



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 2, 2024 – 04:32 PM EST

PDB ID : 3FUT
Title : Apo-form of *T. thermophilus* 16S rRNA A1518 and A1519 methyltransferase (KsgA) in space group P21212
Authors : Demirci, H.; Belardinelli, R.; Seri, E.; Gregory, S.T.; Gualerzi, C.; Dahlberg, A.E.; Jogl, G.
Deposited on : 2009-01-14
Resolution : 1.52 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 : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 1.21
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.004 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.40

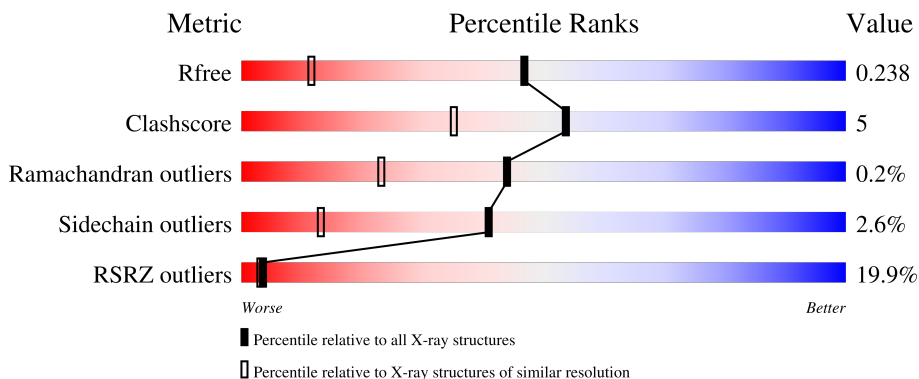
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.52 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}	164625	5293 (1.54-1.50)
Clashscore	180529	5759 (1.54-1.50)
Ramachandran outliers	177936	5653 (1.54-1.50)
Sidechain outliers	177891	5650 (1.54-1.50)
RSRZ outliers	164620	5293 (1.54-1.50)

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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	271	 8% 90% 6% . .
1	B	271	 30% 81% 14% . .

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5013 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 Dimethyladenosine transferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	Se			
1	A	264	2108	1357	382	368	1	0	5	0
1	B	260	2080	1347	376	356	1	0	6	0

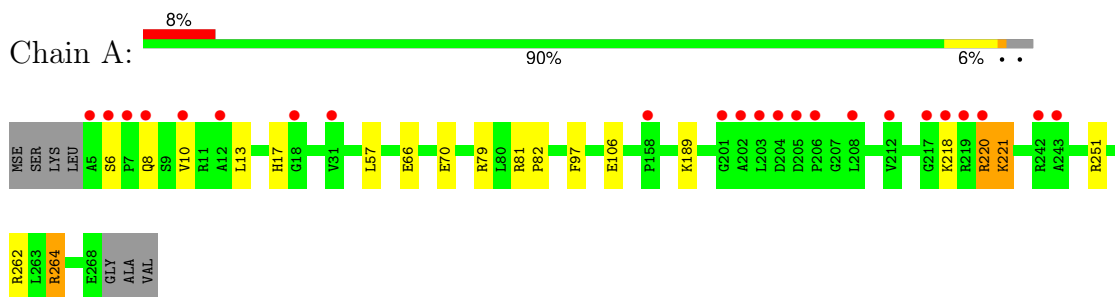
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	450	478	478	2	26
2	B	318	347	347	0	23

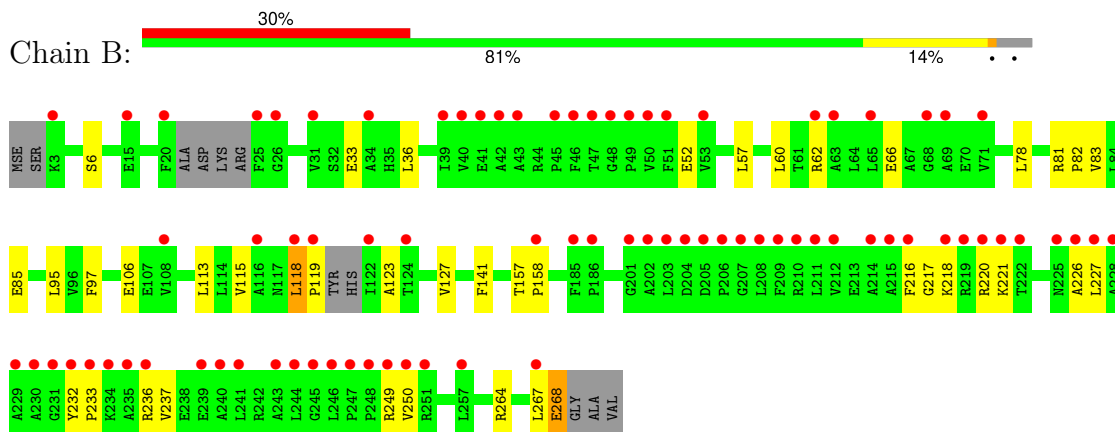
3 Residue-property plots [i](#)

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.

