



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 06:56 PM UTC

PDB ID : 2DRW / pdb\_00002drw  
Title : The crystal structure of D-amino acid amidase from Ochrobactrum anthropi SV3  
Authors : Okazaki, S.; Suzuki, A.; Komeda, H.; Asano, Y.; Yamane, T.  
Deposited on : 2006-06-15  
Resolution : 2.10 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

<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 : 4-5-2 with Phenix2.0  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

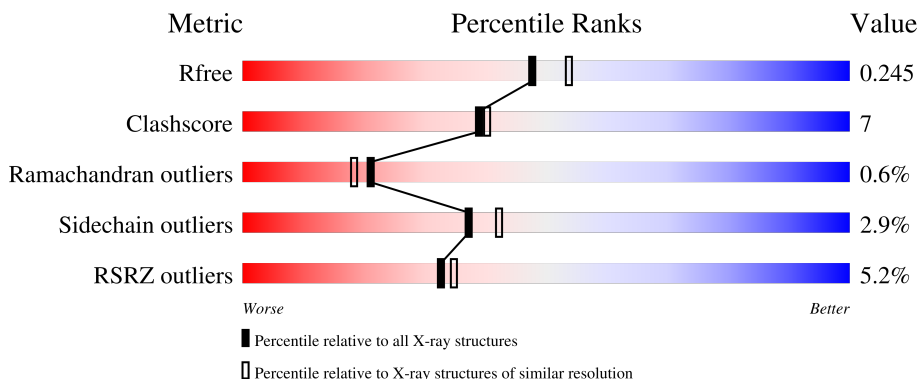
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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))
$R_{free}$	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	363	 0% 87% 12%
1	B	363	 5% 87% 10%
1	C	363	 2% 88% 9%
1	D	363	 0% 85% 10% 5%
1	E	363	 5% 83% 10% 5%

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Mol	Chain	Length	Quality of chain
1	F	363	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into four segments: a red segment on the left labeled '16%', a large green segment labeled '71%', a yellow segment labeled '18%', and a small grey segment on the far right labeled '10%'.</p>

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 18459 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 D-Amino acid amidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	362	2811	1775	486	534	16	0	0	0
1	B	362	2827	1784	488	538	17	0	2	0
1	C	358	2787	1762	482	527	16	0	0	0
1	D	350	2718	1720	471	511	16	0	0	0
1	E	345	2685	1699	466	504	16	0	0	0
1	F	327	2552	1622	439	475	16	0	0	0

- Molecule 2 is BARIUM ION (CCD ID: BA) (formula: Ba).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	4	Total	Ba	0	0
			4	4		
2	B	2	Total	Ba	0	0
			2	2		
2	C	3	Total	Ba	0	0
			3	3		
2	D	5	Total	Ba	0	0
			5	5		
2	E	3	Total	Ba	0	0
			3	3		
2	F	6	Total	Ba	0	0
			6	6		

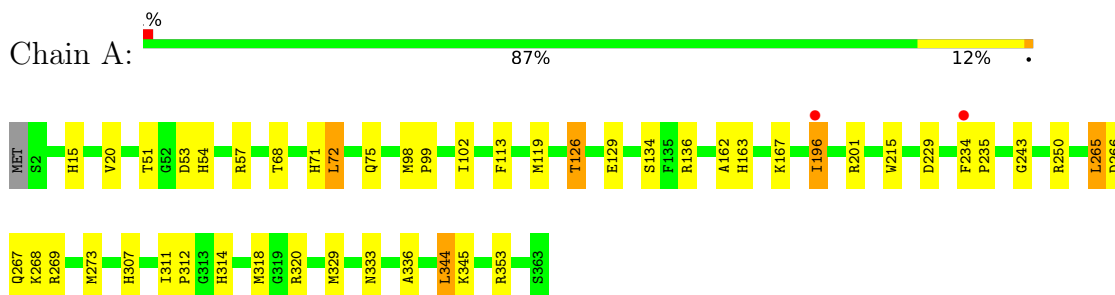
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	358	Total 358	O 358	0	0
3	B	438	Total 438	O 438	0	0
3	C	393	Total 393	O 393	0	0
3	D	385	Total 385	O 385	0	0
3	E	258	Total 258	O 258	0	0
3	F	224	Total 224	O 224	0	0

