



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 13, 2017 – 12:52 am GMT

PDB ID : 2D07  
Title : Crystal Structure of SUMO-3-modified Thymine-DNA Glycosylase  
Authors : Baba, D.; Maita, N.; Jee, J.G.; Uchimura, Y.; Saitoh, H.; Sugasawa, K.; Hanaoka, F.; Tochio, H.; Hiroaki, H.; Shirakawa, M.  
Deposited on : 2005-07-26  
Resolution : 2.10 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	recalc28949

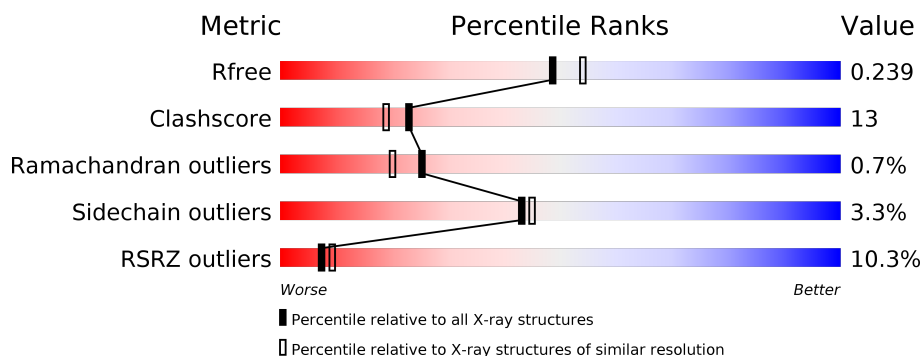
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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))
$R_{free}$	100719	4243 (2.10-2.10)
Clashscore	112137	4788 (2.10-2.10)
Ramachandran outliers	110173	4740 (2.10-2.10)
Sidechain outliers	110143	4741 (2.10-2.10)
RSRZ outliers	101464	4275 (2.10-2.10)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	230	<div> <div>10%</div> <div> <div></div> <div>73%</div> <div>18%</div> <div>•</div> <div>7%</div> </div> </div>
2	B	93	<div> <div>6%</div> <div> <div></div> <div>60%</div> <div>19%</div> <div>•</div> <div>18%</div> </div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2381 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 G/T mismatch-specific thymine DNA glycosylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	215	Total	C	N	O	S	0	1	0
			1667	1069	281	306	11			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	110	GLY	-	CLONING ARTIFACT	UNP Q13569
A	111	SER	-	CLONING ARTIFACT	UNP Q13569

- Molecule 2 is a protein called Ubiquitin-like protein SMT3B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	76	Total	C	N	O	S	0	0	0
			610	378	110	118	4			

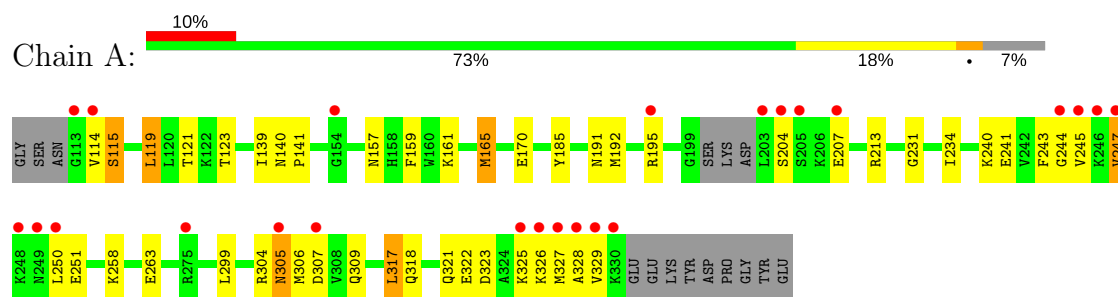
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	76	Total	O	0	0
			76	76		
3	B	28	Total	O	0	0
			28	28		

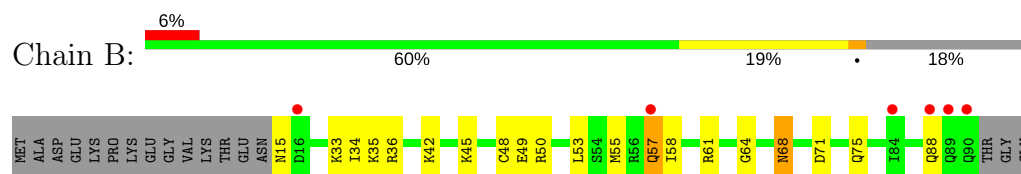
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: G/T mismatch-specific thymine DNA glycosylase



