



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 15, 2017 – 02:01 am GMT

PDB ID : 4O1Q
Title : Crystal Structure of the Q103N-MauG/pre-Methylamine Dehydrogenase Complex
Authors : Yukl, E.T.; Wilmot, C.W.
Deposited on : 2013-12-16
Resolution : 2.59 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

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

with specific help available everywhere you see the ⓘ symbol.

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 : trunk28620
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) : recalc28949

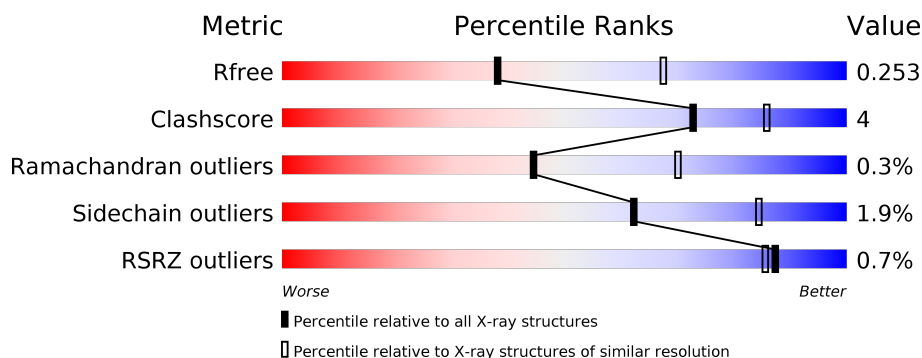
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.59 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	2542 (2.60-2.60)
Clashscore	112137	2895 (2.60-2.60)
Ramachandran outliers	110173	2848 (2.60-2.60)
Sidechain outliers	110143	2848 (2.60-2.60)
RSRZ outliers	101464	2550 (2.60-2.60)

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 ≥ 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	373	<div> <div></div> <div>84% 10% 5%</div> </div>
1	B	373	<div> <div></div> <div>85% 10% 5%</div> </div>
2	C	137	<div> <div></div> <div>77% 14% 9%</div> </div>
2	E	137	<div> <div></div> <div>81% 10% 9%</div> </div>
3	D	385	<div> <div></div> <div>90% 8% .</div> </div>
3	F	385	<div> <div></div> <div>88% 10% .</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
9	MES	D	401	-	-	-	X
9	MES	F	401	-	-	-	X

2 Entry composition

There are 11 unique types of molecules in this entry. The entry contains 13884 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 Methylamine utilization protein MauG.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	354	Total	C	N	O	S	0	1	0
			2742	1711	492	528	11			
1	B	355	Total	C	N	O	S	0	1	0
			2751	1716	493	531	11			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	HIS	-	EXPRESSION TAG	UNP Q51658
A	-4	HIS	-	EXPRESSION TAG	UNP Q51658
A	-3	HIS	-	EXPRESSION TAG	UNP Q51658
A	-2	HIS	-	EXPRESSION TAG	UNP Q51658
A	-1	HIS	-	EXPRESSION TAG	UNP Q51658
A	0	HIS	-	EXPRESSION TAG	UNP Q51658
A	103	ASN	GLN	ENGINEERED MUTATION	UNP Q51658
B	-5	HIS	-	EXPRESSION TAG	UNP Q51658
B	-4	HIS	-	EXPRESSION TAG	UNP Q51658
B	-3	HIS	-	EXPRESSION TAG	UNP Q51658
B	-2	HIS	-	EXPRESSION TAG	UNP Q51658
B	-1	HIS	-	EXPRESSION TAG	UNP Q51658
B	0	HIS	-	EXPRESSION TAG	UNP Q51658
B	103	ASN	GLN	ENGINEERED MUTATION	UNP Q51658

- Molecule 2 is a protein called Methylamine dehydrogenase light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	125	Total	C	N	O	S	0	0	0
			955	590	161	191	13			
2	E	125	Total	C	N	O	S	0	1	0
			958	592	161	191	14			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-5	HIS	-	EXPRESSION TAG	UNP A1BBA0
C	-4	HIS	-	EXPRESSION TAG	UNP A1BBA0
C	-3	HIS	-	EXPRESSION TAG	UNP A1BBA0
C	-2	HIS	-	EXPRESSION TAG	UNP A1BBA0
C	-1	HIS	-	EXPRESSION TAG	UNP A1BBA0
C	0	HIS	-	EXPRESSION TAG	UNP A1BBA0
E	-5	HIS	-	EXPRESSION TAG	UNP A1BBA0
E	-4	HIS	-	EXPRESSION TAG	UNP A1BBA0
E	-3	HIS	-	EXPRESSION TAG	UNP A1BBA0
E	-2	HIS	-	EXPRESSION TAG	UNP A1BBA0
E	-1	HIS	-	EXPRESSION TAG	UNP A1BBA0
E	0	HIS	-	EXPRESSION TAG	UNP A1BBA0

