



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 19, 2018 – 10:59 PM EST

PDB ID : 6FKX  
Title : Crystal structure of an acetyl xylan esterase from a desert metagenome  
Authors : Adesioye, F.A.; Makhalanyane, T.P.; Vikram, S.; Sewell, B.T.; Schubert, W.; Cowan, D.A.  
Deposited on : 2018-01-24  
Resolution : 2.03 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20030736  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20030736

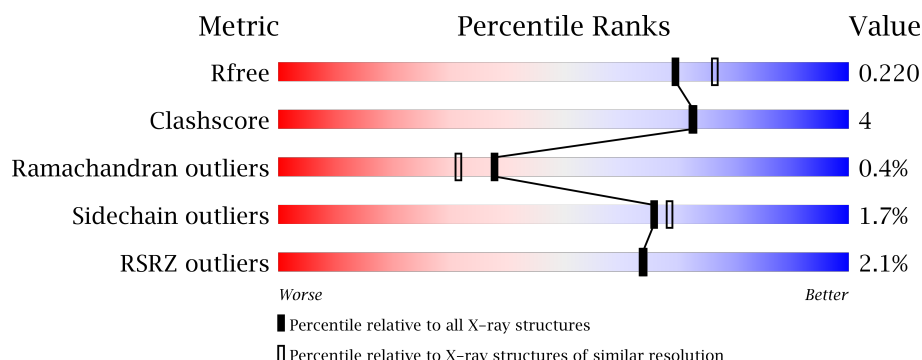
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.03 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))
$R_{free}$	100719	8396 (2.04-2.00)
Clashscore	112137	9678 (2.04-2.00)
Ramachandran outliers	110173	9566 (2.04-2.00)
Sidechain outliers	110143	9565 (2.04-2.00)
RSRZ outliers	101464	8490 (2.04-2.00)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	324	<div> <div>4%</div> <div> <div></div> <div>94%</div> <div>6%</div> </div> </div>
2	B	322	<div> <div>3%</div> <div> <div></div> <div>89%</div> <div>11%</div> </div> </div>
2	D	322	<div> <div>2%</div> <div> <div></div> <div>92%</div> <div>7%</div> </div> </div>
2	E	322	<div> <div>2%</div> <div> <div></div> <div>87%</div> <div>13%</div> </div> </div>
2	F	322	<div> <div>0%</div> <div> <div></div> <div>90%</div> <div>9%</div> </div> </div>

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Mol	Chain	Length	Quality of chain
3	C	319	<div> <div></div> <div>%</div> <div>89%</div> <div>10%</div> <div>.</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	MES	A	402	-	-	-	X
5	MES	C	404	-	-	-	X
5	MES	D	404	-	-	-	X
5	MES	E	402	-	-	-	X
5	MES	F	402	-	-	-	X
5	MES	F	403	-	-	-	X

## 2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 17799 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 Acetyl xylan esterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	324	Total	C	N	O	S	0	4	1
			2566	1639	446	472	9			

- Molecule 2 is a protein called Acetyl xylan esterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	322	Total	C	N	O	S	0	11	0
			2591	1659	444	479	9			
2	D	322	Total	C	N	O	S	0	6	0
			2560	1637	441	473	9			
2	E	322	Total	C	N	O	S	0	5	0
			2554	1633	444	468	9			
2	F	322	Total	C	N	O	S	0	12	0
			2604	1667	455	473	9			

- Molecule 3 is a protein called Acetyl xylan esterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	319	Total	C	N	O	S	0	8	0
			2548	1629	443	467	9			

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

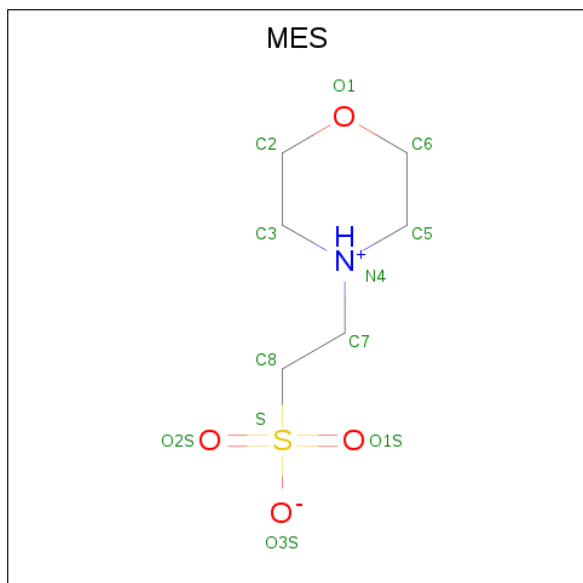
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	D	1	Total	Na	0	0
			1	1		
4	E	1	Total	Na	0	0
			1	1		
4	B	1	Total	Na	0	0
			1	1		
4	C	1	Total	Na	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Na	0	0
			1	1		
4	F	1	Total	Na	0	0
			1	1		

- Molecule 5 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).



