



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 07:44 PM GMT

PDB ID : 1GY9
Title : TAURINE/ALPHA-KETOGLUTARATE DIOXYGENASE FROM ES-
CHERICHIA COLI
Authors : Elkins, J.M.; Burzlaff, N.I.; Ryle, M.J.; Lloyd, J.S.; Clifton, I.J.; Baldwin,
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Deposited on : 2002-04-22
Resolution : 2.50 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

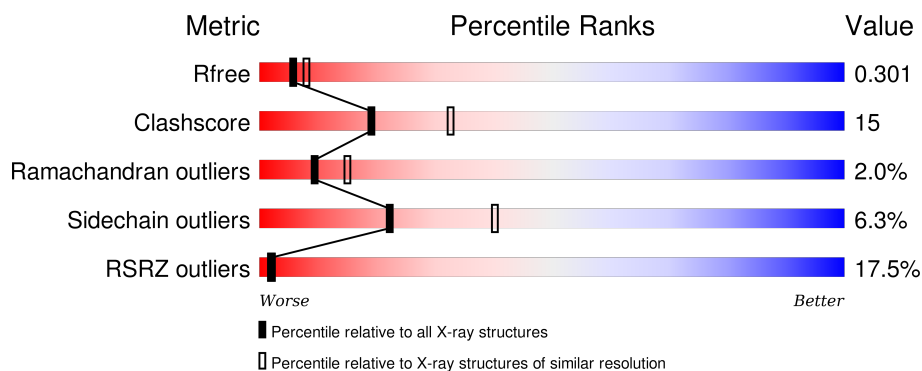
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	3553 (2.50-2.50)
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)
RSRZ outliers	91569	3562 (2.50-2.50)

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	283	
1	B	283	

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	AKG	A	351	-	-	-	X
4	AKG	B	351	-	-	-	X

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4416 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.

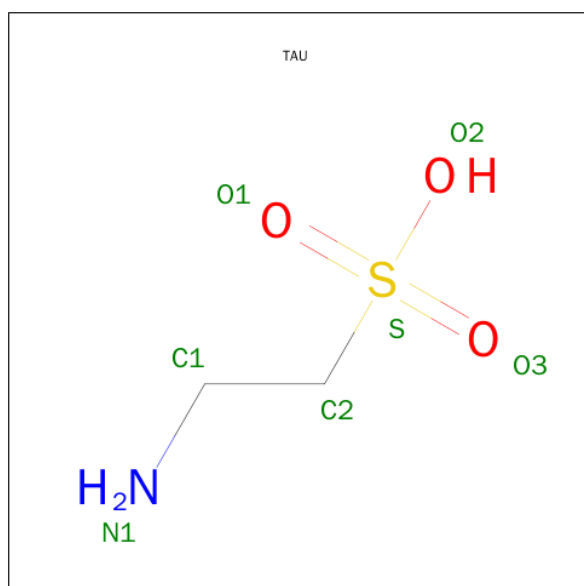
- Molecule 1 is a protein called ALPHA-KETOGLUTARATE-DEPENDENT TAURINE DIOXYGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	279	Total	C	N	O	S	0	0	0
			2197	1409	389	398	1			
1	B	275	Total	C	N	O	S	0	0	0
			2160	1383	382	394	1			

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

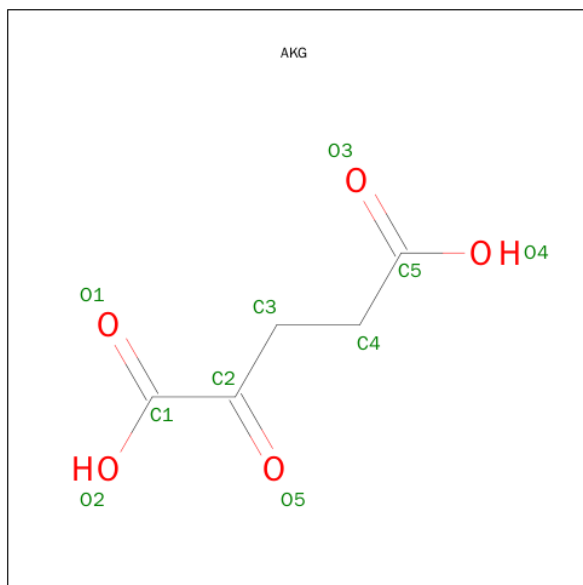
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Fe	0	0
			1	1		
2	A	2	Total	Fe	0	0
			2	2		

- Molecule 3 is 2-AMINOETHANESULFONIC ACID (three-letter code: TAU) (formula: C₂H₇NO₃S).



