



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 26, 2024 – 06:40 AM EDT

PDB ID : 6TFM  
Title : Frizzled8 CRD  
Authors : Zhao, Y.; Jones, E.Y.  
Deposited on : 2019-11-14  
Resolution : 2.34 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 ⓘ 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 : 2.37.1  
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) : 2.37.1

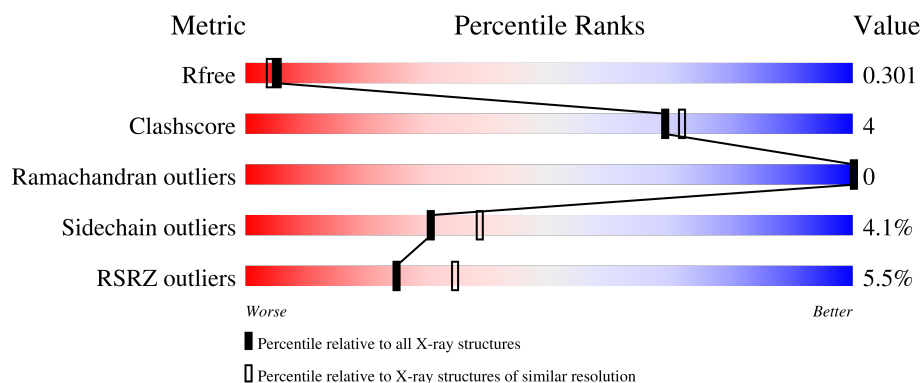
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.34 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	2096 (2.36-2.32)
Clashscore	141614	2193 (2.36-2.32)
Ramachandran outliers	138981	2159 (2.36-2.32)
Sidechain outliers	138945	2160 (2.36-2.32)
RSRZ outliers	127900	2067 (2.36-2.32)

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.

Mol	Chain	Length	Quality of chain
1	A	138	<div> <div>5%</div> <div>83%</div> <div>10%</div> <div>7%</div> </div>
1	B	138	<div> <div>6%</div> <div>86%</div> <div>7%</div> <div>7%</div> </div>
1	C	138	<div> <div>4%</div> <div>75%</div> <div>16%</div> <div>7%</div> </div>
1	D	138	<div> <div>6%</div> <div>79%</div> <div>12%</div> <div>8%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4199 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 Frizzled-8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	129	Total	C	N	O	S	0	0	0
			1043	664	172	192	15			
1	D	127	Total	C	N	O	S	0	0	0
			1028	654	170	189	15			
1	B	129	Total	C	N	O	S	0	0	0
			1043	664	172	192	15			
1	C	128	Total	C	N	O	S	0	0	0
			1036	660	171	190	15			

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	25	GLU	-	expression tag	UNP Q61091
A	26	THR	-	expression tag	UNP Q61091
A	27	GLY	-	expression tag	UNP Q61091
A	49	GLU	ASN	conflict	UNP Q61091
A	152	GLU	-	expression tag	UNP Q61091
A	153	ARG	-	expression tag	UNP Q61091
A	154	GLY	-	expression tag	UNP Q61091
A	155	THR	-	expression tag	UNP Q61091
A	156	LEU	-	expression tag	UNP Q61091
A	157	GLU	-	expression tag	UNP Q61091
A	158	VAL	-	expression tag	UNP Q61091
A	159	LEU	-	expression tag	UNP Q61091
A	160	PHE	-	expression tag	UNP Q61091
A	161	GLN	-	expression tag	UNP Q61091
A	162	GLY	-	expression tag	UNP Q61091
D	25	GLU	-	expression tag	UNP Q61091
D	26	THR	-	expression tag	UNP Q61091
D	27	GLY	-	expression tag	UNP Q61091
D	49	GLU	ASN	conflict	UNP Q61091
D	152	GLU	-	expression tag	UNP Q61091
D	153	ARG	-	expression tag	UNP Q61091

