



# Full wwPDB X-ray Structure Validation Report i

Jan 5, 2026 – 04:08 PM JST

PDB ID : 9LYV / pdb\_00009lyv  
Title : structure of prrx bound to DNA  
Authors : Dong, C.; Yan, X.J.; Guo, S.M.; Huang, Y.L.  
Deposited on : 2025-02-21  
Resolution : 1.52 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](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 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](#) ①) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.011 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.47

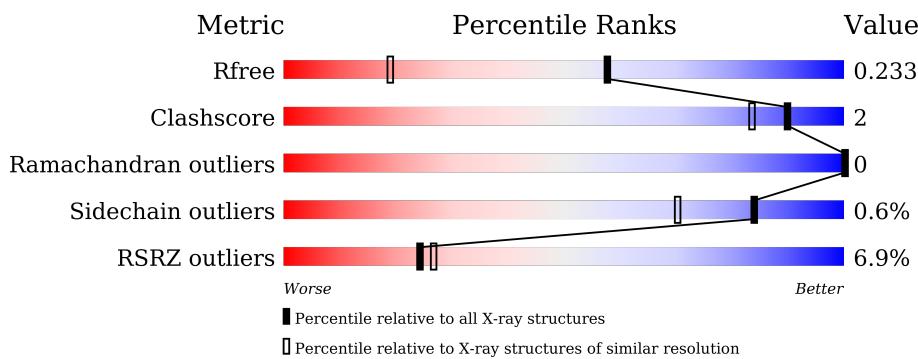
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.52 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))
$R_{free}$	164625	5293 (1.54-1.50)
Clashscore	180529	5759 (1.54-1.50)
Ramachandran outliers	177936	5653 (1.54-1.50)
Sidechain outliers	177891	5650 (1.54-1.50)
RSRZ outliers	164620	5293 (1.54-1.50)

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  $\geq 3$ , 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.



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Mol	Chain	Length	Quality of chain
2	F	12	<div style="width: 83%;"><div style="width: 8%;">8%</div><div style="width: 92%;">83%</div><div style="width: 17%;">17%</div></div>
2	H	12	<div style="width: 100%;">100%</div>
2	I	12	<div style="width: 100%;">100%</div>

## 2 Entry composition [\(i\)](#)

There are 3 unique types of molecules in this entry. The entry contains 3439 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 Paired mesoderm homeobox protein 2.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
1	A	59	Total	C	N	O	0	1	0
			526	323	115	88			
1	D	59	Total	C	N	O	0	0	0
			515	317	112	86			
1	G	58	Total	C	N	O	0	0	0
			484	298	104	82			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	103	GLY	-	expression tag	UNP Q99811
D	103	GLY	-	expression tag	UNP Q99811
G	103	GLY	-	expression tag	UNP Q99811

- Molecule 2 is a DNA chain called DNA (5'-D(\*TP\*AP\*CP\*TP\*AP\*AP\*TP\*TP\*AP\*GP\*TP\*A)-3').

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	12	Total	C	N	O	P	0	0
			243	119	43	70	11		
2	C	12	Total	C	N	O	P	0	0
			246	119	43	72	12		
2	E	12	Total	C	N	O	P	0	0
			246	119	43	72	12		
2	F	12	Total	C	N	O	P	0	0
			246	119	43	72	12		
2	H	12	Total	C	N	O	P	0	0
			243	119	43	70	11		
2	I	12	Total	C	N	O	P	0	0
			246	119	43	72	12		

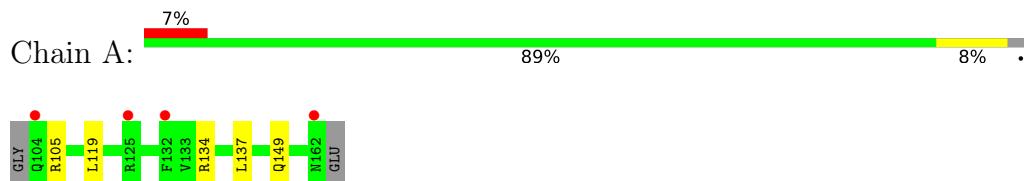
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	104	Total O 104 104	0	0
3	B	52	Total O 52 52	0	0
3	C	35	Total O 35 35	0	0
3	D	67	Total O 67 67	0	0
3	E	34	Total O 34 34	0	0
3	F	25	Total O 25 25	0	0
3	G	52	Total O 52 52	0	0
3	H	43	Total O 43 43	0	0
3	I	32	Total O 32 32	0	0

