



# wwPDB X-ray Structure Validation Summary Report i

Feb 28, 2014 – 11:17 AM GMT

PDB ID : 3H3D  
Title : Drosophila Pumilio RNA binding domain (Puf domain)  
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Deposited on : 2009-04-16  
Resolution : 2.30 Å(reported)

This is a wwPDB 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/ValidationPDFNotes.html>

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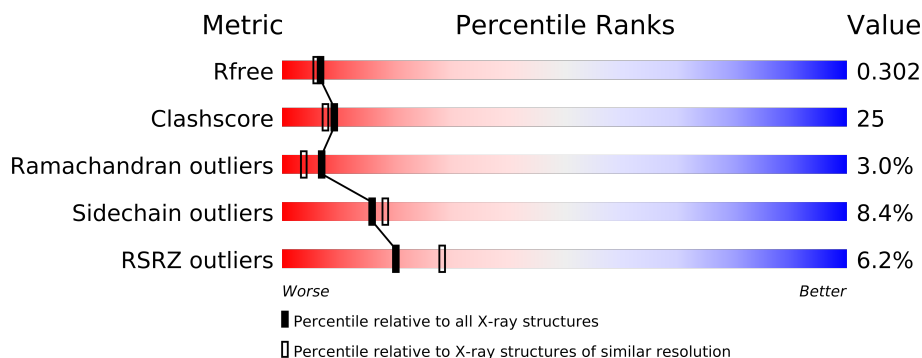
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	dev-1323
EDS	:	stable22639
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.3.0 (Settle)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.30 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))
$R_{free}$	66092	2929 (2.30-2.30)
Clashscore	79885	3679 (2.30-2.30)
Ramachandran outliers	78287	3642 (2.30-2.30)
Sidechain outliers	78261	3641 (2.30-2.30)
RSRZ outliers	66119	2930 (2.30-2.30)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	X	323	
1	Y	323	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5344 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Maternal protein pumilio.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	X	313	Total	C	N	O	S	0	0	0
			2501	1577	438	469	17			
1	Y	314	Total	C	N	O	S	0	0	0
			2508	1581	442	468	17			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
X	-2	GLY	-	EXPRESSION TAG	UNP P25822
X	-1	SER	-	EXPRESSION TAG	UNP P25822
X	0	HIS	-	EXPRESSION TAG	UNP P25822
X	1	MET	-	EXPRESSION TAG	UNP P25822
X	315	LYS	PRO	SEE REMARK 999	UNP P25822
X	316	ASN	HIS	SEE REMARK 999	UNP P25822
Y	312	GLY	-	EXPRESSION TAG	UNP P25822
Y	313	SER	-	EXPRESSION TAG	UNP P25822
Y	314	HIS	-	EXPRESSION TAG	UNP P25822
Y	315	MET	-	EXPRESSION TAG	UNP P25822
Y	629	LYS	PRO	SEE REMARK 999	UNP P25822
Y	630	ASN	HIS	SEE REMARK 999	UNP P25822

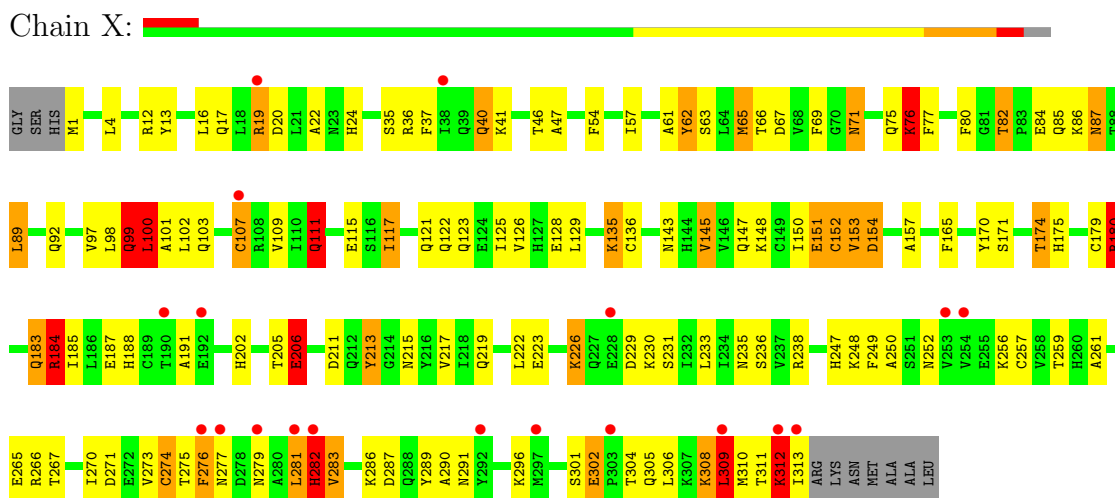
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	X	179	Total	O	0	0
			179	179		
2	Y	156	Total	O	0	0
			156	156		

