



# Full wwPDB X-ray Structure Validation Report ⓘ

May 21, 2020 – 05:56 am BST

PDB ID : 3VZ2  
Title : Structural insights into substrate and cofactor selection by sp2771  
Authors : Yuan, Y.A.; Yuan, Z.; Yin, B.; Wei, D.  
Deposited on : 2012-10-09  
Resolution : 2.50 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.

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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 : 2.11  
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) : 2.11

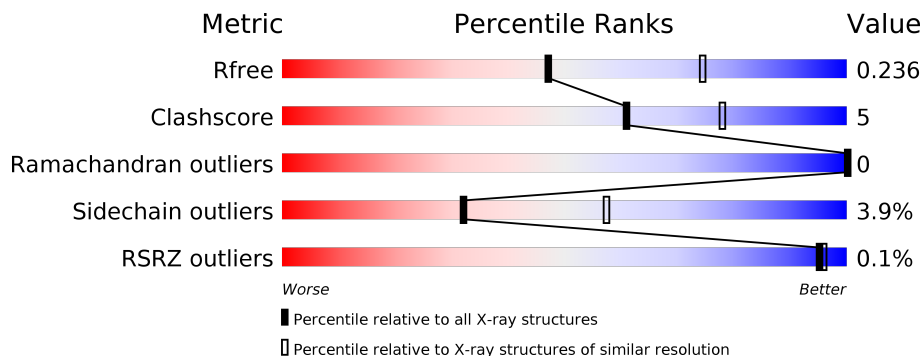
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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 on 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	470	 84% 11% . .
1	B	470	 88% 10% . .

## 2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 7169 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 Succinate-semialdehyde dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	453	3445	2204	582	646	13	0	0	0
1	B	461	3506	2242	595	655	14	0	0	0

There are 34 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	-14	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	-13	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	-12	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	-11	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	-10	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	-9	SER	-	EXPRESSION TAG	UNP B1XMM6
A	-8	SER	-	EXPRESSION TAG	UNP B1XMM6
A	-7	GLY	-	EXPRESSION TAG	UNP B1XMM6
A	-6	LEU	-	EXPRESSION TAG	UNP B1XMM6
A	-5	VAL	-	EXPRESSION TAG	UNP B1XMM6
A	-4	PRO	-	EXPRESSION TAG	UNP B1XMM6
A	-3	ARG	-	EXPRESSION TAG	UNP B1XMM6
A	-2	GLY	-	EXPRESSION TAG	UNP B1XMM6
A	-1	SER	-	EXPRESSION TAG	UNP B1XMM6
A	0	HIS	-	EXPRESSION TAG	UNP B1XMM6
A	419	ALA	SER	ENGINEERED MUTATION	UNP B1XMM6
B	-15	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	-14	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	-13	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	-12	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	-11	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	-10	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	-9	SER	-	EXPRESSION TAG	UNP B1XMM6
B	-8	SER	-	EXPRESSION TAG	UNP B1XMM6

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-7	GLY	-	EXPRESSION TAG	UNP B1XMM6
B	-6	LEU	-	EXPRESSION TAG	UNP B1XMM6
B	-5	VAL	-	EXPRESSION TAG	UNP B1XMM6
B	-4	PRO	-	EXPRESSION TAG	UNP B1XMM6
B	-3	ARG	-	EXPRESSION TAG	UNP B1XMM6
B	-2	GLY	-	EXPRESSION TAG	UNP B1XMM6
B	-1	SER	-	EXPRESSION TAG	UNP B1XMM6
B	0	HIS	-	EXPRESSION TAG	UNP B1XMM6
B	419	ALA	SER	ENGINEERED MUTATION	UNP B1XMM6

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	117	Total O 117 117	0	0
2	B	101	Total O 101 101	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	46.93Å 116.96Å 180.60Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.12 – 2.50 49.09 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.9 (42.12-2.50) 97.9 (49.09-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	7.47 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.177 , 0.237 0.182 , 0.236	Depositor DCC
$R_{free}$ test set	1755 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.1	Xtrriage
Anisotropy	0.080	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 32.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7169	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	27.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.97% 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	0.76	0/3518	0.85	6/4780 (0.1%)
1	B	0.76	0/3581	0.86	7/4865 (0.1%)
All	All	0.76	0/7099	0.85	13/9645 (0.1%)

There are no bond length outliers.

