



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 07:47 AM UTC

PDB ID : 3KG6 / pdb\_00003kg6  
Title : Dehydratase domain from CurF module of Curacin polyketide synthase  
Authors : Akey, D.L.; Smith, J.L.  
Deposited on : 2009-10-28  
Resolution : 2.70 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>.

---

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

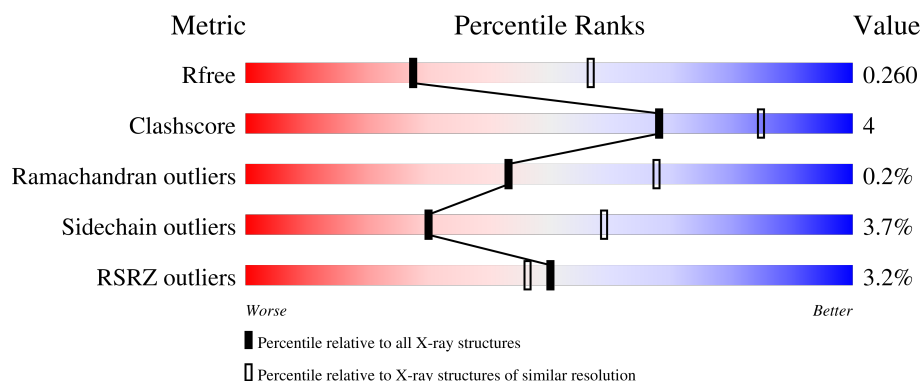
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	285	<div> <div>4%</div> <div>87%</div> <div>9%</div> <div>..</div> </div>
1	B	285	<div> <div>3%</div> <div>85%</div> <div>13%</div> <div>.</div> </div>
1	C	285	<div> <div>5%</div> <div>88%</div> <div>8%</div> <div>.</div> </div>
1	D	285	<div> <div>%</div> <div>83%</div> <div>14%</div> <div>..</div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8859 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 CurF.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	274	Total	C	N	O	S	0	0	0
			2177	1397	359	419	2			
1	B	279	Total	C	N	O	S	0	0	0
			2216	1419	366	429	2			
1	C	277	Total	C	N	O	S	0	0	0
			2204	1413	364	425	2			
1	D	278	Total	C	N	O	S	0	0	0
			2205	1413	365	425	2			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1684	SER	-	expression tag	UNP Q6DNE7
A	1685	ASN	-	expression tag	UNP Q6DNE7
A	1686	ALA	-	expression tag	UNP Q6DNE7
B	1684	SER	-	expression tag	UNP Q6DNE7
B	1685	ASN	-	expression tag	UNP Q6DNE7
B	1686	ALA	-	expression tag	UNP Q6DNE7
C	1684	SER	-	expression tag	UNP Q6DNE7
C	1685	ASN	-	expression tag	UNP Q6DNE7
C	1686	ALA	-	expression tag	UNP Q6DNE7
D	1684	SER	-	expression tag	UNP Q6DNE7
D	1685	ASN	-	expression tag	UNP Q6DNE7
D	1686	ALA	-	expression tag	UNP Q6DNE7

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Ca	0	0
			3	3		
2	D	2	Total	Ca	0	0
			2	2		

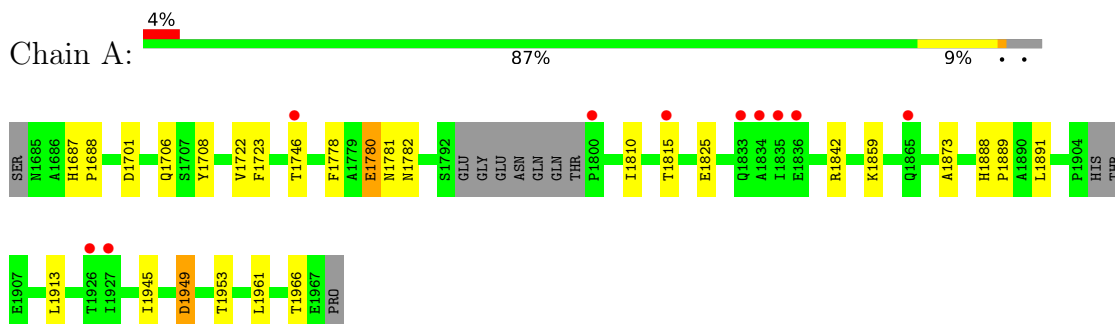
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	33	Total 33	O 33	0	0
3	B	6	Total 6	O 6	0	0
3	C	5	Total 5	O 5	0	0
3	D	8	Total 8	O 8	0	0

