



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2014 – 07:37 AM GMT

PDB ID : 2DFD
Title : Crystal Structure of Human Malate Dehydrogenase Type 2
Authors : Ugochukwu, E.; Shafqat, N.; Rojkova, A.; Sundstrom, M.; Arrowsmith, C.; Weigelt, J.; Edwards, A.; von Delft, F.; Oppermann, U.; Structural Genomics Consortium (SGC)
Deposited on : 2006-02-28
Resolution : 1.90 Å(reported)

This is a full wwPDB 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/ValidationPDFNotes.html>

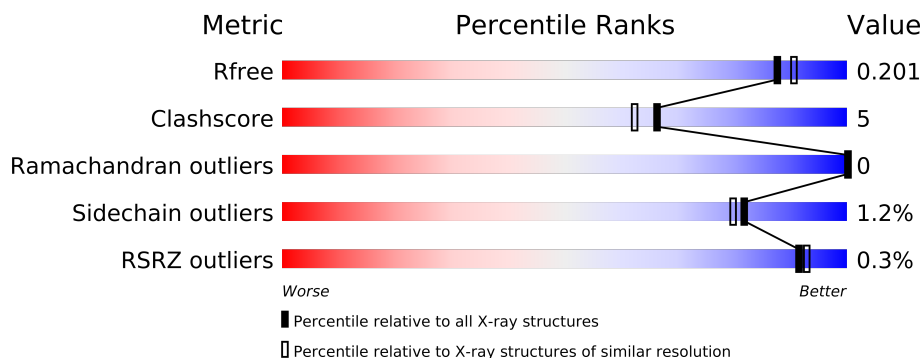
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 1.90 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}	66092	3684 (1.90-1.90)
Clashscore	79885	4465 (1.90-1.90)
Ramachandran outliers	78287	4413 (1.90-1.90)
Sidechain outliers	78261	4414 (1.90-1.90)
RSRZ outliers	66119	3686 (1.90-1.90)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	342	
1	B	342	
1	C	342	
1	D	342	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
3	CL	C	3204	-	X
5	HIS	A	3301	-	X
5	HIS	B	3401	-	X
5	HIS	C	3501	-	X
6	ALA	A	3302	-	X

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 10300 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Malate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	314	Total	C	N	O	S	0	5	0
			2320	1481	384	440	15			
1	B	314	Total	C	N	O	S	0	4	0
			2294	1464	380	436	14			
1	C	314	Total	C	N	O	S	0	7	0
			2320	1476	385	446	13			
1	D	314	Total	C	N	O	S	0	4	0
			2313	1475	387	437	14			

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-21	MET	-	CLONING ARTIFACT	UNP P40926
A	-20	HIS	-	CLONING ARTIFACT	UNP P40926
A	-19	HIS	-	CLONING ARTIFACT	UNP P40926
A	-18	HIS	-	CLONING ARTIFACT	UNP P40926
A	-17	HIS	-	CLONING ARTIFACT	UNP P40926
A	-16	HIS	-	CLONING ARTIFACT	UNP P40926
A	-15	HIS	-	CLONING ARTIFACT	UNP P40926
A	-14	SER	-	CLONING ARTIFACT	UNP P40926
A	-13	SER	-	CLONING ARTIFACT	UNP P40926
A	-12	GLY	-	CLONING ARTIFACT	UNP P40926
A	-11	VAL	-	CLONING ARTIFACT	UNP P40926
A	-10	ASP	-	CLONING ARTIFACT	UNP P40926
A	-9	LEU	-	CLONING ARTIFACT	UNP P40926
A	-8	GLY	-	CLONING ARTIFACT	UNP P40926
A	-7	THR	-	CLONING ARTIFACT	UNP P40926
A	-6	GLU	-	CLONING ARTIFACT	UNP P40926
A	-5	ASN	-	CLONING ARTIFACT	UNP P40926
A	-4	LEU	-	CLONING ARTIFACT	UNP P40926
A	-3	TYR	-	CLONING ARTIFACT	UNP P40926
A	-2	PHE	-	CLONING ARTIFACT	UNP P40926
A	-1	GLN	-	CLONING ARTIFACT	UNP P40926

