



Full wwPDB X-ray Structure Validation Report

Feb 26, 2014 – 04:27 PM GMT

PDB ID : 2O2R
Title : Crystal structure of the C-terminal domain of rat 10'formyltetrahydrofolate dehydrogenase in complex with NADPH
Authors : Tsybovsky, Y.; Donato, H.; Krupenko, N.I.; Davies, C.; Krupenko, S.A.
Deposited on : 2006-11-30
Resolution : 2.20 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>

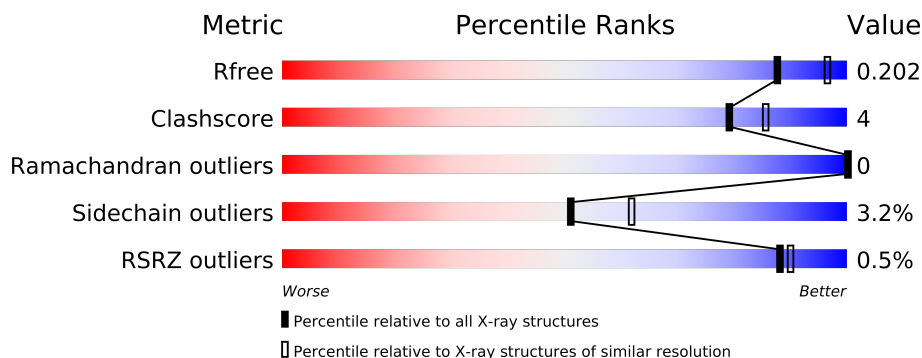
The following versions of software and data (see [references](#)) were used in the production of this report:

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 2.20 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	2938 (2.20-2.20)
Clashscore	79885	3751 (2.20-2.20)
Ramachandran outliers	78287	3681 (2.20-2.20)
Sidechain outliers	78261	3682 (2.20-2.20)
RSRZ outliers	66119	2939 (2.20-2.20)

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	517	
1	B	517	
1	C	517	
1	D	517	

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

Mol	Type	Chain	Res	Geometry	Electron density
2	SO4	A	2002	-	X
2	SO4	A	2011	-	X
2	SO4	A	2015	-	X
2	SO4	A	2019	-	X

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Mol	Type	Chain	Res	Geometry	Electron density
2	SO4	B	2005	-	X
2	SO4	B	2009	-	X
2	SO4	C	2007	-	X
2	SO4	C	2010	-	X
2	SO4	C	2013	-	X
2	SO4	C	2018	-	X
2	SO4	D	2012	-	X
4	GOL	A	3001	-	X
4	GOL	B	3002	-	X
4	GOL	C	3003	-	X
4	GOL	D	3004	-	X

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 16615 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 Formyltetrahydrofolatedehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	498	Total	C	N	O	S	0	15	0
			3902	2478	672	731	21			
1	B	498	Total	C	N	O	S	0	16	0
			3897	2473	672	731	21			
1	C	498	Total	C	N	O	S	0	13	0
			3884	2466	672	725	21			
1	D	498	Total	C	N	O	S	0	15	0
			3894	2472	669	732	21			

There are 44 discrepancies between the modelled and reference sequences:

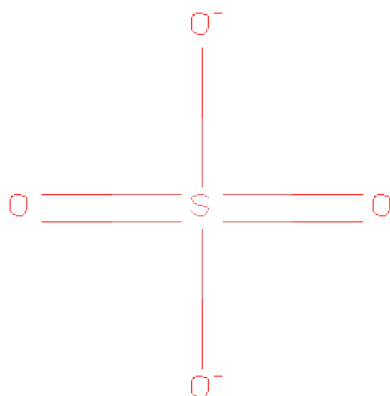
Chain	Residue	Modelled	Actual	Comment	Reference
A	386	MET	-	INITIATING METHIONINE	UNP Q5HQB2
A	387	ARG	-	CLONING ARTIFACT	UNP Q5HQB2
A	388	GLY	-	CLONING ARTIFACT	UNP Q5HQB2
A	389	SER	-	CLONING ARTIFACT	UNP Q5HQB2
A	390	HIS	-	EXPRESSION TAG	UNP Q5HQB2
A	391	HIS	-	EXPRESSION TAG	UNP Q5HQB2
A	392	HIS	-	EXPRESSION TAG	UNP Q5HQB2
A	393	HIS	-	EXPRESSION TAG	UNP Q5HQB2
A	394	HIS	-	EXPRESSION TAG	UNP Q5HQB2
A	395	THR	-	CLONING ARTIFACT	UNP Q5HQB2
A	396	THR	-	CLONING ARTIFACT	UNP Q5HQB2
B	386	MET	-	INITIATING METHIONINE	UNP Q5HQB2
B	387	ARG	-	CLONING ARTIFACT	UNP Q5HQB2
B	388	GLY	-	CLONING ARTIFACT	UNP Q5HQB2
B	389	SER	-	CLONING ARTIFACT	UNP Q5HQB2
B	390	HIS	-	EXPRESSION TAG	UNP Q5HQB2
B	391	HIS	-	EXPRESSION TAG	UNP Q5HQB2
B	392	HIS	-	EXPRESSION TAG	UNP Q5HQB2
B	393	HIS	-	EXPRESSION TAG	UNP Q5HQB2
B	394	HIS	-	EXPRESSION TAG	UNP Q5HQB2
B	395	THR	-	CLONING ARTIFACT	UNP Q5HQB2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	396	THR	-	CLONING ARTIFACT	UNP Q5HQB2
C	386	MET	-	INITIATING METHIONINE	UNP Q5HQB2
C	387	ARG	-	CLONING ARTIFACT	UNP Q5HQB2
C	388	GLY	-	CLONING ARTIFACT	UNP Q5HQB2
C	389	SER	-	CLONING ARTIFACT	UNP Q5HQB2
C	390	HIS	-	EXPRESSION TAG	UNP Q5HQB2
C	391	HIS	-	EXPRESSION TAG	UNP Q5HQB2
C	392	HIS	-	EXPRESSION TAG	UNP Q5HQB2
C	393	HIS	-	EXPRESSION TAG	UNP Q5HQB2
C	394	HIS	-	EXPRESSION TAG	UNP Q5HQB2
C	395	THR	-	CLONING ARTIFACT	UNP Q5HQB2
C	396	THR	-	CLONING ARTIFACT	UNP Q5HQB2
D	386	MET	-	INITIATING METHIONINE	UNP Q5HQB2
D	387	ARG	-	CLONING ARTIFACT	UNP Q5HQB2
D	388	GLY	-	CLONING ARTIFACT	UNP Q5HQB2
D	389	SER	-	CLONING ARTIFACT	UNP Q5HQB2
D	390	HIS	-	EXPRESSION TAG	UNP Q5HQB2
D	391	HIS	-	EXPRESSION TAG	UNP Q5HQB2
D	392	HIS	-	EXPRESSION TAG	UNP Q5HQB2
D	393	HIS	-	EXPRESSION TAG	UNP Q5HQB2
D	394	HIS	-	EXPRESSION TAG	UNP Q5HQB2
D	395	THR	-	CLONING ARTIFACT	UNP Q5HQB2
D	396	THR	-	CLONING ARTIFACT	UNP Q5HQB2

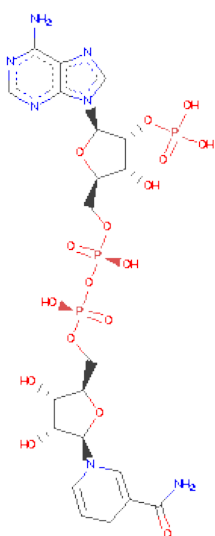
- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

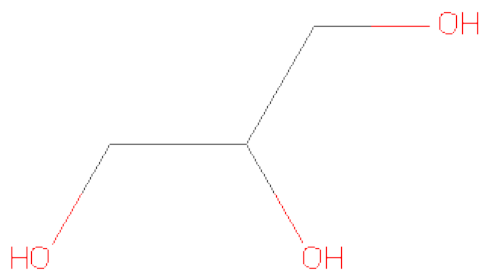
- Molecule 3 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDEPHOS-

PHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	B	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	C	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
3	D	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

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



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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	173	Total 173	O 173	0	2
5	B	173	Total 173	O 173	0	2
5	C	229	Total 229	O 229	0	4
5	D	210	Total 210	O 210	0	3

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	258.70Å 194.30Å 97.10Å 90.00° 108.90° 90.00°	Depositor
Resolution (Å)	50.00 – 2.20 49.85 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.2 (50.00-2.20) 99.2 (49.85-2.20)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.10	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.66 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.180 , 0.202 0.181 , 0.202	Depositor DCC
R_{free} test set	11302 reflections (5.24%)	DCC
Wilson B-factor (Å ²)	24.5	Xtriage
Anisotropy	0.290	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 31.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	0 of 226790 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	16615	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.77% 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: GOL, SO4, NDP