- Molecule 2: Ubiquitin-like protein SMT3B



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	106.48Å 75.93Å 50.53Å 90.00° 114.98° 90.00°	Depositor
Resolution (Å)	20.00 – 2.10 19.89 – 2.10	Depositor EDS
% Data completeness (in resolution range)	100.0 (20.00-2.10) 100.0 (19.89-2.10)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.27 (at 2.09Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, $R_{free}$	0.208 , 0.241 0.208 , 0.239	Depositor DCC
$R_{free}$ test set	1043 reflections (4.89%)	DCC
Wilson B-factor (Å <sup>2</sup> )	27.1	Xtriage
Anisotropy	0.254	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 50.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	2381	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.62% of the height of the origin peak. No significant pseudotranslation is detected.*

<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

### 5.1 Standard geometry

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	0.33	0/1708	0.58	0/2311
2	B	0.34	0/619	0.53	0/831
All	All	0.33	0/2327	0.57	0/3142

There are no bond length outliers.

There are no bond angle outliers.

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	A	1667	0	1613	42	1
2	B	610	0	593	19	0
3	A	76	0	0	0	0
3	B	28	0	0	1	0
All	All	2381	0	2206	58	1

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 13.

All (58) 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:245:VAL:HG22	1:A:247:VAL:H	1.31	0.95

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:119:LEU:HD23	1:A:119:LEU:H	1.30	0.93
1:A:161:LYS:O	1:A:165:MET:HG2	1.72	0.89
2:B:68:ASN:C	2:B:68:ASN:HD22	1.84	0.79
2:B:57:GLN:OE1	2:B:58:ILE:HG12	1.88	0.74
2:B:68:ASN:ND2	2:B:71:ASP:H	1.89	0.71
2:B:68:ASN:HD21	2:B:71:ASP:H	1.42	0.67
2:B:68:ASN:HD21	2:B:71:ASP:N	1.96	0.63
1:A:305:ASN:HD22	1:A:306:MET:N	1.97	0.62
1:A:250:LEU:HD23	1:A:251:GLU:N	2.16	0.60
1:A:119:LEU:HD23	1:A:119:LEU:N	2.10	0.60
1:A:114:VAL:O	1:A:115:SER:HB3	2.02	0.59
2:B:45:LYS:O	2:B:49:GLU:HG3	2.03	0.58
2:B:64:GLY:HA2	3:B:107:HOH:O	2.02	0.58
1:A:318:GLN:O	1:A:322:GLU:HG3	2.06	0.56
1:A:157:ASN:HD22	1:A:159:PHE:H	1.54	0.54
1:A:123:THR:HG22	1:A:195:ARG:HA	1.88	0.54
1:A:326:LYS:O	1:A:329:VAL:HG22	2.08	0.53
2:B:68:ASN:ND2	2:B:68:ASN:C	2.56	0.53
2:B:15:ASN:ND2	2:B:35:LYS:HD3	2.24	0.53
1:A:243:PHE:HB2	1:A:245:VAL:HG12	1.91	0.53
1:A:114:VAL:O	1:A:115:SER:CB	2.58	0.52
1:A:139:ILE:HG13	1:A:140:ASN:N	2.25	0.52
1:A:204:SER:HB3	1:A:207:GLU:HG3	1.91	0.52
1:A:170:GLU:HG2	1:A:185:TYR:OH	2.10	0.52
1:A:141:PRO:HG3	1:A:191:ASN:ND2	2.23	0.52
1:A:307:ASP:OD1	2:B:42:LYS:NZ	2.42	0.51
1:A:139:ILE:HG13	1:A:140:ASN:H	1.76	0.51
1:A:309:GLN:NE2	2:B:33:LYS:HD2	2.28	0.49
1:A:304:ARG:HG3	1:A:305:ASN:H	1.77	0.49
1:A:213:ARG:HH22	1:A:241:GLU:C	2.16	0.48
2:B:58:ILE:CD1	2:B:88:GLN:HG2	2.43	0.48
1:A:317:LEU:O	1:A:321:GLN:HG2	2.13	0.47
2:B:15:ASN:HD21	2:B:35:LYS:HD3	1.78	0.47
1:A:114:VAL:HG13	1:A:114:VAL:O	2.15	0.47
1:A:121:THR:HG21	1:A:195:ARG:HH21	1.80	0.47
2:B:61:ARG:NH2	2:B:64:GLY:O	2.48	0.46
1:A:247:VAL:CG1	1:A:250:LEU:HB2	2.46	0.45
1:A:165:MET:H	1:A:165:MET:HG2	1.61	0.45
2:B:36:ARG:HG2	2:B:36:ARG:HH11	1.82	0.45
2:B:71:ASP:HA	2:B:75:GLN:OE1	2.16	0.44
1:A:213:ARG:N	1:A:213:ARG:HE	2.15	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:240:LYS:O	1:A:244:GLY:HA2	2.18	0.43
1:A:192:MET:HB2	1:A:234:ILE:CD1	2.48	0.43
1:A:119:LEU:CD2	1:A:119:LEU:H	2.11	0.43
1:A:192:MET:HB2	1:A:234:ILE:HD11	1.99	0.43
1:A:305:ASN:HD22	1:A:306:MET:H	1.63	0.43
1:A:325:LYS:O	1:A:328:ALA:HB3	2.19	0.43
1:A:305:ASN:ND2	1:A:306:MET:N	2.66	0.42
2:B:48:CYS:SG	2:B:55:MET:HG2	2.60	0.42
1:A:119:LEU:CD2	1:A:119:LEU:N	2.79	0.41
1:A:304:ARG:HG3	1:A:305:ASN:N	2.35	0.41
2:B:53:LEU:HD13	2:B:58:ILE:HD11	2.03	0.41
1:A:231:GLY:O	1:A:234:ILE:HG22	2.22	0.40
1:A:258:LYS:NZ	1:A:263:GLU:OE1	2.48	0.40
1:A:322:GLU:O	1:A:326:LYS:HG3	2.21	0.40
1:A:323:ASP:O	1:A:327:MET:HG3	2.22	0.40
1:A:307:ASP:O	2:B:34:ILE:HA	2.21	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:305:ASN:OD1	1:A:305:ASN:OD1[2_656]	2.16	0.04

