



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 15, 2024 – 01:39 AM EST

PDB ID : 3NFF  
Title : Crystal structure of extended Dimerization module of RNA polymerase I sub-complex A49/A34.5  
Authors : Geiger, S.R.; Lorenzen, K.; Schrieck, A.; Hanecker, P.; Kostrewa, D.; Heck, A.J.R.; Cramer, P.  
Deposited on : 2010-06-10  
Resolution : 3.24 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

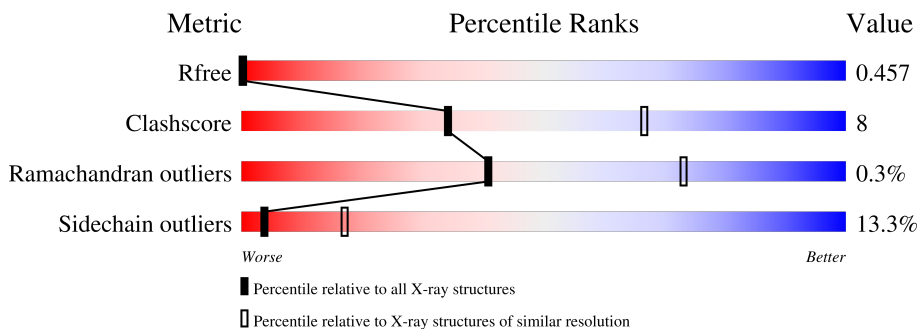
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.24 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	1619 (3.28-3.20)
Clashscore	141614	1755 (3.28-3.20)
Ramachandran outliers	138981	1728 (3.28-3.20)
Sidechain outliers	138945	1727 (3.28-3.20)

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  $\geq 3$ , 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	122	57% 22% 19%
1	C	122	66% 9% 24%
1	E	122	57% 18% 24%
1	G	122	62% 13% 24%
2	B	121	57% 28% 5% 9%
2	D	121	59% 28% 9%
2	F	121	68% 21% 9%

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Mol	Chain	Length	Quality of chain
2	H	121	 45% 37% 8% • 8%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6539 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 RNA polymerase I subunit A49.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	99	805	511	135	158	1	0	1	0
1	C	93	759	481	127	150	1	0	1	0
1	E	93	759	481	127	150	1	0	1	0
1	G	93	759	481	127	150	1	0	1	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP Q6FNZ9
A	-1	SER	-	expression tag	UNP Q6FNZ9
A	0	HIS	-	expression tag	UNP Q6FNZ9
A	72	MET	VAL	engineered mutation	UNP Q6FNZ9
C	-2	GLY	-	expression tag	UNP Q6FNZ9
C	-1	SER	-	expression tag	UNP Q6FNZ9
C	0	HIS	-	expression tag	UNP Q6FNZ9
C	72	MET	VAL	engineered mutation	UNP Q6FNZ9
E	-2	GLY	-	expression tag	UNP Q6FNZ9
E	-1	SER	-	expression tag	UNP Q6FNZ9
E	0	HIS	-	expression tag	UNP Q6FNZ9
E	72	MET	VAL	engineered mutation	UNP Q6FNZ9
G	-2	GLY	-	expression tag	UNP Q6FNZ9
G	-1	SER	-	expression tag	UNP Q6FNZ9
G	0	HIS	-	expression tag	UNP Q6FNZ9
G	72	MET	VAL	engineered mutation	UNP Q6FNZ9

- Molecule 2 is a protein called RNA polymerase I subunit A34.5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	110	Total 863	C 546	N 140	O 175	S 2	0	0	0
2	D	110	Total 863	C 546	N 140	O 175	S 2	0	0	0
2	F	110	Total 863	C 546	N 140	O 175	S 2	0	0	0
2	H	111	Total 868	C 549	N 141	O 176	S 2	0	0	0

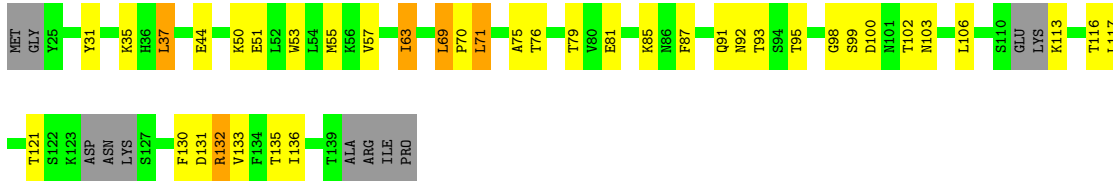
There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	23	MET	-	expression tag	UNP Q6FQI3
B	24	GLY	-	expression tag	UNP Q6FQI3
B	55	MET	LEU	engineered mutation	UNP Q6FQI3
D	23	MET	-	expression tag	UNP Q6FQI3
D	24	GLY	-	expression tag	UNP Q6FQI3
D	55	MET	LEU	engineered mutation	UNP Q6FQI3
F	23	MET	-	expression tag	UNP Q6FQI3
F	24	GLY	-	expression tag	UNP Q6FQI3
F	55	MET	LEU	engineered mutation	UNP Q6FQI3
H	23	MET	-	expression tag	UNP Q6FQI3
H	24	GLY	-	expression tag	UNP Q6FQI3
H	55	MET	LEU	engineered mutation	UNP Q6FQI3