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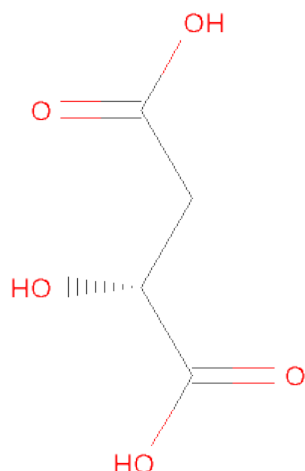
Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	CLONING ARTIFACT	UNP P40926
A	1	MET	-	CLONING ARTIFACT	UNP P40926
B	-21	MET	-	CLONING ARTIFACT	UNP P40926
B	-20	HIS	-	CLONING ARTIFACT	UNP P40926
B	-19	HIS	-	CLONING ARTIFACT	UNP P40926
B	-18	HIS	-	CLONING ARTIFACT	UNP P40926
B	-17	HIS	-	CLONING ARTIFACT	UNP P40926
B	-16	HIS	-	CLONING ARTIFACT	UNP P40926
B	-15	HIS	-	CLONING ARTIFACT	UNP P40926
B	-14	SER	-	CLONING ARTIFACT	UNP P40926
B	-13	SER	-	CLONING ARTIFACT	UNP P40926
B	-12	GLY	-	CLONING ARTIFACT	UNP P40926
B	-11	VAL	-	CLONING ARTIFACT	UNP P40926
B	-10	ASP	-	CLONING ARTIFACT	UNP P40926
B	-9	LEU	-	CLONING ARTIFACT	UNP P40926
B	-8	GLY	-	CLONING ARTIFACT	UNP P40926
B	-7	THR	-	CLONING ARTIFACT	UNP P40926
B	-6	GLU	-	CLONING ARTIFACT	UNP P40926
B	-5	ASN	-	CLONING ARTIFACT	UNP P40926
B	-4	LEU	-	CLONING ARTIFACT	UNP P40926
B	-3	TYR	-	CLONING ARTIFACT	UNP P40926
B	-2	PHE	-	CLONING ARTIFACT	UNP P40926
B	-1	GLN	-	CLONING ARTIFACT	UNP P40926
B	0	SER	-	CLONING ARTIFACT	UNP P40926
B	1	MET	-	CLONING ARTIFACT	UNP P40926
C	-21	MET	-	CLONING ARTIFACT	UNP P40926
C	-20	HIS	-	CLONING ARTIFACT	UNP P40926
C	-19	HIS	-	CLONING ARTIFACT	UNP P40926
C	-18	HIS	-	CLONING ARTIFACT	UNP P40926
C	-17	HIS	-	CLONING ARTIFACT	UNP P40926
C	-16	HIS	-	CLONING ARTIFACT	UNP P40926
C	-15	HIS	-	CLONING ARTIFACT	UNP P40926
C	-14	SER	-	CLONING ARTIFACT	UNP P40926
C	-13	SER	-	CLONING ARTIFACT	UNP P40926
C	-12	GLY	-	CLONING ARTIFACT	UNP P40926
C	-11	VAL	-	CLONING ARTIFACT	UNP P40926
C	-10	ASP	-	CLONING ARTIFACT	UNP P40926
C	-9	LEU	-	CLONING ARTIFACT	UNP P40926
C	-8	GLY	-	CLONING ARTIFACT	UNP P40926
C	-7	THR	-	CLONING ARTIFACT	UNP P40926
C	-6	GLU	-	CLONING ARTIFACT	UNP P40926
C	-5	ASN	-	CLONING ARTIFACT	UNP P40926

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	LEU	-	CLONING ARTIFACT	UNP P40926
C	-3	TYR	-	CLONING ARTIFACT	UNP P40926
C	-2	PHE	-	CLONING ARTIFACT	UNP P40926
C	-1	GLN	-	CLONING ARTIFACT	UNP P40926
C	0	SER	-	CLONING ARTIFACT	UNP P40926
C	1	MET	-	CLONING ARTIFACT	UNP P40926
D	-21	MET	-	CLONING ARTIFACT	UNP P40926
D	-20	HIS	-	CLONING ARTIFACT	UNP P40926
D	-19	HIS	-	CLONING ARTIFACT	UNP P40926
D	-18	HIS	-	CLONING ARTIFACT	UNP P40926
D	-17	HIS	-	CLONING ARTIFACT	UNP P40926
D	-16	HIS	-	CLONING ARTIFACT	UNP P40926
D	-15	HIS	-	CLONING ARTIFACT	UNP P40926
D	-14	SER	-	CLONING ARTIFACT	UNP P40926
D	-13	SER	-	CLONING ARTIFACT	UNP P40926
D	-12	GLY	-	CLONING ARTIFACT	UNP P40926
D	-11	VAL	-	CLONING ARTIFACT	UNP P40926
D	-10	ASP	-	CLONING ARTIFACT	UNP P40926
D	-9	LEU	-	CLONING ARTIFACT	UNP P40926
D	-8	GLY	-	CLONING ARTIFACT	UNP P40926
D	-7	THR	-	CLONING ARTIFACT	UNP P40926
D	-6	GLU	-	CLONING ARTIFACT	UNP P40926
D	-5	ASN	-	CLONING ARTIFACT	UNP P40926
D	-4	LEU	-	CLONING ARTIFACT	UNP P40926
D	-3	TYR	-	CLONING ARTIFACT	UNP P40926
D	-2	PHE	-	CLONING ARTIFACT	UNP P40926
D	-1	GLN	-	CLONING ARTIFACT	UNP P40926
D	0	SER	-	CLONING ARTIFACT	UNP P40926
D	1	MET	-	CLONING ARTIFACT	UNP P40926

- Molecule 2 is MALATE ION (three-letter code: MLT) (formula: $C_4H_6O_5$).