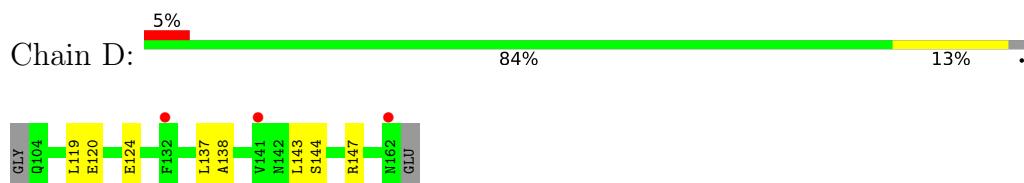
### 3 Residue-property plots [\(i\)](#)

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 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.

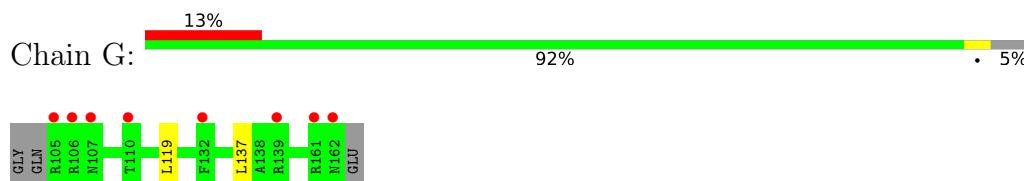
- Molecule 1: Paired mesoderm homeobox protein 2



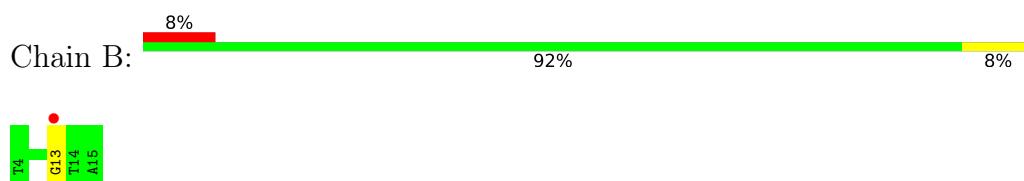
- Molecule 1: Paired mesoderm homeobox protein 2



- Molecule 1: Paired mesoderm homeobox protein 2



- Molecule 2: DNA ( $5'-D(*TP*AP*CP*TP*AP*AP*TP*TP*AP*GP*TP*A)-3'$ )



- Molecule 2: DNA ( $5'-D(*TP*AP*CP*TP*AP*AP*TP*TP*AP*GP*TP*A)-3'$ )



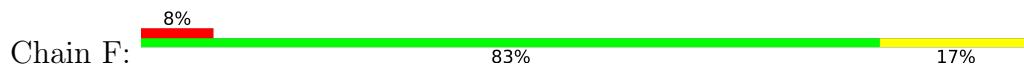
There are no outlier residues recorded for this chain.

- Molecule 2: DNA ( $5'-D(*TP*AP*CP*TP*AP*AP*TP*TP*AP*GP*TP*A)-3'$ )



There are no outlier residues recorded for this chain.

- Molecule 2: DNA (5'-D(\*TP\*AP\*CP\*TP\*AP\*AP\*TP\*TP\*AP\*GP\*TP\*A)-3')



- Molecule 2: DNA (5'-D(\*TP\*AP\*CP\*TP\*AP\*AP\*TP\*TP\*AP\*GP\*TP\*A)-3')



There are no outlier residues recorded for this chain.

- Molecule 2: DNA (5'-D(\*TP\*AP\*CP\*TP\*AP\*AP\*TP\*TP\*AP\*GP\*TP\*A)-3')



There are no outlier residues recorded for this chain.

## 4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.90Å 96.90Å 39.28Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.45 – 1.52 48.45 – 1.52	Depositor EDS
% Data completeness (in resolution range)	99.4 (48.45-1.52) 99.4 (48.45-1.52)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle^1$	1.46 (at 1.52Å)	Xtriage
Refinement program	PHENIX (1.17.1_3660: ???)	Depositor
$R$ , $R_{free}$	0.192 , 0.225 0.205 , 0.233	Depositor DCC
$R_{free}$ test set	2025 reflections (3.19%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	23.7	Xtriage
Anisotropy	0.193	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 41.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.025 for -h,-k,l 0.029 for h,-h-k,-l 0.026 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	3439	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 16.49% 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	0.34	0/535	0.51	0/716
1	D	0.27	0/524	0.49	0/702
1	G	0.49	0/492	0.68	0/662
2	B	0.40	0/272	0.73	0/418
2	C	0.40	0/275	0.77	0/422
2	E	0.37	0/275	0.67	0/422
2	F	0.36	0/275	0.70	0/422
2	H	0.53	0/272	0.75	0/418
2	I	0.39	0/275	0.69	0/422
All	All	0.39	0/3195	0.65	0/4604

There are no bond length outliers.