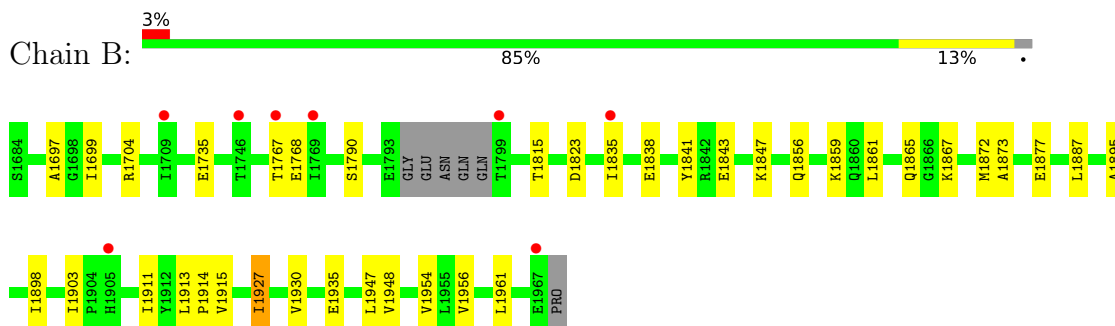
### 3 Residue-property plots

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 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.

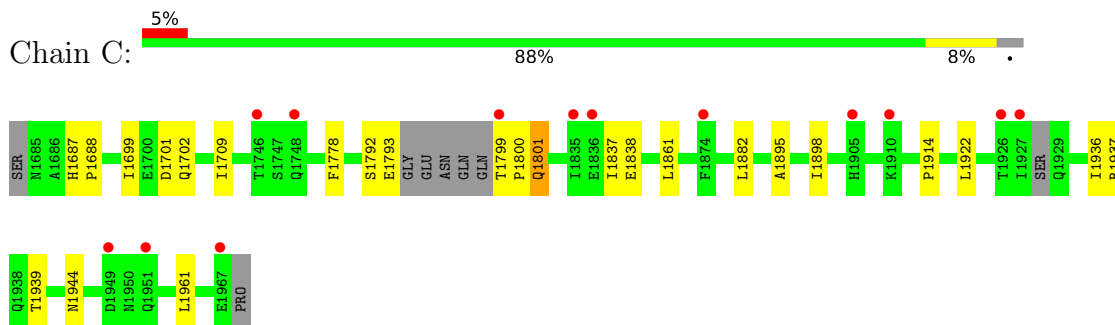
#### • Molecule 1: CurF



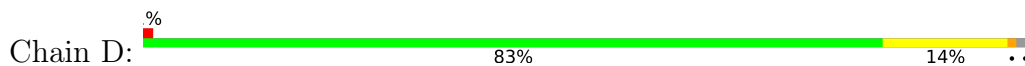
#### • Molecule 1: CurF

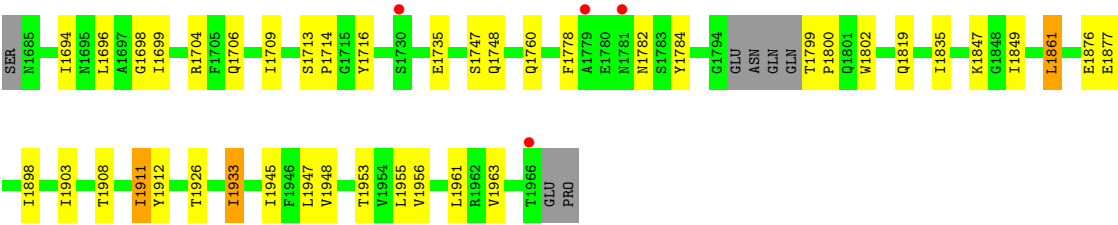


#### • Molecule 1: CurF



#### • Molecule 1: CurF





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	87.38Å 198.38Å 146.76Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.89 – 2.70 41.89 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.2 (41.89-2.70) 99.3 (41.89-2.70)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	0.11	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.29 (at 2.69Å)	Xtriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.213 , 0.265 0.208 , 0.260	Depositor DCC
$R_{free}$ test set	1980 reflections (5.56%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	60.7	Xtriage
Anisotropy	0.527	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 65.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	8859	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	70.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.44% 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: CA

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	0.43	0/2223	0.73	0/3013
1	B	0.41	0/2264	0.75	0/3072
1	C	0.40	0/2251	0.68	0/3053
1	D	0.43	0/2253	0.74	0/3057
All	All	0.42	0/8991	0.73	0/12195

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	2177	0	2148	14	0
1	B	2216	0	2180	21	0
1	C	2204	0	2169	11	0
1	D	2205	0	2172	26	0
2	A	3	0	0	0	0
2	D	2	0	0	0	0
