



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 03:58 PM GMT

PDB ID : 4DZS  
Title : Crystal structure of yeast Puf4p RNA binding domain in complex with HO-4BE mutant RNA  
Authors : Qiu, C.; Hall, T.M.T  
Deposited on : 2012-03-01  
Resolution : 3.14 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  
<http://wwpdb.org/validation/2016/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 : 1.7 (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

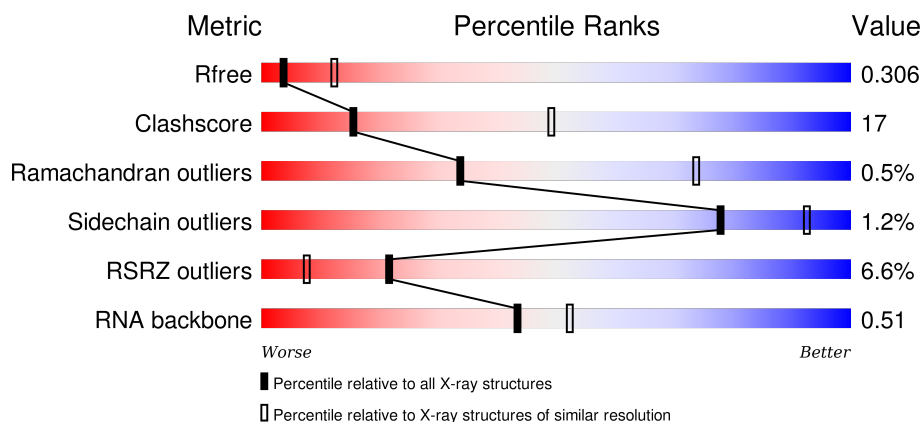
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.14 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	1095 (3.18-3.10)
Clashscore	102246	1202 (3.18-3.10)
Ramachandran outliers	100387	1162 (3.18-3.10)
Sidechain outliers	100360	1162 (3.18-3.10)
RSRZ outliers	91569	1097 (3.18-3.10)
RNA backbone	2183	1016 (3.58-2.70)

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. 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	357	<div> <div>3%</div> <div>58%</div> <div>33%</div> <div>8%</div> </div>
1	B	357	<div> <div>9%</div> <div>53%</div> <div>36%</div> <div>11%</div> </div>
2	C	9	<div> <div>33%</div> <div>56%</div> <div>11%</div> </div>
2	D	9	<div> <div>56%</div> <div>44%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5524 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 Pumilio homology domain family member 4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	328	Total	C	N	O	S	0	0	0
			2611	1658	446	494	13			
1	B	319	Total	C	N	O	S	0	0	0
			2541	1612	436	480	13			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	532	GLY	-	EXPRESSION TAG	UNP P25339
A	533	SER	-	EXPRESSION TAG	UNP P25339
A	534	PHE	-	EXPRESSION TAG	UNP P25339
A	535	THR	-	EXPRESSION TAG	UNP P25339
B	532	GLY	-	EXPRESSION TAG	UNP P25339
B	533	SER	-	EXPRESSION TAG	UNP P25339
B	534	PHE	-	EXPRESSION TAG	UNP P25339
B	535	THR	-	EXPRESSION TAG	UNP P25339

