



wwPDB X-ray Structure Validation Summary Report

Feb 28, 2014 – 04:23 PM GMT

PDB ID : 4A2S
Title : Structure of the engineered retro-aldolase RA95.5
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Deposited on : 2011-09-28
Resolution : 1.40 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>

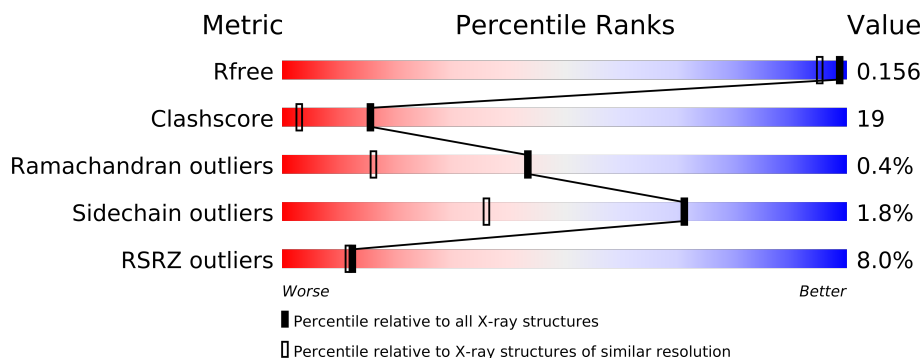
The following versions of software and data (see [references](#)) were used in the production of this report:

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 1.40 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	1097 (1.42-1.38)
Clashscore	79885	1246 (1.42-1.38)
Ramachandran outliers	78287	1206 (1.42-1.38)
Sidechain outliers	78261	1205 (1.42-1.38)
RSRZ outliers	66119	1097 (1.42-1.38)

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	258	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4730 atoms, of which 2285 are hydrogens 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.

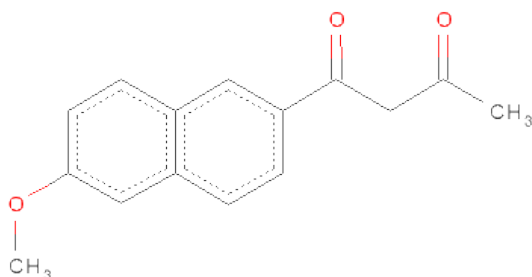
- Molecule 1 is a protein called INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	247	4429	1394	2243	370	413	9	0	31	0

There are 27 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	10	GLU	LYS	ENGINEERED MUTATION	UNP Q06121
A	22	VAL	PHE	ENGINEERED MUTATION	UNP Q06121
A	51	TYR	GLU	ENGINEERED MUTATION	UNP Q06121
A	53	SER	LYS	ENGINEERED MUTATION	UNP Q06121
A	83	LYS	LEU	ENGINEERED MUTATION	UNP Q06121
A	110	SER	LYS	ENGINEERED MUTATION	UNP Q06121
A	159	LEU	GLU	ENGINEERED MUTATION	UNP Q06121
A	180	PHE	ASN	ENGINEERED MUTATION	UNP Q06121
A	182	MET	ARG	ENGINEERED MUTATION	UNP Q06121
A	183	ASN	ASP	ENGINEERED MUTATION	UNP Q06121
A	184	PHE	LEU	ENGINEERED MUTATION	UNP Q06121
A	210	LYS	GLU	ENGINEERED MUTATION	UNP Q06121
A	211	LEU	SER	ENGINEERED MUTATION	UNP Q06121
A	233	SER	GLY	ENGINEERED MUTATION	UNP Q06121
A	246	LEU	-	EXPRESSION TAG	UNP Q06121
A	247	ILE	-	EXPRESSION TAG	UNP Q06121
A	248	GLU	-	EXPRESSION TAG	UNP Q06121
A	249	GLY	-	EXPRESSION TAG	UNP Q06121
A	250	SER	-	EXPRESSION TAG	UNP Q06121
A	251	LEU	-	EXPRESSION TAG	UNP Q06121
A	252	GLU	-	EXPRESSION TAG	UNP Q06121
A	253	HIS	-	EXPRESSION TAG	UNP Q06121
A	254	HIS	-	EXPRESSION TAG	UNP Q06121
A	255	HIS	-	EXPRESSION TAG	UNP Q06121
A	256	HIS	-	EXPRESSION TAG	UNP Q06121
A	257	HIS	-	EXPRESSION TAG	UNP Q06121
A	258	HIS	-	EXPRESSION TAG	UNP Q06121

- Molecule 2 is 1-(6-METHOXYNAPHTHALEN-2-YL)BUTANE-1,3-DIONE (three-letter code: 3NK) (formula: C₁₅H₁₄O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	0	1
			62	30	28	4		
2	A	1	Total	C	H	O	0	0
			31	15	14	2		

- Molecule 3 is water.