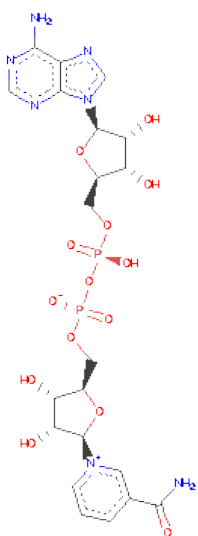


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	D	1	Total	C	O	0	0
			9	4	5		
2	B	1	Total	C	O	0	0
			9	4	5		
2	C	1	Total	C	O	0	0
			9	4	5		
2	A	1	Total	C	O	0	0
			9	4	5		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

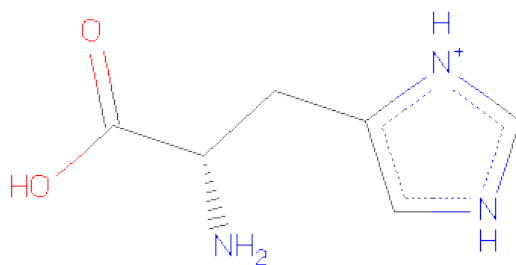
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Cl	0	0
			1	1		
3	A	2	Total	Cl	0	0
			2	2		
3	D	2	Total	Cl	0	0
			2	2		
3	C	2	Total	Cl	0	0
			2	2		

- Molecule 4 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: C₂₁H₂₇N₇O₁₄P₂).



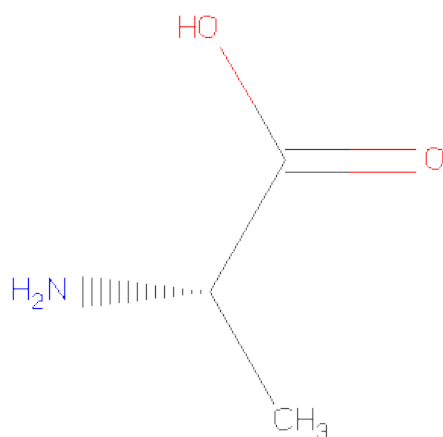
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	B	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	C	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	A	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	D	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 5 is HISTIDINE (three-letter code: HIS) (formula: C₆H₁₀N₃O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			10	6	3	1		
5	B	1	Total	C	N	O	0	0
			10	6	3	1		
5	C	1	Total	C	N	O	0	0
			10	6	3	1		

- Molecule 6 is ALANINE (three-letter code: ALA) (formula: $C_3H_7NO_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			5	3	1	1		

- Molecule 7 is water.

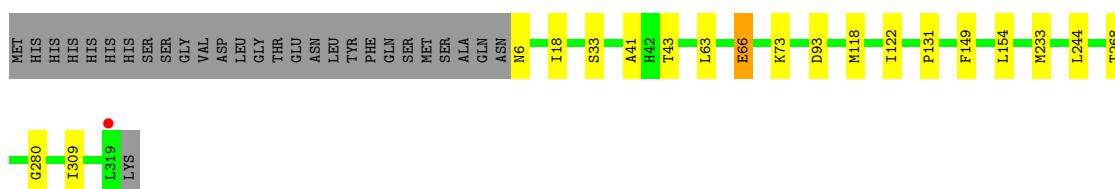
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	194	Total	O	0	0
			194	194		
7	B	140	Total	O	0	0
			140	140		
7	C	252	Total	O	0	0
			252	252		
7	D	213	Total	O	0	0
			213	213		

3 Residue-property plots

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 ($RSRZ > 2$). 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.

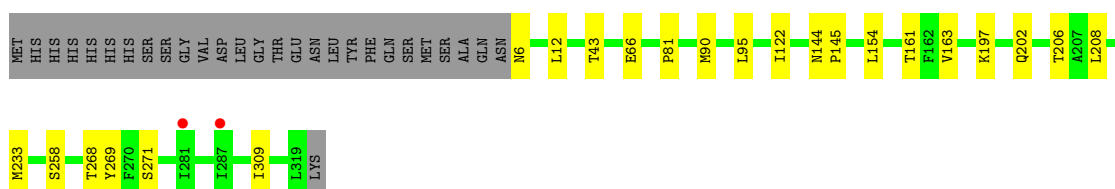
- Molecule 1: Malate dehydrogenase

Chain A:



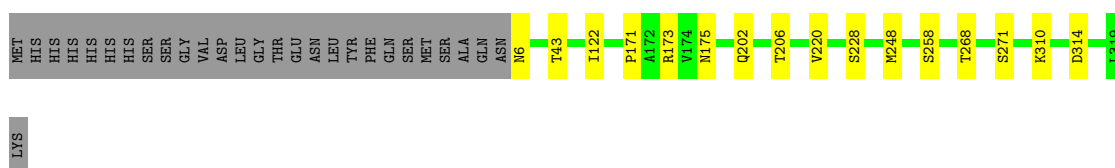
- Molecule 1: Malate dehydrogenase

Chain B:



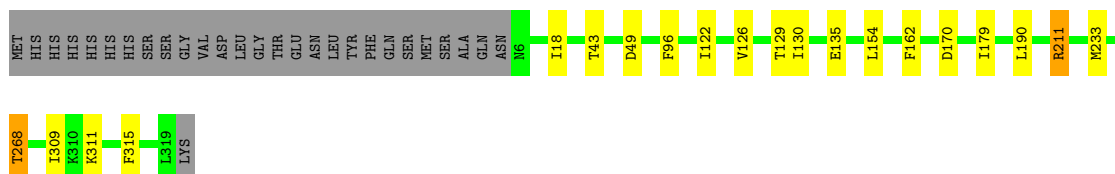
- Molecule 1: Malate dehydrogenase

Chain C:



- Molecule 1: Malate dehydrogenase

Chain D:



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	59.94Å 152.53Å 154.83Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	6.01 – 1.90 68.41 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.8 (6.01-1.90) 99.8 (68.41-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.73 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.156 , 0.194 0.164 , 0.201	Depositor DCC
R_{free} test set	5640 reflections (5.28%)	DCC
Wilson B-factor (Å ²)	28.0	Xtriage
Anisotropy	0.006	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 60.3	EDS
Estimated twinning fraction	0.011 for -h,l,k	Xtriage
L-test for twinning	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 112501 reflections	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	10300	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.15% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

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

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	0.73	0/2376	0.68	0/3230
1	B	0.67	0/2348	0.67	0/3196
1	C	0.83	0/2387	0.71	0/3249
1	D	0.78	0/2365	0.73	2/3216 (0.1%)
All	All	0.75	0/9476	0.70	2/12891 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	170	ASP	CB-CG-OD2	-5.42	113.42	118.30
1	D	49	ASP	CB-CG-OD1	5.30	123.07	118.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2320	0	2389	28	0
1	B	2294	0	2336	26	0
1	C	2320	0	2362	10	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2313	0	2374	25	0
2	A	9	0	4	1	0
2	B	9	0	4	1	0
2	C	9	0	4	2	0
2	D	9	0	4	1	0
3	A	2	0	0	0	0
3	B	1	0	0	1	0
3	C	2	0	0	0	0
3	D	2	0	0	1	0
4	A	44	0	26	6	0
4	B	44	0	26	3	0
4	C	44	0	26	3	0
4	D	44	0	26	8	0
5	A	10	0	6	0	0
5	B	10	0	6	0	0
5	C	10	0	6	1	0
6	A	5	0	5	0	0
7	A	194	0	0	3	0
7	B	140	0	0	4	0
7	C	252	0	0	4	0
7	D	213	0	0	5	0
All	All	10300	0	9604	97	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 5.

All (97) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:D:233[A]:MET:HE3	4:D:3004:NAD:H4N	1.32	1.08
1:D:154:LEU:HD22	1:D:233[A]:MET:HE2	1.34	1.06
1:A:118[B]:MET:CE	1:A:244:LEU:HD11	1.98	0.93
1:B:154:LEU:HB2	1:B:233[A]:MET:HE2	1.51	0.91
1:C:268[B]:THR:HG21	7:C:3569:HOH:O	1.69	0.90
1:D:268[A]:THR:HG22	7:D:3305:HOH:O	1.72	0.90
1:D:233[A]:MET:HE3	4:D:3004:NAD:C4N	2.00	0.90
1:A:118[B]:MET:HE2	1:A:244:LEU:HD11	1.52	0.89
1:D:268[A]:THR:HG21	7:D:3300:HOH:O	1.71	0.89
1:A:154:LEU:HB2	1:A:233[A]:MET:HE2	1.59	0.85
2:A:3104:MLT:H2	4:A:3003:NAD:C4N	2.07	0.85
2:C:3103:MLT:H2	4:C:3002:NAD:C4N	2.08	0.83
1:D:154:LEU:CD2	1:D:233[A]:MET:HE2	2.08	0.83
1:D:154:LEU:HD22	1:D:233[A]:MET:CE	2.08	0.83

