



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:04 PM UTC

PDB ID : 3PGJ / pdb_00003pgj
Title : 2.49 Angstrom resolution crystal structure of shikimate 5-dehydrogenase (aroE) from *Vibrio cholerae* O1 biovar eltor str. N16961 in complex with shikimate
Authors : Halavaty, A.S.; Light, S.H.; Shuvalova, L.; Papazisi, L.; Anderson, W.F.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on : 2010-11-02
Resolution : 2.49 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

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

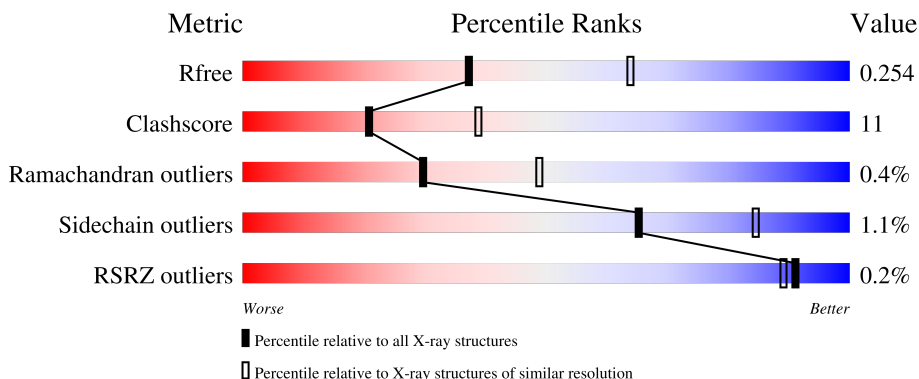
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.49 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}	180053	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (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 of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. 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	302	 71% 18% • 10%
1	B	302	 67% 21% • 11%
1	C	302	 66% 20% • 13%
1	D	302	 67% 22% • 10%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 8441 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 Shikimate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	272	2092	1322	367	393	10	0	1	0
1	B	268	2070	1308	365	388	9	0	1	0
1	C	264	2034	1288	358	379	9	0	0	0
1	D	271	2082	1317	365	391	9	0	0	0

There are 96 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-23	MET	-	expression tag	UNP Q9KVT3
A	-22	HIS	-	expression tag	UNP Q9KVT3
A	-21	HIS	-	expression tag	UNP Q9KVT3
A	-20	HIS	-	expression tag	UNP Q9KVT3
A	-19	HIS	-	expression tag	UNP Q9KVT3
A	-18	HIS	-	expression tag	UNP Q9KVT3
A	-17	HIS	-	expression tag	UNP Q9KVT3
A	-16	SER	-	expression tag	UNP Q9KVT3
A	-15	SER	-	expression tag	UNP Q9KVT3
A	-14	GLY	-	expression tag	UNP Q9KVT3
A	-13	VAL	-	expression tag	UNP Q9KVT3
A	-12	ASP	-	expression tag	UNP Q9KVT3
A	-11	LEU	-	expression tag	UNP Q9KVT3
A	-10	GLY	-	expression tag	UNP Q9KVT3
A	-9	THR	-	expression tag	UNP Q9KVT3
A	-8	GLU	-	expression tag	UNP Q9KVT3
A	-7	ASN	-	expression tag	UNP Q9KVT3
A	-6	LEU	-	expression tag	UNP Q9KVT3
A	-5	TYR	-	expression tag	UNP Q9KVT3
A	-4	PHE	-	expression tag	UNP Q9KVT3
A	-3	GLN	-	expression tag	UNP Q9KVT3

