



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 09:06 PM GMT

PDB ID : 1NJ8
Title : Crystal Structure of Prolyl-tRNA Synthetase from Methanocaldococcus
janaschii
Authors : Kamtekar, S.; Kennedy, W.D.; Wang, J.; Stathopoulos, C.; Soll, D.; Steitz,
T.A.
Deposited on : 2002-12-30
Resolution : 3.20 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
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
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) : trunk26865

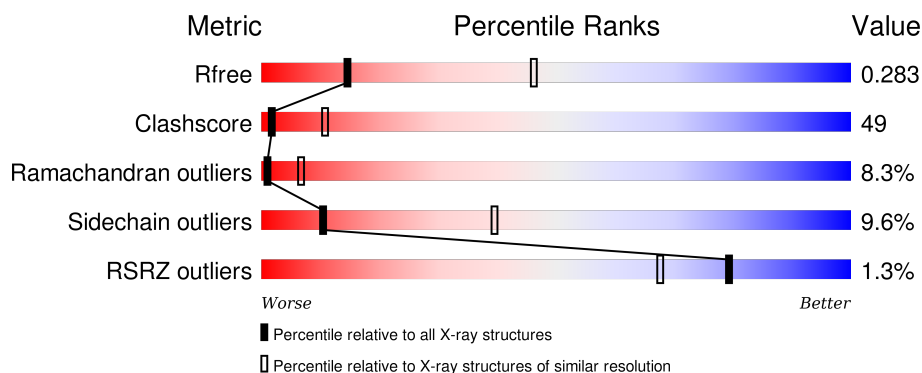
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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}	91344	1124 (3.24-3.16)
Clashscore	102246	1024 (3.22-3.18)
Ramachandran outliers	100387	1004 (3.22-3.18)
Sidechain outliers	100360	1003 (3.22-3.18)
RSRZ outliers	91569	1129 (3.24-3.16)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 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	459	<div> <div>2%</div> <div> <div></div> <div>31%</div> <div>56%</div> <div>12%</div> <div>..</div> </div> </div>
1	B	459	<div> <div>%</div> <div> <div></div> <div>31%</div> <div>57%</div> <div>10%</div> <div>..</div> </div> </div>
1	C	459	<div> <div>%</div> <div> <div></div> <div>29%</div> <div>58%</div> <div>12%</div> <div>..</div> </div> </div>
1	D	459	<div> <div>2%</div> <div> <div></div> <div>31%</div> <div>58%</div> <div>10%</div> <div>.</div> </div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 15182 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 Proline-tRNA Synthetase.

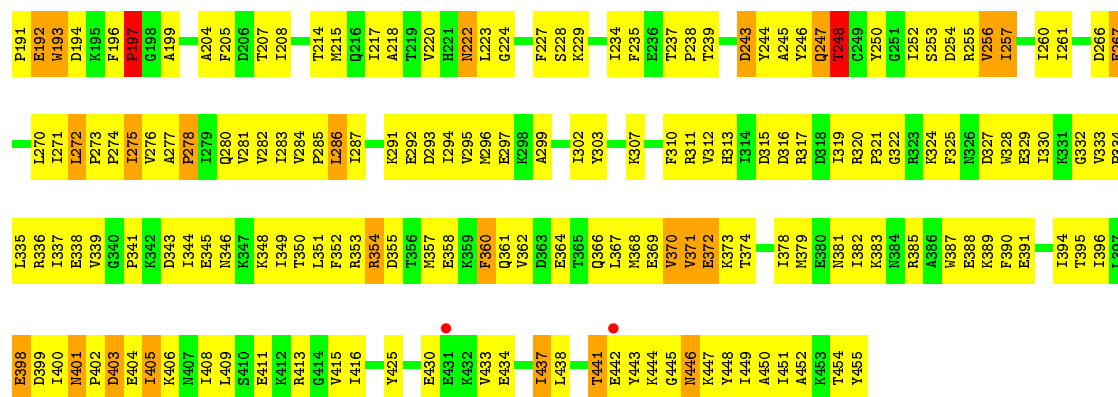
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	456	Total	C	N	O	S	0	0	0
			3772	2447	614	698	13			
1	B	456	Total	C	N	O	S	0	0	0
			3772	2447	614	698	13			
1	C	456	Total	C	N	O	S	0	0	0
			3772	2447	614	698	13			
1	D	456	Total	C	N	O	S	0	0	0
			3772	2447	614	698	13			

There are 20 discrepancies between the modelled and reference sequences:

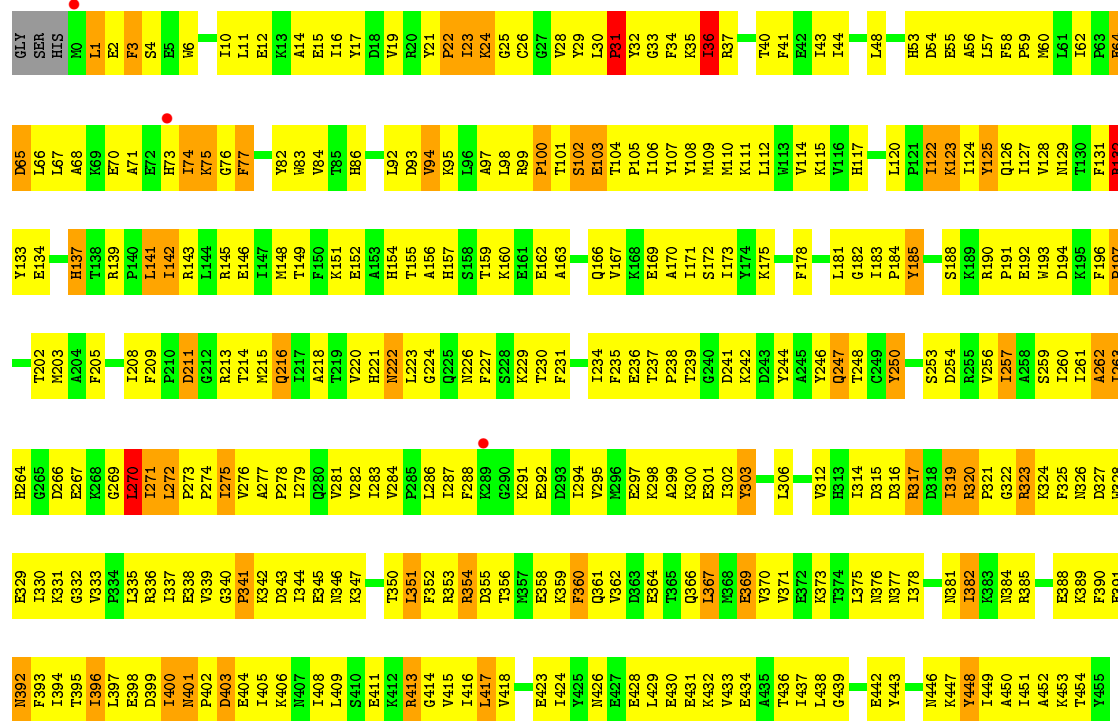
Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	GLY	-	EXPRESSION TAG	UNP Q58635
A	-2	SER	-	EXPRESSION TAG	UNP Q58635
A	-1	HIS	-	EXPRESSION TAG	UNP Q58635
A	0	MET	-	EXPRESSION TAG	UNP Q58635
A	1	LEU	MET	CLONING ARTIFACT	UNP Q58635
B	-3	GLY	-	EXPRESSION TAG	UNP Q58635
B	-2	SER	-	EXPRESSION TAG	UNP Q58635
B	-1	HIS	-	EXPRESSION TAG	UNP Q58635
B	0	MET	-	EXPRESSION TAG	UNP Q58635
B	1	LEU	MET	CLONING ARTIFACT	UNP Q58635
C	-3	GLY	-	EXPRESSION TAG	UNP Q58635
C	-2	SER	-	EXPRESSION TAG	UNP Q58635
C	-1	HIS	-	EXPRESSION TAG	UNP Q58635
C	0	MET	-	EXPRESSION TAG	UNP Q58635
C	1	LEU	MET	CLONING ARTIFACT	UNP Q58635
D	-3	GLY	-	EXPRESSION TAG	UNP Q58635
D	-2	SER	-	EXPRESSION TAG	UNP Q58635
D	-1	HIS	-	EXPRESSION TAG	UNP Q58635
D	0	MET	-	EXPRESSION TAG	UNP Q58635
D	1	LEU	MET	CLONING ARTIFACT	UNP Q58635

- Molecule 2 is water.

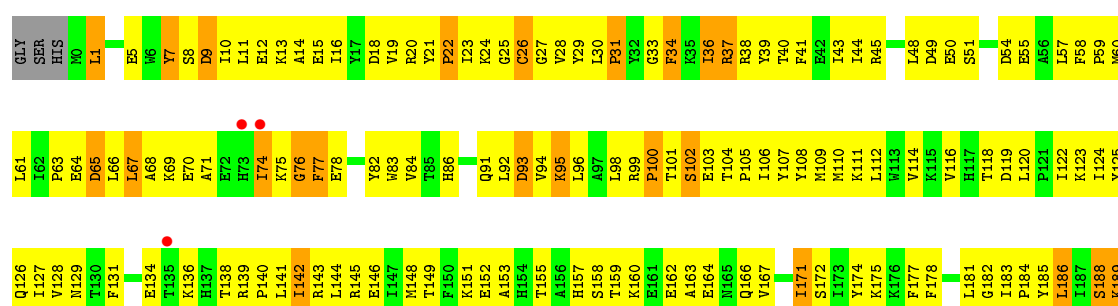
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	35	Total 35	O 35	0	0
2	B	16	Total 16	O 16	0	0
2	C	25	Total 25	O 25	0	0
2	D	18	Total 18	O 18	0	0