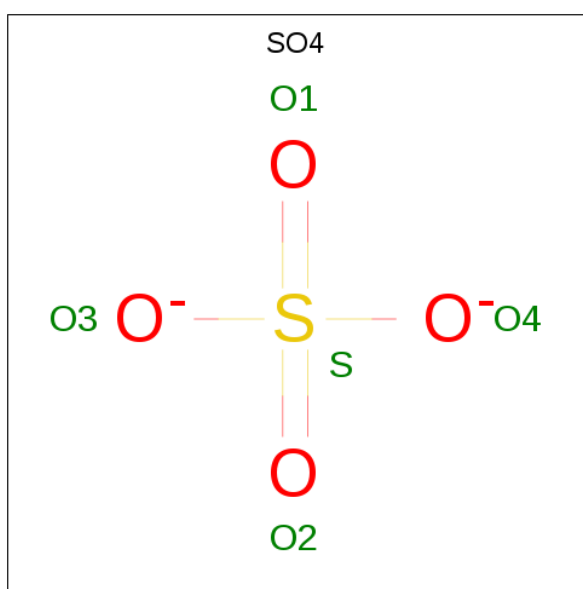
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			8	3	1	3	1		
5	B	1	Total	C	N	O	S	0	0
			7	2	1	3	1		
5	B	1	Total	C	O	S		0	0
			5	1	3	1			
5	D	1	Total	C	N	O	S	0	0
			8	3	1	3	1		
5	D	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
5	D	1	Total	C	N	O	S	0	0
			11	5	1	4	1		
5	C	1	Total	C	O	S		0	0
			6	2	3	1			
5	C	1	Total	C	N	O	S	0	0
			7	2	1	3	1		
5	C	1	Total	C	O	S		0	0
			6	2	3	1			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	E	1	Total	C	N	O	S	0	0
			7	2	1	3	1		
5	E	1	Total	C	O	S		0	0
			6	2	3	1			
5	F	1	Total	C	N	O	S	0	0
			7	2	1	3	1		
5	F	1	Total	C	N	O	S	0	0
			8	3	1	3	1		

- Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	O	S	0	0
			5	4	1		

- Molecule 7 is FORMIC ACID (three-letter code: FMT) (formula: CH<sub>2</sub>O<sub>2</sub>).



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

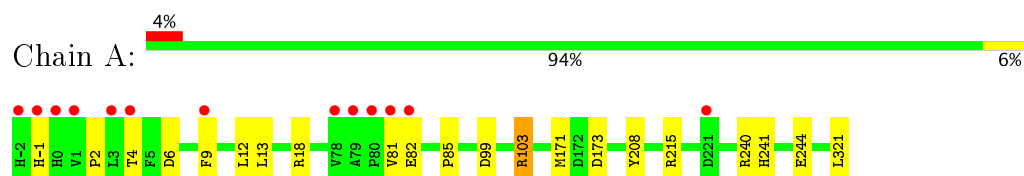
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	350	Total	O	0	0
			350	350		
8	B	366	Total	O	0	0
			366	366		
8	D	379	Total	O	0	0
			379	379		
8	C	377	Total	O	0	0
			377	377		
8	E	367	Total	O	0	0
			367	367		
8	F	425	Total	O	0	0
			425	425		

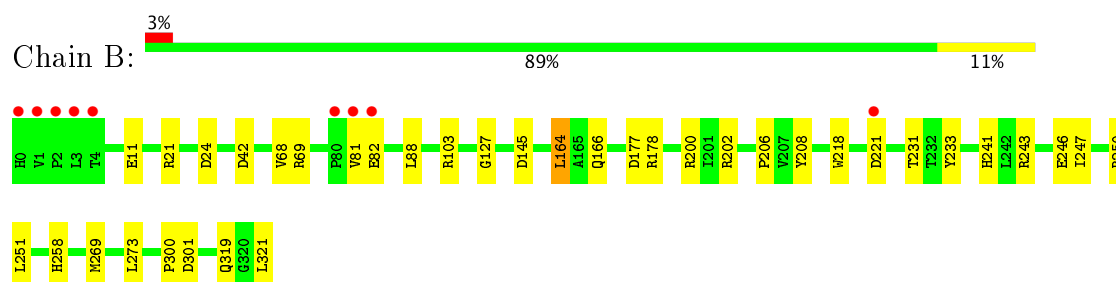
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

