



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 10:40 AM GMT

PDB ID : 3MFL
Title : Axial Ligand Swapping In Double Mutant Maintains Intradiol-cleavage Chemistry in Protocatechuate 3,4-Dioxygenase
Authors : Purpero, V.M.; Lipscomb, J.D.
Deposited on : 2010-04-02
Resolution : 1.78 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 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
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) : trunk26865

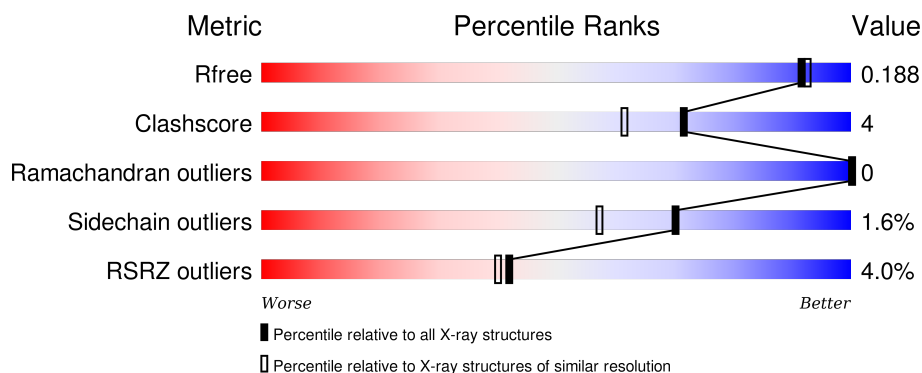
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.78 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}	91344	6655 (1.80-1.76)
Clashscore	102246	7658 (1.80-1.76)
Ramachandran outliers	100387	7570 (1.80-1.76)
Sidechain outliers	100360	7569 (1.80-1.76)
RSRZ outliers	91569	6671 (1.80-1.76)

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	200	<div> <div>5%</div> <div>91%</div> <div>10%</div> </div>
1	B	200	<div> <div>3%</div> <div>96%</div> <div>5%</div> </div>
1	C	200	<div> <div>8%</div> <div>93%</div> <div>7%</div> </div>
2	M	238	<div> <div>4%</div> <div>92%</div> <div>8%</div> </div>
2	N	238	<div> <div>2%</div> <div>92%</div> <div>8%</div> </div>

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Mol	Chain	Length	Quality of chain
2	O	238	

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
4	GOL	A	203	-	-	-	X
4	GOL	B	202[A]	-	-	-	X
4	GOL	B	202[B]	-	-	-	X
4	GOL	N	1[A]	-	-	-	X
4	GOL	N	1[B]	-	-	-	X
4	GOL	O	1[A]	-	-	-	X
4	GOL	O	1[B]	-	-	-	X
5	BME	A	204	-	-	-	X
5	BME	B	203	-	-	-	X
5	BME	B	204	-	-	X	X
8	DHY	M	539[A]	-	-	-	X
8	DHY	M	539[B]	-	-	X	X
8	DHY	N	539[A]	-	-	-	X
8	DHY	N	539[B]	-	-	-	X
8	DHY	O	540[A]	-	-	-	X
8	DHY	O	540[B]	-	-	X	X

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 11806 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 Protocatechuate 3,4-dioxygenase alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	200	Total	C	N	O	S	0	9	0
			1624	1033	279	309	3			
1	B	200	Total	C	N	O	S	0	4	0
			1599	1011	280	305	3			
1	C	200	Total	C	N	O	S	0	1	0
			1581	1000	277	301	3			

- Molecule 2 is a protein called Protocatechuate 3,4-dioxygenase beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	M	238	Total	C	N	O	S	0	6	0
			1915	1215	351	340	9			
2	N	238	Total	C	N	O	S	0	8	0
			1921	1220	348	344	9			
2	O	238	Total	C	N	O	S	0	9	0
			1933	1228	353	343	9			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
M	447	HIS	TYR	engineered	UNP P00437
M	462	TYR	HIS	engineered	UNP P00437
N	447	HIS	TYR	engineered	UNP P00437
N	462	TYR	HIS	engineered	UNP P00437
O	447	HIS	TYR	engineered	UNP P00437
O	462	TYR	HIS	engineered	UNP P00437