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:D:154:LEU:HB2	1:D:233[A]:MET:HE2	1.64	0.79
1:B:90:MET:HE1	1:B:95:LEU:CD2	2.11	0.79
2:D:3101:MLT:H2	4:D:3004:NAD:C4N	2.14	0.78
1:B:202:GLN:HE21	1:B:206:THR:CG2	1.97	0.78
1:B:90:MET:HE1	1:B:95:LEU:HD23	1.67	0.77
1:D:154:LEU:HB2	1:D:233[A]:MET:CE	2.15	0.76
1:B:154:LEU:HB2	1:B:233[A]:MET:CE	2.17	0.74
2:B:3102:MLT:H2	4:B:3001:NAD:C4N	2.18	0.73
1:A:233[A]:MET:HE3	4:A:3003:NAD:H4N	1.68	0.73
3:D:3207:CL:CL	7:D:3416:HOH:O	2.48	0.69
1:A:118[B]:MET:HE3	1:A:244:LEU:HD11	1.77	0.67
1:A:118[B]:MET:CE	1:A:149:PHE:HE2	2.07	0.67
1:A:118[B]:MET:HE1	1:A:149:PHE:CE2	2.30	0.66
1:B:202:GLN:HE21	1:B:206:THR:HG23	1.61	0.65
1:A:118[B]:MET:HE2	1:A:280:GLY:HA2	1.80	0.63
1:D:154:LEU:CB	1:D:233[A]:MET:HE2	2.29	0.61
1:A:154:LEU:HB2	1:A:233[A]:MET:CE	2.28	0.61
1:B:268[A]:THR:HG23	1:B:269:TYR:CD2	2.35	0.61
1:A:154:LEU:HD22	1:A:233[A]:MET:CE	2.31	0.60
1:A:118[B]:MET:HE1	1:A:149:PHE:HE2	1.63	0.59
1:D:233[A]:MET:HE1	4:D:3004:NAD:O7N	2.02	0.59
1:A:118[B]:MET:CE	1:A:149:PHE:CE2	2.85	0.59
1:A:268[B]:THR:HG22	7:A:3326:HOH:O	2.04	0.57
1:B:90:MET:HE1	1:B:95:LEU:HD21	1.85	0.57
1:B:154:LEU:CB	1:B:233[A]:MET:CE	2.85	0.55
1:C:310:LYS:NZ	1:C:314:ASP:OD2	2.40	0.54
1:D:268[A]:THR:HG23	1:D:309:ILE:HG21	1.91	0.53
3:B:3206:CL:CL	7:B:3533:HOH:O	2.56	0.53
1:D:154:LEU:CB	1:D:233[A]:MET:CE	2.85	0.53
1:D:233[A]:MET:CE	4:D:3004:NAD:H4N	2.22	0.53
1:A:66:GLU:CD	1:A:66:GLU:H	2.12	0.53
1:B:268[A]:THR:HG23	1:B:269:TYR:HD2	1.76	0.51
1:A:154:LEU:CB	1:A:233[A]:MET:HE2	2.37	0.51
1:D:154:LEU:CD2	1:D:233[A]:MET:CE	2.79	0.50
1:A:154:LEU:HD22	1:A:233[A]:MET:HE2	1.93	0.50
1:A:18:ILE:HD11	4:A:3003:NAD:C6N	2.42	0.50
1:B:268[A]:THR:CG2	1:B:309:ILE:HG21	2.43	0.49
1:A:233[A]:MET:HE1	4:A:3003:NAD:O7N	2.13	0.48
1:A:118[B]:MET:CE	1:A:280:GLY:HA2	2.42	0.48
1:D:211[B]:ARG:NH2	7:D:3297:HOH:O	2.46	0.48
1:B:197:LYS:NZ	7:B:3520:HOH:O	2.47	0.48
1:A:233[A]:MET:HE3	4:A:3003:NAD:C4N	2.40	0.47

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:175[B]:ASN:ND2	7:C:3532:HOH:O	2.24	0.47
7:A:3442:HOH:O	4:D:3004:NAD:H8A	2.16	0.46
1:A:154:LEU:CB	1:A:233[A]:MET:CE	2.93	0.46
1:A:154:LEU:HD22	1:A:233[A]:MET:HE3	1.97	0.46
1:C:248:MET:HE2	7:C:3677:HOH:O	2.15	0.46
1:A:6:ASN:HA	1:A:33:SER:HB3	1.98	0.46
1:D:96:PHE:CG	1:D:311:LYS:HE3	2.51	0.45
1:B:12:LEU:O	1:B:81:PRO:HD2	2.15	0.45
1:A:118[B]:MET:HE3	1:A:149:PHE:HE2	1.80	0.45
1:C:175[B]:ASN:ND2	7:C:3622:HOH:O	2.36	0.45
1:C:202:GLN:O	1:C:206:THR:HG23	2.17	0.45
1:A:154:LEU:CD2	1:A:233[A]:MET:CE	2.95	0.45
1:B:122:ILE:O	4:B:3001:NAD:H2N	2.17	0.44
1:D:315:PHE:C	1:D:315:PHE:CD2	2.90	0.44
1:A:122:ILE:O	4:A:3003:NAD:H2N	2.17	0.44
1:B:154:LEU:CB	1:B:233[A]:MET:HE2	2.35	0.44
1:D:162:PHE:CE2	1:D:211[B]:ARG:HG2	2.53	0.43
1:D:135:GLU:OE1	7:D:3299:HOH:O	2.21	0.43
1:B:144:ASN:HA	1:B:145:PRO:HD2	1.89	0.43
1:D:18:ILE:HD11	4:D:3004:NAD:C6N	2.49	0.43
1:B:233[A]:MET:HE1	7:B:3404:HOH:O	2.18	0.43
1:B:233[A]:MET:HE3	4:B:3001:NAD:H4N	2.00	0.43
1:C:171:PRO:O	5:C:3501:HIS:HE1	2.02	0.42
1:B:163:VAL:HG22	1:B:208:LEU:HD21	2.02	0.42
1:C:122:ILE:O	4:C:3002:NAD:H2N	2.18	0.42
2:C:3103:MLT:H2	4:C:3002:NAD:C3N	2.50	0.42
1:B:268[A]:THR:HG22	7:B:3509:HOH:O	2.20	0.42
1:A:131:PRO:HG2	1:A:309:ILE:HA	2.01	0.42
7:A:3375:HOH:O	1:B:161:THR:HG23	2.19	0.42
1:A:41:ALA:HA	1:A:63:LEU:HD11	2.01	0.42
1:B:202:GLN:O	1:B:206:THR:HG23	2.20	0.41
1:B:90:MET:CE	1:B:95:LEU:CD2	2.90	0.41
1:B:154:LEU:HD22	1:B:233[A]:MET:CE	2.51	0.41
1:C:258:SER:O	1:C:271:SER:HA	2.21	0.41
1:C:220:VAL:HG22	1:C:228:SER:HB3	2.03	0.41
1:D:126:VAL:HA	1:D:129:THR:OG1	2.22	0.40
1:D:122:ILE:O	4:D:3004:NAD:H2N	2.21	0.40
1:D:179:ILE:HD13	1:D:190:LEU:HD11	2.03	0.40
1:B:258:SER:O	1:B:271:SER:HA	2.21	0.40
1:D:130:ILE:HA	1:D:130:ILE:HD13	1.98	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	317/342 (93%)	312 (98%)	5 (2%)	0	100	100
1	B	316/342 (92%)	309 (98%)	7 (2%)	0	100	100
1	C	319/342 (93%)	311 (98%)	8 (2%)	0	100	100
1	D	316/342 (92%)	309 (98%)	7 (2%)	0	100	100
All	All	1268/1368 (93%)	1241 (98%)	27 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution. The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	252/278 (91%)	248 (98%)	4 (2%)	75	70
1	B	246/278 (88%)	244 (99%)	2 (1%)	89	89
1	C	253/278 (91%)	250 (99%)	3 (1%)	82	80
1	D	249/278 (90%)	244 (98%)	5 (2%)	68	61
All	All	1000/1112 (90%)	986 (99%)	14 (1%)	82	75

