Full wwPDB X-ray Structure Validation Report (i)

Aug 21, 2023 – 11:48 AM EDT

PDB ID	:	2PXD
Title	:	Variant 1 of Ribonucleoprotein Core of the E. Coli Signal Recognition Particle
Authors	:	Keel, A.Y.; Rambo, R.P.; Batey, R.T.; Kieft, J.S.
Deposited on	:	2007-05-14
Resolution	:	2.00 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 (i) 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 (i)) were used in the production of this report:

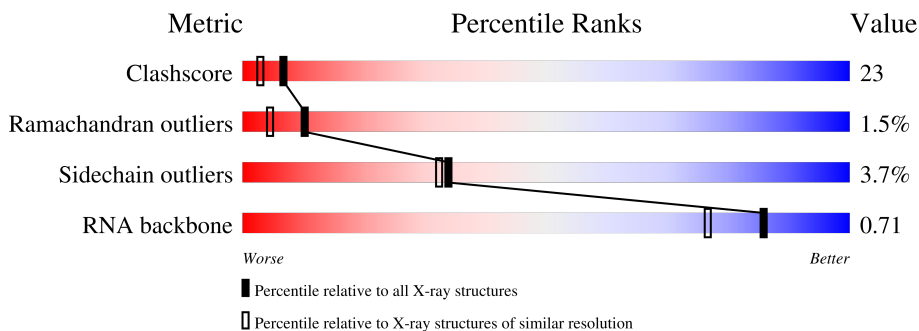|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

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 2.00 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		23
Ramachandran outliers		1.5%
Sidechain outliers		3.7%
RNA backbone		0.71

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	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RNA backbone	3102	1079 (2.50-1.50)

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 <=5%

Mol	Chain	Length	Quality of chain
1	B	49	41%　　57%　　•
2	A	102	33%　　33%　　•　　32%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 1634 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 4.5 S RNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	49	Total	C	N	O	P	0	0	0
			1052	470	197	337	48			

- Molecule 2 is a protein called Signal recognition particle protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	69	Total	C	N	O	Se	0	0	0
			533	329	97	99	8			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	9G	MSE	MET	modified residue	UNP P0AGD7
A	9J	MSE	MET	modified residue	UNP P0AGD7
A	9N	MSE	MET	modified residue	UNP P0AGD7
A	9T	MSE	MET	modified residue	UNP P0AGD7
A	10E	MSE	MET	modified residue	UNP P0AGD7
A	28	MSE	MET	modified residue	UNP P0AGD7
A	35	MSE	MET	modified residue	UNP P0AGD7
A	37	MSE	MET	modified residue	UNP P0AGD7
A	58	SER	CYS	engineered mutation	UNP P0AGD7
A	60	MSE	MET	modified residue	UNP P0AGD7
A	75	MSE	MET	modified residue	UNP P0AGD7
A	78	MSE	MET	modified residue	UNP P0AGD7
A	79	MSE	MET	modified residue	UNP P0AGD7
A	82	MSE	MET	modified residue	UNP P0AGD7

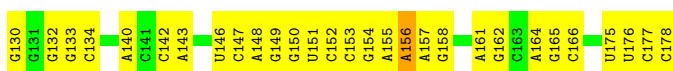- Molecule 3 is COBALT HEXAMMINE(III) (three-letter code: NCO) (formula: $CoH_{18}N_6$).

NCO

N2　　　N3
H_3N　　NH_3

N1 H_3N — Co $^{+3}$ — NH_3 N4

CO
H_3N　　NH_3
N6　　　N5
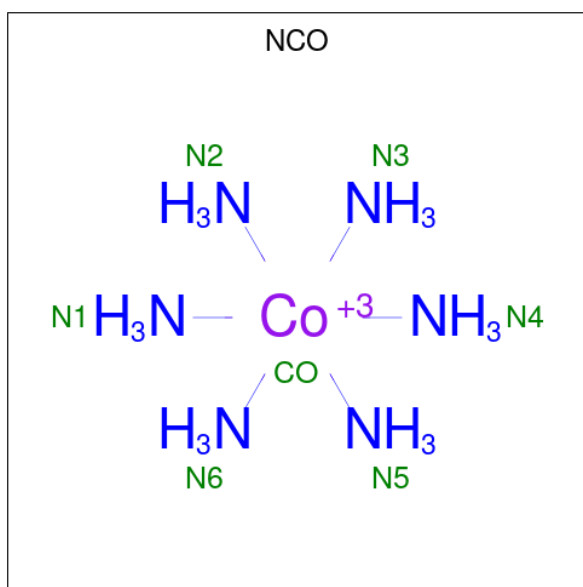
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total 7	Co 1	N 6	0	0
3	B	1	Total 7	Co 1	N 6	0	0
3	B	1	Total 7	Co 1	N 6	0	0
3	B	1	Total 7	Co 1	N 6	0	0
3	B	1	Total 7	Co 1	N 6	0	0
3	B	1	Total 7	Co 1	N 6	0	0
3	B	1	Total 7	Co 1	N 6	0	0

