



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:09 AM UTC

PDB ID : 5TSU / pdb_00005tsu
Title : Active conformation for Engineered human cystathionine gamma lyase (E59N, R119L, E339V) to depleting methionine
Authors : Yan, W.; Zhang, Y.
Deposited on : 2016-10-31
Resolution : 2.20 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
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
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

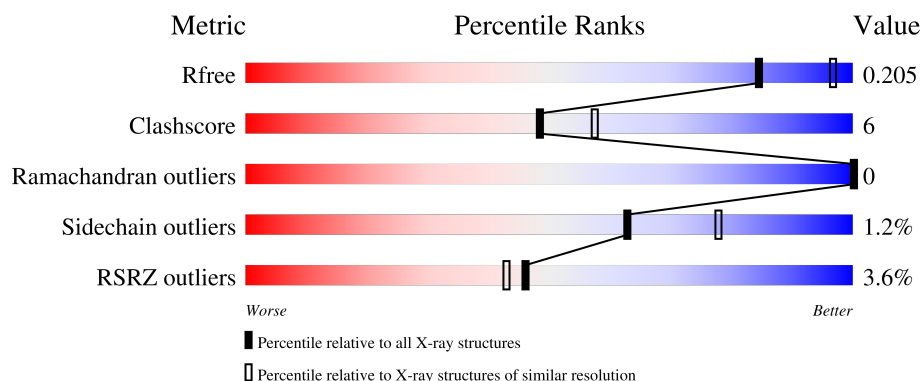
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments 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	422	3% 79% 11% • 9%
1	B	422	5% 81% 9% 9%
1	D	422	4% 79% 11% • 9%
1	F	422	5% 78% 12% 10%
1	G	422	4% 80% 10% • 9%

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Mol	Chain	Length	Quality of chain
1	H	422	3% 80% 11% 9%
2	C	422	2% 81% 10% 9%
2	E	422	2% 80% 11% 9%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 24978 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 Cystathionine gamma-lyase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	384	Total	C	N	O	P	S	0	0	0
			2985	1905	507	553	1	19			
1	B	385	Total	C	N	O	P	S	0	0	0
			2992	1909	508	555	1	19			
1	D	384	Total	C	N	O	P	S	0	0	0
			2976	1898	505	553	1	19			
1	F	381	Total	C	N	O	P	S	0	0	0
			2961	1889	503	549	1	19			
1	G	386	Total	C	N	O	P	S	0	0	0
			2996	1913	508	555	1	19			
1	H	386	Total	C	N	O	P	S	0	0	0
			3001	1915	509	557	1	19			

There are 126 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-16	MET	-	expression tag	UNP P32929
A	-15	GLY	-	expression tag	UNP P32929
A	-14	GLY	-	expression tag	UNP P32929
A	-13	HIS	-	expression tag	UNP P32929
A	-12	HIS	-	expression tag	UNP P32929
A	-11	HIS	-	expression tag	UNP P32929
A	-10	HIS	-	expression tag	UNP P32929
A	-9	HIS	-	expression tag	UNP P32929
A	-8	HIS	-	expression tag	UNP P32929
A	-7	GLY	-	expression tag	UNP P32929
A	-6	LEU	-	expression tag	UNP P32929
A	-5	GLU	-	expression tag	UNP P32929
A	-4	VAL	-	expression tag	UNP P32929
A	-3	LEU	-	expression tag	UNP P32929
A	-2	PHE	-	expression tag	UNP P32929
A	-1	GLN	-	expression tag	UNP P32929
A	0	GLY	-	expression tag	UNP P32929

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1	PRO	-	expression tag	UNP P32929
A	59	ASN	GLU	engineered mutation	UNP P32929
A	119	LEU	ARG	engineered mutation	UNP P32929
A	339	VAL	GLU	engineered mutation	UNP P32929
B	-16	MET	-	expression tag	UNP P32929
B	-15	GLY	-	expression tag	UNP P32929
B	-14	GLY	-	expression tag	UNP P32929
B	-13	HIS	-	expression tag	UNP P32929
B	-12	HIS	-	expression tag	UNP P32929
B	-11	HIS	-	expression tag	UNP P32929
B	-10	HIS	-	expression tag	UNP P32929
B	-9	HIS	-	expression tag	UNP P32929
B	-8	HIS	-	expression tag	UNP P32929
B	-7	GLY	-	expression tag	UNP P32929
B	-6	LEU	-	expression tag	UNP P32929
B	-5	GLU	-	expression tag	UNP P32929
B	-4	VAL	-	expression tag	UNP P32929
B	-3	LEU	-	expression tag	UNP P32929
B	-2	PHE	-	expression tag	UNP P32929
B	-1	GLN	-	expression tag	UNP P32929
B	0	GLY	-	expression tag	UNP P32929
B	1	PRO	-	expression tag	UNP P32929
B	59	ASN	GLU	engineered mutation	UNP P32929
B	119	LEU	ARG	engineered mutation	UNP P32929
B	339	VAL	GLU	engineered mutation	UNP P32929
D	-16	MET	-	expression tag	UNP P32929
D	-15	GLY	-	expression tag	UNP P32929
D	-14	GLY	-	expression tag	UNP P32929
D	-13	HIS	-	expression tag	UNP P32929
D	-12	HIS	-	expression tag	UNP P32929
D	-11	HIS	-	expression tag	UNP P32929
D	-10	HIS	-	expression tag	UNP P32929
D	-9	HIS	-	expression tag	UNP P32929
D	-8	HIS	-	expression tag	UNP P32929
D	-7	GLY	-	expression tag	UNP P32929
D	-6	LEU	-	expression tag	UNP P32929
D	-5	GLU	-	expression tag	UNP P32929
D	-4	VAL	-	expression tag	UNP P32929
D	-3	LEU	-	expression tag	UNP P32929
D	-2	PHE	-	expression tag	UNP P32929
D	-1	GLN	-	expression tag	UNP P32929
D	0	GLY	-	expression tag	UNP P32929

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Chain	Residue	Modelled	Actual	Comment	Reference
D	1	PRO	-	expression tag	UNP P32929
D	59	ASN	GLU	engineered mutation	UNP P32929
D	119	LEU	ARG	engineered mutation	UNP P32929
D	339	VAL	GLU	engineered mutation	UNP P32929
F	-16	MET	-	expression tag	UNP P32929
F	-15	GLY	-	expression tag	UNP P32929
F	-14	GLY	-	expression tag	UNP P32929
F	-13	HIS	-	expression tag	UNP P32929
F	-12	HIS	-	expression tag	UNP P32929
F	-11	HIS	-	expression tag	UNP P32929
F	-10	HIS	-	expression tag	UNP P32929
F	-9	HIS	-	expression tag	UNP P32929
F	-8	HIS	-	expression tag	UNP P32929
F	-7	GLY	-	expression tag	UNP P32929
F	-6	LEU	-	expression tag	UNP P32929
F	-5	GLU	-	expression tag	UNP P32929
F	-4	VAL	-	expression tag	UNP P32929
F	-3	LEU	-	expression tag	UNP P32929
F	-2	PHE	-	expression tag	UNP P32929
F	-1	GLN	-	expression tag	UNP P32929
F	0	GLY	-	expression tag	UNP P32929
F	1	PRO	-	expression tag	UNP P32929
F	59	ASN	GLU	engineered mutation	UNP P32929
F	119	LEU	ARG	engineered mutation	UNP P32929
F	339	VAL	GLU	engineered mutation	UNP P32929
G	-16	MET	-	expression tag	UNP P32929
G	-15	GLY	-	expression tag	UNP P32929
G	-14	GLY	-	expression tag	UNP P32929
G	-13	HIS	-	expression tag	UNP P32929
G	-12	HIS	-	expression tag	UNP P32929
G	-11	HIS	-	expression tag	UNP P32929
G	-10	HIS	-	expression tag	UNP P32929
G	-9	HIS	-	expression tag	UNP P32929
G	-8	HIS	-	expression tag	UNP P32929
G	-7	GLY	-	expression tag	UNP P32929
G	-6	LEU	-	expression tag	UNP P32929
G	-5	GLU	-	expression tag	UNP P32929
G	-4	VAL	-	expression tag	UNP P32929
G	-3	LEU	-	expression tag	UNP P32929
G	-2	PHE	-	expression tag	UNP P32929
G	-1	GLN	-	expression tag	UNP P32929
G	0	GLY	-	expression tag	UNP P32929

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Chain	Residue	Modelled	Actual	Comment	Reference
G	1	PRO	-	expression tag	UNP P32929
G	59	ASN	GLU	engineered mutation	UNP P32929
G	119	LEU	ARG	engineered mutation	UNP P32929
G	339	VAL	GLU	engineered mutation	UNP P32929
H	-16	MET	-	expression tag	UNP P32929
H	-15	GLY	-	expression tag	UNP P32929
H	-14	GLY	-	expression tag	UNP P32929
H	-13	HIS	-	expression tag	UNP P32929
H	-12	HIS	-	expression tag	UNP P32929
H	-11	HIS	-	expression tag	UNP P32929
H	-10	HIS	-	expression tag	UNP P32929
H	-9	HIS	-	expression tag	UNP P32929
H	-8	HIS	-	expression tag	UNP P32929
H	-7	GLY	-	expression tag	UNP P32929
H	-6	LEU	-	expression tag	UNP P32929
H	-5	GLU	-	expression tag	UNP P32929
H	-4	VAL	-	expression tag	UNP P32929
H	-3	LEU	-	expression tag	UNP P32929
H	-2	PHE	-	expression tag	UNP P32929
H	-1	GLN	-	expression tag	UNP P32929
H	0	GLY	-	expression tag	UNP P32929
H	1	PRO	-	expression tag	UNP P32929
H	59	ASN	GLU	engineered mutation	UNP P32929
H	119	LEU	ARG	engineered mutation	UNP P32929
H	339	VAL	GLU	engineered mutation	UNP P32929

- Molecule 2 is a protein called Cystathionine gamma-lyase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	386	Total	C	N	O	S	0	0	0
			2984	1906	508	551	19			
2	E	385	Total	C	N	O	S	0	0	0
			2978	1903	507	549	19			

There are 42 discrepancies between the modelled and reference sequences:

