wwPDB X-ray Structure Validation Summary Report (i)

Sep 17, 2023 – 05:48 PM EDT

PDB ID	:	4Y17
Title	:	SdiA in complex with 3-oxo-C8-homoserine lactone
Authors	:	Nguyen, N.X.; Nguyen, Y.; Sperandio, V.; Jiang, Y.
Deposited on	:	2015-02-06
Resolution	:	2.84 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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:

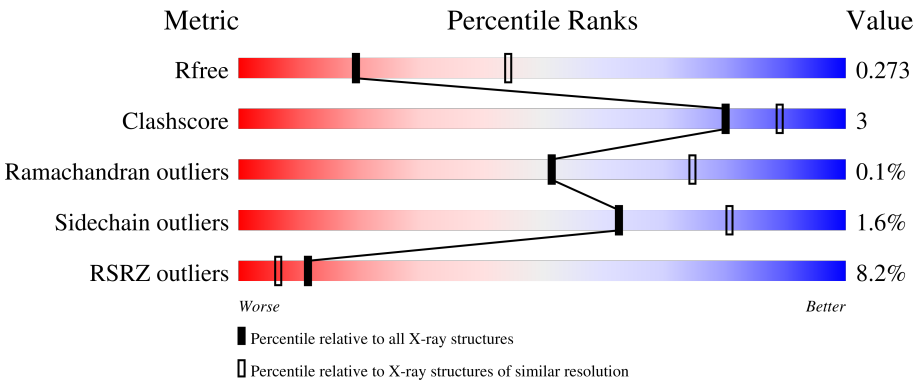
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.84 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	1031 (2.86-2.82)
Clashscore	141614	1078 (2.86-2.82)
Ramachandran outliers	138981	1050 (2.86-2.82)
Sidechain outliers	138945	1051 (2.86-2.82)
RSRZ outliers	127900	1019 (2.86-2.82)

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	246	.% 90% 7% •
1	B	246	2% 91% 5% •
1	C	246	21% 87% 11% •

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 11647 atoms, of which 5715 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.

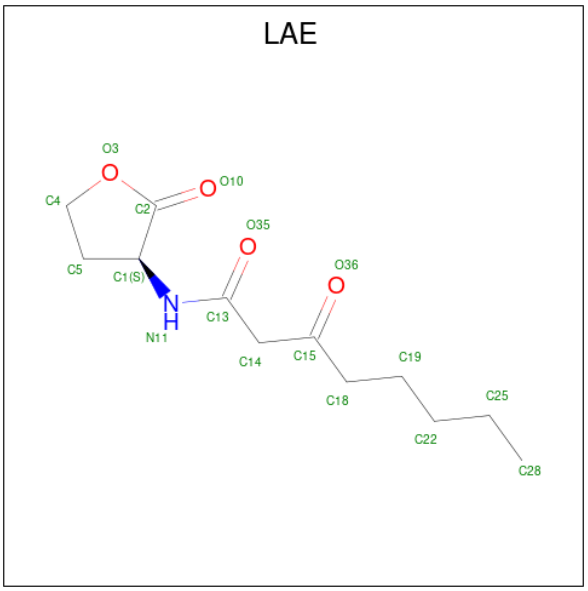
- Molecule 1 is a protein called Transcriptional regulator of ftsQAZ gene cluster.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	238	3839	1241	1894	339	351	14	0	0	0
1	B	237	3841	1240	1901	336	350	14	0	0	0
1	C	243	3908	1265	1920	349	360	14	0	0	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	241	HIS	-	expression tag	UNP Q8XBD0
A	242	HIS	-	expression tag	UNP Q8XBD0
A	243	HIS	-	expression tag	UNP Q8XBD0
A	244	HIS	-	expression tag	UNP Q8XBD0
A	245	HIS	-	expression tag	UNP Q8XBD0
A	246	HIS	-	expression tag	UNP Q8XBD0
B	241	HIS	-	expression tag	UNP Q8XBD0
B	242	HIS	-	expression tag	UNP Q8XBD0
B	243	HIS	-	expression tag	UNP Q8XBD0
B	244	HIS	-	expression tag	UNP Q8XBD0
B	245	HIS	-	expression tag	UNP Q8XBD0
B	246	HIS	-	expression tag	UNP Q8XBD0
C	241	HIS	-	expression tag	UNP Q8XBD0
C	242	HIS	-	expression tag	UNP Q8XBD0
C	243	HIS	-	expression tag	UNP Q8XBD0
C	244	HIS	-	expression tag	UNP Q8XBD0
C	245	HIS	-	expression tag	UNP Q8XBD0
C	246	HIS	-	expression tag	UNP Q8XBD0

