



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 13, 2026 – 02:21 pm BST

PDB ID : 4C2B / pdb_00004c2b
Title : Crystal Structure of High-Affinity von Willebrand Factor A1 domain with Disulfide Mutation in Complex with High Affinity GPIb alpha
Authors : Blenner, M.A.; Dong, X.; Springer, T.A.
Deposited on : 2013-08-16
Resolution : 2.80 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	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

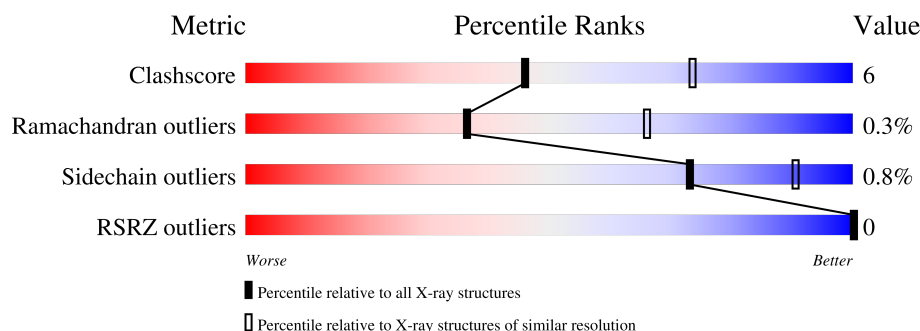
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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))
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	215	
1	C	215	
1	E	215	
1	G	215	
2	B	291	
2	D	291	

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Mol	Chain	Length	Quality of chain
2	F	291	 76% 14% • 9%
2	H	291	 77% 12% • 10%

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	SO4	H	1266	-	-	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 14768 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 VON WILLEBRAND FACTOR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	199	Total	C	N	O	S	0	0	0
			1603	1021	287	289	6			
1	C	199	Total	C	N	O	S	0	0	0
			1602	1020	287	289	6			
1	E	199	Total	C	N	O	S	0	0	0
			1603	1021	287	289	6			
1	G	197	Total	C	N	O	S	0	0	0
			1585	1009	283	287	6			

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1263	MET	-	expression tag	UNP P04275
A	1472	HIS	-	expression tag	UNP P04275
A	1473	HIS	-	expression tag	UNP P04275
A	1474	HIS	-	expression tag	UNP P04275
A	1475	HIS	-	expression tag	UNP P04275
A	1476	HIS	-	expression tag	UNP P04275
A	1477	HIS	-	expression tag	UNP P04275
A	1271	CYS	TYR	engineered mutation	UNP P04275
A	1272	ARG	CYS	engineered mutation	UNP P04275
A	1381	ALA	THR	variant	UNP P04275
C	1263	MET	-	expression tag	UNP P04275
C	1472	HIS	-	expression tag	UNP P04275
C	1473	HIS	-	expression tag	UNP P04275
C	1474	HIS	-	expression tag	UNP P04275
C	1475	HIS	-	expression tag	UNP P04275
C	1476	HIS	-	expression tag	UNP P04275
C	1477	HIS	-	expression tag	UNP P04275
C	1271	CYS	TYR	engineered mutation	UNP P04275
C	1272	ARG	CYS	engineered mutation	UNP P04275
C	1381	ALA	THR	variant	UNP P04275
E	1263	MET	-	expression tag	UNP P04275

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Chain	Residue	Modelled	Actual	Comment	Reference
E	1472	HIS	-	expression tag	UNP P04275
E	1473	HIS	-	expression tag	UNP P04275
E	1474	HIS	-	expression tag	UNP P04275
E	1475	HIS	-	expression tag	UNP P04275
E	1476	HIS	-	expression tag	UNP P04275
E	1477	HIS	-	expression tag	UNP P04275
E	1271	CYS	TYR	engineered mutation	UNP P04275
E	1272	ARG	CYS	engineered mutation	UNP P04275
E	1381	ALA	THR	variant	UNP P04275
G	1263	MET	-	expression tag	UNP P04275
G	1472	HIS	-	expression tag	UNP P04275
G	1473	HIS	-	expression tag	UNP P04275
G	1474	HIS	-	expression tag	UNP P04275
G	1475	HIS	-	expression tag	UNP P04275
G	1476	HIS	-	expression tag	UNP P04275
G	1477	HIS	-	expression tag	UNP P04275
G	1271	CYS	TYR	engineered mutation	UNP P04275
G	1272	ARG	CYS	engineered mutation	UNP P04275
G	1381	ALA	THR	variant	UNP P04275

- Molecule 2 is a protein called PLATELET GLYCOPROTEIN IB ALPHA CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	264	Total	C	N	O	S	0	0	0
			2069	1333	345	383	8			
2	D	262	Total	C	N	O	S	0	0	0
			2055	1326	343	378	8			
2	F	264	Total	C	N	O	S	0	0	0
			2069	1333	345	383	8			
2	H	261	Total	C	N	O	S	0	0	0
			2048	1321	341	378	8			