- Molecule 1: Dimethyladenosine transferase



- Molecule 1: Dimethyladenosine transferase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	137.05Å 53.69Å 69.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.04 – 1.52 25.04 – 1.52	Depositor EDS
% Data completeness (in resolution range)	97.5 (25.04-1.52) 97.4 (25.04-1.52)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.61 (at 1.52Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.204 , 0.241 0.200 , 0.238	Depositor DCC
R_{free} test set	3868 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	19.4	Xtrriage
Anisotropy	0.046	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 44.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5013	wwPDB-VP
Average B, all atoms (Å ²)	17.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.03% 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	0.54	0/2155	0.64	0/2927
1	B	0.54	1/2124 (0.0%)	0.68	1/2882 (0.0%)
All	All	0.54	1/4279 (0.0%)	0.66	1/5809 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	249	ARG	CZ-NH1	6.48	1.41	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	249	ARG	NE-CZ-NH2	-6.28	117.16	120.30

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	2108	0	2176	13	1
1	B	2080	0	2171	28	0
2	A	478	0	0	7	1
2	B	347	0	0	3	0
All	All	5013	0	4347	41	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 5.

All (41) 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:106[B]:GLU:OE1	2:A:427:HOH:O	1.66	1.11
1:B:127[B]:VAL:CG2	1:B:141[B]:PHE:CZ	2.55	0.89
1:B:127[B]:VAL:HG23	1:B:141[B]:PHE:CE2	2.10	0.86
1:A:70:GLU:HG2	2:A:378:HOH:O	1.77	0.84
1:B:118:LEU:HD23	1:B:141[B]:PHE:HD2	1.43	0.83
1:B:127[B]:VAL:HG22	1:B:141[B]:PHE:CZ	2.14	0.81
1:B:267:LEU:O	1:B:268:GLU:HB2	1.82	0.78
1:A:264:ARG:NH1	2:A:349:HOH:O	2.17	0.76
1:B:127[B]:VAL:HG23	1:B:141[B]:PHE:CZ	2.19	0.75
1:B:106[B]:GLU:OE1	2:B:544:HOH:O	2.02	0.75
1:A:218:LYS:HD3	1:A:221:LYS:HE2	1.73	0.71
1:B:221:LYS:HD3	1:B:226:ALA:HA	1.80	0.63
1:B:33:GLU:HG3	2:B:353:HOH:O	1.98	0.63
1:B:118:LEU:CD2	1:B:141[B]:PHE:HD2	2.13	0.60
1:A:10:VAL:HG13	1:A:57:LEU:HD11	1.84	0.58
1:B:233:PRO:HD2	1:B:236:ARG:HE	1.70	0.56
1:A:79:ARG:NH1	2:A:358:HOH:O	2.38	0.55
1:B:216:PHE:O	1:B:218:LYS:N	2.42	0.52
1:B:95:LEU:HG	1:B:97:PHE:CE2	2.45	0.52
1:B:233:PRO:O	1:B:237:VAL:HG23	2.09	0.52
1:B:57:LEU:HD22	1:B:83:VAL:HG11	1.93	0.51
1:A:81:ARG:HA	1:A:97:PHE:CZ	2.46	0.50
1:B:62:ARG:NH2	1:B:66:GLU:OE2	2.46	0.49
1:B:118:LEU:HD23	1:B:141[B]:PHE:CD2	2.34	0.49
1:B:62:ARG:HB3	1:B:62:ARG:CZ	2.43	0.47
1:B:127[B]:VAL:HG22	1:B:141[B]:PHE:CE1	2.49	0.46
1:A:81:ARG:HB3	1:A:82:PRO:HD3	1.98	0.46
1:A:262:ARG:NH2	2:A:607:HOH:O	2.45	0.45
1:B:118:LEU:HA	1:B:119:PRO:HD2	1.62	0.45
1:B:52:GLU:HA	1:B:115:VAL:O	2.17	0.45
1:B:123:ALA:O	1:B:127[B]:VAL:HB	2.16	0.45
1:B:227:LEU:HB3	1:B:232:TYR:HB2	2.00	0.43
1:B:81:ARG:HB3	1:B:82:PRO:HD3	2.01	0.42
1:B:81:ARG:NH1	1:B:85:GLU:OE2	2.52	0.42
1:A:220:ARG:HA	1:A:251:ARG:HH12	1.85	0.41
1:B:250:VAL:HG12	2:B:314[A]:HOH:O	2.20	0.41
1:A:189:LYS:HE2	2:A:431:HOH:O	2.19	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:36:LEU:HD11	1:B:60:LEU:HA	2.02	0.41
1:A:66[A]:GLU:HG2	2:A:746:HOH:O	2.21	0.40
1:A:13:LEU:O	1:A:17:HIS:HD2	2.04	0.40
1:B:157:THR:HB	1:B:158:PRO:HD2	2.03	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:6:SER:OG	2:A:387:HOH:O[4_566]	1.95	0.25

