



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 12, 2026 – 02:33 PM UTC

PDB ID : 3EI4 / pdb\_00003ei4  
Title : Structure of the hsDDB1-hsDDB2 complex  
Authors : Scrima, A.; Pavletich, N.P.; Thoma, N.H.  
Deposited on : 2008-09-15  
Resolution : 3.30 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](mailto: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>.

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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

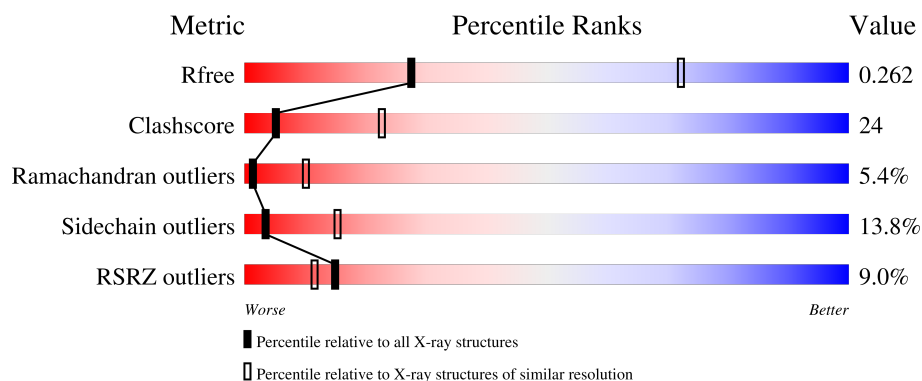
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.30 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	1169 (3.32-3.28)
Clashscore	190562	1209 (3.32-3.28)
Ramachandran outliers	187476	1188 (3.32-3.28)
Sidechain outliers	187428	1187 (3.32-3.28)
RSRZ outliers	180081	1169 (3.32-3.28)

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  $\geq 3$ , 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	1158	<div> <div>9%</div> <div>53% 36% 7% ..</div> </div>
1	C	1158	<div> <div>10%</div> <div>54% 36% 8% ..</div> </div>
1	E	1158	<div> <div>9%</div> <div>53% 37% 8% ..</div> </div>
2	B	436	<div> <div>9%</div> <div>38% 35% 10% . 16%</div> </div>
2	D	436	<div> <div>5%</div> <div>39% 34% 9% . 16%</div> </div>

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Mol	Chain	Length	Quality of chain
2	F	436	<div><div></div><div>5%</div><div>39%</div><div>36%</div><div>8%</div><div>16%</div></div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 35241 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 damage-binding protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1140	Total	C	N	O	S	0	0	0
			8861	5610	1493	1709	49			
1	C	1140	Total	C	N	O	S	0	0	0
			8861	5610	1493	1709	49			
1	E	1140	Total	C	N	O	S	0	0	0
			8861	5610	1493	1709	49			

There are 63 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-17	MET	-	expression tag	UNP Q16531
A	-16	HIS	-	expression tag	UNP Q16531
A	-15	HIS	-	expression tag	UNP Q16531
A	-14	HIS	-	expression tag	UNP Q16531
A	-13	HIS	-	expression tag	UNP Q16531
A	-12	HIS	-	expression tag	UNP Q16531
A	-11	HIS	-	expression tag	UNP Q16531
A	-10	ARG	-	expression tag	UNP Q16531
A	-9	ARG	-	expression tag	UNP Q16531
A	-8	LEU	-	expression tag	UNP Q16531
A	-7	VAL	-	expression tag	UNP Q16531
A	-6	PRO	-	expression tag	UNP Q16531
A	-5	ARG	-	expression tag	UNP Q16531
A	-4	GLY	-	expression tag	UNP Q16531
A	-3	SER	-	expression tag	UNP Q16531
A	-2	GLY	-	expression tag	UNP Q16531
A	-1	GLY	-	expression tag	UNP Q16531
A	0	ARG	-	expression tag	UNP Q16531
A	422	TYR	ASP	SEE REMARK 999	UNP Q16531
A	898	ASP	GLU	SEE REMARK 999	UNP Q16531
A	899	VAL	LEU	SEE REMARK 999	UNP Q16531
C	-17	MET	-	expression tag	UNP Q16531
C	-16	HIS	-	expression tag	UNP Q16531