There are 20 discrepancies between the modelled and reference sequences:

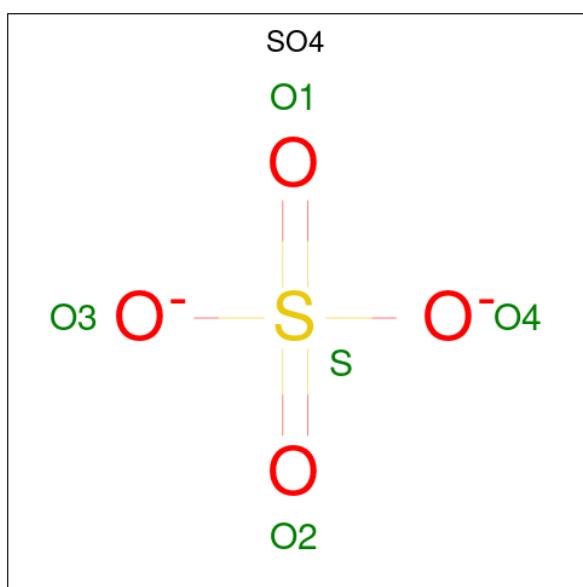
Chain	Residue	Modelled	Actual	Comment	Reference
B	291	GLY	-	expression tag	UNP P07359
B	21	ARG	ASN	engineered mutation	UNP P07359
B	159	ARG	ASN	engineered mutation	UNP P07359
B	233	VAL	GLY	engineered mutation	UNP P07359
B	239	VAL	MET	engineered mutation	UNP P07359
D	291	GLY	-	expression tag	UNP P07359
D	21	ARG	ASN	engineered mutation	UNP P07359

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Chain	Residue	Modelled	Actual	Comment	Reference
D	159	ARG	ASN	engineered mutation	UNP P07359
D	233	VAL	GLY	engineered mutation	UNP P07359
D	239	VAL	MET	engineered mutation	UNP P07359
F	291	GLY	-	expression tag	UNP P07359
F	21	ARG	ASN	engineered mutation	UNP P07359
F	159	ARG	ASN	engineered mutation	UNP P07359
F	233	VAL	GLY	engineered mutation	UNP P07359
F	239	VAL	MET	engineered mutation	UNP P07359
H	291	GLY	-	expression tag	UNP P07359
H	21	ARG	ASN	engineered mutation	UNP P07359
H	159	ARG	ASN	engineered mutation	UNP P07359
H	233	VAL	GLY	engineered mutation	UNP P07359
H	239	VAL	MET	engineered mutation	UNP P07359

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



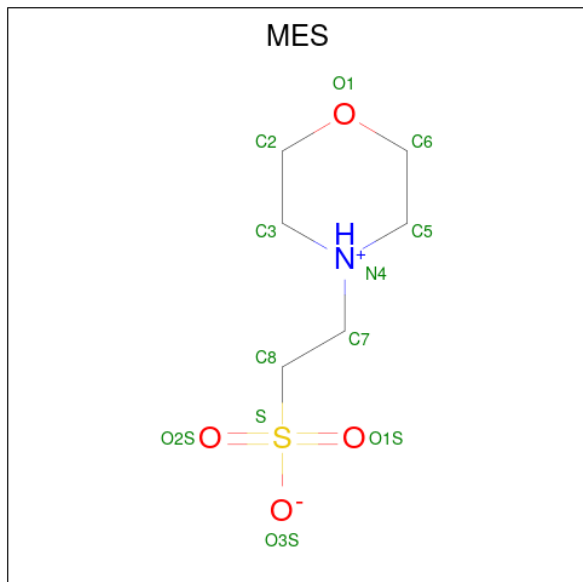
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	C	1	Total	O	S	0	0
			5	4	1		
3	D	1	Total	O	S	0	0
			5	4	1		
3	E	1	Total	O	S	0	0
			5	4	1		

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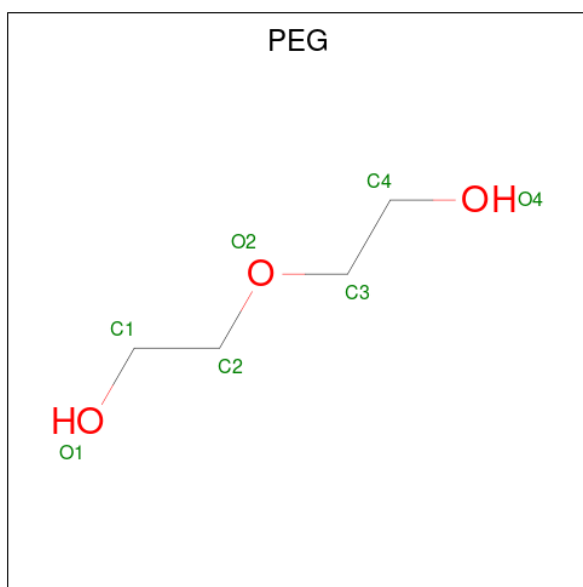
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	F	1	Total	O	S	0	0
			5	4	1		
3	G	1	Total	O	S	0	0
			5	4	1		
3	G	1	Total	O	S	0	0
			5	4	1		
3	H	1	Total	O	S	0	0
			5	4	1		
3	H	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0
			12	6	1	4	1	0

