



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 10:02 PM UTC

PDB ID : 6B2O / pdb_00006b2o
Title : LarE, a sulfur transferase involved in synthesis of the cofactor for lactate racemase, C176A variant
Authors : Fellner, M.; Hausinger, R.P.; Hu, J.
Deposited on : 2017-09-20
Resolution : 2.35 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:

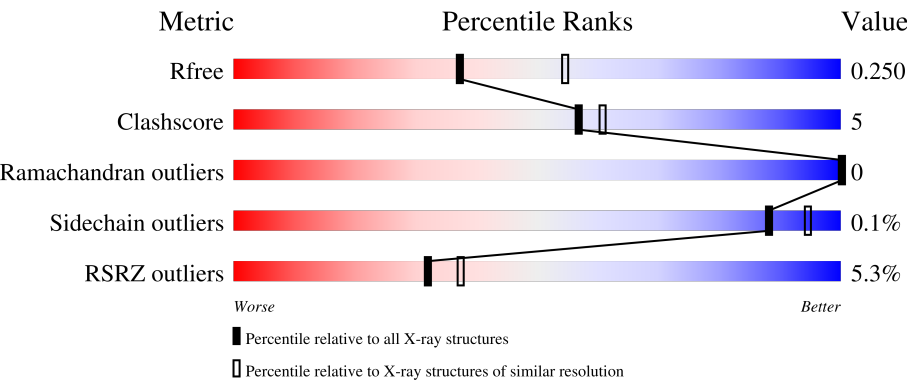
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry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

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.35 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	1596 (2.36-2.36)
Clashscore	190562	1663 (2.36-2.36)
Ramachandran outliers	187476	1646 (2.36-2.36)
Sidechain outliers	187428	1646 (2.36-2.36)
RSRZ outliers	180081	1598 (2.36-2.36)

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	286	3% 82% 9% 9%
1	B	286	% 78% 8% 14%
1	C	286	% 78% 9% 13%
1	D	286	16% 69% 12% 19%
1	E	286	3% 82% 9% 9%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	F	286	

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
3	SO4	B	302	-	-	X	-
3	SO4	F	302	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 11913 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 ATP-utilizing enzyme of the PP-loopsuperfamily.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	261	Total	C	N	O	S	0	0	0
			1986	1252	344	384	6			
1	B	247	Total	C	N	O	S	0	0	0
			1896	1195	329	367	5			
1	C	249	Total	C	N	O	S	0	0	0
			1906	1202	333	366	5			
1	D	233	Total	C	N	O	S	0	0	0
			1712	1072	301	336	3			
1	E	261	Total	C	N	O	S	0	0	0
			1968	1248	338	376	6			
1	F	249	Total	C	N	O	S	0	0	0
			1897	1198	329	365	5			

There are 66 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	176	ALA	CYS	engineered mutation	UNP A0A0G9FES3
A	277	ALA	-	expression tag	UNP A0A0G9FES3
A	278	SER	-	expression tag	UNP A0A0G9FES3
A	279	TRP	-	expression tag	UNP A0A0G9FES3
A	280	SER	-	expression tag	UNP A0A0G9FES3
A	281	HIS	-	expression tag	UNP A0A0G9FES3
A	282	PRO	-	expression tag	UNP A0A0G9FES3
A	283	GLN	-	expression tag	UNP A0A0G9FES3
A	284	PHE	-	expression tag	UNP A0A0G9FES3
A	285	GLU	-	expression tag	UNP A0A0G9FES3
A	286	LYS	-	expression tag	UNP A0A0G9FES3
B	176	ALA	CYS	engineered mutation	UNP A0A0G9FES3
B	277	ALA	-	expression tag	UNP A0A0G9FES3
B	278	SER	-	expression tag	UNP A0A0G9FES3
B	279	TRP	-	expression tag	UNP A0A0G9FES3
B	280	SER	-	expression tag	UNP A0A0G9FES3
B	281	HIS	-	expression tag	UNP A0A0G9FES3

