WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 22, 2024 – 06:58 PM EST

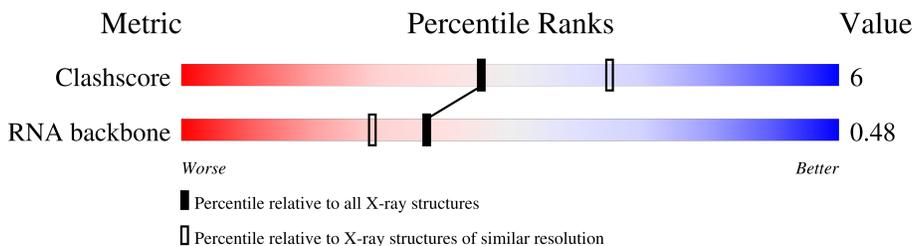|		
PDB ID	:	4TNA
Title	:	FURTHER REFINEMENT OF THE STRUCTURE OF YEAST T-RNA-PHE
Authors	:	Hingerty, B.E.; Brown, R.S.; Jack, A.
Deposited on	:	1978-04-12
Resolution	:	2.50 Å(reported)

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 2.50 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	Percentile Ranks	Value
Clashscore		6
RNA backbone		0.48

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	5346 (2.50-2.50)
RNA backbone	3102	1008 (2.84-2.16)

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	76	25% 51% 24%

2 Entry composition ⓘ

There are 2 unique types of molecules in this entry. The entry contains 1656 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 TRNAPHE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	76	Total 1652	C 746	N 294	O 536	P 76	0	0	0

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	4	Total 4	Mg 4	0	0

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. 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: TRNAPHE

Chain A:

25%   51%   24%

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	56.30Å 33.40Å 63.00Å 90.00° 90.25° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.50 29.51 – 2.00	Depositor EDS
% Data completeness (in resolution range)	(Not available) ((Not available)-2.50) 51.4 (29.51-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	1.53 (at 2.00Å)	Xtriage
Refinement program	JACK-LEVITT	Depositor
R, R_{free}	(Not available) , (Not available) 0.301 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	17.8	Xtriage
Anisotropy	0.710	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.22 , -17.3	EDS
L-test for twinning [2]	$<|L|> = 0.42, <L^2> = 0.24$	Xtriage
Estimated twinning fraction	0.081 for h,-k,-l	Xtriage
F_o,F_c correlation	0.85	EDS
Total number of atoms	1656	wwPDB-VP
Average B, all atoms (Å^2)	0.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.47% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $<|L|>$, $<L^2>$ 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 ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 7MG, 1MA, MG, 5MU, OMC, YG, 5MC, 2MG, H2U, M2G, PSU, OMG

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	3.09	177/1487 (11.9%)	4.96	431/2315 (18.6%)

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	44

The worst 5 of 177 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	19	G	C6-N1	-17.44	1.27	1.39
1	A	18	G	C8-N7	15.39	1.40	1.30
1	A	42	G	C8-N7	15.03	1.40	1.30
1	A	3	G	C8-N7	13.50	1.39	1.30
1	A	4	G	C8-N7	13.42	1.39	1.30

The worst 5 of 431 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	22	G	N3-C4-C5	-19.57	118.82	128.60
1	A	20	G	N3-C4-C5	-19.36	118.92	128.60
1	A	57	G	N3-C4-C5	-19.20	119.00	128.60
1	A	31	A	C2-N3-C4	18.78	119.99	110.60
1	A	53	G	N3-C4-C5	-18.73	119.23	128.60

There are no chirality outliers.

5 of 44 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1	G	Sidechain
1	A	2	C	Sidechain
1	A	3	G	Sidechain
1	A	5	A	Sidechain
1	A	6	U	Sidechain

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	1652	0	859	16	0
2	A	4	0	0	0	0
All	All	1656	0	859	16	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 16 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:74:C:H2'	1:A:75:C:H6	1.57	0.69
1:A:37:YG:H101	1:A:37:YG:HN2	1.58	0.68
1:A:74:C:H2'	1:A:75:C:C6	2.27	0.68
1:A:37:YG:H1'	1:A:37:YG:H31	1.83	0.58
1:A:37:YG:H31	1:A:37:YG:C1'	2.40	0.52

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

There are no protein molecules in this entry.

