



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 11:12 AM UTC

PDB ID : 3NQ4 / pdb_00003nq4
Title : 30mer structure of Lumazine synthase from Salmonella typhimurium LT2
Authors : Kumar, P.; Singh, M.; Karthikeyan, S.
Deposited on : 2010-06-29
Resolution : 3.50 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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

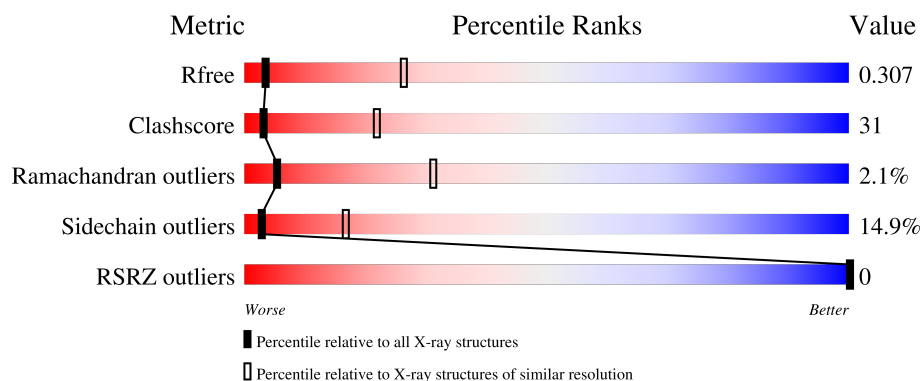
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.50 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.



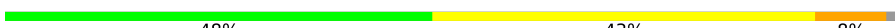
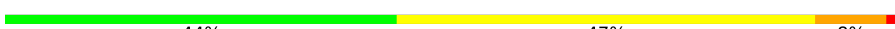
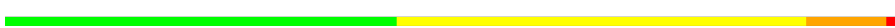
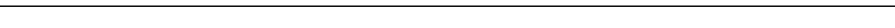
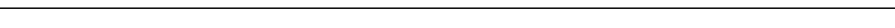
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1085 (3.54-3.46)
Clashscore	190562	1140 (3.54-3.46)
Ramachandran outliers	187476	1113 (3.54-3.46)
Sidechain outliers	187428	1114 (3.54-3.46)
RSRZ outliers	180081	1084 (3.54-3.46)

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	1	156	
1	2	156	
1	3	156	
1	4	156	
1	A	156	

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Mol	Chain	Length	Quality of chain
1	B	156	 47% 47% 5% .
1	C	156	 44% 46% 8% ..
1	D	156	 47% 40% 10% ..
1	E	156	 48% 43% 8% .
1	F	156	 44% 47% 8% ..
1	G	156	 44% 46% 9% ..
1	H	156	 50% 41% 7% ..
1	I	156	 49% 44% 6% .
1	J	156	 47% 43% 8% .
1	K	156	 51% 40% 7% ..
1	L	156	 53% 39% 6% ..
1	M	156	 51% 40% 7% .
1	N	156	 46% 46% 8% .
1	O	156	 51% 42% 6% .
1	P	156	 41% 47% 10% ..
1	Q	156	 47% 42% 9% ..
1	R	156	 45% 45% 9% .
1	S	156	 42% 47% 10% .
1	T	156	 51% 40% 8% .
1	U	156	 47% 42% 10% .
1	V	156	 42% 49% 8% .
1	W	156	 52% 41% 6% .
1	X	156	 45% 44% 9% ..
1	Y	156	 50% 41% 7% ..
1	Z	156	 49% 43% 6% ..

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
2	SO4	1	157	-	-	X	-
2	SO4	F	158	-	-	X	-
2	SO4	H	157	-	-	X	-

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 33262 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 6,7-dimethyl-8-ribityllumazine synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	B	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	C	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	D	154	Total	C	N	O	S	0	0	0
			1106	699	188	217	2			
1	E	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	F	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	G	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	H	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	I	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	J	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	K	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	L	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	M	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	N	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	O	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	P	154	Total	C	N	O	S	0	0	0
			1099	695	187	215	2			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	Q	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	R	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	S	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	T	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	U	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	V	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	W	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	X	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	Y	154	Total	C	N	O	S	0	0	0
			1099	695	187	215	2			
1	Z	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	1	154	Total	C	N	O	S	0	0	0
			1106	699	188	217	2			
1	2	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	3	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			
1	4	154	Total	C	N	O	S	0	0	0
			1102	696	187	217	2			

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		
2	E	1	Total	O	S	0	0
			5	4	1		
2	F	1	Total	O	S	0	0
			5	4	1		
2	F	1	Total	O	S	0	0
			5	4	1		
2	G	1	Total	O	S	0	0
			5	4	1		
2	H	1	Total	O	S	0	0
			5	4	1		
2	H	1	Total	O	S	0	0
			5	4	1		
2	H	1	Total	O	S	0	0
			5	4	1		
2	J	1	Total	O	S	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	K	1	Total	O	S	0	0
			5	4	1		
2	L	1	Total	O	S	0	0
			5	4	1		
2	L	1	Total	O	S	0	0
			5	4	1		
2	M	1	Total	O	S	0	0
			5	4	1		
2	M	1	Total	O	S	0	0
			5	4	1		
2	M	1	Total	O	S	0	0
			5	4	1		
2	N	1	Total	O	S	0	0
			5	4	1		
2	P	1	Total	O	S	0	0
			5	4	1		
2	Q	1	Total	O	S	0	0
			5	4	1		
2	Q	1	Total	O	S	0	0
			5	4	1		
2	Q	1	Total	O	S	0	0
			5	4	1		
2	R	1	Total	O	S	0	0
			5	4	1		
2	S	1	Total	O	S	0	0
			5	4	1		
2	U	1	Total	O	S	0	0
			5	4	1		
2	V	1	Total	O	S	0	0
			5	4	1		
2	V	1	Total	O	S	0	0
			5	4	1		
2	X	1	Total	O	S	0	0
			5	4	1		
2	X	1	Total	O	S	0	0
			5	4	1		
2	Z	1	Total	O	S	0	0
			5	4	1		
2	Z	1	Total	O	S	0	0
			5	4	1		
2	1	1	Total	O	S	0	0
			5	4	1		