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Chain	Residue	Modelled	Actual	Comment	Reference
D	154	GLY	-	expression tag	UNP Q61091
D	155	THR	-	expression tag	UNP Q61091
D	156	LEU	-	expression tag	UNP Q61091
D	157	GLU	-	expression tag	UNP Q61091
D	158	VAL	-	expression tag	UNP Q61091
D	159	LEU	-	expression tag	UNP Q61091
D	160	PHE	-	expression tag	UNP Q61091
D	161	GLN	-	expression tag	UNP Q61091
D	162	GLY	-	expression tag	UNP Q61091
B	25	GLU	-	expression tag	UNP Q61091
B	26	THR	-	expression tag	UNP Q61091
B	27	GLY	-	expression tag	UNP Q61091
B	49	GLU	ASN	conflict	UNP Q61091
B	152	GLU	-	expression tag	UNP Q61091
B	153	ARG	-	expression tag	UNP Q61091
B	154	GLY	-	expression tag	UNP Q61091
B	155	THR	-	expression tag	UNP Q61091
B	156	LEU	-	expression tag	UNP Q61091
B	157	GLU	-	expression tag	UNP Q61091
B	158	VAL	-	expression tag	UNP Q61091
B	159	LEU	-	expression tag	UNP Q61091
B	160	PHE	-	expression tag	UNP Q61091
B	161	GLN	-	expression tag	UNP Q61091
B	162	GLY	-	expression tag	UNP Q61091
C	25	GLU	-	expression tag	UNP Q61091
C	26	THR	-	expression tag	UNP Q61091
C	27	GLY	-	expression tag	UNP Q61091
C	49	GLU	ASN	conflict	UNP Q61091
C	152	GLU	-	expression tag	UNP Q61091
C	153	ARG	-	expression tag	UNP Q61091
C	154	GLY	-	expression tag	UNP Q61091
C	155	THR	-	expression tag	UNP Q61091
C	156	LEU	-	expression tag	UNP Q61091
C	157	GLU	-	expression tag	UNP Q61091
C	158	VAL	-	expression tag	UNP Q61091
C	159	LEU	-	expression tag	UNP Q61091
C	160	PHE	-	expression tag	UNP Q61091
C	161	GLN	-	expression tag	UNP Q61091
C	162	GLY	-	expression tag	UNP Q61091

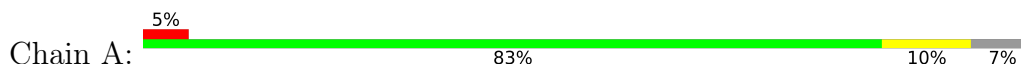
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	16	Total 16	O 16	0	0
2	D	8	Total 8	O 8	0	0
2	B	14	Total 14	O 14	0	0
2	C	11	Total 11	O 11	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.

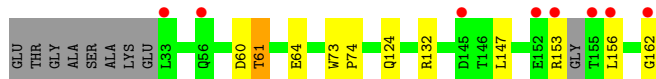
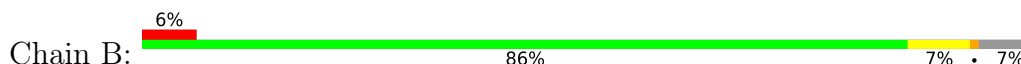
- Molecule 1: Frizzled-8



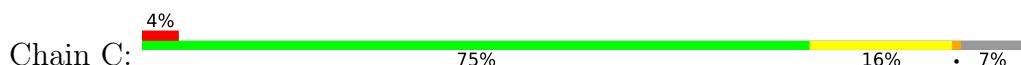
- Molecule 1: Frizzled-8



- Molecule 1: Frizzled-8



- Molecule 1: Frizzled-8



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	52.30Å 66.04Å 72.67Å 90.00° 90.10° 90.00°	Depositor
Resolution (Å)	72.67 – 2.34 72.67 – 2.34	Depositor EDS
% Data completeness (in resolution range)	93.7 (72.67-2.34) 93.3 (72.67-2.34)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.71 (at 2.34Å)	Xtriage
Refinement program	PHENIX dev_3488	Depositor
R, $R_{free}$	0.243 , 0.300 0.244 , 0.301	Depositor DCC
$R_{free}$ test set	1012 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	13.8	Xtriage
Anisotropy	0.248	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 14.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.189 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	4199	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 34.53 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.7249e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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	0.29	0/1072	0.50	0/1454
1	B	0.28	0/1072	0.50	0/1454
1	C	0.28	0/1065	0.54	0/1444
1	D	0.27	0/1057	0.46	0/1433
All	All	0.28	0/4266	0.50	0/5785

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	1043	0	988	5	0
1	B	1043	0	988	4	0
1	C	1036	0	981	12	0
1	D	1028	0	970	9	0
2	A	16	0	0	0	0
2	B	14	0	0	0	0
2	C	11	0	0	0	0
2	D	8	0	0	0	0
All	All	4199	0	3927	30	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 4.