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	282	PRO	-	expression tag	UNP A0A0G9FES3
B	283	GLN	-	expression tag	UNP A0A0G9FES3
B	284	PHE	-	expression tag	UNP A0A0G9FES3
B	285	GLU	-	expression tag	UNP A0A0G9FES3
B	286	LYS	-	expression tag	UNP A0A0G9FES3
C	176	ALA	CYS	engineered mutation	UNP A0A0G9FES3
C	277	ALA	-	expression tag	UNP A0A0G9FES3
C	278	SER	-	expression tag	UNP A0A0G9FES3
C	279	TRP	-	expression tag	UNP A0A0G9FES3
C	280	SER	-	expression tag	UNP A0A0G9FES3
C	281	HIS	-	expression tag	UNP A0A0G9FES3
C	282	PRO	-	expression tag	UNP A0A0G9FES3
C	283	GLN	-	expression tag	UNP A0A0G9FES3
C	284	PHE	-	expression tag	UNP A0A0G9FES3
C	285	GLU	-	expression tag	UNP A0A0G9FES3
C	286	LYS	-	expression tag	UNP A0A0G9FES3
D	176	ALA	CYS	engineered mutation	UNP A0A0G9FES3
D	277	ALA	-	expression tag	UNP A0A0G9FES3
D	278	SER	-	expression tag	UNP A0A0G9FES3
D	279	TRP	-	expression tag	UNP A0A0G9FES3
D	280	SER	-	expression tag	UNP A0A0G9FES3
D	281	HIS	-	expression tag	UNP A0A0G9FES3
D	282	PRO	-	expression tag	UNP A0A0G9FES3
D	283	GLN	-	expression tag	UNP A0A0G9FES3
D	284	PHE	-	expression tag	UNP A0A0G9FES3
D	285	GLU	-	expression tag	UNP A0A0G9FES3
D	286	LYS	-	expression tag	UNP A0A0G9FES3
E	176	ALA	CYS	engineered mutation	UNP A0A0G9FES3
E	277	ALA	-	expression tag	UNP A0A0G9FES3
E	278	SER	-	expression tag	UNP A0A0G9FES3
E	279	TRP	-	expression tag	UNP A0A0G9FES3
E	280	SER	-	expression tag	UNP A0A0G9FES3
E	281	HIS	-	expression tag	UNP A0A0G9FES3
E	282	PRO	-	expression tag	UNP A0A0G9FES3
E	283	GLN	-	expression tag	UNP A0A0G9FES3
E	284	PHE	-	expression tag	UNP A0A0G9FES3
E	285	GLU	-	expression tag	UNP A0A0G9FES3
E	286	LYS	-	expression tag	UNP A0A0G9FES3
F	176	ALA	CYS	engineered mutation	UNP A0A0G9FES3
F	277	ALA	-	expression tag	UNP A0A0G9FES3
F	278	SER	-	expression tag	UNP A0A0G9FES3
F	279	TRP	-	expression tag	UNP A0A0G9FES3

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
F	280	SER	-	expression tag	UNP A0A0G9FES3
F	281	HIS	-	expression tag	UNP A0A0G9FES3
F	282	PRO	-	expression tag	UNP A0A0G9FES3
F	283	GLN	-	expression tag	UNP A0A0G9FES3
F	284	PHE	-	expression tag	UNP A0A0G9FES3
F	285	GLU	-	expression tag	UNP A0A0G9FES3
F	286	LYS	-	expression tag	UNP A0A0G9FES3

