



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 10:41 AM UTC

PDB ID : 4BHU / pdb_00004bhu
Title : Crystal structure of BslA - A bacterial hydrophobin
Authors : Rao, F.V.; Hobley, L.; Ostrowski, A.; Bromley, K.M.; Porter, M.; Prescott, A.R.; Swedlow, J.R.; MacPhee, C.E.; van Aalten, D.M.F.; Stanley-Wall, N.R.
Deposited on : 2013-04-08
Resolution : 1.91 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

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:

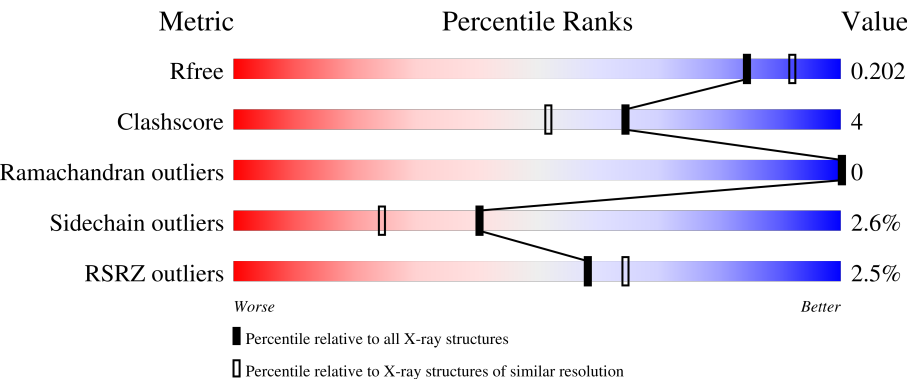
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.91 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	1188 (1.92-1.92)
Clashscore	190562	1209 (1.92-1.92)
Ramachandran outliers	187476	1195 (1.92-1.92)
Sidechain outliers	187428	1195 (1.92-1.92)
RSRZ outliers	180081	1188 (1.92-1.92)

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	130	91%8%
1	B	130	97%
1	C	130	88%9%
1	D	130	2%88%9%
1	E	130	97%

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Mol	Chain	Length	Quality of chain
1	F	130	% 92% 8%
1	G	130	% 91% 7%
1	H	130	% 84% 12%
1	J	130	6% 82% 8%
2	I	130	10% 82% 9%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 21151 atoms, of which 9970 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 UNCHARACTERIZED PROTEIN YUAB.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	128	Total	C	H	N	O	Se	0	5	0
			2008	632	1016	165	193	2			
1	B	129	Total	C	H	N	O	Se	0	3	0
			1998	629	1009	166	192	2			
1	C	130	Total	C	H	N	O	Se	0	3	0
			2021	636	1023	167	193	2			
1	D	129	Total	C	H	N	O	Se	0	2	0
			1992	627	1006	166	191	2			
1	E	130	Total	C	H	N	O	Se	0	0	0
			1991	627	1005	166	191	2			
1	F	130	Total	C	H	N	O	Se	0	0	0
			1990	627	1004	166	191	2			
1	G	128	Total	C	H	N	O	Se	0	2	0
			1982	624	1002	165	189	2			
1	H	128	Total	C	H	N	O	Se	0	2	0
			1982	624	1002	165	189	2			
1	J	118	Total	C	H	N	O	Se	0	2	0
			1837	580	925	153	177	2			

There are 54 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	43	GLY	-	expression tag	UNP P71014
A	44	PRO	-	expression tag	UNP P71014
A	45	LEU	-	expression tag	UNP P71014
A	46	GLY	-	expression tag	UNP P71014
A	47	SER	-	expression tag	UNP P71014
A	98	MSE	LEU	engineered mutation	UNP P71014
B	43	GLY	-	expression tag	UNP P71014
B	44	PRO	-	expression tag	UNP P71014
B	45	LEU	-	expression tag	UNP P71014
B	46	GLY	-	expression tag	UNP P71014
B	47	SER	-	expression tag	UNP P71014