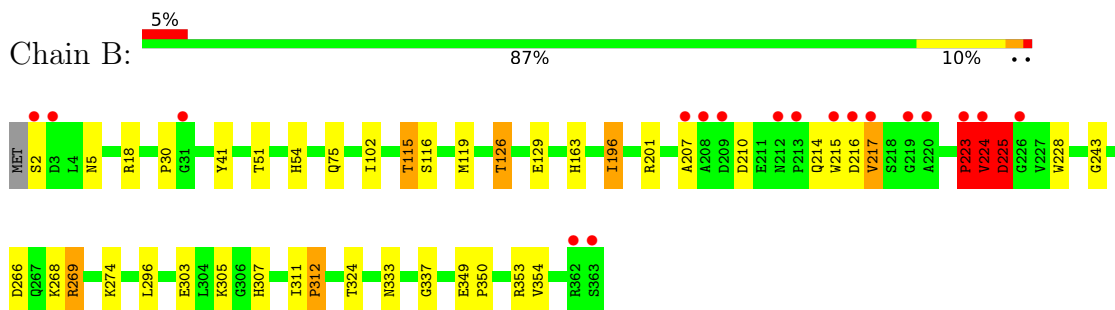
### 3 Residue-property plots [i](#)

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.

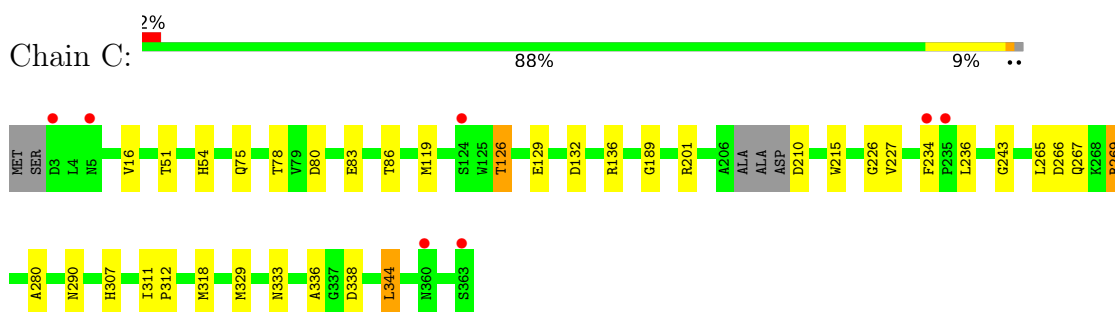
- Molecule 1: D-Amino acid amidase



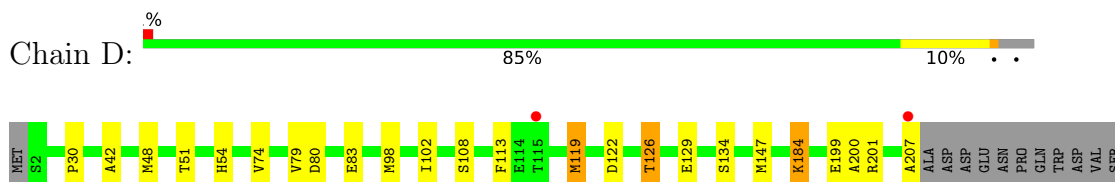
- Molecule 1: D-Amino acid amidase

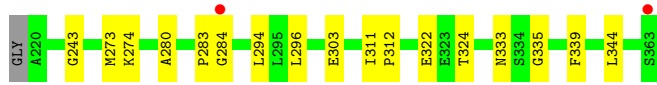


- Molecule 1: D-Amino acid amidase

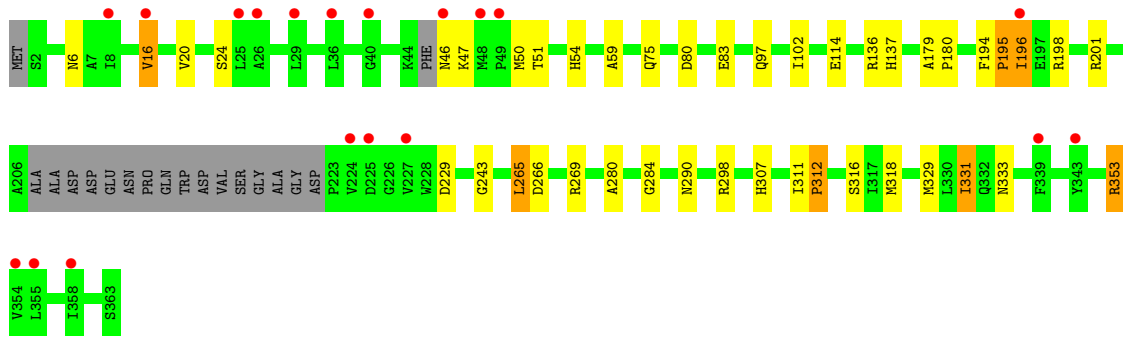
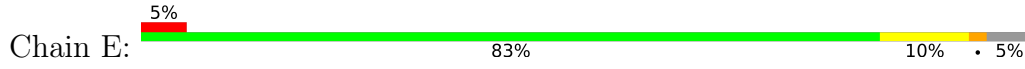


