



# wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 25, 2024 – 06:11 PM EST

PDB ID : 3GEU  
Title : Crystal Structure of IcaR from Staphylococcus aureus, a member of the tetracycline repressor protein family  
Authors : Anderson, S.M.; Brunzelle, J.S.; Wawrzak, Z.; Skarina, T.; Papazisi, L.; Anderson, W.F.; Savchenko, A.; Center for Structural Genomics of Infectious Diseases (CSGID)  
Deposited on : 2009-02-26  
Resolution : 1.90 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	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

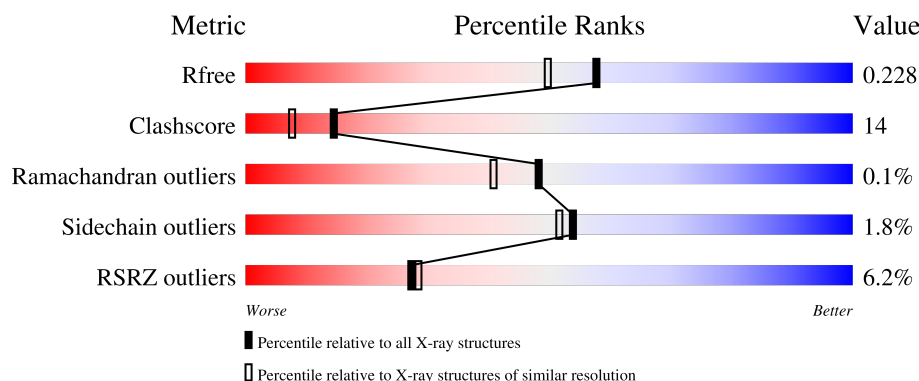
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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))
$R_{free}$	164625	7293 (1.90-1.90)
Clashscore	180529	8090 (1.90-1.90)
Ramachandran outliers	177936	8022 (1.90-1.90)
Sidechain outliers	177891	8022 (1.90-1.90)
RSRZ outliers	164620	7292 (1.90-1.90)

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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	189	<div> <div>8%</div> <div>79%</div> <div>19%</div> </div>
1	B	189	<div> <div>7%</div> <div>83%</div> <div>16%</div> </div>
1	C	189	<div> <div>5%</div> <div>81%</div> <div>17%</div> </div>
1	D	189	<div> <div>4%</div> <div>83%</div> <div>16%</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	CL	B	187	-	-	X	-
2	CL	B	188	-	-	X	-
3	FMT	A	188	-	-	X	-
3	FMT	A	191	-	-	X	-

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 6860 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 Intercellular adhesion protein R.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	189	Total	C	N	O	S	Se	0	2	0
			1579	1022	243	306	3	5			
1	B	189	Total	C	N	O	S	Se	6	7	0
			1608	1043	246	309	3	7			
1	C	189	Total	C	N	O	S	Se	0	6	0
			1600	1037	242	311	3	7			
1	D	189	Total	C	N	O	S	Se	0	5	0
			1595	1032	245	310	3	5			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP Q5HCN2
A	-1	ASN	-	expression tag	UNP Q5HCN2
A	0	ALA	-	expression tag	UNP Q5HCN2
B	-2	SER	-	expression tag	UNP Q5HCN2
B	-1	ASN	-	expression tag	UNP Q5HCN2
B	0	ALA	-	expression tag	UNP Q5HCN2
C	-2	SER	-	expression tag	UNP Q5HCN2
C	-1	ASN	-	expression tag	UNP Q5HCN2
C	0	ALA	-	expression tag	UNP Q5HCN2
D	-2	SER	-	expression tag	UNP Q5HCN2
D	-1	ASN	-	expression tag	UNP Q5HCN2
D	0	ALA	-	expression tag	UNP Q5HCN2

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Cl	0	0
			1	1		
2	B	2	Total	Cl	0	0
			2	2		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	2	Total 3	Cl 3	0	1