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

- Molecule 4 is 2-OXOGLUTARIC ACID (three-letter code: AKG) (formula: C₅H₆O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			10	5	5		
4	B	1	Total	C	O	0	0
			10	5	5		

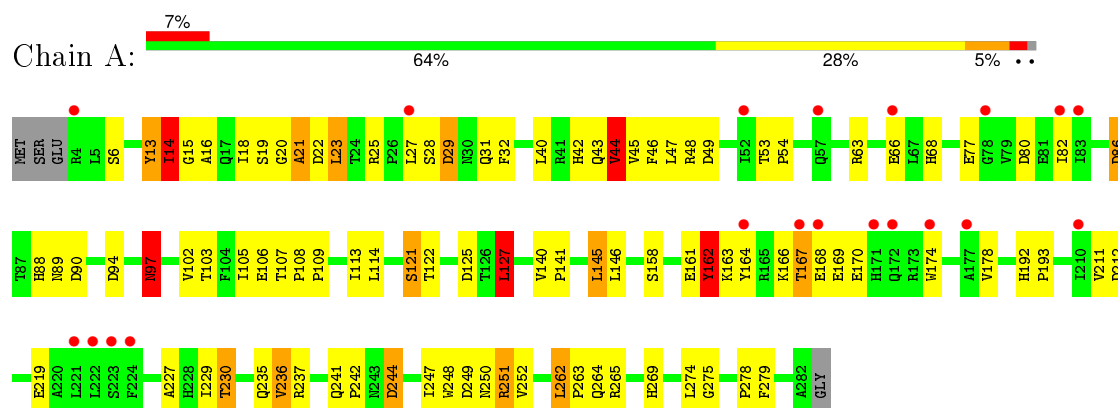
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	18	Total	O	0	2
			18	18		
5	B	4	Total	O	0	0
			4	4		

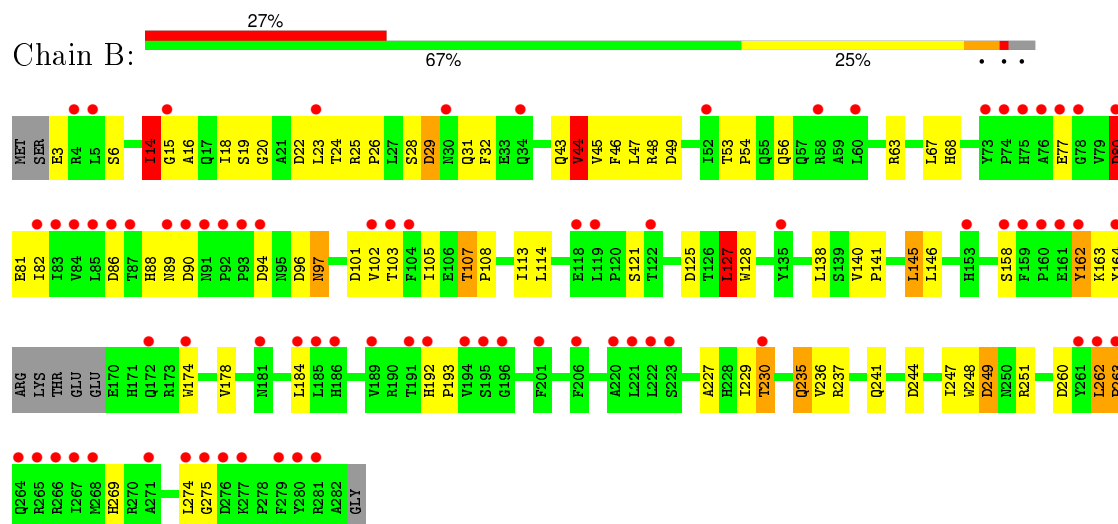
3 Residue-property plots [i](#)