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-15	HIS	-	expression tag	UNP Q16531
C	-14	HIS	-	expression tag	UNP Q16531
C	-13	HIS	-	expression tag	UNP Q16531
C	-12	HIS	-	expression tag	UNP Q16531
C	-11	HIS	-	expression tag	UNP Q16531
C	-10	ARG	-	expression tag	UNP Q16531
C	-9	ARG	-	expression tag	UNP Q16531
C	-8	LEU	-	expression tag	UNP Q16531
C	-7	VAL	-	expression tag	UNP Q16531
C	-6	PRO	-	expression tag	UNP Q16531
C	-5	ARG	-	expression tag	UNP Q16531
C	-4	GLY	-	expression tag	UNP Q16531
C	-3	SER	-	expression tag	UNP Q16531
C	-2	GLY	-	expression tag	UNP Q16531
C	-1	GLY	-	expression tag	UNP Q16531
C	0	ARG	-	expression tag	UNP Q16531
C	422	TYR	ASP	SEE REMARK 999	UNP Q16531
C	898	ASP	GLU	SEE REMARK 999	UNP Q16531
C	899	VAL	LEU	SEE REMARK 999	UNP Q16531
E	-17	MET	-	expression tag	UNP Q16531
E	-16	HIS	-	expression tag	UNP Q16531
E	-15	HIS	-	expression tag	UNP Q16531
E	-14	HIS	-	expression tag	UNP Q16531
E	-13	HIS	-	expression tag	UNP Q16531
E	-12	HIS	-	expression tag	UNP Q16531
E	-11	HIS	-	expression tag	UNP Q16531
E	-10	ARG	-	expression tag	UNP Q16531
E	-9	ARG	-	expression tag	UNP Q16531
E	-8	LEU	-	expression tag	UNP Q16531
E	-7	VAL	-	expression tag	UNP Q16531
E	-6	PRO	-	expression tag	UNP Q16531
E	-5	ARG	-	expression tag	UNP Q16531
E	-4	GLY	-	expression tag	UNP Q16531
E	-3	SER	-	expression tag	UNP Q16531
E	-2	GLY	-	expression tag	UNP Q16531
E	-1	GLY	-	expression tag	UNP Q16531
E	0	ARG	-	expression tag	UNP Q16531
E	422	TYR	ASP	SEE REMARK 999	UNP Q16531
E	898	ASP	GLU	SEE REMARK 999	UNP Q16531
E	899	VAL	LEU	SEE REMARK 999	UNP Q16531

- Molecule 2 is a protein called DNA damage-binding protein 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	368	Total 2886	C 1841	N 513	O 515	S 17	0	0	0
2	D	368	Total 2886	C 1841	N 513	O 515	S 17	0	0	0
2	F	368	Total 2886	C 1841	N 513	O 515	S 17	0	0	0

There are 54 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-8	MET	-	expression tag	UNP Q92466
B	-7	HIS	-	expression tag	UNP Q92466
B	-6	HIS	-	expression tag	UNP Q92466
B	-5	HIS	-	expression tag	UNP Q92466
B	-4	HIS	-	expression tag	UNP Q92466
B	-3	HIS	-	expression tag	UNP Q92466
B	-2	HIS	-	expression tag	UNP Q92466
B	-1	ARG	-	expression tag	UNP Q92466
B	0	ARG	-	expression tag	UNP Q92466
B	1	LEU	-	expression tag	UNP Q92466
B	2	VAL	-	expression tag	UNP Q92466
B	3	PRO	-	expression tag	UNP Q92466
B	4	ARG	-	expression tag	UNP Q92466
B	5	GLY	-	expression tag	UNP Q92466
B	6	SER	-	expression tag	UNP Q92466
B	7	GLY	-	expression tag	UNP Q92466
B	8	GLY	-	expression tag	UNP Q92466
B	9	ARG	-	expression tag	UNP Q92466
D	-8	MET	-	expression tag	UNP Q92466
D	-7	HIS	-	expression tag	UNP Q92466
D	-6	HIS	-	expression tag	UNP Q92466
D	-5	HIS	-	expression tag	UNP Q92466
D	-4	HIS	-	expression tag	UNP Q92466
D	-3	HIS	-	expression tag	UNP Q92466
D	-2	HIS	-	expression tag	UNP Q92466
D	-1	ARG	-	expression tag	UNP Q92466
D	0	ARG	-	expression tag	UNP Q92466
D	1	LEU	-	expression tag	UNP Q92466
D	2	VAL	-	expression tag	UNP Q92466
D	3	PRO	-	expression tag	UNP Q92466
D	4	ARG	-	expression tag	UNP Q92466
D	5	GLY	-	expression tag	UNP Q92466
D	6	SER	-	expression tag	UNP Q92466