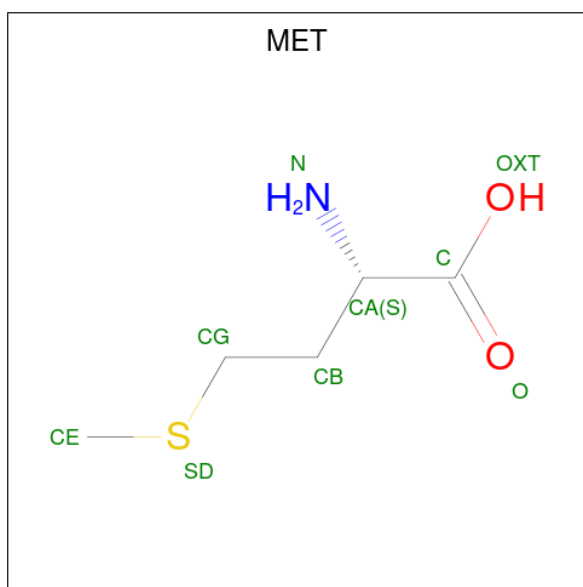
Chain	Residue	Modelled	Actual	Comment	Reference
C	-16	MET	-	initiating methionine	UNP P32929
C	-15	GLY	-	expression tag	UNP P32929
C	-14	GLY	-	expression tag	UNP P32929
C	-13	HIS	-	expression tag	UNP P32929
C	-12	HIS	-	expression tag	UNP P32929

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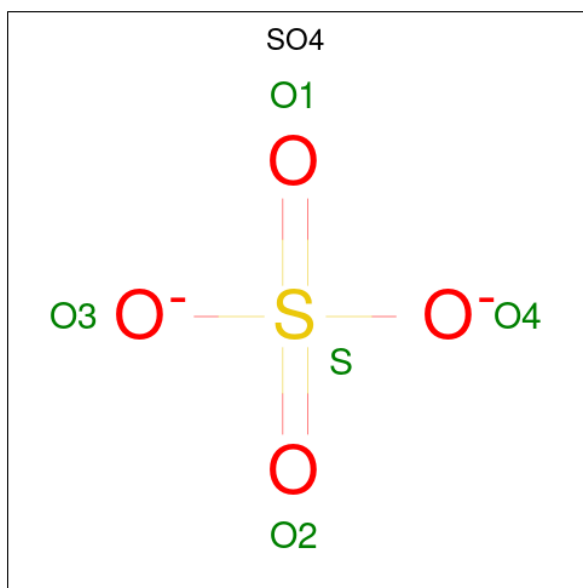
Chain	Residue	Modelled	Actual	Comment	Reference
C	-11	HIS	-	expression tag	UNP P32929
C	-10	HIS	-	expression tag	UNP P32929
C	-9	HIS	-	expression tag	UNP P32929
C	-8	HIS	-	expression tag	UNP P32929
C	-7	GLY	-	expression tag	UNP P32929
C	-6	LEU	-	expression tag	UNP P32929
C	-5	GLU	-	expression tag	UNP P32929
C	-4	VAL	-	expression tag	UNP P32929
C	-3	LEU	-	expression tag	UNP P32929
C	-2	PHE	-	expression tag	UNP P32929
C	-1	GLN	-	expression tag	UNP P32929
C	0	GLY	-	expression tag	UNP P32929
C	1	PRO	-	expression tag	UNP P32929
C	59	ASN	GLU	engineered mutation	UNP P32929
C	119	LEU	ARG	engineered mutation	UNP P32929
C	339	VAL	GLU	engineered mutation	UNP P32929
E	-16	MET	-	initiating methionine	UNP P32929
E	-15	GLY	-	expression tag	UNP P32929
E	-14	GLY	-	expression tag	UNP P32929
E	-13	HIS	-	expression tag	UNP P32929
E	-12	HIS	-	expression tag	UNP P32929
E	-11	HIS	-	expression tag	UNP P32929
E	-10	HIS	-	expression tag	UNP P32929
E	-9	HIS	-	expression tag	UNP P32929
E	-8	HIS	-	expression tag	UNP P32929
E	-7	GLY	-	expression tag	UNP P32929
E	-6	LEU	-	expression tag	UNP P32929
E	-5	GLU	-	expression tag	UNP P32929
E	-4	VAL	-	expression tag	UNP P32929
E	-3	LEU	-	expression tag	UNP P32929
E	-2	PHE	-	expression tag	UNP P32929
E	-1	GLN	-	expression tag	UNP P32929
E	0	GLY	-	expression tag	UNP P32929
E	1	PRO	-	expression tag	UNP P32929
E	59	ASN	GLU	engineered mutation	UNP P32929
E	119	LEU	ARG	engineered mutation	UNP P32929
E	339	VAL	GLU	engineered mutation	UNP P32929

- Molecule 3 is METHIONINE (CCD ID: MET) (formula: C₅H₁₁NO₂S).



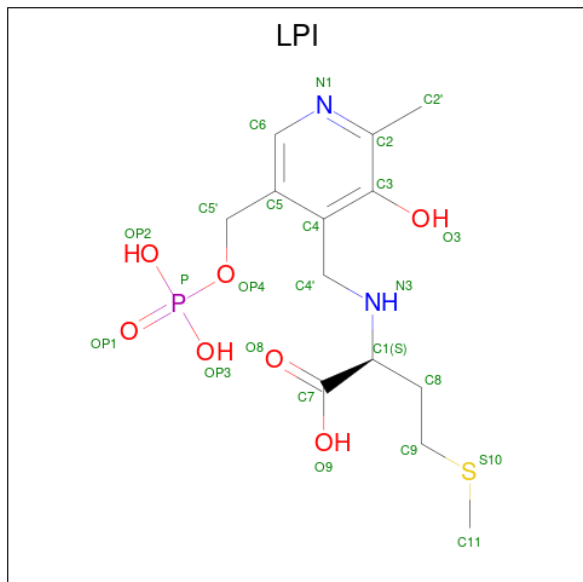
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			9	5	1	2	1		

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



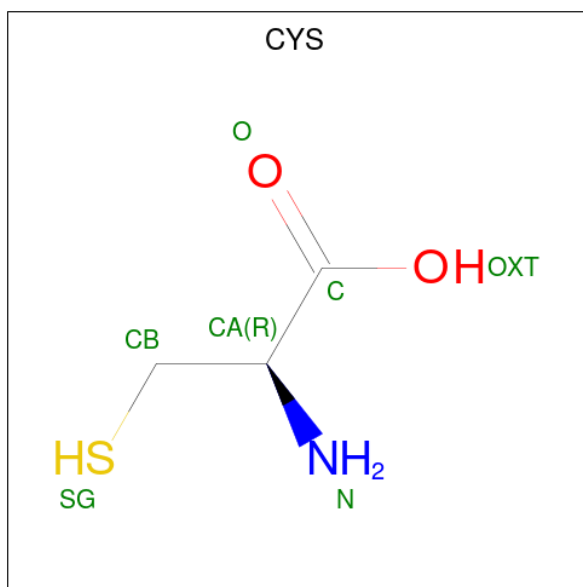
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is N-({3-hydroxy-2-methyl-5-[(phosphonooxy)methyl]pyridin-4-yl}methyl)-L-methionine (CCD ID: LPI) (formula: $C_{13}H_{21}N_2O_7PS$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
5	C	1	Total	C	N	O	P	S	0	0
			24	13	2	7	1	1		
5	E	1	Total	C	N	O	P	S	0	0
			24	13	2	7	1	1		

- Molecule 6 is CYSTEINE (CCD ID: CYS) (formula: $C_3H_7NO_2S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	F	1	Total	C	N	O	S	0	0
			7	3	1	2	1		
6	G	1	Total	C	N	O	S	0	0
			7	3	1	2	1		
6	H	1	Total	C	N	O	S	0	0
			7	3	1	2	1		

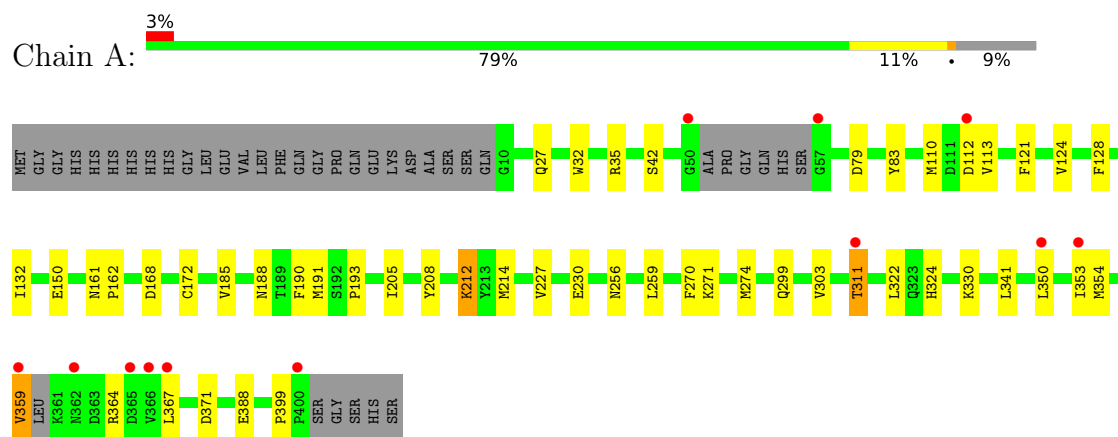
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	177	Total	O	0	0
			177	177		
7	B	139	Total	O	0	0
			139	139		
7	C	176	Total	O	0	0
			176	176		
7	D	157	Total	O	0	0
			157	157		
7	E	103	Total	O	0	0
			103	103		
7	F	63	Total	O	0	0
			63	63		
7	G	94	Total	O	0	0
			94	94		
7	H	103	Total	O	0	0
			103	103		

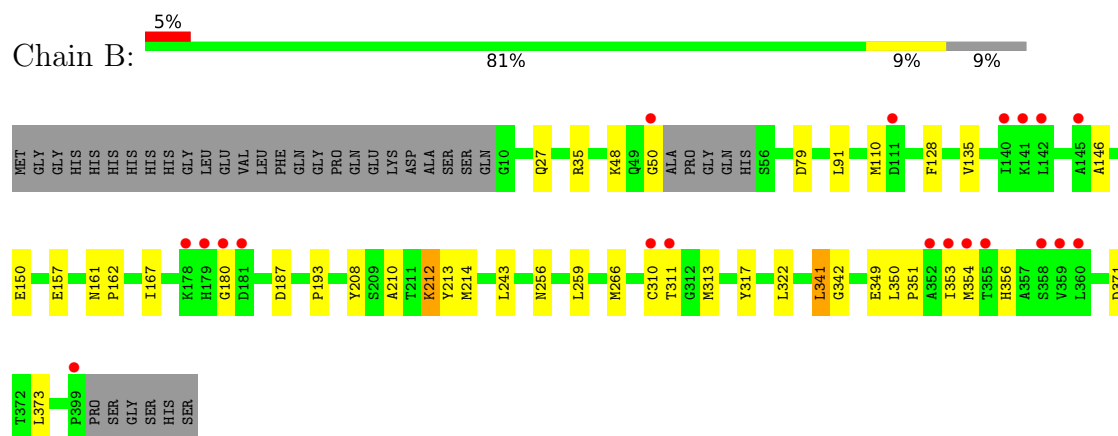
3 Residue-property plots [i](#)

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.