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	267/271 (98%)	265 (99%)	2 (1%)	0	100	100
1	B	259/271 (96%)	254 (98%)	4 (2%)	1 (0%)	30	12
All	All	526/542 (97%)	519 (99%)	6 (1%)	1 (0%)	44	23

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	217	GLY

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	
1	A	217/215 (101%)	213 (98%)	4 (2%)	54	26
1	B	215/215 (100%)	208 (97%)	7 (3%)	33	8
All	All	432/430 (100%)	421 (98%)	11 (2%)	41	14

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	8	GLN
1	A	220	ARG
1	A	221	LYS
1	A	264	ARG
1	B	6	SER
1	B	78	LEU
1	B	113	LEU
1	B	118	LEU
1	B	220	ARG
1	B	264	ARG
1	B	268	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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

6.1 Protein, DNA and RNA chains

Warning: The R factor obtained from EDS is 0.2657, which does not match the depositor's R factor of 0.204. Please interpret the results in this section carefully.

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	263/271 (97%)	0.60	23 (8%) 17 18	4, 11, 21, 31	5 (1%)
1	B	259/271 (95%)	1.65	81 (31%) 1 1	5, 15, 32, 34	6 (2%)
All	All	522/542 (96%)	1.12	104 (19%) 3 3	4, 14, 28, 34	11 (2%)

All (104) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	246	LEU	6.0
1	B	202	ALA	5.8
1	B	203	LEU	5.6
1	A	5	ALA	5.2
1	B	232	TYR	5.1
1	B	248	PRO	4.9
1	B	206	PRO	4.8
1	A	219	ARG	4.6
1	A	12	ALA	4.5
1	B	230	ALA	4.4
1	B	47	THR	4.4
1	B	204	ASP	4.3
1	B	45	PRO	4.3
1	B	201	GLY	4.3
1	B	207	GLY	4.3
1	B	233	PRO	4.2
1	B	247	PRO	4.2
1	B	218	LYS	4.1
1	B	241	LEU	4.1
1	B	119	PRO	4.1
1	B	209	PHE	4.0
1	B	50	VAL	4.0

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Mol	Chain	Res	Type	RSRZ
1	A	218	LYS	4.0
1	B	48	GLY	4.0
1	B	122	ILE	4.0
1	B	235	ALA	4.0
1	B	245	GLY	3.9
1	B	208	LEU	3.9
1	A	6	SER	3.9
1	B	25	PHE	3.9
1	B	116	ALA	3.9
1	B	240	ALA	3.9
1	B	250	VAL	3.9
1	B	40	VAL	3.8
1	B	244	LEU	3.7
1	B	228	ALA	3.6
1	A	208	LEU	3.6
1	B	205	ASP	3.6
1	B	227	LEU	3.6
1	A	202	ALA	3.5
1	B	46	PHE	3.4
1	B	225	ASN	3.3
1	B	229	ALA	3.3
1	A	206	PRO	3.3
1	B	243	ALA	3.2
1	B	49	PRO	3.2
1	B	185	PHE	3.2
1	B	220	ARG	3.2
1	B	51	PHE	3.2
1	A	220	ARG	3.2
1	B	239	GLU	3.1
1	B	219	ARG	3.1
1	A	158	PRO	3.1
1	B	20	PHE	3.1
1	A	203	LEU	3.1
1	B	43	ALA	3.0
1	B	221	LYS	2.9
1	B	41	GLU	2.9
1	A	201	GLY	2.9
1	B	26	GLY	2.8
1	B	118	LEU	2.8
1	A	204	ASP	2.7
1	B	211	LEU	2.7
1	A	8	GLN	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	210	ARG	2.7
1	B	236	ARG	2.7
1	B	222	THR	2.6
1	A	242	ARG	2.6
1	B	158	PRO	2.5
1	B	68	GLY	2.5
1	A	7	PRO	2.5
1	B	212	VAL	2.5
1	B	267	LEU	2.5
1	B	214	ALA	2.5
1	B	186	PRO	2.5
1	A	243	ALA	2.5
1	B	251	ARG	2.5
1	B	108	VAL	2.4
1	B	215	ALA	2.4
1	B	226	ALA	2.4
1	B	3[A]	LYS	2.4
1	B	39	ILE	2.4
1	B	257	LEU	2.4
1	A	18	GLY	2.4
1	B	34	ALA	2.4
1	B	62	ARG	2.4
1	B	234	LYS	2.4
1	B	31	VAL	2.4
1	B	216	PHE	2.3
1	B	124	THR	2.3
1	B	42	ALA	2.3
1	A	205	ASP	2.3
1	A	10	VAL	2.3
1	B	53	VAL	2.3
1	B	249	ARG	2.2
1	A	217	GLY	2.2
1	A	31	VAL	2.2
1	B	71	VAL	2.1
1	B	65	LEU	2.1
1	B	15	GLU	2.1
1	B	69	ALA	2.1
1	B	231	GLY	2.0
1	B	63	ALA	2.0
1	A	212	VAL	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 monosaccharides 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.