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



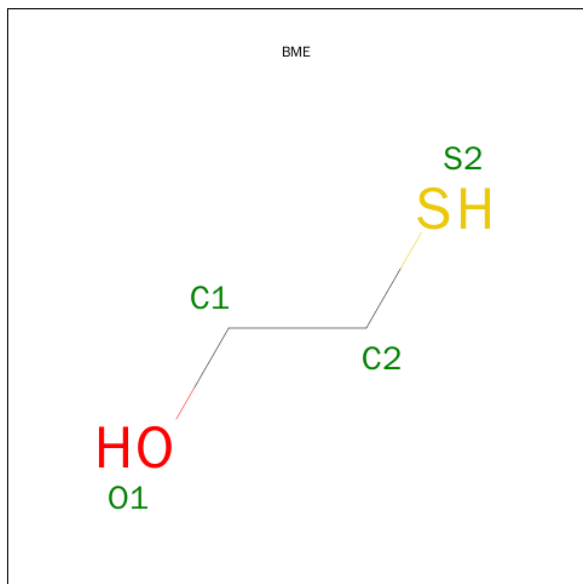
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	S	0	0
			5	4	1		
3	B	1	Total	O	S	0	0
			5	4	1		
3	N	1	Total	O	S	0	0
			5	4	1		
3	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	1
			12	6	6		
4	A	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	1
			12	6	6		
4	N	1	Total	C	O	0	1
			12	6	6		
4	C	1	Total	C	O	0	0
			6	3	3		
4	O	1	Total	C	O	0	1
			12	6	6		

- Molecule 5 is BETA-MERCAPTOETHANOL (three-letter code: BME) (formula: C_2H_6OS).



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

- Molecule 6 is FE (III) ION (three-letter code: FE) (formula: Fe).

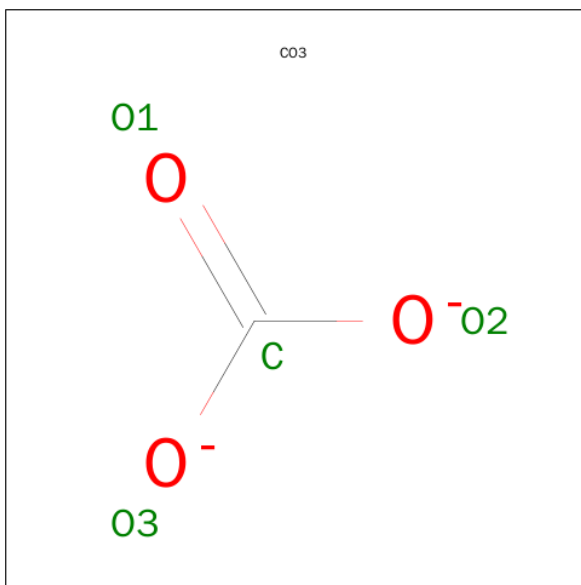
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	O	1	Total	Fe	0	0
			1	1		

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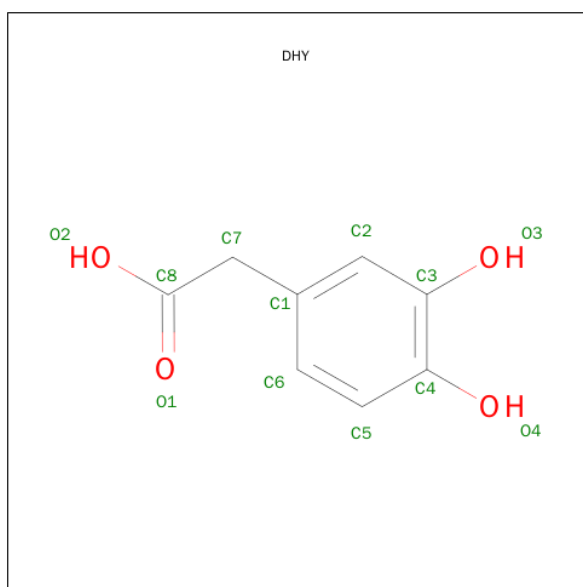
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	N	1	Total	Fe	0	0
			1	1		
6	M	1	Total	Fe	0	0
			1	1		

- Molecule 7 is CARBONATE ION (three-letter code: CO3) (formula: CO₃).



