	GLN
1	B	131	LYS
1	B	152	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	33	GLN
1	A	149	ASN
1	A	150	GLN
1	A	152	ASN
1	B	88	ASN
1	B	121	GLN
1	B	150	GLN
1	B	152	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 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
3	NAP	A	1249	-	24,32,52	1.16	2 (8%)	29,49,80	1.31	1 (3%)

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
3	NAP	A	1249	-	-	1/14/36/67	0/3/3/5

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1249	NAP	C2A-N3A	3.87	1.38	1.32
3	A	1249	NAP	C2A-N1A	2.26	1.38	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1249	NAP	N3A-C2A-N1A	-5.92	119.43	128.68

There are no chirality outliers.

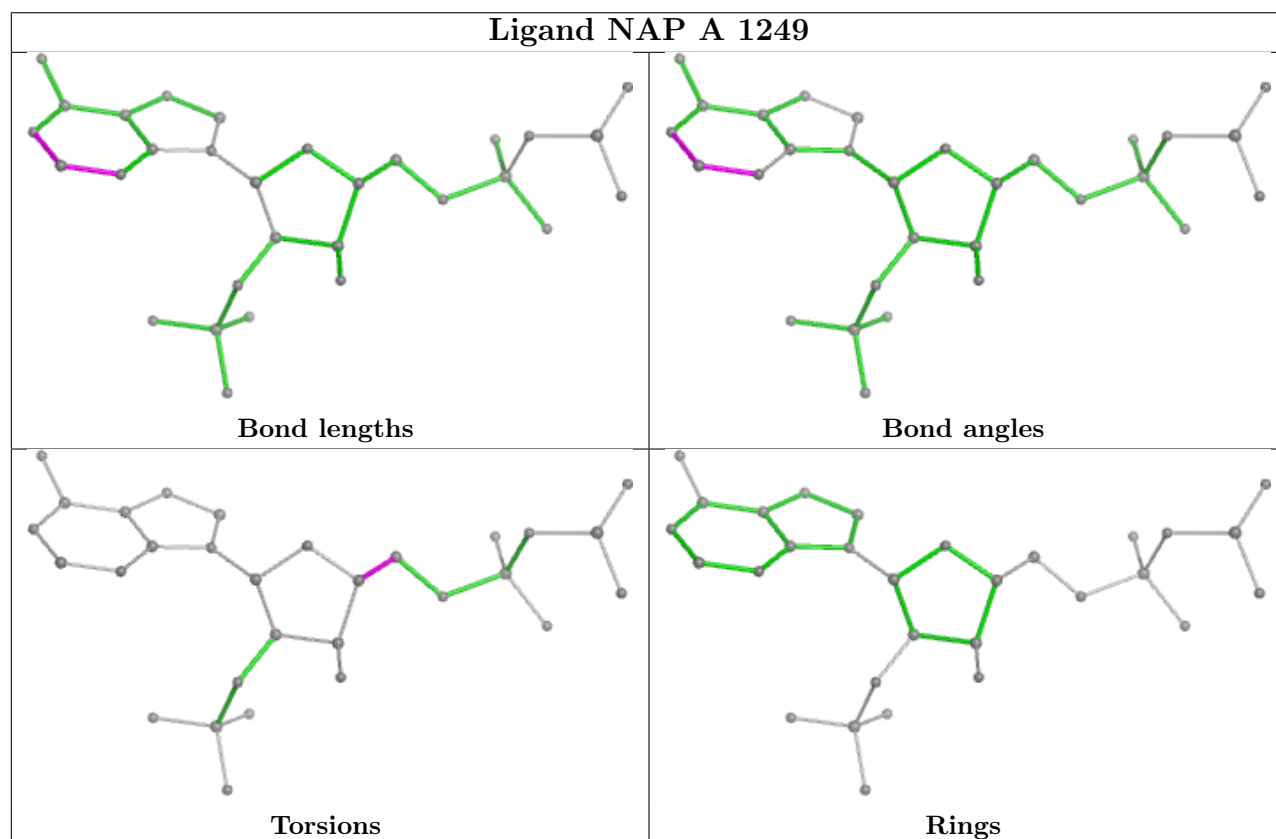
All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1249	NAP	O4B-C4B-C5B-O5B

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 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

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<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	239/247 (96%)	0.58	33 (13%) <b>2</b>   <b>3</b>	15, 21, 34, 49	0
1	B	226/247 (91%)	0.45	26 (11%) <b>4</b>   <b>5</b>	10, 20, 42, 47	0
All	All	465/494 (94%)	0.52	59 (12%) <b>3</b>   <b>4</b>	10, 20, 39, 49	0

