



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2026 – 09:02 PM UTC

PDB ID : 2PGE / pdb_00002pge
Title : Crystal structure of MenC from Desulfotalea psychrophila LSv54
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Deposited on : 2007-04-09
Resolution : 1.60 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

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>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

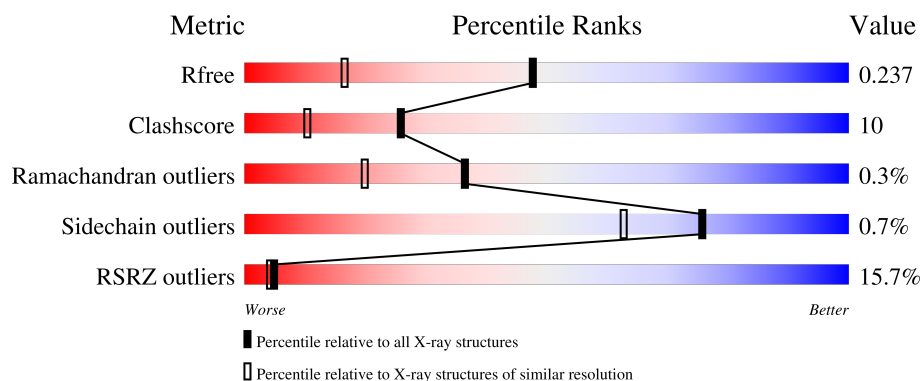
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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}	180053	4673 (1.60-1.60)
Clashscore	190562	4931 (1.60-1.60)
Ramachandran outliers	187476	4831 (1.60-1.60)
Sidechain outliers	187428	4830 (1.60-1.60)
RSRZ outliers	180081	4672 (1.60-1.60)

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 $\leq 5\%$. 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	377	15% 78% 15% 6%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3028 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 MenC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	356	2783	1769	490	514	10	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	cloning artifact	UNP Q6ARP5
A	2	LEU	-	cloning artifact	UNP Q6ARP5
A	370	GLU	-	cloning artifact	UNP Q6ARP5
A	371	GLY	-	cloning artifact	UNP Q6ARP5
A	372	HIS	-	cloning artifact	UNP Q6ARP5
A	373	HIS	-	cloning artifact	UNP Q6ARP5
A	374	HIS	-	cloning artifact	UNP Q6ARP5
A	375	HIS	-	cloning artifact	UNP Q6ARP5
A	376	HIS	-	cloning artifact	UNP Q6ARP5
A	377	HIS	-	cloning artifact	UNP Q6ARP5

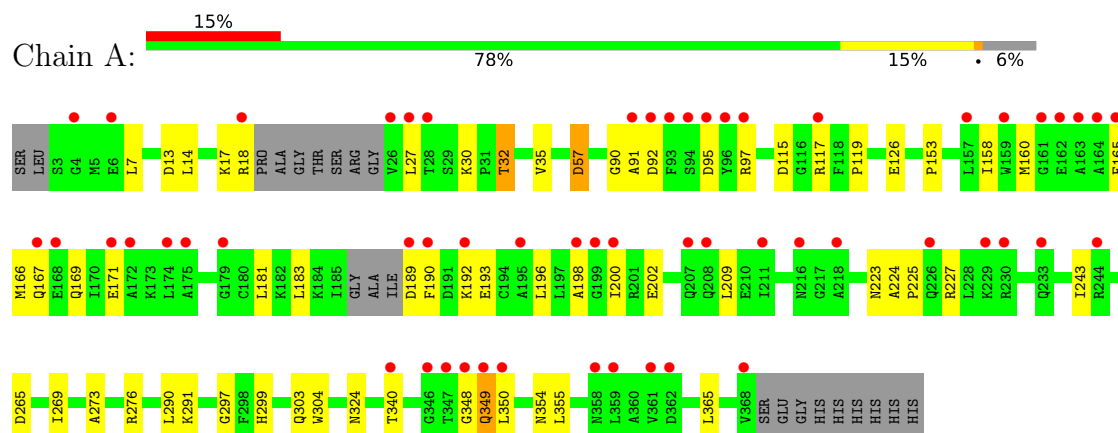
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	245	Total	O	0	0
			245	245		

