



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 06:24 AM UTC

PDB ID : 3OXU / pdb_00003oxu
Title : Complement components factor H CCP19-20 and C3d in complex
Authors : Morgan, H.P.; Schmidt, C.Q.; Guariento, M.; Gillespie, D.; Herbert, A.P.; Mertens, H.; Blaum, B.S.; Svergun, D.; Johansson, C.M.; Uhrin, D.; Barlow, P.N.; Hannan, J.P.
Deposited on : 2010-09-22
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

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
Mogul : 2022.3.0, CSD as543be (2022)
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

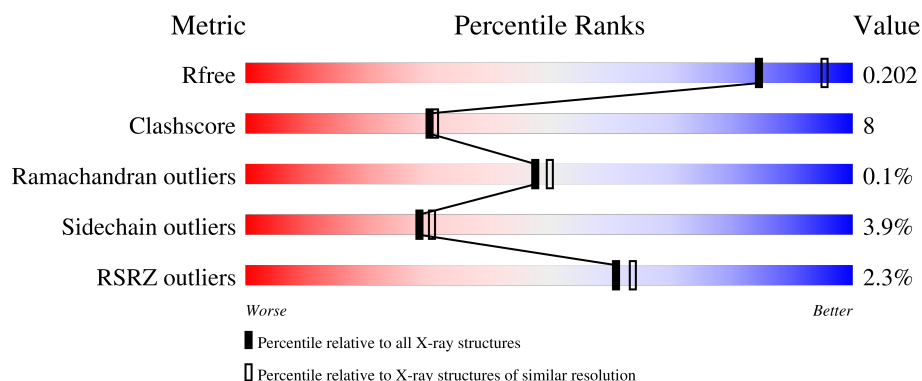
1 Overall quality at a glance

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 ≥ 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	317	80% 12% 7%
1	B	317	77% 15% 7%
1	C	317	72% 19% 7%
2	D	129	84% 10% 6%
2	E	129	81% 12% 6%

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Mol	Chain	Length	Quality of chain
2	F	129	

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
3	GOL	C	312	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10982 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 Complement C3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	295	Total	C	N	O	S	0	2	0
			2348	1508	394	437	9			
1	B	295	Total	C	N	O	S	0	4	0
			2337	1501	388	439	9			
1	C	294	Total	C	N	O	S	0	2	0
			2335	1502	393	431	9			

There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	GLY	-	expression tag	UNP P01024
A	-5	PRO	-	expression tag	UNP P01024
A	-4	LEU	-	expression tag	UNP P01024
A	-3	GLY	-	expression tag	UNP P01024
A	-2	SER	-	expression tag	UNP P01024
A	-1	PRO	-	expression tag	UNP P01024
A	0	GLU	-	expression tag	UNP P01024
A	1	PHE	-	expression tag	UNP P01024
A	2	ARG	-	expression tag	UNP P01024
A	17	ALA	CYS	engineered mutation	UNP P01024
B	-6	GLY	-	expression tag	UNP P01024
B	-5	PRO	-	expression tag	UNP P01024
B	-4	LEU	-	expression tag	UNP P01024
B	-3	GLY	-	expression tag	UNP P01024
B	-2	SER	-	expression tag	UNP P01024
B	-1	PRO	-	expression tag	UNP P01024
B	0	GLU	-	expression tag	UNP P01024
B	1	PHE	-	expression tag	UNP P01024
B	2	ARG	-	expression tag	UNP P01024
B	17	ALA	CYS	engineered mutation	UNP P01024
C	-6	GLY	-	expression tag	UNP P01024
C	-5	PRO	-	expression tag	UNP P01024
C	-4	LEU	-	expression tag	UNP P01024

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-3	GLY	-	expression tag	UNP P01024
C	-2	SER	-	expression tag	UNP P01024
C	-1	PRO	-	expression tag	UNP P01024
C	0	GLU	-	expression tag	UNP P01024
C	1	PHE	-	expression tag	UNP P01024
C	2	ARG	-	expression tag	UNP P01024
C	17	ALA	CYS	engineered mutation	UNP P01024