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



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

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

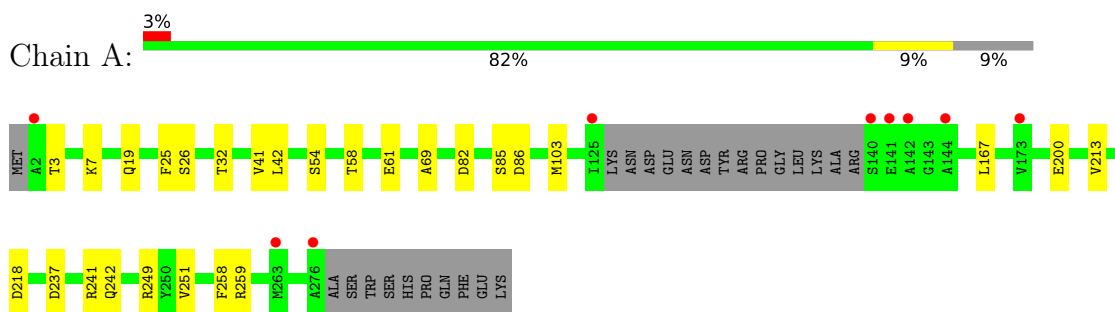
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	79	Total	O	0	0
			79	79		
4	B	160	Total	O	0	0
			160	160		
4	C	75	Total	O	0	0
			75	75		
4	D	42	Total	O	0	0
			42	42		
4	E	64	Total	O	0	0
			64	64		
4	F	73	Total	O	0	0
			73	73		

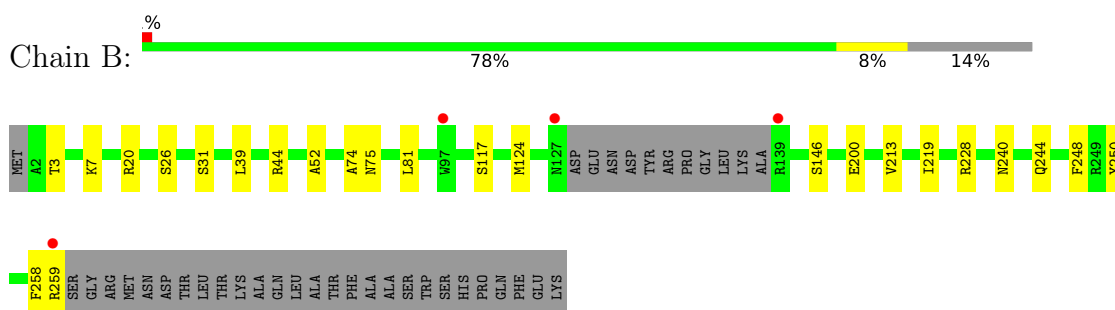
3 Residue-property plots [i](#)

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.

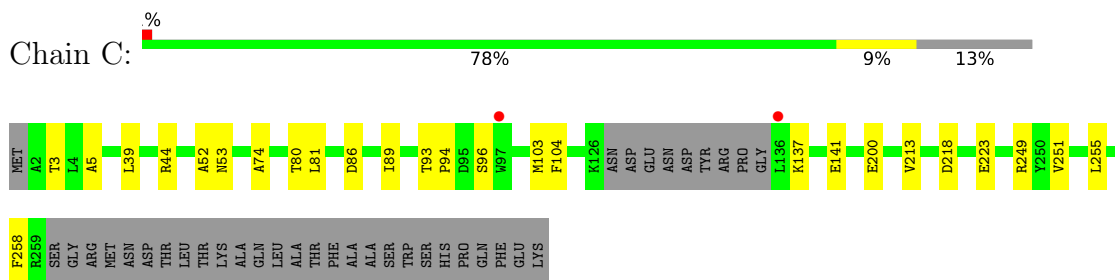
- Molecule 1: ATP-utilizing enzyme of the PP-loopsuperfamily



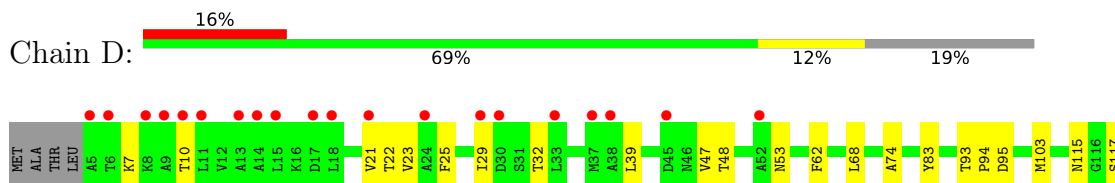
- Molecule 1: ATP-utilizing enzyme of the PP-loopsuperfamily