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	0.59	0/4041	0.65	2/5463 (0.0%)
1	B	0.59	0/4050	0.63	0/5475
1	C	0.65	0/4023	0.67	1/5439 (0.0%)
1	D	0.60	0/4039	0.65	0/5461
All	All	0.61	0/16153	0.65	3/21838 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	741[A]	GLU	OE1-CD-OE2	-5.43	116.78	123.30
1	A	741[B]	GLU	OE1-CD-OE2	-5.43	116.78	123.30
1	C	485	ARG	NE-CZ-NH2	-5.38	117.61	120.30

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	3902	0	3927	30	0
1	B	3897	0	3914	29	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	3884	0	3905	33	0
1	D	3894	0	3906	29	0
2	A	25	0	0	0	0
2	B	25	0	0	0	0
2	C	30	0	0	0	0
2	D	25	0	0	0	0
3	A	31	0	11	0	0
3	B	31	0	11	0	0
3	C	31	0	11	0	0
3	D	31	0	11	1	0
4	A	6	0	8	0	0
4	B	6	0	8	2	0
4	C	6	0	8	0	0
4	D	6	0	8	0	0
5	A	173	0	0	3	0
5	B	173	0	0	3	0
5	C	229	0	0	1	0
5	D	210	0	0	2	0
All	All	16615	0	15728	111	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 4.

All (111) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:841[B]:ARG:HH11	1:C:841[B]:ARG:HG2	1.14	1.11
1:D:725[A]:GLN:NE2	1:D:729:GLU:OE2	1.84	1.10
1:B:841[B]:ARG:HH11	1:B:841[B]:ARG:HG2	1.02	1.08
1:A:725[A]:GLN:NE2	1:A:729:GLU:OE2	1.88	1.06
1:C:692:VAL:O	1:C:696:MET:HG3	1.64	0.97
1:B:841[B]:ARG:NH1	1:B:841[B]:ARG:HG2	1.82	0.90
1:A:569:ILE:HD12	1:A:594:VAL:HG21	1.55	0.86
1:A:725[A]:GLN:HE21	1:A:729:GLU:CD	1.82	0.83
1:C:610:ALA:HB2	1:C:625:ILE:HD12	1.67	0.76
1:A:491[B]:ARG:HH12	1:A:498:GLN:HE22	1.32	0.75
1:D:487:ARG:HG2	1:D:487:ARG:HH11	1.49	0.75
1:A:725[A]:GLN:NE2	1:A:729:GLU:CD	2.38	0.74
1:B:569:ILE:HD12	1:B:594:VAL:HG21	1.70	0.74
1:C:725[A]:GLN:OE1	1:C:729:GLU:OE2	2.07	0.73
1:D:428:GLY:HA3	1:D:620:LYS:HD2	1.69	0.72
1:C:799:TYR:CE2	1:C:803[A]:GLU:HG3	2.24	0.71
1:C:841[B]:ARG:HG2	1:C:841[B]:ARG:NH1	1.93	0.71