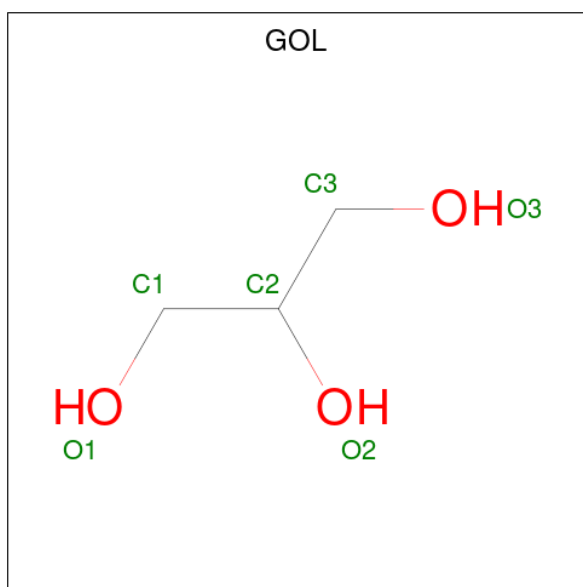
- Molecule 2 is a protein called HF protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	125	Total	C	N	O	S	0	1	0
			1006	630	182	185	9			
2	E	121	Total	C	N	O	S	0	2	0
			976	611	177	179	9			
2	F	122	Total	C	N	O	S	0	1	0
			984	614	179	182	9			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	1103	GLU	-	expression tag	UNP Q14006
D	1104	ALA	-	expression tag	UNP Q14006
D	1105	GLU	-	expression tag	UNP Q14006
D	1106	PHE	-	expression tag	UNP Q14006
E	1103	GLU	-	expression tag	UNP Q14006
E	1104	ALA	-	expression tag	UNP Q14006
E	1105	GLU	-	expression tag	UNP Q14006
E	1106	PHE	-	expression tag	UNP Q14006
F	1103	GLU	-	expression tag	UNP Q14006
F	1104	ALA	-	expression tag	UNP Q14006
F	1105	GLU	-	expression tag	UNP Q14006
F	1106	PHE	-	expression tag	UNP Q14006

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		
3	C	1	Total	C	O	0	0
			6	3	3		
3	C	1	Total	C	O	0	0
			6	3	3		
3	D	1	Total	C	O	0	0
			6	3	3		
3	D	1	Total	C	O	0	0
			6	3	3		
3	E	1	Total	C	O	0	0
			6	3	3		

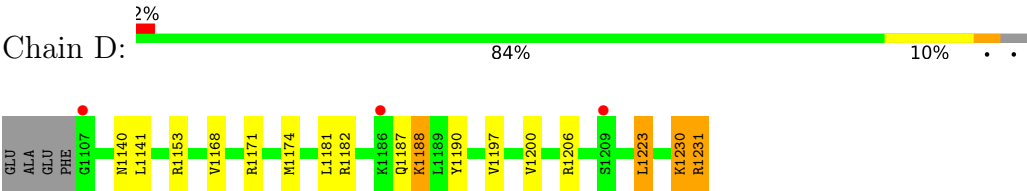
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	240	Total	O	0	0
			240	240		
4	B	228	Total	O	0	0
			228	228		
4	C	155	Total	O	0	0
			155	155		
4	D	141	Total	O	0	0
			141	141		

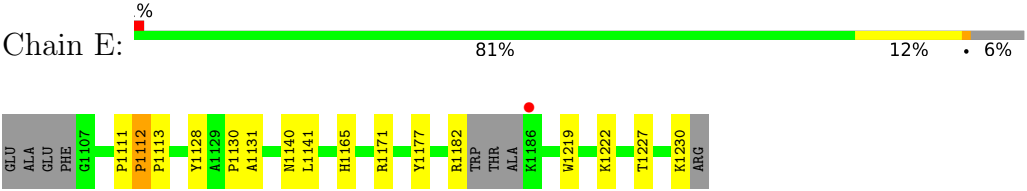
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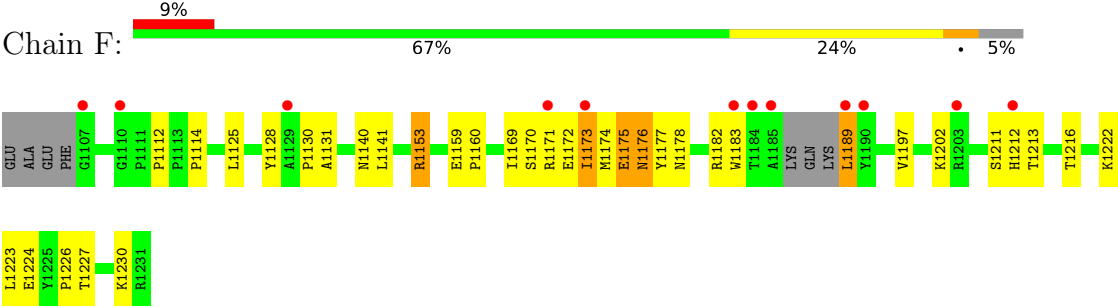
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	E	125	Total	O	0	0
			125	125		
4	F	59	Total	O	0	0
			59	59		