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 ($RSRZ > 2$). 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: ALPHA-KETOGLUTARATE-DEPENDENT TAURINE DIOXYGENASE



• Molecule 1: ALPHA-KETOGLUTARATE-DEPENDENT TAURINE DIOXYGENASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 62 2 2	Depositor
Cell constants a, b, c, α , β , γ	116.79Å 116.79Å 201.94Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.18 – 2.50 45.22 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.3 (45.18-2.50) 98.9 (45.22-2.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.51 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.0	Depositor
R, R_{free}	0.261 , 0.293 0.275 , 0.301	Depositor DCC
R_{free} test set	2865 reflections (11.13%)	DCC
Wilson B-factor (Å ²)	58.5	Xtriage
Anisotropy	0.469	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 55.4	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.53$, $\langle L^2 \rangle = 0.37$	Xtriage
Outliers	1 of 28789 reflections (0.003%)	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	4416	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.30% 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: TAU, AKG, FE

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	1.17	9/2264 (0.4%)	1.15	15/3100 (0.5%)
1	B	0.78	1/2225 (0.0%)	1.02	14/3048 (0.5%)
All	All	0.99	10/4489 (0.2%)	1.09	29/6148 (0.5%)

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	211	VAL	CB-CG2	-9.24	1.33	1.52
1	A	219	GLU	CD-OE1	7.48	1.33	1.25
1	A	66	GLU	CD-OE1	6.72	1.33	1.25
1	A	97	ASN	CB-CG	-5.91	1.37	1.51
1	A	236	VAL	CB-CG2	-5.76	1.40	1.52
1	B	97	ASN	CB-CG	-5.49	1.38	1.51
1	A	21	ALA	CA-CB	-5.22	1.41	1.52
1	A	251	ARG	CB-CG	-5.12	1.38	1.52
1	A	252	VAL	CB-CG2	-5.05	1.42	1.52
1	A	44	VAL	CB-CG2	-5.02	1.42	1.52

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	260	ASP	CB-CG-OD2	10.29	127.56	118.30
1	A	14	ILE	N-CA-C	9.28	136.06	111.00
1	A	94	ASP	CB-CG-OD2	8.12	125.61	118.30
1	A	44	VAL	CB-CA-C	-8.10	96.00	111.40
1	B	96	ASP	CB-CG-OD2	7.25	124.83	118.30
1	B	44	VAL	CB-CA-C	-7.13	97.85	111.40
1	B	14	ILE	N-CA-C	6.80	129.37	111.00
1	B	249	ASP	CB-CG-OD2	6.66	124.29	118.30
1	B	90	ASP	CB-CG-OD2	6.56	124.21	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	94	ASP	CB-CG-OD2	6.46	124.11	118.30
1	A	23	LEU	CA-CB-CG	-6.43	100.52	115.30
1	A	80	ASP	CB-CG-OD2	6.33	124.00	118.30
1	A	212	ASP	CB-CG-OD2	6.26	123.94	118.30
1	B	86	ASP	CB-CG-OD2	6.26	123.94	118.30
1	A	90	ASP	CB-CG-OD2	6.19	123.87	118.30
1	B	49	ASP	CB-CG-OD2	6.15	123.84	118.30
1	A	127	LEU	CA-CB-CG	6.12	129.38	115.30
1	B	125	ASP	CB-CG-OD1	5.81	123.53	118.30
1	B	127	LEU	CA-CB-CG	5.68	128.36	115.30
1	B	80	ASP	CB-CG-OD2	5.54	123.28	118.30
1	A	244	ASP	CB-CG-OD1	5.41	123.17	118.30
1	B	101	ASP	CB-CG-OD1	5.40	123.16	118.30
1	A	49	ASP	CB-CG-OD2	5.21	122.99	118.30
1	A	42	HIS	CB-CA-C	5.12	120.65	110.40
1	A	13	TYR	N-CA-C	-5.10	97.24	111.00
1	A	40	LEU	CA-CB-CG	5.08	126.99	115.30
1	A	125	ASP	CB-CG-OD1	5.06	122.86	118.30
1	B	260	ASP	OD1-CG-OD2	-5.03	113.75	123.30
1	A	86	ASP	CB-CG-OD2	5.01	122.81	118.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2197	0	2084	72	0
1	B	2160	0	2044	63	0
2	A	2	0	0	0	0
2	B	1	0	0	0	0
3	A	7	0	6	0	0
3	B	7	0	7	0	0
4	A	10	0	4	1	0
4	B	10	0	4	0	0
5	A	18	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	4	0	0	1	0
All	All	4416	0	4149	130	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 15.