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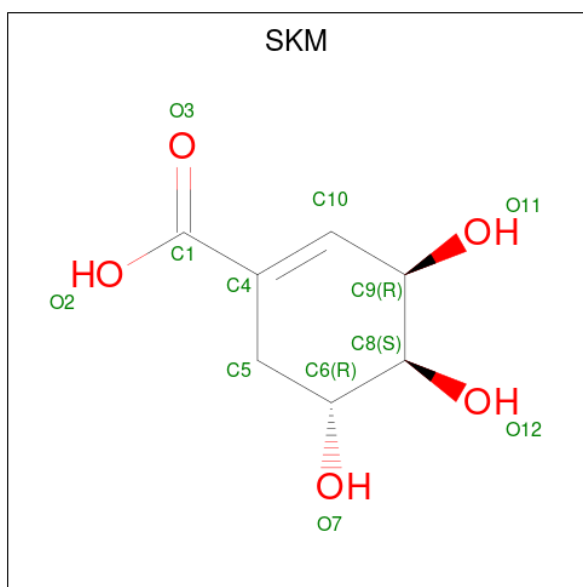
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP Q9KVT3
A	-1	ASN	-	expression tag	UNP Q9KVT3
A	0	ALA	-	expression tag	UNP Q9KVT3
B	-23	MET	-	expression tag	UNP Q9KVT3
B	-22	HIS	-	expression tag	UNP Q9KVT3
B	-21	HIS	-	expression tag	UNP Q9KVT3
B	-20	HIS	-	expression tag	UNP Q9KVT3
B	-19	HIS	-	expression tag	UNP Q9KVT3
B	-18	HIS	-	expression tag	UNP Q9KVT3
B	-17	HIS	-	expression tag	UNP Q9KVT3
B	-16	SER	-	expression tag	UNP Q9KVT3
B	-15	SER	-	expression tag	UNP Q9KVT3
B	-14	GLY	-	expression tag	UNP Q9KVT3
B	-13	VAL	-	expression tag	UNP Q9KVT3
B	-12	ASP	-	expression tag	UNP Q9KVT3
B	-11	LEU	-	expression tag	UNP Q9KVT3
B	-10	GLY	-	expression tag	UNP Q9KVT3
B	-9	THR	-	expression tag	UNP Q9KVT3
B	-8	GLU	-	expression tag	UNP Q9KVT3
B	-7	ASN	-	expression tag	UNP Q9KVT3
B	-6	LEU	-	expression tag	UNP Q9KVT3
B	-5	TYR	-	expression tag	UNP Q9KVT3
B	-4	PHE	-	expression tag	UNP Q9KVT3
B	-3	GLN	-	expression tag	UNP Q9KVT3
B	-2	SER	-	expression tag	UNP Q9KVT3
B	-1	ASN	-	expression tag	UNP Q9KVT3
B	0	ALA	-	expression tag	UNP Q9KVT3
C	-23	MET	-	expression tag	UNP Q9KVT3
C	-22	HIS	-	expression tag	UNP Q9KVT3
C	-21	HIS	-	expression tag	UNP Q9KVT3
C	-20	HIS	-	expression tag	UNP Q9KVT3
C	-19	HIS	-	expression tag	UNP Q9KVT3
C	-18	HIS	-	expression tag	UNP Q9KVT3
C	-17	HIS	-	expression tag	UNP Q9KVT3
C	-16	SER	-	expression tag	UNP Q9KVT3
C	-15	SER	-	expression tag	UNP Q9KVT3
C	-14	GLY	-	expression tag	UNP Q9KVT3
C	-13	VAL	-	expression tag	UNP Q9KVT3
C	-12	ASP	-	expression tag	UNP Q9KVT3
C	-11	LEU	-	expression tag	UNP Q9KVT3
C	-10	GLY	-	expression tag	UNP Q9KVT3
C	-9	THR	-	expression tag	UNP Q9KVT3

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-8	GLU	-	expression tag	UNP Q9KVT3
C	-7	ASN	-	expression tag	UNP Q9KVT3
C	-6	LEU	-	expression tag	UNP Q9KVT3
C	-5	TYR	-	expression tag	UNP Q9KVT3
C	-4	PHE	-	expression tag	UNP Q9KVT3
C	-3	GLN	-	expression tag	UNP Q9KVT3
C	-2	SER	-	expression tag	UNP Q9KVT3
C	-1	ASN	-	expression tag	UNP Q9KVT3
C	0	ALA	-	expression tag	UNP Q9KVT3
D	-23	MET	-	expression tag	UNP Q9KVT3
D	-22	HIS	-	expression tag	UNP Q9KVT3
D	-21	HIS	-	expression tag	UNP Q9KVT3
D	-20	HIS	-	expression tag	UNP Q9KVT3
D	-19	HIS	-	expression tag	UNP Q9KVT3
D	-18	HIS	-	expression tag	UNP Q9KVT3
D	-17	HIS	-	expression tag	UNP Q9KVT3
D	-16	SER	-	expression tag	UNP Q9KVT3
D	-15	SER	-	expression tag	UNP Q9KVT3
D	-14	GLY	-	expression tag	UNP Q9KVT3
D	-13	VAL	-	expression tag	UNP Q9KVT3
D	-12	ASP	-	expression tag	UNP Q9KVT3
D	-11	LEU	-	expression tag	UNP Q9KVT3
D	-10	GLY	-	expression tag	UNP Q9KVT3
D	-9	THR	-	expression tag	UNP Q9KVT3
D	-8	GLU	-	expression tag	UNP Q9KVT3
D	-7	ASN	-	expression tag	UNP Q9KVT3
D	-6	LEU	-	expression tag	UNP Q9KVT3
D	-5	TYR	-	expression tag	UNP Q9KVT3
D	-4	PHE	-	expression tag	UNP Q9KVT3
D	-3	GLN	-	expression tag	UNP Q9KVT3
D	-2	SER	-	expression tag	UNP Q9KVT3
D	-1	ASN	-	expression tag	UNP Q9KVT3
D	0	ALA	-	expression tag	UNP Q9KVT3