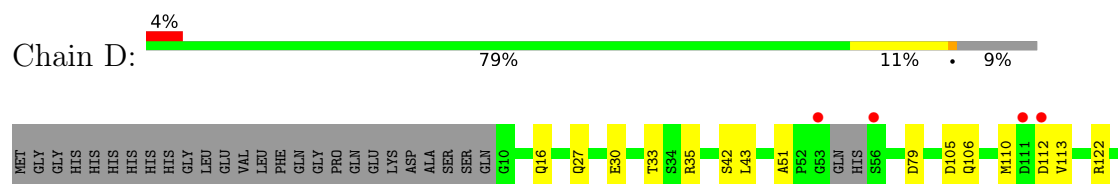
• Molecule 1: Cystathionine gamma-lyase

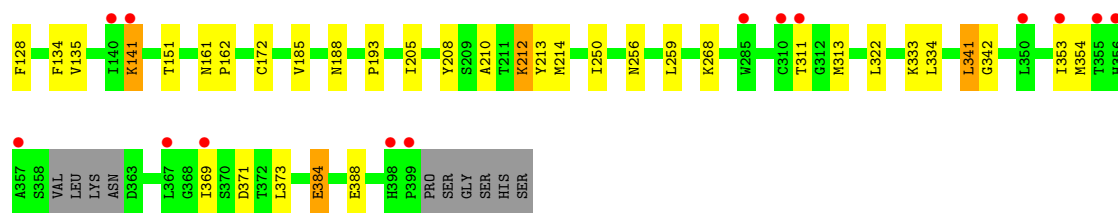


• Molecule 1: Cystathionine gamma-lyase

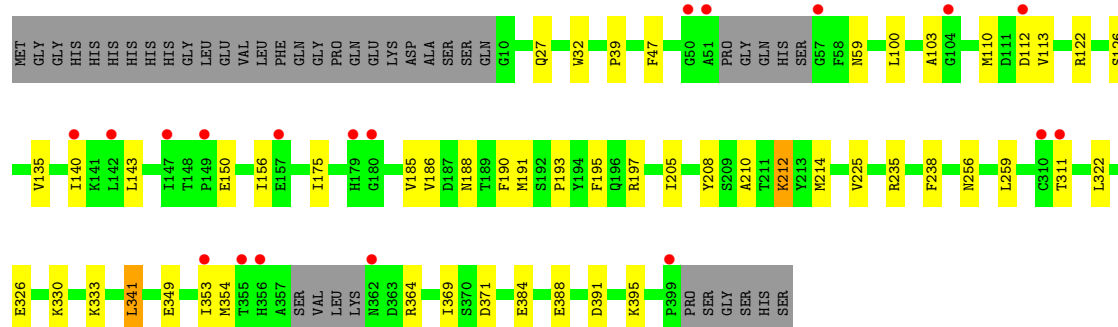
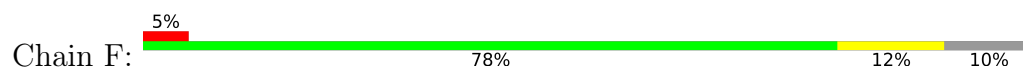


• Molecule 1: Cystathionine gamma-lyase

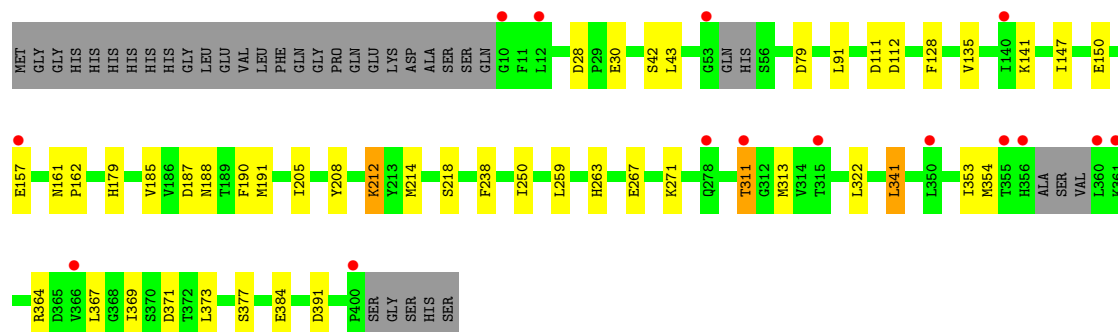
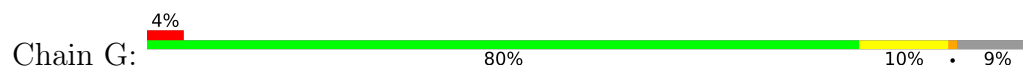




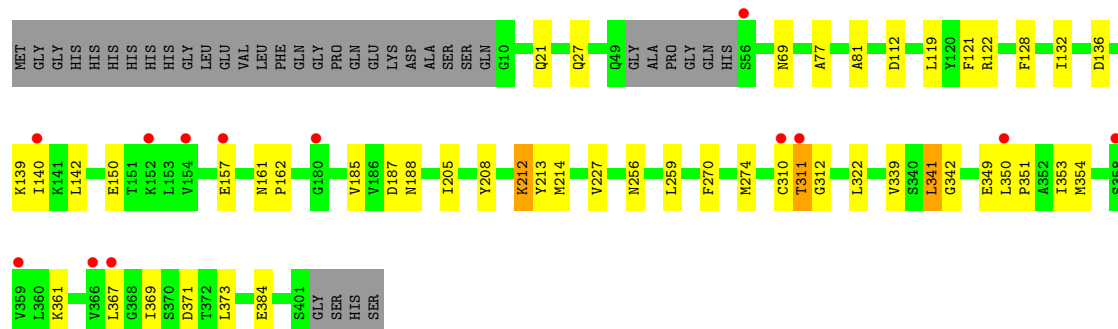
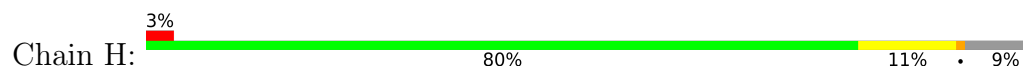
• Molecule 1: Cystathionine gamma-lyase



• Molecule 1: Cystathionine gamma-lyase

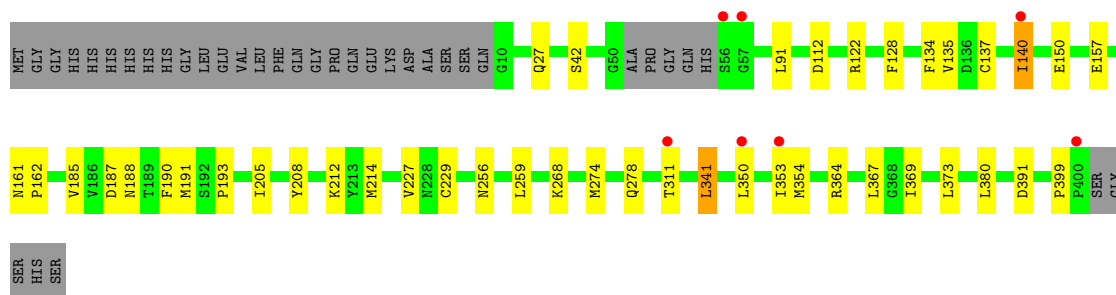


• Molecule 1: Cystathionine gamma-lyase



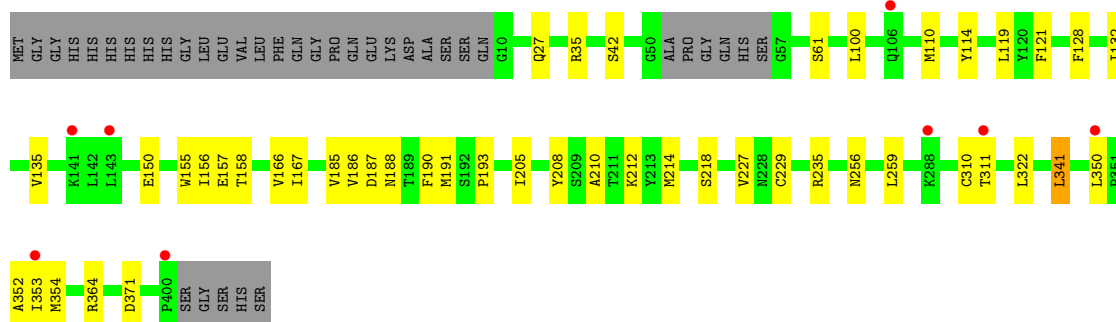
● Molecule 2: Cystathionine gamma-lyase

Chain C: 



● Molecule 2: Cystathionine gamma-lyase

Chain E: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α , β , γ	111.89Å 163.68Å 181.10Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.04 – 2.20 49.04 – 2.20	Depositor EDS
% Data completeness (in resolution range)	96.1 (49.04-2.20) 95.7 (49.04-2.20)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.10	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.37 (at 2.20Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.171 , 0.202 0.176 , 0.205	Depositor DCC
R_{free} test set	8040 reflections (4.76%)	wwPDB-VP
Wilson B-factor (Å ²)	36.1	Xtriage
Anisotropy	0.570	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 47.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	24978	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.57% 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: LPI, SO4, LLP

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	0.22	0/3026	0.43	1/4105 (0.0%)
1	B	0.17	0/3033	0.38	0/4115
1	D	0.17	0/3017	0.38	0/4093
1	F	0.15	0/3001	0.35	0/4071
1	G	0.16	0/3038	0.38	0/4122
1	H	0.17	0/3043	0.38	0/4130
2	C	0.19	0/3051	0.42	0/4141
2	E	0.16	0/3045	0.37	0/4133
All	All	0.18	0/24254	0.39	1/32910 (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	A	359	VAL	N-CA-C	-5.65	95.18	111.00

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2985	0	2974	35	0
1	B	2992	0	2984	30	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2976	0	2959	35	0
1	F	2961	0	2945	39	0
1	G	2996	0	2985	35	0
1	H	3001	0	2993	36	0
2	C	2984	0	2986	30	0
2	E	2978	0	2982	34	0
3	A	9	0	8	2	0
4	A	5	0	0	0	0
4	B	5	0	0	0	0
4	D	5	0	0	0	0
5	C	24	0	0	0	0
5	E	24	0	0	3	0
6	F	7	0	4	1	0
6	G	7	0	4	0	0
6	H	7	0	4	3	0
7	A	177	0	0	4	0
7	B	139	0	0	1	0
7	C	176	0	0	4	0
7	D	157	0	0	6	0
7	E	103	0	0	5	0
7	F	63	0	0	4	0
7	G	94	0	0	7	0
7	H	103	0	0	5	0
All	All	24978	0	23828	263	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 6.