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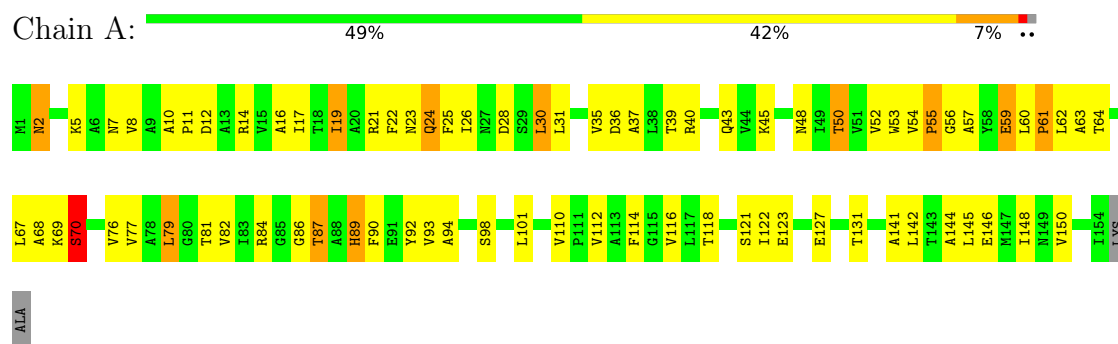
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	1	1	Total	O	S	0	0
			5	4	1		
2	2	1	Total	O	S	0	0
			5	4	1		
2	2	1	Total	O	S	0	0
			5	4	1		
2	2	1	Total	O	S	0	0
			5	4	1		
2	3	1	Total	O	S	0	0
			5	4	1		

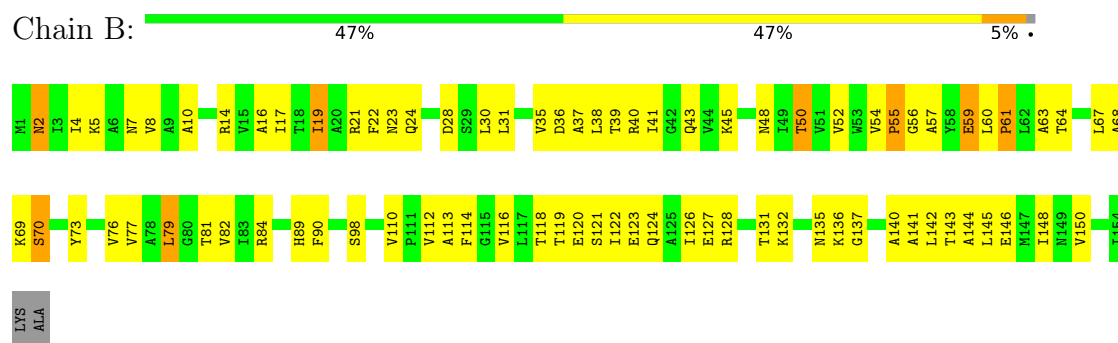
3 Residue-property plots [i](#)

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.

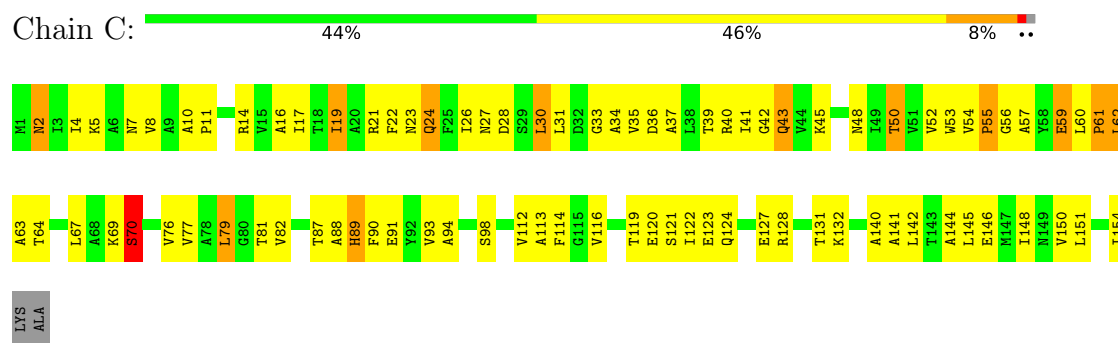
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase



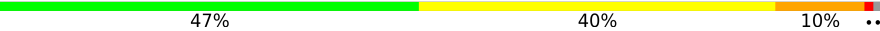
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

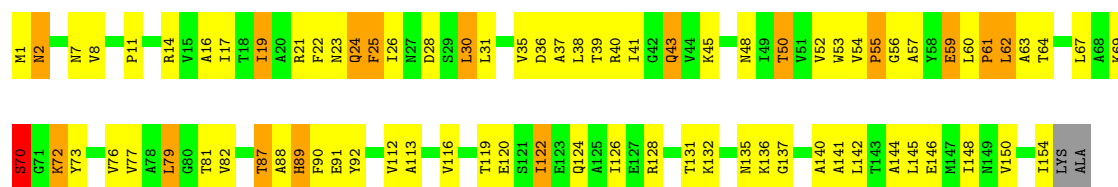


- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase



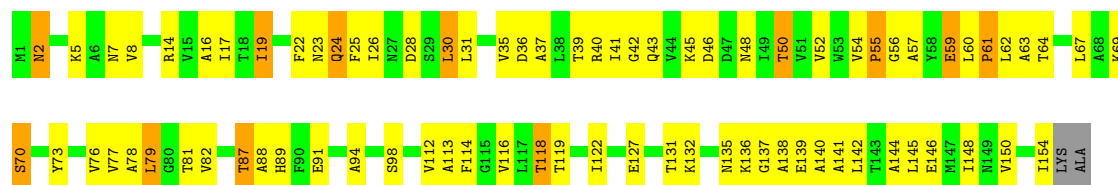
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain D:  47% 40% 10% ..

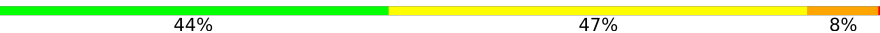


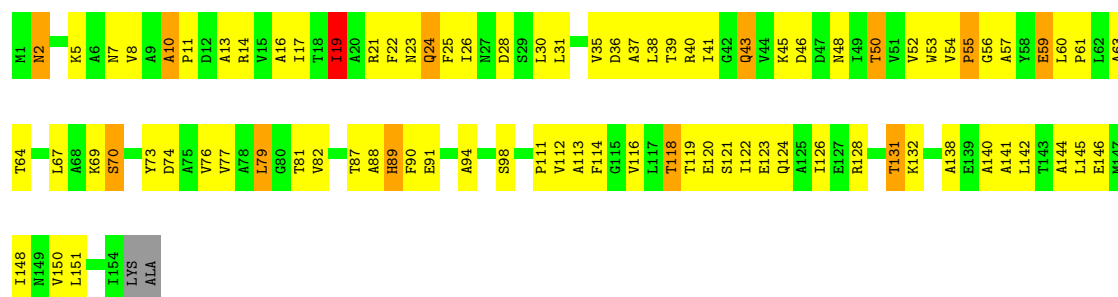
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain E:  48% 43% 8% .