## 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	211/230 (92%)	204 (97%)	5 (2%)	2 (1%)	20	14
2	B	74/93 (80%)	72 (97%)	2 (3%)	0	100	100
All	All	285/323 (88%)	276 (97%)	7 (2%)	2 (1%)	25	20



All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	115	SER
1	A	247	VAL

### 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	175/201 (87%)	170 (97%)	5 (3%)	48	51
2	B	67/82 (82%)	64 (96%)	3 (4%)	32	30
All	All	242/283 (86%)	234 (97%)	8 (3%)	43	45

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	119	LEU
1	A	165	MET
1	A	299	LEU
1	A	305	ASN
1	A	317	LEU
2	B	50	ARG
2	B	57	GLN
2	B	68	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	140	ASN
1	A	151	HIS
1	A	157	ASN
1	A	220	GLN
1	A	305	ASN
1	A	309	GLN
1	A	321	GLN

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Mol	Chain	Res	Type
2	B	19	ASN
2	B	65	GLN
2	B	68	ASN

### 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 carbohydrates 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 ⓘ

### 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, 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	215/230 (93%)	0.48	24 (11%) 6 7	15, 26, 64, 71	0
2	B	76/93 (81%)	0.57	6 (7%) 13 17	18, 30, 50, 65	0
All	All	291/323 (90%)	0.51	30 (10%) 7 9	15, 27, 61, 71	0

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	113	GLY	10.8
1	A	329	VAL	6.9
2	B	90	GLN	6.6
1	A	245	VAL	5.6
2	B	89	GLN	5.2
1	A	247	VAL	4.8
1	A	205	SER	4.3
1	A	154	GLY	4.3
1	A	244	GLY	4.0
2	B	57	GLN	3.7
2	B	16	ASP	3.6
1	A	114	VAL	3.5
1	A	326	LYS	3.4
1	A	275	ARG	3.3
1	A	248	LYS	3.3
1	A	327	MET	3.3
1	A	328	ALA	3.0
1	A	305	ASN	2.7
1	A	207	GLU	2.7
1	A	249	ASN	2.7
1	A	203	LEU	2.7
1	A	195	ARG	2.6
2	B	88	GLN	2.5
1	A	250	LEU	2.4

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Mol	Chain	Res	Type	RSRZ
2	B	84	ILE	2.3
1	A	325	LYS	2.2
1	A	246	LYS	2.2
1	A	204	SER	2.2
1	A	330[A]	LYS	2.1
1	A	307	ASP	2.0

## 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 carbohydrates 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.