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

- Molecule 8 is 2-(3,4-DIHYDROXYPHENYL)ACETIC ACID (three-letter code: DHY) (formula: C₈H₈O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	M	1	Total	C	O	0	1
			24	16	8		
8	N	1	Total	C	O	0	1
			24	16	8		
8	O	1	Total	C	O	0	1
			24	16	8		

- Molecule 9 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	O	1	Total	Cl	0	0
			1	1		

- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	149	Total	O	0	5
			154	154		
10	M	211	Total	O	0	1
			212	212		
10	B	163	Total	O	0	1
			164	164		
10	N	209	Total	O	0	1
			210	210		
10	C	126	Total	O	0	2
			128	128		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	O	190	Total 193	O 193	0	3

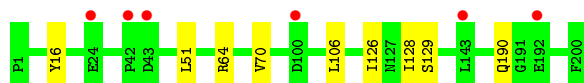
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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 ($\text{RSRZ} > 2$). 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.

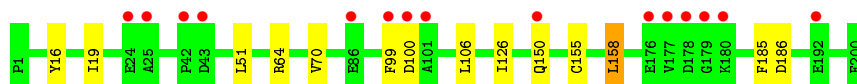
- Molecule 1: Protocatechuate 3,4-dioxygenase alpha chain



- Molecule 1: Protocatechuate 3,4-dioxygenase alpha chain



- Molecule 1: Protocatechuate 3,4-dioxygenase alpha chain



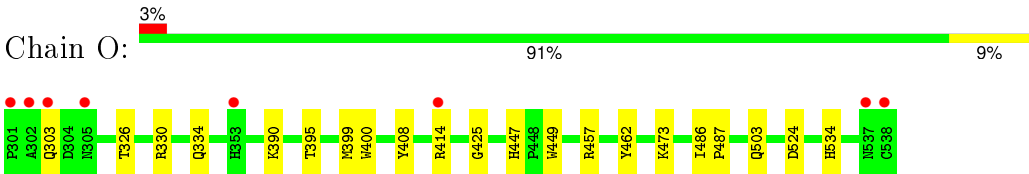
- Molecule 2: Protocatechuate 3,4-dioxygenase beta chain



- Molecule 2: Protocatechuate 3,4-dioxygenase beta chain



- Molecule 2: Protocatechuate 3,4-dioxygenase beta chain



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	128.32Å 140.77Å 168.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	23.87 – 1.78 23.87 – 1.78	Depositor EDS
% Data completeness (in resolution range)	99.8 (23.87-1.78) 99.7 (23.87-1.78)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.90 (at 1.78Å)	Xtriage
Refinement program	REFMAC 5.5.0072	Depositor
R, R_{free}	0.157 , 0.185 0.160 , 0.188	Depositor DCC
R_{free} test set	7253 reflections (5.28%)	DCC
Wilson B-factor (Å ²)	16.8	Xtriage
Anisotropy	0.016	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 48.3	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 145551 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11806	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.70% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, CO3, BME, CL, FE, DHY, SO4

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.63	0/1693	0.65	0/2305
1	B	0.64	0/1651	0.69	0/2247
1	C	0.57	0/1624	0.64	0/2211
2	M	0.62	0/1990	0.71	2/2706 (0.1%)
2	N	0.62	0/2002	0.71	0/2725
2	O	0.59	0/2017	0.68	0/2744
All	All	0.61	0/10977	0.68	2/14938 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	430	LEU	CA-CB-CG	5.16	127.17	115.30
2	M	457	ARG	NE-CZ-NH2	-5.14	117.73	120.30