All (130) 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)
1:B:89:ASN:HD21	1:B:263:PRO:CB	1.88	0.86
1:A:23:LEU:HD21	1:A:27:LEU:HD21	1.56	0.86
1:B:89:ASN:HD21	1:B:263:PRO:HB2	1.43	0.84
1:A:21:ALA:HB1	1:A:23:LEU:HD21	1.58	0.84
1:A:279:PHE:HB3	1:B:26:PRO:HG2	1.64	0.79
1:B:262:LEU:HD12	1:B:263:PRO:HA	1.66	0.78
1:B:14:ILE:HG23	1:B:236:VAL:HG23	1.66	0.78
1:A:89:ASN:HD21	1:A:263:PRO:CB	1.96	0.76
1:A:168:GLU:C	1:A:170:GLU:H	1.90	0.74
1:B:44:VAL:HG13	1:B:248:TRP:HB3	1.71	0.71
1:B:53:THR:HG23	1:B:56:GLN:OE1	1.91	0.71
1:B:3:GLU:HG2	1:B:31:GLN:NE2	2.07	0.70
1:A:262:LEU:HD12	1:A:263:PRO:HA	1.75	0.68
1:B:249:ASP:OD1	1:B:251:ARG:HG2	1.94	0.68
1:A:54:PRO:O	1:A:82:ILE:CD1	2.42	0.68
1:A:89:ASN:HD21	1:A:263:PRO:HB2	1.57	0.67
1:A:227:ALA:O	1:A:230:THR:HB	1.93	0.67
1:A:242:PRO:O	5:A:2016:HOH:O	2.12	0.67
1:A:249:ASP:OD1	1:A:251:ARG:HG2	1.93	0.67
1:A:162:TYR:CE1	1:A:163:LYS:HG3	2.30	0.67
1:A:44:VAL:HG13	1:A:248:TRP:HB3	1.77	0.66
1:A:127:LEU:HD22	1:A:237:ARG:HG3	1.77	0.66
1:B:18:ILE:HB	1:B:47:LEU:CD2	2.25	0.66
1:A:18:ILE:HB	1:A:47:LEU:CD2	2.26	0.64
1:B:54:PRO:O	1:B:82:ILE:CD1	2.46	0.64
1:A:48:ARG:NH2	1:A:241:GLN:HB2	2.13	0.64
1:A:21:ALA:HB1	1:A:23:LEU:CD2	2.27	0.63
1:B:229:ILE:C	1:B:229:ILE:HD12	2.20	0.62
1:A:14:ILE:HG23	1:A:236:VAL:HG23	1.82	0.61
1:B:127:LEU:HD22	1:B:237:ARG:HG3	1.80	0.61
1:A:54:PRO:O	1:A:82:ILE:HD12	2.00	0.61
1:B:48:ARG:NH2	1:B:241:GLN:HB2	2.16	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:227:ALA:O	1:B:230:THR:HB	2.02	0.60
1:B:3:GLU:CG	1:B:31:GLN:NE2	2.64	0.60
1:B:174:TRP:O	1:B:178:VAL:HG23	2.03	0.59
1:A:229:ILE:C	1:A:229:ILE:HD12	2.23	0.59
1:A:113:ILE:HG12	1:A:247:ILE:HG12	1.87	0.57
1:A:162:TYR:CD1	1:A:162:TYR:C	2.77	0.57
1:A:23:LEU:CD2	1:A:27:LEU:HD21	2.31	0.57
1:B:28:SER:O	1:B:29:ASP:C	2.43	0.56
1:B:105:ILE:O	1:B:108:PRO:HD3	2.05	0.56
1:A:166:LYS:O	1:A:167:THR:CB	2.53	0.56
1:A:97:ASN:ND2	1:A:97:ASN:C	2.59	0.56