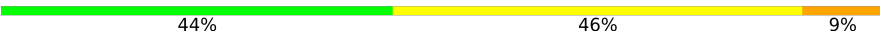


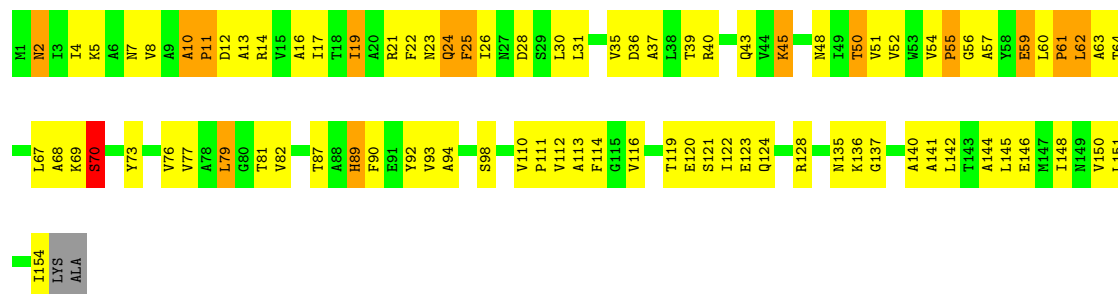
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain F:  44% 47% 8% ..



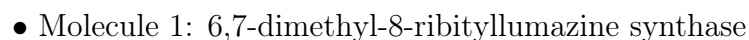
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain G:  44% 46% 9% ..

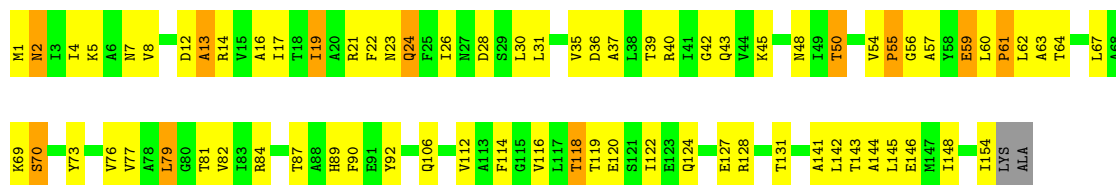


• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

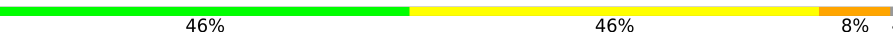
Chain H:  50% 41% 7% ..

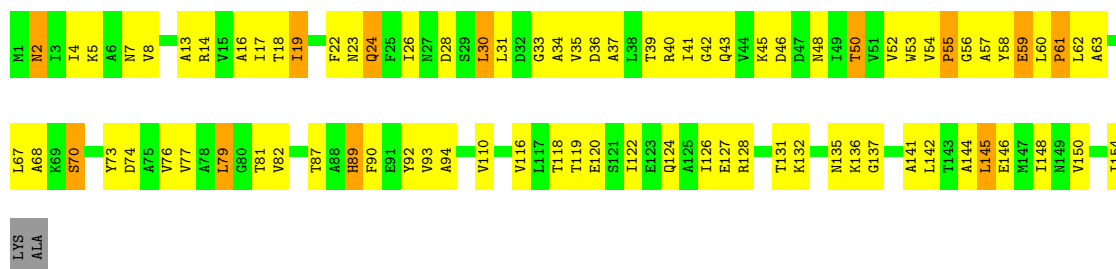


Chain M:  51% 40% 7% .



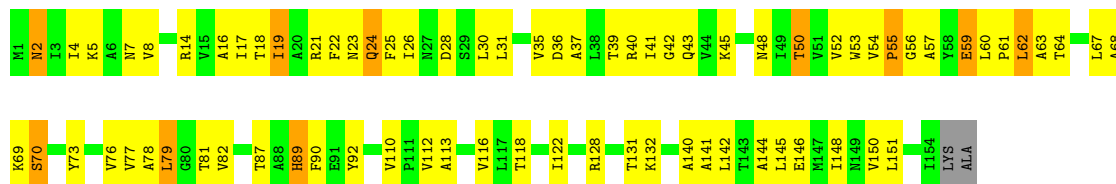
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain N:  46% 46% 8% .

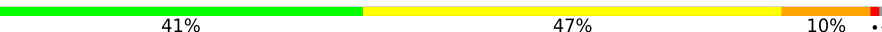


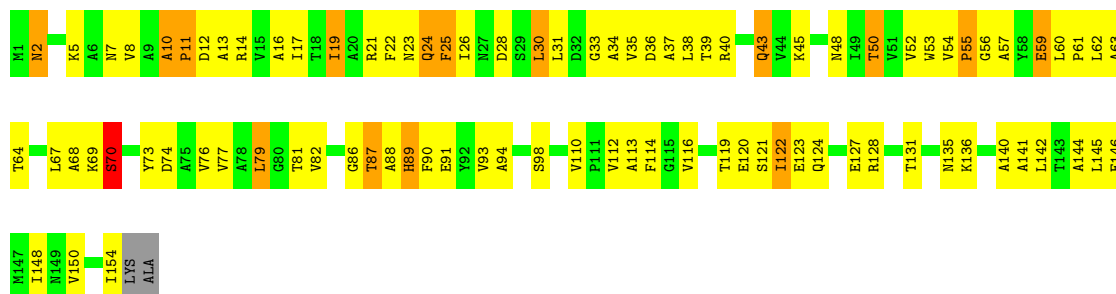
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain O:  51% 42% 6% .