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:738:ASN:HB3	1:A:741[A]:GLU:HG3	1.73	0.70
1:A:491[A]:ARG:NH2	5:A:3169:HOH:O	2.24	0.69
1:C:648:PHE:CD1	1:C:658:ILE:HD12	2.25	0.69
1:D:491[B]:ARG:HH12	1:D:498:GLN:HE22	1.42	0.68
1:D:771:THR:CG2	1:D:793:ASP:OD1	2.42	0.67
1:A:491[B]:ARG:HH12	1:A:498:GLN:NE2	1.92	0.66
1:C:776:GLY:O	5:C:3227:HOH:O	2.14	0.65
1:D:692:VAL:O	1:D:696:MET:HG2	1.97	0.64
1:B:414:ASN:OD1	1:B:742:ARG:NH2	2.33	0.60
1:C:569:ILE:HD12	1:C:594:VAL:HG21	1.84	0.58
1:A:487:ARG:NH1	1:C:490[B]:TYR:OH	2.37	0.58
1:C:696:MET:HE1	1:C:731:VAL:HG23	1.86	0.58
1:C:696:MET:HE3	1:C:700:PHE:HE2	1.70	0.56
1:D:771:THR:HG21	1:D:793:ASP:OD1	2.04	0.56
1:B:687:ASP:HB3	1:B:690:LYS:HD3	1.87	0.55
1:D:771:THR:HG23	1:D:793:ASP:OD1	2.06	0.55
1:D:781[B]:ARG:HD2	1:D:785:PHE:CD2	2.42	0.55
1:D:560[B]:LYS:HE3	1:D:562:GLU:HG2	1.89	0.54
1:C:648:PHE:CD1	1:C:658:ILE:CD1	2.91	0.53
1:C:632:LEU:C	1:C:632:LEU:HD23	2.28	0.53
1:D:658:ILE:HD11	3:D:903:NDP:C2A	2.39	0.53
1:D:794:VAL:HG21	1:D:811:ILE:HG23	1.91	0.53
1:D:901:GLU:OE2	5:D:3206:HOH:O	2.19	0.53
1:A:517:LEU:CD2	1:A:522:HIS:CE1	2.92	0.52
1:D:708:ILE:CG2	1:D:872:PHE:HE1	2.22	0.52
1:A:632:LEU:C	1:A:632:LEU:HD23	2.30	0.52
1:A:539:LYS:HD3	1:C:536:TRP:CE2	2.45	0.51
1:C:819:ASP:C	1:C:819:ASP:OD2	2.48	0.51
1:C:643:VAL:O	1:C:668:LYS:HE3	2.10	0.51
1:B:461:VAL:HG22	1:B:633:VAL:HG13	1.92	0.51
1:A:850:SER:HB3	1:A:858:VAL:HG11	1.92	0.51
1:D:414:ASN:OD1	1:D:742:ARG:NH2	2.40	0.49
1:D:708:ILE:CG2	1:D:872:PHE:CE1	2.95	0.49
1:A:693[B]:GLN:NE2	5:A:3148:HOH:O	2.46	0.49
1:D:424:LEU:O	1:D:430:PHE:HA	2.12	0.48
5:B:3056:HOH:O	1:D:483:ARG:HD3	2.12	0.48
1:B:491[B]:ARG:HH12	1:B:498:GLN:HE22	1.63	0.47
1:D:569:ILE:HD12	1:D:594:VAL:HG21	1.97	0.47
1:B:738:ASN:HB3	1:B:741[A]:GLU:HG3	1.96	0.47
1:A:720:HIS:CD2	1:A:814:ARG:HG2	2.49	0.47
1:A:702:ASN:O	1:A:703:LYS:HG2	2.15	0.47
1:D:487:ARG:HH11	1:D:487:ARG:CG	2.24	0.47

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:490[A]:TYR:OH	1:D:487:ARG:NH1	2.48	0.46
1:C:424:LEU:O	1:C:430:PHE:HA	2.16	0.46
1:C:441:THR:HG23	1:C:450:ILE:HB	1.97	0.46
1:D:632:LEU:HD23	1:D:632:LEU:C	2.36	0.46
1:A:529:THR:HG21	1:A:582:TRP:HA	1.97	0.46
1:D:597:LYS:HG2	1:D:633:VAL:HG11	1.98	0.46
1:B:484:ASP:OD2	5:B:3168:HOH:O	2.21	0.45
1:C:660:LYS:HG3	1:D:660:LYS:HG3	1.97	0.45
1:D:620:LYS:HG2	5:D:3126:HOH:O	2.17	0.45
1:A:844:ASN:HD22	1:D:841[B]:ARG:HH21	1.64	0.45
1:A:824:LEU:HD21	1:A:849:VAL:HG13	1.98	0.45
1:B:794:VAL:HG21	1:B:811:ILE:HG23	1.98	0.44
1:B:841[B]:ARG:HH12	1:C:844:ASN:ND2	2.16	0.44
1:A:441:THR:HG23	1:A:450:ILE:HB	1.99	0.44
1:D:597:LYS:HG2	1:D:633:VAL:CG1	2.48	0.44
1:B:411:LYS:HG2	1:B:413:VAL:HG22	2.00	0.44
1:B:706:ASN:HD21	4:B:3002:GOL:H12	1.82	0.43
1:C:692:VAL:O	1:C:696:MET:CG	2.52	0.43
1:A:779:VAL:HG12	1:A:781[B]:ARG:HG2	2.01	0.43
1:C:620:LYS:HG2	1:C:620:LYS:O	2.19	0.43
1:B:648:PHE:CD1	1:B:658:ILE:CD1	3.02	0.43
1:B:648:PHE:CD1	1:B:658:ILE:HD12	2.54	0.43
1:B:465:VAL:HG11	1:B:640:HIS:CE1	2.54	0.43
1:A:536:TRP:CE2	1:C:539:LYS:HD3	2.54	0.43
5:A:3055:HOH:O	1:C:483:ARG:HD3	2.19	0.42
1:B:708:ILE:CG2	1:B:872:PHE:CE1	3.02	0.42
1:D:738:ASN:HB3	1:D:741[A]:GLU:HG3	2.02	0.42
1:B:850:SER:HB3	1:B:858:VAL:HG11	2.01	0.42
1:C:664:LEU:HD21	1:D:660:LYS:HD3	2.01	0.42
1:C:696:MET:CE	1:C:700:PHE:HE2	2.31	0.42
1:C:485:ARG:HD3	1:C:588:LEU:O	2.19	0.42
1:A:676:GLY:HA2	1:A:832:PHE:CG	2.55	0.42
1:B:756[B]:ARG:HD3	5:B:3099:HOH:O	2.20	0.41
1:A:862:THR:HB	1:B:901:GLU:HB2	2.02	0.41
1:A:758:LEU:HD21	1:A:807:GLY:HA3	2.02	0.41
1:B:866:THR:HG21	4:B:3002:GOL:H11	2.02	0.41
1:A:758:LEU:CD2	1:A:807:GLY:HA3	2.51	0.41
1:C:572:PRO:HG3	1:C:649:THR:HG22	2.03	0.41
1:B:441:THR:HG23	1:B:450:ILE:HB	2.03	0.41
1:C:693[A]:GLN:HE21	1:C:693[A]:GLN:HB3	1.65	0.41
1:C:696:MET:CE	1:C:700:PHE:CE2	3.04	0.41
1:A:569:ILE:CD1	1:A:594:VAL:HG21	2.38	0.40