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Chain	Residue	Modelled	Actual	Comment	Reference
B	98	MSE	LEU	engineered mutation	UNP P71014
C	43	GLY	-	expression tag	UNP P71014
C	44	PRO	-	expression tag	UNP P71014
C	45	LEU	-	expression tag	UNP P71014
C	46	GLY	-	expression tag	UNP P71014
C	47	SER	-	expression tag	UNP P71014
C	98	MSE	LEU	engineered mutation	UNP P71014
D	43	GLY	-	expression tag	UNP P71014
D	44	PRO	-	expression tag	UNP P71014
D	45	LEU	-	expression tag	UNP P71014
D	46	GLY	-	expression tag	UNP P71014
D	47	SER	-	expression tag	UNP P71014
D	98	MSE	LEU	engineered mutation	UNP P71014
E	43	GLY	-	expression tag	UNP P71014
E	44	PRO	-	expression tag	UNP P71014
E	45	LEU	-	expression tag	UNP P71014
E	46	GLY	-	expression tag	UNP P71014
E	47	SER	-	expression tag	UNP P71014
E	98	MSE	LEU	engineered mutation	UNP P71014
F	43	GLY	-	expression tag	UNP P71014
F	44	PRO	-	expression tag	UNP P71014
F	45	LEU	-	expression tag	UNP P71014
F	46	GLY	-	expression tag	UNP P71014
F	47	SER	-	expression tag	UNP P71014
F	98	MSE	LEU	engineered mutation	UNP P71014
G	43	GLY	-	expression tag	UNP P71014
G	44	PRO	-	expression tag	UNP P71014
G	45	LEU	-	expression tag	UNP P71014
G	46	GLY	-	expression tag	UNP P71014
G	47	SER	-	expression tag	UNP P71014
G	98	MSE	LEU	engineered mutation	UNP P71014
H	43	GLY	-	expression tag	UNP P71014
H	44	PRO	-	expression tag	UNP P71014
H	45	LEU	-	expression tag	UNP P71014
H	46	GLY	-	expression tag	UNP P71014
H	47	SER	-	expression tag	UNP P71014
H	98	MSE	LEU	engineered mutation	UNP P71014
J	43	GLY	-	expression tag	UNP P71014
J	44	PRO	-	expression tag	UNP P71014
J	45	LEU	-	expression tag	UNP P71014
J	46	GLY	-	expression tag	UNP P71014
J	47	SER	-	expression tag	UNP P71014

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Chain	Residue	Modelled	Actual	Comment	Reference
J	98	MSE	LEU	engineered mutation	UNP P71014

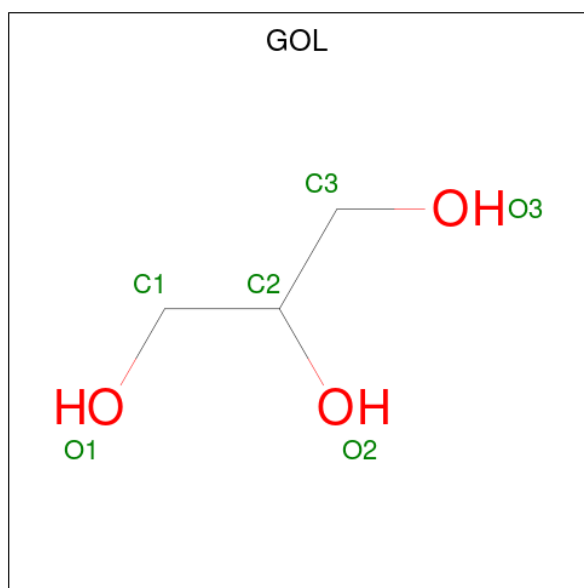
- Molecule 2 is a protein called UNCHARACTERIZED PROTEIN YUAB.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	I	119	Total	C	H	N	O	Se	0	2	0
			1845	580	930	153	180	2			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	43	GLY	-	expression tag	UNP P71014
I	44	PRO	-	expression tag	UNP P71014
I	45	LEU	-	expression tag	UNP P71014
I	46	GLY	-	expression tag	UNP P71014
I	47	SER	-	expression tag	UNP P71014
I	74	ASP	ASN	conflict	UNP P71014
I	98	MSE	LEU	engineered mutation	UNP P71014

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	H	O	0	0
			14	3	8	3		
3	B	1	Total	C	H	O	0	0
			14	3	8	3		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	E	1	Total	C	H	O	0	0
			14	3	8	3		
3	F	1	Total	C	H	O	0	0
			14	3	8	3		
3	F	1	Total	C	H	O	0	0
			14	3	8	3		
3	J	1	Total	C	H	O	0	0
			14	3	8	3		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Cl	0	0
			1	1		
4	B	1	Total	Cl	0	0
			1	1		
4	C	2	Total	Cl	0	0
			2	2		
4	E	2	Total	Cl	0	0
			2	2		
4	F	1	Total	Cl	0	0
			1	1		
4	H	1	Total	Cl	0	0
			1	1		
4	I	2	Total	Cl	0	0
			2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	162	Total	O	0	0
			162	162		
5	B	161	Total	O	0	0
			161	161		
5	C	191	Total	O	0	0
			191	191		
5	D	145	Total	O	0	0
			145	145		
5	E	180	Total	O	0	0
			180	180		
5	F	166	Total	O	0	0
			166	166		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	G	117	Total 117	O 117	0	0
5	H	145	Total 145	O 145	0	0
5	I	59	Total 59	O 59	0	0
5	J	85	Total 85	O 85	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.