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	1624	0	1572	17	0
1	B	1599	0	1537	9	0
1	C	1581	0	1516	12	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	M	1915	0	1886	17	0
2	N	1921	0	1890	15	0
2	O	1933	0	1910	22	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
3	N	5	0	0	0	0
4	A	18	0	24	4	0
4	B	12	0	16	0	0
4	C	6	0	8	3	0
4	N	12	0	16	0	0
4	O	12	0	16	1	0
5	A	4	0	6	0	0
5	B	8	0	12	4	0
6	M	1	0	0	0	0
6	N	1	0	0	0	0
6	O	1	0	0	0	0
7	M	4	0	0	0	0
8	M	24	0	10	9	0
8	N	24	0	10	7	0
8	O	24	0	10	8	0
9	O	1	0	0	0	0
10	A	154	0	0	1	0
10	B	164	0	0	0	0
10	C	128	0	0	1	0
10	M	212	0	0	4	0
10	N	210	0	0	3	0
10	O	193	0	0	2	0
All	All	11806	0	10439	90	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 (90) 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:M:507[B]:LYS:HE2	10:M:1009:HOH:O	1.21	1.31
5:B:204:BME:H12	2:N:470:ILE:HD12	1.26	1.11
2:O:414[B]:ARG:HH21	2:O:414[B]:ARG:HG2	1.09	1.09
2:M:507[B]:LYS:CE	10:M:1009:HOH:O	1.86	1.00
2:O:414[B]:ARG:CG	2:O:414[B]:ARG:HH21	1.80	0.92

