



wwPDB X-ray Structure Validation Summary Report ⓘ

May 14, 2020 – 09:06 am BST

PDB ID : 1SER
Title : THE 2.9 ANGSTROMS CRYSTAL STRUCTURE OF T. THERMOPHILUS
SERYL-TRNA SYNTHETASE COMPLEXED WITH TRNA SER
Authors : Biou, S.; Cusack, V.; Yaremchuk, A.; Tukalo, M.
Deposited on : 1994-02-21
Resolution : 2.90 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

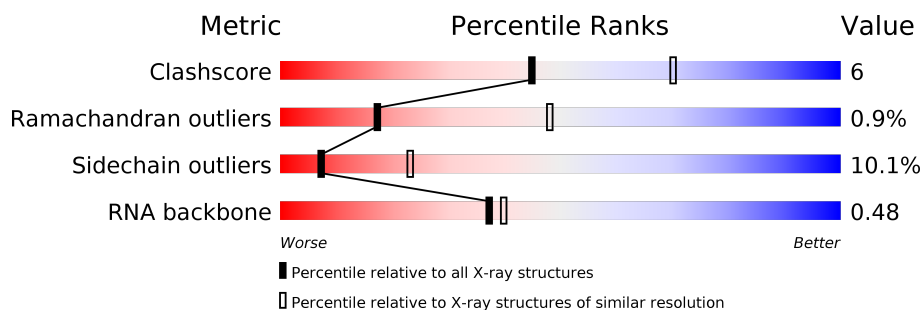
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RNA backbone	3102	1007 (3.16-2.64)

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 ≥ 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	T	94	
2	A	421	
2	B	421	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7780 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 RNA chain called TRNASER.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	T	65	Total	C	N	O	P	60	0	0
			1381	613	247	456	65			

- Molecule 2 is a protein called PROTEIN (SERYL-TRNA SYNTHETASE (E.C.6.1.1.11)).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	372	Total	C	N	O	S	30	0	0
			2982	1901	531	539	11			
2	B	421	Total	C	N	O	S	0	0	0
			3373	2143	606	613	11			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	208	TYR	THR	CONFLICT	UNP P34945
B	708	TYR	THR	CONFLICT	UNP P34945

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	T	1	Total	O	0	0
			1	1		
3	A	14	Total	O	0	0
			14	14		
3	B	29	Total	O	0	0
			29	29		

3 Residue-property plots

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. 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.

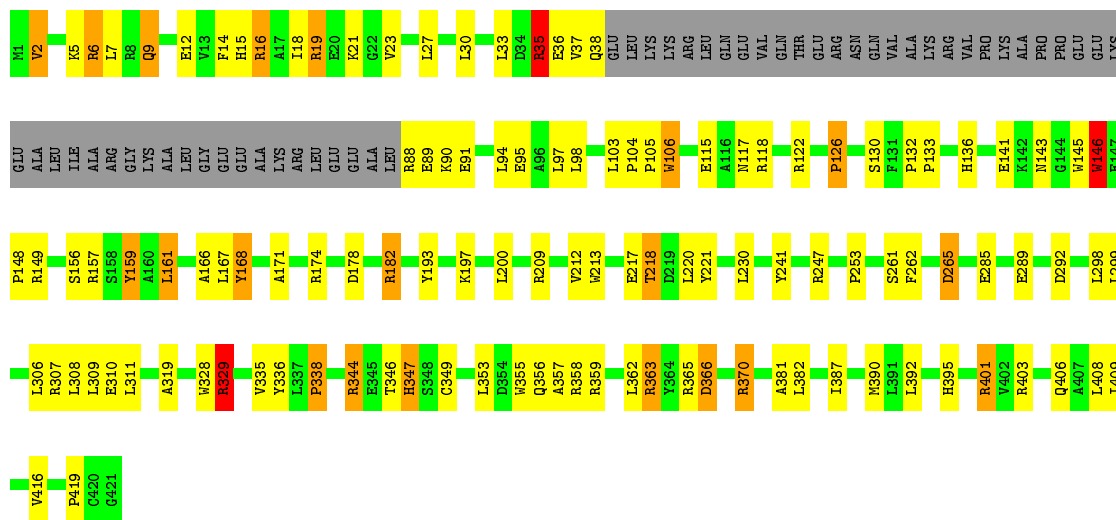
• Molecule 1: TRNASER

Chain T: 



• Molecule 2: PROTEIN (SERYL-TRNA SYNTHETASE (E.C.6.1.1.11))

Chain A: 



• Molecule 2: PROTEIN (SERYL-TRNA SYNTHETASE (E.C.6.1.1.11))

Chain B: 



L603	L720	W721	L730	E737	Y741	E758	S761	D765	V766	R767	G768	L769	W770	F775	H776	K777	V778	E779	Q780	L783	E789	R793	L799	E800	W801	R807	L808	L809	Y813	A819	K827	W828	V835	P838	R842	Y843	R844	S850	L853
W606	Y721	L730	E737	Y741	E758	S761	D765	V766	R767	G768	L769	W770	F775	H776	K777	V778	E779	Q780	L783	E789	R793	L799	E800	W801	R807	L808	L809	Y813	A819	K827	W828	V835	P838	R842	Y843	R844	S850	L853	
A609	W617	R622	S630	F631	P632	F633	L634	D635	H636	V637	A638	L639	W640	W645	W646	E647	F648	R649	S656	R657	A660	L661	K662	L665	R674	M677	R682	R683	P687	H688	T689	L690	Y693	A694	R695	F699	R709	W713	E717
A609	W617	R622	S630	F631	P632	F633	L634	D635	H636	V637	A638	L639	W640	W645	W646	E647	F648	R649	S656	R657	A660	L661	K662	L665	R674	M677	R682	R683	P687	H688	T689	L690	Y693	A694	R695	F699	R709	W713	E717
A609	W617	R622	S630	F631	P632	F633	L634	D635	H636	V637	A638	L639	W640	W645	W646	E647	F648	R649	S656	R657	A660	L661	K662	L665	R674	M677	R682	R683	P687	H688	T689	L690	Y693	A694	R695	F699	R709	W713	E717