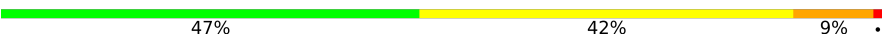


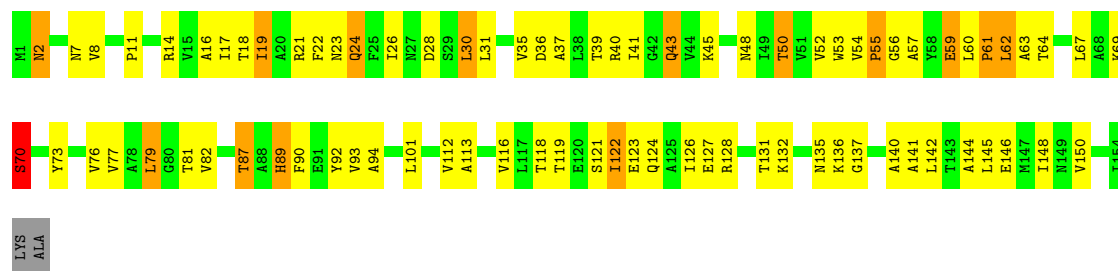
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain P:  41% 47% 10% ..



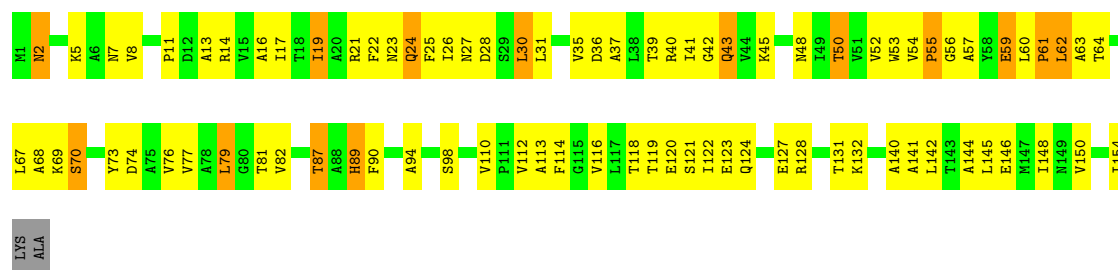
• Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain Q:  47% 42% 9% ..



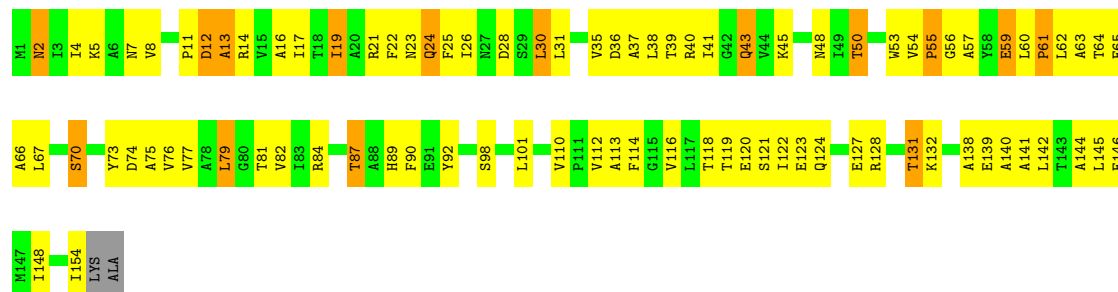
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain R: 45% 45% 9% .



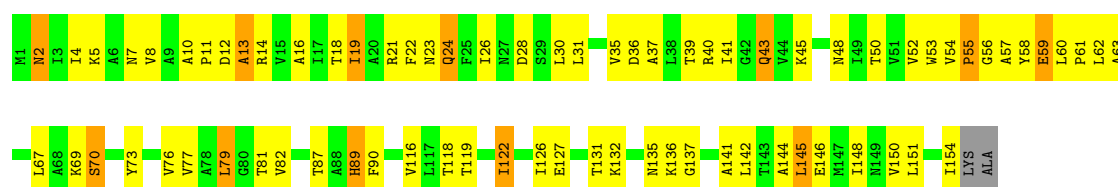
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain S: 42% 47% 10% .



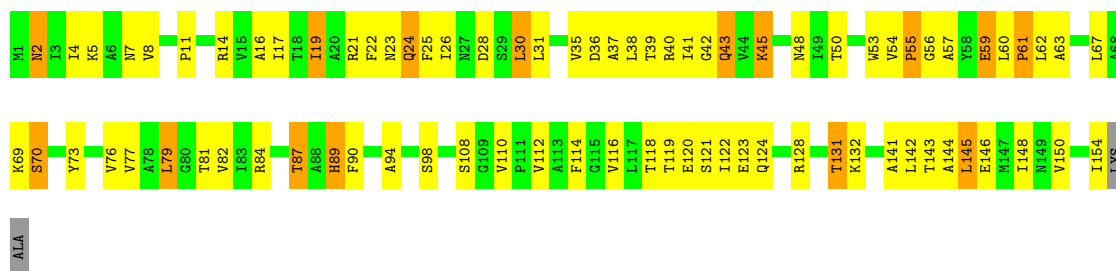
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain T: 51% 40% 8% .



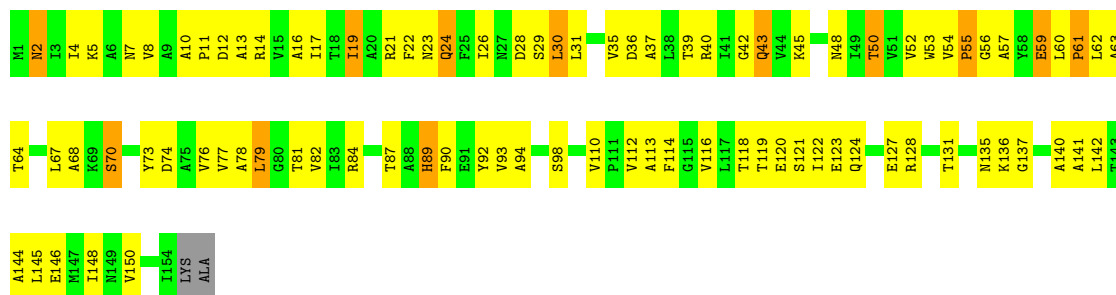
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain U: 47% 42% 10% .



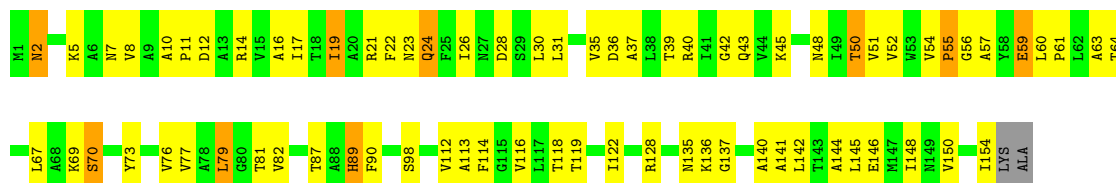
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain V: 42% 49% 8% .



- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain W: 52% 41% 6% .



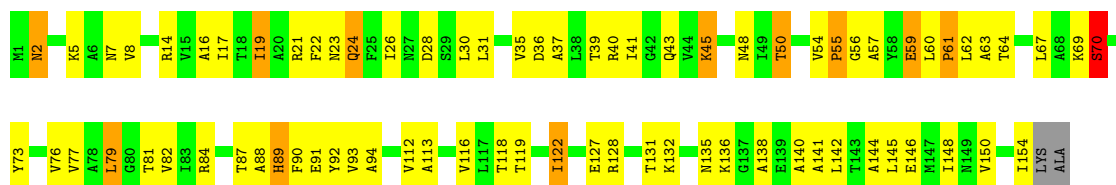
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain X: 45% 44% 9% ..



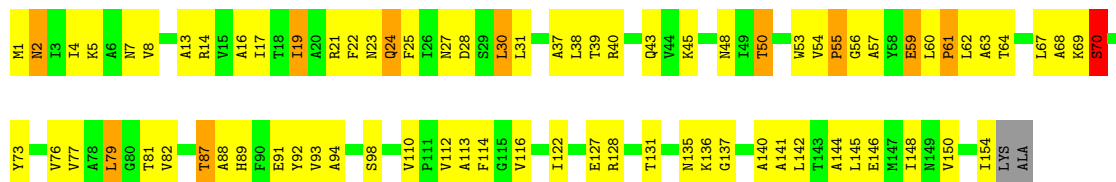
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain Y: 50% 41% 7% ..



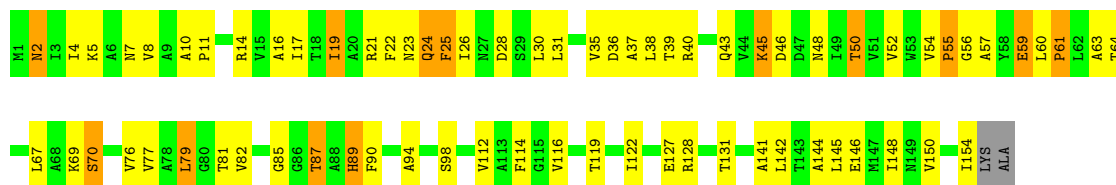
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain Z: 49% 43% 6% ..



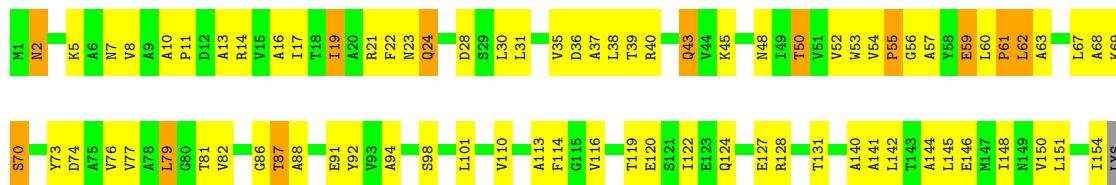
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain 1: 53% 37% 8% .



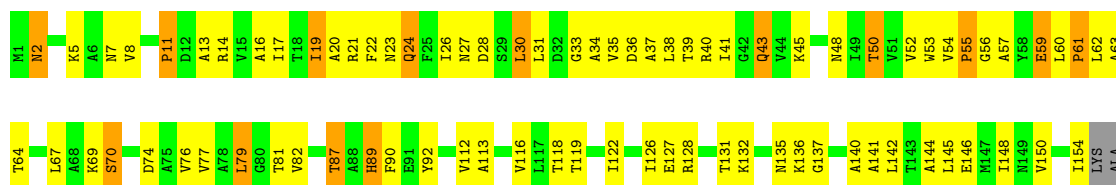
- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain 2: 48% 43% 8% .



- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

Chain 3: 47% 43% 9% .



- Molecule 1: 6,7-dimethyl-8-ribityllumazine synthase

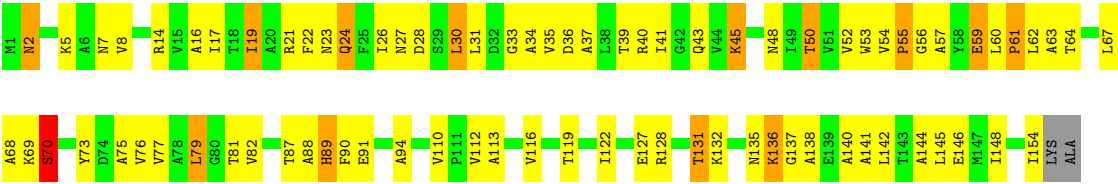
Chain 4:

47%

42%

8%

..



4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	174.43Å 157.49Å 202.79Å 90.00° 91.58° 90.00°	Depositor
Resolution (Å)	78.75 – 3.50 78.75 – 3.50	Depositor EDS
% Data completeness (in resolution range)	66.0 (78.75-3.50) 62.2 (78.75-3.50)	Depositor EDS
R_{merge}	0.26	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.71 (at 3.49Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.1_357)	Depositor
R, R_{free}	0.255 , 0.299 0.266 , 0.307	Depositor DCC
R_{free} test set	1139 reflections (2.50%)	wwPDB-VP
Wilson B-factor (Å ²)	31.8	Xtriage
Anisotropy	0.291	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 34.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.39$, $\langle L^2 \rangle = 0.21$	Xtriage
Estimated twinning fraction	0.079 for h,-k,-l	Xtriage
F_o, F_c correlation	0.87	EDS
Total number of atoms	33262	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.30% 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, 0.333 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: SO4