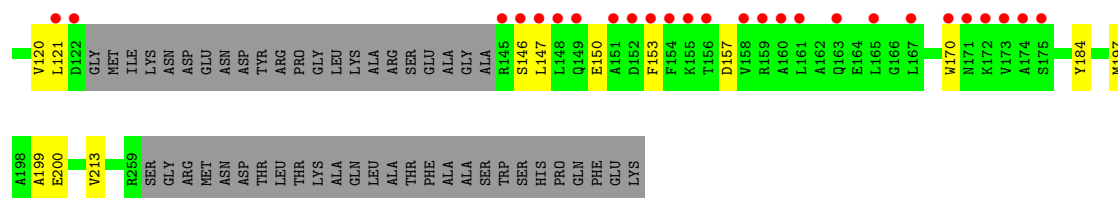


- Molecule 1: ATP-utilizing enzyme of the PP-loopsuperfamily



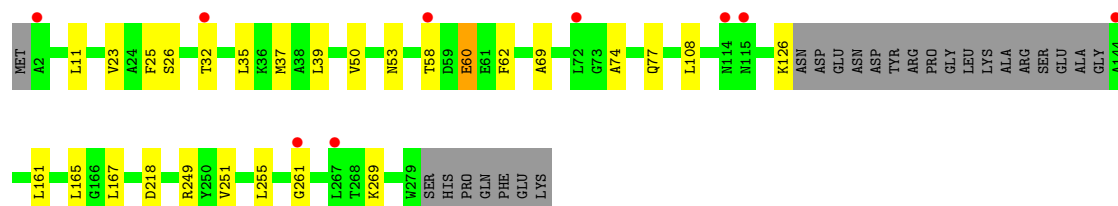
- Molecule 1: ATP-utilizing enzyme of the PP-loopsuperfamily





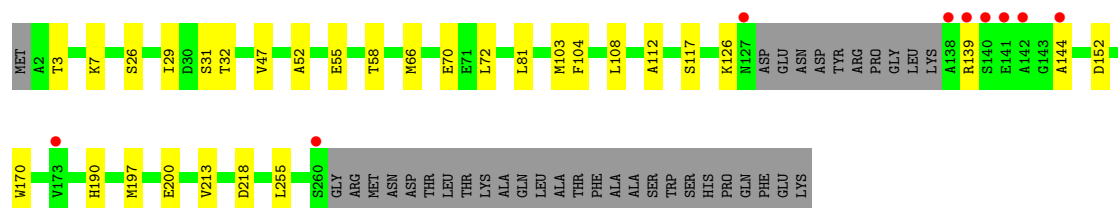
- Molecule 1: ATP-utilizing enzyme of the PP-loopsuperfamily

Chain E: 3% 82% 9% 9%



- Molecule 1: ATP-utilizing enzyme of the PP-loopsuperfamily

Chain F: 3% 77% 10% 13%



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 2 2	Depositor
Cell constants a, b, c, α , β , γ	108.66Å 108.66Å 328.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.67 – 2.35 48.67 – 2.35	Depositor EDS
% Data completeness (in resolution range)	99.4 (48.67-2.35) 99.3 (48.67-2.35)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.87 (at 2.34Å)	Xtriage
Refinement program	PHENIX 1.12-2829	Depositor
R, R_{free}	0.187 , 0.244 0.193 , 0.250	Depositor DCC
R_{free} test set	4135 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	41.9	Xtriage
Anisotropy	0.260	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 52.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	11913	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.43% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, PO4

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	0.34	0/2016	0.52	0/2735
1	B	0.41	0/1925	0.61	0/2610
1	C	0.35	0/1935	0.54	0/2622
1	D	0.31	0/1739	0.57	0/2369
1	E	0.32	0/2000	0.53	1/2715 (0.0%)
1	F	0.33	0/1926	0.52	0/2612
All	All	0.35	0/11541	0.55	1/15663 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	60	GLU	CB-CA-C	-5.47	102.05	110.81

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	1986	0	1941	17	0
1	B	1896	0	1853	15	0
1	C	1906	0	1875	17	0
1	D	1712	0	1570	22	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	1968	0	1914	18	0
1	F	1897	0	1854	17	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	0	0
2	E	5	0	0	0	0
2	F	5	0	0	0	0
3	A	5	0	0	1	0
3	B	5	0	0	3	0
3	C	5	0	0	0	0
3	E	5	0	0	1	0
3	F	5	0	0	2	0
4	A	79	0	0	2	0
4	B	160	0	0	0	0
4	C	75	0	0	2	0
4	D	42	0	0	1	0
4	E	64	0	0	1	0
4	F	73	0	0	0	0
All	All	11913	0	11007	103	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 5.

