



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 08:12 PM UTC

PDB ID : 3TJB / pdb_00003tjb
Title : Crystal structure of wild-type human peroxiredoxin IV
Authors : Cao, Z.; Tavender, T.J.; Roszak, A.W.; Cogdell, R.J.; Bulleid, N.J.
Deposited on : 2011-08-24
Resolution : 2.38 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 ⓘ 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

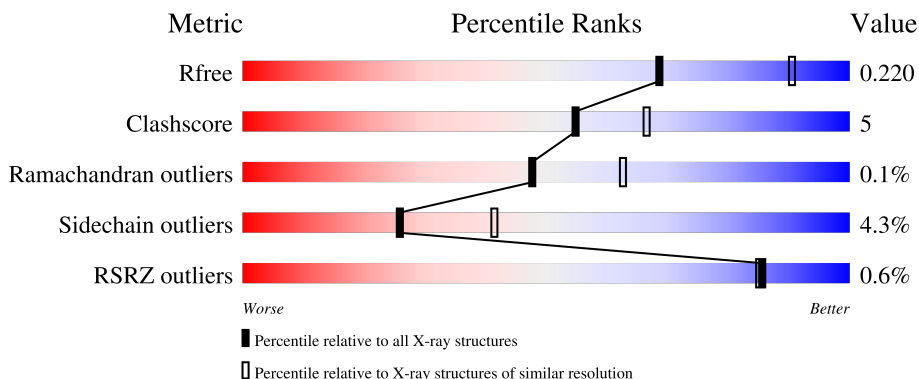
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.38 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	7164 (2.40-2.36)
Clashscore	190562	7722 (2.40-2.36)
Ramachandran outliers	187476	7626 (2.40-2.36)
Sidechain outliers	187428	7627 (2.40-2.36)
RSRZ outliers	180081	7170 (2.40-2.36)

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	254	% 57% 9% • 33%
1	B	254	57% 7% • 34%
1	C	254	57% 7% • 34%
1	D	254	% 54% 11% • 33%
1	E	254	58% 6% • 34%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 7704 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 Peroxiredoxin-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	170	Total	C	N	O	S	0	5	0
			1403	908	234	258	3			
1	B	167	Total	C	N	O	S	0	5	0
			1382	895	231	254	2			
1	C	167	Total	C	N	O	S	0	4	0
			1370	889	226	253	2			
1	D	170	Total	C	N	O	S	0	4	0
			1397	905	232	257	3			
1	E	167	Total	C	N	O	S	0	4	0
			1372	888	227	255	2			

There are 100 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	18	MET	-	expression tag	UNP Q13162
A	19	GLY	-	expression tag	UNP Q13162
A	20	SER	-	expression tag	UNP Q13162
A	21	SER	-	expression tag	UNP Q13162
A	22	HIS	-	expression tag	UNP Q13162
A	23	HIS	-	expression tag	UNP Q13162
A	24	HIS	-	expression tag	UNP Q13162
A	25	HIS	-	expression tag	UNP Q13162
A	26	HIS	-	expression tag	UNP Q13162
A	27	HIS	-	expression tag	UNP Q13162
A	28	SER	-	expression tag	UNP Q13162
A	29	GLN	-	expression tag	UNP Q13162
A	30	ASP	-	expression tag	UNP Q13162
A	31	PRO	-	expression tag	UNP Q13162
A	32	LEU	-	expression tag	UNP Q13162
A	33	VAL	-	expression tag	UNP Q13162
A	34	PRO	-	expression tag	UNP Q13162
A	35	ARG	-	expression tag	UNP Q13162
A	36	GLY	-	expression tag	UNP Q13162

