



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 01:44 PM UTC

PDB ID : 4ABY / pdb_00004aby
Title : Crystal structure of Deinococcus radiodurans RecN head domain
Authors : Pellegrino, S.; Radzimanowski, J.; de Sanctis, D.; McSweeney, S.; Timmins, J.
Deposited on : 2011-12-12
Resolution : 3.00 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
Mogul	:	2022.3.0, CSD as543be (2022)
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

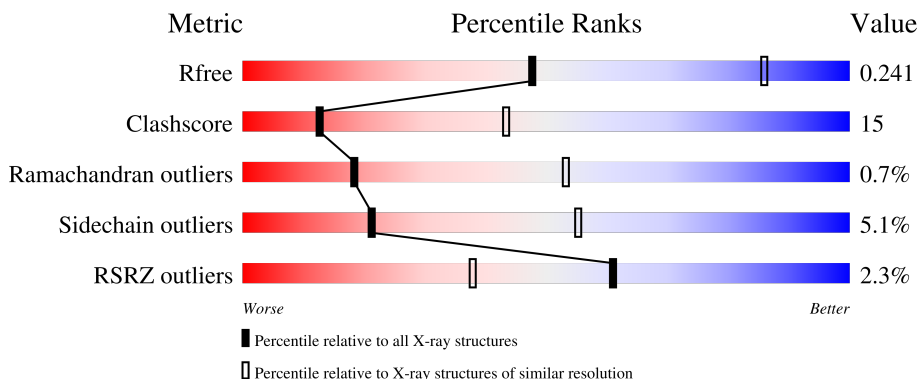
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

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	415	0.2% 65% 20% • 14%
1	B	415	0.2% 63% 22% • 13%
1	C	415	3% 53% 27% • 15%
1	D	415	2% 49% 25% • 25%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 10447 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 DNA REPAIR PROTEIN REC�.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	358	Total	C	N	O	S	Se	0	0	0
			2694	1674	504	511	1	4			
1	B	361	Total	C	N	O	S	Se	0	0	0
			2715	1686	508	516	1	4			
1	C	351	Total	C	N	O	S	Se	0	0	0
			2619	1628	485	501	1	4			
1	D	311	Total	C	N	O	S	Se	0	0	0
			2317	1442	428	442	1	4			