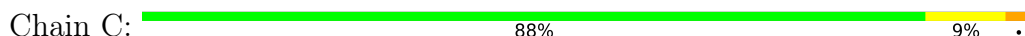
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



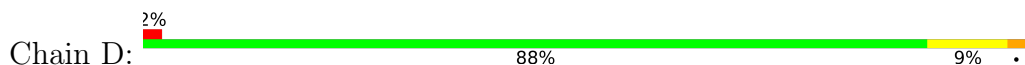
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



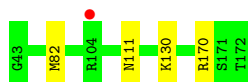
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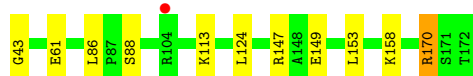
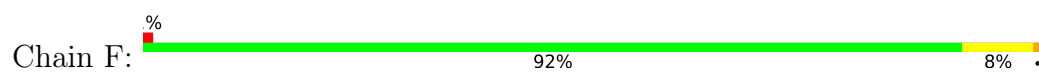
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



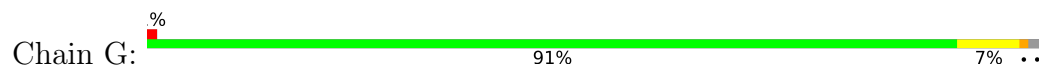
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



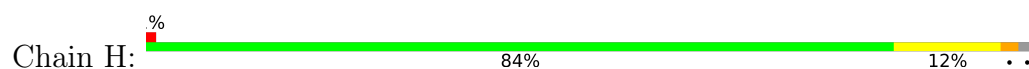
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



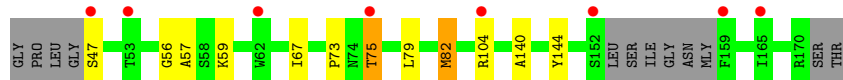
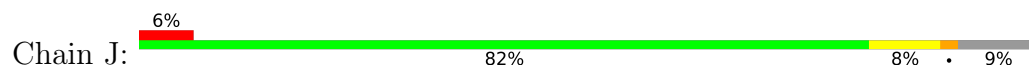
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



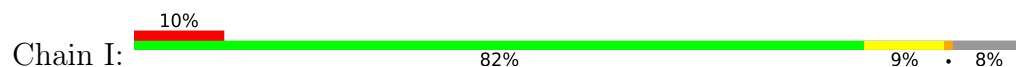
- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



- Molecule 1: UNCHARACTERIZED PROTEIN YUAB



- Molecule 2: UNCHARACTERIZED PROTEIN YUAB



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	69.70Å 95.98Å 259.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	77.19 – 1.91 77.19 – 1.91	Depositor EDS
% Data completeness (in resolution range)	100.0 (77.19-1.91) 97.6 (77.19-1.91)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.73 (at 1.91Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.165 , 0.199 0.169 , 0.202	Depositor DCC
R_{free} test set	6835 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	23.9	Xtriage
Anisotropy	0.439	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.41 , 45.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	21151	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.82% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CL, GOL, MLY

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	0.63	0/990	0.73	0/1341
1	B	0.62	0/981	0.75	0/1329
1	C	0.67	0/990	0.81	0/1342
1	D	0.67	0/975	0.76	0/1321
1	E	0.73	0/967	0.79	0/1310
1	F	0.73	0/967	0.84	0/1310
1	G	0.68	0/969	0.81	0/1313
1	H	0.62	0/969	0.78	0/1313
1	J	0.54	0/910	0.75	1/1231 (0.1%)
2	I	0.53	0/912	0.79	4/1234 (0.3%)
All	All	0.65	0/9630	0.78	5/13044 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	I	72	ARG	CA-C-N	-5.96	113.80	119.76
2	I	72	ARG	C-N-CA	-5.96	113.80	119.76
2	I	73	PRO	N-CA-C	-5.76	102.14	111.19
2	I	74	ASP	N-CA-C	-5.69	106.38	113.38
1	J	75	THR	N-CA-C	-5.59	101.64	109.69

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	992	1016	1003	4	0
1	B	989	1009	997	2	0
1	C	998	1023	1011	11	0
1	D	986	1006	993	11	0
1	E	986	1005	1003	2	0
1	F	986	1004	1003	9	0
1	G	980	1002	988	7	0
1	H	980	1002	988	16	0
1	J	912	925	911	8	0
2	I	915	930	916	6	0
3	A	6	8	8	0	0
3	B	6	8	8	0	0
3	E	6	8	8	0	0
3	F	12	16	16	1	0
3	J	6	8	8	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	2	0	0	1	0
4	E	2	0	0	0	0
4	F	1	0	0	1	0
4	H	1	0	0	0	0
4	I	2	0	0	0	0
5	A	162	0	0	1	0
5	B	161	0	0	2	0
5	C	191	0	0	3	0
5	D	145	0	0	4	0
5	E	180	0	0	2	1
5	F	166	0	0	4	1
5	G	117	0	0	4	0
5	H	145	0	0	4	0
5	I	59	0	0	2	0
5	J	85	0	0	0	0
All	All	11181	9970	9861	76	1