- Molecule 2 is (3R,4S,5R)-3,4,5-TRIHYDROXYCYCLOHEX-1-ENE-1-CARBOXYLIC ACID (CCD ID: SKM) (formula: C₇H₁₀O₅).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 12 7 5	0	0
2	B	1	Total C O 12 7 5	0	0
2	C	1	Total C O 12 7 5	0	0
2	D	1	Total C O 12 7 5	0	0

- Molecule 3 is water.

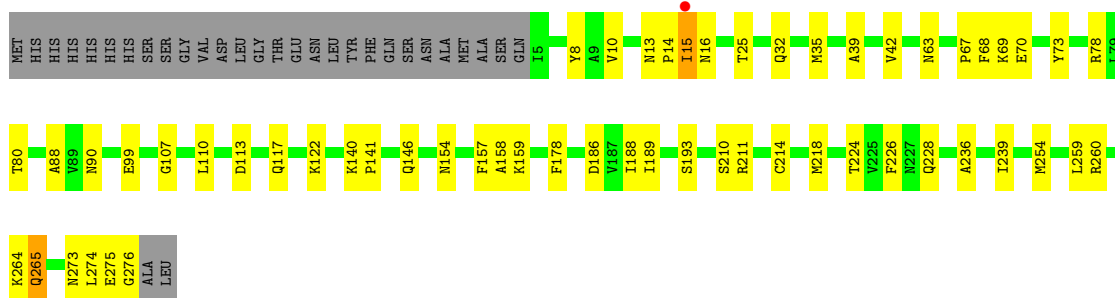
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	33	Total O 33 33	0	0
3	B	24	Total O 24 24	0	0
3	C	26	Total O 26 26	0	0
3	D	32	Total O 32 32	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes 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.

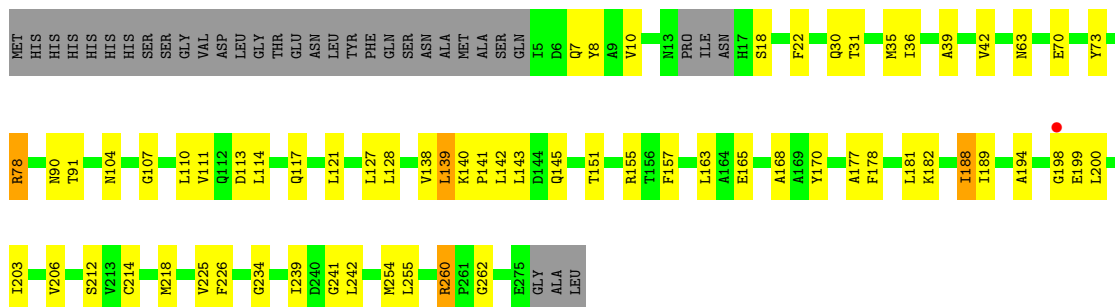
- Molecule 1: Shikimate dehydrogenase

Chain A: 



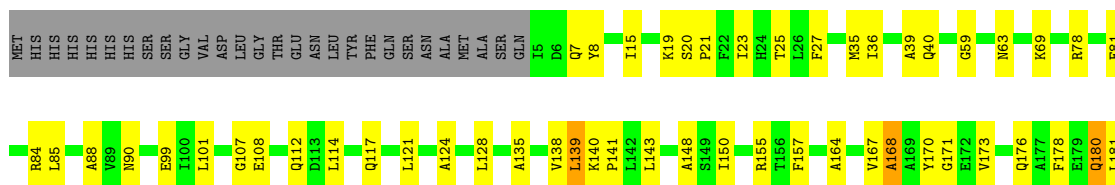
- Molecule 1: Shikimate dehydrogenase

Chain B: 



- Molecule 1: Shikimate dehydrogenase

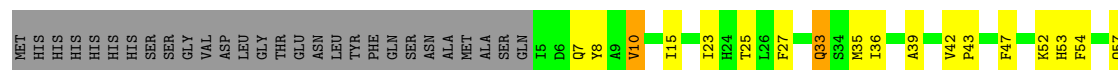
Chain C: 