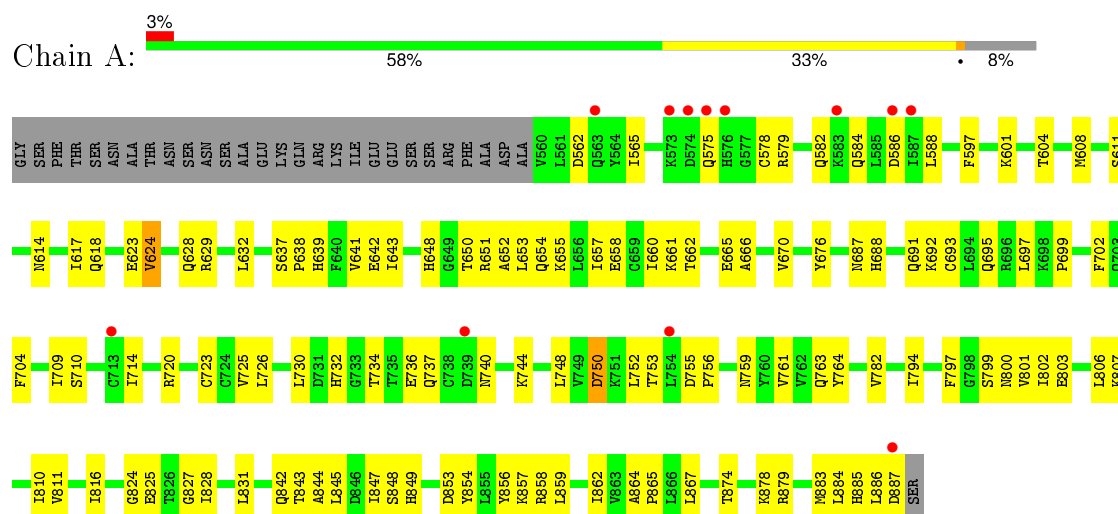
- Molecule 2 is a RNA chain called 5'-R(\*UP\*GP\*UP\*AP\*UP\*CP\*AP\*UP\*A)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	9	Total	C	N	O	P	0	0	0
			186	85	31	62	8			
2	D	9	Total	C	N	O	P	0	0	0
			186	85	31	62	8			

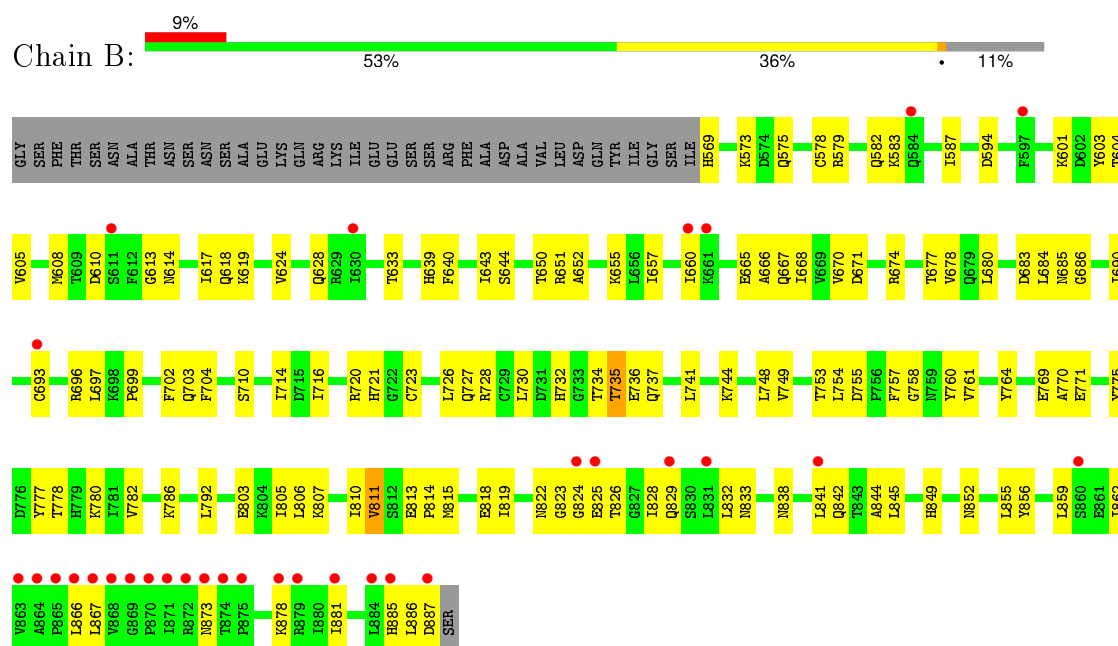
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Pumilio homology domain family member 4