All (103) 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:F:26:SER:OG	3:F:302:SO4:O1	1.86	0.92
1:A:26:SER:OG	3:A:302:SO4:O2	1.94	0.85
1:B:31:SER:N	3:B:302:SO4:O2	2.09	0.84
1:B:26:SER:OG	3:B:302:SO4:O3	1.95	0.83
1:E:50:VAL:HG11	1:E:108:LEU:HD21	1.62	0.79
1:C:3:THR:HG22	1:C:5:ALA:H	1.53	0.74
1:F:126:LYS:HG3	1:F:152:ASP:HA	1.69	0.73
1:A:54:SER:O	4:A:401:HOH:O	2.08	0.71
1:F:31:SER:N	3:F:302:SO4:O3	2.16	0.70
1:E:23:VAL:HG21	1:E:35:LEU:HD12	1.78	0.66
1:E:126:LYS:O	4:E:401:HOH:O	2.13	0.66
1:E:58:THR:HG22	1:E:60:GLU:H	1.61	0.64
1:A:82:ASP:OD2	1:A:85:SER:HB3	1.98	0.64
1:E:11:LEU:HD23	1:E:37:MET:HE2	1.79	0.64

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:44:ARG:NH2	4:C:401:HOH:O	2.31	0.63
1:F:139:ARG:HG2	1:F:144:ALA:HB3	1.81	0.63
1:A:237:ASP:OD1	1:A:241:ARG:NH1	2.32	0.62
1:D:23:VAL:HG12	1:D:121:LEU:HB2	1.82	0.62
1:D:93:THR:OG1	1:D:95:ASP:OD1	2.16	0.62
1:D:22:THR:HG22	1:D:48:THR:HB	1.83	0.61
1:C:93:THR:HG22	1:C:94:PRO:HD2	1.84	0.59
1:D:94:PRO:HA	1:D:184:TYR:CE2	2.38	0.58
1:A:242:GLN:NE2	4:A:404:HOH:O	2.38	0.57
1:D:22:THR:HG21	1:D:115:ASN:HD21	1.70	0.56
1:A:3:THR:O	1:A:7:LYS:HG3	2.05	0.56
1:B:31:SER:HB3	3:B:302:SO4:O2	2.05	0.56
1:C:137:LYS:O	1:C:141:GLU:HG3	2.06	0.55
1:C:89:ILE:HA	1:C:96:SER:HB3	1.89	0.54
1:D:200:GLU:HG2	1:D:213:VAL:HG13	1.88	0.54
1:B:39:LEU:HD11	1:B:74:ALA:HB2	1.87	0.54
1:A:86:ASP:HB2	1:A:103:MET:HE1	1.89	0.54
1:B:200:GLU:HG2	1:B:213:VAL:HG23	1.90	0.53
1:C:200:GLU:HG2	1:C:213:VAL:HG23	1.91	0.52
1:E:161:LEU:O	1:E:165:LEU:HG	2.10	0.52
1:B:20:ARG:HG2	1:B:117:SER:HA	1.92	0.51
1:C:53:ASN:O	1:C:80:THR:HA	2.10	0.51
1:C:39:LEU:HD11	1:C:74:ALA:HB2	1.91	0.51
1:B:258:PHE:O	1:B:259:ARG:HB2	2.10	0.51
1:E:50:VAL:HG11	1:E:108:LEU:CD2	2.38	0.51
1:C:53:ASN:ND2	4:C:406:HOH:O	2.43	0.51
1:F:58:THR:HG22	1:F:197:MET:HE3	1.92	0.50
1:F:66:MET:O	1:F:70:GLU:HG2	2.11	0.50
1:F:200:GLU:HG2	1:F:213:VAL:HG23	1.93	0.50
1:D:22:THR:O	1:D:120:VAL:HA	2.10	0.50
1:E:50:VAL:HA	1:E:77:GLN:O	2.12	0.50
1:C:218:ASP:HB2	1:C:249:ARG:HB3	1.94	0.50
1:D:83:TYR:HA	1:D:103:MET:HE1	1.94	0.49
1:F:52:ALA:HB2	1:F:104:PHE:CE2	2.48	0.49
1:D:29:ILE:O	1:D:32:THR:HB	2.12	0.49
1:D:68:LEU:CD2	1:D:170:TRP:HA	2.43	0.48
1:E:53:ASN:HB2	1:E:62:PHE:CD1	2.48	0.48
1:D:53:ASN:HB2	1:D:62:PHE:CE1	2.48	0.48
1:D:199:ALA:HB3	1:D:213:VAL:HG21	1.96	0.48
1:C:223:GLU:HB3	1:C:258:PHE:HA	1.96	0.47
1:D:21:VAL:O	1:D:47:VAL:HA	2.14	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:68:LEU:HD22	1:D:170:TRP:HA	1.95	0.47