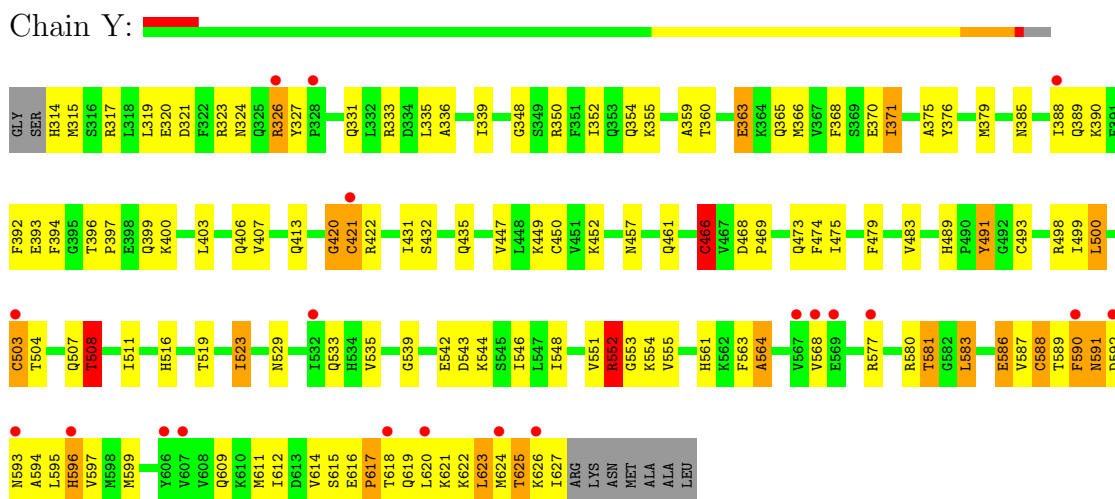
### 3 Residue-property plots

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: Maternal protein pumilio



#### • Molecule 1: Maternal protein pumilio



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	94.58Å 94.58Å 229.27Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.78 – 2.30 19.78 – 2.30	Depositor EDS
% Data completeness (in resolution range)	95.3 (19.78-2.30) 94.7 (19.78-2.30)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.01 (at 2.30Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.252 , 0.298 0.252 , 0.302	Depositor DCC
$R_{free}$ test set	2440 reflections (5.29%)	DCC
Wilson B-factor (Å <sup>2</sup> )	37.2	Xtriage
Anisotropy	0.006	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.42 , 50.5	EDS
Estimated twinning fraction	0.079 for h,-h-k,-l	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.29$	Xtriage
Outliers	1 of 48553 reflections (0.002%)	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	5344	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.48% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality

### 5.1 Standard geometry

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	X	1.68	22/2544 (0.9%)	1.28	25/3435 (0.7%)
1	Y	1.50	16/2551 (0.6%)	1.25	9/3444 (0.3%)
All	All	1.59	38/5095 (0.7%)	1.26	34/6879 (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	X	0	1

The worst 5 of 38 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	X	107	CYS	CB-SG	36.44	2.44	1.82
1	Y	466	CYS	CB-SG	18.19	2.13	1.82
1	X	107	CYS	CA-CB	15.43	1.87	1.53
1	Y	421	CYS	CA-CB	14.30	1.85	1.53
1	X	183	GLN	CD-NE2	13.38	1.66	1.32

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	Y	421	CYS	CA-CB-SG	19.74	149.53	114.00
1	X	107	CYS	CA-CB-SG	19.57	149.22	114.00
1	Y	421	CYS	N-CA-CB	16.31	139.96	110.60
1	X	136	CYS	CA-CB-SG	-11.20	93.84	114.00
1	X	107	CYS	N-CA-CB	11.15	130.66	110.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	X	309	LEU	Peptide

## 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	X	2501	0	2491	115	0
1	Y	2508	0	2497	139	0
2	X	179	0	0	10	0
2	Y	156	0	0	12	0
All	All	5344	0	4988	249	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 25.

The worst 5 of 249 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:X:183:GLN:CB	1:X:183:GLN:CG	1.77	1.56
1:X:111:GLN:CG	1:X:111:GLN:CD	1.75	1.54
1:Y:421:CYS:N	1:Y:421:CYS:CA	1.70	1.53
1:X:107:CYS:CA	1:X:107:CYS:CB	1.87	1.51
1:Y:421:CYS:CA	1:Y:421:CYS:CB	1.85	1.49

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	
1	X	311/323 (96%)	288 (93%)	12 (4%)	11 (4%)	6	3
1	Y	312/323 (97%)	282 (90%)	22 (7%)	8 (3%)	8	5
All	All	623/646 (96%)	570 (92%)	34 (6%)	19 (3%)	7	4

5 of 19 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	X	180	ARG
1	X	282	HIS
1	X	312	LYS
1	Y	590	PHE
1	Y	617	PRO

### 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	
1	X	279/289 (96%)	251 (90%)	28 (10%)	11	12
1	Y	279/289 (96%)	260 (93%)	19 (7%)	22	28
All	All	558/578 (96%)	511 (92%)	47 (8%)	16	18

5 of 47 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	X	282	HIS
1	X	311	THR
1	Y	591	ASN
1	X	301	SER
1	X	312	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	X	219	GLN
1	X	247	HIS
1	Y	561	HIS

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Mol	Chain	Res	Type
1	X	220	HIS
1	X	224	HIS

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.

### 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 ⓘ

There are no carbohydrates in this entry.

### 5.6 Ligand geometry ⓘ

There are no ligands in this entry.

### 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

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	X	313/323 (96%)	0.37	19 (6%) 21 29	17, 39, 71, 87	0
1	Y	314/323 (97%)	0.47	20 (6%) 19 27	19, 42, 73, 97	0
All	All	627/646 (97%)	0.42	39 (6%) 20 28	17, 41, 72, 97	0

The worst 5 of 39 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	Y	593	ASN	7.8
1	X	276	PHE	7.7
1	Y	590	PHE	4.5
1	X	281	LEU	4.0
1	X	107	CYS	3.9

### 6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates

There are no carbohydrates in this entry.

### 6.4 Ligands

There are no ligands in this entry.

### 6.5 Other polymers

There are no such residues in this entry.