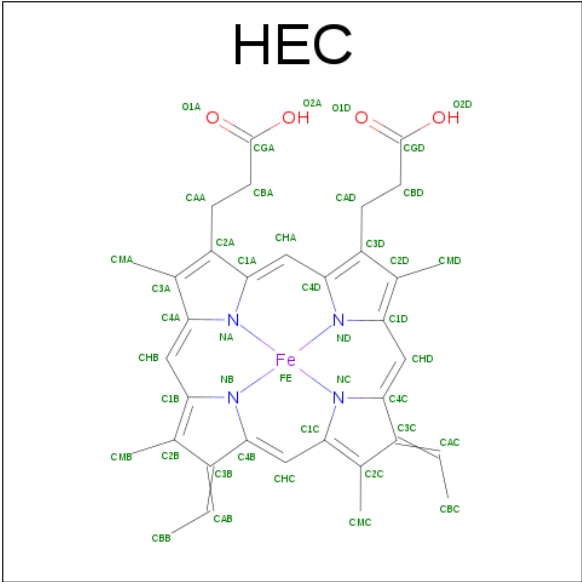
- Molecule 3 is a protein called Methylamine dehydrogenase heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	376	Total	C	N	O	S	0	0	0
			2923	1853	502	560	8			
3	F	376	Total	C	N	O	S	0	1	0
			2931	1857	503	563	8			

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

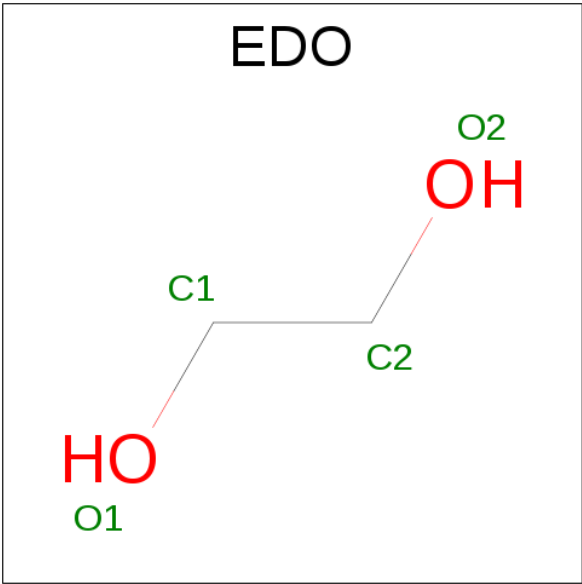
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Ca	0	0
			1	1		
4	A	1	Total	Ca	0	0
			1	1		

- Molecule 5 is HEME C (three-letter code: HEC) (formula: C₃₄H₃₄FeN₄O₄).



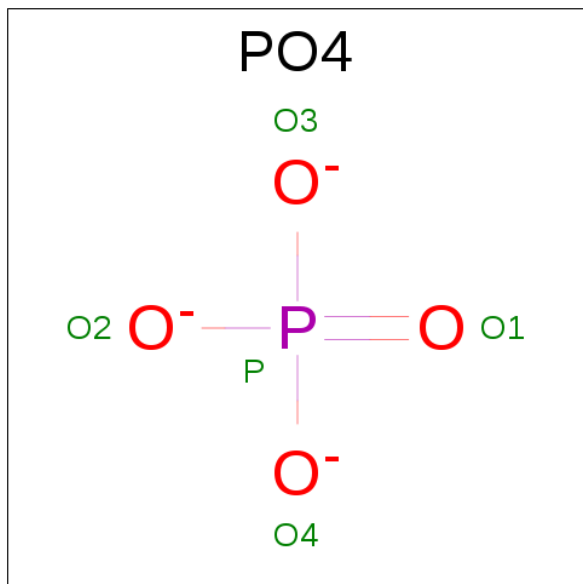
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
5	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
5	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
5	B	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 6 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



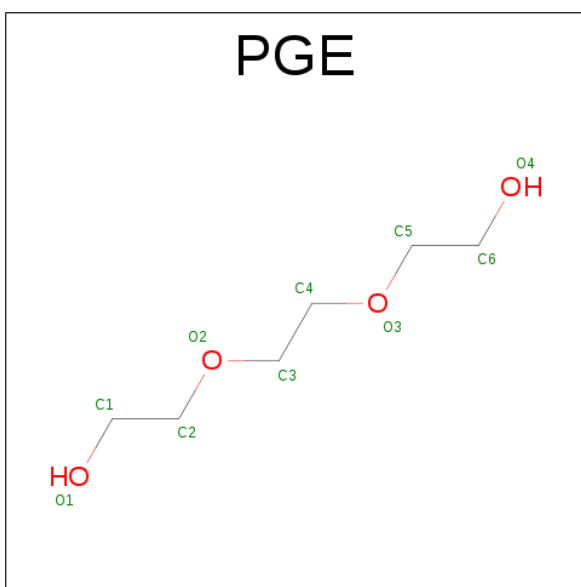
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 7 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