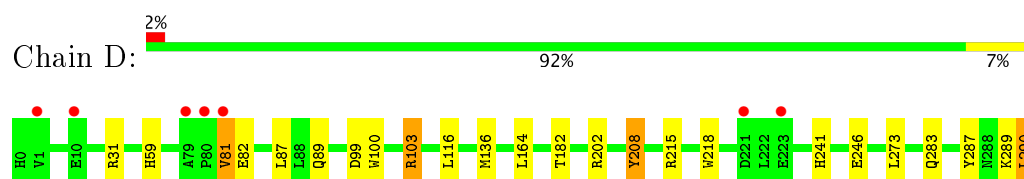
- Molecule 1: Acetyl xylan esterase



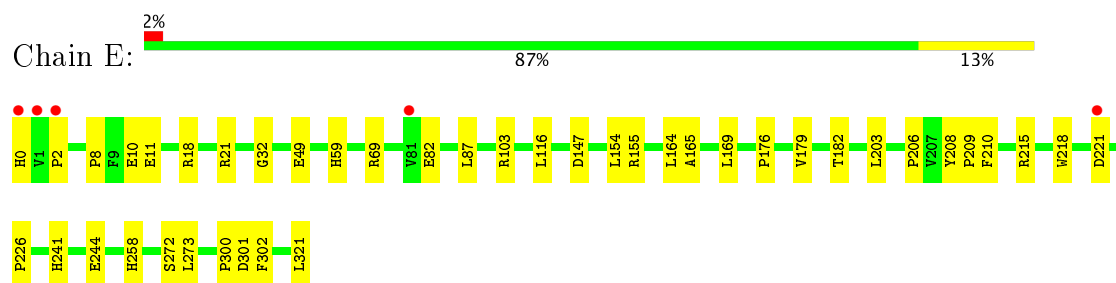
- Molecule 2: Acetyl xylan esterase



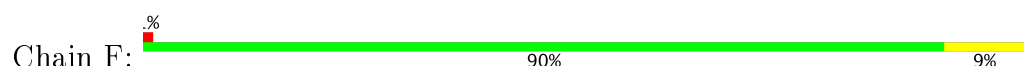
- Molecule 2: Acetyl xylan esterase



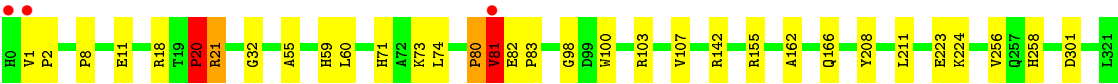
- Molecule 2: Acetyl xylan esterase



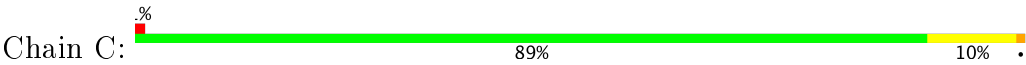
- Molecule 2: Acetyl xylan esterase







● Molecule 3: Acetyl xylan esterase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	107.68Å 116.82Å 159.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	89.23 – 2.03 94.23 – 2.03	Depositor EDS
% Data completeness (in resolution range)	100.0 (89.23-2.03) 100.0 (94.23-2.03)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.04 (at 2.03Å)	Xtriage
Refinement program	PHENIX (1.11.1 _2575: ???)	Depositor
R, $R_{free}$	0.169 , 0.220 0.168 , 0.220	Depositor DCC
$R_{free}$ test set	6683 reflections (5.14%)	DCC
Wilson B-factor (Å <sup>2</sup> )	18.3	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 50.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	17799	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.87% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NA, FMT, 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	0.27	0/2649	0.48	0/3616
2	B	0.27	0/2697	0.49	0/3683
2	D	0.28	0/2651	0.48	0/3621
2	E	0.28	0/2642	0.49	0/3609
2	F	0.32	0/2713	0.55	3/3700 (0.1%)
3	C	0.30	0/2643	0.54	2/3605 (0.1%)
All	All	0.29	0/15995	0.51	5/21834 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
3	C	0	1

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	81	VAL	CA-CB-CG2	6.54	120.72	110.90
3	C	224	LYS	CB-CA-C	6.43	123.27	110.40
2	F	81	VAL	CG1-CB-CG2	5.91	120.35	110.90
3	C	224	LYS	N-CA-CB	-5.59	100.54	110.60
2	F	20	PRO	C-N-CA	5.17	134.62	121.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	C	223	GLU	Peptide