- Molecule 5 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	G	1	Total	C	O	0	0
			7	4	3		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	5	Total	O	0	0
			5	5		
6	B	5	Total	O	0	0
			5	5		
6	C	3	Total	O	0	0
			3	3		
6	D	14	Total	O	0	0
			14	14		
6	E	9	Total	O	0	0
			9	9		
6	F	11	Total	O	0	0
			11	11		
6	G	9	Total	O	0	0
			9	9		
6	H	9	Total	O	0	0
			9	9		

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.

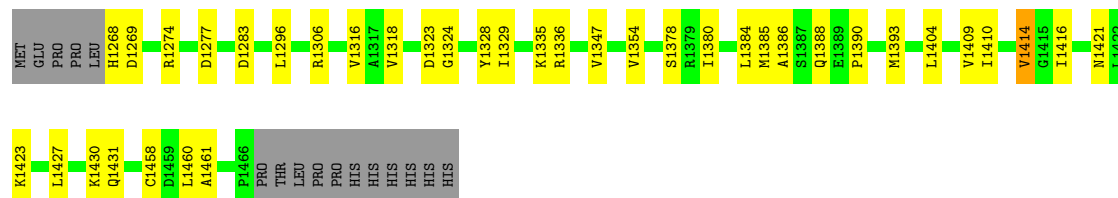
• Molecule 1: VON WILLEBRAND FACTOR

Chain A: 



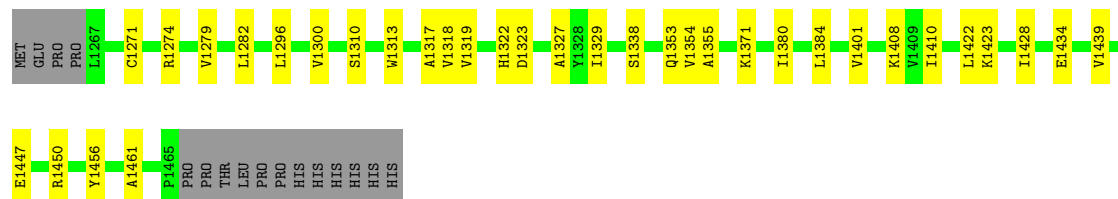
• Molecule 1: VON WILLEBRAND FACTOR

Chain C: 



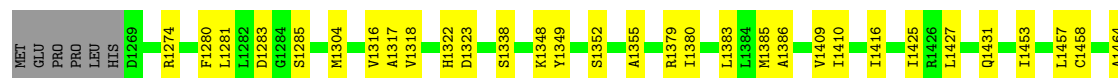
• Molecule 1: VON WILLEBRAND FACTOR

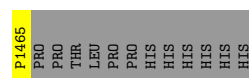
Chain E: 



• Molecule 1: VON WILLEBRAND FACTOR

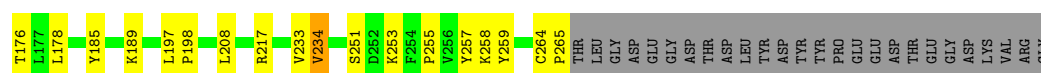
Chain G: 





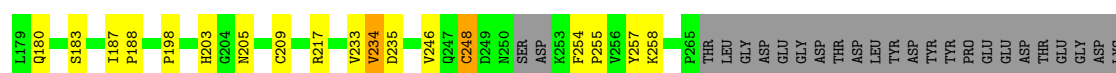
• Molecule 2: PLATELET GLYCOPROTEIN IB ALPHA CHAIN

Chain B:  73% 17% 9%



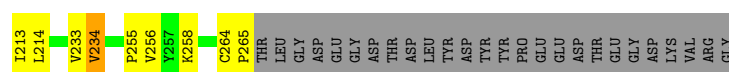
• Molecule 2: PLATELET GLYCOPROTEIN IB ALPHA CHAIN