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	48	ARG	NE-CZ-NH1	11.78	126.19	120.30
1	B	48	ARG	NE-CZ-NH2	-9.19	115.71	120.30
1	B	254	ARG	NE-CZ-NH2	-7.05	116.77	120.30
1	B	267	ARG	NE-CZ-NH2	-6.84	116.88	120.30
1	B	254	ARG	NE-CZ-NH1	6.61	123.61	120.30
1	A	420	ASP	CB-CG-OD1	6.46	124.11	118.30
1	B	420	ASP	CB-CG-OD1	6.45	124.10	118.30
1	A	233	ASP	CB-CG-OD2	-5.47	113.37	118.30
1	A	401	ARG	NE-CZ-NH1	5.43	123.02	120.30
1	A	204	LEU	CA-CB-CG	5.36	127.62	115.30
1	B	293	ASP	CB-CG-OD1	5.27	123.04	118.30
1	A	60	ARG	NE-CZ-NH1	5.25	122.92	120.30
1	A	254	ARG	NE-CZ-NH2	-5.25	117.68	120.30

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	3445	0	3454	33	0
1	B	3506	0	3521	31	0
2	A	117	0	0	0	0
2	B	101	0	0	2	0
All	All	7169	0	6975	63	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 5.

All (63) 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:B:298:GLU:HG2	2:B:541:HOH:O	1.57	1.02
1:A:251:THR:O	1:A:255:THR:HB	1.77	0.84
1:A:313:ILE:HD11	1:A:364:VAL:HG21	1.63	0.80
1:B:194:ILE:HD13	1:B:214:LEU:HD12	1.65	0.78
1:B:243:LEU:HD11	1:B:274:ILE:HG13	1.73	0.71
1:B:243:LEU:HD21	1:B:274:ILE:HG12	1.75	0.68
1:A:254:ARG:HD2	1:A:254:ARG:O	1.95	0.66
1:A:313:ILE:CD1	1:A:364:VAL:HG21	2.28	0.64
1:A:254:ARG:CD	1:A:254:ARG:O	2.47	0.62
1:A:122:GLY:H	1:A:149:ASN:HD22	1.51	0.59
1:B:254:ARG:CD	1:B:254:ARG:O	2.50	0.59
1:A:128:MET:HG3	1:A:137:VAL:HG22	1.86	0.56
1:B:260:GLN:HE22	1:B:305:ALA:H	1.55	0.55
1:B:306:THR:OG1	1:B:309:ILE:HG12	2.07	0.55
1:B:254:ARG:HD2	1:B:254:ARG:O	2.05	0.54
1:B:239:PRO:HA	1:B:274:ILE:HD13	1.90	0.54
1:A:347:THR:HG22	1:A:367:VAL:HG22	1.91	0.53
1:A:111:ALA:HB2	1:A:452:TRP:NE1	2.24	0.51
1:A:263:ILE:HG21	1:A:425:PHE:HZ	1.76	0.51
1:B:75:LYS:HE2	1:B:257:ASN:HD21	1.77	0.49
1:B:48:ARG:HD3	1:B:95:ALA:O	2.12	0.49
1:B:121:LEU:N	1:B:149:ASN:HD21	2.11	0.49
1:A:121:LEU:H	1:A:149:ASN:HD21	1.59	0.49
1:B:243:LEU:HD21	1:B:274:ILE:CG1	2.44	0.48
1:B:254:ARG:HD3	1:B:254:ARG:O	2.14	0.48
1:A:270:LEU:O	1:A:369:THR:HA	2.12	0.47
1:B:5:THR:HG23	1:B:72:GLU:HG2	1.96	0.47
1:A:401:ARG:HD2	1:A:405:GLU:OE2	2.15	0.47
1:A:139:ARG:NH2	1:A:228:GLU:OE1	2.48	0.47
1:B:434:GLY:O	1:B:435:ARG:NH1	2.44	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:208:GLU:HB3	1:B:209:PRO:HD3	1.97	0.46
1:B:111:ALA:HB2	1:B:452:TRP:NE1	2.30	0.46
1:A:344:THR:HB	1:A:364:VAL:HG22	1.98	0.46
1:A:94:TYR:CD2	1:A:143:PRO:HD3	2.51	0.46
1:B:123:ILE:HD12	1:B:198:ARG:HB3	1.98	0.46
1:A:137:VAL:HG11	1:A:166:VAL:HG11	1.97	0.45
1:A:61:ASP:O	1:A:62:THR:C	2.54	0.45
1:B:159:VAL:HG23	1:B:159:VAL:O	2.17	0.45
1:A:321:VAL:HG21	1:A:327:ILE:HD11	1.99	0.45
1:A:127:VAL:CG1	1:A:204:LEU:HD22	2.47	0.45
1:A:51:LEU:HD13	1:A:91:CYS:O	2.17	0.45
1:B:0:HIS:ND1	1:B:18:LYS:HG2	2.32	0.44
1:A:122:GLY:H	1:A:149:ASN:ND2	2.16	0.44
1:A:191:GLU:O	1:A:192:GLN:C	2.55	0.43
1:B:194:ILE:CD1	1:B:214:LEU:HD12	2.43	0.43
1:A:139:ARG:NE	1:A:436:GLU:OE1	2.43	0.43
1:B:122:GLY:H	1:B:149:ASN:HD22	1.65	0.43
1:A:204:LEU:CD1	1:A:204:LEU:C	2.87	0.43
1:B:111:ALA:HB2	1:B:452:TRP:CE2	2.54	0.43
1:A:254:ARG:HD3	1:A:254:ARG:O	2.19	0.42
1:B:254:ARG:HD3	1:B:254:ARG:HA	1.67	0.42
1:A:347:THR:HG22	1:A:367:VAL:CG2	2.49	0.41
1:B:121:LEU:H	1:B:149:ASN:HD21	1.67	0.41
1:A:154:LYS:HD3	1:A:155:HIS:O	2.20	0.41
1:A:123:ILE:HD12	1:A:198:ARG:HB3	2.02	0.41
1:B:69:MET:HG2	1:B:133:PRO:HG2	2.02	0.41
1:A:254:ARG:HD3	1:A:254:ARG:HA	1.62	0.41
1:A:452:TRP:HB3	1:B:412:PHE:CD2	2.56	0.41
1:B:37:GLN:HA	1:B:37:GLN:HE21	1.86	0.41
1:A:208:GLU:HA	1:A:229:LEU:HD13	2.04	0.40
1:B:298:GLU:CG	2:B:541:HOH:O	2.37	0.40
1:A:5:THR:HG23	1:A:72:GLU:HG2	2.03	0.40
1:B:86:LYS:NZ	1:B:419:ALA:O	2.53	0.40