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 (76) 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:C:43:GLY:N	5:C:2001:HOH:O	1.97	0.96
1:D:158:MLY:O	5:D:2122:HOH:O	1.92	0.85
1:F:61:GLU:OE2	1:F:170:ARG:CD	2.25	0.85
1:F:61:GLU:OE2	1:F:170:ARG:HD2	1.78	0.83
1:G:157:ASN:ND2	5:G:2009:HOH:O	2.13	0.81
1:C:83:GLU:OE1	1:C:116:ARG:NH1	2.13	0.80
5:E:2132:HOH:O	1:H:43:GLY:N	2.13	0.80
1:F:61:GLU:CD	1:F:170:ARG:HD2	2.11	0.76
4:C:1174:CL:CL	5:C:2146:HOH:O	2.39	0.76
1:F:61:GLU:OE2	1:F:170:ARG:HD3	1.91	0.71
2:I:160:TYR:N	5:I:2008:HOH:O	2.25	0.69
1:F:147:ARG:NH2	5:F:2131:HOH:O	2.21	0.69
2:I:73:PRO:O	5:I:2010:HOH:O	2.11	0.68
1:A:132:LYS:NZ	5:A:2094:HOH:O	2.20	0.67
2:I:60:THR:O	2:I:63:SER:OG	2.13	0.66
1:J:56:GLY:O	1:J:59:MLY:HH22	1.96	0.64
1:A:68:GLU:OE2	1:A:132:LYS:HE3	1.99	0.63
5:F:2108:HOH:O	1:J:104:ARG:NH1	2.16	0.63
1:D:149:GLU:HG3	5:D:2122:HOH:O	2.00	0.62
1:H:147:ARG:HD2	1:H:160:TYR:CD1	2.38	0.58
1:H:116:ARG:NH1	5:H:2099:HOH:O	2.24	0.57
1:G:151:LYS:NZ	5:G:2045:HOH:O	2.33	0.57
1:F:149:GLU:OE1	5:F:2130:HOH:O	2.17	0.57
2:I:58:SER:OG	2:I:60:THR:HG22	2.05	0.56
1:D:83:GLU:OE2	1:D:116:ARG:NH2	2.37	0.56
1:D:149:GLU:CG	5:D:2122:HOH:O	2.53	0.56
1:D:171:SER:OG	5:D:2144:HOH:O	2.18	0.55
1:C:45:LEU:HD13	1:C:156:GLY:HA2	1.90	0.53
1:E:170:ARG:HG2	5:E:2043:HOH:O	2.08	0.53
1:G:53[A]:THR:HG23	5:G:2015:HOH:O	2.10	0.52
1:F:43:GLY:HA3	4:F:1175:CL:CL	2.48	0.50
1:J:57:ALA:O	1:J:59:MLY:HH13	2.11	0.50
1:H:147:ARG:HD3	1:H:162:GLU:OE2	2.12	0.50
2:I:143:THR:HG22	2:I:166:ASP:OD1	2.10	0.50
1:D:170:ARG:O	1:D:171:SER:C	2.54	0.50
1:G:56:GLY:O	1:G:59:MLY:HH22	2.12	0.49
1:B:113:LYS:HG2	5:B:2065:HOH:O	2.11	0.49
1:J:82:MSE:HE2	1:J:82:MSE:HA	1.93	0.49
1:H:61:GLU:OE2	1:H:170:ARG:NH1	2.46	0.49
1:H:132:LYS:NZ	5:H:2103:HOH:O	2.36	0.48
1:G:151:LYS:CE	5:G:2045:HOH:O	2.61	0.48
1:D:82:MSE:HG3	1:D:120:ALA:CB	2.42	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:149:GLU:OE1	5:B:2131:HOH:O	2.20	0.48
1:C:82:MSE:HG3	1:C:120:ALA:CB	2.43	0.48
1:H:113:LYS:NZ	5:H:2098:HOH:O	2.43	0.48
1:C:147:ARG:HD3	1:C:162:GLU:OE2	2.14	0.48
1:F:153:LEU:HD22	1:H:79:LEU:HG	1.96	0.48
1:D:45:LEU:HD13	1:D:156:GLY:HA2	1.95	0.47
1:G:45:LEU:HD13	1:G:156:GLY:HA2	1.95	0.47
1:C:147:ARG:HD2	1:C:160:TYR:CD1	2.50	0.47
1:C:169:LYS:HD2	5:C:2186:HOH:O	2.14	0.46
1:J:73:PRO:C	1:J:75:THR:H	2.24	0.46
1:C:67:ILE:HD12	1:C:67:ILE:N	2.31	0.46
1:H:132:LYS:CE	5:H:2103:HOH:O	2.64	0.46
3:F:1174:GOL:H11	5:F:2166:HOH:O	2.16	0.45
1:H:82:MSE:HG3	1:H:120:ALA:CB	2.45	0.45
1:D:104:ARG:HD3	1:D:105:THR:N	2.31	0.45
1:H:67:ILE:N	1:H:67:ILE:HD12	2.31	0.45
1:A:149[A]:GLU:HG2	1:A:151:LYS:HG2	1.99	0.45
1:C:152:SER:O	1:C:158:MLY:HH13	2.17	0.44
1:H:59:MLY:HH12	1:H:59:MLY:HD2	1.78	0.43
1:C:76[A]:LEU:HD12	1:C:76[A]:LEU:HA	1.86	0.43
1:A:75:THR:HB	1:A:155:ILE:O	2.19	0.43
2:I:67:ILE:HD12	2:I:67:ILE:N	2.34	0.43
1:H:79:LEU:C	1:H:79:LEU:HD23	2.44	0.42
1:D:123:LEU:HG	1:D:124:LEU:HD22	2.02	0.42
1:G:67:ILE:HD12	1:G:67:ILE:N	2.36	0.41
1:H:120:ALA:HB1	1:H:129:PHE:CZ	2.55	0.41
1:C:59:MLY:HH12	1:H:166:ASP:OD2	2.21	0.41
1:J:140:ALA:O	1:J:144:TYR:OH	2.31	0.41
1:J:82:MSE:HA	1:J:82:MSE:CE	2.51	0.41
1:F:86:LEU:O	1:F:113:LYS:HG3	2.21	0.41
1:E:82:MSE:HE3	1:E:82:MSE:HB3	2.03	0.40
1:D:104:ARG:HD3	1:D:105:THR:H	1.86	0.40
1:H:170:ARG:HH11	1:H:170:ARG:HB2	1.85	0.40