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Chain	Residue	Modelled	Actual	Comment	Reference
A	37	SER	-	expression tag	UNP Q13162
B	18	MET	-	expression tag	UNP Q13162
B	19	GLY	-	expression tag	UNP Q13162
B	20	SER	-	expression tag	UNP Q13162
B	21	SER	-	expression tag	UNP Q13162
B	22	HIS	-	expression tag	UNP Q13162
B	23	HIS	-	expression tag	UNP Q13162
B	24	HIS	-	expression tag	UNP Q13162
B	25	HIS	-	expression tag	UNP Q13162
B	26	HIS	-	expression tag	UNP Q13162
B	27	HIS	-	expression tag	UNP Q13162
B	28	SER	-	expression tag	UNP Q13162
B	29	GLN	-	expression tag	UNP Q13162
B	30	ASP	-	expression tag	UNP Q13162
B	31	PRO	-	expression tag	UNP Q13162
B	32	LEU	-	expression tag	UNP Q13162
B	33	VAL	-	expression tag	UNP Q13162
B	34	PRO	-	expression tag	UNP Q13162
B	35	ARG	-	expression tag	UNP Q13162
B	36	GLY	-	expression tag	UNP Q13162
B	37	SER	-	expression tag	UNP Q13162
C	18	MET	-	expression tag	UNP Q13162
C	19	GLY	-	expression tag	UNP Q13162
C	20	SER	-	expression tag	UNP Q13162
C	21	SER	-	expression tag	UNP Q13162
C	22	HIS	-	expression tag	UNP Q13162
C	23	HIS	-	expression tag	UNP Q13162
C	24	HIS	-	expression tag	UNP Q13162
C	25	HIS	-	expression tag	UNP Q13162
C	26	HIS	-	expression tag	UNP Q13162
C	27	HIS	-	expression tag	UNP Q13162
C	28	SER	-	expression tag	UNP Q13162
C	29	GLN	-	expression tag	UNP Q13162
C	30	ASP	-	expression tag	UNP Q13162
C	31	PRO	-	expression tag	UNP Q13162
C	32	LEU	-	expression tag	UNP Q13162
C	33	VAL	-	expression tag	UNP Q13162
C	34	PRO	-	expression tag	UNP Q13162
C	35	ARG	-	expression tag	UNP Q13162
C	36	GLY	-	expression tag	UNP Q13162
C	37	SER	-	expression tag	UNP Q13162
D	18	MET	-	expression tag	UNP Q13162