1:C:251:VAL:HG12	1:E:255:LEU:HD12	1.97	0.47
1:E:39:LEU:HD11	1:E:74:ALA:HB2	1.96	0.47
1:C:81:LEU:HD11	1:C:104:PHE:HD2	1.79	0.47
1:A:19:GLN:O	1:A:42:LEU:HD13	2.14	0.46
1:A:258:PHE:CZ	1:A:259:ARG:HD3	2.51	0.46
1:D:146:SER:O	1:D:150:GLU:HG3	2.16	0.46
1:A:41:VAL:HG12	1:A:42:LEU:HD23	1.98	0.46
1:D:147:LEU:HA	1:D:150:GLU:CD	2.40	0.46
1:D:7:LYS:O	1:D:10:THR:OG1	2.28	0.46
1:D:25:PHE:HE2	1:D:32:THR:HA	1.81	0.46
1:B:219:ILE:HG12	1:B:250:TYR:HB2	1.98	0.45
1:D:153:PHE:HA	1:D:157:ASP:OD2	2.17	0.45
1:E:25:PHE:CD1	1:E:69:ALA:HB2	2.52	0.44
1:E:261:GLY:O	1:E:269:LYS:HD3	2.17	0.44
1:A:200:GLU:HG2	1:A:213:VAL:HG23	2.00	0.44
1:F:104:PHE:CZ	1:F:108:LEU:HD11	2.53	0.44
1:C:86:ASP:HB2	1:C:103:MET:HE1	2.00	0.44
1:C:103:MET:HE2	1:C:103:MET:HB2	1.81	0.44
1:F:55:GLU:CD	1:F:190:HIS:HD1	2.24	0.44
1:B:124:MET:HB2	1:B:146:SER:HB3	2.00	0.43
1:D:22:THR:HG23	1:D:117:SER:OG	2.18	0.43
1:A:25:PHE:CD2	1:A:69:ALA:HB2	2.53	0.43
1:D:39:LEU:HD11	1:D:74:ALA:HB2	2.01	0.43
1:F:81:LEU:HD22	1:F:103:MET:HG2	2.00	0.43
1:A:58:THR:OG1	1:A:61:GLU:OE1	2.34	0.43
1:F:3:THR:O	1:F:7:LYS:HG3	2.18	0.43
1:E:218:ASP:HB2	1:E:249:ARG:HB3	2.01	0.42
1:E:32:THR:HG22	1:E:167:LEU:HD13	2.00	0.42
1:C:52:ALA:HB2	1:C:104:PHE:HE2	1.84	0.42
1:E:50:VAL:CG1	1:E:108:LEU:HD21	2.41	0.42
1:F:32:THR:HG23	1:F:72:LEU:HD11	2.02	0.42
1:F:112:ALA:HB1	1:F:117:SER:HB2	2.02	0.42
1:B:240:ASN:O	1:B:244:GLN:HG3	2.19	0.42
1:B:244:GLN:HA	1:B:248:PHE:O	2.20	0.42
1:A:32:THR:HG22	1:A:167:LEU:HD13	2.02	0.41
1:B:3:THR:O	1:B:7:LYS:HG3	2.20	0.41
1:B:228:ARG:HH11	1:B:228:ARG:HG3	1.85	0.41
1:E:26:SER:OG	3:E:302:SO4:O3	2.38	0.41
1:B:44:ARG:HH11	1:B:75:ASN:ND2	2.18	0.41
1:A:218:ASP:HB2	1:A:249:ARG:HB3	2.03	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:52:ALA:HB1	1:B:81:LEU:HD12	2.02	0.41
1:F:29:ILE:HD12	1:F:170:TRP:CZ2	2.56	0.40
1:C:255:LEU:HD12	1:E:251:VAL:HG12	2.03	0.40
1:A:218:ASP:OD1	1:A:218:ASP:N	2.54	0.40
1:A:251:VAL:HG12	1:F:255:LEU:HD12	2.03	0.40
1:D:197:MET:HE1	4:D:404:HOH:O	2.21	0.40
1:F:218:ASP:OD1	1:F:218:ASP:N	2.55	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	257/286 (90%)	251 (98%)	6 (2%)	0	100	100
1	B	243/286 (85%)	238 (98%)	5 (2%)	0	100	100
1	C	245/286 (86%)	239 (98%)	6 (2%)	0	100	100
1	D	229/286 (80%)	222 (97%)	7 (3%)	0	100	100
1	E	257/286 (90%)	250 (97%)	7 (3%)	0	100	100
1	F	245/286 (86%)	238 (97%)	7 (3%)	0	100	100
All	All	1476/1716 (86%)	1438 (97%)	38 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