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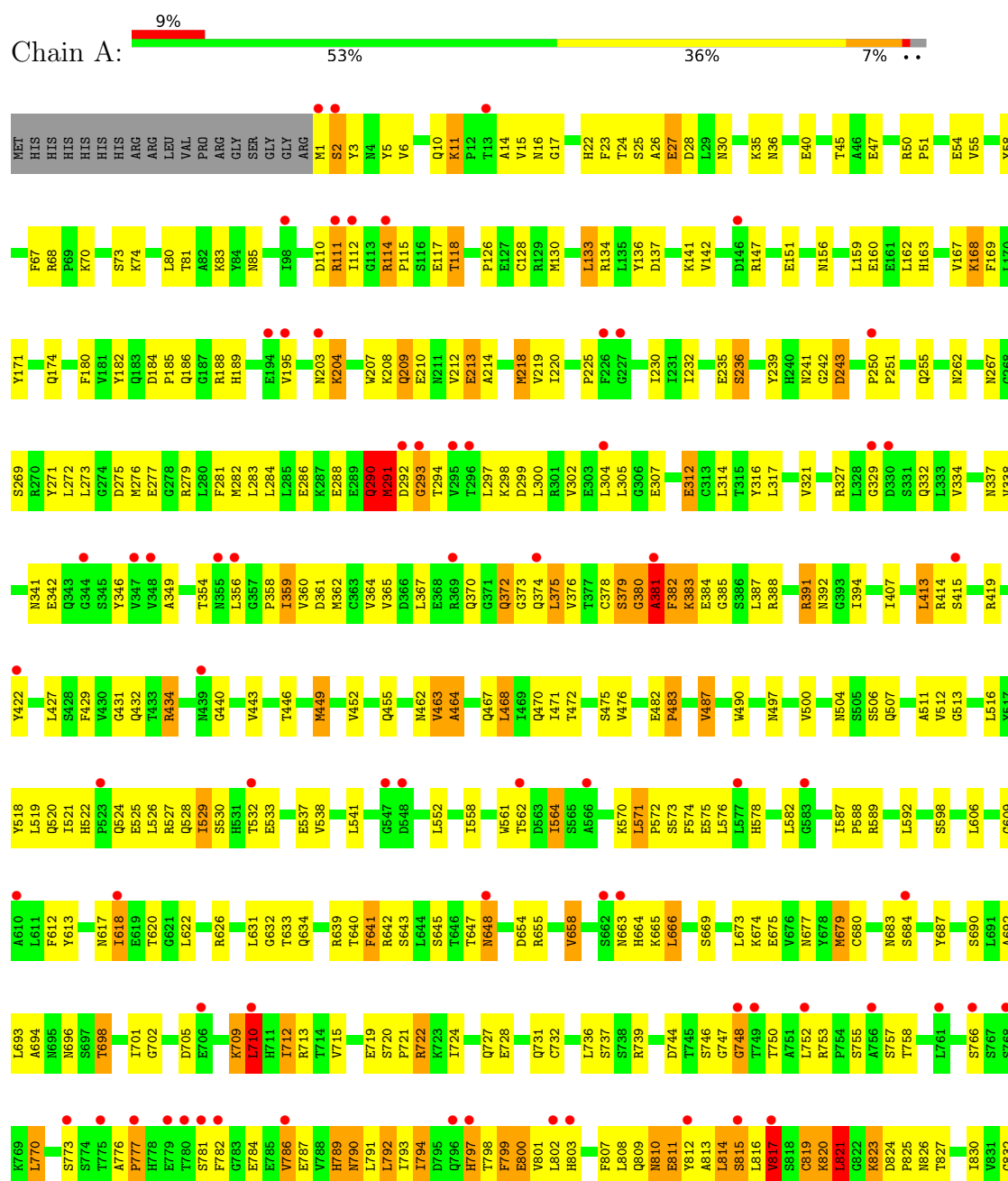
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Chain	Residue	Modelled	Actual	Comment	Reference
D	7	GLY	-	expression tag	UNP Q92466
D	8	GLY	-	expression tag	UNP Q92466
D	9	ARG	-	expression tag	UNP Q92466
F	-8	MET	-	expression tag	UNP Q92466
F	-7	HIS	-	expression tag	UNP Q92466
F	-6	HIS	-	expression tag	UNP Q92466
F	-5	HIS	-	expression tag	UNP Q92466
F	-4	HIS	-	expression tag	UNP Q92466
F	-3	HIS	-	expression tag	UNP Q92466
F	-2	HIS	-	expression tag	UNP Q92466
F	-1	ARG	-	expression tag	UNP Q92466
F	0	ARG	-	expression tag	UNP Q92466
F	1	LEU	-	expression tag	UNP Q92466
F	2	VAL	-	expression tag	UNP Q92466
F	3	PRO	-	expression tag	UNP Q92466
F	4	ARG	-	expression tag	UNP Q92466
F	5	GLY	-	expression tag	UNP Q92466
F	6	SER	-	expression tag	UNP Q92466
F	7	GLY	-	expression tag	UNP Q92466
F	8	GLY	-	expression tag	UNP Q92466
F	9	ARG	-	expression tag	UNP Q92466