- Molecule 3 is FORMIC ACID (three-letter code: FMT) (formula: CH<sub>2</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total 3	C 1	O 2	0	0
3	A	1	Total 3	C 1	O 2	0	0
3	A	1	Total 3	C 1	O 2	0	0
3	A	1	Total 3	C 1	O 2	0	0
3	B	1	Total 3	C 1	O 2	0	0
3	B	1	Total 3	C 1	O 2	0	0
3	B	1	Total 3	C 1	O 2	0	0
3	D	1	Total 3	C 1	O 2	0	0
3	D	1	Total 3	C 1	O 2	0	0
3	D	1	Total 3	C 1	O 2	0	0

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	1	Total	Na	0	0
			1	1		

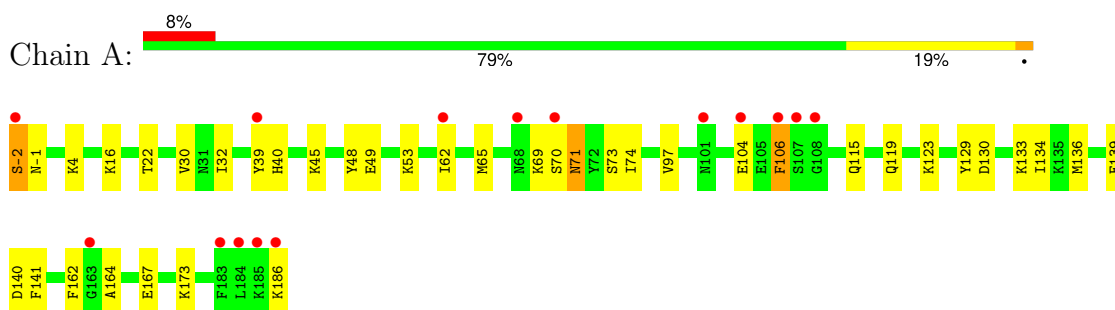
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	127	Total	O	0	3
			130	130		
5	B	90	Total	O	0	1
			91	91		
5	C	124	Total	O	0	4
			128	128		
5	D	90	Total	O	0	3
			92	92		

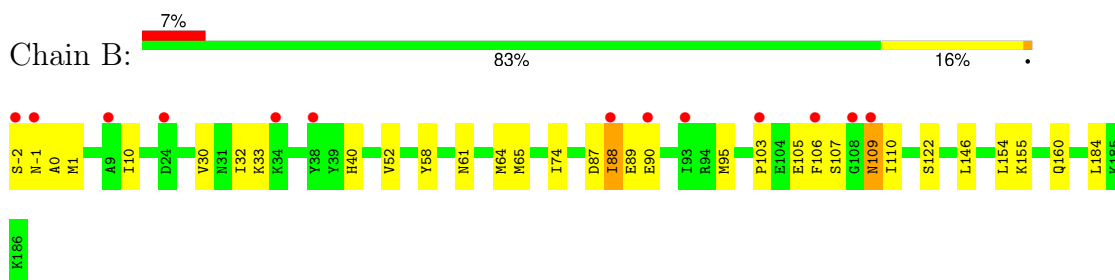
### 3 Residue-property plots

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. 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. 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.

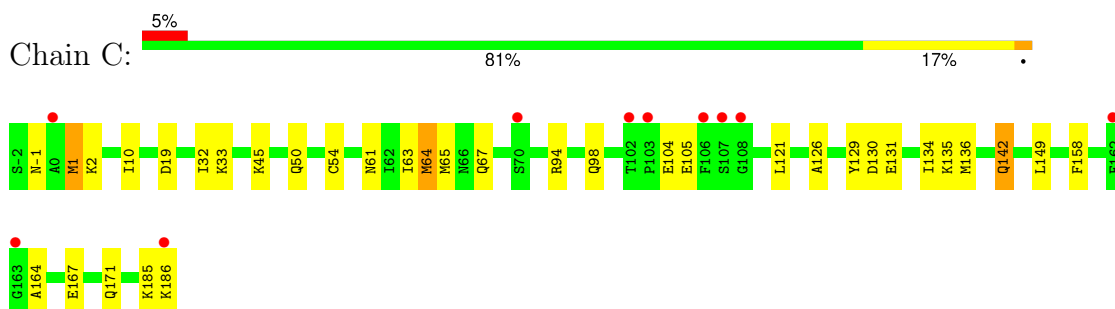
- Molecule 1: Intercellular adhesion protein R