- Molecule 2 is 3-OXO-OCTANOIC ACID (2-OXO-TETRAHYDRO-FURAN-3-YL)-AMIDE (three-letter code: LAE) (formula: $C_{12}H_{19}NO_4$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	17	12	1	4	0	0
2	B	1	17	12	1	4	0	0
2	C	1	17	12	1	4	0	0

- Molecule 3 is water.

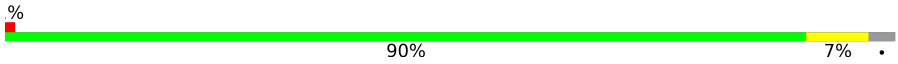
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	4	4	4	0	0
3	B	3	3	3	0	0
3	C	1	1	1	0	0

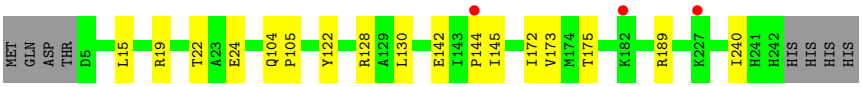
3 Residue-property plots (i)

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: Transcriptional regulator of ftsQAZ gene cluster

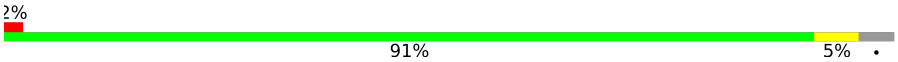
Chain A:

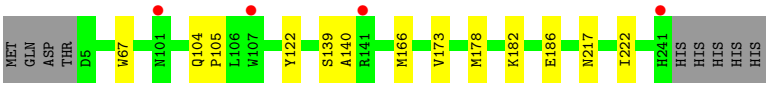




- Molecule 1: Transcriptional regulator of ftsQAZ gene cluster

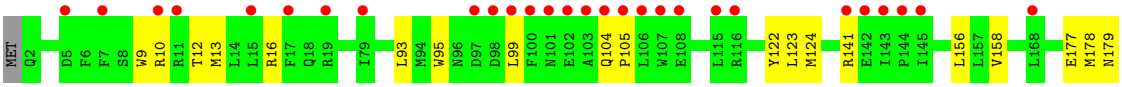
Chain B:

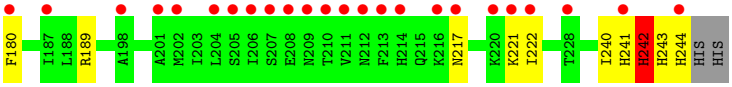




- Molecule 1: Transcriptional regulator of ftsQAZ gene cluster

Chain C:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	88.49Å 92.43Å 119.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.47 – 2.84 41.47 – 2.84	Depositor EDS
% Data completeness (in resolution range)	99.5 (41.47-2.84) 99.5 (41.47-2.84)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.10	Depositor
$< I/\sigma(I) >$ [1]	2.40 (at 2.86Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.4_1496)	Depositor
R, R_{free}	0.234 , 0.271 0.240 , 0.273	Depositor DCC
R_{free} test set	1181 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	69.0	Xtriage
Anisotropy	0.273	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 60.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.024 for k,h,-l	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	11647	wwPDB-VP
Average B, all atoms (Å^2)	84.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.63% 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 (i)

5.1 Standard geometry (i)

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

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	0.24	0/1993	0.43	0/2699
1	B	0.28	0/1988	0.47	0/2693
1	C	0.25	0/2039	0.51	0/2763
All	All	0.26	0/6020	0.47	0/8155

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	3
1	B	0	1
1	C	0	1
All	All	0	5

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	142	GLU	Peptide
1	A	144	PRO	Peptide
1	A	145	ILE	Peptide
1	B	140	ALA	Peptide
1	C	141	ARG	Peptide

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	1945	1894	1893	8	0
1	B	1940	1901	1901	7	0
1	C	1988	1920	1923	18	0
2	A	17	0	19	0	0
2	B	17	0	19	2	0
2	C	17	0	19	1	0
3	A	4	0	0	0	0
3	B	3	0	0	0	0
3	C	1	0	0	0	0
All	All	5932	5715	5774	31	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 3.