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	GLY	-	expression tag	UNP Q9WXF2
A	-4	ILE	-	expression tag	UNP Q9WXF2
A	-3	ASP	-	expression tag	UNP Q9WXF2
A	-2	PRO	-	expression tag	UNP Q9WXF2
A	-1	PHE	-	expression tag	UNP Q9WXF2
A	0	THR	-	expression tag	UNP Q9WXF2
A	352	GLU	-	linker	UNP Q9WXF2
A	353	SER	-	linker	UNP Q9WXF2
A	354	SER	-	linker	UNP Q9WXF2
A	355	LYS	-	linker	UNP Q9WXF2
A	356	HIS	-	linker	UNP Q9WXF2
A	357	PRO	-	linker	UNP Q9WXF2
A	358	THR	-	linker	UNP Q9WXF2
A	359	SER	-	linker	UNP Q9WXF2
A	360	LEU	-	linker	UNP Q9WXF2
A	361	VAL	-	linker	UNP Q9WXF2
A	362	PRO	-	linker	UNP Q9WXF2
A	363	ARG	-	linker	UNP Q9WXF2
A	364	GLY	-	linker	UNP Q9WXF2
A	365	SER	-	linker	UNP Q9WXF2
B	-5	GLY	-	expression tag	UNP Q9WXF2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	ILE	-	expression tag	UNP Q9WXF2
B	-3	ASP	-	expression tag	UNP Q9WXF2
B	-2	PRO	-	expression tag	UNP Q9WXF2
B	-1	PHE	-	expression tag	UNP Q9WXF2
B	0	THR	-	expression tag	UNP Q9WXF2
B	352	GLU	-	linker	UNP Q9WXF2
B	353	SER	-	linker	UNP Q9WXF2
B	354	SER	-	linker	UNP Q9WXF2
B	355	LYS	-	linker	UNP Q9WXF2
B	356	HIS	-	linker	UNP Q9WXF2
B	357	PRO	-	linker	UNP Q9WXF2
B	358	THR	-	linker	UNP Q9WXF2
B	359	SER	-	linker	UNP Q9WXF2
B	360	LEU	-	linker	UNP Q9WXF2
B	361	VAL	-	linker	UNP Q9WXF2
B	362	PRO	-	linker	UNP Q9WXF2
B	363	ARG	-	linker	UNP Q9WXF2
B	364	GLY	-	linker	UNP Q9WXF2
B	365	SER	-	linker	UNP Q9WXF2
C	-5	GLY	-	expression tag	UNP Q9WXF2
C	-4	ILE	-	expression tag	UNP Q9WXF2
C	-3	ASP	-	expression tag	UNP Q9WXF2
C	-2	PRO	-	expression tag	UNP Q9WXF2
C	-1	PHE	-	expression tag	UNP Q9WXF2
C	0	THR	-	expression tag	UNP Q9WXF2
C	352	GLU	-	linker	UNP Q9WXF2
C	353	SER	-	linker	UNP Q9WXF2
C	354	SER	-	linker	UNP Q9WXF2
C	355	LYS	-	linker	UNP Q9WXF2
C	356	HIS	-	linker	UNP Q9WXF2
C	357	PRO	-	linker	UNP Q9WXF2
C	358	THR	-	linker	UNP Q9WXF2
C	359	SER	-	linker	UNP Q9WXF2
C	360	LEU	-	linker	UNP Q9WXF2
C	361	VAL	-	linker	UNP Q9WXF2
C	362	PRO	-	linker	UNP Q9WXF2
C	363	ARG	-	linker	UNP Q9WXF2
C	364	GLY	-	linker	UNP Q9WXF2
C	365	SER	-	linker	UNP Q9WXF2
D	-5	GLY	-	expression tag	UNP Q9WXF2
D	-4	ILE	-	expression tag	UNP Q9WXF2
D	-3	ASP	-	expression tag	UNP Q9WXF2

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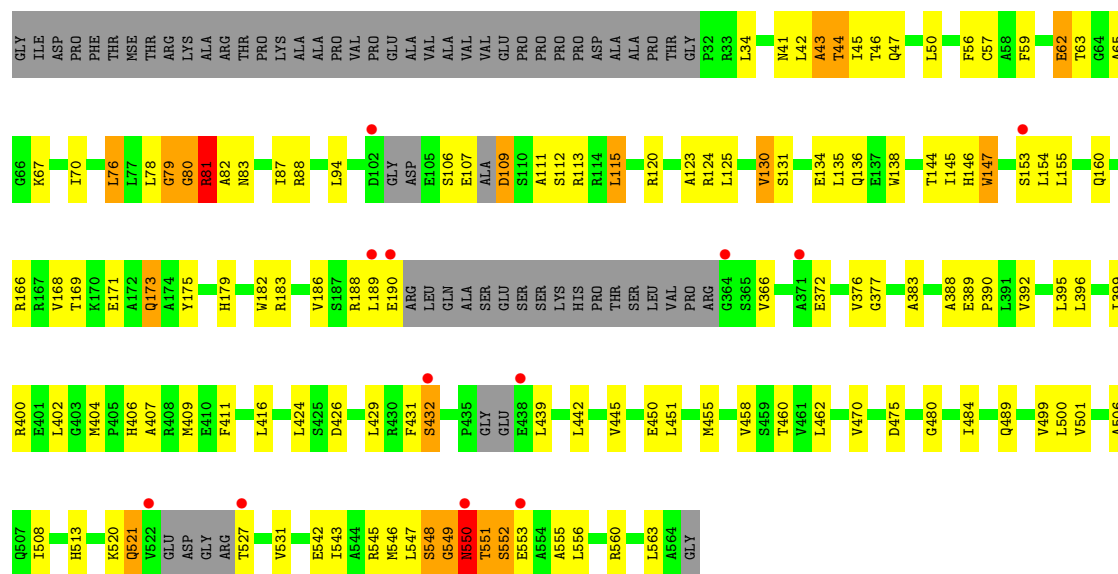
Chain	Residue	Modelled	Actual	Comment	Reference
D	-2	PRO	-	expression tag	UNP Q9WXF2
D	-1	PHE	-	expression tag	UNP Q9WXF2
D	0	THR	-	expression tag	UNP Q9WXF2
D	352	GLU	-	linker	UNP Q9WXF2
D	353	SER	-	linker	UNP Q9WXF2
D	354	SER	-	linker	UNP Q9WXF2
D	355	LYS	-	linker	UNP Q9WXF2
D	356	HIS	-	linker	UNP Q9WXF2
D	357	PRO	-	linker	UNP Q9WXF2
D	358	THR	-	linker	UNP Q9WXF2
D	359	SER	-	linker	UNP Q9WXF2
D	360	LEU	-	linker	UNP Q9WXF2
D	361	VAL	-	linker	UNP Q9WXF2
D	362	PRO	-	linker	UNP Q9WXF2
D	363	ARG	-	linker	UNP Q9WXF2
D	364	GLY	-	linker	UNP Q9WXF2
D	365	SER	-	linker	UNP Q9WXF2