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:N:326[B]:THR:HG22	10:N:1038:HOH:O	1.72	0.89
2:O:414[B]:ARG:HG2	2:O:414[B]:ARG:NH2	1.91	0.85
8:M:539[B]:DHY:O1	10:M:916:HOH:O	1.97	0.81
2:O:447[B]:HIS:CE1	8:O:540[B]:DHY:C4	2.68	0.76
1:C:186:ASP:H	4:C:202:GOL:H32	1.51	0.75
2:O:447[B]:HIS:HE1	8:O:540[B]:DHY:C4	2.01	0.73
2:M:447[B]:HIS:CE1	8:M:539[B]:DHY:C4	2.73	0.72
1:B:70:VAL:HG11	1:B:106:LEU:HD11	1.70	0.72
2:M:507[B]:LYS:NZ	10:M:1009:HOH:O	2.14	0.72
2:M:447[B]:HIS:HE1	8:M:539[B]:DHY:C4	2.02	0.71
8:N:539[A]:DHY:O1	10:N:1037:HOH:O	2.09	0.70
5:B:204:BME:H12	2:N:470:ILE:CD1	2.15	0.68
1:A:16:TYR:CE2	8:M:539[B]:DHY:H2	2.30	0.67
2:O:414[B]:ARG:CG	2:O:414[B]:ARG:NH2	2.45	0.66
2:N:447[B]:HIS:CE1	8:N:539[B]:DHY:C4	2.81	0.64
1:A:41:LYS:HE3	4:A:203:GOL:H2	1.80	0.63
1:C:186:ASP:H	4:C:202:GOL:C3	2.11	0.62
1:A:19[B]:ILE:CD1	1:A:26:ALA:HB1	2.31	0.61
2:N:447[B]:HIS:HE1	8:N:539[B]:DHY:C4	2.14	0.61
2:M:447[B]:HIS:HE1	8:M:539[B]:DHY:C5	2.15	0.60
1:C:16:TYR:CE2	8:O:540[A]:DHY:H2	2.38	0.59
2:N:503[B]:GLN:NE2	10:N:872:HOH:O	2.10	0.58
1:B:129:SER:OG	5:B:204:BME:H11	2.03	0.57
2:O:414[B]:ARG:HB2	2:O:414[B]:ARG:CZ	2.34	0.57
2:O:447[B]:HIS:CE1	8:O:540[B]:DHY:C3	2.89	0.56
1:A:19[B]:ILE:HD11	2:M:410:HIS:HB2	1.88	0.55
1:C:64:ARG:NH2	1:C:100:ASP:O	2.40	0.55
1:A:85:LEU:O	4:A:203:GOL:H12	2.05	0.55
2:O:414[B]:ARG:CB	2:O:414[B]:ARG:NH2	2.70	0.55
2:O:447[B]:HIS:HE1	8:O:540[B]:DHY:C3	2.20	0.55
1:B:16:TYR:CE2	8:N:539[B]:DHY:H2	2.44	0.53
2:O:503[B]:GLN:NE2	10:O:1042:HOH:O	2.18	0.52
1:A:16:TYR:CE2	8:M:539[A]:DHY:H2	2.45	0.52
1:A:70:VAL:HG11	1:A:106:LEU:HD11	1.94	0.50
1:C:185:PHE:HA	4:C:202:GOL:H31	1.91	0.50
2:O:449:TRP:CE3	8:O:540[B]:DHY:H6	2.47	0.50
1:B:51:LEU:HD11	1:B:126:ILE:CD1	2.42	0.49
2:N:478:LEU:HD23	2:N:478:LEU:C	2.33	0.49
1:B:128:ILE:C	5:B:204:BME:H21	2.33	0.48
1:A:19[B]:ILE:HD13	1:A:26:ALA:CB	2.44	0.48
2:M:352:SER:HA	2:M:430:LEU:HD11	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:N:447[B]:HIS:CE1	8:N:539[B]:DHY:C3	2.97	0.48
2:O:400:TRP:HA	2:O:425:GLY:O	2.13	0.48
1:C:155:CYS:HB3	1:C:158:LEU:HB2	1.96	0.47
2:M:478:LEU:C	2:M:478:LEU:HD23	2.34	0.47
1:A:87:ASN:O	4:A:203:GOL:H32	2.14	0.47
1:C:70:VAL:HG11	1:C:106:LEU:HD11	1.95	0.47
2:N:400:TRP:HA	2:N:425:GLY:O	2.15	0.47
2:O:334[B]:GLN:OE1	10:O:574:HOH:O	2.21	0.47
2:N:352:SER:HA	2:N:430:LEU:HD11	1.95	0.47
2:M:449:TRP:CB	8:M:539[B]:DHY:H6	2.45	0.47
1:C:51:LEU:HD11	1:C:126:ILE:CD1	2.46	0.46
1:A:18[B]:HIS:ND1	10:A:1024:HOH:O	2.48	0.46
1:A:19[B]:ILE:HD13	1:A:26:ALA:HB1	1.97	0.46
1:A:72:GLN:HB3	1:A:126[B]:ILE:HG23	1.98	0.45
1:C:64:ARG:HD3	1:C:99:PHE:O	2.17	0.45
2:M:400:TRP:HA	2:M:425:GLY:O	2.17	0.45
2:O:457:ARG:HD3	8:O:540[B]:DHY:H5	1.98	0.45
1:B:16:TYR:CE2	8:N:539[A]:DHY:H2	2.53	0.44
2:N:326[A]:THR:HG22	2:N:330:ARG:HD2	1.99	0.44
2:M:326:THR:HG22	2:M:330:ARG:HD2	1.99	0.44
2:O:414[B]:ARG:CZ	2:O:414[B]:ARG:CB	2.93	0.43
2:N:429[A]:CYS:SG	2:N:437:TYR:HB2	2.58	0.43
2:O:486:ILE:HB	2:O:487:PRO:HD3	1.99	0.43
2:O:399:MET:HA	2:O:462:TYR:O	2.18	0.43
1:A:186:ASP:H	4:A:202[B]:GOL:H31	1.83	0.43
2:N:399:MET:HA	2:N:462:TYR:O	2.20	0.42
1:A:98:THR:O	1:A:102:GLY:HA2	2.20	0.42
2:M:304:ASP:HB2	2:M:343:ILE:HB	2.00	0.42
2:O:326[A]:THR:HG22	2:O:330:ARG:HD2	2.01	0.42
2:M:447[B]:HIS:CE1	8:M:539[B]:DHY:C3	3.03	0.42
1:A:19[B]:ILE:HD11	2:M:410:HIS:CB	2.49	0.42
1:B:190:GLN:HG3	2:N:333:ARG:HG2	2.02	0.42
2:O:449:TRP:HB2	8:O:540[A]:DHY:H6	2.01	0.41
2:M:399:MET:HA	2:M:462:TYR:O	2.20	0.41
1:B:51:LEU:HD11	1:B:126:ILE:HD12	2.01	0.41
2:M:447[B]:HIS:CE1	8:M:539[B]:DHY:C5	3.00	0.40
2:N:447[B]:HIS:HE1	8:N:539[B]:DHY:C3	2.33	0.40
1:C:51:LEU:HD11	1:C:126:ILE:HD12	2.03	0.40
1:C:19:ILE:HD11	2:O:408:TYR:HB3	2.04	0.40
2:O:524:ASP:HB2	4:O:1[A]:GOL:H2	2.03	0.40
1:A:50:LEU:O	1:A:182:ALA:HA	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:150:GLN:HG3	10:C:286:HOH:O	2.21	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	207/200 (104%)	203 (98%)	4 (2%)	0	100	100
1	B	202/200 (101%)	199 (98%)	3 (2%)	0	100	100
1	C	199/200 (100%)	195 (98%)	4 (2%)	0	100	100
2	M	242/238 (102%)	237 (98%)	5 (2%)	0	100	100
2	N	244/238 (102%)	239 (98%)	5 (2%)	0	100	100
2	O	245/238 (103%)	240 (98%)	5 (2%)	0	100	100
All	All	1339/1314 (102%)	1313 (98%)	26 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	172/163 (106%)	168 (98%)	4 (2%)	58	40
1	B	167/163 (102%)	167 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	164/163 (101%)	163 (99%)	1 (1%)	90	87
2	M	208/202 (103%)	205 (99%)	3 (1%)	74	63
2	N	210/202 (104%)	205 (98%)	5 (2%)	57	38
2	O	211/202 (104%)	205 (97%)	6 (3%)	51	32
All	All	1132/1095 (103%)	1113 (98%)	19 (2%)	70	54

