



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 06:55 pm BST

PDB ID : 1U63  
Title : THE STRUCTURE OF A RIBOSOMAL PROTEIN L1-mRNA COMPLEX  
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Deposited on : 2004-07-29  
Resolution : 3.40 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](mailto: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.

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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) : 1.13  
EDS : 2.11  
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) : 2.11

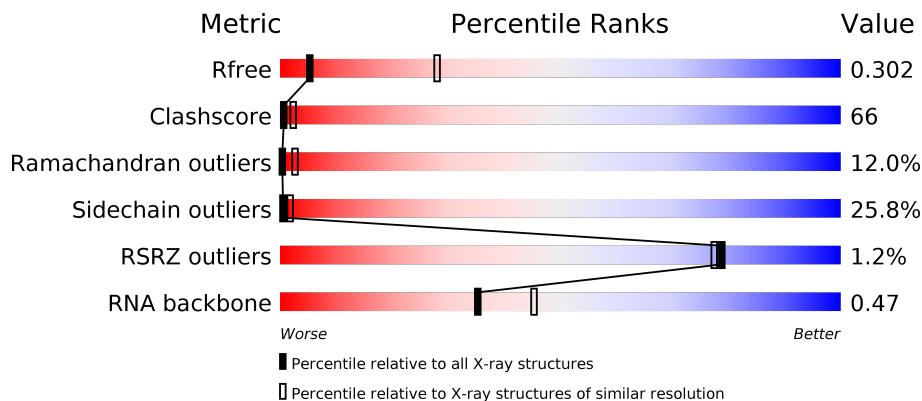
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.40 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))
$R_{free}$	130704	1026 (3.48-3.32)
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)
RSRZ outliers	127900	2173 (3.50-3.30)
RNA backbone	3102	1006 (3.84-2.96)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	B	49	
1	D	49	
2	A	219	
2	C	219	

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 5510 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 49 NT FRAGMENT OF MRNA FOR L1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	B	49	Total	C	N	O	P	0	0	0
			1055	470	199	337	49			
1	D	49	Total	C	N	O	P	0	0	0
			1055	470	199	337	49			

- Molecule 2 is a protein called 50S ribosomal protein L1P.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
2	A	214	Total	C	N	O	S	Se	0	0	0
			1700	1088	303	302	1	6			
2	C	214	Total	C	N	O	S	Se	0	0	0
			1700	1088	303	302	1	6			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	37	MSE	MET	MODIFIED RESIDUE	UNP P54050
A	112	MSE	MET	MODIFIED RESIDUE	UNP P54050
A	119	MSE	MET	MODIFIED RESIDUE	UNP P54050
A	129	MSE	MET	MODIFIED RESIDUE	UNP P54050
A	169	MSE	MET	MODIFIED RESIDUE	UNP P54050
A	205	MSE	MET	MODIFIED RESIDUE	UNP P54050
C	37	MSE	MET	MODIFIED RESIDUE	UNP P54050
C	112	MSE	MET	MODIFIED RESIDUE	UNP P54050
C	119	MSE	MET	MODIFIED RESIDUE	UNP P54050
C	129	MSE	MET	MODIFIED RESIDUE	UNP P54050
C	169	MSE	MET	MODIFIED RESIDUE	UNP P54050
C	205	MSE	MET	MODIFIED RESIDUE	UNP P54050

### 3 Residue-property plots [i](#)


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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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: 49 NT FRAGMENT OF MRNA FOR L1

Chain B: 

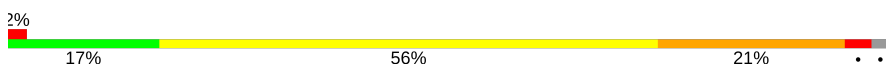


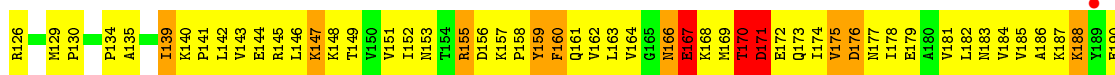
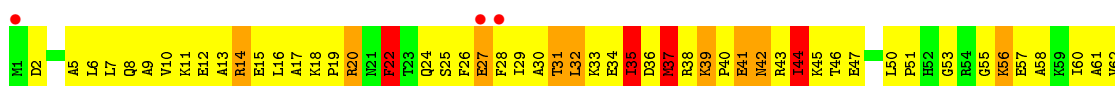
- Molecule 1: 49 NT FRAGMENT OF MRNA FOR L1

Chain D: 




- Molecule 2: 50S ribosomal protein L1P

Chain A: 



- Molecule 2: 50S ribosomal protein L1P

Chain C: 



V62	M129	K188
I63	P130	Y189
G64	K131	E190
T65	P132	K191
G66	V133	G192
	P134	L193
A69	A135	Y194
K70	M136	H195
Q71	A137	I196
A72	N138	K197
E73	I139	D198
E74	K140	A199
L75	P141	Y200
G76	L142	V201
L77	V143	K202
T78	E144	L203
V79	R145	T204
I80	L146	M205
R81	K147	G206
K82	K148	P207
E83	T149	A208
E84	V150	V209
I85	V151	K210
E86	L152	V211
E87	M153	K212
L88	T154	K213
G89	R155	E214
K90	D156	LYS
N91	K157	ALA
K92	P158	LYS
R93	Y159	LYS
K94	F160	LYS
L95	Q161	
R96	V162	
K97	L163	
	V164	
	G165	
H102	M166	
D103	E167	
F104	K168	
F105	M169	
I106	T170	
A107	D171	
Q108	E172	
A109	Q173	
D110	I174	
L111	V175	
M112	D176	
P113	M177	
L114	L178	
L115	E179	
G116	A180	
R117	V181	
Y118	L182	
	M183	
V121	V184	
L122	V185	
L123	A186	
G124	K187	
P125		
A126		
R126		

## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	212.29 Å 68.90 Å 115.87 Å 90.00° 122.99° 90.00°	Depositor
Resolution (Å)	8.00 – 3.40 28.97 – 3.40	Depositor EDS
% Data completeness (in resolution range)	92.7 (8.00-3.40) 92.5 (28.97-3.40)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.06 (at 3.39 Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.276 , 0.302 0.278 , 0.302	Depositor DCC
$R_{free}$ test set	941 reflections (5.17%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	95.0	Xtrriage
Anisotropy	0.638	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.24 , 54.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.26$	Xtrriage
Estimated twinning fraction	0.399 for -h-2*1,-k,l	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	5510	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	84.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.95% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	B	0.63	2/1181 (0.2%)	1.31	16/1839 (0.9%)
1	D	0.70	2/1181 (0.2%)	1.47	23/1839 (1.3%)
2	A	0.70	1/1718 (0.1%)	0.97	2/2294 (0.1%)
2	C	0.66	1/1718 (0.1%)	0.97	3/2294 (0.1%)
All	All	0.68	6/5798 (0.1%)	1.18	44/8266 (0.5%)

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	3	2
1	D	9	3
All	All	12	5

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1	G	OP3-P	-6.92	1.52	1.61
1	D	1	G	OP3-P	-6.75	1.53	1.61
2	A	169	MSE	CG-SE	-5.76	1.75	1.95
2	C	169	MSE	CG-SE	-5.73	1.75	1.95
1	D	43	C	C4'-C3'	-5.57	1.47	1.52

The worst 5 of 44 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	20	G	N9-C1'-C2'	22.85	143.71	114.00
1	D	43	C	N1-C1'-C2'	21.21	141.57	114.00
1	D	11	G	N9-C1'-C2'	19.49	139.34	114.00
1	B	8	A	O5'-P-OP2	-17.98	89.12	110.70
1	D	43	C	O4'-C1'-N1	-16.60	94.92	108.20

5 of 12 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	B	20	G	C4',C3',C1'
1	D	11	G	C4',C3',C1'
1	D	12	A	C4',C3',C1'
1	D	43	C	C4',C3',C1'

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	20	G	Sidechain
1	B	44	A	Sidechain
1	D	11	G	Sidechain
1	D	12	A	Sidechain
1	D	43	C	Sidechain

## 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	B	1055	0	534	94	0
1	D	1055	0	534	75	0
2	A	1700	0	1824	256	0
2	C	1700	0	1824	287	0
All	All	5510	0	4716	678	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 66.

The worst 5 of 678 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:D:23:C:H3'	1:D:24:U:H5''	1.28	1.13
1:D:43:C:H4'	1:D:44:A:OP2	1.41	1.10
1:B:34:G:H2'	1:B:35:A:H5''	1.31	1.09
2:A:62:VAL:HG12	2:A:106:ILE:HG13	1.26	1.09
2:C:44:ILE:HD12	2:C:44:ILE:H	1.15	1.05



There are no symmetry-related clashes.

## 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	
2	A	212/219 (97%)	156 (74%)	29 (14%)	27 (13%)	0	2
2	C	212/219 (97%)	139 (66%)	49 (23%)	24 (11%)	0	3
All	All	424/438 (97%)	295 (70%)	78 (18%)	51 (12%)	0	3

5 of 51 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	A	35	ILE
2	A	82	LYS
2	A	121	VAL
2	A	122	ILE
2	A	135	ALA

### 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	
2	A	182/180 (101%)	134 (74%)	48 (26%)	0	1
2	C	182/180 (101%)	136 (75%)	46 (25%)	0	2
All	All	364/360 (101%)	270 (74%)	94 (26%)	0	2

5 of 94 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	198	ASP
2	C	22	PHE
2	C	190	GLU
2	A	200	TYR
2	A	214	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
2	A	173	GLN
2	A	183	ASN
2	C	91	ASN
2	A	166	ASN
2	C	21	ASN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	B	48/49 (97%)	20 (41%)	3 (6%)
1	D	48/49 (97%)	17 (35%)	5 (10%)
All	All	96/98 (97%)	37 (38%)	8 (8%)

5 of 37 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	B	2	G
1	B	4	A
1	B	8	A
1	B	12	A
1	B	13	G

5 of 8 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	D	11	G
1	D	43	C
1	D	36	G
1	B	44	A
1	D	12	A

#### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	B	49/49 (100%)	-0.56	0 <b>100</b> <b>100</b>	56, 79, 117, 150	0
1	D	49/49 (100%)	-0.37	1 (2%) 65 64	53, 82, 139, 153	0
2	A	208/219 (94%)	-0.37	4 (1%) 66 65	9, 77, 134, 153	0
2	C	208/219 (94%)	-0.41	1 (0%) 91 90	21, 79, 132, 146	0
All	All	514/536 (95%)	-0.40	6 (1%) 79 77	9, 79, 134, 153	0

The worst 5 of 6 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	A	1	MET	4.7
2	C	1	MET	2.9
2	A	189	TYR	2.6
2	A	28	PHE	2.2
2	A	27	GLU	2.1

### 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

There are no such residues in this entry.