All (263) 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:G:157:GLU:HG2	1:G:187:ASP:HB3	1.35	1.03
1:H:157:GLU:HG2	1:H:187:ASP:HB3	1.45	0.98
1:G:391:ASP:OD1	7:G:601:HOH:O	1.88	0.90
1:H:212:LLP:H4'1	6:H:501:CYS:N	1.90	0.86
1:F:47:PHE:O	7:F:601:HOH:O	1.95	0.83
2:E:218:SER:OG	7:E:601:HOH:O	1.97	0.83
1:A:388:GLU:OE1	7:A:601:HOH:O	1.97	0.81
1:B:311:THR:HG23	1:B:313:MET:H	1.47	0.80
1:D:311:THR:HG23	1:D:313:MET:H	1.46	0.80
2:E:229:CYS:SG	7:E:699:HOH:O	2.21	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:353:ILE:HG13	1:F:354:MET:HG3	1.64	0.78
1:D:79:ASP:OD1	7:D:601:HOH:O	2.01	0.77
1:G:30:GLU:OE1	7:G:602:HOH:O	2.03	0.77
1:G:218:SER:OG	7:G:603:HOH:O	2.03	0.76
2:C:191:MET:HA	2:C:311:THR:HG21	1.66	0.76
1:B:180:GLY:O	7:B:601:HOH:O	2.03	0.75
1:F:191:MET:HA	1:F:311:THR:HG21	1.67	0.75
1:F:388:GLU:OE2	7:F:602:HOH:O	2.05	0.75
1:D:353:ILE:HG13	1:D:354:MET:HG3	1.68	0.74
1:B:157:GLU:HG2	1:B:187:ASP:HB3	1.71	0.72
1:D:105:ASP:OD2	7:D:602:HOH:O	2.07	0.72
2:C:229:CYS:SG	7:C:775:HOH:O	2.47	0.72
1:D:268:LYS:NZ	7:D:607:HOH:O	2.24	0.70
2:C:353:ILE:HG23	2:C:354:MET:HG3	1.72	0.70
2:E:190:PHE:O	2:E:311:THR:HG21	1.93	0.68
1:G:191:MET:HA	1:G:311:THR:HG21	1.74	0.68
1:F:391:ASP:OD2	1:F:395:LYS:NZ	2.28	0.67
1:B:212:LLP:HB2	1:B:341:LEU:HD22	1.77	0.66
2:C:364:ARG:HG2	2:C:369:ILE:HB	1.77	0.66
2:E:353:ILE:HG13	2:E:354:MET:HG3	1.78	0.66
1:A:191:MET:HA	1:A:311:THR:HG21	1.76	0.66
1:F:212:LLP:H4'1	6:F:501:CYS:N	2.11	0.66
2:C:212:LYS:HB3	2:C:341:LEU:HD22	1.79	0.65
1:D:16:GLN:OE1	7:D:603:HOH:O	2.13	0.65
2:E:191:MET:HA	2:E:311:THR:HG21	1.79	0.64
1:B:322:LEU:HB2	1:B:371:ASP:HB3	1.80	0.64
2:E:352:ALA:O	2:E:364:ARG:NH1	2.31	0.64
1:F:140:ILE:HD12	1:F:143:LEU:HB3	1.78	0.64
1:F:190:PHE:O	1:F:311:THR:HG21	1.98	0.64
1:G:79:ASP:OD1	1:G:208:TYR:OH	2.11	0.63
1:B:212:LLP:HD3	1:B:341:LEU:HD13	1.81	0.62
1:A:212:LLP:H4'1	3:A:501:MET:N	2.14	0.62
1:A:32:TRP:O	1:A:35:ARG:NH1	2.32	0.62
1:H:361:LYS:N	7:H:605:HOH:O	2.34	0.61
2:C:190:PHE:O	2:C:311:THR:HG21	2.00	0.61
1:G:212:LLP:HB2	1:G:341:LEU:HD22	1.84	0.60
1:H:212:LLP:C4'	6:H:501:CYS:N	2.62	0.60
1:H:311:THR:OG1	1:H:312:GLY:N	2.32	0.60
2:E:157:GLU:HG2	2:E:187:ASP:HB3	1.82	0.60
1:F:110:MET:HB3	1:F:113:VAL:HG13	1.83	0.60
2:E:114:TYR:OH	5:E:501:LPI:S10	2.46	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:157:GLU:HG2	2:C:187:ASP:HB3	1.84	0.59
1:D:388:GLU:OE1	7:D:604:HOH:O	2.17	0.59
2:E:100:LEU:O	2:E:235:ARG:NH2	2.36	0.59
1:F:384:GLU:OE1	1:F:384:GLU:N	2.31	0.59
1:H:212:LLP:HD3	1:H:341:LEU:HD13	1.84	0.59
1:G:369:ILE:HA	1:G:373:LEU:HD22	1.84	0.58
1:A:190:PHE:O	1:A:311:THR:HG21	2.03	0.58
1:H:212:LLP:HB2	1:H:341:LEU:HD22	1.85	0.57
2:E:212:LYS:HE3	5:E:501:LPI:C4'	2.35	0.57
1:A:168:ASP:OD2	7:A:602:HOH:O	2.18	0.57
1:H:213:TYR:HH	1:H:311:THR:HG1	1.51	0.57
1:G:190:PHE:O	1:G:311:THR:HG21	2.05	0.57
1:H:185:VAL:HG22	1:H:205:ILE:HB	1.86	0.57
1:H:112:ASP:HB2	1:H:367:LEU:HD22	1.87	0.56
1:H:139:LYS:HB2	1:H:142:LEU:HD13	1.88	0.56
1:F:388:GLU:HG3	7:F:602:HOH:O	2.05	0.56
1:H:353:ILE:HG13	1:H:354:MET:HG3	1.88	0.56
1:D:212:LLP:HD3	1:D:341:LEU:HD13	1.88	0.55
1:F:384:GLU:H	1:F:384:GLU:CD	2.15	0.55
1:A:359:VAL:HG12	1:A:364:ARG:HG3	1.88	0.55
2:E:119:LEU:HD21	1:F:238:PHE:CZ	2.42	0.55
1:F:156:ILE:HD11	1:F:186:VAL:HG22	1.90	0.54
1:A:27:GLN:HE22	1:A:256:ASN:HD21	1.55	0.54
1:A:353:ILE:HG13	1:A:354:MET:HG3	1.88	0.54
1:A:83:TYR:OH	1:A:230:GLU:OE2	2.19	0.54
2:C:150:GLU:N	2:C:150:GLU:OE2	2.41	0.53
1:B:135:VAL:HG11	1:B:146:ALA:HB2	1.90	0.53
1:D:110:MET:HB2	1:D:113:VAL:HG13	1.90	0.53
2:E:35:ARG:NE	7:E:611:HOH:O	2.42	0.53
1:F:191:MET:HA	1:F:311:THR:CG2	2.38	0.53
1:G:353:ILE:HG13	1:G:354:MET:HG3	1.91	0.53
1:G:150:GLU:N	1:G:150:GLU:OE1	2.43	0.52
2:C:212:LYS:HD2	2:C:341:LEU:HD13	1.91	0.52
1:A:205:ILE:HG12	1:A:227:VAL:HG12	1.91	0.52
2:E:150:GLU:N	2:E:150:GLU:OE1	2.42	0.52
2:C:122:ARG:HG3	2:C:134:PHE:HE2	1.74	0.52
1:G:128:PHE:HB3	1:H:128:PHE:HB3	1.91	0.52
1:H:122:ARG:NH1	7:H:610:HOH:O	2.42	0.52
1:F:212:LLP:HD3	1:F:341:LEU:HD13	1.91	0.52
1:A:150:GLU:N	1:A:150:GLU:OE2	2.43	0.51
1:B:27:GLN:HE22	1:B:256:ASN:HD21	1.57	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:79:ASP:OD1	1:B:208:TYR:OH	2.23	0.51
1:F:212:LLP:HB2	1:F:341:LEU:HD22	1.92	0.51
1:A:110:MET:HB2	1:A:113:VAL:HG13	1.91	0.51
1:D:27:GLN:HE22	1:D:256:ASN:HD21	1.58	0.51
2:E:27:GLN:HE22	2:E:256:ASN:HD21	1.58	0.51
1:F:185:VAL:HG22	1:F:205:ILE:HB	1.92	0.51
1:F:322:LEU:HB2	1:F:371:ASP:HB3	1.91	0.51
2:C:42:SER:HB3	7:C:626:HOH:O	2.11	0.51
1:A:112:ASP:HB2	1:A:367:LEU:HD22	1.91	0.51
1:G:212:LLP:HD3	1:G:341:LEU:HD13	1.92	0.51
1:D:214:MET:HE3	1:D:259:LEU:HD21	1.93	0.50
2:E:212:LYS:CE	5:E:501:LPI:C4'	2.89	0.50
1:G:322:LEU:HB2	1:G:371:ASP:HB3	1.93	0.50
1:B:317:TYR:CZ	1:B:373:LEU:HD12	2.47	0.50
2:E:110:MET:SD	2:E:167:ILE:HD11	2.51	0.50
1:G:263:HIS:ND1	7:G:607:HOH:O	2.34	0.50
1:F:364:ARG:HB2	1:F:369:ILE:HB	1.93	0.50
1:F:188:ASN:HB3	1:F:208:TYR:CE2	2.46	0.50
1:D:212:LLP:HB2	1:D:341:LEU:HD22	1.93	0.49
1:G:214:MET:HE3	1:G:259:LEU:HD21	1.92	0.49
1:A:42:SER:HB3	7:A:640:HOH:O	2.13	0.49
2:E:42:SER:HB3	7:E:616:HOH:O	2.12	0.49
2:C:391:ASP:OD1	7:C:601:HOH:O	2.20	0.49
2:E:212:LYS:HB3	2:E:341:LEU:HD22	1.95	0.49
1:H:81:ALA:O	7:H:602:HOH:O	2.20	0.49
1:H:150:GLU:OE1	1:H:150:GLU:N	2.43	0.49
1:B:150:GLU:N	1:B:150:GLU:OE1	2.45	0.49
2:E:185:VAL:HG22	2:E:205:ILE:HB	1.95	0.49
1:D:384:GLU:CD	1:D:384:GLU:H	2.19	0.48
1:H:310:CYS:SG	1:H:311:THR:N	2.85	0.48
1:F:27:GLN:HE22	1:F:256:ASN:HD21	1.59	0.48
1:A:79:ASP:OD1	1:A:208:TYR:OH	2.21	0.48
1:H:384:GLU:HB3	7:H:695:HOH:O	2.14	0.48
2:C:274:MET:O	2:C:278:GLN:HG3	2.14	0.47
1:A:188:ASN:HB3	1:A:208:TYR:CE2	2.49	0.47
1:H:322:LEU:HB2	1:H:371:ASP:HB3	1.96	0.47
2:E:188:ASN:HB3	2:E:208:TYR:CE2	2.50	0.47
1:H:121:PHE:HB3	1:H:132:ILE:HG21	1.96	0.47
1:H:69:ASN:OD1	7:H:603:HOH:O	2.20	0.47
1:A:128:PHE:HB3	1:B:128:PHE:HB3	1.96	0.47
1:G:188:ASN:HB3	1:G:208:TYR:CE2	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:H:21:GLN:NE2	1:H:77:ALA:HB1	2.30	0.47
1:H:188:ASN:HB3	1:H:208:TYR:CE2	2.50	0.47
1:F:140:ILE:HD11	1:F:175:ILE:HG21	1.97	0.47
1:G:313:MET:HE1	1:G:377:SER:OG	2.14	0.47
1:G:30:GLU:OE1	1:G:30:GLU:N	2.47	0.47
2:E:158:THR:HG23	2:E:166:VAL:HA	1.95	0.46
2:C:185:VAL:HG22	2:C:205:ILE:HB	1.98	0.46
1:A:212:LLP:C4'	3:A:501:MET:N	2.78	0.46