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	43[A]	ASP
1	A	43[B]	ASP
1	A	100	ASP
1	A	176	GLU
2	M	395	THR
2	M	473	LYS
2	M	534	HIS
2	N	395	THR
2	N	399	MET
2	N	414	ARG
2	N	473	LYS
2	N	534	HIS
1	C	158	LEU
2	O	303[A]	GLN
2	O	303[B]	GLN
2	O	390	LYS
2	O	395	THR
2	O	473	LYS
2	O	534	HIS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	N	303	GLN

5.3.3 RNA ⓘ

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 28 ligands modelled in this entry, 4 are monoatomic - leaving 24 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
3	SO4	A	201	-	4,4,4	0.33	0	6,6,6	0.23	0
4	GOL	A	202[A]	-	5,5,5	0.31	0	5,5,5	0.79	0
4	GOL	A	202[B]	-	5,5,5	0.28	0	5,5,5	0.44	0
4	GOL	A	203	-	5,5,5	0.30	0	5,5,5	0.44	0
5	BME	A	204	-	3,3,3	0.40	0	2,2,2	0.51	0
3	SO4	B	201	-	4,4,4	0.30	0	6,6,6	0.18	0
4	GOL	B	202[A]	-	5,5,5	0.30	0	5,5,5	0.62	0
4	GOL	B	202[B]	-	5,5,5	0.38	0	5,5,5	0.25	0
5	BME	B	203	-	3,3,3	0.30	0	2,2,2	0.71	0
5	BME	B	204	-	3,3,3	0.67	0	2,2,2	1.34	0
3	SO4	C	201	-	4,4,4	0.24	0	6,6,6	0.26	0
4	GOL	C	202	-	5,5,5	0.31	0	5,5,5	0.22	0
7	CO3	M	1	-	0,3,3	0.00	-	0,3,3	0.00	-
8	DHY	M	539[A]	6	9,12,12	1.62	1 (11%)	13,16,16	0.70	0
8	DHY	M	539[B]	6	9,12,12	1.61	1 (11%)	13,16,16	0.66	0
4	GOL	N	1[A]	-	5,5,5	0.48	0	5,5,5	0.33	0
4	GOL	N	1[B]	-	5,5,5	0.45	0	5,5,5	0.30	0
3	SO4	N	4	-	4,4,4	0.13	0	6,6,6	0.11	0
8	DHY	N	539[A]	6	9,12,12	1.53	1 (11%)	13,16,16	0.78	0
8	DHY	N	539[B]	6	9,12,12	1.51	1 (11%)	13,16,16	1.03	1 (7%)
4	GOL	O	1[A]	-	5,5,5	0.35	0	5,5,5	0.28	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	GOL	O	1[B]	-	5,5,5	0.34	0	5,5,5	0.33	0
8	DHY	O	540[A]	6	9,12,12	1.57	1 (11%)	13,16,16	1.38	2 (15%)
8	DHY	O	540[B]	6	9,12,12	1.55	1 (11%)	13,16,16	0.75	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	SO4	A	201	-	-	0/0/0/0	0/0/0/0
4	GOL	A	202[A]	-	-	0/4/4/4	0/0/0/0
4	GOL	A	202[B]	-	-	0/4/4/4	0/0/0/0
4	GOL	A	203	-	-	0/4/4/4	0/0/0/0
5	BME	A	204	-	-	0/1/1/1	0/0/0/0
3	SO4	B	201	-	-	0/0/0/0	0/0/0/0
4	GOL	B	202[A]	-	-	0/4/4/4	0/0/0/0
4	GOL	B	202[B]	-	-	0/4/4/4	0/0/0/0
5	BME	B	203	-	-	0/1/1/1	0/0/0/0
5	BME	B	204	-	-	0/1/1/1	0/0/0/0
3	SO4	C	201	-	-	0/0/0/0	0/0/0/0
4	GOL	C	202	-	-	0/4/4/4	0/0/0/0
7	CO3	M	1	-	-	0/0/0/0	0/0/0/0
8	DHY	M	539[A]	6	-	0/2/4/4	0/1/1/1
8	DHY	M	539[B]	6	-	0/2/4/4	0/1/1/1
4	GOL	N	1[A]	-	-	0/4/4/4	0/0/0/0
4	GOL	N	1[B]	-	-	0/4/4/4	0/0/0/0
3	SO4	N	4	-	-	0/0/0/0	0/0/0/0
8	DHY	N	539[A]	6	-	0/2/4/4	0/1/1/1
8	DHY	N	539[B]	6	-	0/2/4/4	0/1/1/1
4	GOL	O	1[A]	-	-	0/4/4/4	0/0/0/0
4	GOL	O	1[B]	-	-	0/4/4/4	0/0/0/0
8	DHY	O	540[A]	6	-	0/2/4/4	0/1/1/1
8	DHY	O	540[B]	6	-	0/2/4/4	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	O	540[A]	DHY	C4-C3	4.43	1.47	1.40
8	N	539[B]	DHY	C4-C3	4.44	1.47	1.40
8	N	539[A]	DHY	C4-C3	4.51	1.48	1.40
8	O	540[B]	DHY	C4-C3	4.63	1.48	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	M	539[A]	DHY	C4-C3	4.67	1.48	1.40
8	M	539[B]	DHY	C4-C3	4.77	1.48	1.40