## 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	2566	0	2492	14	0
2	B	2591	0	2536	25	0
2	D	2560	0	2494	19	0
2	E	2554	0	2496	25	0
2	F	2604	0	2572	19	0
3	C	2548	0	2496	21	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	F	1	0	0	0	0
5	A	8	0	4	0	0
5	B	12	0	4	0	0
5	C	19	0	8	3	0
5	D	31	0	24	5	0
5	E	13	0	6	4	0
5	F	15	0	8	3	0
6	A	5	0	0	0	0
7	B	3	0	1	0	0
8	A	350	0	0	4	0
8	B	366	0	0	7	0
8	C	377	0	0	5	0
8	D	379	0	0	3	0
8	E	367	0	0	0	0
8	F	425	0	0	0	0
All	All	17799	0	15141	119	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 (119) 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:223[A]:GLU:HG2	2:F:224:LYS:HG3	1.48	0.94
1:A:99:ASP:O	1:A:103:ARG:NH2	2.12	0.83
1:A:4:THR:HG22	1:A:6:ASP:H	1.48	0.77
2:E:49:GLU:H	5:E:402:MES:H81	1.52	0.74
1:A:81:VAL:HG23	1:A:82:GLU:HG3	1.72	0.72
3:C:59:HIS:HE1	5:C:403:MES:H81	1.56	0.68
2:F:73[A]:LYS:NZ	2:F:98:GLY:O	2.24	0.67
2:B:206:PRO:HG2	2:B:269:MET:HG3	1.77	0.67
3:C:59:HIS:CE1	5:C:403:MES:H81	2.32	0.64
2:B:202:ARG:NH1	2:B:321:LEU:O	2.31	0.64
2:E:241:HIS:NE2	2:F:301:ASP:OD2	2.23	0.64
1:A:2:PRO:HG2	3:C:219:GLU:HB3	1.83	0.61
3:C:11:GLU:OE1	8:C:501:HOH:O	2.16	0.61
3:C:3:LEU:O	3:C:4:THR:HG23	2.01	0.60
2:D:81:VAL:HG13	2:D:82:GLU:H	1.68	0.58
2:D:59:HIS:HE1	5:D:402:MES:H72	1.69	0.57
2:D:287:TYR:HA	2:D:290:LEU:HD22	1.85	0.57
2:F:21:ARG:HB2	2:F:258:HIS:CE1	2.40	0.57
2:F:8:PRO:HG2	2:F:11:GLU:HG3	1.88	0.56
3:C:81:VAL:HG23	3:C:82:GLU:H	1.71	0.56
1:A:85:PRO:HB3	1:A:321:LEU:HD13	1.87	0.55
2:B:24:ASP:OD2	8:B:502:HOH:O	2.18	0.54
2:E:215:ARG:NH2	2:E:244:GLU:OE1	2.40	0.54
2:D:208:TYR:HA	2:D:283:GLN:NE2	2.24	0.53
1:A:215:ARG:NH1	1:A:244:GLU:OE1	2.38	0.52
1:A:18[B]:ARG:NH1	8:A:510:HOH:O	2.41	0.52
2:B:221[A]:ASP:OD1	8:B:503:HOH:O	2.19	0.52
2:F:100:TRP:HE1	5:F:402:MES:H81	1.73	0.52
2:F:73[B]:LYS:NZ	2:F:98:GLY:O	2.30	0.52
1:A:173:ASP:OD2	8:A:501:HOH:O	2.19	0.52
2:E:206:PRO:HB2	2:E:209:PRO:HG3	1.93	0.51
1:A:240:ARG:NH1	8:A:513:HOH:O	2.43	0.51
2:D:215:ARG:NE	8:D:508:HOH:O	2.42	0.51
2:F:60:LEU:HD12	2:F:74:LEU:HD22	1.93	0.51
2:B:241:HIS:NE2	3:C:301:ASP:OD2	2.31	0.51
3:C:8:PRO:HB2	3:C:10:GLU:OE2	2.12	0.50
2:B:68[A]:VAL:HG13	2:B:127:GLY:HA3	1.94	0.50
2:F:211:LEU:O	2:F:256[B]:VAL:HG13	2.12	0.50
2:F:59:HIS:HD2	2:F:71:HIS:NE2	2.09	0.50
2:B:202:ARG:NH2	8:B:527:HOH:O	2.45	0.49
2:E:18[A]:ARG:NH1	2:F:2:PRO:HD3	2.26	0.49
2:F:59:HIS:NE2	5:F:402:MES:H71	2.27	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:246[B]:GLU:HG3	2:B:247:ILE:N	2.27	0.49
2:E:165:ALA:O	2:E:169:LEU:HD23	2.12	0.49
2:D:273:LEU:HB2	2:D:300:PRO:HA	1.95	0.48
2:E:21:ARG:HB2	2:E:258:HIS:CE1	2.48	0.48
3:C:202[A]:ARG:NH2	8:C:520:HOH:O	2.45	0.48
2:E:49:GLU:HB3	5:E:402:MES:H72	1.96	0.48
2:B:177:ASP:OD2	2:B:200[A]:ARG:NH2	2.39	0.48
2:D:59:HIS:CE1	5:D:402:MES:H72	2.49	0.48
1:A:241:HIS:NE2	2:B:301:ASP:OD2	2.26	0.48
2:B:177:ASP:O	2:B:202:ARG:HD3	2.14	0.47
2:D:87:LEU:HD11	2:D:182:THR:HG22	1.96	0.47
3:C:7:LEU:HD13	3:C:216:ARG:NH2	2.29	0.47
2:D:100:TRP:HE1	5:D:402:MES:H81	1.79	0.47
2:E:273:LEU:HB2	2:E:300:PRO:HA	1.97	0.47