1:A:89:ASN:HD21	1:A:263:PRO:HB3	1.69	0.55
1:A:6:SER:O	1:A:18:ILE:HA	2.07	0.55
1:B:102:VAL:HG12	1:B:102:VAL:O	2.05	0.55
1:A:168:GLU:O	1:A:170:GLU:N	2.40	0.55
1:B:46:PHE:O	1:B:47:LEU:HD23	2.08	0.54
1:B:113:ILE:HG12	1:B:247:ILE:HG12	1.88	0.54
1:B:68:HIS:HB2	1:B:274:LEU:HG	1.90	0.54
1:A:18:ILE:HB	1:A:47:LEU:HD22	1.90	0.53
1:A:22:ASP:C	1:A:23:LEU:HD23	2.29	0.53
1:A:106:GLU:CG	1:B:29:ASP:OD1	2.57	0.53
1:A:86:ASP:OD2	1:A:265:ARG:NH2	2.33	0.52
1:B:103:THR:HA	1:B:108:PRO:HB3	1.91	0.52
1:A:102:VAL:HG12	1:A:102:VAL:O	2.09	0.52
1:B:24:THR:HA	1:B:56:GLN:HE22	1.75	0.52
1:A:121:SER:OG	1:A:264:GLN:NE2	2.43	0.52
1:A:22:ASP:O	1:A:23:LEU:HD23	2.10	0.51
1:A:168:GLU:C	1:A:170:GLU:N	2.58	0.51
1:B:88:HIS:C	1:B:262:LEU:HD11	2.30	0.51
1:A:28:SER:O	1:A:29:ASP:C	2.49	0.50
1:B:18:ILE:HB	1:B:47:LEU:HD22	1.93	0.50
1:A:145:LEU:HD13	1:A:146:LEU:HD23	1.93	0.50
1:A:167:THR:O	1:A:170:GLU:N	2.44	0.50
1:B:89:ASN:HD21	1:B:263:PRO:HB3	1.72	0.49
1:B:145:LEU:HD13	1:B:146:LEU:HD23	1.94	0.49
1:A:15:GLY:HA3	1:A:236:VAL:HG21	1.94	0.49
1:A:163:LYS:C	1:A:164:TYR:CD1	2.85	0.49
1:B:89:ASN:ND2	1:B:263:PRO:HB2	2.21	0.48
1:B:162:TYR:CD1	1:B:162:TYR:C	2.86	0.48
1:B:53:THR:OG1	1:B:56:GLN:HG3	2.14	0.48
1:A:174:TRP:O	1:A:178:VAL:HG23	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:161:GLU:HG2	1:A:174:TRP:CH2	2.48	0.48
1:A:32:PHE:CE2	1:A:63:ARG:HB3	2.49	0.48
1:A:13:TYR:N	1:A:13:TYR:CD1	2.80	0.47
1:B:54:PRO:O	1:B:82:ILE:HD12	2.13	0.47
1:B:15:GLY:HA3	1:B:236:VAL:HG21	1.96	0.47
1:B:18:ILE:HB	1:B:47:LEU:HD21	1.97	0.47
1:B:140:VAL:HB	1:B:141:PRO:HD3	1.95	0.47
1:B:6:SER:O	1:B:18:ILE:HA	2.15	0.47
1:A:16:ALA:O	1:A:45:VAL:HA	2.15	0.46
1:B:192:HIS:ND1	1:B:193:PRO:HD2	2.30	0.46
1:A:279:PHE:HB3	1:B:26:PRO:CG	2.39	0.46
1:A:88:HIS:C	1:A:262:LEU:HD11	2.37	0.45
1:A:106:GLU:HG2	1:B:29:ASP:OD1	2.16	0.45
1:B:127:LEU:HD23	1:B:127:LEU:N	2.32	0.45
1:A:46:PHE:O	1:A:47:LEU:HD23	2.17	0.45
1:A:192:HIS:ND1	1:A:193:PRO:HD2	2.32	0.45