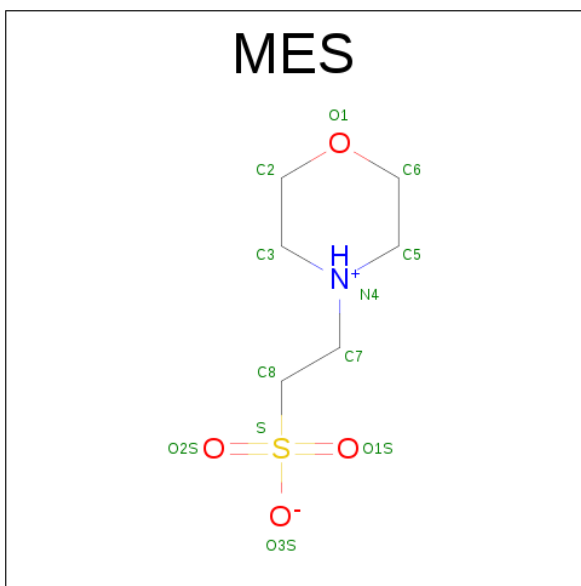
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	B	1	Total	O	P	0	0
			5	4	1		

- Molecule 8 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: C₆H₁₄O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	C	1	Total	C	O	0	0
			10	6	4		

- Molecule 9 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: $C_6H_{13}NO_4S$).



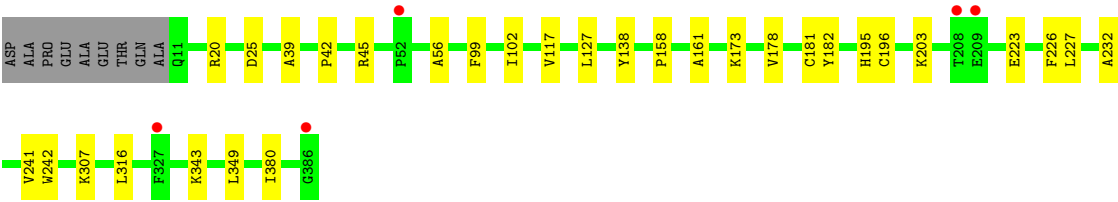
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	D	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
9	F	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 10 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	F	1	Total 1	Na 1	0	0

- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	63	Total 63	O 63	0	0
11	B	97	Total 97	O 97	0	0
11	C	29	Total 29	O 29	0	0
11	D	65	Total 65	O 65	0	0
11	E	27	Total 27	O 27	0	0
11	F	116	Total 117	O 117	0	1

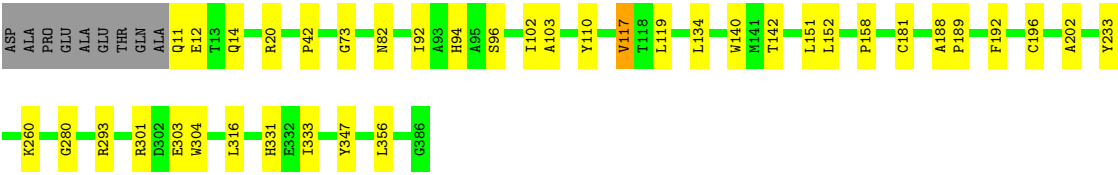


● Molecule 3: Methylamine dehydrogenase heavy chain

Chain F:

88%

10%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	55.53Å 83.52Å 107.78Å 109.94° 91.54° 105.78°	Depositor
Resolution (Å)	44.49 – 2.59 44.49 – 2.59	Depositor EDS
% Data completeness (in resolution range)	98.2 (44.49-2.59) 86.0 (44.49-2.59)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	0.12	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.45 (at 2.58Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.198 , 0.254 0.195 , 0.253	Depositor DCC
R_{free} test set	2653 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	40.2	Xtriage
Anisotropy	0.545	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 27.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	13884	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.02% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PGE, 0AF, NA, PO4, EDO, MES, HEC, CA

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.32	0/2806	0.51	0/3808
1	B	0.33	0/2815	0.52	0/3820
2	C	0.32	0/964	0.51	0/1315
2	E	0.31	0/970	0.52	0/1323
3	D	0.29	0/3000	0.51	0/4088
3	F	0.31	0/3008	0.54	0/4099
All	All	0.31	0/13563	0.52	0/18453