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: MenC



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	59.13Å 82.78Å 89.58Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.70 – 1.60 35.70 – 1.60	Depositor EDS
% Data completeness (in resolution range)	96.4 (35.70-1.60) 96.4 (35.70-1.60)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.87 (at 1.60Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.225 , 0.238 0.224 , 0.237	Depositor DCC
R_{free} test set	1704 reflections (2.95%)	wwPDB-VP
Wilson B-factor (Å ²)	15.1	Xtriage
Anisotropy	0.159	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 33.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3028	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.78% 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, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.41	0/2839	0.89	7/3837 (0.2%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	92	ASP	N-CA-C	-8.02	102.53	111.28
1	A	297	GLY	N-CA-C	6.90	120.13	111.85
1	A	190	PHE	N-CA-C	6.57	118.99	111.11
1	A	273	ALA	CB-CA-C	-5.58	110.12	116.54
1	A	269	ILE	N-CA-C	5.38	116.64	109.37
1	A	340	THR	N-CA-C	-5.17	107.52	113.88
1	A	126	GLU	N-CA-C	-5.13	105.77	111.36

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	2783	0	2772	53	0
2	A	245	0	0	11	0
All	All	3028	0	2772	53	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 10.

All (53) 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:354:ASN:HD22	1:A:355:LEU:H	1.14	0.93
1:A:192:LYS:HD2	1:A:192:LYS:H	1.41	0.85
1:A:324:ASN:H	1:A:354:ASN:HD21	1.27	0.81
1:A:160:MET:HG2	1:A:183:LEU:HD11	1.69	0.74
1:A:354:ASN:HD22	1:A:355:LEU:N	1.88	0.68
1:A:14:LEU:HG	1:A:32:THR:HG21	1.76	0.67
1:A:354:ASN:ND2	1:A:355:LEU:H	1.93	0.64
1:A:349:GLN:HB3	2:A:569:HOH:O	1.97	0.63
1:A:189:ASP:N	1:A:192:LYS:HZ3	1.98	0.60
1:A:223:ASN:O	1:A:227:ARG:HG3	2.01	0.60
1:A:166:MET:CE	1:A:200:ILE:HD11	2.31	0.60
1:A:90:GLY:O	1:A:91:ALA:HB3	2.01	0.60
1:A:165:PHE:O	1:A:169:GLN:HG3	2.02	0.59
1:A:158:ILE:HD11	1:A:183:LEU:HB2	1.84	0.58
1:A:7:LEU:HD11	1:A:35:VAL:CG1	2.33	0.58
1:A:224:ALA:HB3	1:A:225:PRO:HD3	1.87	0.57
1:A:166:MET:HA	1:A:169:GLN:HE21	1.71	0.56
1:A:97:ARG:HG3	2:A:428:HOH:O	2.06	0.55
1:A:115:ASP:OD2	1:A:117:ARG:HD2	2.09	0.53
1:A:160:MET:HE3	1:A:193:GLU:HB3	1.90	0.53
1:A:95:ASP:HA	2:A:599:HOH:O	2.08	0.53
1:A:189:ASP:HA	1:A:192:LYS:HD3	1.93	0.50
1:A:18:ARG:C	2:A:455:HOH:O	2.54	0.50
1:A:348:GLY:O	1:A:350:LEU:N	2.46	0.49
1:A:13:ASP:HA	1:A:32:THR:HG23	1.94	0.48
1:A:196:LEU:O	1:A:200:ILE:HG13	2.13	0.48
1:A:290:LEU:HD22	1:A:290:LEU:N	2.28	0.48
1:A:189:ASP:O	1:A:193:GLU:HG3	2.12	0.48
1:A:27:LEU:HD12	1:A:27:LEU:O	2.15	0.47
1:A:324:ASN:H	1:A:354:ASN:ND2	2.04	0.46
1:A:355:LEU:N	1:A:355:LEU:HD12	2.30	0.46
1:A:30:LYS:O	1:A:32:THR:HG22	2.16	0.46
1:A:95:ASP:HB3	2:A:428:HOH:O	2.15	0.45
1:A:166:MET:HE3	1:A:200:ILE:HD11	1.96	0.45
1:A:243:ILE:HB	2:A:512:HOH:O	2.16	0.45
1:A:7:LEU:HD11	1:A:35:VAL:HG13	1.99	0.44
1:A:181:LEU:HG	1:A:209:LEU:HD11	2.00	0.43
1:A:153:PRO:HA	1:A:365:LEU:HD23	1.99	0.43
1:A:117:ARG:C	1:A:119:PRO:HD3	2.43	0.43
1:A:57:ASP:OD1	1:A:119:PRO:HD2	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:167:GLN:O	1:A:171:GLU:HG3	2.18	0.43
1:A:90:GLY:O	1:A:91:ALA:CB	2.66	0.42
1:A:27:LEU:HG	2:A:525:HOH:O	2.19	0.42
1:A:276:ARG:HG2	1:A:304:TRP:CZ2	2.55	0.42
1:A:324:ASN:N	1:A:354:ASN:HD21	2.05	0.42
1:A:299:HIS:O	1:A:303:GLN:HG3	2.19	0.42
1:A:117:ARG:HD3	2:A:578:HOH:O	2.20	0.41
1:A:265:ASP:OD2	1:A:291:LYS:HE3	2.21	0.41
1:A:158:ILE:CG2	1:A:181:LEU:HD13	2.50	0.41
1:A:32:THR:HB	2:A:421:HOH:O	2.21	0.41
1:A:198:ALA:O	1:A:202:GLU:HG3	2.21	0.41
1:A:17:LYS:CE	2:A:569:HOH:O	2.68	0.40
1:A:17:LYS:HD2	2:A:569:HOH:O	2.20	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	350/377 (93%)	332 (95%)	17 (5%)	1 (0%)	36	20