3	A	33	0	0	0	0
3	B	6	0	0	0	0
3	C	5	0	0	0	0

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	8	0	0	0	0
All	All	8859	0	8669	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 4.

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:1704:ARG:HH12	1:D:1698:GLY:H	1.28	0.79
1:B:1697:ALA:O	1:D:1704:ARG:NH1	2.14	0.79
1:D:1849:ILE:HD11	1:D:1911:ILE:HG13	1.71	0.73
1:C:1799:THR:N	1:C:1800:PRO:CD	2.59	0.65
1:C:1792:SER:O	1:C:1793:GLU:HB2	2.00	0.61
1:B:1927:ILE:H	1:B:1927:ILE:HD13	1.66	0.61
1:C:1799:THR:N	1:C:1800:PRO:HD3	2.16	0.60
1:B:1947:LEU:HB2	1:B:1956:VAL:HB	1.84	0.60
1:A:1746:THR:H	1:D:1747:SER:HB3	1.67	0.59
1:B:1838:GLU:H	1:B:1838:GLU:CD	2.11	0.57
1:B:1867:LYS:HG2	1:B:1935:GLU:HG2	1.90	0.54
1:D:1926:THR:HG21	1:D:1955:LEU:HD13	1.90	0.54
1:A:1949:ASP:HB2	1:A:1953:THR:HB	1.89	0.54
1:B:1697:ALA:HB2	1:D:1802:TRP:CD2	2.43	0.53
1:D:1696:LEU:HD11	1:D:1704:ARG:HD2	1.91	0.53
1:C:1701:ASP:HB3	1:C:1778:PHE:HB2	1.89	0.53
1:A:1945:ILE:HD11	1:A:1961:LEU:HD22	1.91	0.53
1:A:1701:ASP:HB3	1:A:1778:PHE:HB3	1.92	0.52
1:B:1767:THR:HG23	1:B:1768:GLU:HG3	1.92	0.52
1:B:1699:ILE:HB	1:D:1704:ARG:HH22	1.76	0.51
1:B:1704:ARG:HH22	1:D:1699:ILE:N	2.09	0.50
1:A:1722:VAL:HG12	1:A:1723:PHE:HD1	1.77	0.49
1:A:1859:LYS:HG3	1:A:1873:ALA:HB2	1.95	0.49
1:A:1782:ASN:HB3	1:D:1782:ASN:HB2	1.95	0.49
1:A:1782:ASN:HD22	1:D:1782:ASN:HB3	1.77	0.49
1:B:1859:LYS:HB2	1:B:1873:ALA:HB2	1.95	0.48
1:C:1801:GLN:HG2	1:D:1819:GLN:HG3	1.96	0.48
1:B:1865:GLN:H	1:B:1865:GLN:CD	2.22	0.47
1:D:1849:ILE:CD1	1:D:1911:ILE:HG13	2.42	0.47
1:D:1947:LEU:HB2	1:D:1956:VAL:HB	1.96	0.47
1:D:1835:ILE:HB	1:D:1861:LEU:HB3	1.96	0.46
1:C:1914:PRO:HB3	1:C:1961:LEU:HD11	1.98	0.46