All (59) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	193	ALA	6.5
1	A	194	LEU	6.2
1	A	190	MET	6.2
1	A	191	THR	5.6
1	A	189	ASP	5.6
1	B	48	GLY	5.2
1	A	198	ILE	5.1
1	A	192	ARG	5.0
1	B	9	ALA	4.7
1	B	202	ALA	4.7
1	B	188	THR	4.3
1	A	188	THR	4.3
1	A	197	ARG	4.2
1	A	9	ALA	3.6
1	A	138	ILE	3.5
1	B	49	SER	3.4
1	A	136	ILE	3.4
1	A	224	LEU	3.4
1	A	195	ASP	3.3
1	A	98	MET	3.2
1	A	232	ILE	3.2
1	A	237	ILE	3.2
1	B	147	ILE	3.2
1	B	237	ILE	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	203	LEU	3.1
1	B	96	PHE	3.1
1	B	220	VAL	3.0
1	B	205	PHE	2.9
1	B	51	ALA	2.9
1	B	204	GLN	2.8
1	A	223	PHE	2.8
1	B	86	VAL	2.8
1	A	221	VAL	2.7
1	B	137	PHE	2.7
1	A	137	PHE	2.7
1	A	180	VAL	2.6
1	B	47	ARG	2.6
1	A	220	VAL	2.6
1	A	225	ALA	2.6
1	A	86	VAL	2.6
1	B	95	ALA	2.5
1	B	149	ASN	2.5
1	B	50	GLY	2.5
1	B	136	ILE	2.4
1	A	199	GLN	2.4
1	B	224	LEU	2.4
1	A	96	PHE	2.3
1	A	52	PRO	2.3
1	B	53	LYS	2.3
1	A	51	ALA	2.2
1	A	85	LEU	2.2
1	A	66	ASP	2.1
1	A	95	ALA	2.1
1	B	160	VAL	2.1
1	A	49	SER	2.1
1	B	92	SER	2.1
1	B	232	ILE	2.1
1	A	236	VAL	2.0
1	B	225	ALA	2.0

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

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

### 6.3 Carbohydrates [i](#)

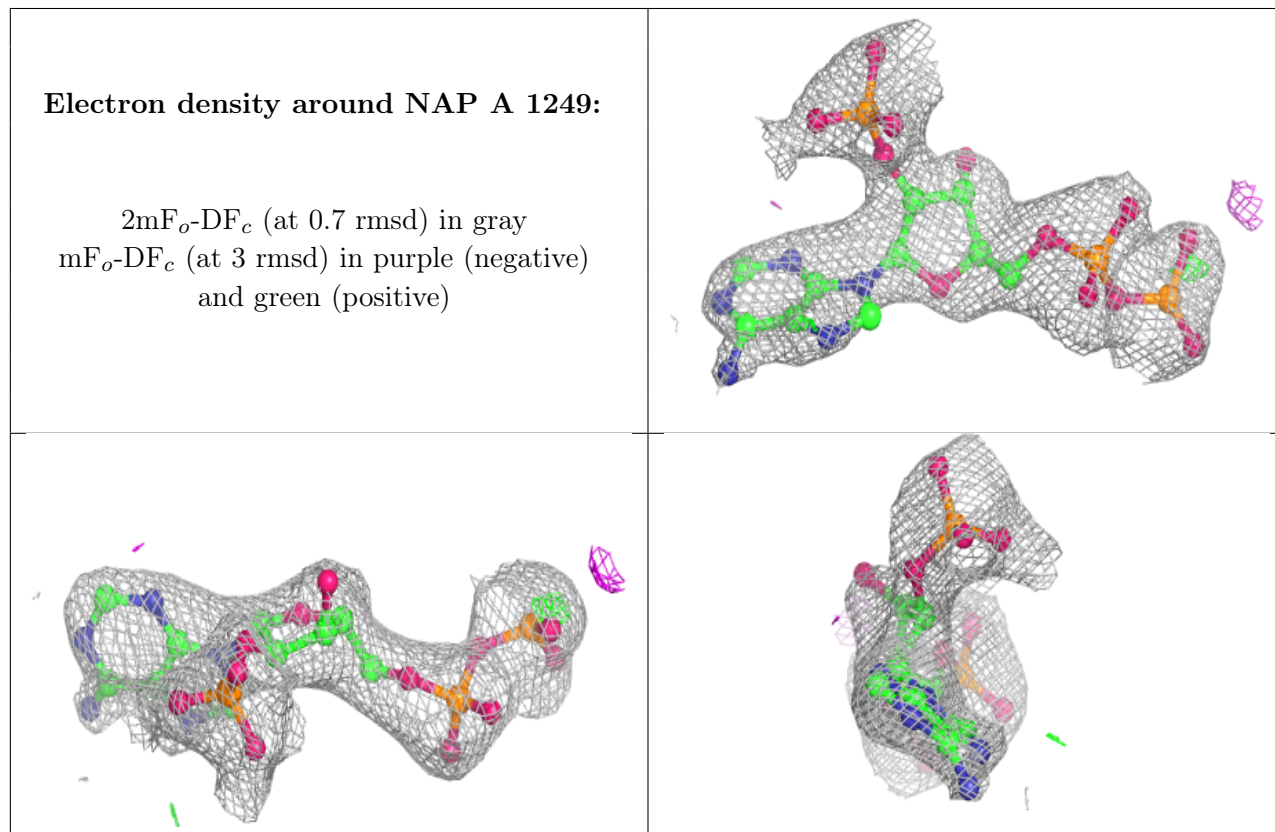
There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	NAP	A	1249	30/48	0.83	0.15	30,32,35,36	0
2	CS	B	1248	1/1	0.97	0.10	60,60,60,60	1
2	CS	A	1248	1/1	0.98	0.05	52,52,52,52	1
2	CS	B	1250	1/1	0.99	0.10	49,49,49,49	0
2	CS	A	1250	1/1	0.99	0.07	51,51,51,51	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.





## 6.5 Other polymers [i](#)

There are no such residues in this entry.