• Molecule 1: Proline-tRNA Synthetase



• Molecule 1: Proline-tRNA Synthetase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	108.94Å 104.84Å 91.75Å 90.00° 93.63° 90.00°	Depositor
Resolution (Å)	20.00 – 3.20 29.81 – 3.16	Depositor EDS
% Data completeness (in resolution range)	87.0 (20.00-3.20) 84.9 (29.81-3.16)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	720.88 (at 3.18Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.231 , 0.301 0.222 , 0.283	Depositor DCC
R_{free} test set	2954 reflections (9.98%)	DCC
Wilson B-factor (Å ²)	67.4	Xtriage
Anisotropy	0.553	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.25 , 54.3	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	0 of 30244 reflections	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	15182	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.11% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.44	0/3860	0.71	3/5213 (0.1%)
1	B	0.40	0/3860	0.63	0/5213
1	C	0.44	0/3860	0.70	3/5213 (0.1%)
1	D	0.39	0/3860	0.63	0/5213
All	All	0.42	0/15440	0.67	6/20852 (0.0%)

There are no bond length outliers.

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	320	ARG	NE-CZ-NH2	-11.57	114.52	120.30
1	C	320	ARG	NE-CZ-NH1	-11.40	114.60	120.30
1	C	320	ARG	NE-CZ-NH2	11.27	125.94	120.30
1	A	320	ARG	NE-CZ-NH1	11.16	125.88	120.30
1	C	320	ARG	CD-NE-CZ	5.36	131.10	123.60

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	3772	0	3804	386	2
1	B	3772	0	3804	353	0
1	C	3772	0	3804	409	1
1	D	3772	0	3804	363	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	35	0	0	2	0
2	B	16	0	0	1	0
2	C	25	0	0	6	0
2	D	18	0	0	3	0
All	All	15182	0	15216	1472	2

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 49.

The worst 5 of 1472 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:B:275:ILE:HD12	1:B:275:ILE:H	1.06	1.14
1:D:275:ILE:H	1:D:275:ILE:HD12	1.08	1.11
1:B:48:LEU:HD11	1:B:151:LYS:HD2	1.32	1.10
1:D:48:LEU:HD11	1:D:151:LYS:HD2	1.34	1.07
1:A:337:ILE:HG12	1:A:351:LEU:HD12	1.36	1.02

All (2) 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:323:ARG:NH1	1:C:323:ARG:NH1[2_646]	1.95	0.25
1:A:293:ASP:OD1	1:D:392:ASN:OD1[1_554]	2.10	0.10

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	454/459 (99%)	331 (73%)	84 (18%)	39 (9%)	1 6
1	B	454/459 (99%)	313 (69%)	104 (23%)	37 (8%)	1 7

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	454/459 (99%)	330 (73%)	85 (19%)	39 (9%)	1	6
1	D	454/459 (99%)	312 (69%)	107 (24%)	35 (8%)	1	8
All	All	1816/1836 (99%)	1286 (71%)	380 (21%)	150 (8%)	1	7

5 of 150 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	36	ILE
1	A	74	ILE
1	A	75	LYS
1	A	76	GLY
1	A	102	SER

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	412/414 (100%)	373 (90%)	39 (10%)	11	40
1	B	412/414 (100%)	373 (90%)	39 (10%)	11	40
1	C	412/414 (100%)	370 (90%)	42 (10%)	9	36
1	D	412/414 (100%)	374 (91%)	38 (9%)	11	41
All	All	1648/1656 (100%)	1490 (90%)	158 (10%)	10	39

5 of 158 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	360	PHE
1	C	137	HIS
1	D	303	TYR
1	B	398	GLU
1	C	31	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 51 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	401	ASN
1	C	216	GLN
1	D	366	GLN
1	C	46	ASN
1	C	222	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 [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, 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	456/459 (99%)	-0.44	8 (1%) 71 58	10, 49, 112, 140	0
1	B	456/459 (99%)	-0.28	4 (0%) 85 78	17, 69, 129, 144	0
1	C	456/459 (99%)	-0.43	3 (0%) 89 83	11, 49, 111, 140	0
1	D	456/459 (99%)	-0.23	9 (1%) 68 54	16, 69, 129, 144	0
All	All	1824/1836 (99%)	-0.35	24 (1%) 79 67	10, 58, 122, 144	0

The worst 5 of 24 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	73	HIS	6.4
1	B	74	ILE	4.8
1	C	73	HIS	4.6
1	D	74	ILE	4.1
1	B	73	HIS	3.8

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.