



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 02:20 PM GMT

PDB ID : 3WVO
Title : Crystal structure of Thermobifida fusca Cse1
Authors : Yuan, Y.A.; Tay, M.
Deposited on : 2014-06-02
Resolution : 3.31 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

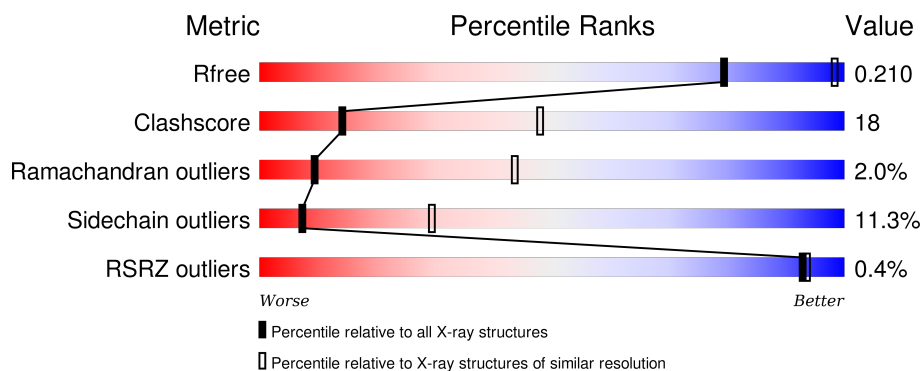
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.31 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}	91344	1198 (3.40-3.24)
Clashscore	102246	1280 (3.40-3.24)
Ramachandran outliers	100387	1260 (3.40-3.24)
Sidechain outliers	100360	1259 (3.40-3.24)
RSRZ outliers	91569	1203 (3.40-3.24)

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. 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	558	<div> <div>%</div> <div> <div></div> <div>57%</div> <div>34%</div> <div>7%</div> <div>.</div> </div> </div>
1	B	558	<div> <div>%</div> <div> <div></div> <div>63%</div> <div>30%</div> <div>.</div> <div>.</div> </div> </div>
1	C	558	<div> <div></div> <div> <div>60%</div> <div>31%</div> <div>5%</div> <div>.</div> </div> </div>

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 12784 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 CRISPR-associated protein, Cse1 family.

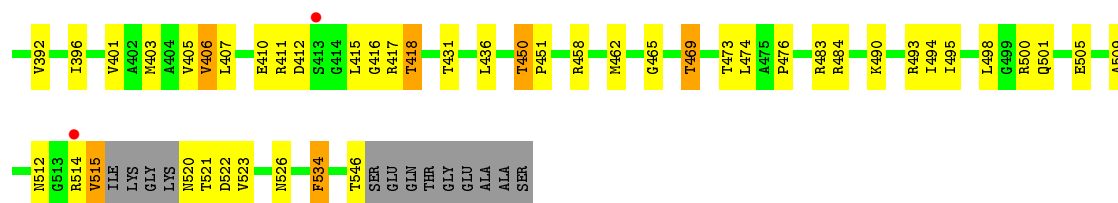
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	543	Total	C	N	O	S	0	0	0
			4261	2697	763	793	8			
1	B	542	Total	C	N	O	S	0	0	0
			4255	2693	763	791	8			
1	C	540	Total	C	N	O	S	0	0	0
			4240	2684	760	788	8			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	EXPRESSION TAG	UNP Q47PI4
A	-1	SER	-	EXPRESSION TAG	UNP Q47PI4
A	0	HIS	-	EXPRESSION TAG	UNP Q47PI4
B	-2	GLY	-	EXPRESSION TAG	UNP Q47PI4
B	-1	SER	-	EXPRESSION TAG	UNP Q47PI4
B	0	HIS	-	EXPRESSION TAG	UNP Q47PI4
C	-2	GLY	-	EXPRESSION TAG	UNP Q47PI4
C	-1	SER	-	EXPRESSION TAG	UNP Q47PI4
C	0	HIS	-	EXPRESSION TAG	UNP Q47PI4

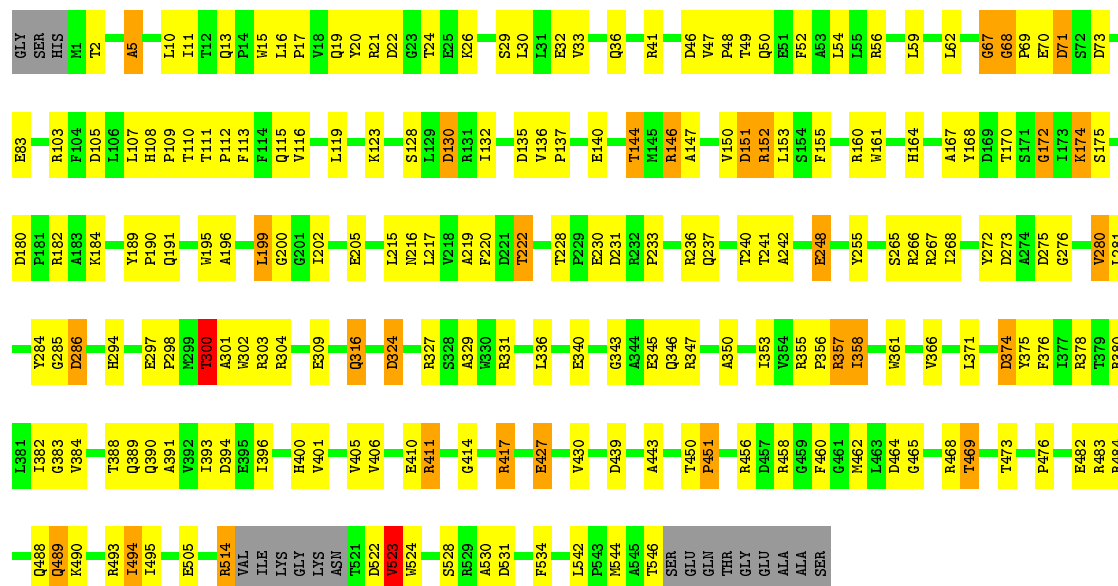
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	7	Total	O	0	0
			7	7		
2	B	13	Total	O	0	0
			13	13		
2	C	8	Total	O	0	0
			8	8		