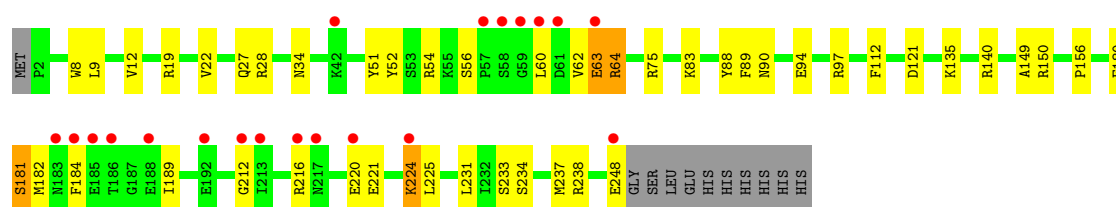
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	208	Total	O	0	0
			208	208		

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: INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE

Chain A: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	53.81Å 62.81Å 93.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 1.40 8.00 – 1.40	Depositor EDS
% Data completeness (in resolution range)	99.5 (8.00-1.40) 99.5 (8.00-1.40)	Depositor EDS
R_{merge}	0.02	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.92 (at 1.40Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.132 , 0.162 0.130 , 0.156	Depositor DCC
R_{free} test set	1866 reflections (3.00%)	DCC
Wilson B-factor (Å ²)	22.8	Xtriage
Anisotropy	0.345	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.63 , 80.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 62215 reflections	Xtriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	4730	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.75% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 3NK

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	0.68	0/2250	0.81	5/3028 (0.2%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	64	ARG	NE-CZ-NH1	11.41	126.01	120.30
1	A	64	ARG	NE-CZ-NH2	-10.22	115.19	120.30
1	A	140	ARG	NE-CZ-NH1	8.15	124.37	120.30
1	A	140	ARG	NE-CZ-NH2	-7.28	116.66	120.30
1	A	150	ARG	NE-CZ-NH2	-5.06	117.77	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 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	2186	2243	0	81	0
2	A	51	42	0	21	0
3	A	208	0	0	12	0
All	All	2445	2285	0	84	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 19.

The worst 5 of 84 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:112:PHE:CD1	1:A:112:PHE:HD2	0.93	1.63
1:A:52:TYR:HE2	1:A:52:TYR:CE1	0.93	1.62
1:A:180:PHE:HD1	1:A:180:PHE:CD2	0.93	1.60
1:A:52:TYR:CD2	1:A:52:TYR:HD1	0.93	1.59
1:A:112:PHE:CD2	1:A:112:PHE:HD1	0.93	1.59

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	276/258 (107%)	264 (96%)	10 (4%)	2 (1%)	30 7

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	181[A]	SER
1	A	181[B]	SER

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	254/233 (109%)	250 (98%)	4 (2%)	75 43

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	19	ARG
1	A	63	GLU
1	A	224	LYS
1	A	248	GLU

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

Mol	Chain	Res	Type
1	A	41	ASN
1	A	228	ASN

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

3 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	3NK	A	1083[A]	1	16,18,19	3.04	3 (18%)	13,24,26	11.06	2 (15%)
2	3NK	A	1083[B]	1	16,18,19	2.12	4 (25%)	13,24,26	8.66	3 (23%)
2	3NK	A	1210	1	16,18,19	2.55	5 (31%)	13,24,26	10.36	3 (23%)

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	3NK	A	1083[A]	1	-	0/8/31/32	0/0/2/2
2	3NK	A	1083[B]	1	-	0/8/31/32	0/0/2/2
2	3NK	A	1210	1	-	0/8/31/32	0/0/2/2

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1083[A]	3NK	C7-C6	10.85	1.45	1.34
2	A	1210	3NK	C7-C6	7.78	1.42	1.34
2	A	1083[B]	3NK	C7-C6	6.31	1.40	1.34
2	A	1210	3NK	C1-C2	-4.18	1.35	1.44
2	A	1083[B]	3NK	C1-C2	-3.63	1.36	1.44

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1083[A]	3NK	O6-C6-C7	-39.65	118.27	127.28
2	A	1210	3NK	O6-C6-C7	-37.01	118.87	127.28
2	A	1083[B]	3NK	O6-C6-C7	-30.82	120.27	127.28
2	A	1210	3NK	C3-C2-C1	3.43	121.01	117.49
2	A	1083[B]	3NK	C3-C2-C1	2.92	120.49	117.49

There are no chirality outliers.

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	247/258 (95%)	-0.10	20 (8%) 12 11	18, 31, 67, 84	0

The worst 5 of 20 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	184	PHE	8.9
1	A	185	GLU	8.5
1	A	213	ILE	7.1
1	A	212	GLY	6.2
1	A	60	LEU	6.2

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 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	3NK	A	1083[A]	17/18	0.11	0.70	22,27,37,37	31

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Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	3NK	A	1083[B]	17/18	0.11	0.50	28,36,49,49	31
2	3NK	A	1210	17/18	0.11	-0.32	28,36,50,50	31

6.5 Other polymers ⓘ

There are no such residues in this entry.