- Molecule 1: D-Amino acid amidase

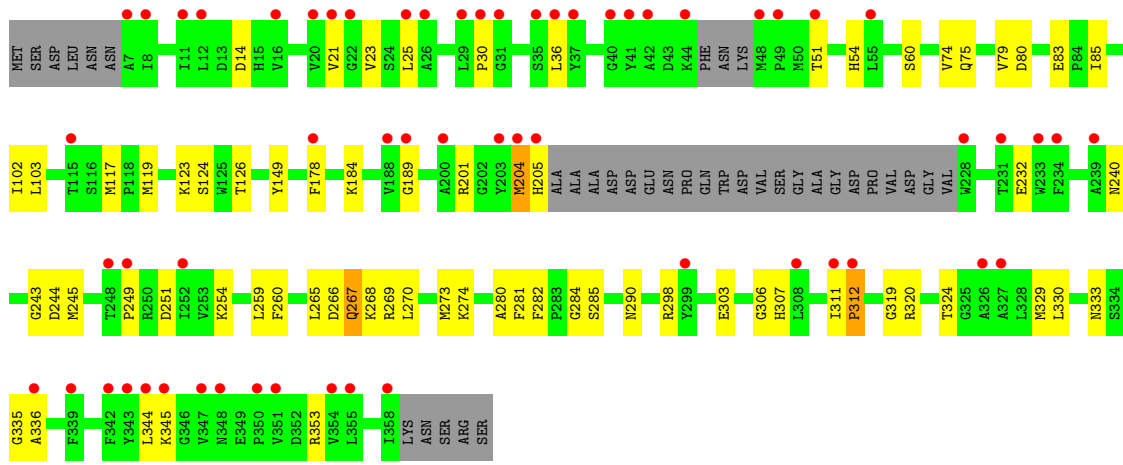




• Molecule 1: D-Amino acid amidase



• Molecule 1: D-Amino acid amidase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	77.20Å 123.22Å 115.71Å 90.00° 104.36° 90.00°	Depositor
Resolution (Å)	47.57 – 2.10 47.57 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.9 (47.57-2.10) 99.9 (47.57-2.10)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.88 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.182 , 0.243 0.183 , 0.245	Depositor DCC
$R_{free}$ test set	6124 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.3	Xtrriage
Anisotropy	0.069	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 50.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	18459	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.78% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: BA

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	0.64	0/2883	0.82	0/3910
1	B	0.69	0/2899	0.92	3/3931 (0.1%)
1	C	0.64	0/2858	0.82	1/3874 (0.0%)
1	D	0.65	0/2786	0.86	2/3774 (0.1%)
1	E	0.58	0/2751	0.84	2/3724 (0.1%)
1	F	0.63	0/2617	0.85	1/3544 (0.0%)
All	All	0.64	0/16794	0.85	9/22757 (0.0%)

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	B	0	3

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	224	VAL	N-CA-C	15.66	129.11	108.12
1	D	311	ILE	N-CA-C	-9.05	101.77	109.19
1	B	225	ASP	N-CA-C	8.07	120.35	110.91
1	B	217	VAL	N-CA-C	6.26	122.36	109.34
1	E	194	PHE	CA-C-N	6.25	127.65	119.84

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	223	PRO	Peptide
1	B	224	VAL	Peptide
1	B	225	ASP	Peptide

## 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	2811	0	2710	46	0
1	B	2827	0	2722	37	0
1	C	2787	0	2691	29	0
1	D	2718	0	2639	24	0
1	E	2685	0	2613	32	0
1	F	2552	0	2482	57	0
2	A	4	0	0	0	0
2	B	2	0	0	0	0
2	C	3	0	0	0	0
2	D	5	0	0	0	0
2	E	3	0	0	0	0
2	F	6	0	0	0	0
3	A	358	0	0	8	0
3	B	438	0	0	9	2
3	C	393	0	0	4	1
3	D	385	0	0	5	1
3	E	258	0	0	1	0
3	F	224	0	0	9	0
All	All	18459	0	15857	217	2

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 7.