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	O	540[A]	DHY	C7-C1-C2	-2.68	115.15	120.69
8	N	539[B]	DHY	C8-C7-C1	2.55	117.80	112.73
8	O	540[A]	DHY	C8-C7-C1	2.69	118.06	112.73

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

11 monomers are involved in 36 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	202[B]	GOL	1	0
4	A	203	GOL	3	0
5	B	204	BME	4	0
4	C	202	GOL	3	0
8	M	539[A]	DHY	1	0
8	M	539[B]	DHY	8	0
8	N	539[A]	DHY	2	0
8	N	539[B]	DHY	5	0
4	O	1[A]	GOL	1	0
8	O	540[A]	DHY	2	0
8	O	540[B]	DHY	6	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	200/200 (100%)	-0.02	10 (5%) 32 30	12, 18, 32, 45	3 (1%)
1	B	200/200 (100%)	-0.13	6 (3%) 54 52	11, 18, 28, 33	3 (1%)
1	C	200/200 (100%)	0.28	15 (7%) 17 16	13, 24, 39, 51	6 (3%)
2	M	238/238 (100%)	-0.17	9 (3%) 44 42	13, 17, 27, 41	1 (0%)
2	N	238/238 (100%)	-0.27	4 (1%) 73 72	12, 16, 26, 39	3 (1%)
2	O	238/238 (100%)	-0.08	8 (3%) 49 47	14, 19, 30, 42	1 (0%)
All	All	1314/1314 (100%)	-0.07	52 (3%) 42 40	11, 18, 31, 51	17 (1%)

All (52) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	177	VAL	5.8
1	C	178	ASP	5.4
2	M	538	CYS	5.0
1	A	178	ASP	5.0
2	O	301	PRO	4.9
2	N	538	CYS	4.8
2	O	538	CYS	4.7
2	O	303[A]	GLN	4.4
1	C	100	ASP	4.3
1	C	179	GLY	4.2
1	A	179	GLY	4.1
2	O	537	ASN	3.7
1	C	99	PHE	3.7
2	M	303	GLN	3.7
2	O	414[A]	ARG	3.6
1	C	180	LYS	3.5
1	A	99	PHE	3.5
2	O	305	ASN	3.5
2	M	305	ASN	3.4