1:A:105:ILE:O	1:A:108:PRO:HD3	2.17	0.45
1:A:23:LEU:HD21	1:A:27:LEU:CD2	2.37	0.44
1:A:106:GLU:OE2	1:B:29:ASP:OD1	2.35	0.44
1:B:16:ALA:O	1:B:45:VAL:HA	2.17	0.44
1:A:23:LEU:C	1:A:25:ARG:N	2.66	0.44
1:A:140:VAL:HB	1:A:141:PRO:HD3	1.99	0.44
1:B:138:LEU:HD13	1:B:146:LEU:HD12	2.00	0.44
1:A:114:LEU:HD21	4:A:351:AKG:H41	2.00	0.44
1:A:174:TRP:CH2	1:A:178:VAL:HG21	2.52	0.44
1:A:103:THR:HA	1:A:108:PRO:HB3	2.00	0.43
1:A:68:HIS:HB2	1:A:274:LEU:HG	1.99	0.43
1:B:53:THR:HB	1:B:54:PRO:HD2	2.00	0.43
1:B:3:GLU:HG3	1:B:31:GLN:HE21	1.84	0.43
1:A:28:SER:O	1:A:31:GLN:N	2.51	0.43
1:B:23:LEU:O	1:B:24:THR:C	2.58	0.43
1:B:229:ILE:C	1:B:229:ILE:CD1	2.87	0.43
1:B:114:LEU:HD12	1:B:269:HIS:O	2.18	0.42
1:B:3:GLU:CG	1:B:31:GLN:HE21	2.33	0.42
1:B:97:ASN:C	1:B:97:ASN:OD1	2.58	0.42
1:B:236:VAL:HG22	5:B:2001:HOH:O	2.19	0.42
1:A:114:LEU:HD12	1:A:269:HIS:O	2.19	0.42
1:A:48:ARG:NH2	1:A:244:ASP:OD2	2.50	0.42
1:B:67:LEU:HD12	1:B:81:GLU:HG2	2.00	0.42
1:B:22:ASP:O	1:B:25:ARG:N	2.38	0.42
1:B:48:ARG:HH21	1:B:241:GLN:HB2	1.82	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:163:LYS:C	1:B:164:TYR:CD1	2.93	0.42
1:B:128:TRP:O	1:B:235:GLN:HB3	2.20	0.42
1:A:107:THR:OG1	1:A:275:GLY:O	2.38	0.41
1:B:28:SER:O	1:B:31:GLN:N	2.53	0.41
1:A:127:LEU:HD23	1:A:127:LEU:N	2.36	0.41
1:B:80:ASP:OD1	1:B:80:ASP:N	2.53	0.41
1:B:32:PHE:CE2	1:B:63:ARG:HB3	2.56	0.41
1:A:174:TRP:CZ2	1:A:178:VAL:HG21	2.55	0.41
1:B:48:ARG:NH2	1:B:244:ASP:OD2	2.49	0.41
1:A:161:GLU:CG	1:A:174:TRP:CH2	3.04	0.41
1:A:53:THR:HB	1:A:54:PRO:HD2	2.03	0.41
1:A:170:GLU:O	1:A:174:TRP:N	2.52	0.41
1:B:107:THR:OG1	1:B:275:GLY:O	2.40	0.40
1:A:109:PRO:O	1:A:250:ASN:HB3	2.21	0.40
1:A:229:ILE:C	1:A:229:ILE:CD1	2.89	0.40
1:A:278:PRO:HA	5:A:2018:HOH:O	2.20	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	277/283 (98%)	252 (91%)	18 (6%)	7 (2%)	7	10
1	B	271/283 (96%)	255 (94%)	12 (4%)	4 (2%)	13	22
All	All	548/566 (97%)	507 (92%)	30 (6%)	11 (2%)	9	15