- Molecule 2 is water.

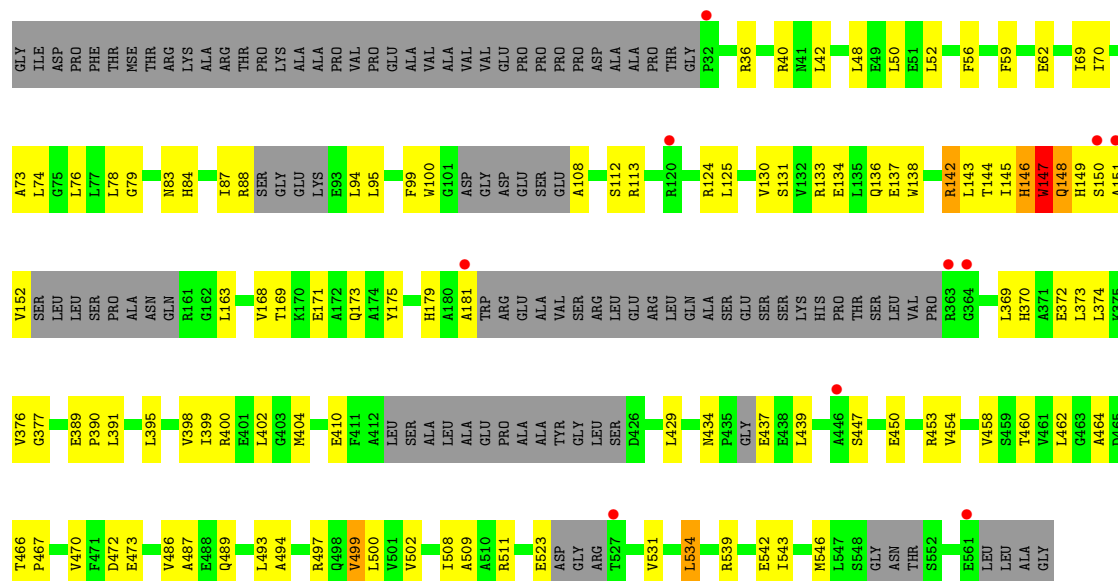
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	26	Total O 26 26	0	0
2	B	46	Total O 46 46	0	0
2	C	18	Total O 18 18	0	0
2	D	12	Total O 12 12	0	0

