



wwPDB X-ray Structure Validation Summary Report i

Feb 27, 2014 – 01:47 AM GMT

PDB ID : 1TXT
Title : Staphylococcus aureus 3-hydroxy-3-methylglutaryl-CoAsynthase
Authors : Campobasso, N.; Patel, M.; Wilding, I.E.; Kallender, H.; Rosenberg, M.;
Gwynn, M.
Deposited on : 2004-07-06
Resolution : 2.50 Å (reported)

This is a wwPDB validation summary report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

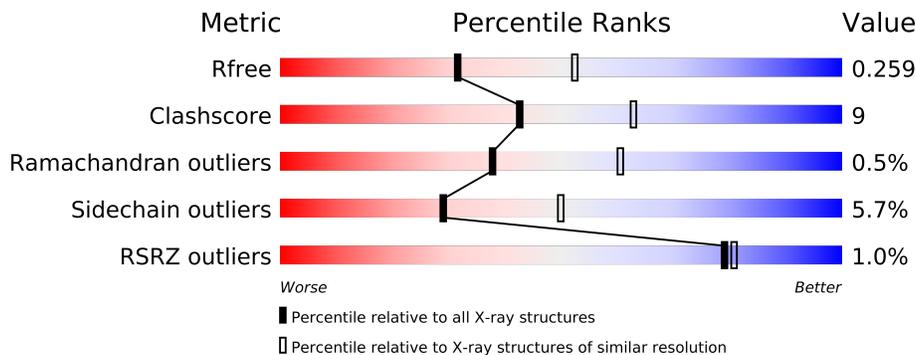
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.50 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}	66092	2784 (2.50-2.50)
Clashscore	79885	3562 (2.50-2.50)
Ramachandran outliers	78287	3480 (2.50-2.50)
Sidechain outliers	78261	3482 (2.50-2.50)
RSRZ outliers	66119	2785 (2.50-2.50)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	388	
1	B	388	
1	C	388	
1	D	388	

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 12750 atoms, of which 0 are hydrogen and 0 are deuterium.

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.

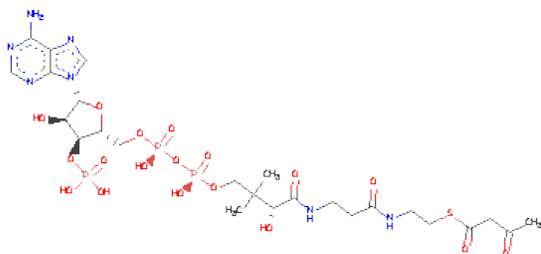
- Molecule 1 is a protein called 3-hydroxy-3-methylglutaryl-CoAsynthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	387	3040	1921	510	599	10	0	0	0
1	B	387	3040	1921	510	599	10	0	0	0
1	C	387	3040	1921	510	599	10	0	0	0
1	D	387	3040	1921	510	599	10	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	111	CSD	CYS	MODIFIED RESIDUE	UNP Q9FD87
A	320	GLU	VAL	CONFLICT	UNP Q9FD87
B	111	CSD	CYS	MODIFIED RESIDUE	UNP Q9FD87
B	320	GLU	VAL	CONFLICT	UNP Q9FD87
C	111	CSD	CYS	MODIFIED RESIDUE	UNP Q9FD87
C	320	GLU	VAL	CONFLICT	UNP Q9FD87
D	111	CSD	CYS	MODIFIED RESIDUE	UNP Q9FD87
D	320	GLU	VAL	CONFLICT	UNP Q9FD87

- Molecule 2 is ACETOACETYL-COENZYME A (three-letter code: CAA) (formula: $C_{25}H_{40}N_7O_{18}P_3S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	P			S
2	A	1	54	25	7	18	3	1	0	0
2	B	1	54	25	7	18	3	1	0	0
2	C	1	54	25	7	18	3	1	0	0
2	D	1	54	25	7	18	3	1	0	0

- Molecule 3 is water.