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	1	0.54	0/1119	0.86	3/1524 (0.2%)
1	2	0.56	0/1115	0.87	2/1520 (0.1%)
1	3	0.58	0/1115	0.86	1/1520 (0.1%)
1	4	0.58	0/1115	0.89	2/1520 (0.1%)
1	A	0.57	0/1115	0.85	3/1520 (0.2%)
1	B	0.56	0/1115	0.86	3/1520 (0.2%)
1	C	0.57	0/1115	0.86	3/1520 (0.2%)
1	D	0.53	0/1119	0.88	2/1524 (0.1%)
1	E	0.60	0/1115	0.85	1/1520 (0.1%)
1	F	0.56	0/1115	0.97	7/1520 (0.5%)
1	G	0.57	0/1115	0.98	3/1520 (0.2%)
1	H	0.55	0/1115	0.91	3/1520 (0.2%)
1	I	0.55	0/1115	0.87	2/1520 (0.1%)
1	J	0.53	0/1115	0.93	3/1520 (0.2%)
1	K	0.59	0/1115	0.87	1/1520 (0.1%)
1	L	0.55	0/1115	0.85	2/1520 (0.1%)
1	M	0.58	0/1115	0.84	1/1520 (0.1%)
1	N	0.61	0/1115	0.87	1/1520 (0.1%)
1	O	0.54	0/1115	0.86	1/1520 (0.1%)
1	P	0.57	0/1112	0.85	3/1516 (0.2%)
1	Q	0.53	0/1115	0.85	1/1520 (0.1%)
1	R	0.58	0/1115	0.84	1/1520 (0.1%)
1	S	0.55	0/1115	0.90	3/1520 (0.2%)
1	T	0.55	0/1115	0.88	3/1520 (0.2%)
1	U	0.58	0/1115	0.90	4/1520 (0.3%)
1	V	0.54	0/1115	0.87	3/1520 (0.2%)
1	W	0.53	0/1115	0.88	3/1520 (0.2%)
1	X	0.56	0/1115	0.92	5/1520 (0.3%)
1	Y	0.53	0/1112	0.86	1/1516 (0.1%)
1	Z	0.56	0/1115	0.85	2/1520 (0.1%)
All	All	0.56	0/33452	0.88	73/45600 (0.2%)

There are no bond length outliers.

The worst 5 of 73 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	10	ALA	CA-C-N	12.90	135.97	119.84
1	G	10	ALA	C-N-CA	12.90	135.97	119.84
1	H	10	ALA	CA-C-N	9.31	131.48	119.84
1	H	10	ALA	C-N-CA	9.31	131.48	119.84
1	F	10	ALA	CA-C-N	9.06	131.16	119.84

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	1	1106	0	1126	67	0
1	2	1102	0	1115	74	0
1	3	1102	0	1115	76	0
1	4	1102	0	1115	84	0
1	A	1102	0	1115	68	0
1	B	1102	0	1115	72	0
1	C	1102	0	1115	88	0
1	D	1106	0	1126	89	0
1	E	1102	0	1115	77	0
1	F	1102	0	1115	95	0
1	G	1102	0	1115	78	0
1	H	1102	0	1115	76	0
1	I	1102	0	1115	74	0
1	J	1102	0	1115	85	0
1	K	1102	0	1115	73	0
1	L	1102	0	1115	71	0
1	M	1102	0	1115	77	0
1	N	1102	0	1115	89	0
1	O	1102	0	1115	78	0
1	P	1099	0	1113	83	0
1	Q	1102	0	1115	79	0
1	R	1102	0	1115	85	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	S	1102	0	1115	90	0
1	T	1102	0	1115	74	0
1	U	1102	0	1115	87	0
1	V	1102	0	1115	86	0
1	W	1102	0	1115	58	0
1	X	1102	0	1115	77	0
1	Y	1099	0	1113	82	0
1	Z	1102	0	1115	67	0
2	1	10	0	0	3	0
2	2	15	0	0	1	0
2	3	5	0	0	0	0
2	A	5	0	0	1	0
2	B	5	0	0	0	0
2	C	10	0	0	0	0
2	D	10	0	0	1	0
2	E	5	0	0	0	0
2	F	10	0	0	3	0
2	G	5	0	0	0	0
2	H	15	0	0	4	0
2	J	5	0	0	1	0
2	K	5	0	0	0	0
2	L	10	0	0	0	0
2	M	15	0	0	0	0
2	N	5	0	0	0	0
2	P	5	0	0	1	0
2	Q	15	0	0	1	0
2	R	5	0	0	0	0
2	S	5	0	0	0	0
2	U	5	0	0	0	0
2	V	10	0	0	0	0
2	X	10	0	0	0	0
2	Z	10	0	0	0	0
All	All	33262	0	33468	2081	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 31.

The worst 5 of 2081 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:P:11:PRO:HB3	1:P:43:GLN:HB3	1.41	1.03

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:11:PRO:HB3	1:F:43:GLN:HB3	1.40	1.01
1:S:7:ASN:ND2	1:Y:41:ILE:HA	1.77	0.99
1:P:122:ILE:HD12	1:P:122:ILE:H	1.28	0.98
1:S:41:ILE:HA	1:Y:7:ASN:ND2	1.82	0.95

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	1	152/156 (97%)	127 (84%)	21 (14%)	4 (3%)	4	27
1	2	152/156 (97%)	122 (80%)	28 (18%)	2 (1%)	9	39
1	3	152/156 (97%)	124 (82%)	24 (16%)	4 (3%)	4	27
1	4	152/156 (97%)	126 (83%)	22 (14%)	4 (3%)	4	27
1	A	152/156 (97%)	124 (82%)	25 (16%)	3 (2%)	6	32
1	B	152/156 (97%)	124 (82%)	26 (17%)	2 (1%)	9	39
1	C	152/156 (97%)	127 (84%)	22 (14%)	3 (2%)	6	32
1	D	152/156 (97%)	124 (82%)	24 (16%)	4 (3%)	4	27
1	E	152/156 (97%)	121 (80%)	27 (18%)	4 (3%)	4	27
1	F	152/156 (97%)	122 (80%)	28 (18%)	2 (1%)	9	39
1	G	152/156 (97%)	122 (80%)	25 (16%)	5 (3%)	3	23
1	H	152/156 (97%)	123 (81%)	25 (16%)	4 (3%)	4	27
1	I	152/156 (97%)	121 (80%)	29 (19%)	2 (1%)	9	39
1	J	152/156 (97%)	125 (82%)	25 (16%)	2 (1%)	9	39
1	K	152/156 (97%)	122 (80%)	27 (18%)	3 (2%)	6	32
1	L	152/156 (97%)	126 (83%)	24 (16%)	2 (1%)	9	39