3:C:96:ASN:ND2	8:C:523:HOH:O	2.46	0.47
1:A:9:PHE:HA	1:A:12:LEU:HD12	1.95	0.47
2:D:218:TRP:CZ2	2:D:241:HIS:HE1	2.33	0.47
2:B:81:VAL:HG23	2:B:82[A]:GLU:H	1.80	0.46
2:B:145:ASP:OD2	2:B:233:TYR:OH	2.30	0.46
2:D:99:ASP:O	2:D:103[A]:ARG:NH1	2.48	0.46
2:F:32:GLY:HA2	2:F:155[A]:ARG:NH2	2.30	0.46
2:E:116:LEU:HB2	2:E:164:LEU:HD22	1.96	0.46
2:B:178[B]:ARG:HD2	2:B:321:LEU:O	2.15	0.46
5:D:404:MES:H52	5:D:404:MES:H81	1.65	0.46
1:A:171:MET:HB3	1:A:173:ASP:OD1	2.16	0.46
3:C:81:VAL:HG23	3:C:82:GLU:HG2	1.98	0.46
2:B:218:TRP:CZ2	2:B:241:HIS:HE1	2.34	0.46
3:C:28:TYR:OH	3:C:155:ARG:HD2	2.16	0.46
2:E:59:HIS:CE1	5:E:402:MES:H82	2.51	0.45
3:C:192:LEU:HD21	3:C:206:PRO:HG3	1.98	0.45
3:C:208:TYR:HA	3:C:283:GLN:OE1	2.16	0.45
2:E:10:GLU:HG3	2:E:11:GLU:N	2.31	0.45
2:B:81:VAL:HG23	2:B:82[B]:GLU:H	1.80	0.45
2:B:166:GLN:NE2	8:B:517:HOH:O	2.39	0.45
2:D:289:LYS:NZ	8:D:507:HOH:O	2.41	0.45
2:F:55:ALA:HB2	2:F:107:VAL:HG11	1.99	0.45
2:E:169:LEU:HD22	2:E:179:VAL:HG21	1.98	0.44
2:E:59:HIS:NE2	5:E:402:MES:H82	2.33	0.44
2:F:82:GLU:HG3	2:F:83:PRO:HD2	2.00	0.44
2:E:32:GLY:HA2	2:E:155:ARG:NH2	2.33	0.44
2:B:321:LEU:HD23	2:B:321:LEU:HA	1.91	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:100:TRP:HE1	5:C:403:MES:H82	1.83	0.44
2:D:136:MET:O	5:D:404:MES:H61	2.18	0.43
3:C:266:GLU:OE1	8:C:502:HOH:O	2.21	0.43
2:B:243:ARG:HB3	2:B:246[B]:GLU:HG2	2.00	0.43
2:F:20:PRO:O	2:F:21:ARG:HB3	2.18	0.43
2:B:42:ASP:HB3	2:B:69:ARG:HH12	1.83	0.43
3:C:62:PHE:CD1	3:C:163:ARG:HG2	2.54	0.43
3:C:276[B]:LYS:NZ	8:C:533:HOH:O	2.52	0.43
2:E:8:PRO:HG2	2:E:11:GLU:HG3	2.01	0.43
1:A:215:ARG:NE	8:A:522:HOH:O	2.51	0.43
2:E:218:TRP:CZ2	2:E:241:HIS:HE1	2.37	0.42
2:F:142:ARG:HD2	5:F:403:MES:N4	2.34	0.42
3:C:87:LEU:HD11	3:C:182:THR:HG22	2.02	0.42
2:D:31:ARG:HD3	8:D:585:HOH:O	2.20	0.42
2:E:210:PHE:CZ	2:E:226:PRO:HB2	2.54	0.42
2:B:21:ARG:HB2	2:B:258:HIS:CE1	2.55	0.42
3:C:32:GLY:HA2	3:C:155:ARG:NH2	2.35	0.42
2:D:116:LEU:HB2	2:D:164:LEU:HD22	2.01	0.42
2:B:88:LEU:HD22	2:B:164:LEU:HD13	2.02	0.41
2:D:81:VAL:HG13	2:D:82:GLU:N	2.33	0.41
2:E:169:LEU:HD13	2:E:176:PRO:HA	2.02	0.41
2:D:241:HIS:NE2	2:E:301:ASP:OD2	2.33	0.41
2:E:87:LEU:HD11	2:E:182:THR:HG22	2.01	0.41
2:F:80:PRO:O	2:F:81:VAL:HG22	2.20	0.41
2:B:319:GLN:NE2	8:B:518:HOH:O	2.39	0.41
2:E:69:ARG:HD2	2:E:69:ARG:HA	1.92	0.41
2:B:273:LEU:HB2	2:B:300:PRO:HA	2.03	0.41
2:D:89:GLN:OE1	2:D:103[B]:ARG:HD3	2.21	0.41
2:E:272:SER:HB2	2:E:302:PHE:O	2.21	0.41
2:E:0:HIS:ND1	2:E:2:PRO:HD3	2.36	0.40
2:E:203:LEU:HD12	2:E:321:LEU:HD13	2.03	0.40
2:F:162:ALA:O	2:F:166:GLN:HG3	2.21	0.40
1:A:9:PHE:CZ	1:A:13:LEU:HD11	2.57	0.40
2:B:231:THR:OG1	8:B:504:HOH:O	2.22	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	326/324 (101%)	315 (97%)	10 (3%)	1 (0%)	44	39
2	B	331/322 (103%)	320 (97%)	11 (3%)	0	100	100
2	D	326/322 (101%)	318 (98%)	7 (2%)	1 (0%)	44	39
2	E	325/322 (101%)	313 (96%)	11 (3%)	1 (0%)	44	39
2	F	332/322 (103%)	320 (96%)	7 (2%)	5 (2%)	12	5
3	C	325/319 (102%)	314 (97%)	11 (3%)	0	100	100
All	All	1965/1931 (102%)	1900 (97%)	57 (3%)	8 (0%)	38	31