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	43	THR
1	A	66	GLU
1	A	73	LYS
1	A	93	ASP
1	B	6	ASN

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Mol	Chain	Res	Type
1	B	43	THR
1	C	6	ASN
1	C	43	THR
1	C	173	ARG
1	D	43	THR
1	D	211[A]	ARG
1	D	211[B]	ARG
1	D	268[A]	THR
1	D	268[B]	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	146	ASN
1	A	249	ASN
1	B	6	ASN
1	B	202	GLN
1	B	249	ASN
1	C	6	ASN
1	C	249	ASN
1	D	146	ASN

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 19 ligands modelled in this entry, 7 are monoatomic - leaving 12 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$
4	NAD	A	3003	-	48,48,48	1.47	5 (10%)	73,73,73	1.82	11 (15%)
2	MLT	A	3104	-	8,8,8	1.54	1 (12%)	10,10,10	1.28	1 (10%)
5	HIS	A	3301	6	10,10,11	6.23	2 (20%)	10,12,14	1.26	1 (10%)
6	ALA	A	3302	5	4,4,5	9.60	2 (50%)	3,4,6	4.95	2 (66%)
4	NAD	B	3001	-	48,48,48	1.40	4 (8%)	73,73,73	1.96	11 (15%)
2	MLT	B	3102	-	8,8,8	1.48	1 (12%)	10,10,10	1.00	0
5	HIS	B	3401	-	10,10,11	5.89	2 (20%)	10,12,14	1.61	1 (10%)
4	NAD	C	3002	-	48,48,48	1.51	8 (16%)	73,73,73	2.19	18 (24%)
2	MLT	C	3103	-	8,8,8	1.55	2 (25%)	10,10,10	1.27	1 (10%)
5	HIS	C	3501	-	10,10,11	6.43	2 (20%)	10,12,14	0.70	1 (10%)
4	NAD	D	3004	-	48,48,48	1.37	5 (10%)	73,73,73	2.26	17 (23%)
2	MLT	D	3101	-	8,8,8	1.26	0	10,10,10	1.10	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	NAD	A	3003	-	-	0/30/62/62	0/3/5/5
2	MLT	A	3104	-	1/1/3/3	0/8/8/8	0/0/0/0
5	HIS	A	3301	6	-	0/4/6/8	0/1/1/1
6	ALA	A	3302	5	-	0/0/2/4	0/0/0/0
4	NAD	B	3001	-	-	0/30/62/62	0/3/5/5
2	MLT	B	3102	-	1/1/3/3	0/8/8/8	0/0/0/0
5	HIS	B	3401	-	-	0/4/6/8	0/1/1/1
4	NAD	C	3002	-	-	0/30/62/62	0/3/5/5
2	MLT	C	3103	-	1/1/3/3	0/8/8/8	0/0/0/0
5	HIS	C	3501	-	-	0/4/6/8	0/1/1/1
4	NAD	D	3004	-	-	0/30/62/62	0/3/5/5
2	MLT	D	3101	-	1/1/3/3	0/8/8/8	0/0/0/0