All (1) 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)
5:E:2037:HOH:O	5:F:2155:HOH:O[1_655]	2.06	0.14

5.3 Torsion angles

5.3.1 Protein backbone

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	128/130 (98%)	127 (99%)	1 (1%)	0	100	100
1	B	127/130 (98%)	126 (99%)	1 (1%)	0	100	100
1	C	128/130 (98%)	126 (98%)	2 (2%)	0	100	100
1	D	126/130 (97%)	124 (98%)	2 (2%)	0	100	100
1	E	125/130 (96%)	124 (99%)	1 (1%)	0	100	100
1	F	125/130 (96%)	124 (99%)	1 (1%)	0	100	100
1	G	125/130 (96%)	123 (98%)	2 (2%)	0	100	100
1	H	125/130 (96%)	123 (98%)	2 (2%)	0	100	100
1	J	114/130 (88%)	109 (96%)	5 (4%)	0	100	100
2	I	115/130 (88%)	112 (97%)	3 (3%)	0	100	100
All	All	1238/1300 (95%)	1218 (98%)	20 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	106/101 (105%)	103 (97%)	3 (3%)	38	22
1	B	105/101 (104%)	105 (100%)	0	100	100
1	C	106/101 (105%)	101 (95%)	5 (5%)	23	9
1	D	104/101 (103%)	102 (98%)	2 (2%)	50	37

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	103/101 (102%)	102 (99%)	1 (1%)	68	64
1	F	103/101 (102%)	100 (97%)	3 (3%)	37	21
1	G	103/101 (102%)	100 (97%)	3 (3%)	37	21
1	H	103/101 (102%)	97 (94%)	6 (6%)	18	5
1	J	97/101 (96%)	94 (97%)	3 (3%)	35	19
2	I	98/101 (97%)	94 (96%)	4 (4%)	27	12
All	All	1028/1010 (102%)	998 (97%)	30 (3%)	40	21

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	124	LEU
1	A	169	LYS
1	A	170	ARG
1	C	76[A]	LEU
1	C	76[B]	LEU
1	C	82	MSE
1	C	116	ARG
1	C	147	ARG
1	D	104	ARG
1	D	124	LEU
1	E	111	ASN
1	F	88	SER
1	F	124	LEU
1	F	170	ARG
1	G	53[A]	THR
1	G	53[B]	THR
1	G	111	ASN
1	H	53[A]	THR
1	H	53[B]	THR
1	H	76	LEU
1	H	82	MSE
1	H	147	ARG
1	H	170	ARG
2	I	53[A]	THR
2	I	53[B]	THR
2	I	109	LEU
2	I	119	LEU
1	J	47	SER
1	J	79	LEU

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Mol	Chain	Res	Type
1	J	82	MSE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	150	ASN
1	A	157	ASN
1	E	157	ASN
1	J	134	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