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2742	0	2613	26	0
1	B	2751	0	2619	23	0
2	C	955	0	859	15	0
2	E	958	0	863	10	0
3	D	2923	0	2808	17	0
3	F	2931	0	2810	22	0
4	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	1	0	0	0	0
5	A	86	0	60	9	0
5	B	86	0	60	5	0
6	A	8	0	12	0	0
6	B	4	0	6	0	0
7	B	5	0	0	0	0
8	C	10	0	14	0	0
9	D	12	0	13	0	0
9	F	12	0	13	0	0
10	F	1	0	0	0	0
11	A	63	0	0	1	0
11	B	97	0	0	3	0
11	C	29	0	0	1	0
11	D	65	0	0	1	0
11	E	27	0	0	1	0
11	F	117	0	0	1	0
All	All	13884	0	12750	101	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 (101) 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)
5:B:403:HEC:HBC3	5:B:403:HEC:HMC1	1.75	0.68
1:B:39:ARG:NH2	1:B:276:GLY:O	2.31	0.63
1:B:103:ASN:ND2	11:B:597:HOH:O	2.32	0.62
3:F:82:ASN:HB3	3:F:142:THR:HB	1.81	0.61
2:E:107:ILE:HD12	2:E:119:TYR:HB2	1.83	0.61
5:A:403:HEC:HBC3	5:A:403:HEC:HMC1	1.83	0.60
1:B:210:GLN:HE22	2:E:44:THR:HG21	1.67	0.60
1:A:172:ASP:O	1:A:177:ARG:NH1	2.35	0.59
3:F:96:SER:HB3	3:F:110:TYR:CZ	2.38	0.59
1:A:210:GLN:HE22	2:C:44:THR:HG21	1.68	0.57
1:B:107:PRO:CG	11:B:597:HOH:O	2.52	0.57
1:B:197:ILE:HG22	1:B:206:MET:CE	2.36	0.55
5:B:402:HEC:HBC3	5:B:402:HEC:HMC1	1.88	0.54
2:C:104:ASN:OD1	3:D:307:LYS:NZ	2.42	0.52
1:B:266:VAL:HG22	5:B:403:HEC:HMD3	1.91	0.52
2:C:105:ASP:HB2	3:D:138:TYR:OH	2.08	0.52
3:F:196:CYS:SG	3:F:202:ALA:HB2	2.50	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:260:GLN:HA	1:B:263:ARG:HD2	1.93	0.51
3:D:232:ALA:HB3	3:D:241:VAL:HB	1.93	0.51
1:A:40:ALA:HA	1:A:354:TYR:CE2	2.47	0.50
2:C:21:GLN:HE22	3:F:14:GLN:HE21	1.58	0.50
1:A:178:VAL:HA	1:A:183:GLU:O	2.12	0.50
2:E:99:ARG:NH1	11:E:212:HOH:O	2.38	0.50
2:E:118:THR:HG21	3:F:103:ALA:HB1	1.94	0.49
2:C:20:ILE:HG22	2:C:25:TYR:CE2	2.47	0.49
3:F:73:GLY:HA3	3:F:119:LEU:HD11	1.94	0.49
1:B:91:GLN:O	1:B:92:PHE:HB2	2.13	0.48
1:A:67:THR:OG1	5:A:402:HEC:HMD3	2.14	0.48
2:C:82:VAL:HG12	3:D:56:ALA:HA	1.96	0.48
2:C:20:ILE:HG22	2:C:25:TYR:CZ	2.48	0.47
1:B:272:VAL:HG21	5:B:403:HEC:HMA3	1.95	0.47
3:F:142:THR:CG2	3:F:151:LEU:HD21	2.45	0.47
2:C:95:LEU:HD22	3:D:226:PHE:CE1	2.49	0.47
1:A:114:MET:CG	5:A:402:HEC:HMC2	2.46	0.47
3:F:347:TYR:HB3	3:F:356:LEU:HD11	1.97	0.46
1:B:198:THR:HG22	2:E:58:VAL:HG13	1.97	0.46
3:F:293:ARG:NH2	11:F:565:HOH:O	2.46	0.46
1:A:159:LEU:HD13	5:A:402:HEC:HBB3	1.98	0.46
1:A:28:THR:OG1	1:A:57:ASP:OD1	2.34	0.46
3:F:151:LEU:HD23	3:F:151:LEU:C	2.36	0.46
1:A:91:GLN:O	1:A:92:PHE:HB2	2.15	0.46
3:D:181:CYS:HA	3:D:196:CYS:HA	1.97	0.46
1:A:49:ALA:CB	1:A:234:ALA:HA	2.46	0.46
1:B:197:ILE:HG22	1:B:206:MET:HE2	1.97	0.46
1:B:200:ASN:O	5:B:403:HEC:HMC3	2.14	0.46
2:C:25:TYR:HB3	2:C:28:HIS:CD2	2.51	0.46
1:B:52:ALA:O	1:B:66:ASN:HA	2.16	0.46
1:B:331:GLY:O	3:F:158:PRO:HA	2.15	0.45
