



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:51 AM UTC

PDB ID : 1K3W / pdb_00001k3w
Title : Crystal structure of a trapped reaction intermediate of the DNA Repair Enzyme Endonuclease VIII with DNA
Authors : Golan, G.; Zharkov, D.O.; Gilboa, R.; Fernandes, A.S.; Kycia, J.H.; Gerchman, S.E.; Rieger, R.A.; Grollman, A.P.; Shoham, G.
Deposited on : 2001-10-04
Resolution : 1.42 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

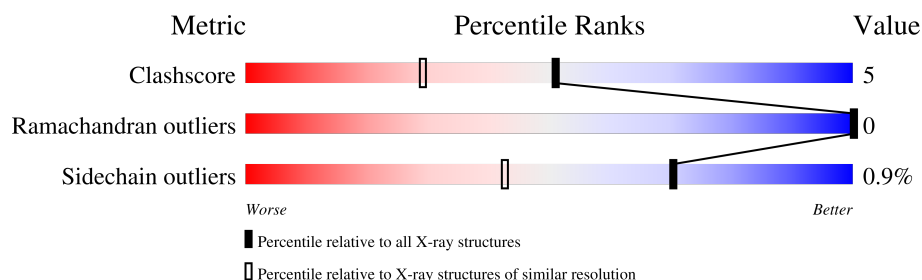
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.42 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))
Clashscore	190562	4154 (1.44-1.40)
Ramachandran outliers	187476	4083 (1.44-1.40)
Sidechain outliers	187428	4082 (1.44-1.40)

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 $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	B	13	
2	C	13	
3	A	262	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 2874 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 DNA chain called 5'-D(*GP*GP*CP*TP*TP*CP*AP*TP*CP*CP*TP*GP*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	8	Total	C	N	O	P	0	0	0
			160	77	25	50	8			

- Molecule 2 is a DNA chain called 5'-D(*CP*CP*AP*GP*GP*AP*(PED)P*GP*AP*AP*GP*CP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	11	Total	C	N	O	P	0	0	0
			221	103	46	61	11			

- Molecule 3 is a protein called Endonuclease VIII.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	254	Total	C	N	O	S	0	8	0
			2080	1325	378	372	5			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	34	THR	PRO	SEE REMARK 999	UNP P50465
A	112	ARG	THR	SEE REMARK 999	UNP P50465

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		

- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	14	Total	O	0	0
			14	14		
6	C	19	Total	O	0	0
			19	19		
6	A	364	Total	O	0	0
			364	364		

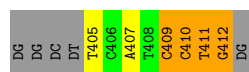
3 Residue-property plots [i](#)

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. 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. 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.

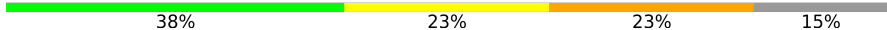
Note EDS was not executed.

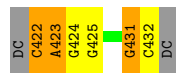
- Molecule 1: 5'-D(*GP*GP*CP*TP*TP*CP*AP*TP*CP*CP*TP*GP*G)-3'

Chain B: 



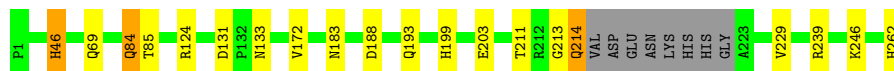
- Molecule 2: 5'-D(*CP*CP*AP*GP*GP*AP*(PED)P*GP*AP*AP*GP*CP*C)-3'

Chain C: 



- Molecule 3: Endonuclease VIII

Chain A: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 43 2 2	Depositor
Cell constants a, b, c, α , β , γ	76.03Å 76.03Å 164.93Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.42	Depositor
% Data completeness (in resolution range)	95.2 (10.00-1.42)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
Refinement program	SHELXL-97, CNS	Depositor
R, R_{free}	0.165 , 0.203	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2874	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: PED, SO4, ZN

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	B	1.21	1/177 (0.6%)	2.41	11/270 (4.1%)
2	C	1.03	1/236 (0.4%)	2.49	17/360 (4.7%)
3	A	0.78	0/2162	1.38	13/2930 (0.4%)
All	All	0.84	2/2575 (0.1%)	1.62	41/3560 (1.2%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	431	DG	O3'-P	-5.98	1.52	1.61
1	B	411	DT	C5-C7	5.06	1.60	1.50

All (41) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	411	DT	P-O3'-C3'	11.51	137.46	120.20
2	C	431	DG	OP1-P-O3'	11.51	142.52	108.00
2	C	423	DA	P-O3'-C3'	8.64	133.17	120.20
2	C	423	DA	O4'-C1'-N9	7.71	119.97	108.40
2	C	422	DC	O5'-C5'-C4'	7.68	122.32	110.80
2	C	431	DG	O3'-P-O5'	-7.42	92.87	104.00
1	B	405	DT	C6-C5-C7	-7.31	113.03	124.00
3	A	183	ASN	O-C-N	-7.16	111.79	122.39
2	C	422	DC	C6-N1-C1'	6.81	129.91	119.70
3	A	46[A]	HIS	CA-CB-CG	6.75	120.55	113.80
3	A	46[B]	HIS	CA-CB-CG	6.75	120.55	113.80
1	B	412	DG	N3-C4-C5	-6.67	118.39	128.40
2	C	422	DC	O4'-C4'-C3'	-6.50	95.65	105.40
3	A	131	ASP	CA-CB-CG	6.32	118.92	112.60
2	C	431	DG	C8-N9-C1'	6.31	136.46	127.00
3	A	213	GLY	CA-C-N	6.31	133.05	121.70