28 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
1	MLY	J	130	1	9,10,11	0.64	0	6,11,13	0.85	0
1	MLY	B	59	1	9,10,11	0.76	0	6,11,13	0.69	0
1	MLY	D	158	1	9,10,11	0.66	0	6,11,13	0.76	0
1	MLY	F	158	1	9,10,11	0.87	1 (11%)	6,11,13	0.81	0
1	MLY	G	130	1	9,10,11	0.74	0	6,11,13	1.34	1 (16%)
1	MLY	J	59	1	9,10,11	0.88	0	6,11,13	0.91	0
1	MLY	E	59	1	9,10,11	0.93	0	6,11,13	0.97	0
1	MLY	G	158	1	9,10,11	0.61	0	6,11,13	0.68	0
1	MLY	C	130	1	9,10,11	0.66	0	6,11,13	0.84	0
1	MLY	C	59	1	9,10,11	0.67	0	6,11,13	0.66	0
1	MLY	B	130	1	9,10,11	1.00	0	6,11,13	1.51	1 (16%)
1	MLY	H	130	1	9,10,11	0.94	0	6,11,13	1.05	1 (16%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
1	MLY	A	130	1	9,10,11	0.88	0	6,11,13	1.19	1 (16%)
1	MLY	B	158	1	9,10,11	0.78	0	6,11,13	0.95	0
1	MLY	H	158	1	9,10,11	0.74	0	6,11,13	0.49	0
1	MLY	C	158	1	9,10,11	0.62	0	6,11,13	0.76	0
1	MLY	E	130	1	9,10,11	0.76	0	6,11,13	1.27	2 (33%)
1	MLY	F	130	1	9,10,11	0.67	0	6,11,13	1.17	0
1	MLY	H	59	1	9,10,11	0.73	0	6,11,13	0.77	0
1	MLY	A	59	1	9,10,11	0.84	0	6,11,13	0.64	0
1	MLY	D	130	1	9,10,11	0.81	0	6,11,13	1.12	0
1	MLY	G	59	1	9,10,11	0.44	0	6,11,13	1.02	0
1	MLY	F	59	1	9,10,11	0.79	0	6,11,13	0.63	0
2	MLY	I	59	2	9,10,11	0.75	0	6,11,13	0.84	0
1	MLY	D	59	1	9,10,11	0.57	0	6,11,13	0.94	0
2	MLY	I	130	2	9,10,11	0.78	0	6,11,13	0.78	0
1	MLY	E	158	1	9,10,11	0.70	0	6,11,13	0.64	0
1	MLY	A	158	1	9,10,11	0.78	0	6,11,13	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
1	MLY	J	130	1	-	1/8/9/11	-
1	MLY	B	59	1	-	2/8/9/11	-
1	MLY	D	158	1	-	1/8/9/11	-
1	MLY	F	158	1	-	1/8/9/11	-
1	MLY	G	130	1	-	0/8/9/11	-
1	MLY	J	59	1	-	3/8/9/11	-
1	MLY	E	59	1	-	1/8/9/11	-
1	MLY	G	158	1	-	0/8/9/11	-
1	MLY	C	130	1	-	1/8/9/11	-
1	MLY	C	59	1	-	4/8/9/11	-
1	MLY	B	130	1	-	0/8/9/11	-
1	MLY	H	130	1	-	1/8/9/11	-
1	MLY	A	130	1	-	0/8/9/11	-
1	MLY	B	158	1	-	0/8/9/11	-
1	MLY	H	158	1	-	1/8/9/11	-
1	MLY	C	158	1	-	0/8/9/11	-
1	MLY	E	130	1	-	3/8/9/11	-
1	MLY	F	130	1	-	0/8/9/11	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	MLY	H	59	1	-	5/8/9/11	-
1	MLY	A	59	1	-	1/8/9/11	-
1	MLY	D	130	1	-	0/8/9/11	-
1	MLY	G	59	1	-	4/8/9/11	-
1	MLY	F	59	1	-	0/8/9/11	-
2	MLY	I	59	2	-	6/8/9/11	-
1	MLY	D	59	1	-	3/8/9/11	-
2	MLY	I	130	2	-	0/8/9/11	-
1	MLY	E	158	1	-	0/8/9/11	-
1	MLY	A	158	1	-	0/8/9/11	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	158	MLY	CE-NZ	2.05	1.53	1.46

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	130	MLY	CH2-NZ-CE	-2.90	99.24	110.75
1	A	130	MLY	CD-CE-NZ	-2.60	106.99	113.71
1	G	130	MLY	CH1-NZ-CE	-2.58	100.52	110.75
1	E	130	MLY	CH2-NZ-CH1	-2.15	104.20	109.72
1	E	130	MLY	CH2-NZ-CE	-2.08	102.52	110.75
1	H	130	MLY	CH2-NZ-CE	-2.03	102.69	110.75