• Molecule 2: HF protein



• Molecule 2: HF protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	74.67Å 82.99Å 85.61Å 112.75° 110.14° 99.96°	Depositor
Resolution (Å)	40.48 – 2.10 40.48 – 2.10	Depositor EDS
% Data completeness (in resolution range)	95.9 (40.48-2.10) 95.8 (40.48-2.10)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.11 (at 2.10Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.2_432)	Depositor
R, R_{free}	0.171 , 0.206 0.168 , 0.202	Depositor DCC
R_{free} test set	4681 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	28.0	Xtriage
Anisotropy	0.079	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 48.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.012 for -h,-k,h+k+l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10982	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.90% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: GOL

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	0.52	0/2398	0.76	0/3248
1	B	0.52	0/2386	0.79	1/3234 (0.0%)
1	C	0.43	0/2388	0.76	2/3235 (0.1%)
2	D	0.48	0/1032	0.80	1/1399 (0.1%)
2	E	0.48	1/1004 (0.1%)	0.78	2/1354 (0.1%)
2	F	0.37	0/1009	0.82	1/1366 (0.1%)
All	All	0.48	1/10217 (0.0%)	0.78	7/13836 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	1111	PRO	CA-C	5.09	1.54	1.51

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	144	ASN	N-CA-C	8.11	122.26	110.42
2	F	1173	ILE	N-CA-C	-7.28	102.38	112.50
1	B	256	VAL	N-CA-C	6.21	119.81	112.35
2	D	1230	LYS	N-CA-C	5.70	117.95	111.11
2	E	1112	PRO	CA-C-N	5.59	123.74	119.66

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	2348	0	2345	26	0
1	B	2337	0	2339	44	0
1	C	2335	0	2345	46	0
2	D	1006	0	983	13	0
2	E	976	0	965	10	0
2	F	984	0	952	33	0
3	A	6	0	8	0	0
3	B	12	0	16	0	0
3	C	12	0	16	4	0
3	D	12	0	16	2	0
3	E	6	0	8	3	0
4	A	240	0	0	2	0
4	B	228	0	0	8	0
4	C	155	0	0	3	0
4	D	141	0	0	2	0
4	E	125	0	0	2	0
4	F	59	0	0	2	0
All	All	10982	0	9993	168	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 8.

The worst 5 of 168 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)
2:F:1172:GLU:HG2	2:F:1174:MET:HB2	1.41	1.00
1:B:55:LEU:HA	1:B:58:LYS:HE2	1.54	0.87
1:B:164:ILE:HD12	4:B:1004:HOH:O	1.74	0.86
1:A:155:LEU:HD21	1:A:206:MET:HE1	1.57	0.84
2:F:1171:ARG:HA	2:F:1172:GLU:HG3	1.62	0.81

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	295/317 (93%)	290 (98%)	5 (2%)	0	100	100
1	B	293/317 (92%)	287 (98%)	6 (2%)	0	100	100
1	C	294/317 (93%)	280 (95%)	13 (4%)	1 (0%)	36	36
2	D	124/129 (96%)	119 (96%)	5 (4%)	0	100	100
2	E	118/129 (92%)	117 (99%)	1 (1%)	0	100	100
2	F	119/129 (92%)	115 (97%)	4 (3%)	0	100	100
All	All	1243/1338 (93%)	1208 (97%)	34 (3%)	1 (0%)	48	50