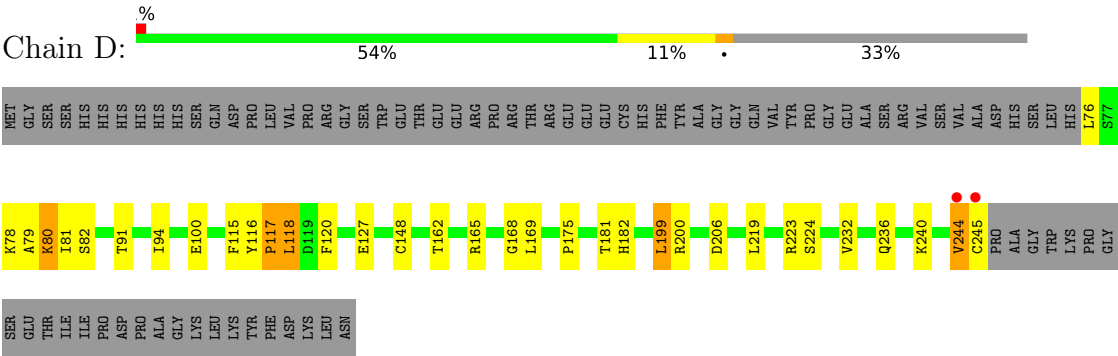
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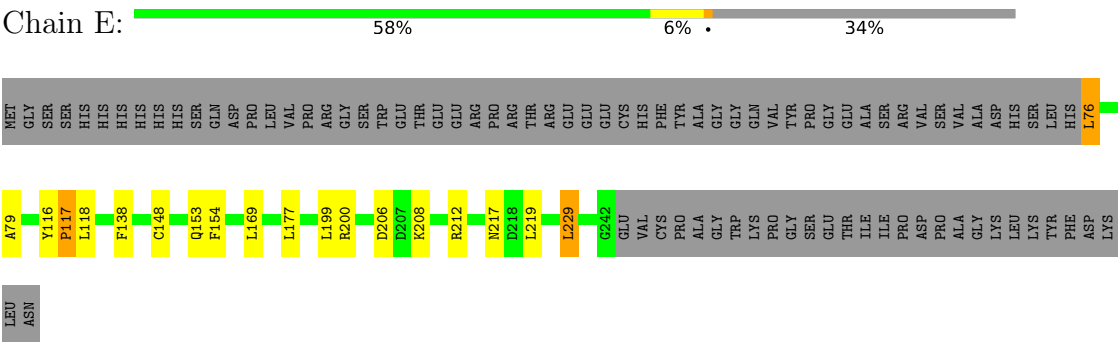
Chain	Residue	Modelled	Actual	Comment	Reference
D	19	GLY	-	expression tag	UNP Q13162
D	20	SER	-	expression tag	UNP Q13162
D	21	SER	-	expression tag	UNP Q13162
D	22	HIS	-	expression tag	UNP Q13162
D	23	HIS	-	expression tag	UNP Q13162
D	24	HIS	-	expression tag	UNP Q13162
D	25	HIS	-	expression tag	UNP Q13162
D	26	HIS	-	expression tag	UNP Q13162
D	27	HIS	-	expression tag	UNP Q13162
D	28	SER	-	expression tag	UNP Q13162
D	29	GLN	-	expression tag	UNP Q13162
D	30	ASP	-	expression tag	UNP Q13162
D	31	PRO	-	expression tag	UNP Q13162
D	32	LEU	-	expression tag	UNP Q13162
D	33	VAL	-	expression tag	UNP Q13162
D	34	PRO	-	expression tag	UNP Q13162
D	35	ARG	-	expression tag	UNP Q13162
D	36	GLY	-	expression tag	UNP Q13162
D	37	SER	-	expression tag	UNP Q13162
E	18	MET	-	expression tag	UNP Q13162
E	19	GLY	-	expression tag	UNP Q13162
E	20	SER	-	expression tag	UNP Q13162
E	21	SER	-	expression tag	UNP Q13162
E	22	HIS	-	expression tag	UNP Q13162
E	23	HIS	-	expression tag	UNP Q13162
E	24	HIS	-	expression tag	UNP Q13162
E	25	HIS	-	expression tag	UNP Q13162
E	26	HIS	-	expression tag	UNP Q13162
E	27	HIS	-	expression tag	UNP Q13162
E	28	SER	-	expression tag	UNP Q13162
E	29	GLN	-	expression tag	UNP Q13162
E	30	ASP	-	expression tag	UNP Q13162
E	31	PRO	-	expression tag	UNP Q13162
E	32	LEU	-	expression tag	UNP Q13162
E	33	VAL	-	expression tag	UNP Q13162
E	34	PRO	-	expression tag	UNP Q13162
E	35	ARG	-	expression tag	UNP Q13162
E	36	GLY	-	expression tag	UNP Q13162
E	37	SER	-	expression tag	UNP Q13162

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	160	Total 160	O 160	0	0
2	B	165	Total 165	O 165	0	0
2	C	145	Total 145	O 145	0	0
2	D	148	Total 148	O 148	0	0
2	E	162	Total 162	O 162	0	0



● Molecule 1: Peroxiredoxin-4



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	107.98Å 139.43Å 95.92Å 90.00° 102.81° 90.00°	Depositor
Resolution (Å)	69.71 – 2.38 69.71 – 2.38	Depositor EDS
% Data completeness (in resolution range)	96.4 (69.71-2.38) 96.4 (69.71-2.38)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.53 (at 2.37Å)	Xtriage
Refinement program	REFMAC 5.5.0110	Depositor
R, R_{free}	0.163 , 0.221 0.164 , 0.220	Depositor DCC
R_{free} test set	2719 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	49.0	Xtriage
Anisotropy	0.075	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 75.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	7704	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.96% 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	1.05	1/1448 (0.1%)	1.05	4/1960 (0.2%)
1	B	0.99	1/1424 (0.1%)	1.07	4/1930 (0.2%)
1	C	0.87	1/1412 (0.1%)	0.91	1/1917 (0.1%)
1	D	0.95	2/1436 (0.1%)	1.04	3/1946 (0.2%)
1	E	0.99	0/1414	1.09	3/1916 (0.2%)
All	All	0.97	5/7134 (0.1%)	1.04	15/9669 (0.2%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	79	ALA	CA-CB	-5.40	1.45	1.53
1	D	244	VAL	CA-CB	5.32	1.60	1.54
1	B	116	TYR	C-O	-5.29	1.18	1.24
1	A	116	TYR	C-O	-5.24	1.18	1.24
1	D	116	TYR	C-O	-5.04	1.19	1.24