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	213	GLY	C-N-CA	6.31	133.05	121.70
1	B	412	DG	N7-C8-N9	6.28	122.92	113.50
2	C	424	DG	C8-N9-C1'	6.25	136.37	127.00
2	C	431	DG	N7-C8-N9	6.15	122.73	113.50
1	B	410	DC	P-O3'-C3'	5.96	129.15	120.20
1	B	409	DC	N3-C2-O2	5.89	130.74	121.90
1	B	412	DG	C2-N3-C4	5.84	120.56	111.80
1	B	409	DC	C2-N3-C4	5.82	128.73	120.00
2	C	425	DG	N7-C8-N9	5.74	122.11	113.50
1	B	411	DT	C6-C5-C7	-5.62	115.58	124.00
2	C	424	DG	N7-C8-N9	5.59	121.88	113.50
2	C	422	DC	C2-N1-C1'	-5.50	111.46	119.70
3	A	239	ARG	NE-CZ-NH2	-5.47	114.28	119.20
3	A	193	GLN	OE1-CD-NE2	5.44	128.04	122.60
1	B	411	DT	C2-N3-C4	-5.24	119.14	127.00
1	B	410	DC	C2-N3-C4	5.21	127.82	120.00
3	A	84[A]	GLN	N-CA-CB	5.19	117.53	109.48
3	A	84[B]	GLN	N-CA-CB	5.19	117.53	109.48
3	A	213	GLY	O-C-N	5.18	129.42	122.48
2	C	422	DC	C2-N3-C4	5.10	127.65	120.00
2	C	425	DG	C8-N9-C1'	5.06	134.59	127.00
3	A	133	ASN	OD1-CG-ND2	5.06	127.66	122.60
2	C	423	DA	O3'-P-O5'	-5.05	96.42	104.00
3	A	133	ASN	CA-CB-CG	-5.02	107.58	112.60
2	C	422	DC	N1-C1'-C2'	5.02	121.03	113.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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	B	160	0	92	5	0
2	C	221	0	119	5	0
3	A	2080	0	2078	14	0
4	A	1	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	15	0	0	0	0
6	A	364	0	0	7	0
6	B	14	0	0	1	0
6	C	19	0	0	0	0
All	All	2874	0	2289	24	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.

All (24) 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)
2:C:431:DG:H2''	2:C:432:DC:H5''	1.24	1.17
3:A:211:THR:HA	3:A:214:GLN:HG3	1.67	0.75
2:C:431:DG:C2'	2:C:432:DC:H5''	2.11	0.72
1:B:411:DT:H2''	1:B:412:DG:O5'	1.96	0.65
1:B:410:DC:H1'	1:B:411:DT:H5'	1.78	0.64
3:A:199:HIS:HE1	6:A:688:HOH:O	1.82	0.62
2:C:431:DG:H2''	2:C:432:DC:C5'	2.16	0.60
3:A:262:HIS:HD2	6:A:664:HOH:O	1.83	0.59
3:A:211:THR:CA	3:A:214:GLN:HG3	2.35	0.56
3:A:246:LYS:HE2	6:A:840:HOH:O	2.04	0.56
3:A:188:ASP:HB2	6:A:797:HOH:O	2.05	0.56
3:A:262:HIS:HE1	6:A:670:HOH:O	1.90	0.53
1:B:407:DA:H8	6:B:962:HOH:O	1.92	0.53
3:A:46[B]:HIS:HD2	6:A:830:HOH:O	1.93	0.51
2:C:422:DC:H1'	2:C:423:DA:N7	2.27	0.50
2:C:422:DC:O5'	2:C:422:DC:H2'	2.14	0.48
1:B:409:DC:H2''	1:B:410:DC:O5'	2.14	0.48
3:A:172:VAL:CG1	3:A:229:VAL:HG23	2.44	0.47
3:A:199:HIS:HD2	3:A:203:GLU:OE2	1.99	0.44
1:B:410:DC:H6	1:B:410:DC:H2'	1.56	0.42
3:A:84[B]:GLN:HG2	3:A:85:THR:N	2.34	0.41
3:A:124[B]:ARG:HH11	3:A:124[B]:ARG:HD2	1.74	0.40
3:A:124[B]:ARG:NH2	6:A:821:HOH:O	2.54	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	
3	A	258/262 (98%)	252 (98%)	6 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	
3	A	227/226 (100%)	225 (99%)	2 (1%)	70	43

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

Mol	Chain	Res	Type
3	A	69	GLN
3	A	214	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
3	A	12	ASN
3	A	133	ASN
3	A	199	HIS
3	A	262	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 1 is monoatomic - leaving 3 for Mogul analysis.

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	$\# Z > 2$
5	SO4	A	551	-	4,4,4	0.29	0	6,6,6	0.67	0
5	SO4	A	552	-	4,4,4	0.34	0	6,6,6	0.35	0
5	SO4	A	553	-	4,4,4	0.30	0	6,6,6	0.40	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

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

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.