The Analysed column shows the number of residues for which the sidechain conformation was

analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	204/235 (87%)	204 (100%)	0	100	100
1	B	196/235 (83%)	196 (100%)	0	100	100
1	C	197/235 (84%)	197 (100%)	0	100	100
1	D	162/235 (69%)	162 (100%)	0	100	100
1	E	198/235 (84%)	198 (100%)	0	100	100
1	F	194/235 (83%)	193 (100%)	1 (0%)	81	89
All	All	1151/1410 (82%)	1150 (100%)	1 (0%)	88	94

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	47	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	46	ASN
1	A	171	ASN
1	B	75	ASN
1	B	88	HIS
1	C	46	ASN
1	C	109	ASN
1	D	46	ASN
1	D	75	ASN
1	D	77	GLN
1	D	88	HIS
1	E	88	HIS
1	E	264	ASN
1	F	77	GLN
1	F	88	HIS
1	F	114	ASN
1	F	149	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

11 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	PO4	E	301	-	4,4,4	1.16	0	6,6,6	1.20	0
2	PO4	A	301	-	4,4,4	1.51	0	6,6,6	0.72	0
2	PO4	C	301	-	4,4,4	1.15	0	6,6,6	0.79	0
2	PO4	D	301	-	4,4,4	1.04	0	6,6,6	0.79	0
3	SO4	A	302	-	4,4,4	0.26	0	6,6,6	0.26	0
3	SO4	F	302	-	4,4,4	0.23	0	6,6,6	0.31	0
2	PO4	B	301	-	4,4,4	0.85	0	6,6,6	0.35	0
3	SO4	B	302	-	4,4,4	0.47	0	6,6,6	0.63	0
3	SO4	E	302	-	4,4,4	0.29	0	6,6,6	0.38	0
3	SO4	C	302	-	4,4,4	0.19	0	6,6,6	0.25	0
2	PO4	F	301	-	4,4,4	1.17	0	6,6,6	0.90	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	302	SO4	1	0
3	F	302	SO4	2	0
3	B	302	SO4	3	0
3	E	302	SO4	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	261/286 (91%)	0.03	9 (3%)	48	55	34, 53, 77, 117	0
1	B	247/286 (86%)	-0.41	4 (1%)	70	76	27, 40, 58, 82	0
1	C	249/286 (87%)	-0.16	2 (0%)	82	86	32, 50, 75, 85	0
1	D	233/286 (81%)	0.93	46 (19%)	3	3	36, 78, 139, 156	0
1	E	261/286 (91%)	0.33	9 (3%)	48	55	32, 64, 90, 108	0
1	F	249/286 (87%)	-0.07	9 (3%)	46	52	31, 52, 78, 118	0
All	All	1500/1716 (87%)	0.10	79 (5%)	32	37	27, 53, 101, 156	0