2:E:117:MET:HB3	3:F:134:LEU:HD12	1.98	0.45
1:A:39:ARG:NH2	1:A:276:GLY:O	2.50	0.45
3:D:42:PRO:HD3	3:D:117:VAL:HG12	1.96	0.45
1:A:272:VAL:HG21	5:A:403:HEC:HMA3	1.98	0.45
1:B:178:VAL:HA	1:B:183:GLU:O	2.16	0.45
2:C:130:ALA:O	2:C:131:SER:CB	2.65	0.45
1:A:342:LEU:HD13	5:A:403:HEC:HMB1	1.99	0.45
1:A:67:THR:HG23	5:A:402:HEC:C1D	2.47	0.45
1:B:108:MET:HA	1:B:114:MET:HB2	1.99	0.45
2:C:97:VAL:HG23	2:C:106:ILE:HD11	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:53:ALA:HB2	2:E:109:CYS:HA	1.99	0.44
2:C:118:THR:HG23	3:D:99:PHE:CZ	2.52	0.44
1:A:110:ASN:HB3	1:A:113:GLU:HB2	1.99	0.44
1:B:171:PHE:O	1:B:180:ARG:NH2	2.49	0.44
1:A:110:ASN:OD1	1:A:112:VAL:HG22	2.18	0.44
3:F:12:GLU:OE1	3:F:20:ARG:NH1	2.50	0.44
3:F:188:ALA:HB1	3:F:189:PRO:HD2	2.00	0.44
3:D:45:ARG:NH2	3:D:343:LYS:O	2.51	0.44
1:B:222:GLU:O	1:B:266:VAL:HG23	2.18	0.43
1:A:266:VAL:HG22	5:A:403:HEC:HMD3	2.00	0.43
3:D:39:ALA:HB2	2:E:48:PRO:HG3	1.98	0.43
2:E:57:0AF:CE3	2:E:108:TRP:CD1	3.01	0.43
3:F:331:HIS:HB2	3:F:333:ILE:HD11	2.00	0.43
1:B:98:ASP:OD1	1:B:252:ARG:NH2	2.52	0.43
1:A:91:GLN:HB2	1:A:97:ALA:HB3	2.00	0.43
3:F:140:TRP:CE2	3:F:233:TYR:HB3	2.54	0.42
2:C:53:ALA:HB2	2:C:109:CYS:HA	2.01	0.42
3:D:161:ALA:HA	3:D:178:VAL:HG22	2.02	0.42
3:F:42:PRO:HD3	3:F:117:VAL:HG12	2.00	0.42
3:F:303:GLU:HG3	3:F:304:TRP:CD1	2.55	0.42
3:D:349:LEU:HB2	3:D:380:ILE:HD11	2.02	0.42
3:F:280:GLY:HA3	3:F:301:ARG:CZ	2.49	0.42
2:E:19:ASP:O	2:E:25:TYR:HB2	2.19	0.42
1:A:222:GLU:O	1:A:266:VAL:HG23	2.20	0.42
1:B:107:PRO:CD	11:B:597:HOH:O	2.68	0.42
3:D:227:LEU:HB3	3:D:242:TRP:CD1	2.54	0.42
3:F:142:THR:HG23	3:F:151:LEU:HD21	2.01	0.42
3:F:181:CYS:HA	3:F:196:CYS:HA	2.01	0.41
1:A:300:ARG:HD3	3:D:158:PRO:HG3	2.03	0.41
3:D:182:TYR:N	3:D:195:HIS:O	2.50	0.41
1:B:197:ILE:HG22	1:B:206:MET:HE1	2.01	0.41
1:A:103:ASN:ND2	11:A:563:HOH:O	2.50	0.41
2:C:130:ALA:HB1	11:C:303:HOH:O	2.20	0.41
1:A:304:ALA:O	1:A:314:TRP:NE1	2.47	0.41
1:B:93:TRP:CE2	1:B:280:HIS:HA	2.56	0.41
1:B:355:GLU:N	1:B:356:PRO:CD	2.84	0.41
3:D:25:ASP:HA	11:D:546:HOH:O	2.21	0.41
2:C:57:0AF:CE3	2:C:108:TRP:CD1	3.04	0.41
1:A:35:HIS:CE1	1:A:70:LEU:HD21	2.56	0.40
1:A:279:MET:SD	5:A:403:HEC:HBD1	2.62	0.40
1:A:331:GLY:O	3:D:158:PRO:HA	2.20	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:F:152:LEU:HD13	3:F:192:PHE:CD2	2.57	0.40
1:A:223:TYR:CG	1:A:249:LEU:HD22	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	353/373 (95%)	339 (96%)	13 (4%)	1 (0%)	44	70
1	B	354/373 (95%)	342 (97%)	10 (3%)	2 (1%)	28	53
2	C	122/137 (89%)	115 (94%)	7 (6%)	0	100	100
2	E	123/137 (90%)	116 (94%)	7 (6%)	0	100	100
3	D	374/385 (97%)	356 (95%)	17 (4%)	1 (0%)	44	70
3	F	375/385 (97%)	356 (95%)	18 (5%)	1 (0%)	44	70
All	All	1701/1790 (95%)	1624 (96%)	72 (4%)	5 (0%)	44	70