There are no bond angle outliers.

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	526	0	519	2	0
1	D	515	0	509	4	0
1	G	484	0	468	1	0
2	B	243	0	139	1	0
2	C	246	0	138	0	0
2	E	246	0	138	0	0
2	F	246	0	138	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	H	243	0	139	0	0
2	I	246	0	138	0	0
3	A	104	0	0	0	0
3	B	52	0	0	1	0
3	C	35	0	0	0	0
3	D	67	0	0	0	0
3	E	34	0	0	0	0
3	F	25	0	0	0	0
3	G	52	0	0	0	0
3	H	43	0	0	0	0
3	I	32	0	0	0	0
All	All	3439	0	2326	9	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 2.

All (9) 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:G:119:LEU:HD23	1:G:137:LEU:HD21	1.89	0.55
1:A:119:LEU:HD23	1:A:137:LEU:HD21	1.91	0.52
1:D:119:LEU:HD23	1:D:137:LEU:HD21	1.92	0.50
1:D:138:ALA:HB1	1:D:143:LEU:O	2.17	0.44
2:F:22:DT:H2'	2:F:23:DA:C8	2.53	0.43
1:D:120:GLU:O	1:D:124:GLU:HG2	2.18	0.43
1:A:134:ARG:CZ	1:A:149:GLN:HE21	2.32	0.42
2:B:13:DG:H2'	3:B:103:HOH:O	2.18	0.42
1:D:144:SER:HB3	1:D:147:ARG:HG2	2.03	0.41

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	58/61 (95%)	58 (100%)	0	0	100	100
1	D	57/61 (93%)	57 (100%)	0	0	100	100
1	G	56/61 (92%)	55 (98%)	1 (2%)	0	100	100
All	All	171/183 (93%)	170 (99%)	1 (1%)	0	100	100

There are no Ramachandran outliers to report.

### 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	54/55 (98%)	53 (98%)	1 (2%)	52	23
1	D	53/55 (96%)	53 (100%)	0	100	100
1	G	48/55 (87%)	48 (100%)	0	100	100
All	All	155/165 (94%)	154 (99%)	1 (1%)	84	70

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	105	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	149	GLN
1	D	127	HIS
1	G	107	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 oligosaccharides 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	A	59/61 (96%)	0.26	4 (6%) 25 27	16, 22, 45, 53	1 (1%)
1	D	59/61 (96%)	0.58	3 (5%) 34 38	20, 30, 49, 80	0
1	G	58/61 (95%)	0.74	8 (13%) 8 8	19, 31, 56, 67	0
2	B	12/12 (100%)	0.24	1 (8%) 19 20	18, 27, 39, 42	0
2	C	12/12 (100%)	0.61	0 100 100	24, 31, 37, 53	0
2	E	12/12 (100%)	0.52	0 100 100	23, 35, 49, 59	0
2	F	12/12 (100%)	0.98	1 (8%) 19 20	31, 36, 47, 66	0
2	H	12/12 (100%)	0.12	0 100 100	22, 26, 34, 36	0
2	I	12/12 (100%)	0.60	0 100 100	23, 31, 41, 59	0
All	All	248/255 (97%)	0.52	17 (6%) 24 27	16, 29, 53, 80	1 (0%)

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	162	ASN	3.8
1	G	162	ASN	3.7
1	A	132	PHE	3.7
1	A	104	GLN	3.0
1	D	132	PHE	3.0
1	G	105	ARG	2.9
1	G	107	ASN	2.6
1	D	141	VAL	2.6
1	G	132	PHE	2.5
2	F	19	DT	2.5
2	B	13	DG	2.4
1	G	106	ARG	2.2
1	A	162	ASN	2.2
1	G	110	THR	2.2
1	G	161	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	125[A]	ARG	2.0
1	G	139	ARG	2.0

## 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 oligosaccharides 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.