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	59	MLY	O-C-CA-CB
1	C	59	MLY	O-C-CA-CB
1	D	59	MLY	O-C-CA-CB
1	E	59	MLY	O-C-CA-CB
1	G	59	MLY	O-C-CA-CB
1	H	59	MLY	O-C-CA-CB
2	I	59	MLY	O-C-CA-CB
1	J	59	MLY	O-C-CA-CB
1	E	130	MLY	CE-CD-CG-CB
1	E	130	MLY	CD-CE-NZ-CH2

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Mol	Chain	Res	Type	Atoms
1	G	59	MLY	CD-CE-NZ-CH2
1	H	59	MLY	CD-CE-NZ-CH2
1	B	59	MLY	CD-CE-NZ-CH2
1	E	130	MLY	CD-CE-NZ-CH1
1	G	59	MLY	CD-CE-NZ-CH1
2	I	59	MLY	CD-CE-NZ-CH1
2	I	59	MLY	CD-CE-NZ-CH2
1	H	59	MLY	CD-CE-NZ-CH1
1	H	158	MLY	CD-CE-NZ-CH1
1	J	59	MLY	CD-CE-NZ-CH1
1	H	59	MLY	CG-CD-CE-NZ
1	J	130	MLY	CD-CE-NZ-CH1
1	H	130	MLY	CG-CD-CE-NZ
1	C	59	MLY	CD-CE-NZ-CH1
1	D	59	MLY	CG-CD-CE-NZ
1	C	59	MLY	CA-CB-CG-CD
1	C	130	MLY	CG-CD-CE-NZ
1	C	59	MLY	CG-CD-CE-NZ
1	D	158	MLY	CD-CE-NZ-CH1
1	B	59	MLY	CD-CE-NZ-CH1
1	F	158	MLY	CD-CE-NZ-CH1
2	I	59	MLY	CG-CD-CE-NZ
2	I	59	MLY	N-CA-CB-CG
1	H	59	MLY	CA-CB-CG-CD
1	G	59	MLY	CA-CB-CG-CD
1	D	59	MLY	CA-CB-CG-CD
1	J	59	MLY	CD-CE-NZ-CH2
2	I	59	MLY	C-CA-CB-CG

There are no ring outliers.

6 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	158	MLY	1	0
1	J	59	MLY	2	0
1	C	59	MLY	1	0
1	C	158	MLY	1	0
1	H	59	MLY	1	0
1	G	59	MLY	1	0

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 16 ligands modelled in this entry, 10 are monoatomic - leaving 6 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	GOL	A	1171	-	5,5,5	0.36	0	5,5,5	0.66	0
3	GOL	E	1173	-	5,5,5	0.62	0	5,5,5	1.42	1 (20%)
3	GOL	J	1171	-	5,5,5	0.38	0	5,5,5	0.41	0
3	GOL	B	1172	-	5,5,5	0.27	0	5,5,5	0.79	0
3	GOL	F	1173	-	5,5,5	0.45	0	5,5,5	0.52	0
3	GOL	F	1174	-	5,5,5	0.67	0	5,5,5	0.88	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	A	1171	-	-	0/4/4/4	-
3	GOL	E	1173	-	-	3/4/4/4	-
3	GOL	J	1171	-	-	2/4/4/4	-
3	GOL	B	1172	-	-	0/4/4/4	-
3	GOL	F	1173	-	-	0/4/4/4	-
3	GOL	F	1174	-	-	1/4/4/4	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	1173	GOL	O3-C3-C2	-2.55	98.91	110.38

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	1173	GOL	C1-C2-C3-O3
3	E	1173	GOL	O2-C2-C3-O3
3	J	1171	GOL	C1-C2-C3-O3
3	E	1173	GOL	O1-C1-C2-O2
3	J	1171	GOL	O2-C2-C3-O3
3	F	1174	GOL	O2-C2-C3-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	1174	GOL	1	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

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, 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	123/130 (94%)	-0.49	1 (0%) 82 88	11, 26, 37, 68	4 (3%)
1	B	124/130 (95%)	-0.33	1 (0%) 82 88	11, 28, 43, 59	2 (1%)
1	C	125/130 (96%)	-0.58	0 100 100	12, 24, 40, 50	2 (1%)
1	D	124/130 (95%)	-0.31	3 (2%) 59 66	14, 27, 44, 61	1 (0%)
1	E	125/130 (96%)	-0.58	1 (0%) 82 88	16, 23, 36, 50	0
1	F	125/130 (96%)	-0.58	1 (0%) 82 88	16, 24, 37, 50	0
1	G	123/130 (94%)	-0.41	1 (0%) 82 88	13, 26, 42, 56	1 (0%)
1	H	123/130 (94%)	-0.46	1 (0%) 82 88	13, 26, 42, 52	1 (0%)
1	J	114/130 (87%)	0.44	8 (7%) 22 27	21, 40, 54, 67	1 (0%)
2	I	115/130 (88%)	0.74	13 (11%) 10 12	23, 43, 63, 72	1 (0%)
All	All	1221/1300 (93%)	-0.27	30 (2%) 58 64	11, 27, 49, 72	13 (1%)