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Mol	Chain	Res	Type	RSRZ
2	N	537	ASN	3.4
2	M	537	ASN	3.4
2	M	301	PRO	3.2
1	A	101	ALA	3.2
1	C	176	GLU	3.2
2	O	353	HIS	3.2
1	C	43	ASP	3.0
1	A	100	ASP	3.0
2	M	414[A]	ARG	3.0
1	C	150	GLN	2.9
1	C	42	PRO	2.7
1	B	100[A]	ASP	2.7
1	A	177	VAL	2.6
1	C	86	GLU	2.5
2	N	414	ARG	2.5
1	C	24	GLU	2.5
1	C	192[A]	GLU	2.5
1	A	24[A]	GLU	2.5
2	M	358	ALA	2.4
2	M	370	GLY	2.4
1	C	101	ALA	2.4
1	A	180	LYS	2.4
1	C	25	ALA	2.4
2	M	302	ALA	2.2
1	B	24	GLU	2.2
1	B	192[A]	GLU	2.2
2	O	302	ALA	2.2
1	B	42	PRO	2.2
1	B	143	LEU	2.2
2	N	303	GLN	2.2
1	A	42	PRO	2.1
1	A	43[A]	ASP	2.1
1	B	43	ASP	2.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

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
4	GOL	A	203	6/6	0.71	0.32	7.84	43,49,49,53	0
5	BME	B	204	4/4	0.83	0.24	7.28	17,23,27,35	4
4	GOL	O	1[A]	6/6	0.71	0.25	6.17	30,33,33,34	6
4	GOL	O	1[B]	6/6	0.71	0.25	6.05	37,38,38,39	6
4	GOL	N	1[A]	6/6	0.76	0.23	5.91	36,38,38,39	6
4	GOL	N	1[B]	6/6	0.76	0.23	5.91	36,38,38,38	6
5	BME	B	203	4/4	0.86	0.16	5.79	35,40,41,46	4
8	DHY	M	539[B]	12/12	0.85	0.26	5.65	17,18,18,18	12
8	DHY	M	539[A]	12/12	0.85	0.26	5.60	22,23,29,32	12
5	BME	A	204	4/4	0.56	0.26	4.40	37,39,39,42	4
8	DHY	O	540[A]	12/12	0.88	0.20	3.99	20,22,26,27	12
4	GOL	B	202[A]	6/6	0.86	0.19	3.76	28,30,32,34	6
8	DHY	O	540[B]	12/12	0.88	0.20	3.69	15,17,17,18	12
8	DHY	N	539[A]	12/12	0.90	0.17	3.14	21,23,25,26	12
8	DHY	N	539[B]	12/12	0.90	0.17	3.09	22,24,28,29	12
4	GOL	B	202[B]	6/6	0.86	0.19	2.83	32,33,35,36	6
4	GOL	A	202[B]	6/6	0.88	0.15	1.85	30,32,34,35	6
4	GOL	A	202[A]	6/6	0.88	0.15	1.73	16,19,22,23	6
4	GOL	C	202	6/6	0.83	0.13	0.68	33,35,38,41	0
6	FE	O	600	1/1	0.97	0.04	-1.84	24,24,24,24	1
6	FE	N	600	1/1	0.97	0.05	-2.28	24,24,24,24	1
6	FE	M	600	1/1	0.99	0.04	-3.44	25,25,25,25	1
3	SO4	N	4	5/5	0.80	0.26	-	53,53,53,54	5
7	CO3	M	1	4/4	0.70	0.21	-	58,58,58,58	0
9	CL	O	539	1/1	0.90	0.21	-	66,66,66,66	0
3	SO4	A	201	5/5	0.91	0.15	-	38,39,40,41	5
3	SO4	C	201	5/5	0.94	0.18	-	49,49,49,50	5
3	SO4	B	201	5/5	0.87	0.22	-	48,48,48,49	5

6.5 Other polymers [i](#)

There are no such residues in this entry.