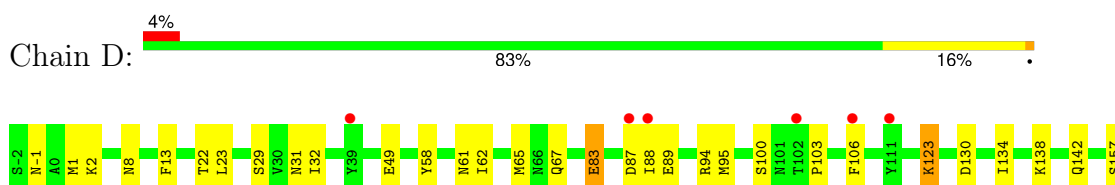
- Molecule 1: Intercellular adhesion protein R



- Molecule 1: Intercellular adhesion protein R



- Molecule 1: Intercellular adhesion protein R







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	113.92Å 121.14Å 61.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.42 – 1.90 40.42 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.8 (40.42-1.90) 98.8 (40.42-1.90)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.64 (at 1.89Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.182 , 0.228 0.183 , 0.228	Depositor DCC
$R_{free}$ test set	3392 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	31.9	Xtriage
Anisotropy	0.258	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 40.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	6860	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.98% 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: CL, NA, FMT

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	0.79	1/1611 (0.1%)	0.75	0/2151
1	B	0.78	0/1653	0.73	0/2201
1	C	0.74	0/1643	0.72	0/2191
1	D	0.76	0/1635	0.68	0/2181
All	All	0.77	1/6542 (0.0%)	0.72	0/8724

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	139	GLU	CG-CD	5.69	1.60	1.51

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	1579	0	1559	57	0
1	B	1608	0	1605	42	0
1	C	1600	0	1585	38	0
1	D	1595	0	1579	40	0
2	A	1	0	0	0	0
2	B	2	0	0	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	3	0	0	0	0
3	A	12	0	4	5	0
3	B	9	0	3	1	0
3	D	9	0	3	1	0
4	C	1	0	0	0	0
5	A	130	0	0	2	0
5	B	91	0	0	8	0
5	C	128	0	0	3	0
5	D	92	0	0	3	0
All	All	6860	0	6338	176	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 14.

The worst 5 of 176 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:-2:SER:CB	1:B:-1:ASN:HA	1.52	1.36
1:B:-2:SER:HB3	1:B:-1:ASN:CA	1.61	1.29
1:D:1:MSE:HE3	1:D:32:ILE:HD13	1.14	1.14
1:D:1:MSE:CE	1:D:32:ILE:HG21	1.82	1.08
1:C:1:MSE:CE	1:C:32:ILE:HG21	1.87	1.05

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	189/189 (100%)	187 (99%)	2 (1%)	0	100	100
1	B	194/189 (103%)	188 (97%)	5 (3%)	1 (0%)	25	17

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	193/189 (102%)	189 (98%)	4 (2%)	0	100	100
1	D	192/189 (102%)	190 (99%)	2 (1%)	0	100	100
All	All	768/756 (102%)	754 (98%)	13 (2%)	1 (0%)	48	41

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	88	ILE

### 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	178/171 (104%)	174 (98%)	4 (2%)	47	43
1	B	183/171 (107%)	181 (99%)	2 (1%)	70	71
1	C	182/171 (106%)	177 (97%)	5 (3%)	40	34
1	D	181/171 (106%)	177 (98%)	4 (2%)	47	43
All	All	724/684 (106%)	709 (98%)	15 (2%)	54	45