All (79) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	5	ALA	5.8
1	C	97	TRP	5.1
1	D	158	VAL	4.8
1	D	173	VAL	4.5
1	D	29	ILE	4.4
1	D	174	ALA	4.3
1	D	153	PHE	4.3
1	F	138	ALA	3.9
1	D	159	ARG	3.9
1	A	140	SER	3.8
1	D	171	ASN	3.7
1	D	154	PHE	3.7
1	D	45	ASP	3.6
1	D	145	ARG	3.5
1	F	127	ASN	3.5
1	D	163	GLN	3.5
1	A	142	ALA	3.4
1	D	33	LEU	3.4
1	D	165	LEU	3.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	F	141	GLU	3.3
1	D	151	ALA	3.3
1	E	144	ALA	3.3
1	D	147	LEU	3.3
1	D	148	LEU	3.3
1	A	141	GLU	3.3
1	E	2	ALA	3.1
1	D	17	ASP	3.1
1	C	136	LEU	3.1
1	A	2	ALA	3.1
1	D	172	LYS	3.0
1	E	115	ASN	3.0
1	D	122	ASP	3.0
1	D	9	ALA	2.9
1	D	10	THR	2.9
1	A	173	VAL	2.9
1	D	15	LEU	2.9
1	D	152	ASP	2.8
1	E	114	ASN	2.8
1	B	139	ARG	2.8
1	D	30	ASP	2.8
1	E	72	LEU	2.7
1	D	155	LYS	2.7
1	D	121	LEU	2.7
1	D	160	ALA	2.6
1	D	6	THR	2.6
1	D	11	LEU	2.6
1	E	267	LEU	2.6
1	D	13	ALA	2.6
1	F	144	ALA	2.5
1	D	170	TRP	2.5
1	D	175	SER	2.5
1	A	276	ALA	2.5
1	D	18	LEU	2.5
1	D	167	LEU	2.5
1	D	14	ALA	2.5
1	F	140	SER	2.4
1	D	161	LEU	2.4
1	D	146	SER	2.3
1	F	173	VAL	2.3
1	B	127	ASN	2.3
1	B	97	TRP	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	F	260	SER	2.3
1	D	37	MET	2.3
1	E	58	THR	2.2
1	D	8	LYS	2.2
1	A	125	ILE	2.2
1	E	261	GLY	2.2
1	B	259	ARG	2.1
1	A	144	ALA	2.1
1	D	38	ALA	2.1
1	D	52	ALA	2.1
1	F	142	ALA	2.1
1	D	156	THR	2.1
1	E	32	THR	2.1
1	D	24	ALA	2.1
1	D	149	GLN	2.1
1	D	21	VAL	2.1
1	A	263	MET	2.0
1	F	139	ARG	2.0

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($\text{\AA}^2$)	Q<0.9
3	SO4	B	302	5/5	0.75	0.25	45,53,57,64	5
3	SO4	F	302	5/5	0.82	0.15	46,65,71,72	5
3	SO4	C	302	5/5	0.88	0.20	49,73,78,79	5
3	SO4	A	302	5/5	0.88	0.14	51,53,63,64	5
3	SO4	E	302	5/5	0.89	0.14	47,58,68,72	5

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	PO4	B	301	5/5	0.92	0.15	31,32,44,86	0
2	PO4	D	301	5/5	0.96	0.09	49,50,55,63	0
2	PO4	F	301	5/5	0.98	0.06	37,41,51,52	0
2	PO4	A	301	5/5	0.98	0.07	42,42,47,57	0
2	PO4	C	301	5/5	0.99	0.04	44,45,49,54	0
2	PO4	E	301	5/5	0.99	0.04	39,39,45,51	0

6.5 Other polymers [i](#)

There are no such residues in this entry.