- Molecule 1: Shikimate dehydrogenase

Chain D: 67% 22% 10%



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	75.53Å 83.66Å 79.58Å 90.00° 93.51° 90.00°	Depositor
Resolution (Å)	28.80 – 2.49 28.80 – 2.49	Depositor EDS
% Data completeness (in resolution range)	98.7 (28.80-2.49) 98.6 (28.80-2.49)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.40 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.193 , 0.247 0.204 , 0.254	Depositor DCC
R_{free} test set	1723 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	53.7	Xtrriage
Anisotropy	0.396	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 55.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.024 for l,-k,h	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8441	wwPDB-VP
Average B, all atoms (Å ²)	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.34% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: SKM

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	0.52	0/2129	0.95	2/2878 (0.1%)
1	B	0.50	0/2105	0.98	5/2842 (0.2%)
1	C	0.46	0/2070	0.95	3/2796 (0.1%)
1	D	0.46	0/2119	0.96	6/2865 (0.2%)
All	All	0.49	0/8423	0.96	16/11381 (0.1%)

There are no bond length outliers.

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	234	GLY	N-CA-C	7.75	126.07	115.30
1	B	42	VAL	N-CA-C	-7.01	101.18	107.56
1	A	264	LYS	N-CA-C	6.46	118.32	111.28
1	C	157	PHE	N-CA-C	6.24	117.75	111.07
1	D	264	LYS	N-CA-C	6.05	117.54	111.07
1	B	18	SER	N-CA-C	5.60	118.39	110.50
1	D	83	ALA	N-CA-C	-5.55	105.31	111.36
1	D	68	PHE	N-CA-C	5.54	119.73	112.92
1	B	212	SER	N-CA-C	5.53	118.47	110.28
1	C	139	LEU	N-CA-C	5.43	116.88	111.07
1	D	25	THR	N-CA-C	-5.38	105.31	111.07
1	C	25	THR	N-CA-C	-5.35	105.53	111.36
1	B	139	LEU	N-CA-C	5.33	116.78	111.07
1	D	126	ILE	N-CA-C	5.17	116.02	108.53
1	D	10	VAL	N-CA-C	-5.15	100.70	108.12
1	A	80	THR	N-CA-C	-5.02	104.05	110.53

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	2092	0	2085	41	0
1	B	2070	0	2065	43	0
1	C	2034	0	2033	50	0
1	D	2082	0	2078	58	0
2	A	12	0	9	0	0
2	B	12	0	9	0	0
2	C	12	0	9	0	0
2	D	12	0	9	1	0
3	A	33	0	0	1	0
3	B	24	0	0	0	0
3	C	26	0	0	0	0
3	D	32	0	0	0	0
All	All	8441	0	8297	185	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 11.

All (185) 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:A:14:PRO:HA	1:A:15:ILE:CG2	1.79	1.11
1:D:15:ILE:HG21	1:D:39:ALA:HB1	1.36	1.07
1:A:14:PRO:CA	1:A:15:ILE:HG22	1.84	1.06
1:B:107:GLY:HA2	1:B:138:VAL:HG12	1.48	0.94
1:D:196:LEU:HD21	1:D:218:MET:SD	2.08	0.93
1:B:254:MET:SD	1:B:260:ARG:NH2	2.45	0.88
1:D:15:ILE:CG2	1:D:39:ALA:HB1	2.05	0.86
1:A:13:ASN:HB2	1:A:42:VAL:HG12	1.58	0.85
1:D:33:GLN:HE21	1:D:33:GLN:HA	1.45	0.82
1:A:13:ASN:HB2	1:A:42:VAL:CG1	2.11	0.80
1:D:254:MET:CE	1:D:260:ARG:HB2	2.12	0.79
1:A:193:SER:HA	1:A:218:MET:HE3	1.64	0.79
1:D:254:MET:HE2	1:D:260:ARG:HB2	1.64	0.79
1:A:14:PRO:HA	1:A:15:ILE:HG22	0.89	0.78
1:A:15:ILE:HD11	1:A:39:ALA:HB1	1.67	0.75