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	349	GLN

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	287/302 (95%)	285 (99%)	2 (1%)	76	63

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	32	THR
1	A	57	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	169	GLN
1	A	208	GLN
1	A	354	ASN

5.3.3 RNA ⓘ

There are no RNA molecules 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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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	356/377 (94%)	0.91	56 (15%) 5 4	7, 19, 35, 40	0

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	93	PHE	8.2
1	A	346	GLY	7.2
1	A	165	PHE	6.6
1	A	347	THR	6.6
1	A	348	GLY	6.3
1	A	91	ALA	6.0
1	A	26	VAL	5.0
1	A	94	SER	4.9
1	A	18	ARG	4.9
1	A	218	ALA	4.6
1	A	226	GLN	4.5
1	A	92	ASP	4.4
1	A	159	TRP	4.2
1	A	27	LEU	4.0
1	A	230	ARG	3.8
1	A	117	ARG	3.6
1	A	349	GLN	3.6
1	A	362	ASP	3.6
1	A	368	VAL	3.6
1	A	190	PHE	3.4
1	A	189	ASP	3.2
1	A	162	GLU	3.2
1	A	167	GLN	3.0
1	A	163	ALA	3.0
1	A	172	ALA	3.0
1	A	175	ALA	3.0
1	A	198	ALA	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	168	GLU	2.9
1	A	157	LEU	2.9
1	A	161	GLY	2.8
1	A	233	GLN	2.8
1	A	358	ASN	2.7
1	A	229	LYS	2.7
1	A	95	ASP	2.7
1	A	361	VAL	2.7
1	A	244	ARG	2.7
1	A	216	ASN	2.7
1	A	6	GLU	2.6
1	A	4	GLY	2.6
1	A	359	LEU	2.6
1	A	171	GLU	2.6
1	A	96	TYR	2.6
1	A	192	LYS	2.5
1	A	164	ALA	2.5
1	A	97	ARG	2.5
1	A	28	THR	2.4
1	A	211	ILE	2.4
1	A	208	GLN	2.3
1	A	174	LEU	2.3
1	A	200	ILE	2.3
1	A	207	GLN	2.2
1	A	195	ALA	2.1
1	A	199	GLY	2.1
1	A	340	THR	2.1
1	A	179	GLY	2.0
1	A	350	LEU	2.0

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 oligosaccharides in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.