### 3 Residue-property plots

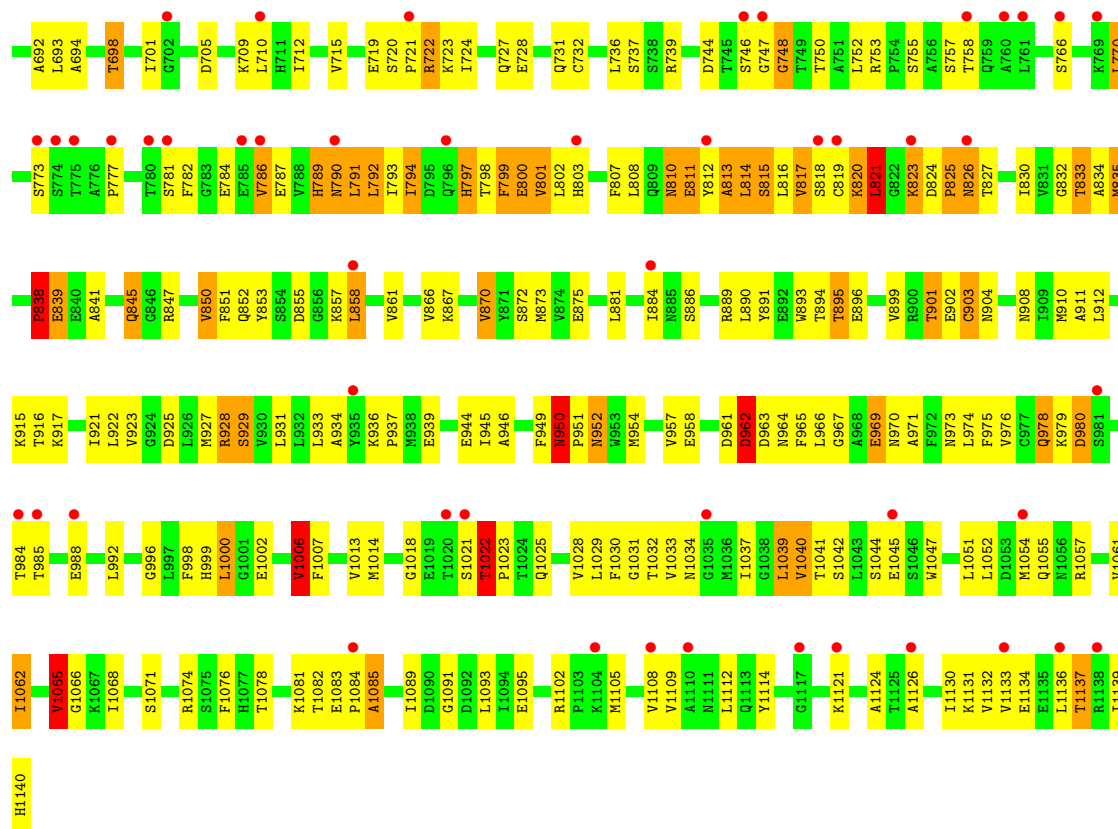
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: DNA damage-binding protein 1