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:218:MET:HE2	1:C:218:MET:HA	1.69	0.75
1:C:184:SER:HB2	1:C:209:SER:HB2	1.70	0.73
1:D:114:LEU:HD13	1:D:121:LEU:HD21	1.71	0.72
1:D:107:GLY:HA2	1:D:138:VAL:HG12	1.70	0.71
1:B:22:PHE:CD1	1:C:36:ILE:HD11	2.29	0.68
1:C:8:TYR:CD1	1:C:35:MET:HE3	2.29	0.67
1:C:211:ARG:HA	1:C:236:ALA:HB2	1.76	0.67
1:B:143:LEU:HD13	1:B:170:TYR:O	1.96	0.66
1:D:33:GLN:HA	1:D:33:GLN:NE2	2.10	0.66
1:A:186:ASP:OD1	1:A:211:ARG:NH2	2.28	0.66
1:C:23:ILE:HG22	1:C:27:PHE:CE2	2.31	0.65
1:C:117:GLN:HG3	1:C:239:ILE:HD13	1.77	0.65
1:B:157:PHE:HB2	1:B:177:ALA:HB2	1.78	0.64
1:D:117:GLN:HG3	1:D:239:ILE:HD13	1.78	0.64
1:D:110:LEU:CD1	1:D:215:TYR:CE1	2.81	0.63
1:D:15:ILE:HG22	1:D:15:ILE:O	1.97	0.63
1:A:117:GLN:HG3	1:A:239:ILE:HD13	1.81	0.63
1:D:110:LEU:HD13	1:D:215:TYR:CE1	2.34	0.62
1:B:7:GLN:NE2	1:B:36:ILE:HG23	2.14	0.62
1:C:108:GLU:OE2	1:C:112:GLN:NE2	2.24	0.62
1:D:196:LEU:HD21	1:D:218:MET:CG	2.30	0.61
1:B:8:TYR:CD1	1:B:35:MET:HE3	2.36	0.60
1:B:200:LEU:HD21	1:B:225:VAL:HG12	1.83	0.60
1:D:195:SER:HB2	1:D:225:VAL:CG2	2.32	0.60
1:D:8:TYR:CD1	1:D:35:MET:HE3	2.37	0.59
1:A:42:VAL:HG11	1:A:68:PHE:CZ	2.37	0.59
1:B:78:ARG:HH21	1:B:78:ARG:HG2	1.68	0.58
1:C:114:LEU:HD13	1:C:121:LEU:HD21	1.86	0.58
1:C:176:GLN:NE2	1:C:181:LEU:HD23	2.18	0.57
1:D:111:VAL:HG11	1:D:145:GLN:HE21	1.70	0.57
1:A:140:LYS:HB3	1:A:141:PRO:HD3	1.86	0.57
1:D:218:MET:HA	1:D:218:MET:HE2	1.86	0.57
1:D:139:LEU:HD11	1:D:163:LEU:HG	1.87	0.56
1:B:78:ARG:HH21	1:B:78:ARG:CG	2.18	0.56
1:B:181:LEU:HD12	1:B:203:ILE:HG23	1.88	0.56
1:D:188:ILE:HD12	1:D:188:ILE:N	2.22	0.55
1:D:140:LYS:HB3	1:D:141:PRO:HD3	1.89	0.55
1:A:32:GLN:NE2	3:A:296:HOH:O	2.39	0.55
1:A:107:GLY:HA3	1:A:141:PRO:HG2	1.87	0.55
1:C:69:LYS:HB3	1:C:88:ALA:HB1	1.89	0.54
1:A:154:ASN:ND2	1:A:159:LYS:HD3	2.22	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:139:LEU:HD11	1:B:163:LEU:HG	1.88	0.54
1:C:78:ARG:HH22	1:C:99:GLU:CD	2.15	0.54
1:D:164:ALA:CB	1:D:175:ALA:HB2	2.37	0.54
1:D:254:MET:HE1	1:D:260:ARG:HB2	1.86	0.54
1:A:69:LYS:HB3	1:A:88:ALA:HB1	1.89	0.54
1:C:107:GLY:HA3	1:C:141:PRO:HG2	1.90	0.54
1:B:22:PHE:HD1	1:C:36:ILE:HD11	1.73	0.53
1:D:110:LEU:CD1	1:D:215:TYR:CZ	2.92	0.53
1:D:23:ILE:HG22	1:D:27:PHE:CE2	2.44	0.53
1:D:196:LEU:HD21	1:D:218:MET:HG3	1.91	0.53
1:D:196:LEU:HD22	1:D:196:LEU:H	1.73	0.53
1:D:15:ILE:CG2	1:D:15:ILE:O	2.57	0.53
1:D:33:GLN:HE21	1:D:33:GLN:CA	2.19	0.53
1:C:140:LYS:HB3	1:C:141:PRO:HD3	1.91	0.52
1:A:25:THR:HB	1:D:36:ILE:HD11	1.89	0.52
1:A:265:GLN:H	1:A:265:GLN:CD	2.18	0.52
1:C:27:PHE:CE1	1:C:266:ILE:HD12	2.44	0.52