Chain D:  73% 16% 10%



• Molecule 2: PLATELET GLYCOPROTEIN IB ALPHA CHAIN

Chain F:  76% 14% 9%



• Molecule 2: PLATELET GLYCOPROTEIN IB ALPHA CHAIN

Chain H:  77% 12% 10%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	96.53Å 103.84Å 119.93Å 90.00° 90.05° 90.00°	Depositor
Resolution (Å)	48.27 – 2.80 48.27 – 2.80	Depositor EDS
% Data completeness (in resolution range)	96.6 (48.27-2.80) 96.3 (48.27-2.80)	Depositor EDS
R_{merge}	0.59	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.253 , 0.286 0.254 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	(Not available)	Xtriage
Anisotropy	(Not available)	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 26.0	EDS
L-test for twinning ¹	$\langle L \rangle =$ (Not available), $\langle L^2 \rangle =$ (Not available)	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Reported twinning fraction	0.480 for h,-k,-l	Depositor
Outliers	(Not available)	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	14768	wwPDB-VP
Average B, all atoms (Å ²)	89.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *(Not available)*

¹Theoretical 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: PEG, SO4, MES

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	0.24	0/1630	0.68	0/2194
1	C	0.24	0/1630	0.68	0/2195
1	E	0.25	0/1630	0.69	0/2194
1	G	0.25	0/1611	0.69	0/2168
2	B	0.25	0/2115	0.72	4/2888 (0.1%)
2	D	0.25	0/2100	0.70	2/2866 (0.1%)
2	F	0.26	0/2115	0.71	2/2888 (0.1%)
2	H	0.26	0/2092	0.72	2/2855 (0.1%)
All	All	0.25	0/14923	0.70	10/20248 (0.0%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	76	LEU	CA-C-N	5.66	125.51	119.28
2	H	76	LEU	C-N-CA	5.66	125.51	119.28
2	F	76	LEU	CA-C-N	5.59	125.43	119.28
2	F	76	LEU	C-N-CA	5.59	125.43	119.28
2	B	197	LEU	CA-C-N	5.22	124.84	119.05
2	B	197	LEU	C-N-CA	5.22	124.84	119.05
2	B	76	LEU	CA-C-N	5.11	124.90	119.28
2	B	76	LEU	C-N-CA	5.11	124.90	119.28
2	D	76	LEU	CA-C-N	5.09	124.88	119.28
2	D	76	LEU	C-N-CA	5.09	124.88	119.28

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	1603	0	1658	17	0
1	C	1602	0	1654	23	0
1	E	1603	0	1658	19	0
1	G	1585	0	1640	19	0
2	B	2069	0	2119	29	0
2	D	2055	0	2109	26	0
2	F	2069	0	2119	24	0
2	H	2048	0	2099	22	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
3	D	5	0	0	0	0
3	E	5	0	0	1	0
3	F	5	0	0	0	0
3	G	10	0	0	1	0
3	H	10	0	0	2	0
4	A	12	0	12	1	0
5	G	7	0	10	1	0
6	A	5	0	0	0	0
6	B	5	0	0	0	0
6	C	3	0	0	0	0
6	D	14	0	0	0	0
6	E	9	0	0	0	0
6	F	11	0	0	0	0
6	G	9	0	0	0	0
6	H	9	0	0	1	0
All	All	14768	0	15078	173	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 6.