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	14	ILE
1	A	77	GLU

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Mol	Chain	Res	Type
1	B	14	ILE
1	B	77	GLU
1	A	169	GLU
1	B	29	ASP
1	A	29	ASP
1	A	162	TYR
1	A	167	THR
1	B	20	GLY
1	A	20	GLY

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	224/244 (92%)	211 (94%)	13 (6%)	25	45
1	B	221/244 (91%)	206 (93%)	15 (7%)	20	36
All	All	445/488 (91%)	417 (94%)	28 (6%)	22	40

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	19	SER
1	A	43	GLN
1	A	44	VAL
1	A	97	ASN
1	A	121	SER
1	A	122	THR
1	A	127	LEU
1	A	145	LEU
1	A	158	SER
1	A	162	TYR
1	A	230	THR
1	A	235	GLN
1	A	262	LEU
1	B	19	SER

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Mol	Chain	Res	Type
1	B	43	GLN
1	B	44	VAL
1	B	80	ASP
1	B	107	THR
1	B	121	SER
1	B	127	LEU
1	B	145	LEU
1	B	158	SER
1	B	162	TYR
1	B	184	LEU
1	B	230	THR
1	B	235	GLN
1	B	262	LEU
1	B	263	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	89	ASN
1	A	97	ASN
1	A	144	GLN
1	A	269	HIS
1	B	31	GLN
1	B	37	HIS
1	B	89	ASN
1	B	144	GLN
1	B	269	HIS

5.3.3 RNA ⓘ

There are no RNA molecules 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 7 ligands modelled in this entry, 3 are monoatomic - leaving 4 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	TAU	A	350	-	5,6,6	0.57	0	6,8,8	4.30	3 (50%)
4	AKG	A	351	2	3,9,9	0.82	0	4,11,11	2.86	3 (75%)
3	TAU	B	350	-	5,6,6	0.95	0	6,8,8	2.84	2 (33%)
4	AKG	B	351	2	3,9,9	1.29	1 (33%)	4,11,11	2.67	2 (50%)

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	TAU	A	350	-	-	0/4/4/4	0/0/0/0
4	AKG	A	351	2	-	0/3/9/9	0/0/0/0
3	TAU	B	350	-	-	0/4/4/4	0/0/0/0
4	AKG	B	351	2	-	0/3/9/9	0/0/0/0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	351	AKG	O5-C2	-2.21	1.18	1.22

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	351	AKG	C3-C2-C1	-3.71	112.61	121.51
3	A	350	TAU	O3-S-O1	-3.65	100.19	113.48
4	B	351	AKG	C3-C4-C5	-3.45	106.42	112.75
3	B	350	TAU	O3-S-O1	-2.95	102.75	113.48
4	A	351	AKG	C4-C3-C2	-2.38	106.96	112.98
4	A	351	AKG	O5-C2-C3	3.16	126.24	120.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	351	AKG	O5-C2-C3	3.18	126.28	120.28
3	B	350	TAU	O1-S-C2	5.78	111.84	106.91
3	A	350	TAU	O3-S-C2	6.12	112.12	106.91
3	A	350	TAU	O1-S-C2	7.66	113.44	106.91

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	351	AKG	1	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	279/283 (98%)	0.75	20 (7%) 18 20	23, 30, 37, 43	0
1	B	275/283 (97%)	1.25	77 (28%) 1 0	23, 30, 37, 43	0
All	All	554/566 (97%)	1.00	97 (17%) 2 2	23, 30, 37, 43	0