5.3.2 Protein sidechains ⓘ

There are no protein molecules in this entry.

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	75/76 (98%)	15 (20%)	4 (5%)

5 of 15 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	9	A
1	A	13	C
1	A	16	H2U
1	A	17	H2U
1	A	18	G

All (4) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	18	G
1	A	21	A
1	A	46	7MG
1	A	58	1MA

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

14 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	YG	A	37	1	31,42,43	1.60	5 (16%)	33,62,65	2.27	13 (39%)
1	H2U	A	17	1	18,21,22	1.21	2 (11%)	21,30,33	1.87	4 (19%)
1	2MG	A	10	1	18,26,27	1.59	4 (22%)	16,38,41	1.57	3 (18%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
1	5MC	A	49	1	18,22,23	1.49	3 (16%)	26,32,35	1.38	4 (15%)
1	5MU	A	54	1	19,22,23	1.54	4 (21%)	28,32,35	2.00	7 (25%)
1	OMC	A	32	1	19,22,23	1.03	2 (10%)	26,31,34	1.05	1 (3%)
1	M2G	A	26	1	20,27,28	1.62	4 (20%)	22,40,43	1.22	3 (13%)
1	5MC	A	40	1	18,22,23	1.23	3 (16%)	26,32,35	1.32	5 (19%)
1	PSU	A	55	1	18,21,22	1.63	3 (16%)	22,30,33	1.87	5 (22%)
1	PSU	A	39	1	18,21,22	1.50	3 (16%)	22,30,33	1.79	4 (18%)
1	OMG	A	34	1	18,26,27	1.41	4 (22%)	19,38,41	1.42	3 (15%)
1	H2U	A	16	1	18,21,22	1.33	3 (16%)	21,30,33	1.77	4 (19%)
1	1MA	A	58	1	16,25,26	1.46	4 (25%)	18,37,40	1.74	4 (22%)
1	7MG	A	46	1	22,26,27	4.07	3 (13%)	29,39,42	2.23	9 (31%)

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	YG	A	37	1	-	5/20/42/43	0/3/4/4
1	H2U	A	17	1	-	4/7/38/39	0/2/2/2
1	2MG	A	10	1	-	0/5/27/28	0/3/3/3
1	5MC	A	49	1	-	2/7/25/26	0/2/2/2
1	5MU	A	54	1	-	0/7/25/26	0/2/2/2
1	OMC	A	32	1	-	0/9/27/28	0/2/2/2
1	M2G	A	26	1	-	1/7/29/30	0/3/3/3
1	5MC	A	40	1	-	0/7/25/26	0/2/2/2
1	PSU	A	55	1	-	2/7/25/26	0/2/2/2
1	PSU	A	39	1	-	0/7/25/26	0/2/2/2
1	OMG	A	34	1	-	0/5/27/28	0/3/3/3
1	H2U	A	16	1	-	4/7/38/39	0/2/2/2
1	1MA	A	58	1	-	1/3/25/26	0/3/3/3
1	7MG	A	46	1	-	2/7/37/38	0/3/3/3

The worst 5 of 47 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	46	7MG	C8-N9	-18.10	1.35	1.46
1	A	37	YG	O23-C21	-5.48	1.24	1.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	26	M2G	C2-N3	4.03	1.35	1.30
1	A	39	PSU	C6-C5	4.02	1.40	1.35
1	A	55	PSU	C6-C5	3.95	1.39	1.35

The worst 5 of 69 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	17	H2U	C4-N3-C2	-5.34	121.37	125.79
1	A	37	YG	O23-C21-O22	-5.20	116.93	124.58
1	A	39	PSU	N1-C2-N3	4.91	120.69	115.13
1	A	46	7MG	N9-C4-N3	4.74	132.56	125.47
1	A	54	5MU	C5-C4-N3	4.65	119.28	115.31

There are no chirality outliers.

5 of 21 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	16	H2U	O4'-C1'-N1-C6
1	A	16	H2U	C2'-C1'-N1-C6
1	A	17	H2U	O4'-C1'-N1-C6
1	A	17	H2U	C2'-C1'-N1-C6
1	A	37	YG	C12-C13-C14-C15

There are no ring outliers.

4 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	37	YG	3	0
1	A	17	H2U	2	0
1	A	32	OMC	2	0
1	A	16	H2U	5	0

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

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 ⓘ

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 ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.