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1914:PRO:HB3	1:B:1961:LEU:HD11	1.98	0.46
1:B:1948:VAL:HG12	1:B:1954:VAL:HA	1.98	0.46
1:A:1913:LEU:HD12	1:A:1966:THR:HG21	1.98	0.46
1:B:1699:ILE:O	1:B:1699:ILE:HG23	2.15	0.45
1:D:1847:LYS:HD2	1:D:1908:THR:O	2.17	0.45
1:B:1835:ILE:HB	1:B:1861:LEU:HG	1.99	0.45
1:B:1872:MET:HG3	1:B:1930:VAL:HG23	1.98	0.45
1:D:1778:PHE:HD1	1:D:1784:TYR:CZ	2.35	0.45
1:A:1888:HIS:HB3	1:A:1891:LEU:HG	2.00	0.44
1:D:1945:ILE:HD11	1:D:1961:LEU:HD22	1.99	0.44
1:D:1933:ILE:O	1:D:1945:ILE:HA	2.18	0.44
1:C:1895:ALA:O	1:C:1898:ILE:HG12	2.18	0.43
1:D:1694:ILE:HD11	1:D:1706:GLN:HB2	1.99	0.43
1:C:1937:ARG:HD3	1:C:1944:ASN:OD1	2.19	0.43
1:B:1895:ALA:O	1:B:1898:ILE:HG12	2.17	0.43
1:D:1849:ILE:HD11	1:D:1911:ILE:CG1	2.45	0.43
1:A:1706:GLN:NE2	1:A:1708:TYR:OH	2.52	0.43
1:C:1699:ILE:CG2	1:C:1702:GLN:HB3	2.48	0.42
1:A:1780:GLU:HG2	1:A:1781:ASN:N	2.34	0.42
1:B:1843:GLU:O	1:B:1847:LYS:HG3	2.20	0.42
1:D:1847:LYS:HE3	1:D:1911:ILE:HB	2.01	0.42
1:C:1687:HIS:HA	1:C:1688:PRO:HD3	1.95	0.42
1:B:1841:TYR:CZ	1:B:1856:GLN:HA	2.56	0.41
1:D:1912:TYR:HB3	1:D:1963:VAL:HB	2.02	0.41
1:B:1887:LEU:HD13	1:B:1927:ILE:HD11	2.01	0.41
1:C:1936:ILE:HG12	1:C:1937:ARG:N	2.35	0.41
1:D:1714:PRO:HB2	1:D:1716:TYR:CE1	2.56	0.41
1:A:1687:HIS:HA	1:A:1688:PRO:HD3	1.92	0.40
1:A:1888:HIS:HA	1:A:1889:PRO:HD3	1.93	0.40
1:D:1713:SER:HA	1:D:1714:PRO:HA	1.91	0.40
1:D:1799:THR:N	1:D:1800:PRO:CD	2.85	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	268/285 (94%)	258 (96%)	9 (3%)	1 (0%)	30	54
1	B	275/285 (96%)	267 (97%)	7 (2%)	1 (0%)	30	54
1	C	271/285 (95%)	263 (97%)	8 (3%)	0	100	100
1	D	274/285 (96%)	265 (97%)	9 (3%)	0	100	100
All	All	1088/1140 (95%)	1053 (97%)	33 (3%)	2 (0%)	43	68