All (30) 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:83:ASP:OD2	1:A:113:ARG:NE	2.06	0.89
1:C:147:LEU:HA	1:C:162:GLY:HA2	1.60	0.83
1:A:83:ASP:OD1	1:A:151:TYR:OH	2.03	0.76
1:D:147:LEU:HA	1:D:162:GLY:HA2	1.69	0.73
1:B:147:LEU:HA	1:B:162:GLY:HA2	1.72	0.71
1:C:61:THR:HG23	1:C:64:GLU:H	1.63	0.62
1:C:46:ILE:O	1:C:156:LEU:HD22	2.09	0.52
1:C:153:ARG:HA	1:C:156:LEU:HA	1.91	0.52
1:B:153:ARG:HA	1:B:156:LEU:H	1.75	0.51
1:A:139:PRO:HG2	1:A:148:CYS:HB3	1.94	0.49
1:C:43:CYS:O	1:C:46:ILE:HG13	2.12	0.49
1:D:139:PRO:HG2	1:D:148:CYS:HB3	1.96	0.48
1:C:149:MET:HG3	1:C:158:VAL:HG13	1.96	0.48
1:D:42:LEU:O	1:D:85:LYS:HE2	2.14	0.47
1:C:73:TRP:CG	1:C:74:PRO:HD3	2.50	0.46
1:B:73:TRP:CG	1:B:74:PRO:HD3	2.52	0.45
1:C:87:PHE:HE2	1:C:133:MET:HE2	1.83	0.43
1:B:61:THR:HG23	1:B:64:GLU:H	1.84	0.43
1:A:73:TRP:CG	1:A:74:PRO:HD3	2.53	0.43
1:D:82:PRO:HB2	1:D:153:ARG:HH12	1.84	0.43
1:D:73:TRP:CG	1:D:74:PRO:HD3	2.54	0.42
1:D:83:ASP:OD1	1:D:151:TYR:OH	2.26	0.42
1:C:35:CYS:HB3	1:C:50:TYR:HB3	2.02	0.42
1:D:56:GLN:O	1:D:56:GLN:HG2	2.20	0.42
1:D:101:LYS:HA	1:D:101:LYS:HD3	1.87	0.41
1:D:134:ARG:HG3	1:D:137:ARG:HG2	2.02	0.41
1:C:132:ARG:H	1:C:132:ARG:HG2	1.67	0.40
1:A:147:LEU:HD22	1:A:160:PHE:HB3	2.04	0.40
1:C:63:ASP:O	1:C:67:LEU:HD13	2.22	0.40
1:C:73:TRP:CD1	1:C:74:PRO:HD3	2.57	0.40

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	A	125/138 (91%)	122 (98%)	3 (2%)	0	100	100
1	B	125/138 (91%)	120 (96%)	5 (4%)	0	100	100
1	C	124/138 (90%)	121 (98%)	3 (2%)	0	100	100
1	D	123/138 (89%)	119 (97%)	4 (3%)	0	100	100
All	All	497/552 (90%)	482 (97%)	15 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 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	A	116/121 (96%)	111 (96%)	5 (4%)	29	36
1	B	116/121 (96%)	112 (97%)	4 (3%)	37	46
1	C	115/121 (95%)	108 (94%)	7 (6%)	18	21
1	D	114/121 (94%)	111 (97%)	3 (3%)	46	56
All	All	461/484 (95%)	442 (96%)	19 (4%)	30	38

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	33	LEU
1	A	60	ASP
1	A	124	GLN
1	A	132	ARG
1	A	153	ARG
1	D	56	GLN
1	D	131	ASP
1	D	156	LEU
1	B	60	ASP
1	B	61	THR

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Mol	Chain	Res	Type
1	B	124	GLN
1	B	132	ARG
1	C	33	LEU
1	C	67	LEU
1	C	68	GLU
1	C	77	GLU
1	C	78	ILE
1	C	123	ARG
1	C	132	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	56	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

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	129/138 (93%)	0.25	7 (5%)	25 36	7, 17, 33, 45	0
1	B	129/138 (93%)	0.45	8 (6%)	20 28	10, 21, 41, 47	0
1	C	128/138 (92%)	0.27	5 (3%)	39 50	8, 21, 33, 52	0
1	D	127/138 (92%)	0.22	8 (6%)	20 28	7, 18, 37, 52	0
All	All	513/552 (92%)	0.30	28 (5%)	25 34	7, 19, 38, 52	0

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	33	LEU	5.0
1	A	33	LEU	4.3
1	C	152	GLU	4.2
1	C	162	GLY	4.1
1	D	162	GLY	3.9
1	B	162	GLY	3.6
1	A	146	THR	3.5
1	A	162	GLY	3.0
1	D	146	THR	3.0
1	B	56	GLN	2.9
1	B	145	ASP	2.9
1	C	127	PHE	2.8
1	B	156	LEU	2.8
1	A	153	ARG	2.7
1	B	153	ARG	2.7
1	C	33	LEU	2.6
1	D	153	ARG	2.4
1	A	151	TYR	2.3
1	D	156	LEU	2.2
1	D	56	GLN	2.2
1	A	56	GLN	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	155	THR	2.2
1	C	153	ARG	2.2
1	B	152	GLU	2.1
1	D	145	ASP	2.1
1	D	144	PRO	2.1
1	D	143	ASN	2.1
1	A	144	PRO	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 monosaccharides 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.