1:A:260:ARG:HD2	1:B:206:VAL:HA	1.91	0.52
1:B:113:ASP:O	1:B:117:GLN:HG2	2.10	0.52
1:A:78:ARG:HD2	1:A:99:GLU:OE2	2.10	0.51
1:C:176:GLN:HE21	1:C:181:LEU:HD23	1.75	0.51
1:B:214:CYS:SG	1:B:226:PHE:HE2	2.34	0.51
1:A:8:TYR:CD1	1:A:35:MET:HE3	2.46	0.51
1:C:176:GLN:NE2	1:C:180:GLN:OE1	2.43	0.51
1:D:10:VAL:HG12	1:D:39:ALA:HA	1.92	0.51
1:D:42:VAL:HG13	1:D:43:PRO:HD2	1.92	0.51
1:B:218:MET:HA	1:B:218:MET:HE2	1.93	0.51
1:B:188:ILE:N	1:B:188:ILE:HD12	2.26	0.51
1:D:193:SER:O	1:D:196:LEU:HD23	2.11	0.51
1:B:140:LYS:HB3	1:B:141:PRO:HD3	1.94	0.50
1:A:14:PRO:HB2	1:A:16:ASN:N	2.26	0.50
1:C:184:SER:CB	1:C:209:SER:HB2	2.38	0.50
1:C:7:GLN:HG3	1:C:59:GLY:HA2	1.94	0.50
1:A:210:SER:O	1:A:236:ALA:HB2	2.11	0.50
1:C:78:ARG:O	1:C:101:LEU:HD12	2.12	0.49
1:B:110:LEU:HD21	1:B:189:ILE:HD13	1.93	0.49
1:A:274:LEU:C	1:A:276:GLY:H	2.20	0.49
1:C:78:ARG:NH2	1:C:99:GLU:OE2	2.39	0.49
1:C:19:LYS:NZ	1:C:274:LEU:HD21	2.26	0.49
1:B:194:ALA:HB1	1:B:199:GLU:O	2.13	0.49
1:C:8:TYR:CE1	1:C:35:MET:HE3	2.46	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:47:PHE:HB2	1:D:68:PHE:CD1	2.48	0.49
1:B:214:CYS:SG	1:B:226:PHE:CE2	3.06	0.48
1:C:139:LEU:HD13	1:C:167:VAL:HG21	1.95	0.48
1:C:81:GLU:O	1:C:84:ARG:HB3	2.14	0.48
1:C:178:PHE:CD1	1:C:203:ILE:HG12	2.49	0.47
1:B:128:LEU:HD23	1:B:139:LEU:HD21	1.96	0.47
1:D:195:SER:HB2	1:D:225:VAL:HG23	1.96	0.47
1:C:63:ASN:HA	1:C:90:ASN:O	2.15	0.47
1:B:111:VAL:HG11	1:B:145:GLN:NE2	2.31	0.46
1:C:128:LEU:HD21	1:C:135:ALA:HB1	1.96	0.46
1:C:23:ILE:CG2	1:C:27:PHE:CE2	2.99	0.46
1:D:196:LEU:HD22	1:D:196:LEU:N	2.31	0.46
1:A:122:LYS:NZ	1:A:146:GLN:OE1	2.49	0.46
1:A:63:ASN:HA	1:A:90:ASN:O	2.16	0.46
1:C:164:ALA:O	1:C:168:ALA:HB2	2.16	0.45
1:B:181:LEU:HD12	1:B:203:ILE:CG2	2.47	0.45
1:C:218:MET:HE2	1:C:218:MET:CA	2.43	0.45
1:D:73:TYR:CE1	1:D:79:LEU:HD13	2.52	0.45
1:C:15:ILE:HG12	1:C:39:ALA:HB1	1.99	0.45
1:C:27:PHE:CD1	1:C:266:ILE:HD12	2.52	0.45
1:A:254:MET:HA	1:A:259:LEU:O	2.16	0.45
1:B:30:GLN:HG3	1:B:31:THR:HG23	1.97	0.45
1:D:164:ALA:HB3	1:D:175:ALA:HB2	1.99	0.45
1:A:214[B]:CYS:SG	1:A:226:PHE:CE2	3.10	0.45
1:B:127:LEU:HD12	1:B:151:THR:O	2.15	0.45
1:B:198:GLY:HA2	1:B:225:VAL:HG21	1.99	0.45
1:D:251:GLU:O	1:D:254:MET:HB3	2.15	0.45
1:C:85:LEU:HD12	1:C:140:LYS:HG2	1.98	0.45
1:C:181:LEU:HD12	1:C:203:ILE:HG23	1.99	0.45
1:D:114:LEU:HD12	1:D:121:LEU:HD11	1.99	0.45
1:A:224:THR:O	1:A:228:GLN:HG3	2.17	0.44
1:B:30:GLN:OE1	1:B:262:GLY:N	2.50	0.44
1:B:90:ASN:OD1	1:B:104:ASN:HA	2.18	0.44
1:D:65:THR:HG22	2:D:279:SKM:C4	2.47	0.44
1:A:273:ASN:ND2	1:D:7:GLN:OE1	2.50	0.44
1:B:165:GLU:HA	1:B:168:ALA:HB2	1.98	0.44