The worst 5 of 217 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:F:265:LEU:HD12	1:F:273:MET:CE	1.77	1.14
1:F:265:LEU:CD1	1:F:273:MET:CE	2.29	1.10
1:A:102:ILE:HG21	3:A:3366:HOH:O	1.53	1.07

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:41:TYR:HE1	3:B:3436:HOH:O	1.47	0.97
1:A:353:ARG:NH1	3:A:3375:HOH:O	1.96	0.95

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:3436:HOH:O	3:D:3163:HOH:O[1_655]	2.12	0.08
3:B:3448:HOH:O	3:C:3298:HOH:O[2_646]	2.12	0.08

## 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	360/363 (99%)	348 (97%)	11 (3%)	1 (0%)	36	36
1	B	362/363 (100%)	344 (95%)	14 (4%)	4 (1%)	11	8
1	C	354/363 (98%)	343 (97%)	10 (3%)	1 (0%)	36	36
1	D	346/363 (95%)	335 (97%)	10 (3%)	1 (0%)	36	36
1	E	339/363 (93%)	329 (97%)	7 (2%)	3 (1%)	14	10
1	F	321/363 (88%)	309 (96%)	10 (3%)	2 (1%)	21	18
All	All	2082/2178 (96%)	2008 (96%)	62 (3%)	12 (1%)	21	18

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	217	VAL
1	B	223	PRO
1	E	195	PRO
1	F	312	PRO
1	E	312	PRO

### 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	300/301 (100%)	292 (97%)	8 (3%)	39	45
1	B	302/301 (100%)	292 (97%)	10 (3%)	33	37
1	C	298/301 (99%)	290 (97%)	8 (3%)	39	45
1	D	290/301 (96%)	285 (98%)	5 (2%)	53	62
1	E	288/301 (96%)	278 (96%)	10 (4%)	32	35
1	F	272/301 (90%)	261 (96%)	11 (4%)	28	29
All	All	1750/1806 (97%)	1698 (97%)	52 (3%)	37	41

5 of 52 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	122	ASP
1	E	196	ILE
1	F	267	GLN
1	D	126	THR
1	E	97	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 38 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	75	GLN
1	F	137	HIS
1	E	137	HIS
1	E	360	ASN
1	F	205	HIS

### 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](#)

Of 23 ligands modelled in this entry, 23 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 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	362/363 (99%)	-0.14	2 (0%) 85 87	11, 23, 36, 45	0
1	B	362/363 (99%)	-0.20	18 (4%) 34 36	10, 17, 45, 57	2 (0%)
1	C	358/363 (98%)	-0.19	7 (1%) 65 67	10, 20, 40, 52	0
1	D	350/363 (96%)	-0.30	4 (1%) 78 80	9, 18, 36, 53	0
1	E	345/363 (95%)	0.46	19 (5%) 30 32	15, 31, 53, 64	0
1	F	327/363 (90%)	1.11	59 (18%) 3 3	15, 37, 56, 63	0
All	All	2104/2178 (96%)	0.11	109 (5%) 33 35	9, 24, 50, 64	2 (0%)

The worst 5 of 109 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	217	VAL	4.7
1	F	40	GLY	4.3
1	F	344	LEU	4.2
1	B	2	SER	4.0
1	F	42	ALA	4.0

### 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](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	BA	F	3021	1/1	0.75	0.13	76,76,76,76	1
2	BA	D	3014	1/1	0.77	0.14	45,45,45,45	1
2	BA	E	3019	1/1	0.78	0.13	56,56,56,56	1
2	BA	D	3022	1/1	0.83	0.18	55,55,55,55	1
2	BA	A	3009	1/1	0.84	0.23	47,47,47,47	1
2	BA	F	3016	1/1	0.85	0.11	72,72,72,72	1
2	BA	B	3010	1/1	0.85	0.19	46,46,46,46	1
2	BA	F	3008	1/1	0.89	0.18	44,44,44,44	1
2	BA	A	3020	1/1	0.90	0.10	52,52,52,52	1
2	BA	E	3012	1/1	0.90	0.08	49,49,49,49	1
2	BA	E	3018	1/1	0.91	0.07	47,47,47,47	1
2	BA	B	3002	1/1	0.93	0.07	43,43,43,43	1
2	BA	C	3011	1/1	0.94	0.08	46,46,46,46	1
2	BA	D	3017	1/1	0.95	0.11	59,59,59,59	1
2	BA	F	3023	1/1	0.95	0.09	70,70,70,70	1
2	BA	D	3015	1/1	0.96	0.11	45,45,45,45	1
2	BA	D	3013	1/1	0.97	0.06	44,44,44,44	1
2	BA	A	3004	1/1	0.97	0.04	34,34,34,34	1
2	BA	F	3006	1/1	0.97	0.07	43,43,43,43	1
2	BA	F	3007	1/1	0.97	0.06	52,52,52,52	1
2	BA	A	3003	1/1	0.99	0.03	37,37,37,37	1
2	BA	C	3001	1/1	0.99	0.03	34,34,34,34	1
2	BA	C	3005	1/1	0.99	0.02	20,20,20,20	1

## 6.5 Other polymers [i](#)

There are no such residues in this entry.