2:C:122:ARG:HG3	2:C:134:PHE:CE2	2.50	0.46
1:A:110:MET:HE2	1:A:110:MET:HB3	1.81	0.46
1:D:210:ALA:HA	1:D:214:MET:HB2	1.97	0.46
1:G:112:ASP:HB2	1:G:367:LEU:HD22	1.96	0.46
1:A:324:HIS:CG	1:A:399:PRO:HB3	2.50	0.46
1:F:191:MET:HE3	1:F:195:PHE:HB3	1.98	0.46
2:C:191:MET:HA	2:C:311:THR:CG2	2.41	0.46
2:E:214:MET:HE3	2:E:259:LEU:HD21	1.97	0.46
1:A:191:MET:HA	1:A:311:THR:CG2	2.43	0.46
1:D:161:ASN:HA	1:D:162:PRO:HA	1.78	0.46
1:D:141:LYS:HD2	1:D:141:LYS:HA	1.71	0.46
1:H:369:ILE:HA	1:H:373:LEU:HD22	1.96	0.46
1:A:214:MET:HE3	1:A:259:LEU:HD21	1.97	0.45
1:A:350:LEU:HD23	1:A:353:ILE:H	1.80	0.45
2:C:369:ILE:HA	2:C:373:LEU:HD22	1.98	0.45
1:F:333:LYS:HE3	1:F:333:LYS:HB2	1.81	0.45
1:G:111:ASP:OD1	1:G:112:ASP:N	2.49	0.45
1:G:364:ARG:HG2	1:G:369:ILE:O	2.16	0.45
1:B:48:LYS:NZ	1:D:30:GLU:OE2	2.33	0.45
1:D:112:ASP:N	1:D:112:ASP:OD1	2.48	0.45
1:A:124:VAL:HG11	1:B:243:LEU:HD21	1.97	0.45
1:A:193:PRO:HD3	1:A:208:TYR:CE2	2.52	0.45
1:G:42:SER:HB3	7:G:631:HOH:O	2.16	0.45
1:A:185:VAL:HG22	1:A:205:ILE:HB	1.98	0.45
1:G:141:LYS:H	1:G:141:LYS:HD2	1.82	0.45
1:B:110:MET:HE2	1:B:167:ILE:HD11	1.97	0.45
1:D:30:GLU:OE1	1:D:30:GLU:N	2.48	0.45
2:C:350:LEU:HD23	2:C:353:ILE:H	1.82	0.44
1:A:322:LEU:HB2	1:A:371:ASP:HB3	1.99	0.44
1:B:161:ASN:O	1:B:356:HIS:NE2	2.51	0.44
2:C:128:PHE:HB3	1:D:128:PHE:HB3	1.98	0.44
2:C:399:PRO:HB2	1:F:384:GLU:HB2	1.99	0.44
1:D:213:TYR:CZ	1:D:311:THR:OG1	2.69	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:310:CYS:SG	2:E:311:THR:N	2.90	0.44
1:A:270:PHE:CE1	1:A:274:MET:HE2	2.53	0.44
1:H:213:TYR:CE1	1:H:342:GLY:HA2	2.53	0.44
2:C:256:ASN:HB3	7:C:739:HOH:O	2.18	0.44
1:A:324:HIS:CD2	1:A:399:PRO:HB3	2.53	0.44
1:B:310:CYS:SG	1:B:311:THR:N	2.91	0.44
1:D:188:ASN:HB3	1:D:208:TYR:CE2	2.52	0.44
1:G:267:GLU:O	1:G:271:LYS:HG3	2.18	0.44
1:D:122:ARG:HG3	1:D:134:PHE:CE1	2.53	0.44
1:G:161:ASN:HA	1:G:162:PRO:HA	1.77	0.44
2:E:61:SER:OG	7:E:603:HOH:O	2.21	0.43
1:H:349:GLU:OE2	1:H:351:PRO:HA	2.18	0.43
1:D:334:LEU:HD23	1:D:334:LEU:HA	1.85	0.43
2:E:128:PHE:HA	1:F:103:ALA:HB2	1.99	0.43
1:F:100:LEU:O	1:F:235:ARG:NH2	2.50	0.43
1:G:191:MET:HA	1:G:311:THR:CG2	2.45	0.43
2:C:112:ASP:HB2	2:C:367:LEU:HD22	1.99	0.43
2:E:191:MET:HA	2:E:311:THR:CG2	2.45	0.43
1:A:256:ASN:HB3	7:A:732:HOH:O	2.19	0.43
1:B:349:GLU:OE2	1:B:351:PRO:HA	2.18	0.43
1:D:193:PRO:HD3	1:D:208:TYR:CE2	2.53	0.43
1:B:35:ARG:HH11	1:D:51:ALA:HB3	1.83	0.43
1:G:212:LLP:H	1:G:212:LLP:HG3	1.51	0.43
1:H:350:LEU:HD23	1:H:353:ILE:HG23	2.00	0.43
2:E:193:PRO:HD3	2:E:208:TYR:CE2	2.53	0.43
1:F:140:ILE:CD1	1:F:175:ILE:HD13	2.49	0.43
2:C:161:ASN:HA	2:C:162:PRO:HA	1.85	0.43
1:G:147:ILE:HG21	1:G:179:HIS:CD2	2.54	0.43
1:H:213:TYR:OH	1:H:311:THR:OG1	2.26	0.43
2:C:214:MET:HE3	2:C:259:LEU:HD21	1.99	0.43
1:A:161:ASN:HA	1:A:162:PRO:HA	1.81	0.43
1:B:50:GLY:N	1:D:35:ARG:HH22	2.17	0.43
1:B:161:ASN:HA	1:B:162:PRO:HA	1.83	0.43
2:C:137:CYS:O	2:C:140:ILE:HD13	2.19	0.43
1:H:139:LYS:CB	1:H:142:LEU:HD13	2.49	0.43
1:F:214:MET:HE3	1:F:259:LEU:HD21	2.01	0.42
2:C:188:ASN:HB3	2:C:208:TYR:CE2	2.54	0.42
2:E:322:LEU:HB2	2:E:371:ASP:HB3	2.00	0.42
1:F:150:GLU:N	1:F:150:GLU:OE1	2.52	0.42
1:H:136:ASP:HB3	1:H:142:LEU:HD23	2.01	0.42
2:E:350:LEU:HD23	2:E:353:ILE:HG23	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:185:VAL:HG22	1:G:205:ILE:HB	2.02	0.42
1:G:191:MET:HG2	7:G:617:HOH:O	2.19	0.42
1:H:161:ASN:HA	1:H:162:PRO:HA	1.79	0.42
2:E:121:PHE:O	2:E:132:ILE:HG13	2.18	0.42
1:G:43:LEU:HD21	1:G:250:ILE:HG12	2.01	0.42
1:B:353:ILE:HG13	1:B:354:MET:HG3	2.01	0.42
1:A:330:LYS:HA	1:A:330:LYS:HD3	1.85	0.42
2:C:91:LEU:HD23	2:C:91:LEU:HA	1.92	0.42
1:B:213:TYR:CE1	1:B:342:GLY:HA2	2.54	0.41
1:D:110:MET:HE2	1:D:110:MET:HB3	1.93	0.41
2:E:156:ILE:HD11	2:E:186:VAL:HG22	2.02	0.41
1:B:213:TYR:CZ	1:B:311:THR:OG1	2.69	0.41
2:C:193:PRO:HD3	2:C:208:TYR:CE2	2.55	0.41
1:D:185:VAL:HG22	1:D:205:ILE:HB	2.02	0.41
1:F:110:MET:HG3	1:F:112:ASP:H	1.85	0.41
1:F:205:ILE:HG23	1:F:225:VAL:HG13	2.02	0.41
2:C:27:GLN:HE22	2:C:256:ASN:HD21	1.68	0.41
1:F:193:PRO:HD3	1:F:208:TYR:CE2	2.55	0.41
2:E:193:PRO:HD3	2:E:208:TYR:CZ	2.55	0.41
1:H:214:MET:HE3	1:H:259:LEU:HD21	2.03	0.41
1:A:121:PHE:HB3	1:A:132:ILE:HG21	2.03	0.41
1:A:299:GLN:O	1:A:303:VAL:HG23	2.19	0.41
1:D:106:GLN:HB3	1:D:151:THR:HA	2.02	0.41
1:D:369:ILE:HA	1:D:373:LEU:HD22	2.02	0.41
1:H:27:GLN:HE22	1:H:256:ASN:HD21	1.68	0.41
1:B:350:LEU:HD22	1:B:353:ILE:HG23	2.03	0.41
1:D:42:SER:HB3	7:D:665:HOH:O	2.20	0.41
1:F:122:ARG:O	1:F:126:SER:OG	2.23	0.41
1:G:28:ASP:HB3	7:G:602:HOH:O	2.21	0.41
2:C:268:LYS:HB3	2:C:380:LEU:HD22	2.02	0.41
1:D:322:LEU:HB2	1:D:371:ASP:HB3	2.02	0.41
1:G:238:PHE:CZ	1:H:119:LEU:HD21	2.55	0.41
1:H:270:PHE:CE1	1:H:274:MET:HE2	2.55	0.41
1:H:339:VAL:HB	6:H:501:CYS:HB2	2.02	0.41
1:B:214:MET:HE3	1:B:259:LEU:HD21	2.03	0.41
2:E:155:TRP:CZ3	2:E:185:VAL:HG11	2.56	0.41
1:B:91:LEU:HD23	1:B:91:LEU:HA	1.95	0.40
1:B:266:MET:HE1	1:B:311:THR:OG1	2.21	0.40
1:D:43:LEU:HD21	1:D:250:ILE:HG12	2.04	0.40
1:F:210:ALA:HA	1:F:214:MET:HB2	2.02	0.40
1:B:210:ALA:HA	1:B:214:MET:HB2	2.02	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:213:TYR:CE1	1:D:342:GLY:HA2	2.56	0.40
1:F:32:TRP:CZ2	1:F:39:PRO:HB3	2.57	0.40
1:F:197:ARG:NH2	7:F:605:HOH:O	2.35	0.40
1:F:326:GLU:O	1:F:330:LYS:HD3	2.21	0.40
1:G:91:LEU:HD23	1:G:91:LEU:HA	1.88	0.40
1:B:193:PRO:HD3	1:B:208:TYR:CE2	2.57	0.40
2:E:210:ALA:HA	2:E:214:MET:HB2	2.03	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	377/422 (89%)	365 (97%)	12 (3%)	0	100	100
1	B	380/422 (90%)	371 (98%)	9 (2%)	0	100	100
1	D	377/422 (89%)	367 (97%)	10 (3%)	0	100	100
1	F	374/422 (89%)	363 (97%)	11 (3%)	0	100	100
1	G	379/422 (90%)	371 (98%)	8 (2%)	0	100	100
1	H	381/422 (90%)	373 (98%)	8 (2%)	0	100	100
2	C	382/422 (90%)	372 (97%)	10 (3%)	0	100	100
2	E	381/422 (90%)	372 (98%)	9 (2%)	0	100	100
All	All	3031/3376 (90%)	2954 (98%)	77 (2%)	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	326/356 (92%)	322 (99%)	4 (1%)	63	78
1	B	327/356 (92%)	326 (100%)	1 (0%)	86	93
1	D	324/356 (91%)	317 (98%)	7 (2%)	45	61
1	F	322/356 (90%)	318 (99%)	4 (1%)	63	78
1	G	327/356 (92%)	323 (99%)	4 (1%)	63	78
1	H	329/356 (92%)	325 (99%)	4 (1%)	63	78
2	C	329/357 (92%)	325 (99%)	4 (1%)	63	78
2	E	328/357 (92%)	325 (99%)	3 (1%)	70	84
All	All	2612/2850 (92%)	2581 (99%)	31 (1%)	63	78