1:D:271:ARG:O	1:D:275:GLU:HG2	2.18	0.44
1:A:193:SER:CA	1:A:218:MET:HE3	2.42	0.44
1:B:117:GLN:HG3	1:B:239:ILE:HD13	2.00	0.44
1:B:7:GLN:NE2	1:B:36:ILE:CG2	2.81	0.43
1:C:264:LYS:O	1:C:268:ARG:HG3	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:154:ASN:HD21	1:A:159:LYS:HD3	1.84	0.43
1:C:107:GLY:HA2	1:C:138:VAL:HG12	2.00	0.43
1:C:143:LEU:HD21	1:C:150:ILE:HD12	2.01	0.43
1:C:143:LEU:HD13	1:C:170:TYR:HB2	2.01	0.43
1:C:240:ASP:OD1	1:C:240:ASP:C	2.62	0.43
1:D:110:LEU:HD11	1:D:215:TYR:CE1	2.52	0.43
1:A:70:GLU:O	1:A:73:TYR:HB3	2.19	0.42
1:C:178:PHE:CE1	1:C:203:ILE:HD11	2.54	0.42
1:D:53:HIS:NE2	1:D:57:GLN:OE1	2.51	0.42
1:C:27:PHE:CD1	1:C:261:PRO:CG	3.02	0.42
1:A:188:ILE:HD12	1:A:188:ILE:N	2.34	0.42
1:D:167:VAL:HG23	1:D:173:VAL:HG21	2.00	0.42
1:B:70:GLU:O	1:B:73:TYR:HB3	2.19	0.42
1:C:20:SER:N	1:C:21:PRO:CD	2.83	0.42
1:D:221:LYS:HG3	1:D:275:GLU:OE1	2.19	0.42
1:B:91:THR:HG21	1:B:255:LEU:HD23	2.01	0.42
1:A:154:ASN:C	1:A:178:PHE:CE1	2.98	0.42
1:B:36:ILE:HD11	1:C:21:PRO:HB2	2.01	0.42
1:A:10:VAL:O	1:A:10:VAL:HG13	2.19	0.42
1:D:183:GLN:O	1:D:207:ILE:HA	2.20	0.42
1:A:157:PHE:O	1:A:158:ALA:C	2.63	0.41
1:A:67:PRO:HD2	1:A:68:PHE:CE1	2.55	0.41
1:A:154:ASN:ND2	1:A:159:LYS:HB3	2.36	0.41
1:B:114:LEU:HD13	1:B:121:LEU:HD21	2.02	0.41
1:D:54:PHE:CE2	1:D:59:GLY:HA3	2.55	0.41
1:A:14:PRO:HB2	1:A:16:ASN:HB2	2.03	0.41
1:D:52:LYS:HG3	1:D:75:PHE:HE1	1.85	0.41
1:B:63:ASN:HA	1:B:90:ASN:O	2.20	0.41
1:C:15:ILE:CG1	1:C:39:ALA:HB1	2.50	0.41
1:D:111:VAL:HG11	1:D:145:GLN:NE2	2.36	0.41
1:D:154:ASN:HB2	1:D:160:ALA:HB2	2.02	0.41
1:B:39:ALA:HB3	1:C:40:GLN:HA	2.02	0.41
1:B:241:GLY:O	1:B:242:LEU:C	2.63	0.41
1:A:110:LEU:HD21	1:A:189:ILE:HD13	2.03	0.41
1:C:155:ARG:HA	1:C:178:PHE:CE2	2.55	0.41
1:D:240:ASP:OD1	1:D:240:ASP:C	2.64	0.41
1:A:113:ASP:O	1:A:117:GLN:HG2	2.21	0.41
1:B:111:VAL:HG22	1:B:142:LEU:HD23	2.03	0.41
1:B:155:ARG:HA	1:B:178:PHE:CD2	2.56	0.41
1:D:245:LEU:O	1:D:248:GLN:HG3	2.21	0.41
1:D:85:LEU:HD12	1:D:140:LYS:HB2	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:210:SER:O	1:D:236:ALA:HB2	2.21	0.40
1:B:10:VAL:O	1:B:10:VAL:HG13	2.22	0.40
1:C:124:ALA:O	1:C:148:ALA:N	2.50	0.40
1:C:171:GLY:O	1:C:173:VAL:HG23	2.21	0.40
1:D:228:GLN:O	1:D:232:GLN:HG3	2.21	0.40
1:D:231:ARG:NH2	1:D:236:ALA:O	2.54	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	271/302 (90%)	256 (94%)	13 (5%)	2 (1%)	18	34
1	B	265/302 (88%)	254 (96%)	11 (4%)	0	100	100
1	C	260/302 (86%)	246 (95%)	12 (5%)	2 (1%)	16	31
1	D	269/302 (89%)	261 (97%)	8 (3%)	0	100	100
All	All	1065/1208 (88%)	1017 (96%)	44 (4%)	4 (0%)	30	49