All (34) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	3501	HIS	O-C	19.96	1.25	1.11
5	A	3301	HIS	O-C	19.45	1.24	1.11
6	A	3302	ALA	O-C	18.94	1.24	1.11
5	B	3401	HIS	O-C	18.35	1.24	1.11
4	C	3002	NAD	O7N-C7N	6.75	1.40	1.24
4	B	3001	NAD	O7N-C7N	6.52	1.39	1.24
4	A	3003	NAD	O7N-C7N	6.43	1.39	1.24
4	D	3004	NAD	O7N-C7N	5.39	1.36	1.24
4	D	3004	NAD	C2A-N3A	3.56	1.39	1.32
2	A	3104	MLT	C2-C1	-3.53	1.46	1.52
4	A	3003	NAD	C2N-N1N	3.45	1.39	1.35
5	C	3501	HIS	CA-C	3.24	1.54	1.48
4	B	3001	NAD	C2A-N1A	3.23	1.40	1.33
6	A	3302	ALA	CA-C	3.08	1.54	1.48
2	C	3103	MLT	C2-C1	-3.05	1.47	1.52
2	B	3102	MLT	C2-C1	-3.03	1.47	1.52
4	C	3002	NAD	PN-O3	2.81	1.66	1.60
5	A	3301	HIS	CA-C	2.80	1.53	1.48
4	B	3001	NAD	C2A-N3A	2.75	1.37	1.32
4	A	3003	NAD	C2A-N1A	2.64	1.39	1.33
4	C	3002	NAD	C2A-N1A	2.63	1.39	1.33
4	B	3001	NAD	C2N-N1N	2.62	1.38	1.35
4	C	3002	NAD	C4N-C3N	2.61	1.43	1.39
4	A	3003	NAD	C2A-N3A	2.58	1.37	1.32
4	C	3002	NAD	C4A-N9A	-2.56	1.34	1.37
4	C	3002	NAD	C2A-N3A	2.44	1.37	1.32
5	B	3401	HIS	CA-C	2.42	1.52	1.48
4	C	3002	NAD	PA-O3	2.21	1.63	1.59
4	D	3004	NAD	C8A-N7A	2.21	1.39	1.34
4	D	3004	NAD	C8A-N9A	2.10	1.39	1.36
2	C	3103	MLT	C3-C2	2.06	1.56	1.52
4	D	3004	NAD	PN-O3	2.03	1.64	1.60
4	A	3003	NAD	O4B-C4B	-2.03	1.40	1.45
4	C	3002	NAD	O4D-C1D	2.01	1.44	1.41

All (64) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	3002	NAD	N3A-C2A-N1A	-12.35	118.38	128.71
4	D	3004	NAD	N3A-C2A-N1A	-11.88	118.78	128.71
4	B	3001	NAD	N3A-C2A-N1A	-10.45	119.97	128.71
4	A	3003	NAD	N3A-C2A-N1A	-9.57	120.71	128.71

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	3302	ALA	C-CA-N	-7.85	112.38	113.27
4	D	3004	NAD	O4B-C1B-N9A	5.47	113.53	108.44
4	A	3003	NAD	O4B-C1B-N9A	5.35	113.42	108.44
4	D	3004	NAD	C3N-C7N-N7N	5.28	123.78	117.77
5	B	3401	HIS	C-CA-N	-5.00	108.83	113.83
4	C	3002	NAD	O4B-C1B-N9A	4.94	113.04	108.44
4	B	3001	NAD	C4B-O4B-C1B	-4.91	104.41	109.75
4	D	3004	NAD	O4D-C1D-N1N	4.72	112.78	107.95
4	C	3002	NAD	C4B-O4B-C1B	-4.57	104.78	109.75
4	B	3001	NAD	O4B-C1B-N9A	4.51	112.64	108.44
4	B	3001	NAD	O2N-PN-O1N	4.31	131.71	118.72
4	D	3004	NAD	O7N-C7N-C3N	-4.21	114.84	119.58
4	C	3002	NAD	C8A-N9A-C4A	4.17	110.08	106.90
5	A	3301	HIS	C-CA-N	-3.90	109.93	113.83
4	A	3003	NAD	C4A-C5A-N7A	-3.73	106.33	109.52
4	B	3001	NAD	N3A-C4A-N9A	3.69	132.09	125.43
4	C	3002	NAD	N3A-C4A-N9A	3.57	131.88	125.43
4	D	3004	NAD	N3A-C4A-N9A	3.57	131.88	125.43
4	C	3002	NAD	O7N-C7N-C3N	-3.57	115.56	119.58
6	A	3302	ALA	CB-CA-C	3.41	109.98	108.46
4	A	3003	NAD	N3A-C4A-N9A	3.36	131.51	125.43
4	D	3004	NAD	O2N-PN-O1N	3.33	128.78	118.72
4	B	3001	NAD	O7N-C7N-C3N	-2.95	116.26	119.58
4	C	3002	NAD	O2N-PN-O1N	2.93	127.56	118.72
4	A	3003	NAD	N7A-C8A-N9A	-2.85	106.29	114.36
4	D	3004	NAD	O4B-C1B-C2B	-2.78	102.51	106.77
4	D	3004	NAD	N7A-C8A-N9A	-2.78	106.51	114.36
4	C	3002	NAD	C3N-C7N-N7N	2.76	120.92	117.77
4	A	3003	NAD	C3N-C7N-N7N	2.76	120.91	117.77
2	C	3103	MLT	O3-C2-C3	2.62	116.30	109.86
4	C	3002	NAD	N7A-C8A-N9A	-2.57	107.09	114.36
4	B	3001	NAD	C8A-N9A-C4A	2.56	108.86	106.90
4	D	3004	NAD	C5A-C4A-N3A	-2.56	120.13	125.70
4	B	3001	NAD	O4B-C4B-C3B	2.53	110.30	105.17
4	D	3004	NAD	C2A-N3A-C4A	2.49	121.09	114.01
4	B	3001	NAD	N7A-C8A-N9A	-2.49	107.33	114.36
4	C	3002	NAD	O4D-C1D-C2D	-2.48	102.97	106.77
2	A	3104	MLT	O2-C1-C2	2.45	119.79	113.19
4	A	3003	NAD	C8A-N7A-C5A	2.41	111.06	103.58
4	A	3003	NAD	C4B-O4B-C1B	-2.41	107.13	109.75
4	C	3002	NAD	PN-O3-PA	-2.37	122.78	132.95
4	C	3002	NAD	O5D-PN-O1N	-2.35	98.65	108.61