- Molecule 1: Pumilio homology domain family member 4



- Molecule 2: 5'-R(\*UP\*GP\*UP\*AP\*UP\*CP\*AP\*UP\*A)-3'

Chain C:  33% 56% 11%



- Molecule 2: 5'-R(\*UP\*GP\*UP\*AP\*UP\*CP\*AP\*UP\*A)-3'

Chain D:  56% 44%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.42Å 135.75Å 148.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	43.28 – 3.14 49.07 – 3.14	Depositor EDS
% Data completeness (in resolution range)	90.0 (43.28-3.14) 89.3 (49.07-3.14)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.60 (at 3.12Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.1_743)	Depositor
R, $R_{free}$	0.260 , 0.316 0.245 , 0.306	Depositor DCC
$R_{free}$ test set	1902 reflections (8.89%)	DCC
Wilson B-factor (Å <sup>2</sup> )	49.3	Xtriage
Anisotropy	0.990	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 36.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.27$	Xtriage
Outliers	3 of 22389 reflections (0.013%)	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	5524	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	64.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.51% 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, 0.375 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	0.23	0/2655	0.39	0/3592
1	B	0.22	0/2584	0.39	0/3495
2	C	0.20	0/207	0.43	0/320
2	D	0.16	0/207	0.43	0/320
All	All	0.22	0/5653	0.39	0/7727

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	2611	0	2654	92	0
1	B	2541	0	2583	95	0
2	C	186	0	97	6	0
2	D	186	0	97	4	0
All	All	5524	0	5431	188	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 17.

The worst 5 of 188 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:A:782:VAL:HG21	1:A:811:VAL:HG11	1.42	0.97
1:A:734:THR:HG22	1:A:736:GLU:H	1.34	0.93
1:A:575:GLN:HE21	1:A:579:ARG:HE	0.90	0.90
1:A:624:VAL:HG13	1:A:628:GLN:HB2	1.53	0.89
1:A:575:GLN:NE2	1:A:579:ARG:HE	1.74	0.84

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	326/357 (91%)	291 (89%)	33 (10%)	2 (1%)	30	70
1	B	317/357 (89%)	287 (90%)	29 (9%)	1 (0%)	46	81
All	All	643/714 (90%)	578 (90%)	62 (10%)	3 (0%)	34	74

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	735	THR
1	A	586	ASP
1	A	794	ILE

### 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	298/322 (92%)	294 (99%)	4 (1%)	76	91
1	B	290/322 (90%)	287 (99%)	3 (1%)	82	93
All	All	588/644 (91%)	581 (99%)	7 (1%)	78	92

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	810	ILE
1	B	811	VAL
1	B	603	TYR
1	A	720	ARG
1	B	685	ASN

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

Mol	Chain	Res	Type
1	B	569	HIS
1	B	628	GLN
1	B	654	GLN
1	A	763	GLN
1	B	648	HIS

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	C	8/9 (88%)	1 (12%)	0
2	D	8/9 (88%)	0	0
All	All	16/18 (88%)	1 (6%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	C	7	A

There are no RNA pucker outliers to report.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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	A	328/357 (91%)	0.36	12 (3%) 45 22	34, 56, 103, 118	0
1	B	319/357 (89%)	0.66	32 (10%) 9 3	38, 59, 101, 116	0
2	C	9/9 (100%)	0.50	0 100 100	64, 85, 108, 111	0
2	D	9/9 (100%)	0.36	0 100 100	62, 74, 94, 99	0
All	All	665/732 (90%)	0.50	44 (6%) 22 8	34, 57, 103, 118	0

The worst 5 of 44 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	874	THR	7.0
1	B	871	ILE	6.0
1	B	868	VAL	5.6
1	B	867	LEU	5.2
1	B	887	ASP	5.2

### 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.