All (97) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	75	HIS	7.3
1	B	161	GLU	6.1
1	B	191	THR	5.6
1	A	172	GLN	5.0
1	B	196	GLY	4.9
1	B	80	ASP	4.5
1	B	164	TYR	4.4
1	B	159	PHE	4.3
1	B	86	ASP	4.2
1	B	90	ASP	4.1
1	B	162	TYR	4.0
1	B	192	HIS	3.9
1	B	280	TYR	3.9
1	B	74	PRO	3.8
1	B	82	ILE	3.7
1	B	83	ILE	3.6
1	B	275	GLY	3.6
1	B	118	GLU	3.5
1	B	181	ASN	3.4
1	B	78	GLY	3.3
1	B	174	TRP	3.3
1	B	172	GLN	3.3
1	B	263	PRO	3.3
1	A	174	TRP	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	164	TYR	3.3
1	B	279	PHE	3.2
1	B	158	SER	3.2
1	B	264	GLN	3.2
1	B	267	ILE	3.2
1	B	93	PRO	3.1
1	B	276	ASP	3.1
1	B	87	THR	3.1
1	A	171	HIS	3.0
1	B	119	LEU	3.0
1	B	4	ARG	3.0
1	B	103	THR	3.0
1	A	66	GLU	3.0
1	B	206	PHE	2.9
1	B	160	PRO	2.9
1	B	73	TYR	2.9
1	B	201	PHE	2.9
1	B	102	VAL	2.9
1	B	76	ALA	2.8
1	B	15	GLY	2.8
1	B	274	LEU	2.8
1	B	23	LEU	2.7
1	B	85	LEU	2.7
1	A	167	THR	2.7
1	B	153	HIS	2.7
1	B	265	ARG	2.6
1	B	268	MET	2.6
1	B	220	ALA	2.6
1	B	60	LEU	2.6
1	B	223	SER	2.6
1	B	194	VAL	2.6
1	B	184	LEU	2.6
1	A	82	ILE	2.6
1	B	266	ARG	2.6
1	A	57	GLN	2.6
1	B	91	ASN	2.6
1	A	223	SER	2.5
1	B	122	THR	2.5
1	A	221	LEU	2.4
1	B	58	ARG	2.4
1	B	230	THR	2.4
1	B	262	LEU	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	83	ILE	2.4
1	B	185	LEU	2.4
1	B	281	ARG	2.4
1	B	5	LEU	2.4
1	B	195	SER	2.4
1	B	261	TYR	2.3
1	B	89	ASN	2.3
1	A	224	PHE	2.3
1	A	177	ALA	2.3
1	B	94	ASP	2.3
1	A	222	LEU	2.3
1	B	277	LYS	2.3
1	A	210	ILE	2.3
1	B	221	LEU	2.3
1	B	84	VAL	2.3
1	B	186	HIS	2.2
1	B	30	ASN	2.2
1	B	77	GLU	2.2
1	A	168	GLU	2.2
1	B	135	TYR	2.2
1	A	4	ARG	2.1
1	B	34	GLN	2.1
1	B	189	VAL	2.1
1	B	271	ALA	2.1
1	A	52	ILE	2.1
1	A	78	GLY	2.1
1	B	222	LEU	2.0
1	B	52	ILE	2.0
1	B	92	PRO	2.0
1	A	27	LEU	2.0
1	B	104	PHE	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	RSCC	RSR	LLDF	B-factors(Å ²)	Q<0.9
4	AKG	A	351	10/10	0.93	0.24	2.43	22,25,30,30	0
4	AKG	B	351	10/10	0.91	0.37	2.16	23,25,28,29	0
3	TAU	B	350	7/7	0.90	0.36	1.19	24,30,30,34	0
2	FE	B	300	1/1	0.95	0.19	0.51	27,27,27,27	0
3	TAU	A	350	7/7	0.97	0.17	-0.70	24,29,30,34	0
2	FE	A	300	1/1	0.95	0.03	-7.78	25,25,25,25	0
2	FE	A	310	1/1	0.94	0.10	-	46,46,46,46	1

6.5 Other polymers

There are no such residues in this entry.