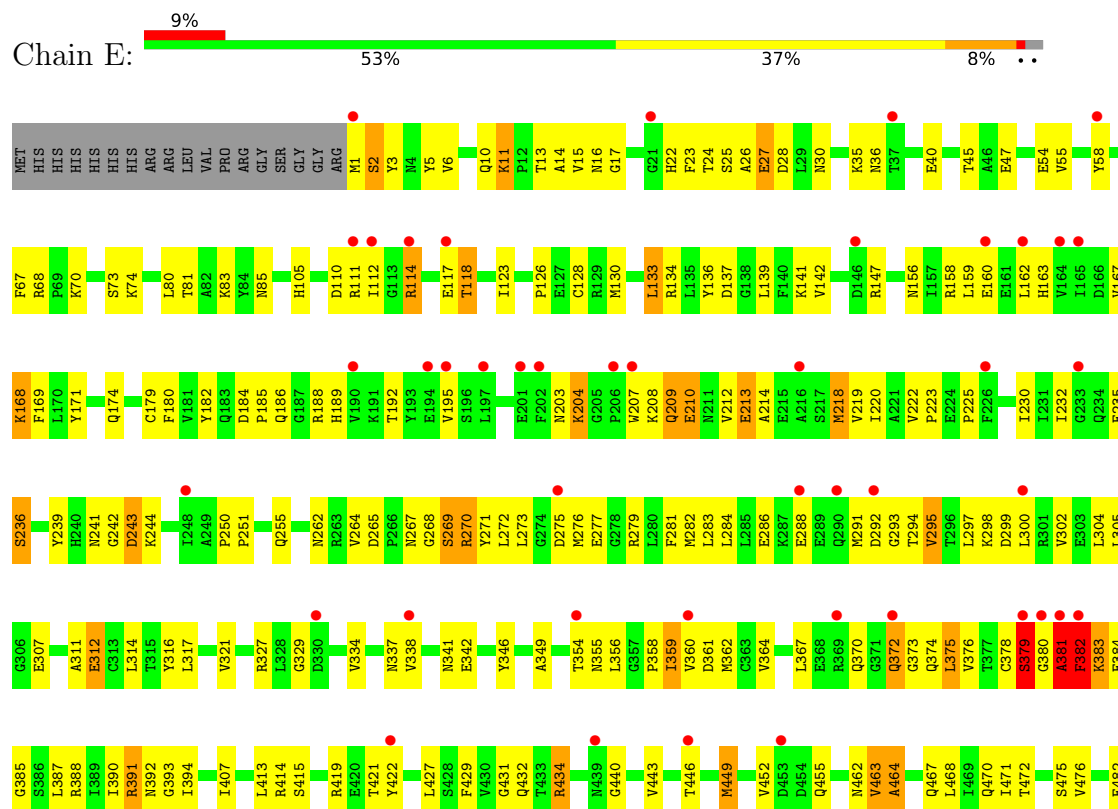


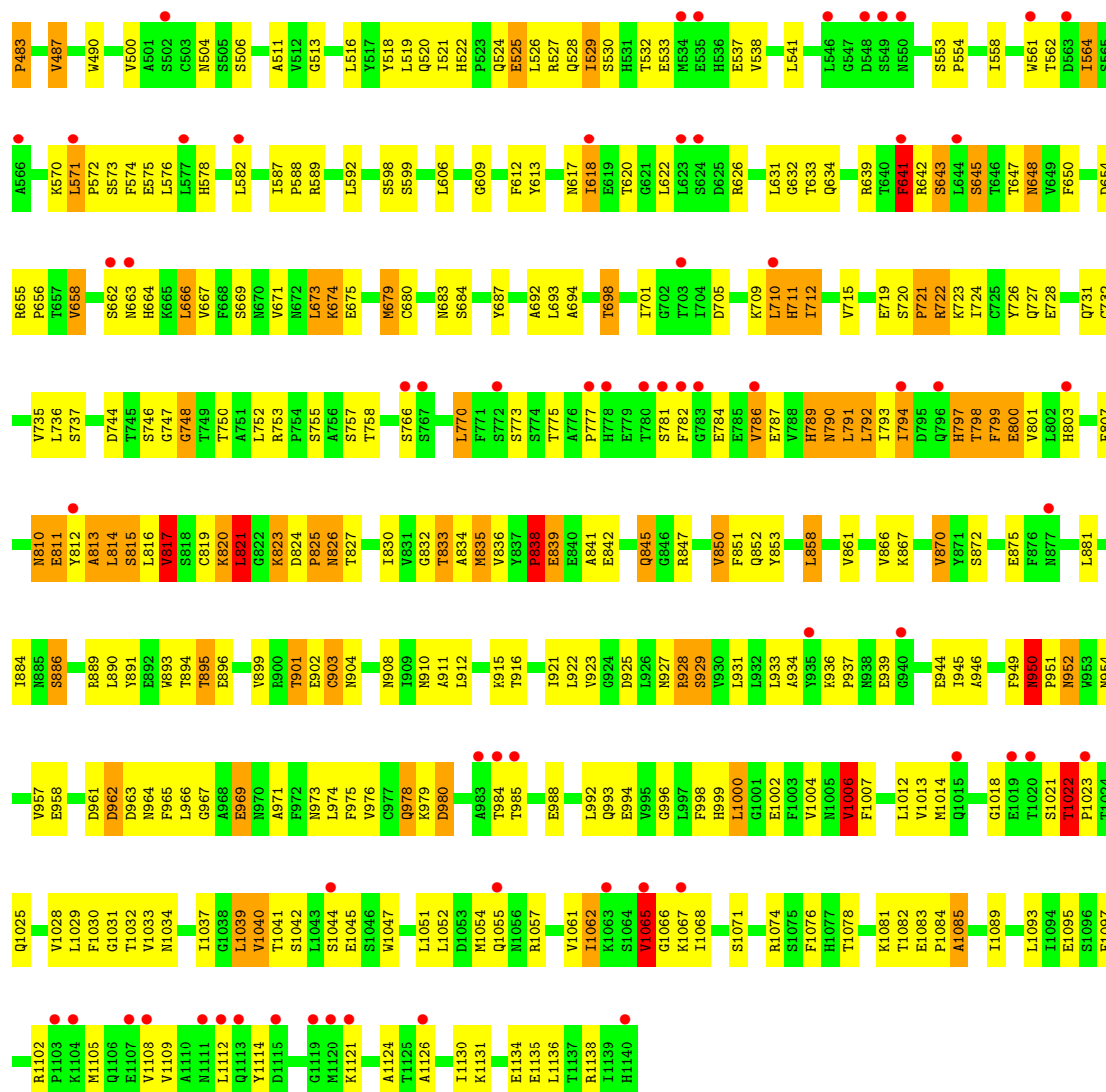




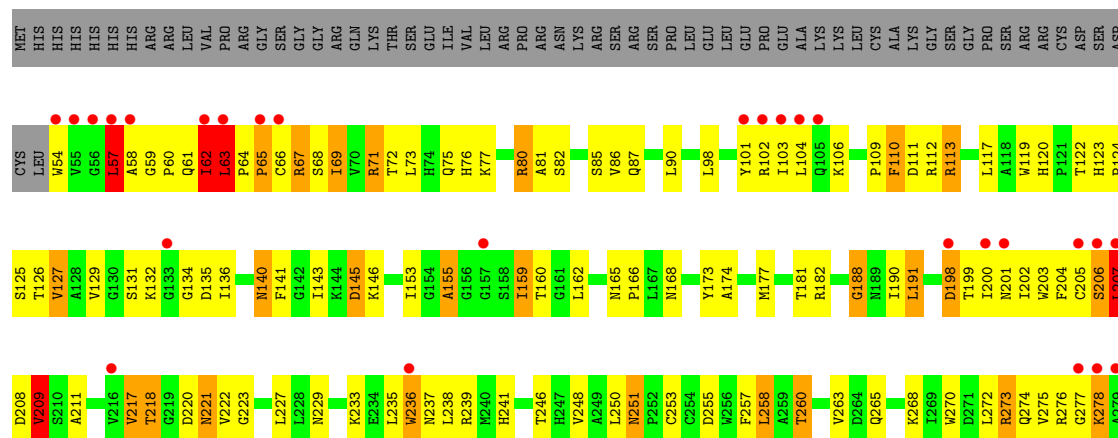


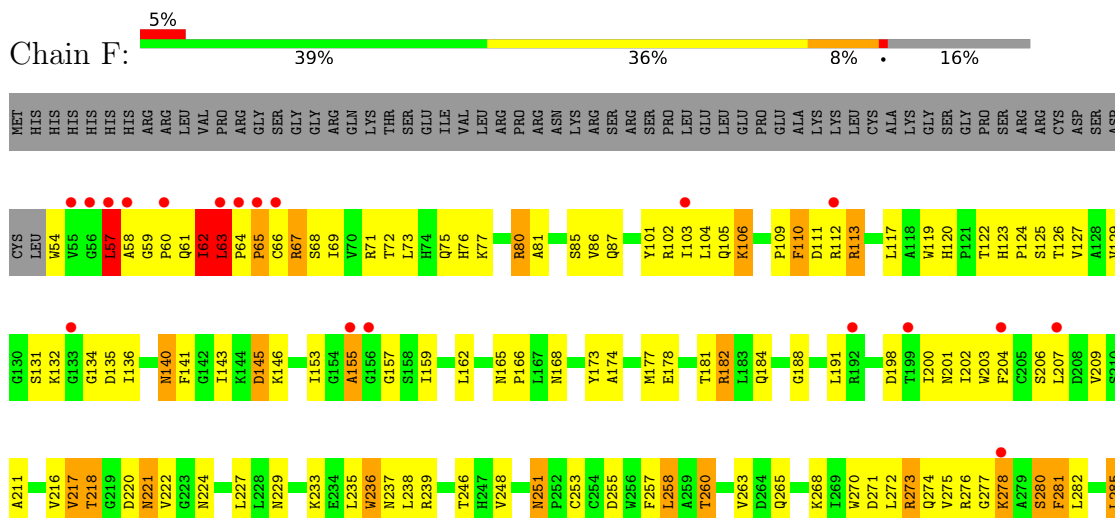
• Molecule 1: DNA damage-binding protein 1

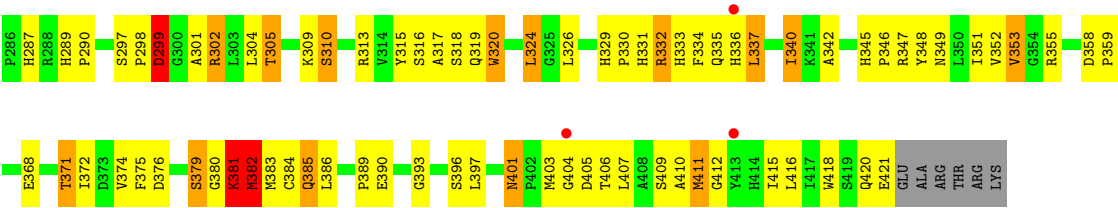




### • Molecule 2: DNA damage-binding protein 2







## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	268.50Å 268.50Å 471.00Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	25.00 – 3.30 25.00 – 3.30	Depositor EDS
% Data completeness (in resolution range)	80.2 (25.00-3.30) 88.5 (25.00-3.30)	Depositor EDS