The worst 5 of 31 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:C:242:HIS:O	1:C:244:HIS:ND1	2.27	0.59
1:C:178:MET:HG2	1:C:222:ILE:HD12	1.86	0.56
1:C:189:ARG:HG2	1:C:240:ILE:HG23	1.88	0.55
1:C:178:MET:HG2	1:C:222:ILE:CD1	2.38	0.54
1:B:67:TRP:CZ2	2:B:301:LAE:H41	2.47	0.49

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	236/246 (96%)	229 (97%)	7 (3%)	0	100	100
1	B	235/246 (96%)	228 (97%)	7 (3%)	0	100	100
1	C	241/246 (98%)	228 (95%)	12 (5%)	1 (0%)	34	56
All	All	712/738 (96%)	685 (96%)	26 (4%)	1 (0%)	51	75

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	242	HIS

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	206/219 (94%)	204 (99%)	2 (1%)	76	88
1	B	207/219 (94%)	204 (99%)	3 (1%)	67	83
1	C	211/219 (96%)	206 (98%)	5 (2%)	49	72
All	All	624/657 (95%)	614 (98%)	10 (2%)	62	81

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	217	ASN
1	C	242	HIS
1	C	243	HIS
1	B	139	SER
1	B	217	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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)

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	LAE	A	301	-	17,17,17	2.19	5 (29%)	16,21,21	1.88	4 (25%)
2	LAE	C	301	-	17,17,17	2.22	5 (29%)	16,21,21	1.65	5 (31%)
2	LAE	B	301	-	17,17,17	2.21	5 (29%)	16,21,21	2.20	4 (25%)

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	LAE	A	301	-	-	6/13/23/23	0/1/1/1
2	LAE	C	301	-	-	5/13/23/23	0/1/1/1
2	LAE	B	301	-	-	3/13/23/23	0/1/1/1

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	LAE	O3-C2	6.02	1.48	1.35
2	A	301	LAE	O3-C2	5.90	1.48	1.35
2	B	301	LAE	O3-C2	5.79	1.47	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	LAE	C13-N11	3.98	1.42	1.34
2	A	301	LAE	O3-C4	-3.97	1.36	1.46

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

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	301	LAE	O3-C2-O10	5.21	126.82	121.42
2	A	301	LAE	O3-C2-O10	4.53	126.12	121.42
2	C	301	LAE	O3-C2-O10	4.08	125.65	121.42
2	B	301	LAE	C4-O3-C2	-4.07	106.63	110.39
2	A	301	LAE	C4-O3-C2	-3.61	107.06	110.39

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	LAE	C13-C14-C15-O36
2	A	301	LAE	C14-C15-C18-C19
2	A	301	LAE	O36-C15-C18-C19
2	C	301	LAE	N11-C13-C14-C15
2	C	301	LAE	O35-C13-C14-C15

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	LAE	1	0
2	B	301	LAE	2	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data (i)

6.1 Protein, DNA and RNA chains (i)

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	238/246 (96%)	0.45	3 (1%)	77	74	42, 65, 111, 183	0
1	B	237/246 (96%)	0.31	4 (1%)	70	66	42, 63, 97, 159	0
1	C	243/246 (98%)	1.17	52 (21%)	0	0	49, 91, 141, 247	0
All	All	718/738 (97%)	0.65	59 (8%)	11	6	42, 71, 131, 247	0

The worst 5 of 59 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	144	PRO	18.0
1	C	143	ILE	10.8
1	A	144	PRO	6.8
1	C	207	SER	5.3
1	C	15	LEU	4.5

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, 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	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	LAE	C	301	17/17	0.85	0.33	71,75,81,83	0
2	LAE	B	301	17/17	0.91	0.38	53,63,71,76	0
2	LAE	A	301	17/17	0.95	0.24	48,55,62,65	0

6.5 Other polymers (i)

There are no such residues in this entry.