5 of 15 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	64[A]	MSE
1	D	83[B]	GLU
1	C	64[B]	MSE
1	D	123	LYS
1	D	31	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	118	ASN

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Mol	Chain	Res	Type
1	D	181	ASN
1	B	118	ASN
1	C	-1	ASN
1	C	50	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 oligosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

Of 17 ligands modelled in this entry, 7 are monoatomic - leaving 10 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
3	FMT	B	189	-	2,2,2	0.73	0	1,1,1	0.01	0
3	FMT	A	190	-	2,2,2	0.69	0	1,1,1	0.45	0
3	FMT	A	189	-	2,2,2	0.81	0	1,1,1	0.33	0
3	FMT	D	189	-	2,2,2	0.75	0	1,1,1	0.24	0
3	FMT	D	188	-	2,2,2	0.87	0	1,1,1	0.36	0
3	FMT	D	187	-	2,2,2	0.80	0	1,1,1	0.16	0
3	FMT	A	188	-	2,2,2	0.59	0	1,1,1	0.03	0
3	FMT	A	191	-	2,2,2	1.26	0	1,1,1	1.26	0
3	FMT	B	191	-	2,2,2	0.64	0	1,1,1	0.14	0
3	FMT	B	190	-	2,2,2	0.88	0	1,1,1	0.19	0

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.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	189	FMT	1	0
3	D	189	FMT	1	0
3	A	188	FMT	3	0
3	A	191	FMT	2	0

## 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](#)

**Warning:** The R factor obtained from EDS is 0.2333, which does not match the depositor's R factor of 0.182. Please interpret the results in this section carefully.

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	184/189 (97%)	0.34	15 (8%) 19 20	20, 31, 50, 77	2 (1%)
1	B	184/189 (97%)	0.84	13 (7%) 23 24	21, 34, 56, 86	5 (2%)
1	C	184/189 (97%)	0.42	10 (5%) 32 34	15, 30, 50, 81	4 (2%)
1	D	184/189 (97%)	0.63	8 (4%) 40 42	15, 33, 55, 78	5 (2%)
All	All	736/756 (97%)	0.56	46 (6%) 27 28	15, 32, 55, 86	16 (2%)

The worst 5 of 46 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	106	PHE	5.4
1	C	162	PHE	4.4
1	A	186	LYS	4.1
1	B	-2	SER	3.7
1	B	-1	ASN	3.6

### 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 monosaccharides in this entry.

## 6.4 Ligands

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(Å <sup>2</sup> )	Q<0.9
3	FMT	D	188	3/3	0.41	0.40	231,231,231,231	0
3	FMT	D	187	3/3	0.68	0.19	59,59,62,65	0
3	FMT	B	191	3/3	0.76	0.21	55,55,61,61	0
3	FMT	A	189	3/3	0.84	0.15	61,61,61,62	0
3	FMT	A	190	3/3	0.85	0.13	53,53,55,57	0
3	FMT	B	190	3/3	0.86	0.15	52,52,59,61	0
3	FMT	D	189	3/3	0.86	0.11	59,59,61,62	0
3	FMT	B	189	3/3	0.88	0.20	44,44,55,62	0
3	FMT	A	188	3/3	0.90	0.15	42,42,48,49	0
4	NA	C	189	1/1	0.91	0.14	56,56,56,56	0
2	CL	B	188	1/1	0.93	0.20	39,39,39,39	1
2	CL	C	187[A]	1/1	0.94	0.10	35,35,35,35	1
2	CL	C	187[B]	1/1	0.94	0.10	38,38,38,38	1
3	FMT	A	191	3/3	0.96	0.14	23,23,24,39	0
2	CL	C	188	1/1	0.97	0.12	27,27,27,27	1
2	CL	B	187	1/1	0.97	0.13	53,53,53,53	0
2	CL	A	187	1/1	1.00	0.14	24,24,24,24	1

## 6.5 Other polymers

There are no such residues in this entry.