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	-1	HIS
2	F	20	PRO
2	F	21	ARG
2	F	81	VAL
2	F	1	VAL
2	D	81	VAL
2	E	221	ASP
2	F	80	PRO

### 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.

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	266/263 (101%)	264 (99%)	2 (1%)	85	88
2	B	272/261 (104%)	265 (97%)	7 (3%)	51	51
2	D	267/261 (102%)	262 (98%)	5 (2%)	62	64
2	E	266/261 (102%)	260 (98%)	6 (2%)	56	56
2	F	273/261 (105%)	270 (99%)	3 (1%)	78	81
3	C	265/258 (103%)	256 (97%)	9 (3%)	42	39
All	All	1609/1565 (103%)	1577 (98%)	32 (2%)	66	62

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	103	ARG
1	A	208	TYR
2	B	11[A]	GLU
2	B	11[B]	GLU
2	B	103	ARG
2	B	164	LEU
2	B	208	TYR
2	B	250	ARG
2	B	251	LEU
2	D	103[A]	ARG
2	D	103[B]	ARG
2	D	202	ARG
2	D	208	TYR
2	D	290	LEU
3	C	103	ARG
3	C	147	ASP
3	C	154[A]	LEU
3	C	154[B]	LEU
3	C	163	ARG
3	C	202[A]	ARG
3	C	202[B]	ARG
3	C	208	TYR
3	C	271	VAL
2	E	82	GLU
2	E	103[A]	ARG
2	E	103[B]	ARG
2	E	147	ASP

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Mol	Chain	Res	Type
2	E	154	LEU
2	E	208	TYR
2	F	18	ARG
2	F	103	ARG
2	F	208	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	319	GLN
2	D	283	GLN
2	F	59	HIS

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 6 are monoatomic - leaving 15 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	$\# Z  > 2$
5	MES	A	402	-	7,7,12	2.80	1 (14%)	8,9,16	2.34	5 (62%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	SO4	A	403	-	4,4,4	0.16	0	6,6,6	0.08	0
5	MES	B	402	-	6,6,12	3.01	1 (16%)	6,8,16	2.13	3 (50%)
5	MES	B	403	-	2,4,12	1.08	0	1,6,16	3.29	1 (100%)
7	FMT	B	404	-	0,2,2	0.00	-	0,1,1	0.00	-
5	MES	C	402	-	5,5,12	1.44	1 (20%)	7,7,16	2.39	4 (57%)
5	MES	C	403	-	6,6,12	3.01	1 (16%)	6,8,16	2.26	3 (50%)
5	MES	C	404	-	5,5,12	1.40	1 (20%)	7,7,16	2.24	3 (42%)
5	MES	D	402	-	7,7,12	2.84	1 (14%)	8,9,16	2.33	4 (50%)
5	MES	D	403	-	12,12,12	2.07	1 (8%)	14,16,16	2.48	8 (57%)
5	MES	D	404	-	10,10,12	2.40	1 (10%)	11,12,16	1.88	3 (27%)
5	MES	E	402	-	6,6,12	3.12	1 (16%)	6,8,16	2.19	3 (50%)
5	MES	E	403	-	5,5,12	1.41	1 (20%)	7,7,16	2.15	3 (42%)
5	MES	F	402	-	6,6,12	2.99	1 (16%)	6,8,16	2.97	2 (33%)
5	MES	F	403	-	7,7,12	2.78	1 (14%)	8,9,16	2.27	5 (62%)