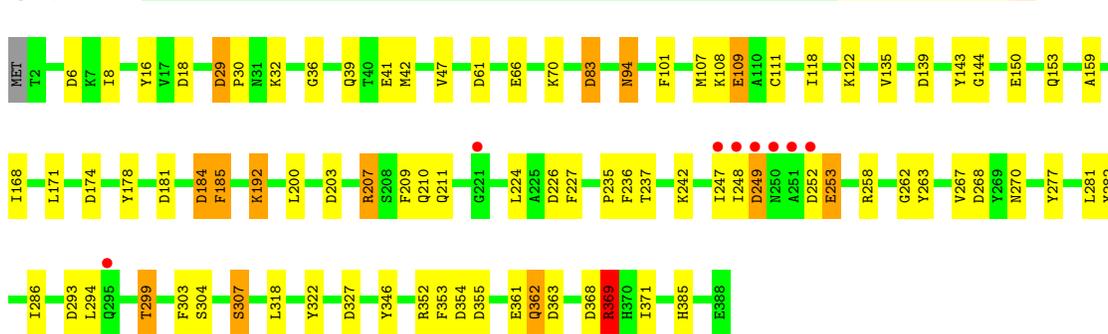
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	89	Total	O	0	0
			89	89		
3	B	93	Total	O	0	0
			93	93		
3	C	102	Total	O	0	0
			102	102		
3	D	90	Total	O	0	0
			90	90		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

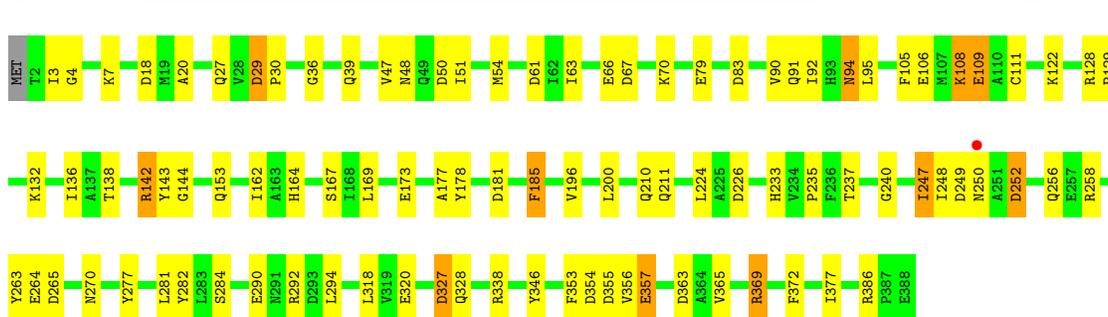
- Molecule 1: 3-hydroxy-3-methylglutaryl-CoAsynthase

Chain A:



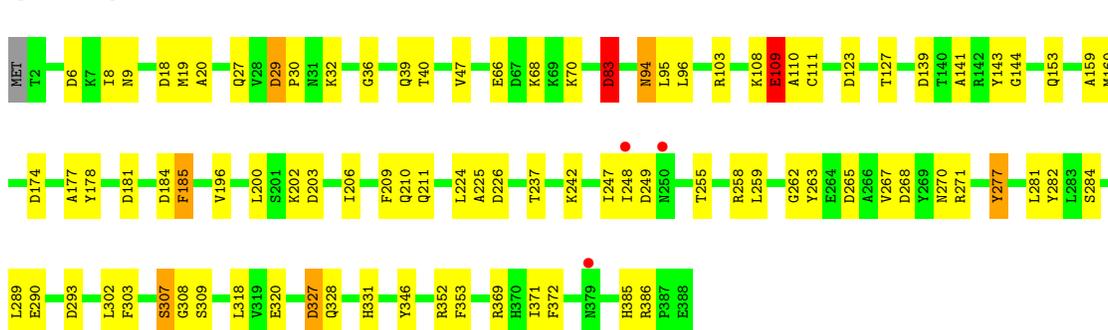
- Molecule 1: 3-hydroxy-3-methylglutaryl-CoAsynthase

Chain B:

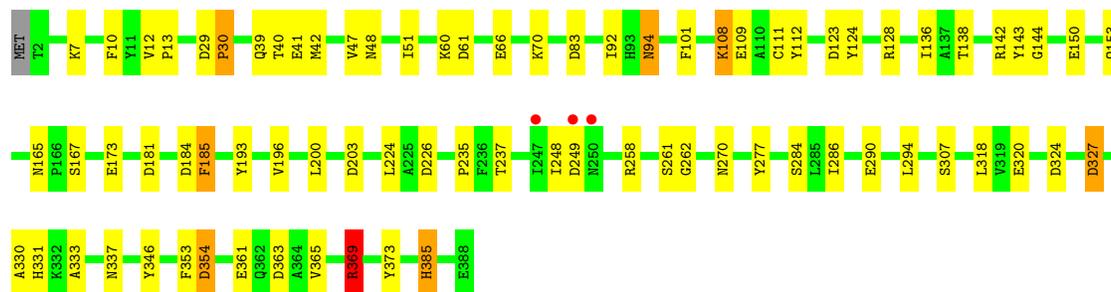


- Molecule 1: 3-hydroxy-3-methylglutaryl-CoAsynthase

Chain C:



- Molecule 1: 3-hydroxy-3-methylglutaryl-CoAsynthase

Chain D: 

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	119.95Å 64.48Å 121.91Å 90.00° 97.17° 90.00°	Depositor
Resolution (Å)	20.00 – 2.50 44.11 – 2.50	Depositor EDS
% Data completeness (in resolution range)	85.6 (20.00-2.50) 85.5 (44.11-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.92 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.2	Depositor
R, R_{free}	0.187 , 0.255 0.192 , 0.259	Depositor DCC
R_{free} test set	2760 reflections (5.27%)	DCC
Wilson B-factor (Å ²)	22.0	Xtrriage
Anisotropy	0.408	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 15.5	EDS
Estimated twinning fraction	0.007 for l,-k,h	Xtrriage
L-test for twinning	$\langle L \rangle = 0.54$, $\langle L^2 \rangle = 0.38$	Xtrriage
Outliers	17 of 59617 reflections (0.029%)	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	12750	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 58.19 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 2.1190e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: CSD, CAA

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	0.95	0/3094	1.03	19/4193 (0.5%)
1	B	0.95	0/3094	1.02	14/4193 (0.3%)
1	C	0.96	2/3094 (0.1%)	1.06	20/4193 (0.5%)
1	D	0.94	0/3094	1.01	13/4193 (0.3%)
All	All	0.95	2/12376 (0.0%)	1.03	66/16772 (0.4%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	320	GLU	CD-OE2	6.07	1.32	1.25
1	C	277	TYR	CE2-CZ	5.35	1.45	1.38

The worst 5 of 66 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	181	ASP	CB-CG-OD2	10.44	127.69	118.30
1	C	258	ARG	NE-CZ-NH2	-10.11	115.25	120.30
1	D	181	ASP	CB-CG-OD2	8.04	125.54	118.30
1	A	327	ASP	CB-CG-OD2	8.03	125.53	118.30
1	C	327	ASP	CB-CG-OD2	7.99	125.49	118.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit,

and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3040	0	2938	59	0
1	B	3040	0	2938	62	0
1	C	3040	0	2938	55	0
1	D	3040	0	2938	46	0
2	A	54	0	36	10	0
2	B	54	0	36	3	0
2	C	54	0	36	8	0
2	D	54	0	36	2	0
3	A	89	0	0	0	0
3	B	93	0	0	6	0
3	C	102	0	0	1	0
3	D	90	0	0	1	0
All	All	12750	0	11896	216	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 9.

The worst 5 of 216 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:143:TYR:H	1:A:153:GLN:HE21	1.08	0.96
1:B:143:TYR:H	1:B:153:GLN:HE21	1.12	0.94
1:D:143:TYR:H	1:D:153:GLN:HE21	0.94	0.93
1:C:143:TYR:H	1:C:153:GLN:HE21	1.02	0.92
1:A:207:ARG:HG3	1:A:207:ARG:HH11	1.36	0.90

There are no symmetry-related clashes.

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	384/388 (99%)	361 (94%)	20 (5%)	3 (1%)	27 46

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	B	384/388 (99%)	366 (95%)	17 (4%)	1 (0%)	50 73
1	C	384/388 (99%)	364 (95%)	17 (4%)	3 (1%)	27 46
1	D	384/388 (99%)	363 (94%)	20 (5%)	1 (0%)	50 73
All	All	1536/1552 (99%)	1454 (95%)	74 (5%)	8 (0%)	38 60

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	225	ALA
1	A	109	GLU
1	A	307	SER
1	A	253	GLU
1	B	109	GLU

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	317/319 (99%)	300 (95%)	17 (5%)	31 53
1	B	317/319 (99%)	297 (94%)	20 (6%)	25 44
1	C	317/319 (99%)	301 (95%)	16 (5%)	34 58
1	D	317/319 (99%)	298 (94%)	19 (6%)	27 47
All	All	1268/1276 (99%)	1196 (94%)	72 (6%)	29 50

5 of 72 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	327	ASP
1	C	83	ASP
1	D	320	GLU
1	B	346	TYR
1	B	386	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	130	ASN
1	B	385	HIS
1	D	270	ASN
1	B	153	GLN
1	B	270	ASN

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

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

4 non-standard protein/DNA/RNA residues 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
1	CSD	A	111	1	7,7,8	10.14	2 (28%)	6,8,10	3.98	5 (83%)
1	CSD	B	111	1	7,7,8	10.04	2 (28%)	6,8,10	3.84	4 (66%)
1	CSD	C	111	1	7,7,8	10.77	2 (28%)	6,8,10	4.32	5 (83%)
1	CSD	D	111	1	7,7,8	10.10	2 (28%)	6,8,10	4.48	4 (66%)