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	M	152/156 (97%)	123 (81%)	25 (16%)	4 (3%)	4	27
1	N	152/156 (97%)	126 (83%)	23 (15%)	3 (2%)	6	32
1	O	152/156 (97%)	126 (83%)	24 (16%)	2 (1%)	9	39
1	P	152/156 (97%)	124 (82%)	23 (15%)	5 (3%)	3	23
1	Q	152/156 (97%)	126 (83%)	23 (15%)	3 (2%)	6	32
1	R	152/156 (97%)	125 (82%)	25 (16%)	2 (1%)	9	39
1	S	152/156 (97%)	124 (82%)	24 (16%)	4 (3%)	4	27
1	T	152/156 (97%)	125 (82%)	22 (14%)	5 (3%)	3	23
1	U	152/156 (97%)	125 (82%)	24 (16%)	3 (2%)	6	32
1	V	152/156 (97%)	123 (81%)	27 (18%)	2 (1%)	9	39
1	W	152/156 (97%)	123 (81%)	27 (18%)	2 (1%)	9	39
1	X	152/156 (97%)	125 (82%)	24 (16%)	3 (2%)	6	32
1	Y	152/156 (97%)	125 (82%)	24 (16%)	3 (2%)	6	32
1	Z	152/156 (97%)	125 (82%)	24 (16%)	3 (2%)	6	32
All	All	4560/4680 (97%)	3725 (82%)	741 (16%)	94 (2%)	5	31

5 of 94 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	11	PRO
1	S	12	ASP
1	S	13	ALA
1	T	13	ALA
1	H	11	PRO

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	1	110/112 (98%)	95 (86%)	15 (14%)	3	19
1	2	109/112 (97%)	92 (84%)	17 (16%)	2	15

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	3	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	4	109/112 (97%)	94 (86%)	15 (14%)	3	19
1	A	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	B	109/112 (97%)	94 (86%)	15 (14%)	3	19
1	C	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	D	110/112 (98%)	92 (84%)	18 (16%)	2	14
1	E	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	F	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	G	109/112 (97%)	94 (86%)	15 (14%)	3	19
1	H	109/112 (97%)	94 (86%)	15 (14%)	3	19
1	I	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	J	109/112 (97%)	92 (84%)	17 (16%)	2	15
1	K	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	L	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	M	109/112 (97%)	95 (87%)	14 (13%)	4	21
1	N	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	O	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	P	108/112 (96%)	91 (84%)	17 (16%)	2	15
1	Q	109/112 (97%)	91 (84%)	18 (16%)	2	13
1	R	109/112 (97%)	91 (84%)	18 (16%)	2	13
1	S	109/112 (97%)	91 (84%)	18 (16%)	2	13
1	T	109/112 (97%)	92 (84%)	17 (16%)	2	15
1	U	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	V	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	W	109/112 (97%)	93 (85%)	16 (15%)	3	17
1	X	109/112 (97%)	92 (84%)	17 (16%)	2	15
1	Y	108/112 (96%)	91 (84%)	17 (16%)	2	15
1	Z	109/112 (97%)	93 (85%)	16 (15%)	3	17
All	All	3270/3360 (97%)	2783 (85%)	487 (15%)	3	17

5 of 487 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	O	62	LEU
1	2	30	LEU
1	R	82	VAL
1	1	116	VAL
1	4	19	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 69 such sidechains are listed below:

Mol	Chain	Res	Type
1	Y	2	ASN
1	Z	2	ASN
1	3	89	HIS
1	J	7	ASN
1	J	2	ASN

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](#)

40 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	S	157	-	4,4,4	0.29	0	6,6,6	0.27	0
2	SO4	2	157	-	4,4,4	0.34	0	6,6,6	0.39	0
2	SO4	G	157	-	4,4,4	0.30	0	6,6,6	0.16	0
2	SO4	V	158	-	4,4,4	0.28	0	6,6,6	0.27	0
2	SO4	M	159	-	4,4,4	0.22	0	6,6,6	0.52	0
2	SO4	E	157	-	4,4,4	0.25	0	6,6,6	0.36	0
2	SO4	H	157	-	4,4,4	0.39	0	6,6,6	0.68	0
2	SO4	F	157	-	4,4,4	0.26	0	6,6,6	0.30	0
2	SO4	V	157	-	4,4,4	0.29	0	6,6,6	0.18	0
2	SO4	1	157	-	4,4,4	0.34	0	6,6,6	0.30	0
2	SO4	L	157	-	4,4,4	0.35	0	6,6,6	0.57	0
2	SO4	D	158	-	4,4,4	0.25	0	6,6,6	0.17	0
2	SO4	R	158	-	4,4,4	0.25	0	6,6,6	0.30	0
2	SO4	H	159	-	4,4,4	0.18	0	6,6,6	0.43	0
2	SO4	Z	158	-	4,4,4	0.26	0	6,6,6	0.17	0
2	SO4	2	158	-	4,4,4	0.27	0	6,6,6	0.09	0
2	SO4	K	157	-	4,4,4	0.32	0	6,6,6	0.25	0
2	SO4	1	158	-	4,4,4	0.34	0	6,6,6	0.51	0
2	SO4	C	158	-	4,4,4	0.24	0	6,6,6	0.24	0
2	SO4	L	158	-	4,4,4	0.26	0	6,6,6	0.10	0
2	SO4	U	157	-	4,4,4	0.37	0	6,6,6	0.43	0
2	SO4	N	157	-	4,4,4	0.27	0	6,6,6	0.36	0
2	SO4	H	158	-	4,4,4	0.37	0	6,6,6	0.37	0
2	SO4	Q	158	-	4,4,4	0.31	0	6,6,6	0.24	0
2	SO4	J	158	-	4,4,4	0.25	0	6,6,6	0.54	0
2	SO4	F	158	-	4,4,4	0.26	0	6,6,6	0.18	0
2	SO4	D	157	-	4,4,4	0.25	0	6,6,6	0.32	0
2	SO4	Z	157	-	4,4,4	0.23	0	6,6,6	0.22	0
2	SO4	M	157	-	4,4,4	0.21	0	6,6,6	0.50	0
2	SO4	P	157	-	4,4,4	0.38	0	6,6,6	0.46	0
2	SO4	Q	157	-	4,4,4	0.33	0	6,6,6	0.28	0
2	SO4	X	157	-	4,4,4	0.29	0	6,6,6	0.19	0
2	SO4	M	158	-	4,4,4	0.29	0	6,6,6	0.12	0
2	SO4	B	157	-	4,4,4	0.35	0	6,6,6	0.27	0
2	SO4	C	157	-	4,4,4	0.28	0	6,6,6	0.50	0
2	SO4	3	157	-	4,4,4	0.25	0	6,6,6	0.14	0
2	SO4	2	159	-	4,4,4	0.34	0	6,6,6	0.23	0
2	SO4	X	158	-	4,4,4	0.27	0	6,6,6	0.33	0
2	SO4	Q	159	-	4,4,4	0.25	0	6,6,6	0.23	0
2	SO4	A	157	-	4,4,4	0.18	0	6,6,6	0.40	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.