- Molecule 1: CRISPR-associated protein, Cse1 family

Chain C: 60% 31% 5%



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	207.30Å 132.53Å 102.96Å 90.00° 93.75° 90.00°	Depositor
Resolution (Å)	48.37 – 3.31 47.46 – 3.31	Depositor EDS
% Data completeness (in resolution range)	89.4 (48.37-3.31) 89.5 (47.46-3.31)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.61 (at 3.33Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.156 , 0.210 0.156 , 0.210	Depositor DCC
R_{free} test set	1873 reflections (5.31%)	DCC
Wilson B-factor (Å ²)	69.4	Xtriage
Anisotropy	0.163	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 51.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 37117 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	12784	wwPDB-VP
Average B, all atoms (Å ²)	73.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.85% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

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	0.66	0/4365	0.91	3/5942 (0.1%)
1	B	0.60	0/4359	0.84	1/5936 (0.0%)
1	C	0.69	1/4344 (0.0%)	0.92	8/5915 (0.1%)
All	All	0.65	1/13068 (0.0%)	0.89	12/17793 (0.1%)

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	1
1	C	0	2
All	All	0	3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	195	TRP	CB-CG	-5.38	1.40	1.50

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	203	LEU	CB-CA-C	-6.83	97.23	110.20
1	C	280	VAL	CB-CA-C	-6.36	99.31	111.40
1	C	394	ASP	CB-CG-OD1	6.00	123.70	118.30
1	A	452	ARG	NE-CZ-NH1	-5.56	117.52	120.30
1	C	300	THR	CB-CA-C	-5.54	96.65	111.60

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	344	ALA	Peptide
1	C	172	GLY	Peptide
1	C	199	LEU	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	4261	0	4181	176	0
1	B	4255	0	4172	139	0
1	C	4240	0	4157	147	0
2	A	7	0	0	0	0
2	B	13	0	0	1	0
2	C	8	0	0	1	0
All	All	12784	0	12510	459	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 18.

The worst 5 of 459 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:B:366:VAL:HG21	1:B:405:VAL:CG1	1.73	1.18
1:B:366:VAL:HG21	1:B:405:VAL:HG11	1.26	1.11
1:A:49:THR:HG22	1:A:168:TYR:CE1	1.90	1.06
1:C:132:ILE:HG22	1:C:161:TRP:HB3	1.39	1.05
1:C:103:ARG:NH2	1:C:237:GLN:O	1.93	1.01

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	539/558 (97%)	485 (90%)	43 (8%)	11 (2%)	9	43
1	B	538/558 (96%)	477 (89%)	47 (9%)	14 (3%)	7	37
1	C	536/558 (96%)	482 (90%)	47 (9%)	7 (1%)	15	53
All	All	1613/1674 (96%)	1444 (90%)	137 (8%)	32 (2%)	9	43

5 of 32 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	68	GLY
1	A	111	THR
1	A	183	ALA
1	A	345	GLU
1	A	546	THR

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	433/443 (98%)	386 (89%)	47 (11%)	8	31
1	B	432/443 (98%)	379 (88%)	53 (12%)	6	25
1	C	430/443 (97%)	384 (89%)	46 (11%)	8	32
All	All	1295/1329 (97%)	1149 (89%)	146 (11%)	7	29

5 of 146 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	150	VAL
1	B	346	GLN
1	C	411	ARG
1	B	203	LEU
1	B	265	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 23 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	138	ASN
1	B	291	HIS
1	C	367	ASN
1	B	164	HIS
1	B	296	HIS

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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	543/558 (97%)	-0.27	4 (0%) 89 88	37, 67, 107, 185	0
1	B	542/558 (97%)	-0.17	3 (0%) 90 90	43, 81, 116, 184	0
1	C	540/558 (96%)	-0.37	0 100 100	30, 62, 105, 170	0
All	All	1625/1674 (97%)	-0.27	7 (0%) 93 93	30, 70, 112, 185	0

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	MET	3.0
1	B	413	SER	2.7
1	A	521	THR	2.6
1	B	1	MET	2.4
1	A	2	THR	2.3

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 carbohydrates in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.