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:645:LYS:HE3	1:A:892:TYR:CE1	2.56	0.40
1:C:597:LYS:HG2	1:C:633:VAL:HG11	2.03	0.40
1:B:632:LEU:C	1:B:632:LEU:HD23	2.42	0.40
1:A:901:GLU:HB2	1:B:862:THR:HB	2.04	0.40
1:B:643:VAL:O	1:B:668:LYS:HE3	2.21	0.40
1:B:491[B]:ARG:NH1	1:B:498:GLN:HE22	2.19	0.40
1:A:643:VAL:O	1:A:668:LYS:HE3	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	511/517 (99%)	498 (98%)	13 (2%)	0	100	100
1	B	512/517 (99%)	495 (97%)	17 (3%)	0	100	100
1	C	509/517 (98%)	493 (97%)	16 (3%)	0	100	100
1	D	511/517 (99%)	496 (97%)	15 (3%)	0	100	100
All	All	2043/2068 (99%)	1982 (97%)	61 (3%)	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	424/426 (100%)	411 (97%)	13 (3%)	52	63
1	B	425/426 (100%)	408 (96%)	17 (4%)	42	51

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	422/426 (99%)	406 (96%)	16 (4%)	44	53
1	D	424/426 (100%)	409 (96%)	15 (4%)	48	57
All	All	1695/1704 (100%)	1634 (96%)	61 (4%)	51	56

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	437	LYS
1	A	491[A]	ARG
1	A	491[B]	ARG
1	A	507	GLU
1	A	547	ILE
1	A	597	LYS
1	A	625	ILE
1	A	703	LYS
1	A	735	LYS
1	A	745	ASN
1	A	803[A]	GLU
1	A	803[B]	GLU
1	A	806	PHE
1	B	413	VAL
1	B	507	GLU
1	B	517	LEU
1	B	547	ILE
1	B	597	LYS
1	B	690	LYS
1	B	703	LYS
1	B	717	GLU
1	B	725[A]	GLN
1	B	725[B]	GLN
1	B	743[A]	ASP
1	B	743[B]	ASP
1	B	781[A]	ARG
1	B	781[B]	ARG
1	B	806	PHE
1	B	819	ASP
1	B	845	LYS
1	C	507	GLU
1	C	517	LEU
1	C	547	ILE
1	C	551	ARG