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	172	CYS
1	A	271	LYS
1	A	311	THR
1	A	341	LEU
1	B	341	LEU
2	C	135	VAL
2	C	140	ILE
2	C	227	VAL
2	C	341	LEU
1	D	33	THR
1	D	135	VAL
1	D	141	LYS
1	D	172	CYS
1	D	333	LYS
1	D	341	LEU
1	D	384	GLU
2	E	135	VAL
2	E	227	VAL
2	E	341	LEU
1	F	59	ASN
1	F	135	VAL
1	F	341	LEU
1	F	349	GLU

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Mol	Chain	Res	Type
1	G	135	VAL
1	G	311	THR
1	G	341	LEU
1	G	384	GLU
1	H	140	ILE
1	H	227	VAL
1	H	311	THR
1	H	341	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	49	GLN
1	A	174	HIS
1	A	256	ASN
1	B	123	GLN
1	B	256	ASN
2	C	256	ASN
1	D	49	GLN
1	D	256	ASN
1	D	324	HIS
1	D	356	HIS
1	D	398	HIS
2	E	106	GLN
2	E	256	ASN
1	F	256	ASN
1	F	362	ASN
1	G	21	GLN
1	G	27	GLN
1	G	106	GLN
1	G	164	GLN
1	G	256	ASN
1	G	398	HIS
1	H	256	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

6 non-standard protein/DNA/RNA residues 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$
1	LLP	F	212	1	23,24,25	2.55	5 (21%)	25,32,34	1.18	3 (12%)
1	LLP	A	212	1	23,24,25	2.49	6 (26%)	25,32,34	1.34	2 (8%)
1	LLP	D	212	1	23,24,25	2.47	6 (26%)	25,32,34	1.25	3 (12%)
1	LLP	G	212	1	23,24,25	2.52	6 (26%)	25,32,34	1.19	3 (12%)
1	LLP	H	212	1	23,24,25	2.58	6 (26%)	25,32,34	1.20	3 (12%)
1	LLP	B	212	1	23,24,25	2.61	5 (21%)	25,32,34	1.28	3 (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
1	LLP	F	212	1	-	8/16/17/19	0/1/1/1
1	LLP	A	212	1	-	7/16/17/19	0/1/1/1
1	LLP	D	212	1	-	5/16/17/19	0/1/1/1
1	LLP	G	212	1	-	7/16/17/19	0/1/1/1
1	LLP	H	212	1	-	7/16/17/19	0/1/1/1
1	LLP	B	212	1	-	10/16/17/19	0/1/1/1

All (34) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	212	LLP	C4-C4'	7.96	1.63	1.46
1	A	212	LLP	C4-C4'	7.58	1.62	1.46
1	F	212	LLP	C4-C4'	7.56	1.62	1.46
1	H	212	LLP	C4-C4'	7.53	1.62	1.46
1	G	212	LLP	C4-C4'	7.33	1.62	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	212	LLP	C4-C4'	7.31	1.62	1.46
1	A	212	LLP	C4'-NZ	5.41	1.45	1.27
1	H	212	LLP	C4'-NZ	5.39	1.45	1.27
1	B	212	LLP	C4'-NZ	5.35	1.45	1.27
1	F	212	LLP	C4'-NZ	5.20	1.44	1.27
1	G	212	LLP	C4'-NZ	5.19	1.44	1.27
1	D	212	LLP	C4'-NZ	5.13	1.44	1.27
1	G	212	LLP	C2'-C2	3.86	1.56	1.50
1	H	212	LLP	C2'-C2	3.74	1.56	1.50
1	B	212	LLP	C2'-C2	3.72	1.56	1.50
1	F	212	LLP	C2'-C2	3.72	1.56	1.50
1	D	212	LLP	C2'-C2	3.71	1.56	1.50
1	A	212	LLP	C2'-C2	3.60	1.56	1.50
1	F	212	LLP	C4-C5	-3.46	1.37	1.42
1	G	212	LLP	C4-C5	-3.36	1.37	1.42
1	H	212	LLP	C4-C5	-3.28	1.37	1.42
1	B	212	LLP	C6-N1	3.22	1.41	1.34
1	H	212	LLP	C6-N1	3.20	1.40	1.34
1	D	212	LLP	C4-C5	-3.15	1.37	1.42
1	G	212	LLP	C6-N1	3.14	1.40	1.34
1	B	212	LLP	C4-C5	-3.14	1.37	1.42
1	F	212	LLP	C6-N1	2.99	1.40	1.34
1	D	212	LLP	C6-N1	2.95	1.40	1.34
1	A	212	LLP	C6-N1	2.89	1.40	1.34
1	A	212	LLP	C4-C5	-2.81	1.38	1.42
1	D	212	LLP	C5'-C5	2.35	1.57	1.50
1	G	212	LLP	C5'-C5	2.25	1.56	1.50
1	H	212	LLP	C5'-C5	2.17	1.56	1.50
1	A	212	LLP	C5'-C5	2.06	1.56	1.50

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	212	LLP	C4-C4'-NZ	-3.47	108.01	124.04
1	D	212	LLP	C4-C4'-NZ	-3.43	108.20	124.04
1	B	212	LLP	C4-C4'-NZ	-3.15	109.50	124.04
1	H	212	LLP	C4-C4'-NZ	-3.08	109.83	124.04
1	F	212	LLP	C4-C4'-NZ	-3.04	110.02	124.04
1	G	212	LLP	C4-C4'-NZ	-3.02	110.09	124.04
1	F	212	LLP	C5-C6-N1	-2.60	119.60	123.83
1	A	212	LLP	C5-C6-N1	-2.38	119.96	123.83
1	G	212	LLP	C5-C6-N1	-2.27	120.14	123.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	212	LLP	CE-NZ-C4'	-2.27	111.45	118.72
1	F	212	LLP	CE-NZ-C4'	-2.25	111.51	118.72
1	B	212	LLP	C4-C3-C2	2.24	121.41	120.14
1	H	212	LLP	C5-C6-N1	-2.24	120.19	123.83
1	D	212	LLP	C5-C6-N1	-2.17	120.30	123.83
1	B	212	LLP	C5-C6-N1	-2.11	120.40	123.83
1	D	212	LLP	CE-NZ-C4'	-2.10	112.00	118.72
1	H	212	LLP	CE-NZ-C4'	-2.09	112.04	118.72

There are no chirality outliers.

All (44) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	212	LLP	O-C-CA-CB
1	B	212	LLP	C4-C4'-NZ-CE
1	B	212	LLP	C5'-OP4-P-OP2
1	B	212	LLP	C5'-OP4-P-OP3
1	B	212	LLP	O-C-CA-CB
1	D	212	LLP	O-C-CA-CB
1	F	212	LLP	C4-C4'-NZ-CE
1	F	212	LLP	C4-C5-C5'-OP4
1	F	212	LLP	O-C-CA-CB
1	G	212	LLP	C4-C4'-NZ-CE
1	G	212	LLP	N-CA-CB-CG
1	G	212	LLP	O-C-CA-CB
1	H	212	LLP	O-C-CA-CB
1	D	212	LLP	C4-C4'-NZ-CE
1	H	212	LLP	C4-C4'-NZ-CE
1	A	212	LLP	CG-CD-CE-NZ
1	A	212	LLP	C4-C4'-NZ-CE
1	B	212	LLP	C3-C4-C4'-NZ
1	B	212	LLP	C5'-OP4-P-OP1
1	B	212	LLP	CG-CD-CE-NZ
1	F	212	LLP	C6-C5-C5'-OP4
1	F	212	LLP	CG-CD-CE-NZ
1	B	212	LLP	CD-CE-NZ-C4'
1	H	212	LLP	C4-C5-C5'-OP4
1	A	212	LLP	CD-CE-NZ-C4'
1	H	212	LLP	CD-CE-NZ-C4'
1	D	212	LLP	CD-CE-NZ-C4'
1	G	212	LLP	CD-CE-NZ-C4'
1	B	212	LLP	N-CA-CB-CG

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Mol	Chain	Res	Type	Atoms
1	D	212	LLP	N-CA-CB-CG
1	F	212	LLP	N-CA-CB-CG
1	F	212	LLP	C3-C4-C4'-NZ
1	F	212	LLP	CD-CE-NZ-C4'
1	A	212	LLP	C3-C4-C4'-NZ
1	G	212	LLP	C3-C4-C4'-NZ
1	A	212	LLP	CA-CB-CG-CD
1	B	212	LLP	C5-C4-C4'-NZ
1	H	212	LLP	C6-C5-C5'-OP4
1	H	212	LLP	C3-C4-C4'-NZ
1	G	212	LLP	CG-CD-CE-NZ
1	D	212	LLP	C3-C4-C4'-NZ
1	G	212	LLP	C-CA-CB-CG
1	A	212	LLP	N-CA-CB-CG
1	H	212	LLP	N-CA-CB-CG

There are no ring outliers.