- Molecule 1: DNA REPAIR PROTEIN RECNA





• Molecule 1: DNA REPAIR PROTEIN REC N



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	129.86Å 61.99Å 133.82Å 90.00° 102.74° 90.00°	Depositor
Resolution (Å)	49.51 – 3.00 49.51 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.4 (49.51-3.00) 99.4 (49.51-3.00)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.79 (at 3.01Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.209 , 0.249 (Not available) , 0.241	Depositor DCC
R_{free} test set	2117 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	46.9	Xtriage
Anisotropy	0.432	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 34.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.027 for l,-k,h	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	10447	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.57% 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	0.58	2/2725 (0.1%)	0.84	6/3679 (0.2%)
1	B	0.63	7/2745 (0.3%)	0.83	6/3705 (0.2%)
1	C	0.68	4/2646 (0.2%)	0.94	12/3570 (0.3%)
1	D	0.47	0/2336	0.93	7/3145 (0.2%)
All	All	0.60	13/10452 (0.1%)	0.88	31/14099 (0.2%)

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	153	SER	N-CA	-7.79	1.41	1.46
1	B	82	ALA	CA-C	-6.32	1.45	1.53
1	B	153	SER	C-O	-6.00	1.18	1.23
1	A	474	VAL	CA-C	-5.97	1.45	1.52
1	B	82	ALA	CA-CB	-5.77	1.43	1.53

The worst 5 of 31 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	146	HIS	N-CA-C	18.71	134.23	111.40
1	C	80	GLY	N-CA-C	13.51	128.95	112.73
1	D	151	ALA	N-CA-C	-12.59	97.56	111.28
1	A	474	VAL	N-CA-CB	-11.51	80.33	111.75
1	D	148	GLN	N-CA-C	10.66	122.98	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	2694	0	2722	58	0
1	B	2715	0	2744	71	0
1	C	2619	0	2625	99	0
1	D	2317	0	2315	88	0
2	A	26	0	0	0	0
2	B	46	0	0	0	0
2	C	18	0	0	0	0
2	D	12	0	0	0	0
All	All	10447	0	10406	316	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 15.

The worst 5 of 316 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:80:GLY:O	1:C:81:ARG:HB2	1.57	1.03
1:B:152:VAL:HG22	1:B:152:VAL:O	1.58	1.03
1:C:168:VAL:HG12	1:C:168:VAL:O	1.54	1.01
1:D:148:GLN:NE2	1:D:472:ASP:OD2	1.99	0.95
1:C:432:SER:HB2	1:C:439:LEU:HD12	1.48	0.94

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	352/415 (85%)	335 (95%)	14 (4%)	3 (1%)	14	48
1	B	353/415 (85%)	339 (96%)	13 (4%)	1 (0%)	36	70

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	339/415 (82%)	323 (95%)	11 (3%)	5 (2%)	8	35
1	D	293/415 (71%)	284 (97%)	8 (3%)	1 (0%)	36	70
All	All	1337/1660 (80%)	1281 (96%)	46 (3%)	10 (1%)	18	53

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	476	ALA
1	A	550	ASN
1	C	81	ARG
1	C	550	ASN
1	C	552	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	273/312 (88%)	262 (96%)	11 (4%)	28	62
1	B	275/312 (88%)	263 (96%)	12 (4%)	25	60
1	C	264/312 (85%)	243 (92%)	21 (8%)	11	38
1	D	232/312 (74%)	223 (96%)	9 (4%)	28	62
All	All	1044/1248 (84%)	991 (95%)	53 (5%)	21	55

5 of 53 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	115	LEU
1	C	406	HIS
1	D	152	VAL
1	C	120	ARG
1	C	147	TRP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	489	GLN
1	D	47	GLN
1	D	530	HIS
1	C	513	HIS
1	D	136	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	354/415 (85%)	-0.32	6 (1%) 69 45	19, 31, 60, 86	0
1	B	357/415 (86%)	-0.38	4 (1%) 78 57	18, 29, 55, 81	0
1	C	347/415 (83%)	0.14	12 (3%) 47 27	24, 53, 75, 93	0
1	D	307/415 (73%)	0.28	10 (3%) 49 28	26, 56, 75, 108	0
All	All	1365/1660 (82%)	-0.08	32 (2%) 61 38	18, 41, 71, 108	0

The worst 5 of 32 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	527	THR	4.0
1	B	548	SER	3.9
1	A	549	GLY	3.7
1	C	190	GLU	3.7
1	C	522	VAL	3.1

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.