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.
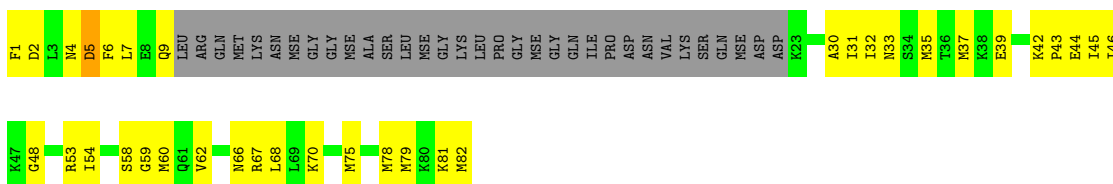
• Molecule 1: 4.5 S RNA

Chain B:

41%   57%

G130 G131 G132 G133 C134 A140 C141 C142 A143 U146 C147 A148 G149 G150 U151 C152 C153 G154 A155 A156 A157 G158 A161 G162 C163 A164 G165 C166 U175 U176 C177 C178

• Molecule 2: Signal recognition particle protein

Chain A:

33%   33%   32%

F1 D2 L3 N4 D5 F6 L7 E8 Q9 LEU ARG GLN MET LYS ASN MSE GLY GLY MSE ALA SER LEU MSE GLY LYS LEU PRO GLY MSE GLY GLN ILE PRO ASP ASN VAL LYS SER GLN MSE ASP ASP K23 A30 I31 I32 N33 S34 M35 T36 M37 K38 E39 K42 P43 E44 I45 I46

K47 G48 R53 I54 S58 G59 M60 Q61 V62 N66 R67 L68 L69 K70 M75 M78 M79 K80 K81 M82

WORLDWIDE PDB
PROTEIN DATA BANK

4　Data and refinement statistics　ⓘ

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	131.88Å　　77.87Å　　32.43Å 90.00°　　94.04°　　90.00°	Depositor
Resolution (Å)	50.00　–　2.00 38.93　–　2.00	Depositor EDS
% Data completeness (in resolution range)	92.2 (50.00-2.00) 98.6 (38.93-2.00)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.37 (at 2.00Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.251　,　　　0.283 0.314　,　(Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	24.1	Xtriage
Anisotropy	0.236	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.23 , 81.3	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	1634	wwPDB-VP
Average B, all atoms (Å^2)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.48% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[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.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NCO

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	B	0.53	0/1178	0.70	0/1837
2	A	0.35	0/527	0.54	0/682
All	All	0.48	0/1705	0.66	0/2519

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	B	0	3

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	154	G	Sidechain
1	B	155	A	Sidechain
1	B	156	A	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.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	1052	0	533	31	0
2	A	533	0	528	33	0
3	B	49	0	0	5	0
All	All	1634	0	1061	59	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 23.

All (59) 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:132:G:N7	3:B:207:NCO:N2	2.25	0.83
2:A:58:SER:O	2:A:60:MSE:HG2	1.84	0.77
2:A:60:MSE:HA	2:A:60:MSE:HE2	1.70	0.72
2:A:67:ARG:O	2:A:70:LYS:HB3	1.92	0.69
1:B:164:A:H4'	2:A:35:MSE:O	1.96	0.65
2:A:62:VAL:HG12	2:A:66:ASN:ND2	2.14	0.63
2:A:79:MSE:C	2:A:81:LYS:H	2.02	0.62
2:A:39:GLU:CD	2:A:53:ARG:HH22	2.03	0.62
1:B:130:G:H1	1:B:178:C:H42	1.51	0.58
1:B:146:U:H2'	1:B:147:C:O4'	2.03	0.58
1:B:132:G:O6	3:B:207:NCO:N3	2.36	0.58
2:A:42:LYS:O	2:A:45:ILE:HG12	2.04	0.57
1:B:151:U:O4'	2:A:59:GLY:HA3	2.04	0.56
1:B:148:A:N1	2:A:33:ASN:HB3	2.21	0.56
1:B:133:G:H1	1:B:175:U:H3	1.54	0.56
1:B:149:G:OP2	3:B:203:NCO:N5	2.38	0.56
1:B:176:U:H2'	1:B:177:C:C6	2.41	0.55
1:B:158:G:N7	3:B:205:NCO:N5	2.56	0.54
2:A:68:LEU:O	2:A:68:LEU:HD13	2.07	0.54
2:A:68:LEU:HD13	2:A:68:LEU:C	2.29	0.53
2:A:42:LYS:HG3	2:A:44:GLU:OE1	2.08	0.53
1:B:152:C:H2'	1:B:153:C:H6	1.76	0.51
1:B:161:A:H2'	1:B:162:G:O4'	2.10	0.51
1:B:130:G:H1	1:B:178:C:N4	2.09	0.51
2:A:44:GLU:OE2	2:A:44:GLU:N	2.32	0.50
2:A:79:MSE:C	2:A:81:LYS:N	2.65	0.50
2:A:31:ILE:CG1	2:A:60:MSE:HG3	2.41	0.50
2:A:2:ASP:OD2	2:A:4:ASN:HB2	2.11	0.50
1:B:149:G:OP2	3:B:203:NCO:N4	2.45	0.49
1:B:150:G:H1	1:B:161:A:H61	1.61	0.49
1:B:152:C:H2'	1:B:153:C:C6	2.47	0.49