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	276	GLY
1	B	358	LEU
3	F	102	ILE
1	A	232	GLU
3	D	102	ILE

5.3.2 Protein sidechains [i](#)

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	277/292 (95%)	271 (98%)	6 (2%)	57	81
1	B	278/292 (95%)	271 (98%)	7 (2%)	53	79
2	C	104/112 (93%)	103 (99%)	1 (1%)	80	93
2	E	105/112 (94%)	105 (100%)	0	100	100
3	D	304/310 (98%)	298 (98%)	6 (2%)	60	83
3	F	305/310 (98%)	299 (98%)	6 (2%)	60	83
All	All	1373/1428 (96%)	1347 (98%)	26 (2%)	62	84

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	75	LEU
1	A	81	ARG
1	A	103	ASN
1	A	300	ARG
1	A	321	ARG
1	A	359	GLU
1	B	7	ASP
1	B	75	LEU
1	B	103	ASN
1	B	219	THR
1	B	269	LEU
1	B	305	LYS
1	B	321	ARG
2	C	71	LEU
3	D	20	ARG
3	D	127	LEU
3	D	173	LYS
3	D	203	LYS
3	D	223	GLU
3	D	316	LEU
3	F	11	GLN
3	F	92	ILE
3	F	94	HIS
3	F	117	VAL
3	F	260	LYS
3	F	316	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	60	GLN
1	A	84	ASN
1	A	91	GLN
1	A	103	ASN
1	A	163	GLN
1	A	210	GLN
1	B	91	GLN
1	B	103	ASN
1	B	163	GLN
1	B	210	GLN
3	D	30	GLN
2	E	21	GLN
2	E	68	GLN
3	F	14	GLN
3	F	331	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 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	$\# Z > 2$
2	0AF	C	57	2	14,16,17	1.41	1 (7%)	12,22,24	1.00	1 (8%)
2	0AF	E	57	2	14,16,17	1.56	1 (7%)	12,22,24	1.03	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
2	0AF	C	57	2	-	0/3/6/8	0/2/2/2
2	0AF	E	57	2	-	0/3/6/8	0/2/2/2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	57	0AF	CZ2-CE2	3.99	1.48	1.42
2	E	57	0AF	CZ2-CE2	4.87	1.49	1.42

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	57	0AF	CB-CA-C	2.06	115.37	111.41

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	57	0AF	1	0
2	E	57	0AF	1	0

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 14 ligands modelled in this entry, 3 are monoatomic - leaving 11 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	HEC	A	402	1	28,50,50	2.47	11 (39%)	16,82,82	3.06	6 (37%)
5	HEC	A	403	1	28,50,50	2.41	12 (42%)	16,82,82	2.37	5 (31%)
6	EDO	A	404	-	3,3,3	0.49	0	2,2,2	0.26	0
6	EDO	A	405	-	3,3,3	0.47	0	2,2,2	0.31	0
5	HEC	B	402	1	28,50,50	2.51	10 (35%)	16,82,82	2.68	7 (43%)
5	HEC	B	403	1	28,50,50	2.47	12 (42%)	16,82,82	2.88	6 (37%)
6	EDO	B	404	-	3,3,3	0.46	0	2,2,2	0.30	0
7	PO4	B	405	-	4,4,4	0.76	0	6,6,6	0.35	0
8	PGE	C	201	-	9,9,9	0.51	0	8,8,8	0.28	0
9	MES	D	401	-	12,12,12	1.93	1 (8%)	14,16,16	8.56	8 (57%)
9	MES	F	401	-	12,12,12	2.08	1 (8%)	14,16,16	8.26	5 (35%)

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	HEC	A	402	1	-	0/6/54/54	0/0/8/8
5	HEC	A	403	1	-	0/6/54/54	0/0/8/8
6	EDO	A	404	-	-	0/1/1/1	0/0/0/0
6	EDO	A	405	-	-	0/1/1/1	0/0/0/0
5	HEC	B	402	1	-	0/6/54/54	0/0/8/8
5	HEC	B	403	1	-	0/6/54/54	0/0/8/8
6	EDO	B	404	-	-	0/1/1/1	0/0/0/0
7	PO4	B	405	-	-	0/0/0/0	0/0/0/0
8	PGE	C	201	-	-	0/7/7/7	0/0/0/0
9	MES	D	401	-	-	0/6/14/14	0/1/1/1
9	MES	F	401	-	-	0/6/14/14	0/1/1/1