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	85	ALA	CA-C-N	-8.43	111.33	119.76
1	B	85	ALA	C-N-CA	-8.43	111.33	119.76
1	E	219	LEU	CA-C-N	-8.43	111.05	119.56
1	E	219	LEU	C-N-CA	-8.43	111.05	119.56
1	D	117	PRO	N-CA-C	6.26	122.42	113.47

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	1403	0	1409	15	0
1	B	1382	0	1383	10	0
1	C	1370	0	1370	12	0
1	D	1397	0	1399	19	0
1	E	1372	0	1367	10	0
2	A	160	0	0	0	0
2	B	165	0	0	2	0
2	C	145	0	0	1	0
2	D	148	0	0	2	0
2	E	162	0	0	1	0
All	All	7704	0	6928	66	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 5.

The worst 5 of 66 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:D:117:PRO:O	1:D:118:LEU:HG	1.79	0.82
1:B:119:ASP:OD2	1:B:156:HIS:HD2	1.63	0.82
1:A:244:VAL:HG22	1:A:245:CYS:N	2.02	0.73
1:D:162:THR:HG22	1:D:168:GLY:HA3	1.72	0.72
1:E:117:PRO:O	1:E:118:LEU:HG	1.89	0.72

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	173/254 (68%)	168 (97%)	5 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	170/254 (67%)	160 (94%)	10 (6%)	0	100	100
1	C	169/254 (66%)	164 (97%)	5 (3%)	0	100	100
1	D	172/254 (68%)	165 (96%)	6 (4%)	1 (1%)	21	30
1	E	169/254 (66%)	164 (97%)	5 (3%)	0	100	100
All	All	853/1270 (67%)	821 (96%)	31 (4%)	1 (0%)	48	62

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	165	ARG

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	155/221 (70%)	148 (96%)	7 (4%)	24	39
1	B	152/221 (69%)	146 (96%)	6 (4%)	28	45
1	C	151/221 (68%)	144 (95%)	7 (5%)	24	38
1	D	154/221 (70%)	145 (94%)	9 (6%)	18	29
1	E	151/221 (68%)	146 (97%)	5 (3%)	33	52
All	All	763/1105 (69%)	729 (96%)	34 (4%)	26	39

5 of 34 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	245	CYS
1	E	76	LEU
1	E	208	LYS
1	B	229	LEU
1	B	219	LEU

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

Mol	Chain	Res	Type
1	B	156	HIS
1	B	166	GLN
1	D	166	GLN

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 oligosaccharides 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	170/254 (66%)	-0.34	2 (1%) 76 76	20, 42, 70, 99	5 (2%)
1	B	167/254 (65%)	-0.28	1 (0%) 85 85	24, 48, 70, 96	5 (2%)
1	C	167/254 (65%)	-0.25	0 100 100	30, 56, 77, 100	4 (2%)
1	D	170/254 (66%)	-0.28	2 (1%) 76 76	28, 50, 74, 107	4 (2%)
1	E	167/254 (65%)	-0.33	0 100 100	24, 46, 68, 93	4 (2%)
All	All	841/1270 (66%)	-0.30	5 (0%) 85 85	20, 49, 75, 107	22 (2%)

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	244	VAL	5.0
1	A	244	VAL	4.9
1	A	245	CYS	4.6
1	B	242	GLY	3.8
1	D	245	CYS	3.5

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 oligosaccharides 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.