6 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	F	212	LLP	3	0
1	A	212	LLP	2	0
1	D	212	LLP	2	0
1	G	212	LLP	3	0
1	H	212	LLP	4	0
1	B	212	LLP	2	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

9 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	$\# Z > 2$
4	SO4	D	501	-	4,4,4	0.24	0	6,6,6	0.09	0
6	CYS	H	501	-	5,6,6	1.17	1 (20%)	3,7,7	1.90	1 (33%)
4	SO4	A	502	-	4,4,4	0.24	0	6,6,6	0.09	0
5	LPI	E	501	-	24,24,24	0.84	0	29,33,33	1.23	4 (13%)
3	MET	A	501	-	7,8,8	0.91	1 (14%)	5,9,9	1.28	1 (20%)
6	CYS	G	501	-	5,6,6	1.09	1 (20%)	3,7,7	1.71	1 (33%)
4	SO4	B	501	-	4,4,4	0.16	0	6,6,6	0.28	0
6	CYS	F	501	-	5,6,6	1.07	1 (20%)	3,7,7	1.64	1 (33%)
5	LPI	C	501	2	24,24,24	0.84	0	29,33,33	1.56	3 (10%)

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
6	CYS	H	501	-	-	2/6/6/6	-
5	LPI	E	501	-	-	11/19/19/19	0/1/1/1
3	MET	A	501	-	-	1/8/8/8	-
6	CYS	G	501	-	-	0/6/6/6	-
6	CYS	F	501	-	-	0/6/6/6	-
5	LPI	C	501	2	-	6/19/19/19	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	H	501	CYS	OXT-C	-2.43	1.22	1.30
3	A	501	MET	OXT-C	-2.35	1.23	1.30
6	G	501	CYS	OXT-C	-2.32	1.23	1.30
6	F	501	CYS	OXT-C	-2.27	1.23	1.30

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	501	LPI	C4'-C4-C5	5.44	125.67	119.75
6	H	501	CYS	OXT-C-O	-3.22	116.77	124.08
5	E	501	LPI	C6-C5-C4	2.94	120.29	118.06

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	G	501	CYS	OXT-C-O	-2.93	117.42	124.08
6	F	501	CYS	OXT-C-O	-2.84	117.63	124.08
3	A	501	MET	OXT-C-O	-2.81	117.70	124.08
5	E	501	LPI	C5-C6-N1	-2.32	120.05	123.83
5	E	501	LPI	C4'-N3-C1	-2.32	109.49	113.84
5	C	501	LPI	C6-C5-C4	2.27	119.78	118.06
5	E	501	LPI	C11-S10-C9	2.05	110.92	100.32
5	C	501	LPI	C3-C4-C5	-2.05	116.87	118.73

There are no chirality outliers.

All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	501	LPI	C7-C1-C8-C9
5	C	501	LPI	N3-C1-C8-C9
5	C	501	LPI	C7-C1-N3-C4'
5	E	501	LPI	C5'-OP4-P-OP1
5	E	501	LPI	C5'-OP4-P-OP3
5	E	501	LPI	N3-C1-C8-C9
6	H	501	CYS	C-CA-CB-SG
5	E	501	LPI	C1-C8-C9-S10
5	E	501	LPI	C8-C9-S10-C11
5	E	501	LPI	C7-C1-C8-C9
5	C	501	LPI	C4-C5-C5'-OP4
5	C	501	LPI	C8-C1-N3-C4'
5	E	501	LPI	C8-C1-N3-C4'
5	E	501	LPI	C7-C1-N3-C4'
5	C	501	LPI	C1-C8-C9-S10
6	H	501	CYS	N-CA-CB-SG
5	E	501	LPI	C8-C1-C7-O8
3	A	501	MET	OXT-C-CA-N
5	E	501	LPI	C8-C1-C7-O9
5	E	501	LPI	C5'-OP4-P-OP2

There are no ring outliers.

4 monomers are involved in 9 short contacts:

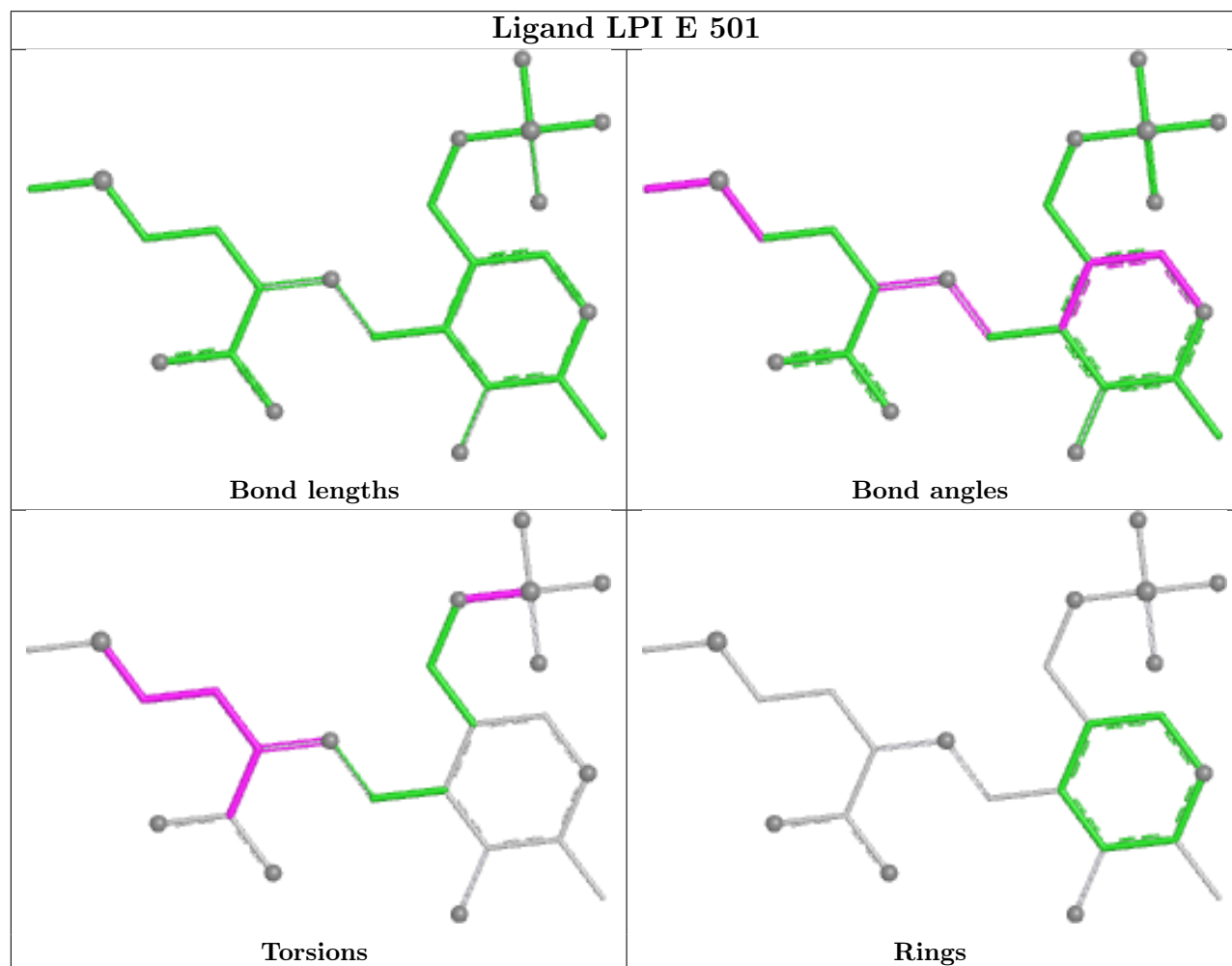
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	H	501	CYS	3	0
5	E	501	LPI	3	0
3	A	501	MET	2	0