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Mol	Chain	Res	Type
1	C	597	LYS
1	C	620	LYS
1	C	667	VAL
1	C	673	GLU
1	C	693[A]	GLN
1	C	693[B]	GLN
1	C	703	LYS
1	C	717	GLU
1	C	725[A]	GLN
1	C	725[B]	GLN
1	C	806	PHE
1	C	819	ASP
1	D	415	LYS
1	D	418	LEU
1	D	487	ARG
1	D	507	GLU
1	D	547	ILE
1	D	597	LYS
1	D	625	ILE
1	D	667	VAL
1	D	673	GLU
1	D	703	LYS
1	D	745	ASN
1	D	771	THR
1	D	803[A]	GLU
1	D	803[B]	GLU
1	D	806	PHE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	498	GLN
1	A	706	ASN
1	A	745	ASN
1	A	750	ASN
1	B	498	GLN
1	B	706	ASN
1	B	750	ASN
1	C	498	GLN
1	C	541	GLN
1	C	706	ASN
1	C	797	HIS

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Mol	Chain	Res	Type
1	D	498	GLN
1	D	706	ASN
1	D	745	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 ⓘ

29 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	SO4	A	2002	-	4,4,4	0.27	0	6,6,6	0.13	0
2	SO4	A	2006	-	4,4,4	0.15	0	6,6,6	0.64	0
2	SO4	A	2011	-	4,4,4	0.13	0	6,6,6	0.17	0
2	SO4	A	2015	-	4,4,4	0.17	0	6,6,6	0.54	0
2	SO4	A	2019	-	4,4,4	0.14	0	6,6,6	0.11	0
4	GOL	A	3001	-	5,5,5	0.30	0	5,5,5	0.41	0
3	NDP	A	903	-	33,33,52	1.18	3 (9%)	52,52,80	2.13	11 (21%)
2	SO4	B	2003	-	4,4,4	0.29	0	6,6,6	0.13	0
2	SO4	B	2005	-	4,4,4	0.08	0	6,6,6	0.17	0
2	SO4	B	2009	-	4,4,4	0.15	0	6,6,6	0.17	0
2	SO4	B	2014	-	4,4,4	0.24	0	6,6,6	0.55	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	SO4	B	2020	-	4,4,4	0.22	0	6,6,6	0.15	0
4	GOL	B	3002	-	5,5,5	0.36	0	5,5,5	0.35	0
3	NDP	B	903	-	33,33,52	1.15	3 (9%)	52,52,80	2.13	9 (17%)
2	SO4	C	2001	-	4,4,4	0.18	0	6,6,6	0.13	0
2	SO4	C	2007	-	4,4,4	0.10	0	6,6,6	0.45	0
2	SO4	C	2010	-	4,4,4	0.09	0	6,6,6	0.11	0
2	SO4	C	2013	-	4,4,4	0.39	0	6,6,6	0.41	0
2	SO4	C	2017	-	4,4,4	0.35	0	6,6,6	0.27	0
2	SO4	C	2018	-	4,4,4	0.11	0	6,6,6	0.20	0
4	GOL	C	3003	-	5,5,5	0.34	0	5,5,5	0.35	0
3	NDP	C	903	-	33,33,52	1.19	3 (9%)	52,52,80	2.04	8 (15%)
2	SO4	D	2004	-	4,4,4	0.09	0	6,6,6	0.17	0
2	SO4	D	2008	-	4,4,4	0.13	0	6,6,6	0.66	0
2	SO4	D	2012	-	4,4,4	0.12	0	6,6,6	0.09	0
2	SO4	D	2016	-	4,4,4	0.30	0	6,6,6	0.60	0
2	SO4	D	2021	-	4,4,4	0.17	0	6,6,6	0.11	0
4	GOL	D	3004	-	5,5,5	0.33	0	5,5,5	0.38	0
3	NDP	D	903	-	33,33,52	1.15	2 (6%)	52,52,80	2.14	10 (19%)

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	SO4	A	2002	-	-	0/0/0/0	0/0/0/0
2	SO4	A	2006	-	-	0/0/0/0	0/0/0/0
2	SO4	A	2011	-	-	0/0/0/0	0/0/0/0
2	SO4	A	2015	-	-	0/0/0/0	0/0/0/0
2	SO4	A	2019	-	-	0/0/0/0	0/0/0/0
4	GOL	A	3001	-	-	0/4/4/4	0/0/0/0
3	NDP	A	903	-	-	0/21/37/77	0/1/3/5
2	SO4	B	2003	-	-	0/0/0/0	0/0/0/0
2	SO4	B	2005	-	-	0/0/0/0	0/0/0/0
2	SO4	B	2009	-	-	0/0/0/0	0/0/0/0
2	SO4	B	2014	-	-	0/0/0/0	0/0/0/0
2	SO4	B	2020	-	-	0/0/0/0	0/0/0/0
4	GOL	B	3002	-	-	0/4/4/4	0/0/0/0
3	NDP	B	903	-	-	0/21/37/77	0/1/3/5
2	SO4	C	2001	-	-	0/0/0/0	0/0/0/0
2	SO4	C	2007	-	-	0/0/0/0	0/0/0/0
2	SO4	C	2010	-	-	0/0/0/0	0/0/0/0