All (173) 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:E:1318:VAL:H	1:E:1329:ILE:HB	1.55	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:1274:ARG:HG3	1:G:1458:CYS:HB3	1.75	0.69
1:E:1380:ILE:HG12	1:E:1410:ILE:HB	1.78	0.66
2:D:233:VAL:HG12	2:D:234:VAL:HG23	1.78	0.65
2:D:255:PRO:HG2	2:D:258:LYS:HB2	1.78	0.65
1:C:1274:ARG:NH1	1:C:1461:ALA:O	2.31	0.63
2:B:88:GLN:HG3	1:E:1439:VAL:HB	1.81	0.62
2:H:244:ALA:O	2:H:247:GLN:NE2	2.33	0.62
2:B:233:VAL:HG12	2:B:234:VAL:HG23	1.83	0.61
1:G:1348:LYS:NZ	1:G:1349:TYR:O	2.34	0.60
2:F:130:TYR:HA	2:F:154:SER:HB3	1.84	0.59
1:E:1434:GLU:O	1:E:1456:TYR:OH	2.19	0.59
2:H:130:TYR:HA	2:H:154:SER:HB3	1.84	0.59
1:A:1274:ARG:NH1	1:A:1461:ALA:O	2.37	0.58
1:C:1296:LEU:HD11	1:C:1384:LEU:HD13	1.86	0.58
1:E:1274:ARG:NH1	1:E:1461:ALA:O	2.37	0.58
2:F:185:TYR:HA	2:F:207:TRP:HA	1.85	0.57
2:F:164:PRO:HB2	2:F:167:LEU:HB2	1.85	0.57
2:B:217:ARG:HG3	2:B:257:TYR:HA	1.87	0.57
1:C:1404:LEU:HB3	1:C:1409:VAL:HB	1.86	0.57
1:A:1415:GLY:N	1:A:1438:PHE:O	2.35	0.56
2:B:76:LEU:HD22	2:B:79:LEU:HD22	1.86	0.56
2:B:175:ASP:HA	2:B:198:PRO:HD2	1.87	0.56
2:D:217:ARG:HG3	2:D:257:TYR:HA	1.87	0.56
1:A:1296:LEU:HD11	1:A:1384:LEU:HD13	1.87	0.56
1:E:1401:VAL:HG11	1:E:1428:ILE:HG12	1.88	0.55
2:H:34:THR:HG23	2:H:35:ILE:HG13	1.87	0.55
1:E:1279:VAL:HG22	1:E:1317:ALA:HB3	1.89	0.55
1:C:1430:LYS:NZ	3:H:1266:SO4:O1	2.37	0.55
2:H:21:ARG:NH1	3:H:1266:SO4:O4	2.39	0.55
2:F:92:LEU:HD12	2:F:93:PRO:HD2	1.88	0.54
2:H:171:LEU:O	6:H:2008:HOH:O	2.18	0.54
2:F:211:CYS:HA	2:F:214:LEU:HD13	1.90	0.54
1:G:1322:HIS:CD2	1:G:1323:ASP:H	2.24	0.54
2:F:49:ALA:HB2	2:F:73:ASP:HB2	1.90	0.53
2:B:127:GLN:HA	2:B:150:LEU:HA	1.91	0.53
1:G:1338:SER:OG	3:G:2466:SO4:O4	2.27	0.52
1:E:1296:LEU:HD11	1:E:1384:LEU:HD13	1.90	0.52
2:B:92:LEU:HD12	2:B:93:PRO:HD2	1.91	0.52
2:F:63:ASP:HA	2:F:87:ASN:HD21	1.75	0.52
1:G:1285:SER:HB3	1:G:1355:ALA:HB2	1.91	0.51
2:D:76:LEU:HD22	2:D:79:LEU:HD22	1.90	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1285:SER:HB3	1:A:1355:ALA:HB2	1.91	0.51
1:C:1380:ILE:HG12	1:C:1410:ILE:HB	1.92	0.51
1:G:1385:MET:HE3	1:G:1425:ILE:HG12	1.93	0.51
2:F:58:THR:HA	2:F:79:LEU:HA	1.93	0.51
2:B:17:CYS:HB2	2:B:38:LEU:HD23	1.92	0.50
2:D:152:LYS:HG2	2:D:176:THR:HB	1.93	0.50
2:D:92:LEU:HD12	2:D:93:PRO:HD2	1.94	0.50
2:B:120:LEU:HD21	2:B:129:LEU:HD22	1.93	0.50
2:H:12:HIS:HB2	2:H:34:THR:HG21	1.93	0.50
2:H:233:VAL:HG12	2:H:234:VAL:HG23	1.93	0.50
2:H:135:GLU:O	2:H:159:ARG:NH2	2.43	0.49
2:B:130:TYR:HA	2:B:154:SER:HB3	1.95	0.49
1:E:1322:HIS:CG	1:E:1323:ASP:H	2.30	0.49
1:C:1268:HIS:CG	1:C:1269:ASP:H	2.31	0.48