$R_{merge}$	0.14	Depositor
$R_{sym}$	0.13	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.60 (at 3.22Å)	Xtriage
Refinement program	REFMAC 5.4.0062	Depositor
R, $R_{free}$	0.254 , 0.288 0.264 , 0.262	Depositor DCC
$R_{free}$ test set	1368 reflections (1.48%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	49.3	Xtriage
Anisotropy	0.419	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 85.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.53$ , $\langle L^2 \rangle = 0.38$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.85	EDS
Total number of atoms	35241	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 33.92 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.4042e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.76	11/9026 (0.1%)	0.99	30/12239 (0.2%)
1	C	0.65	5/9026 (0.1%)	0.95	21/12239 (0.2%)
1	E	0.66	7/9026 (0.1%)	0.96	30/12239 (0.2%)
2	B	0.82	1/2970 (0.0%)	1.04	9/4042 (0.2%)
2	D	0.72	1/2970 (0.0%)	1.01	6/4042 (0.1%)
2	F	0.73	2/2970 (0.1%)	1.00	4/4042 (0.1%)
All	All	0.71	27/35988 (0.1%)	0.98	100/48843 (0.2%)

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	6
1	C	0	7
1	E	0	5
2	B	0	2
2	D	0	1
2	F	0	2
All	All	0	23