4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	124.50Å 128.90Å 121.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.90	Depositor
% Data completeness (in resolution range)	92.9 (10.00-2.90)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.194 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	7780	wwPDB-VP
Average B, all atoms (Å ²)	26.0	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: 5MU, H2U, PSU

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	T	1.54	6/1472 (0.4%)	2.24	96/2290 (4.2%)
2	A	0.86	0/3053	1.60	53/4138 (1.3%)
2	B	0.90	0/3448	1.73	75/4667 (1.6%)
All	All	1.03	6/7973 (0.1%)	1.80	224/11095 (2.0%)

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	T	58	A	C5'-C4'	6.34	1.58	1.51
1	T	18	G	P-O5'	6.24	1.66	1.59
1	T	18	G	C2'-C1'	-6.12	1.46	1.53
1	T	50	C	P-O5'	6.07	1.65	1.59
1	T	18	G	N9-C8	-5.48	1.34	1.37

The worst 5 of 224 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	T	16	U	O4'-C1'-N1	-14.53	96.58	108.20
2	B	903	ARG	NE-CZ-NH2	-14.46	113.07	120.30
1	T	18	G	O4'-C1'-N9	13.52	119.02	108.20
2	B	657	ARG	NE-CZ-NH2	-12.82	113.89	120.30
2	B	657	ARG	NE-CZ-NH1	11.41	126.00	120.30

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	T	1381	0	701	7	0
2	A	2982	0	2974	44	0
2	B	3373	0	3391	48	0
3	A	14	0	0	0	0
3	B	29	0	0	0	0
3	T	1	0	0	0	0
All	All	7780	0	7066	95	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 6.

The worst 5 of 95 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:A:21:LYS:HE3	2:A:105:PRO:HD3	1.51	0.92
2:A:36:GLU:HB3	2:A:90:LYS:HG2	1.74	0.70
2:B:550:GLU:HB3	2:B:576:LEU:HD21	1.75	0.67
2:A:382:LEU:HD21	2:A:387:ILE:HG21	1.80	0.64
2:B:558:VAL:N	2:B:559:PRO:HD2	2.13	0.64

There are no symmetry-related clashes.

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
2	A	368/421 (87%)	345 (94%)	20 (5%)	3 (1%)	19 51

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	419/421 (100%)	405 (97%)	10 (2%)	4 (1%)	15	45
All	All	787/842 (94%)	750 (95%)	30 (4%)	7 (1%)	17	48

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	765	ASP
2	A	35	ARG
2	B	564	GLU
2	A	126	PRO
2	A	338	PRO

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	
2	A	307/347 (88%)	269 (88%)	38 (12%)	4	14
2	B	347/347 (100%)	319 (92%)	28 (8%)	11	33
All	All	654/694 (94%)	588 (90%)	66 (10%)	7	23

5 of 66 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	306	LEU
2	A	390	MET
2	B	838	PRO
2	A	308	LEU
2	A	338	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
2	A	347	HIS
2	A	395	HIS

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Mol	Chain	Res	Type
2	B	776	HIS
2	A	301	ASN
2	B	780	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	T	61/94 (64%)	11 (18%)	5 (8%)

5 of 11 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	T	7	G
1	T	8	U
1	T	9	G
1	T	16	U
1	T	18	G

All (5) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	T	7	G
1	T	16	U
1	T	20(A)	H2U
1	T	24	G
1	T	45	A

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

3 non-standard protein/DNA/RNA residues are modelled in this entry.

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
1	H2U	T	20(A)	1	18,21,22	1.02	2 (11%)	21,30,33	1.09	2 (9%)
1	PSU	T	55	1	17,21,22	1.34	3 (17%)	20,30,33	5.43	9 (45%)
1	5MU	T	54	1	15,22,23	1.61	4 (26%)	16,32,35	3.39	1 (6%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	H2U	T	20(A)	1	-	0/7/38/39	0/2/2/2
1	PSU	T	55	1	-	1/7/25/26	0/2/2/2
1	5MU	T	54	1	-	0/5/25/26	0/2/2/2

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	T	54	5MU	C4-N3	3.72	1.39	1.33
1	T	54	5MU	O4'-C1'	3.47	1.45	1.41
1	T	20(A)	H2U	C5-C4	-2.68	1.43	1.50
1	T	55	PSU	C6-C5	-2.60	1.34	1.38
1	T	55	PSU	C4-C5	2.54	1.46	1.41

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	T	54	5MU	C4-N3-C2	13.11	126.21	115.14
1	T	55	PSU	C4-N3-C2	12.98	126.10	115.14
1	T	55	PSU	N1-C2-N3	-12.82	118.24	128.43
1	T	55	PSU	C5-C4-N3	-10.67	111.61	125.36
1	T	55	PSU	O4'-C1'-C5	9.11	124.03	109.93

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	T	55	PSU	O4'-C4'-C5'-O5'

There are no ring outliers.

No monomer is involved in short contacts.

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 ⓘ

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.