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1780	GLU
1	B	1823	ASP

### 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	235/245 (96%)	230 (98%)	5 (2%)	47	75
1	B	240/245 (98%)	231 (96%)	9 (4%)	29	58
1	C	238/245 (97%)	230 (97%)	8 (3%)	32	62
1	D	238/245 (97%)	225 (94%)	13 (6%)	19	45
All	All	951/980 (97%)	916 (96%)	35 (4%)	30	59

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1810	ILE
1	A	1815	THR
1	A	1825	GLU
1	A	1842	ARG
1	A	1949	ASP
1	B	1735	GLU

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	B	1790	SER
1	B	1815	THR
1	B	1877	GLU
1	B	1903	ILE
1	B	1911	ILE
1	B	1913	LEU
1	B	1915	VAL
1	B	1927	ILE
1	C	1709	ILE
1	C	1801	GLN
1	C	1837	ILE
1	C	1838	GLU
1	C	1861	LEU
1	C	1882	LEU
1	C	1922	LEU
1	C	1939	THR
1	D	1709	ILE
1	D	1735	GLU
1	D	1748	GLN
1	D	1760	GLN
1	D	1861	LEU
1	D	1876	GLU
1	D	1877	GLU
1	D	1898	ILE
1	D	1903	ILE
1	D	1911	ILE
1	D	1933	ILE
1	D	1948	VAL
1	D	1953	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1782	ASN
1	B	1807	GLN
1	B	1897	GLN
1	B	1905	HIS
1	C	1718	ASN
1	C	1721	GLN
1	C	1860	GLN
1	D	1781	ASN
1	D	1817	ASN

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	D	1886	GLN
1	D	1951	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 5 ligands modelled in this entry, 5 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 ⓘ

### 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	274/285 (96%)	0.33	10 (3%) 46 42	59, 69, 89, 100	0
1	B	279/285 (97%)	0.36	8 (2%) 53 50	57, 68, 79, 83	0
1	C	277/285 (97%)	0.52	13 (4%) 36 33	61, 71, 82, 92	0
1	D	278/285 (97%)	0.30	4 (1%) 73 72	59, 69, 83, 98	0
All	All	1108/1140 (97%)	0.38	35 (3%) 50 46	57, 70, 83, 100	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	1836	GLU	3.9
1	C	1949	ASP	3.4
1	B	1746	THR	3.2
1	C	1835	ILE	3.1
1	A	1746	THR	3.0
1	C	1967	GLU	3.0
1	A	1927	ILE	3.0
1	A	1835	ILE	3.0
1	D	1781	ASN	2.8
1	A	1834	ALA	2.7
1	A	1833	GLN	2.7
1	C	1799	THR	2.7
1	B	1835	ILE	2.6
1	A	1800	PRO	2.5
1	B	1767	THR	2.5
1	A	1815	THR	2.5
1	C	1905	HIS	2.5
1	D	1966	THR	2.4
1	C	1926	THR	2.4
1	B	1769	ILE	2.3
1	A	1926	THR	2.2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	D	1730	SER	2.2
1	B	1709	ILE	2.2
1	C	1927	ILE	2.2
1	C	1748	GLN	2.2
1	C	1874	PHE	2.2
1	C	1951	GLN	2.1
1	B	1905	HIS	2.1
1	B	1967	GLU	2.1
1	C	1910	LYS	2.1
1	A	1865	GLN	2.1
1	D	1779	ALA	2.1
1	A	1836	GLU	2.1
1	B	1799	THR	2.1
1	C	1746	THR	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 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	CA	D	1969	1/1	0.69	0.12	117,117,117,117	0
2	CA	A	1969	1/1	0.88	0.09	112,112,112,112	0
2	CA	D	1	1/1	0.90	0.11	59,59,59,59	1
2	CA	A	1	1/1	0.92	0.15	47,47,47,47	1
2	CA	A	1970	1/1	0.95	0.33	63,63,63,63	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.