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	143	ASN

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	246/264 (93%)	237 (96%)	9 (4%)	30	33
1	B	249/264 (94%)	241 (97%)	8 (3%)	34	38
1	C	245/264 (93%)	236 (96%)	9 (4%)	30	33
2	D	113/115 (98%)	107 (95%)	6 (5%)	20	19
2	E	111/115 (96%)	107 (96%)	4 (4%)	31	34
2	F	110/115 (96%)	104 (94%)	6 (6%)	19	18
All	All	1074/1137 (94%)	1032 (96%)	42 (4%)	28	31

5 of 42 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	D	1187	GLN
2	E	1230[B]	LYS
2	D	1188	LYS
2	E	1165	HIS
2	F	1175	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 37 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	1156	GLN
2	F	1140	ASN
2	D	1176	ASN
2	E	1165	HIS
1	B	189	ASN

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](#)

8 ligands are modelled in this entry.

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	GOL	C	311	-	5,5,5	0.34	0	5,5,5	0.29	0
3	GOL	D	6	-	5,5,5	0.26	0	5,5,5	0.57	0
3	GOL	B	312	-	5,5,5	0.48	0	5,5,5	0.64	0
3	GOL	B	311	-	5,5,5	0.36	0	5,5,5	0.32	0
3	GOL	D	8	-	5,5,5	0.30	0	5,5,5	0.41	0
3	GOL	E	2	-	5,5,5	0.33	0	5,5,5	0.60	0
3	GOL	A	311	-	5,5,5	0.50	0	5,5,5	0.58	0
3	GOL	C	312	-	5,5,5	0.50	0	5,5,5	0.96	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	C	311	-	-	2/4/4/4	-
3	GOL	D	6	-	-	2/4/4/4	-
3	GOL	B	312	-	-	4/4/4/4	-
3	GOL	B	311	-	-	0/4/4/4	-
3	GOL	D	8	-	-	2/4/4/4	-
3	GOL	E	2	-	-	2/4/4/4	-
3	GOL	A	311	-	-	0/4/4/4	-
3	GOL	C	312	-	-	4/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	312	GOL	C1-C2-C3-O3
3	C	311	GOL	O1-C1-C2-C3
3	C	312	GOL	O1-C1-C2-O2
3	C	312	GOL	O1-C1-C2-C3
3	D	6	GOL	O1-C1-C2-C3

There are no ring outliers.

3 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	6	GOL	2	0
3	E	2	GOL	3	0
3	C	312	GOL	4	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](#)

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, 95th 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 ²)	Q<0.9
1	A	295/317 (93%)	-0.46	2 (0%) 84 86	14, 24, 46, 84	2 (0%)
1	B	295/317 (93%)	-0.16	4 (1%) 73 75	11, 27, 53, 77	4 (1%)
1	C	294/317 (92%)	0.21	7 (2%) 59 62	16, 38, 75, 98	2 (0%)
2	D	125/129 (96%)	-0.11	3 (2%) 59 62	12, 29, 52, 69	1 (0%)
2	E	121/129 (93%)	-0.09	1 (0%) 82 84	17, 31, 51, 75	2 (1%)
2	F	122/129 (94%)	0.70	12 (9%) 13 13	17, 47, 76, 99	1 (0%)
All	All	1252/1338 (93%)	-0.05	29 (2%) 61 64	11, 31, 66, 99	12 (0%)

The worst 5 of 29 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	F	1185	ALA	5.4
1	B	10	LEU	5.1
1	C	1	PHE	5.0
1	B	270	GLY	4.7
2	E	1186	LYS	4.1

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, 95th 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 ²)	Q<0.9
3	GOL	D	6	6/6	0.75	0.19	45,48,53,59	0
3	GOL	B	311	6/6	0.84	0.13	44,50,58,58	0
3	GOL	C	311	6/6	0.85	0.12	46,52,54,59	0
3	GOL	D	8	6/6	0.85	0.12	51,54,64,66	0
3	GOL	E	2	6/6	0.87	0.16	37,44,52,53	0
3	GOL	C	312	6/6	0.89	0.15	26,32,37,49	0
3	GOL	B	312	6/6	0.94	0.12	19,33,43,45	0
3	GOL	A	311	6/6	0.95	0.08	17,24,28,28	0

6.5 Other polymers [i](#)

There are no such residues in this entry.