The worst 5 of 27 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	384	GLU	C-O	-9.14	1.12	1.24
1	E	711	HIS	N-CA	-8.19	1.36	1.46
1	E	381	ALA	CA-CB	-7.84	1.40	1.53
1	A	392	ASN	N-CA	7.58	1.55	1.46
1	E	710	LEU	C-N	-6.66	1.23	1.33

The worst 5 of 100 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	269	SER	N-CA-C	-11.90	101.05	114.62
1	A	821	LEU	N-CA-C	9.08	121.27	108.74
1	C	821	LEU	N-CA-C	8.84	120.94	108.74
1	E	821	LEU	N-CA-C	8.36	120.28	108.74
2	D	206	SER	CA-C-N	7.62	135.48	122.37

There are no chirality outliers.

5 of 23 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	291	MET	Peptide
1	A	293	GLY	Peptide
1	A	379	SER	Peptide
1	A	380	GLY	Peptide
1	A	381	ALA	Peptide

## 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	A	8861	0	8781	407	0
1	C	8861	0	8781	395	0
1	E	8861	0	8781	406	0
2	B	2886	0	2836	200	0
2	D	2886	0	2836	185	0
2	F	2886	0	2836	193	0
All	All	35241	0	34851	1716	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 24.

The worst 5 of 1716 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:B:208:ASP:O	2:B:209:VAL:CG1	1.66	1.43
1:A:791:LEU:HD22	1:A:814:LEU:O	1.25	1.31

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:791:LEU:HD22	1:E:814:LEU:O	1.25	1.26
1:C:791:LEU:HD22	1:C:814:LEU:O	1.27	1.23
2:D:287:HIS:CE1	2:D:305:THR:HG21	1.75	1.22

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	1138/1158 (98%)	953 (84%)	130 (11%)	55 (5%)	2	12
1	C	1138/1158 (98%)	944 (83%)	135 (12%)	59 (5%)	1	11
1	E	1138/1158 (98%)	949 (83%)	131 (12%)	58 (5%)	1	11
2	B	366/436 (84%)	303 (83%)	39 (11%)	24 (7%)	1	7
2	D	366/436 (84%)	303 (83%)	40 (11%)	23 (6%)	1	8
2	F	366/436 (84%)	308 (84%)	35 (10%)	23 (6%)	1	8
All	All	4512/4782 (94%)	3760 (83%)	510 (11%)	242 (5%)	1	10

5 of 242 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2	SER
1	A	26	ALA
1	A	204	LYS
1	A	243	ASP
1	A	381	ALA

### 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	984/1014 (97%)	852 (87%)	132 (13%)	4	16
1	C	984/1014 (97%)	860 (87%)	124 (13%)	4	18
1	E	984/1014 (97%)	857 (87%)	127 (13%)	4	17
2	B	315/378 (83%)	261 (83%)	54 (17%)	2	10
2	D	315/378 (83%)	265 (84%)	50 (16%)	2	12
2	F	315/378 (83%)	266 (84%)	49 (16%)	2	12
All	All	3897/4176 (93%)	3361 (86%)	536 (14%)	3	15

5 of 536 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	915	LYS
1	E	1014	MET
1	E	901	THR
2	F	310	SER
1	C	114	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 184 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	335	GLN
1	E	520	GLN
2	D	401	ASN
1	E	290	GLN
1	E	790	ASN

### 5.3.3 RNA ⓘ

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	1140/1158 (98%)	0.93	100 (8%) 15 12	23, 63, 97, 120	0
1	C	1140/1158 (98%)	0.97	117 (10%) 12 10	23, 63, 95, 120	0
1	E	1140/1158 (98%)	0.95	108 (9%) 14 11	22, 64, 96, 120	0
2	B	368/436 (84%)	0.91	40 (10%) 10 9	24, 55, 86, 141	0
2	D	368/436 (84%)	0.66	21 (5%) 29 20	24, 55, 88, 136	0
2	F	368/436 (84%)	0.75	22 (5%) 27 19	25, 56, 85, 139	0
All	All	4524/4782 (94%)	0.91	408 (9%) 15 11	22, 62, 94, 141	0

The worst 5 of 408 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	58	ALA	6.7
1	C	566	ALA	5.5
1	C	548	ASP	5.0
1	A	547	GLY	4.6
1	C	1121	LYS	4.5

### 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.