1:E:1353:GLN:HG2	1:E:1354:VAL:HG23	1.95	0.48
2:F:63:ASP:OD2	2:F:64:ARG:NH1	2.44	0.48
2:H:175:ASP:HA	2:H:198:PRO:HD2	1.95	0.48
2:B:67:LEU:HD21	2:B:70:LEU:HB2	1.94	0.48
2:D:248:CYS:HB2	2:D:254:PHE:HB2	1.95	0.48
1:G:1281:LEU:HB2	1:G:1383:LEU:HA	1.96	0.48
2:B:217:ARG:NH1	2:B:259:TYR:O	2.39	0.48
2:H:231:LYS:HG3	2:H:238:ALA:HB3	1.95	0.48
4:A:2466:MES:H51	4:A:2466:MES:H81	1.62	0.47
1:C:1268:HIS:CE1	1:C:1306:ARG:HE	2.33	0.47
1:C:1335:LYS:NZ	2:D:235:ASP:OD1	2.47	0.47
2:F:76:LEU:HD22	2:F:79:LEU:HD22	1.96	0.47
1:G:1280:PHE:N	1:G:1317:ALA:O	2.41	0.47
2:F:85:SER:O	2:F:87:ASN:ND2	2.48	0.47
2:H:137:LYS:NZ	2:H:161:THR:OG1	2.44	0.47
2:H:164:PRO:HB2	2:H:167:LEU:HB2	1.97	0.47
1:G:1352:SER:HA	5:G:2468:PEG:H42	1.96	0.47
1:E:1282:LEU:HD11	1:E:1300:VAL:HG21	1.97	0.47
2:B:42:LEU:HD22	1:E:1422:LEU:HB3	1.98	0.46
1:E:1310:SER:HB3	1:E:1313:TRP:HD1	1.80	0.46
1:A:1318:VAL:H	1:A:1329:ILE:HB	1.79	0.46
2:H:76:LEU:HD22	2:H:79:LEU:HD22	1.97	0.46
1:C:1323:ASP:OD1	1:C:1324:GLY:N	2.49	0.46
2:B:32:ASP:HA	2:B:56:ARG:HG3	1.98	0.46
1:C:1388:GLN:HG3	1:C:1421:ASN:ND2	2.31	0.46
2:B:185:TYR:O	2:B:208:LEU:N	2.46	0.46
2:H:92:LEU:HD12	2:H:93:PRO:HD2	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:247:GLN:HG2	2:H:253:LYS:HA	1.98	0.46
2:D:116:PRO:HG2	2:D:119:ALA:HB2	1.96	0.46
2:F:52:MET:SD	2:F:74:GLY:HA3	2.56	0.46
2:F:164:PRO:HD2	2:F:167:LEU:HD22	1.98	0.45
2:F:213:ILE:HD12	2:F:256:VAL:HG13	1.98	0.45
2:D:47:SER:HA	2:D:71:GLN:HB2	1.98	0.45
2:D:144:LEU:HD22	2:D:171:LEU:HD11	1.97	0.45
2:D:164:PRO:HB2	2:D:167:LEU:HB2	1.98	0.45
2:H:135:GLU:HB2	2:H:159:ARG:HE	1.80	0.45
2:F:233:VAL:HG12	2:F:234:VAL:HG23	1.97	0.45
2:D:144:LEU:HD21	2:D:153:LEU:HD13	1.99	0.45
1:G:1380:ILE:HG12	1:G:1410:ILE:HB	1.99	0.45
2:F:255:PRO:HG2	2:F:258:LYS:HB2	1.98	0.45
1:A:1322:HIS:O	1:A:1356:SER:N	2.46	0.45
2:F:264:CYS:HA	2:F:265:PRO:HD3	1.82	0.45
1:G:1304:MET:HE3	1:G:1316:VAL:HG21	1.99	0.45
2:D:26:PRO:HA	2:D:27:PRO:HD3	1.86	0.44
2:B:128:GLU:HG2	2:B:152:LYS:HB2	1.99	0.44
2:B:264:CYS:HA	2:B:265:PRO:HD3	1.85	0.44
1:A:1303:MET:HE1	1:A:1453:ILE:HB	1.98	0.44
1:C:1423:LYS:HE3	2:H:21:ARG:NH1	2.32	0.44
2:F:93:PRO:HG2	2:F:95:LEU:HD21	2.00	0.44
2:F:48:LEU:HD12	2:F:72:VAL:HG12	1.99	0.44
1:C:1316:VAL:HG23	1:C:1329:ILE:HG21	1.98	0.44
2:B:80:GLY:HA2	2:B:102:LEU:HA	2.00	0.44
1:E:1322:HIS:HA	1:E:1355:ALA:HA	2.00	0.44
1:E:1371:LYS:NZ	2:F:127:GLN:OE1	2.33	0.44
2:B:189:LYS:O	1:C:1336:ARG:NH2	2.47	0.44
1:A:1461:ALA:HA	1:A:1462:PRO:HD3	1.90	0.43
1:E:1447:GLU:OE2	1:E:1450:ARG:NE	2.49	0.43
2:D:175:ASP:HA	2:D:198:PRO:HD2	2.01	0.43
1:C:1328:TYR:CZ	1:C:1347:VAL:HG13	2.53	0.43