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	451/470 (96%)	434 (96%)	17 (4%)	0	100	100
1	B	459/470 (98%)	444 (97%)	15 (3%)	0	100	100
All	All	910/940 (97%)	878 (96%)	32 (4%)	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	351/366 (96%)	335 (95%)	16 (5%)	27	50
1	B	358/366 (98%)	346 (97%)	12 (3%)	37	63
All	All	709/732 (97%)	681 (96%)	28 (4%)	32	57

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	GLN
1	A	60	ARG
1	A	63	SER
1	A	100	GLN
1	A	110	GLN
1	A	155	HIS
1	A	204	LEU
1	A	248	GLU

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Mol	Chain	Res	Type
1	A	254	ARG
1	A	255	THR
1	A	280	GLU
1	A	313	ILE
1	A	336	ARG
1	A	361	PHE
1	A	373	LEU
1	A	453	LEU
1	B	-1	SER
1	B	60	ARG
1	B	63	SER
1	B	155	HIS
1	B	194	ILE
1	B	204	LEU
1	B	254	ARG
1	B	274	ILE
1	B	283	HIS
1	B	336	ARG
1	B	373	LEU
1	B	436	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	33	GLN
1	A	37	GLN
1	A	97	HIS
1	A	149	ASN
1	A	257	ASN
1	A	260	GLN
1	A	357	GLN
1	A	404	GLN
1	B	37	GLN
1	B	78	GLN
1	B	149	ASN
1	B	181	GLN
1	B	257	ASN
1	B	260	GLN
1	B	357	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 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	453/470 (96%)	-0.59	0 <a href="#">100</a>   <a href="#">100</a>	14, 26, 43, 61	0
1	B	461/470 (98%)	-0.56	1 (0%) <a href="#">95</a>   <a href="#">95</a>	12, 25, 46, 58	0
All	All	914/940 (97%)	-0.58	1 (0%) <a href="#">95</a>   <a href="#">96</a>	12, 25, 45, 61	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	-6	LEU	2.6

### 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.