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
5	MES	A	402	-	-	0/5/5/14	0/0/0/1
6	SO4	A	403	-	-	0/0/0/0	0/0/0/0
5	MES	B	402	-	-	0/4/4/14	0/0/0/1
5	MES	B	403	-	-	0/0/0/14	0/0/0/1
7	FMT	B	404	-	-	0/0/0/0	0/0/0/0
5	MES	C	402	-	-	0/3/3/14	0/0/0/1
5	MES	C	403	-	-	0/4/4/14	0/0/0/1
5	MES	C	404	-	-	0/3/3/14	0/0/0/1
5	MES	D	402	-	-	0/5/5/14	0/0/0/1
5	MES	D	403	-	-	0/6/14/14	0/1/1/1
5	MES	D	404	-	-	0/8/8/14	0/0/0/1
5	MES	E	402	-	-	0/4/4/14	0/0/0/1
5	MES	E	403	-	-	0/3/3/14	0/0/0/1
5	MES	F	402	-	-	0/4/4/14	0/0/0/1
5	MES	F	403	-	-	0/5/5/14	0/0/0/1

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	E	402	MES	C8-S	-7.43	1.66	1.77
5	D	402	MES	C8-S	-7.31	1.66	1.77
5	D	404	MES	C8-S	-7.30	1.66	1.77
5	A	402	MES	C8-S	-7.17	1.66	1.77
5	C	403	MES	C8-S	-7.17	1.66	1.77
5	B	402	MES	C8-S	-7.17	1.66	1.77
5	F	402	MES	C8-S	-7.12	1.66	1.77
5	F	403	MES	C8-S	-7.10	1.66	1.77
5	D	403	MES	C8-S	-6.87	1.67	1.77
5	C	402	MES	C8-S	-2.64	1.66	1.77
5	E	403	MES	C8-S	-2.59	1.66	1.77
5	C	404	MES	C8-S	-2.55	1.67	1.77

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	403	MES	O2S-S-O1S	-3.29	108.86	117.93
5	D	403	MES	C2-C3-N4	-2.91	106.03	110.11
5	A	402	MES	C8-C7-N4	-2.45	104.08	111.21
5	F	403	MES	C8-C7-N4	-2.39	104.25	111.21
5	D	404	MES	C8-C7-N4	-2.34	104.39	111.21
5	D	403	MES	C6-C5-N4	-2.28	106.91	110.11
5	C	402	MES	C7-C8-S	-2.25	107.36	113.05
5	C	402	MES	O3S-S-C8	2.01	108.53	106.06
5	A	402	MES	O3S-S-C8	2.13	108.67	106.06
5	E	402	MES	O3S-S-C8	2.37	108.97	106.06
5	D	402	MES	C3-N4-C7	2.47	119.23	111.74
5	B	402	MES	O2S-S-C8	2.52	108.96	106.79
5	F	403	MES	O2S-S-C8	2.54	108.98	106.79
5	D	403	MES	O2S-S-C8	2.56	108.99	106.79
5	A	402	MES	C3-N4-C7	2.59	119.62	111.74
5	B	402	MES	O3S-S-C8	2.63	109.29	106.06
5	F	403	MES	O1S-S-C8	2.64	109.06	106.79
5	F	403	MES	C3-N4-C7	2.73	120.03	111.74
5	E	403	MES	O2S-S-C8	2.75	109.15	106.79
5	D	403	MES	C7-N4-C5	2.75	118.31	111.26
5	C	403	MES	O2S-S-C8	2.79	109.19	106.79
5	E	403	MES	O1S-S-C8	2.82	109.22	106.79
5	E	402	MES	O2S-S-C8	2.83	109.22	106.79
5	D	403	MES	O3S-S-C8	2.88	109.60	106.06
5	D	403	MES	C7-N4-C3	2.90	118.70	111.26
5	D	402	MES	O3S-S-C8	2.93	109.66	106.06
5	C	404	MES	O2S-S-C8	2.97	109.34	106.79

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	402	MES	O2S-S-C8	3.02	109.38	106.79
5	C	404	MES	O3S-S-C8	3.04	109.80	106.06
5	D	404	MES	O1S-S-C8	3.09	109.44	106.79
5	C	403	MES	O1S-S-C8	3.11	109.47	106.79
5	D	404	MES	O3S-S-C8	3.13	109.91	106.06
5	C	403	MES	O3S-S-C8	3.16	109.94	106.06
5	A	402	MES	O2S-S-C8	3.31	109.63	106.79
5	B	402	MES	O1S-S-C8	3.33	109.66	106.79
5	C	402	MES	O1S-S-C8	3.35	109.67	106.79
5	F	403	MES	O3S-S-C8	3.40	110.24	106.06
5	E	403	MES	O3S-S-C8	3.41	110.26	106.06
5	E	402	MES	O1S-S-C8	3.47	109.77	106.79
5	C	404	MES	O1S-S-C8	3.50	109.80	106.79
5	D	402	MES	O1S-S-C8	3.57	109.86	106.79
5	A	402	MES	O1S-S-C8	3.57	109.86	106.79
5	F	402	MES	O3S-S-C8	3.62	110.50	106.06
5	D	403	MES	O1S-S-C8	3.63	109.91	106.79
5	C	402	MES	O2S-S-C8	4.06	110.28	106.79
5	D	403	MES	C5-N4-C3	4.74	119.61	108.87
5	F	402	MES	O1S-S-C8	5.92	111.87	106.79