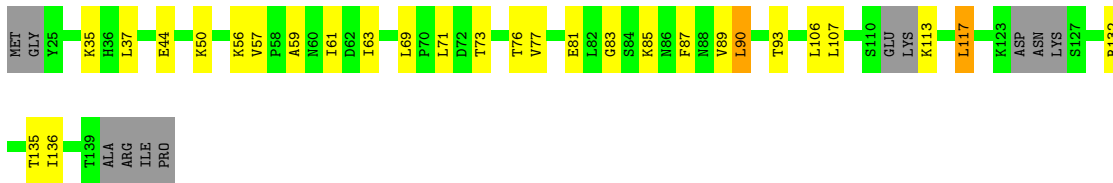
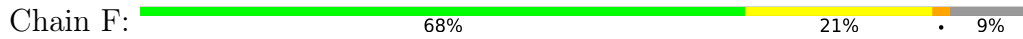




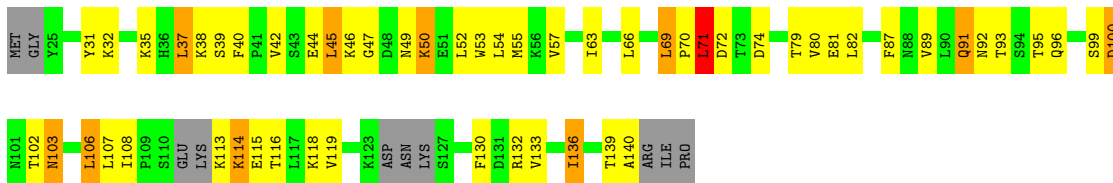
- Molecule 2: RNA polymerase I subunit A34.5



- Molecule 2: RNA polymerase I subunit A34.5



- Molecule 2: RNA polymerase I subunit A34.5



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	108.93Å 221.77Å 129.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.10 – 3.24 77.97 – 3.24	Depositor EDS
% Data completeness (in resolution range)	(Not available) (29.10-3.24) 95.7 (77.97-3.24)	Depositor EDS
$R_{merge}$	0.21	Depositor
$R_{sym}$	0.21	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.24 (at 3.26Å)	Xtrriage
Refinement program	BUSTER 2.9.2	Depositor
R, $R_{free}$	0.287 , 0.361 0.362 , 0.457	Depositor DCC
$R_{free}$ test set	1234 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	103.8	Xtrriage
Anisotropy	0.152	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 199.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.39$ , $\langle L^2 \rangle = 0.21$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.72	EDS
Total number of atoms	6539	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	113.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.26% 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	A	0.50	0/825	1.00	6/1110 (0.5%)
1	C	0.47	0/778	0.75	1/1048 (0.1%)
1	E	0.47	0/778	0.68	0/1048
1	G	0.41	0/778	0.73	0/1048
2	B	0.56	0/876	0.88	2/1184 (0.2%)
2	D	0.55	0/876	0.83	1/1184 (0.1%)
2	F	0.49	0/876	0.78	1/1184 (0.1%)
2	H	0.59	0/881	1.04	6/1191 (0.5%)
All	All	0.51	0/6668	0.85	17/8997 (0.2%)

There are no bond length outliers.

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	99	PHE	CB-CA-C	-11.41	87.57	110.40
1	A	42	LYS	CB-CA-C	-11.27	87.87	110.40
1	A	97	SER	CB-CA-C	9.53	128.21	110.10
2	H	46	LYS	CB-CA-C	-8.47	93.46	110.40
1	A	42	LYS	N-CA-C	-8.18	88.91	111.00

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	805	0	799	17	0
1	C	759	0	754	11	0
1	E	759	0	754	16	0
1	G	759	0	754	16	0
2	B	863	0	871	22	0
2	D	863	0	871	26	0
2	F	863	0	871	16	0
2	H	868	0	876	32	0
All	All	6539	0	6550	110	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 8.

The worst 5 of 110 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:D:63:ILE:HG13	1:C:72:MET:CE	1.63	1.28
2:B:95:THR:O	2:B:99:SER:HB2	1.58	1.01
2:D:63:ILE:HG13	1:C:72:MET:HE1	1.01	1.00
2:F:57:VAL:HG21	1:G:72:MET:CE	1.92	0.98
2:D:63:ILE:CG1	1:C:72:MET:HE1	1.95	0.97

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	
1	A	98/122 (80%)	87 (89%)	11 (11%)	0	100	100
1	C	92/122 (75%)	83 (90%)	9 (10%)	0	100	100
1	E	92/122 (75%)	86 (94%)	6 (6%)	0	100	100
1	G	92/122 (75%)	85 (92%)	7 (8%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	104/121 (86%)	89 (86%)	15 (14%)	0	100	100
2	D	104/121 (86%)	83 (80%)	21 (20%)	0	100	100
2	F	104/121 (86%)	89 (86%)	14 (14%)	1 (1%)	15	50
2	H	105/121 (87%)	86 (82%)	18 (17%)	1 (1%)	15	50
All	All	791/972 (81%)	688 (87%)	101 (13%)	2 (0%)	41	73

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	F	83	GLY
2	H	47	GLY

### 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	
1	A	92/109 (84%)	82 (89%)	10 (11%)	6	25
1	C	87/109 (80%)	80 (92%)	7 (8%)	12	40
1	E	87/109 (80%)	80 (92%)	7 (8%)	12	40
1	G	87/109 (80%)	80 (92%)	7 (8%)	12	40
2	B	104/113 (92%)	84 (81%)	20 (19%)	1	7
2	D	104/113 (92%)	85 (82%)	19 (18%)	1	7
2	F	104/113 (92%)	92 (88%)	12 (12%)	5	23
2	H	104/113 (92%)	84 (81%)	20 (19%)	1	7
All	All	769/888 (87%)	667 (87%)	102 (13%)	4	17

5 of 102 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	F	37	LEU
1	E	41	ARG

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Mol	Chain	Res	Type
1	G	66	THR
2	F	69	LEU
2	F	106	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	101	ASN
1	C	43	GLN
1	G	43	GLN
1	E	84	ASN
2	H	91	GLN

### 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 monosaccharides 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

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.