All (47) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	F	401	MES	C8-S	-6.77	1.67	1.77
9	D	401	MES	C8-S	-6.00	1.68	1.77
5	A	403	HEC	C4C-NC	-2.87	1.33	1.36
5	B	403	HEC	C4C-NC	-2.80	1.33	1.36
5	A	402	HEC	C4B-NB	-2.15	1.34	1.36
5	A	403	HEC	C4B-NB	-2.12	1.34	1.36
5	B	403	HEC	C4B-NB	-2.05	1.34	1.36
5	B	403	HEC	C1D-CHD	2.34	1.46	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	403	HEC	C3B-C4B	2.42	1.47	1.43
5	A	402	HEC	C1C-CHC	2.42	1.46	1.40
5	B	403	HEC	C1C-CHC	2.46	1.46	1.40
5	A	403	HEC	C1C-CHC	2.56	1.47	1.40
5	A	402	HEC	C3B-C4B	2.58	1.47	1.43
5	A	403	HEC	C1D-CHD	2.59	1.47	1.40
5	B	403	HEC	C3B-C4B	2.60	1.47	1.43
5	B	403	HEC	C3C-C4C	2.60	1.47	1.43
5	B	402	HEC	C4D-CHA	2.66	1.47	1.40
5	A	403	HEC	C4D-CHA	2.73	1.47	1.40
5	A	403	HEC	C3C-C4C	2.73	1.48	1.43
5	B	403	HEC	C4D-CHA	2.74	1.47	1.40
5	B	402	HEC	C3B-C4B	2.82	1.48	1.43
5	B	403	HEC	C3D-C2D	2.83	1.46	1.37
5	B	402	HEC	C1C-CHC	2.84	1.47	1.40
5	A	402	HEC	C1B-CHB	2.92	1.47	1.40
5	A	402	HEC	C4D-CHA	2.98	1.48	1.40
5	B	403	HEC	C1B-CHB	2.99	1.48	1.40
5	A	402	HEC	C3D-C2D	3.00	1.46	1.37
5	A	403	HEC	C3D-C2D	3.01	1.46	1.37
5	B	402	HEC	C2A-C3A	3.19	1.47	1.37
5	B	402	HEC	C1B-CHB	3.19	1.48	1.40
5	B	402	HEC	C1D-CHD	3.24	1.48	1.40
5	A	403	HEC	C1B-CHB	3.27	1.48	1.40
5	B	402	HEC	C3C-C4C	3.30	1.49	1.43
5	B	403	HEC	C2A-C3A	3.32	1.47	1.37
5	B	402	HEC	C3D-C2D	3.34	1.47	1.37
5	A	402	HEC	C2A-C3A	3.40	1.47	1.37
5	A	403	HEC	C2A-C3A	3.43	1.47	1.37
5	A	402	HEC	C1D-CHD	3.44	1.49	1.40
5	A	402	HEC	C3C-C4C	3.69	1.49	1.43
5	A	402	HEC	C3C-C2C	5.44	1.46	1.40
5	B	403	HEC	C3C-C2C	5.60	1.46	1.40
5	B	402	HEC	C3C-C2C	5.89	1.47	1.40
5	A	403	HEC	C3C-C2C	6.02	1.47	1.40
5	A	403	HEC	C3B-C2B	6.39	1.47	1.40
5	B	402	HEC	C3B-C2B	7.00	1.48	1.40
5	A	402	HEC	C3B-C2B	7.03	1.48	1.40
5	B	403	HEC	C3B-C2B	7.52	1.48	1.40