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
1	CSD	A	111	1	-	0/3/6/8	0/0/0/0
1	CSD	B	111	1	-	0/3/6/8	0/0/0/0
1	CSD	C	111	1	-	0/3/6/8	0/0/0/0
1	CSD	D	111	1	-	0/3/6/8	0/0/0/0

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	111	CSD	O-C	22.30	1.26	1.11
1	A	111	CSD	O-C	19.62	1.24	1.11
1	B	111	CSD	O-C	19.21	1.24	1.11
1	D	111	CSD	O-C	18.98	1.24	1.11
1	D	111	CSD	OD1-SG	18.62	1.73	1.47

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	111	CSD	CA-CB-SG	8.53	122.98	110.82
1	B	111	CSD	CA-CB-SG	7.33	121.28	110.82
1	C	111	CSD	OD2-SG-OD1	-6.53	98.55	109.39
1	A	111	CSD	CA-CB-SG	6.51	120.11	110.82
1	C	111	CSD	CA-CB-SG	5.85	119.16	110.82

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry

4 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	CAA	A	5866	-	56,56,56	1.57	6 (10%)	83,83,83	2.53	25 (30%)
2	CAA	B	6866	-	56,56,56	1.64	5 (8%)	83,83,83	2.21	20 (24%)
2	CAA	C	7866	-	56,56,56	1.69	6 (10%)	83,83,83	2.56	18 (21%)
2	CAA	D	8866	-	56,56,56	1.49	4 (7%)	83,83,83	2.74	23 (27%)

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	CAA	A	5866	-	1/1/13/15	0/55/71/71	0/1/3/3
2	CAA	B	6866	-	1/1/13/15	0/55/71/71	0/1/3/3
2	CAA	C	7866	-	1/1/13/15	0/55/71/71	0/1/3/3
2	CAA	D	8866	-	1/1/13/15	0/55/71/71	0/1/3/3

The worst 5 of 21 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	7866	CAA	C8A-N9A	7.58	1.47	1.36
2	B	6866	CAA	C8A-N9A	6.91	1.46	1.36
2	D	8866	CAA	C8A-N9A	6.01	1.45	1.36
2	A	5866	CAA	C8A-N9A	5.98	1.45	1.36
2	B	6866	CAA	C1-S1P	-5.40	1.65	1.76

The worst 5 of 86 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	8866	CAA	O4B-C1B-N9A	11.90	119.51	108.44
2	C	7866	CAA	O4B-C1B-N9A	11.27	118.93	108.44
2	D	8866	CAA	N3A-C2A-N1A	-10.73	119.74	128.71
2	C	7866	CAA	N3A-C2A-N1A	-10.66	119.79	128.71
2	A	5866	CAA	C1B-N9A-C4A	-8.46	112.02	126.64

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	D	8866	CAA	C2B
2	B	6866	CAA	C2B
2	C	7866	CAA	C2B
2	A	5866	CAA	C2B

There are no torsion outliers.

There are no ring outliers.

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(Å ²)	Q<0.9
1	A	387/388 (99%)	-0.23	8 (2%) 60 63	13, 23, 36, 50	0
1	B	387/388 (99%)	-0.24	1 (0%) 91 93	13, 23, 36, 49	0
1	C	387/388 (99%)	-0.26	3 (0%) 83 84	12, 23, 37, 48	0
1	D	387/388 (99%)	-0.27	3 (0%) 83 84	12, 23, 35, 50	0
All	All	1548/1552 (99%)	-0.25	15 (0%) 79 81	12, 23, 37, 50	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	250	ASN	5.4
1	B	250	ASN	4.7
1	C	250	ASN	4.2
1	D	250	ASN	3.8
1	A	249	ASP	2.8

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

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(Å ²)	Q<0.9
1	CSD	B	111	8/9	0.15	1.48	17,18,27,27	0
1	CSD	A	111	8/9	0.12	0.63	19,21,27,28	0
1	CSD	D	111	8/9	0.12	0.42	17,18,26,26	0
1	CSD	C	111	8/9	0.12	0.33	18,20,26,30	0

6.3 Carbohydrates

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(Å ²)	Q < 0.9
2	CAA	B	6866	54/54	0.13	0.82	24,36,49,50	0
2	CAA	D	8866	54/54	0.14	0.69	25,38,48,50	0
2	CAA	A	5866	54/54	0.14	0.57	25,33,44,48	0
2	CAA	C	7866	54/54	0.13	0.26	24,34,45,48	0

6.5 Other polymers

There are no such residues in this entry.