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	J	159	PHE	5.7
1	J	152	SER	4.4
2	I	153	LEU	4.2
2	I	64	PHE	3.8
2	I	160	TYR	3.1
1	D	104	ARG	2.8
2	I	53[A]	THR	2.7
1	G	43	GLY	2.6
1	J	53[A]	THR	2.5
2	I	168	ALA	2.4
1	J	75	THR	2.4
1	A	170	ARG	2.3
1	F	104	ARG	2.3

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Mol	Chain	Res	Type	RSRZ
2	I	154	SER	2.3
1	B	171	SER	2.3
1	H	170	ARG	2.2
1	D	171	SER	2.2
2	I	75	THR	2.2
1	J	62	TRP	2.2
2	I	141	ALA	2.2
2	I	144	TYR	2.1
2	I	74	ASP	2.1
1	J	47	SER	2.1
2	I	143	THR	2.1
2	I	170	ARG	2.1
1	J	104	ARG	2.1
1	J	165	ILE	2.0
2	I	51	PHE	2.0
1	D	43	GLY	2.0
1	E	104	ARG	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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
2	MLY	I	59	11/12	0.85	0.16	44,64,73,73	0
1	MLY	J	59	11/12	0.88	0.14	37,51,72,72	0
1	MLY	B	59	11/12	0.92	0.11	27,42,53,53	0
1	MLY	H	59	11/12	0.92	0.11	27,41,57,57	0
1	MLY	G	59	11/12	0.93	0.09	26,36,56,56	0
2	MLY	I	130	11/12	0.93	0.11	29,47,67,67	0
1	MLY	A	59	11/12	0.93	0.10	26,35,52,52	0
1	MLY	C	59	11/12	0.94	0.12	25,41,58,58	0
1	MLY	B	130	11/12	0.94	0.09	16,31,44,44	0
1	MLY	J	130	11/12	0.94	0.10	27,45,55,58	0
1	MLY	E	130	11/12	0.95	0.10	17,30,50,50	0
1	MLY	F	158	11/12	0.95	0.09	14,28,52,52	0
1	MLY	A	130	11/12	0.95	0.08	15,26,41,41	0
1	MLY	C	158	11/12	0.95	0.08	17,27,45,45	0
1	MLY	F	130	11/12	0.96	0.08	16,28,49,49	0
1	MLY	D	158	11/12	0.96	0.07	22,35,54,54	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
1	MLY	D	59	11/12	0.96	0.08	29,38,47,47	0
1	MLY	F	59	11/12	0.96	0.05	16,20,23,24	0
1	MLY	G	158	11/12	0.97	0.06	20,28,35,40	0
1	MLY	E	158	11/12	0.97	0.07	14,26,43,43	0
1	MLY	H	130	11/12	0.97	0.06	14,29,48,48	0
1	MLY	H	158	11/12	0.97	0.06	17,27,40,40	0
1	MLY	A	158	11/12	0.97	0.07	15,28,44,44	0
1	MLY	D	130	11/12	0.97	0.07	18,32,54,54	0
1	MLY	C	130	11/12	0.97	0.07	14,27,46,46	0
1	MLY	B	158	11/12	0.97	0.07	15,29,47,47	0
1	MLY	E	59	11/12	0.98	0.04	16,20,24,24	0
1	MLY	G	130	11/12	0.98	0.05	17,29,47,47	0

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($\text{\AA}^2$)	Q<0.9
3	GOL	F	1174	6/6	0.79	0.13	30,37,45,53	0
3	GOL	J	1171	6/6	0.80	0.13	49,58,67,69	0
4	CL	C	1174	1/1	0.81	0.15	40,40,40,40	0
4	CL	I	1171	1/1	0.88	0.30	61,61,61,61	0
4	CL	I	1172	1/1	0.89	0.19	39,39,39,39	0
3	GOL	E	1173	6/6	0.90	0.11	22,30,34,36	0
4	CL	E	1175	1/1	0.91	0.10	42,42,42,42	0
4	CL	H	1171	1/1	0.91	0.20	59,59,59,59	0
3	GOL	F	1173	6/6	0.92	0.09	24,30,35,39	0
4	CL	C	1173	1/1	0.94	0.23	52,52,52,52	0
3	GOL	B	1172	6/6	0.94	0.07	21,27,30,32	0
3	GOL	A	1171	6/6	0.95	0.07	19,25,30,32	0
4	CL	F	1175	1/1	0.99	0.02	16,16,16,16	0
4	CL	E	1174	1/1	0.99	0.03	17,17,17,17	0
4	CL	A	1172	1/1	1.00	0.02	17,17,17,17	0
4	CL	B	1173	1/1	1.00	0.02	16,16,16,16	0

6.5 Other polymers [i](#)

There are no such residues in this entry.