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	F	401	MES	O3S-S-C8	-16.87	85.30	106.06
9	D	401	MES	O3S-S-C8	-16.36	85.93	106.06
9	D	401	MES	O3S-S-O2S	-12.56	82.58	111.37
9	F	401	MES	O3S-S-O2S	-12.33	83.10	111.37
9	D	401	MES	O3S-S-O1S	-11.82	84.27	111.37
9	F	401	MES	O3S-S-O1S	-11.49	85.04	111.37
5	B	403	HEC	C1D-C2D-C3D	-6.98	102.14	107.00
5	A	402	HEC	C1D-C2D-C3D	-6.85	102.23	107.00
5	B	403	HEC	CBD-CAD-C3D	-6.67	99.74	112.48
5	A	403	HEC	C1D-C2D-C3D	-6.59	102.41	107.00
5	A	402	HEC	CBD-CAD-C3D	-6.41	100.23	112.48
5	B	402	HEC	C1D-C2D-C3D	-5.25	103.34	107.00
5	B	402	HEC	CBD-CAD-C3D	-5.00	102.93	112.48
5	A	402	HEC	C4B-C3B-C2B	-4.58	101.41	106.35
5	B	402	HEC	C4B-C3B-C2B	-3.91	102.13	106.35
5	B	402	HEC	CBA-CAA-C2A	-3.66	105.48	112.47
5	A	403	HEC	C4B-C3B-C2B	-3.64	102.43	106.35
5	A	403	HEC	CBD-CAD-C3D	-3.53	105.74	112.48
5	B	403	HEC	C4B-C3B-C2B	-3.43	102.65	106.35
5	B	402	HEC	C4C-C3C-C2C	-3.20	102.89	106.35
5	A	402	HEC	C4C-C3C-C2C	-3.12	102.98	106.35
5	B	403	HEC	C4C-C3C-C2C	-2.81	103.32	106.35
5	A	402	HEC	CBA-CAA-C2A	-2.47	107.76	112.47
5	A	403	HEC	C4C-C3C-C2C	-2.24	103.93	106.35
5	B	403	HEC	C3C-C4C-NC	2.12	114.94	110.94
5	B	403	HEC	C3B-C4B-NB	2.14	114.99	110.94
5	A	403	HEC	C3B-C4B-NB	2.35	115.38	110.94
5	B	402	HEC	C3B-C4B-NB	2.62	115.89	110.94
5	B	402	HEC	CAD-CBD-CGD	2.89	117.60	112.66
9	D	401	MES	C5-N4-C3	3.11	115.91	108.87
5	A	402	HEC	C3B-C4B-NB	3.21	117.01	110.94
9	D	401	MES	C2-C3-N4	3.48	114.98	110.11
9	D	401	MES	C6-C5-N4	4.71	116.71	110.11
9	F	401	MES	O1S-S-C8	13.10	118.05	106.79
9	D	401	MES	O1S-S-C8	13.41	118.31	106.79
9	F	401	MES	O2S-S-C8	14.41	119.17	106.79
9	D	401	MES	O2S-S-C8	15.27	119.91	106.79

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	402	HEC	4	0
5	A	403	HEC	5	0
5	B	402	HEC	1	0
5	B	403	HEC	4	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	354/373 (94%)	-0.29	3 (0%) 86 83	43, 55, 70, 81	0
1	B	355/373 (95%)	-0.33	3 (0%) 86 83	36, 47, 62, 75	0
2	C	124/137 (90%)	-0.04	1 (0%) 86 83	39, 50, 73, 86	0
2	E	124/137 (90%)	0.02	0 100 100	37, 46, 58, 83	0
3	D	376/385 (97%)	-0.10	5 (1%) 77 73	38, 59, 86, 102	0
3	F	376/385 (97%)	-0.28	0 100 100	35, 46, 63, 73	0
All	All	1709/1790 (95%)	-0.21	12 (0%) 87 85	35, 51, 76, 102	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	6	ALA	6.9
1	A	6	ALA	3.7
3	D	386	GLY	3.3
1	A	7	ASP	3.1
1	A	320	ALA	3.0
1	B	7	ASP	2.8
3	D	208	THR	2.7
3	D	52	PRO	2.5
1	B	321	ARG	2.4
3	D	209	GLU	2.3
3	D	327	PHE	2.2
2	C	131	SER	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [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, 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	LLDF	B-factors(Å ²)	Q<0.9
2	0AF	C	57	15/16	0.91	0.20	-	46,49,52,52	0
2	0AF	E	57	15/16	0.96	0.21	-	44,46,48,48	0

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, 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	LLDF	B-factors(Å ²)	Q<0.9
9	MES	D	401	12/12	0.81	0.33	8.60	105,111,112,113	0
9	MES	F	401	12/12	0.89	0.30	5.96	88,96,101,101	0
5	HEC	B	403	43/43	0.97	0.16	0.97	36,37,38,39	0
4	CA	A	401	1/1	0.93	0.10	0.84	61,61,61,61	0
5	HEC	A	403	43/43	0.97	0.14	0.41	44,45,46,47	0
5	HEC	B	402	43/43	0.97	0.13	0.33	39,41,44,46	0
5	HEC	A	402	43/43	0.97	0.13	0.04	44,48,52,54	0
6	EDO	A	405	4/4	0.85	0.16	-0.35	60,60,60,61	0
4	CA	B	401	1/1	0.98	0.08	-0.36	33,33,33,33	0
6	EDO	B	404	4/4	0.94	0.12	-0.76	59,59,59,60	0
10	NA	F	402	1/1	0.89	0.10	-1.05	52,52,52,52	0
8	PGE	C	201	10/10	0.68	0.24	-	60,69,74,74	0
6	EDO	A	404	4/4	0.87	0.31	-	61,62,62,63	0
7	PO4	B	405	5/5	0.96	0.14	-	76,77,78,78	0

6.5 Other polymers [i](#)

There are no such residues in this entry.