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	SO4	C	2013	-	-	0/0/0/0	0/0/0/0
2	SO4	C	2017	-	-	0/0/0/0	0/0/0/0
2	SO4	C	2018	-	-	0/0/0/0	0/0/0/0
4	GOL	C	3003	-	-	0/4/4/4	0/0/0/0
3	NDP	C	903	-	-	0/21/37/77	0/1/3/5
2	SO4	D	2004	-	-	0/0/0/0	0/0/0/0
2	SO4	D	2008	-	-	0/0/0/0	0/0/0/0
2	SO4	D	2012	-	-	0/0/0/0	0/0/0/0
2	SO4	D	2016	-	-	0/0/0/0	0/0/0/0
2	SO4	D	2021	-	-	0/0/0/0	0/0/0/0
4	GOL	D	3004	-	-	0/4/4/4	0/0/0/0
3	NDP	D	903	-	-	0/21/37/77	0/1/3/5

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	903	NDP	PN-O5D	3.71	1.63	1.50
3	A	903	NDP	PN-O5D	3.67	1.63	1.50
3	D	903	NDP	PN-O5D	3.67	1.63	1.50
3	B	903	NDP	PN-O5D	3.32	1.61	1.50
3	A	903	NDP	C2A-N3A	3.14	1.38	1.32
3	B	903	NDP	C2A-N3A	3.10	1.38	1.32
3	C	903	NDP	C2A-N3A	2.99	1.38	1.32
3	D	903	NDP	C2A-N3A	2.68	1.37	1.32
3	A	903	NDP	C2A-N1A	2.36	1.38	1.33
3	B	903	NDP	C2A-N1A	2.34	1.38	1.33
3	C	903	NDP	C2A-N1A	2.11	1.38	1.33

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	903	NDP	N3A-C2A-N1A	-10.71	119.76	128.71
3	B	903	NDP	N3A-C2A-N1A	-9.95	120.39	128.71
3	A	903	NDP	N3A-C2A-N1A	-9.63	120.66	128.71
3	C	903	NDP	N3A-C2A-N1A	-8.88	121.29	128.71
3	B	903	NDP	O4B-C1B-N9A	7.24	115.17	108.44
3	A	903	NDP	O4B-C1B-C2B	-5.45	101.86	106.95
3	C	903	NDP	O4B-C1B-N9A	5.38	113.45	108.44
3	A	903	NDP	O4B-C1B-N9A	5.38	113.44	108.44
3	C	903	NDP	O4B-C1B-C2B	-5.31	101.98	106.95
3	D	903	NDP	O4B-C1B-C2B	-4.89	102.37	106.95
3	D	903	NDP	O4B-C1B-N9A	4.63	112.75	108.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	903	NDP	O5D-PN-O3	-3.76	95.04	106.65
3	B	903	NDP	O2N-PN-O1N	3.61	123.89	110.82
3	C	903	NDP	O5D-PN-O3	-3.47	95.93	106.65
3	A	903	NDP	N3A-C4A-N9A	3.32	131.43	125.43
3	B	903	NDP	N3A-C4A-N9A	3.16	131.14	125.43
3	A	903	NDP	C4A-C5A-N7A	-3.03	106.93	109.52
3	B	903	NDP	O4B-C1B-C2B	-3.02	104.13	106.95
3	A	903	NDP	O2N-PN-O1N	2.94	121.46	110.82
3	D	903	NDP	N3A-C4A-N9A	2.88	130.64	125.43
3	C	903	NDP	C4A-C5A-N7A	-2.77	107.15	109.52
3	C	903	NDP	N3A-C4A-N9A	2.66	130.23	125.43
3	A	903	NDP	C5A-C4A-N3A	-2.49	120.28	125.70
3	D	903	NDP	C4A-C5A-N7A	-2.25	107.60	109.52
3	A	903	NDP	C2A-N3A-C4A	2.24	120.38	114.01
3	C	903	NDP	N7A-C8A-N9A	-2.20	108.13	114.36
3	D	903	NDP	C2A-N3A-C4A	2.15	120.14	114.01
3	D	903	NDP	C1B-N9A-C4A	-2.14	122.93	126.64
3	C	903	NDP	PN-O3-PA	-2.14	123.74	132.95
3	B	903	NDP	N7A-C8A-N9A	-2.11	108.40	114.36
3	D	903	NDP	PN-O3-PA	-2.10	123.95	132.95
3	D	903	NDP	N7A-C8A-N9A	-2.08	108.48	114.36
3	A	903	NDP	PN-O3-PA	-2.07	124.07	132.95
3	A	903	NDP	N7A-C8A-N9A	-2.06	108.52	114.36
3	B	903	NDP	C5A-C4A-N3A	-2.06	121.21	125.70
3	B	903	NDP	C4A-C5A-N7A	-2.03	107.78	109.52
3	A	903	NDP	C4B-O4B-C1B	2.02	111.94	109.75
3	B	903	NDP	C2A-N3A-C4A	2.01	119.73	114.01