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	168	ALA
1	A	275	GLU
1	C	180	GLN
1	A	15	ILE

5.3.2 Protein sidechains [i](#)

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

resolution.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	216/240 (90%)	215 (100%)	1 (0%)	81	92
1	B	213/240 (89%)	209 (98%)	4 (2%)	50	76
1	C	210/240 (88%)	208 (99%)	2 (1%)	68	86
1	D	215/240 (90%)	213 (99%)	2 (1%)	70	87
All	All	854/960 (89%)	845 (99%)	9 (1%)	65	84

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	265	GLN
1	B	78	ARG
1	B	182	LYS
1	B	188	ILE
1	B	260	ARG
1	C	211	ARG
1	C	218	MET
1	D	33	GLN
1	D	188	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	154	ASN
1	A	183	GLN
1	A	265	GLN
1	A	273	ASN
1	B	7	GLN
1	B	40	GLN
1	B	57	GLN
1	B	145	GLN
1	B	265	GLN
1	C	63	ASN
1	C	176	GLN
1	C	183	GLN
1	D	7	GLN
1	D	145	GLN

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Mol	Chain	Res	Type
1	D	146	GLN
1	D	154	ASN
1	D	180	GLN
1	D	183	GLN
1	D	265	GLN

5.3.3 RNA [i](#)

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 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	SKM	C	279	-	12,12,12	0.85	1 (8%)	16,17,17	0.83	0
2	SKM	D	279	-	12,12,12	0.84	1 (8%)	16,17,17	0.68	0
2	SKM	A	279	-	12,12,12	0.82	0	16,17,17	0.82	0
2	SKM	B	279	-	12,12,12	0.78	0	16,17,17	1.16	2 (12%)

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	SKM	C	279	-	-	0/4/20/20	0/1/1/1
2	SKM	D	279	-	-	0/4/20/20	0/1/1/1
2	SKM	A	279	-	-	0/4/20/20	0/1/1/1
2	SKM	B	279	-	-	0/4/20/20	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	279	SKM	O2-C1	-2.15	1.24	1.30
2	C	279	SKM	O2-C1	-2.06	1.25	1.30

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	279	SKM	O2-C1-C4	2.72	121.17	115.43
2	B	279	SKM	O3-C1-C4	-2.43	117.38	121.64

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
2	D	279	SKM	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 [i](#)

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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	272/302 (90%)	-0.35	1 (0%) 88 86	20, 50, 76, 90	1 (0%)
1	B	268/302 (88%)	-0.24	1 (0%) 88 86	30, 54, 82, 101	1 (0%)
1	C	264/302 (87%)	-0.09	0 100 100	35, 62, 113, 132	0
1	D	271/302 (89%)	-0.18	0 100 100	37, 59, 89, 99	0
All	All	1075/1208 (88%)	-0.22	2 (0%) 91 89	20, 56, 93, 132	2 (0%)

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	15	ILE	3.2
1	B	198	GLY	2.4

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides 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. 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	B-factors(\AA^2)	Q<0.9
2	SKM	D	279	12/12	0.89	0.09	65,67,68,68	0
2	SKM	C	279	12/12	0.93	0.08	58,60,61,64	0
2	SKM	A	279	12/12	0.95	0.07	50,53,56,60	0
2	SKM	B	279	12/12	0.95	0.06	44,48,50,55	0

6.5 Other polymers [i](#)

There are no such residues in this entry.