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	403	MES	3	0
5	D	402	MES	3	0
5	D	404	MES	2	0
5	E	402	MES	4	0
5	F	402	MES	2	0
5	F	403	MES	1	0

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

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	324/324 (100%)	-0.10	13 (4%) 39 40	11, 20, 47, 95	1 (0%)
2	B	322/322 (100%)	-0.15	9 (2%) 53 54	8, 19, 43, 74	0
2	D	322/322 (100%)	-0.19	7 (2%) 62 62	9, 19, 44, 86	1 (0%)
2	E	322/322 (100%)	-0.19	5 (1%) 72 72	7, 18, 44, 102	1 (0%)
2	F	322/322 (100%)	-0.22	3 (0%) 84 84	7, 15, 43, 91	0
3	C	319/319 (100%)	-0.18	4 (1%) 77 77	7, 15, 38, 110	0
All	All	1931/1931 (100%)	-0.17	41 (2%) 64 64	7, 18, 44, 110	3 (0%)

All (41) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	1	VAL	10.0
1	A	81	VAL	7.4
1	A	-1	HIS	4.9
3	C	4	THR	4.8
3	C	3	LEU	4.4
2	B	1	VAL	4.3
2	D	80	PRO	4.1
3	C	81	VAL	4.0
2	F	81	VAL	3.8
2	D	81	VAL	3.8
2	D	1	VAL	3.3
1	A	82	GLU	3.3
2	F	1	VAL	3.2
2	E	81	VAL	3.2
2	B	81	VAL	3.1
1	A	3	LEU	3.0
1	A	4	THR	3.0
2	E	0	HIS	2.9
2	B	2	PRO	2.8

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Mol	Chain	Res	Type	RSRZ
2	B	82[A]	GLU	2.8
2	D	79	ALA	2.7
1	A	1	VAL	2.7
2	E	2	PRO	2.7
2	B	221[A]	ASP	2.6
1	A	80	PRO	2.6
2	D	10	GLU	2.6
1	A	79	ALA	2.5
2	B	0	HIS	2.5
2	F	0	HIS	2.4
2	D	223	GLU	2.4
2	D	221	ASP	2.4
1	A	221	ASP	2.4
2	B	4	THR	2.3
2	B	3	LEU	2.2
1	A	78	VAL	2.2
3	C	224	LYS	2.2
2	B	80	PRO	2.1
1	A	0	HIS	2.1
1	A	-2	HIS	2.0
1	A	9	PHE	2.0
2	E	221	ASP	2.0

## 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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
5	MES	F	403	8/12	0.68	0.28	15.79	42,82,91,93	0
5	MES	D	404	11/12	0.70	0.30	12.39	64,67,94,99	1
5	MES	C	404	6/12	0.72	0.20	5.37	67,84,86,87	0
5	MES	E	402	7/12	0.79	0.27	3.89	80,84,94,95	0
5	MES	A	402	8/12	0.85	0.20	3.64	45,57,64,69	0
5	MES	F	402	7/12	0.89	0.21	3.13	38,44,50,52	0
5	MES	C	403	7/12	0.92	0.18	1.74	52,57,60,69	0
5	MES	D	402	8/12	0.93	0.17	1.36	21,38,49,51	8
7	FMT	B	404	3/3	0.83	0.16	0.82	50,50,51,54	0
4	NA	B	401	1/1	0.95	0.12	0.58	26,26,26,26	0
4	NA	E	401	1/1	0.88	0.14	0.44	31,31,31,31	0
5	MES	B	403	5/12	0.93	0.13	-0.25	40,42,50,65	0
4	NA	F	401	1/1	0.97	0.08	-0.99	16,16,16,16	0
4	NA	A	401	1/1	0.95	0.07	-1.25	35,35,35,35	0
4	NA	D	401	1/1	0.95	0.08	-1.78	31,31,31,31	0
4	NA	C	401	1/1	1.00	0.07	-2.39	18,18,18,18	0
5	MES	D	403	12/12	0.90	0.24	-	41,60,64,66	0
6	SO4	A	403	5/5	0.91	0.15	-	51,65,65,69	0
5	MES	B	402	7/12	0.96	0.12	-	35,47,56,56	0
5	MES	E	403	6/12	0.83	0.21	-	46,59,65,70	0
5	MES	C	402	6/12	0.94	0.15	-	28,33,34,43	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.