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	3003	NAD	C5A-C4A-N3A	-2.30	120.69	125.70
4	C	3002	NAD	O4B-C4B-C3B	2.26	109.74	105.17
4	A	3003	NAD	O7N-C7N-C3N	-2.24	117.05	119.58
4	D	3004	NAD	O4D-C1D-C2D	-2.24	103.33	106.77
4	D	3004	NAD	C1B-N9A-C4A	-2.24	122.76	126.64
4	C	3002	NAD	C4A-C5A-N7A	-2.23	107.61	109.52
4	D	3004	NAD	O2N-PN-O5D	-2.23	98.98	108.19
4	C	3002	NAD	C2A-N3A-C4A	2.23	120.35	114.01
4	C	3002	NAD	C2N-C3N-C4N	2.22	120.83	118.31
4	B	3001	NAD	O4D-C1D-N1N	2.20	110.20	107.95
4	D	3004	NAD	C6N-N1N-C2N	-2.15	119.61	122.04
4	A	3003	NAD	C8A-N9A-C4A	2.11	108.51	106.90
4	D	3004	NAD	O3-PA-O5B	2.09	112.73	103.41
4	C	3002	NAD	C2A-N1A-C6A	2.03	122.44	118.77
5	C	3501	HIS	C-CA-N	-2.03	111.80	113.83
4	C	3002	NAD	C1B-N9A-C4A	-2.03	123.14	126.64
4	D	3004	NAD	C4B-O4B-C1B	-2.01	107.56	109.75
4	B	3001	NAD	C5A-C4A-N3A	-2.01	121.33	125.70

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	3104	MLT	C2
2	B	3102	MLT	C2
2	C	3103	MLT	C2
2	D	3101	MLT	C2

There are no torsion outliers.

There are no ring outliers.

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, 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	314/342 (91%)	-0.35	1 (0%) 91 93	28, 32, 38, 49	0
1	B	314/342 (91%)	-0.09	2 (0%) 86 88	28, 33, 37, 46	0
1	C	314/342 (91%)	-0.35	0 100 100	29, 32, 38, 49	0
1	D	314/342 (91%)	-0.10	0 100 100	28, 32, 38, 49	0
All	All	1256/1368 (91%)	-0.22	3 (0%) 91 94	28, 32, 38, 49	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	287	ILE	2.9
1	B	281	ILE	2.7
1	A	319	LEU	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 ⓘ

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	RSR	LLDF	B-factors(\AA^2)	Q<0.9
6	ALA	A	3302	5/6	0.20	28.03	53,53,54,55	0
5	HIS	C	3501	10/11	0.23	5.38	40,47,51,52	0
5	HIS	B	3401	10/11	0.17	2.29	49,52,57,58	0
3	CL	C	3204	1/1	0.18	2.11	69,69,69,69	0
5	HIS	A	3301	10/11	0.16	2.10	45,49,53,53	0
2	MLT	B	3102	9/9	0.09	0.59	32,36,38,38	0
4	NAD	B	3001	44/44	0.09	0.40	23,28,30,32	0
4	NAD	A	3003	44/44	0.09	0.22	20,26,29,29	0
3	CL	A	3205	1/1	0.08	-0.34	86,86,86,86	0
4	NAD	C	3002	44/44	0.09	-0.54	17,22,24,26	0
3	CL	A	3203	1/1	0.07	-0.57	36,36,36,36	0
4	NAD	D	3004	44/44	0.09	-0.88	21,24,30,31	0
3	CL	C	3201	1/1	0.06	-0.94	28,28,28,28	0
3	CL	D	3207	1/1	0.07	-1.50	77,77,77,77	0
2	MLT	A	3104	9/9	0.07	-1.66	28,31,32,33	0
2	MLT	C	3103	9/9	0.07	-1.68	20,24,26,27	0
3	CL	B	3206	1/1	0.07	-2.14	76,76,76,76	0
3	CL	D	3202	1/1	0.04	-2.33	38,38,38,38	0
2	MLT	D	3101	9/9	0.06	-2.38	25,29,32,33	0

6.5 Other polymers ⓘ

There are no such residues in this entry.