There are no chirality outliers.

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	498/517 (96%)	-0.23	1 (0%) 93 94	9, 25, 38, 46	13 (2%)
1	B	498/517 (96%)	-0.23	3 (0%) 86 88	12, 26, 36, 52	12 (2%)
1	C	498/517 (96%)	-0.43	3 (0%) 86 88	7, 19, 31, 42	13 (2%)
1	D	498/517 (96%)	-0.36	2 (0%) 90 92	10, 24, 37, 47	13 (2%)
All	All	1992/2068 (96%)	-0.31	9 (0%) 88 90	7, 24, 36, 52	51 (2%)

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	405	VAL	5.5
1	B	405	VAL	4.6
1	A	405	VAL	3.6
1	B	819	ASP	3.3
1	C	405	VAL	2.8
1	C	819	ASP	2.3
1	B	817	ASP	2.2
1	D	743[A]	ASP	2.1
1	C	725[A]	GLN	2.1

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(Å ²)	Q<0.9
2	SO4	B	2009	5/5	0.25	24.40	58,58,58,59	5
2	SO4	B	2005	5/5	0.21	10.86	47,47,49,49	5
2	SO4	D	2012	5/5	0.23	9.00	55,55,56,56	5
2	SO4	C	2010	5/5	0.21	7.24	48,48,49,50	5
4	GOL	D	3004	6/6	0.29	7.13	65,66,67,68	0
4	GOL	C	3003	6/6	0.24	6.05	61,63,63,65	0
2	SO4	C	2018	5/5	0.19	5.86	46,47,48,48	5
4	GOL	A	3001	6/6	0.23	5.09	55,56,57,58	0
2	SO4	A	2011	5/5	0.41	4.98	60,60,61,62	5
2	SO4	A	2019	5/5	0.18	4.83	47,47,48,49	5
4	GOL	B	3002	6/6	0.20	3.72	57,58,59,59	0
2	SO4	A	2015	5/5	0.27	3.63	19,28,30,30	5
2	SO4	C	2013	5/5	0.17	3.00	30,34,35,36	5
2	SO4	A	2002	5/5	0.17	2.81	31,32,34,34	5
2	SO4	C	2007	5/5	0.16	2.75	38,38,41,41	5
2	SO4	A	2006	5/5	0.16	1.96	36,37,39,40	5
2	SO4	B	2020	5/5	0.16	1.83	49,50,51,51	5
2	SO4	D	2008	5/5	0.14	1.75	34,37,37,38	5
2	SO4	D	2016	5/5	0.18	1.56	22,30,31,34	5
2	SO4	D	2021	5/5	0.16	1.22	47,48,48,49	5
3	NDP	C	903	31/48	0.10	0.68	19,21,41,42	0
2	SO4	B	2014	5/5	0.16	0.48	37,43,43,45	0
3	NDP	A	903	31/48	0.11	0.17	21,28,46,49	0
3	NDP	D	903	31/48	0.10	0.16	19,22,42,44	0
2	SO4	B	2003	5/5	0.14	0.13	24,24,25,25	5
3	NDP	B	903	31/48	0.11	-0.17	27,29,47,48	0
2	SO4	C	2017	5/5	0.10	-0.31	25,30,30,30	5
2	SO4	D	2004	5/5	0.10	-0.88	37,38,38,39	5
2	SO4	C	2001	5/5	0.08	-1.15	48,49,50,50	5

6.5 Other polymers ⓘ

There are no such residues in this entry.