11 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	157	SO4	3	0
2	1	157	SO4	2	0
2	1	158	SO4	1	0
2	H	158	SO4	1	0
2	J	158	SO4	1	0
2	F	158	SO4	3	0
2	D	157	SO4	1	0
2	P	157	SO4	1	0
2	2	159	SO4	1	0
2	Q	159	SO4	1	0
2	A	157	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	1	154/156 (98%)	-1.34	0 100 100	15, 27, 51, 63	0
1	2	154/156 (98%)	-1.35	0 100 100	12, 27, 48, 61	0
1	3	154/156 (98%)	-1.38	0 100 100	16, 27, 47, 61	0
1	4	154/156 (98%)	-1.35	0 100 100	12, 27, 47, 58	0
1	A	154/156 (98%)	-1.37	0 100 100	8, 27, 48, 59	0
1	B	154/156 (98%)	-1.38	0 100 100	15, 27, 49, 63	0
1	C	154/156 (98%)	-1.39	0 100 100	16, 28, 45, 66	0
1	D	154/156 (98%)	-1.34	0 100 100	15, 28, 48, 63	0
1	E	154/156 (98%)	-1.32	0 100 100	16, 28, 50, 65	0
1	F	154/156 (98%)	-1.35	0 100 100	15, 28, 51, 63	0
1	G	154/156 (98%)	-1.39	0 100 100	16, 28, 50, 65	0
1	H	154/156 (98%)	-1.36	0 100 100	15, 28, 46, 62	0
1	I	154/156 (98%)	-1.40	0 100 100	16, 28, 50, 63	0
1	J	154/156 (98%)	-1.36	0 100 100	14, 28, 50, 61	0
1	K	154/156 (98%)	-1.34	0 100 100	16, 27, 46, 65	0
1	L	154/156 (98%)	-1.36	0 100 100	9, 27, 47, 64	0
1	M	154/156 (98%)	-1.39	0 100 100	13, 27, 49, 62	0
1	N	154/156 (98%)	-1.37	0 100 100	15, 26, 47, 63	0
1	O	154/156 (98%)	-1.38	0 100 100	16, 27, 48, 62	0
1	P	154/156 (98%)	-1.38	0 100 100	15, 27, 46, 60	0
1	Q	154/156 (98%)	-1.36	0 100 100	16, 27, 49, 63	0
1	R	154/156 (98%)	-1.39	0 100 100	6, 27, 45, 66	0
1	S	154/156 (98%)	-1.35	0 100 100	14, 28, 48, 64	0
1	T	154/156 (98%)	-1.33	0 100 100	15, 27, 48, 67	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å²)	Q<0.9		
1	U	154/156 (98%)	-1.36	0	100	100	13, 27, 49, 69	0
1	V	154/156 (98%)	-1.35	0	100	100	15, 28, 47, 64	0
1	W	154/156 (98%)	-1.35	0	100	100	17, 28, 51, 71	0
1	X	154/156 (98%)	-1.33	0	100	100	15, 28, 47, 65	0
1	Y	154/156 (98%)	-1.34	0	100	100	16, 27, 48, 61	0
1	Z	154/156 (98%)	-1.36	0	100	100	16, 28, 50, 63	0
All	All	4620/4680 (98%)	-1.36	0	100	100	6, 27, 50, 71	0

There are no RSRZ outliers to report.

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(Å ²)	Q<0.9
2	SO4	2	158	5/5	0.95	0.13	7,125,158,173	0
2	SO4	D	158	5/5	0.97	0.06	18,61,108,122	0
2	SO4	1	158	5/5	0.98	0.06	11,20,56,96	0
2	SO4	Z	158	5/5	0.98	0.11	54,54,136,173	0
2	SO4	F	157	5/5	0.99	0.04	15,42,63,77	0
2	SO4	G	157	5/5	0.99	0.03	0,46,65,90	0
2	SO4	H	157	5/5	0.99	0.03	7,9,42,76	0
2	SO4	H	158	5/5	0.99	0.06	14,15,75,110	0
2	SO4	H	159	5/5	0.99	0.05	17,32,71,89	0
2	SO4	J	158	5/5	0.99	0.04	10,11,62,73	0
2	SO4	L	158	5/5	0.99	0.09	26,45,126,127	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	SO4	Q	157	5/5	0.99	0.06	6,18,40,85	0
2	SO4	Q	158	5/5	0.99	0.05	19,27,92,107	0
2	SO4	Q	159	5/5	0.99	0.05	23,35,38,63	0
2	SO4	R	158	5/5	0.99	0.04	8,20,44,67	0
2	SO4	S	157	5/5	0.99	0.03	11,18,71,72	0
2	SO4	V	158	5/5	0.99	0.04	15,38,53,59	0
2	SO4	X	157	5/5	0.99	0.05	12,22,75,95	0
2	SO4	X	158	5/5	0.99	0.05	10,29,35,40	0
2	SO4	Z	157	5/5	0.99	0.05	4,23,45,51	0
2	SO4	C	158	5/5	0.99	0.05	4,65,108,137	0
2	SO4	1	157	5/5	0.99	0.04	21,23,40,43	0
2	SO4	A	157	5/5	0.99	0.04	0,9,46,48	0
2	SO4	F	158	5/5	0.99	0.08	35,65,98,122	0
2	SO4	3	157	5/5	0.99	0.04	33,41,74,81	0
2	SO4	K	157	5/5	1.00	0.03	16,22,50,65	0
2	SO4	L	157	5/5	1.00	0.05	0,24,71,90	0
2	SO4	U	157	5/5	1.00	0.03	24,26,45,80	0
2	SO4	V	157	5/5	1.00	0.05	17,23,44,50	0
2	SO4	E	157	5/5	1.00	0.04	4,23,38,53	0
2	SO4	M	157	5/5	1.00	0.02	10,13,15,17	0
2	SO4	M	158	5/5	1.00	0.05	24,29,94,96	0
2	SO4	M	159	5/5	1.00	0.03	3,6,18,57	0
2	SO4	N	157	5/5	1.00	0.03	0,0,65,84	0
2	SO4	P	157	5/5	1.00	0.03	3,10,40,41	0
2	SO4	C	157	5/5	1.00	0.04	7,25,31,40	0
2	SO4	2	157	5/5	1.00	0.04	3,17,46,60	0
2	SO4	D	157	5/5	1.00	0.04	1,22,30,51	0
2	SO4	2	159	5/5	1.00	0.03	1,22,38,44	0
2	SO4	B	157	5/5	1.00	0.03	3,28,29,50	0

6.5 Other polymers ⓘ

There are no such residues in this entry.