2:D:164:PRO:HD2	2:D:167:LEU:HD22	2.00	0.43
2:D:14:GLU:HG3	2:D:35:ILE:HB	2.01	0.43
1:C:1274:ARG:HG3	1:C:1458:CYS:HB3	1.99	0.43
2:B:21:ARG:HD2	1:E:1423:LYS:HD2	2.01	0.42
1:C:1384:LEU:HA	1:C:1414:VAL:HG13	2.01	0.42
2:D:6:VAL:HG22	2:D:15:VAL:HG22	2.00	0.42
2:H:80:GLY:HA2	2:H:102:LEU:HA	2.00	0.42
2:B:32:ASP:OD2	2:B:56:ARG:NH1	2.52	0.42
2:B:109:PHE:N	2:B:132:LYS:O	2.42	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1390:PRO:HG2	1:C:1393:MET:HG3	2.00	0.42
2:B:63:ASP:OD1	2:B:63:ASP:N	2.51	0.42
1:A:1380:ILE:HG12	1:A:1410:ILE:HB	2.01	0.42
1:G:1379:ARG:HB2	1:G:1409:VAL:HA	2.01	0.42
1:A:1280:PHE:N	1:A:1317:ALA:O	2.37	0.42
2:B:152:LYS:HG2	2:B:176:THR:HB	2.02	0.42
1:C:1386:ALA:HB2	1:C:1416:ILE:HB	2.02	0.42
2:D:131:LEU:HB2	2:D:155:LEU:HD23	2.01	0.42
1:A:1311:GLN:NE2	1:A:1333:ASP:O	2.53	0.42
1:G:1280:PHE:HB2	1:G:1318:VAL:HA	2.02	0.42
1:A:1272:ARG:HG3	1:A:1308:ARG:HD2	2.02	0.42
2:B:255:PRO:HG2	2:B:258:LYS:HB2	2.02	0.42
1:G:1386:ALA:HB2	1:G:1416:ILE:HB	2.02	0.42
1:A:1378:SER:OG	1:A:1460:LEU:O	2.30	0.41
2:F:17:CYS:HB2	2:F:38:LEU:HD23	2.02	0.41
2:F:29:LEU:HA	2:F:30:PRO:HD3	1.95	0.41
1:G:1427:LEU:O	1:G:1431:GLN:HG2	2.20	0.41
2:D:178:LEU:HD23	2:D:180:GLN:HE22	1.85	0.41
1:G:1283:ASP:HB2	1:G:1385:MET:HA	2.01	0.41
1:E:1338:SER:OG	3:E:2466:SO4:O4	2.38	0.41
2:F:104:VAL:HG22	2:F:128:GLU:HB2	2.01	0.41
2:H:45:THR:HG22	2:H:69:LYS:HB3	2.03	0.41
2:D:145:THR:OG1	2:D:146:PRO:HD3	2.21	0.41
1:E:1319:VAL:HG22	1:E:1327:ALA:HA	2.01	0.41
2:F:43:LEU:HB2	2:F:65:CYS:HB3	2.01	0.41
2:B:154:SER:HA	2:B:178:LEU:HB2	2.02	0.41
1:C:1318:VAL:H	1:C:1329:ILE:HB	1.85	0.41
2:D:103:THR:HA	2:D:126:LEU:HA	2.03	0.41
2:D:161:THR:HG22	2:D:183:SER:HB2	2.02	0.41
2:H:34:THR:HA	2:H:57:LEU:HA	2.03	0.41
2:H:110:ASN:HB3	2:H:111:ARG:H	1.69	0.41
2:B:31:LYS:HA	2:B:54:TYR:HD1	1.86	0.41
2:B:253:LYS:HD3	2:B:253:LYS:HA	1.85	0.41
2:D:187:ILE:HA	2:D:188:PRO:HD3	1.95	0.41
2:D:203:HIS:O	2:D:205:ASN:ND2	2.54	0.41
1:G:1453:ILE:O	1:G:1457:LEU:HG	2.21	0.41
1:A:1390:PRO:HB2	1:A:1392:ARG:HG2	2.03	0.40
2:D:118:GLY:HA3	2:D:121:ARG:HE	1.87	0.40
1:G:1464:ALA:HA	1:G:1465:PRO:HD3	1.94	0.40
1:A:1464:ALA:HA	1:A:1465:PRO:HD3	1.91	0.40
1:C:1427:LEU:O	1:C:1431:GLN:HG2	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:1379:ARG:O	1:G:1410:ILE:N	2.41	0.40
2:H:178:LEU:HD23	2:H:180:GLN:HE22	1.86	0.40
1:A:1413:PRO:HG3	1:A:1428:ILE:HD12	2.04	0.40
2:B:16:ASN:HA	2:B:37:HIS:HB2	2.02	0.40
1:A:1304:MET:HE3	1:A:1316:VAL:HG21	2.03	0.40
1:C:1277:ASP:N	1:C:1378:SER:O	2.46	0.40
1:C:1283:ASP:HB2	1:C:1385:MET:HA	2.04	0.40
1:C:1410:ILE:HD13	1:C:1460:LEU:HD13	2.04	0.40