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:9:GLN:NE2	2:A:75:MSE:HE3	2.28	0.48
1:B:151:U:C1'	2:A:59:GLY:HA3	2.43	0.48
2:A:9:GLN:HE22	2:A:75:MSE:HE3	1.79	0.47
1:B:150:G:C4'	2:A:30:ALA:HB2	2.45	0.46
1:B:142:C:O5'	1:B:142:C:H6	1.98	0.46
2:A:31:ILE:HG13	2:A:60:MSE:HG3	1.97	0.46
1:B:165:G:H2'	1:B:166:C:O4'	2.16	0.46
2:A:43:PRO:O	2:A:46:ILE:HG13	2.17	0.45
2:A:2:ASP:OD1	2:A:4:ASN:ND2	2.36	0.45
1:B:164:A:H2'	1:B:165:G:H5'	1.99	0.44
1:B:176:U:H2'	1:B:177:C:H6	1.81	0.44
1:B:143:A:H8	1:B:143:A:O5'	2.00	0.44
1:B:133:G:H2'	1:B:134:C:C6	2.53	0.44
2:A:81:LYS:O	2:A:82:MSE:HB3	2.18	0.43
1:B:133:G:H2'	1:B:134:C:H6	1.83	0.43
2:A:1:PHE:CZ	2:A:6:PHE:HB2	2.53	0.43
2:A:2:ASP:OD2	2:A:2:ASP:C	2.56	0.43
2:A:68:LEU:C	2:A:68:LEU:CD1	2.88	0.43
2:A:39:GLU:OE1	2:A:53:ARG:NH2	2.51	0.42
1:B:156:A:H2'	1:B:157:A:O4'	2.18	0.42
1:B:150:G:H1	1:B:161:A:N6	2.16	0.42
1:B:150:G:O2'	1:B:151:U:H5'	2.19	0.42
2:A:7:LEU:HD13	2:A:32:ILE:HD12	2.01	0.42
2:A:78:MSE:O	2:A:81:LYS:HB2	2.20	0.41
1:B:151:U:O2'	1:B:152:C:H5'	2.21	0.41
1:B:175:U:H2'	1:B:176:U:C6	2.55	0.41
2:A:1:PHE:HA	2:A:5:ASP:OD2	2.21	0.41
2:A:35:MSE:HG2	2:A:54:ILE:HD13	2.04	0.40

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	65/102 (64%)	52 (80%)	12 (18%)	1 (2%)	10 4

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	A	48	GLY

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	54/76 (71%)	52 (96%)	2 (4%)	34 32

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	5	ASP
2	A	37	MSE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	A	9	GLN
2	A	66	ASN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	B	48/49 (97%)	1 (2%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	B	140	A

There are no RNA pucker outliers to report.

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

7 ligands 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	#$|Z| > 2$
3	NCO	B	201	-	6,6,6	0.32	0	-		
3	NCO	B	206	-	6,6,6	0.23	0	-		
3	NCO	B	207	-	6,6,6	0.21	0	-		
3	NCO	B	203	1	6,6,6	0.11	0	-		
3	NCO	B	204	-	6,6,6	0.14	0	-		
3	NCO	B	205	-	6,6,6	0.18	0	-		
3	NCO	B	202	-	6,6,6	0.33	0	-		

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.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	207	NCO	2	0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	203	NCO	2	0
3	B	205	NCO	1	0

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.