There are no symmetry-related clashes.

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	197/215 (92%)	188 (95%)	9 (5%)	0	100	100
1	C	197/215 (92%)	184 (93%)	13 (7%)	0	100	100
1	E	197/215 (92%)	188 (95%)	9 (5%)	0	100	100
1	G	195/215 (91%)	185 (95%)	10 (5%)	0	100	100
2	B	262/291 (90%)	240 (92%)	20 (8%)	2 (1%)	16	44
2	D	258/291 (89%)	237 (92%)	19 (7%)	2 (1%)	16	44
2	F	262/291 (90%)	240 (92%)	21 (8%)	1 (0%)	30	60
2	H	257/291 (88%)	238 (93%)	18 (7%)	1 (0%)	30	60
All	All	1825/2024 (90%)	1700 (93%)	119 (6%)	6 (0%)	36	66

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	251	SER
2	D	234	VAL

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Mol	Chain	Res	Type
2	F	234	VAL
2	H	234	VAL
2	B	234	VAL
2	D	246	VAL

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	177/193 (92%)	175 (99%)	2 (1%)	65	87
1	C	177/193 (92%)	175 (99%)	2 (1%)	65	87
1	E	177/193 (92%)	175 (99%)	2 (1%)	65	87
1	G	175/193 (91%)	175 (100%)	0	100	100
2	B	238/261 (91%)	236 (99%)	2 (1%)	73	90
2	D	236/261 (90%)	233 (99%)	3 (1%)	61	86
2	F	238/261 (91%)	237 (100%)	1 (0%)	84	94
2	H	235/261 (90%)	234 (100%)	1 (0%)	84	94
All	All	1653/1816 (91%)	1640 (99%)	13 (1%)	73	90

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1268	HIS
1	A	1354	VAL
2	B	9	VAL
2	B	107	VAL
1	C	1354	VAL
1	C	1414	VAL
2	D	9	VAL
2	D	209	CYS
2	D	248	CYS
1	E	1271	CYS
1	E	1408	LYS

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Mol	Chain	Res	Type
2	F	210	ASN
2	H	237	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1396	ASN
2	B	16	ASN
1	C	1402	GLN
1	C	1448	GLN
2	D	59	GLN
1	E	1449	GLN
2	F	87	ASN
2	F	210	ASN
2	H	232	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](#)

12 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	SO4	G	2467	-	4,4,4	0.14	0	6,6,6	0.07	0
3	SO4	E	2466	-	4,4,4	0.15	0	6,6,6	0.05	0
3	SO4	H	1266	-	4,4,4	0.14	0	6,6,6	0.05	0
5	PEG	G	2468	-	6,6,6	0.62	0	5,5,5	0.73	0
3	SO4	H	1267	-	4,4,4	0.15	0	6,6,6	0.05	0
4	MES	A	2466	-	12,12,12	2.41	1 (8%)	14,16,16	2.32	4 (28%)
3	SO4	A	2266	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	D	1266	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	C	2467	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	B	1266	-	4,4,4	0.15	0	6,6,6	0.04	0
3	SO4	F	1266	-	4,4,4	0.14	0	6,6,6	0.05	0
3	SO4	G	2466	-	4,4,4	0.14	0	6,6,6	0.05	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
4	MES	A	2466	-	-	0/6/14/14	0/1/1/1
5	PEG	G	2468	-	-	1/4/4/4	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	2466	MES	C8-S	-8.03	1.66	1.77

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	2466	MES	C5-N4-C3	5.49	121.19	108.83
4	A	2466	MES	O3S-S-C8	4.44	112.95	105.77
4	A	2466	MES	C7-N4-C3	2.32	117.17	111.23
4	A	2466	MES	C6-C5-N4	-2.11	106.90	110.10

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	G	2468	PEG	C1-C2-O2-C3

There are no ring outliers.

5 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	2466	SO4	1	0
3	H	1266	SO4	2	0
5	G	2468	PEG	1	0
4	A	2466	MES	1	0
3	G	2466	SO4	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 [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	199/215 (92%)	-1.40	0 100 100	71, 96, 125, 138	0
1	C	199/215 (92%)	-1.47	0 100 100	48, 89, 142, 156	0
1	E	199/215 (92%)	-1.46	0 100 100	46, 76, 125, 181	0
1	G	197/215 (91%)	-1.45	0 100 100	51, 85, 131, 213	0
2	B	264/291 (90%)	-1.31	0 100 100	75, 100, 127, 155	0
2	D	262/291 (90%)	-1.26	0 100 100	79, 103, 144, 196	0
2	F	264/291 (90%)	-1.51	0 100 100	33, 73, 110, 207	0
2	H	261/291 (89%)	-1.52	0 100 100	49, 71, 101, 150	0
All	All	1845/2024 (91%)	-1.42	0 100 100	33, 89, 130, 213	0

There are no RSRZ outliers to report.

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($\text{\AA}^2$)	Q<0.9
3	SO4	A	2266	5/5	0.99	0.04	85,88,90,91	0
3	SO4	D	1266	5/5	0.99	0.05	112,113,118,123	0
3	SO4	F	1266	5/5	0.99	0.04	144,147,147,148	0
3	SO4	H	1266	5/5	0.99	0.06	84,87,90,92	0
4	MES	A	2466	12/12	0.99	0.03	67,71,84,89	0
3	SO4	C	2467	5/5	1.00	0.03	37,57,61,73	0
3	SO4	G	2466	5/5	1.00	0.02	72,79,81,83	0
3	SO4	G	2467	5/5	1.00	0.04	90,92,97,104	0
3	SO4	B	1266	5/5	1.00	0.06	66,76,80,84	0
3	SO4	H	1267	5/5	1.00	0.05	59,62,80,84	0
3	SO4	E	2466	5/5	1.00	0.03	45,47,53,55	0
5	PEG	G	2468	7/7	1.00	0.03	33,46,58,60	0

6.5 Other polymers [i](#)

There are no such residues in this entry.