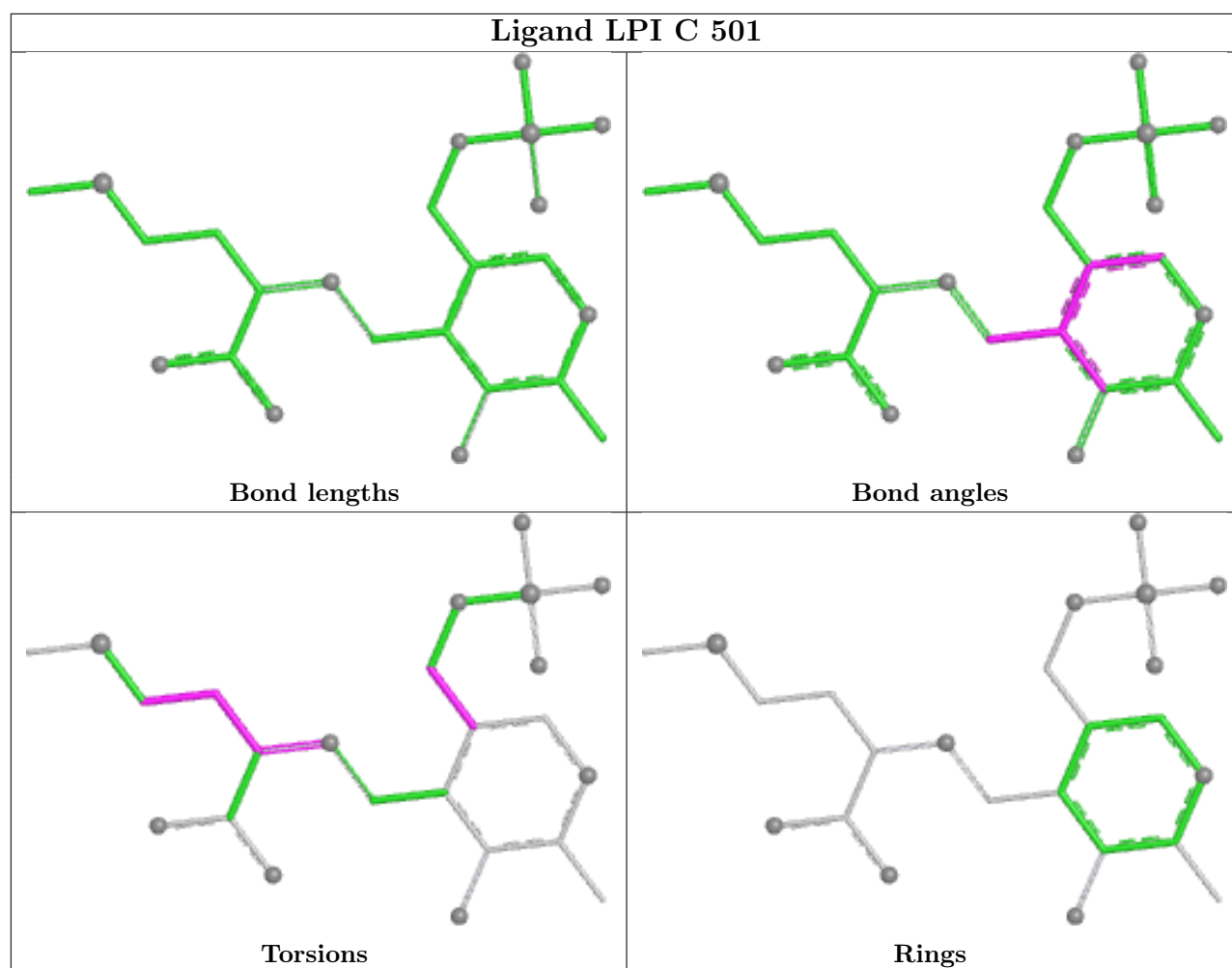
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	F	501	CYS	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





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	383/422 (90%)	-0.22	12 (3%)	51	48	23, 35, 67, 102	0
1	B	384/422 (90%)	0.10	20 (5%)	33	29	25, 46, 84, 114	0
1	D	383/422 (90%)	-0.01	18 (4%)	36	33	23, 43, 85, 114	0
1	F	380/422 (90%)	0.55	19 (5%)	34	31	41, 66, 108, 140	0
1	G	385/422 (91%)	0.38	15 (3%)	43	40	32, 60, 97, 122	0
1	H	385/422 (91%)	0.09	13 (3%)	48	45	29, 50, 91, 109	0
2	C	386/422 (91%)	-0.26	7 (1%)	67	64	23, 36, 64, 88	0
2	E	385/422 (91%)	0.13	8 (2%)	63	60	30, 53, 86, 102	0
All	All	3071/3376 (90%)	0.10	112 (3%)	46	43	23, 48, 91, 140	0

All (112) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	311	THR	5.6
1	A	311	THR	5.6
1	B	311	THR	5.4
1	F	310	CYS	5.1
1	G	311	THR	4.8
1	D	311	THR	4.7
1	A	112	ASP	4.6
1	G	10	GLY	4.4
1	F	311	THR	4.3
1	H	311	THR	4.3
1	H	140	ILE	4.2
1	G	400	PRO	4.0
1	F	51	ALA	3.9
1	D	399	PRO	3.8
1	B	353	ILE	3.8
1	B	359	VAL	3.8

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Mol	Chain	Res	Type	RSRZ
2	C	140	ILE	3.8
1	D	53	GLY	3.7
1	B	141	LYS	3.6
1	F	50	GLY	3.5
2	E	400	PRO	3.4
2	E	311	THR	3.3
1	B	140	ILE	3.3
1	A	350	LEU	3.2
1	D	112	ASP	3.2
1	G	356	HIS	3.2
1	D	310	CYS	3.1
1	D	111	ASP	3.1
1	F	112	ASP	3.1
2	E	350	LEU	3.1
1	B	399	PRO	3.0
1	B	111	ASP	3.0
1	B	179	HIS	2.9
1	B	355	THR	2.9
1	H	367	LEU	2.9
1	B	180	GLY	2.9
1	G	360	LEU	2.9
2	C	56	SER	2.8
1	H	359	VAL	2.8
1	F	180	GLY	2.8
1	G	157	GLU	2.8
1	B	50	GLY	2.8
1	F	149	PRO	2.8
2	E	106	GLN	2.7
1	D	353	ILE	2.7
2	C	353	ILE	2.7
1	H	310	CYS	2.7
1	G	12	LEU	2.7
1	B	358	SER	2.6
1	B	142	LEU	2.6
1	B	360	LEU	2.6
1	F	142	LEU	2.6
1	B	181	ASP	2.6
1	F	179	HIS	2.6
1	A	367	LEU	2.5
1	F	157	GLU	2.5
1	H	157	GLU	2.5
1	B	310	CYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	D	56	SER	2.5
2	E	353	ILE	2.5
1	D	350	LEU	2.5
1	G	366	VAL	2.5
1	A	362	ASN	2.5
1	G	361	LYS	2.5
1	F	399	PRO	2.5
1	B	145	ALA	2.5
1	G	140	ILE	2.4
2	C	350	LEU	2.4
1	D	285	TRP	2.4
1	F	356	HIS	2.4
1	G	315	THR	2.4
1	G	355	THR	2.4
1	D	357	ALA	2.4
1	H	152	LYS	2.3
1	A	359	VAL	2.3
1	A	365	ASP	2.3
2	E	141	LYS	2.3
1	H	358	SER	2.3
1	H	366	VAL	2.3
1	F	140	ILE	2.2
1	F	57	GLY	2.2
1	H	154	VAL	2.2
1	G	53	GLY	2.2
2	C	400	PRO	2.2
1	D	355	THR	2.1
1	A	353	ILE	2.1
1	B	178	LYS	2.1
1	D	369	ILE	2.1
1	H	350	LEU	2.1
1	F	362	ASN	2.1
1	D	398	HIS	2.1
1	A	50	GLY	2.1
1	A	57	GLY	2.1
1	H	180	GLY	2.1
1	D	141	LYS	2.1
1	D	140	ILE	2.1
1	B	352	ALA	2.1
1	G	278	GLN	2.1
2	E	143	LEU	2.1
1	A	400	PRO	2.1

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Mol	Chain	Res	Type	RSRZ
2	E	288	LYS	2.0
1	B	354	MET	2.0
1	D	367	LEU	2.0
1	A	366	VAL	2.0
1	F	104	GLY	2.0
2	C	57	GLY	2.0
1	F	355	THR	2.0
1	H	56	SER	2.0
1	D	356	HIS	2.0
1	G	350	LEU	2.0
1	F	147	ILE	2.0
1	F	353	ILE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	LLP	G	212	24/25	0.93	0.11	43,51,61,65	0
1	LLP	F	212	24/25	0.94	0.11	46,56,62,63	0
1	LLP	H	212	24/25	0.94	0.10	34,43,50,54	0
1	LLP	B	212	24/25	0.95	0.10	35,42,51,63	0
1	LLP	D	212	24/25	0.96	0.08	31,39,48,52	0
1	LLP	A	212	24/25	0.96	0.07	22,30,34,37	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

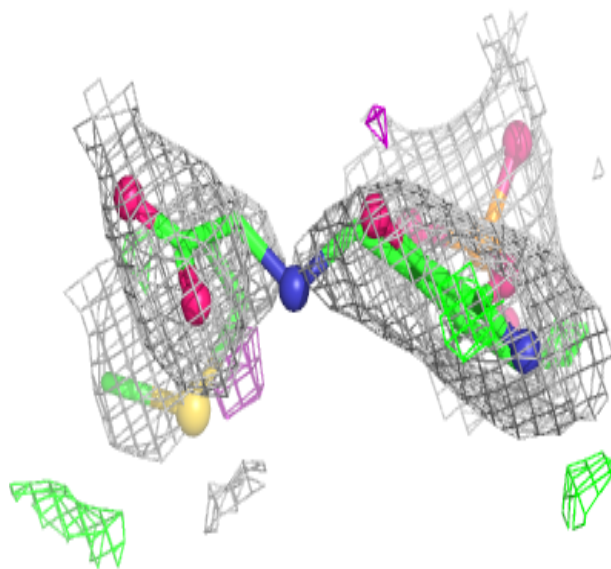
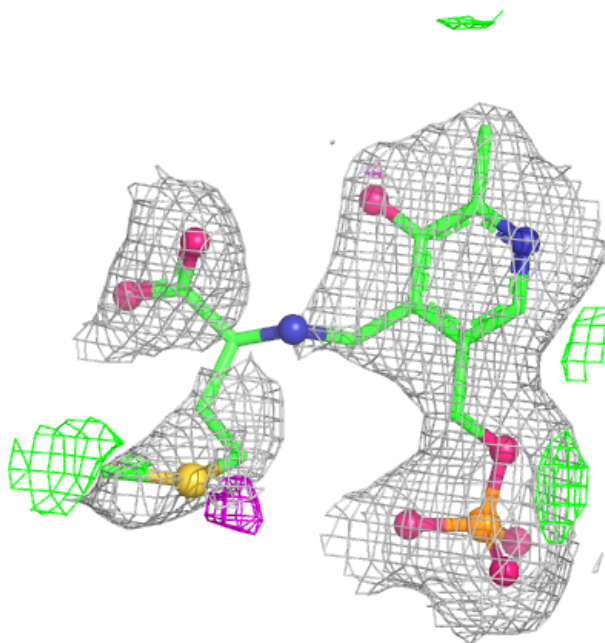
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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
4	SO4	B	501	5/5	0.59	0.28	34,37,43,52	5
4	SO4	A	502	5/5	0.78	0.15	109,110,110,112	0
6	CYS	G	501	7/7	0.79	0.18	64,71,88,89	0
3	MET	A	501	9/9	0.86	0.21	41,64,85,87	0
6	CYS	F	501	7/7	0.89	0.17	72,72,83,87	0
6	CYS	H	501	7/7	0.89	0.14	48,53,72,81	0
5	LPI	E	501	24/24	0.91	0.11	39,49,53,58	3
4	SO4	D	501	5/5	0.91	0.09	62,64,73,73	0
5	LPI	C	501	24/24	0.92	0.12	23,35,64,80	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

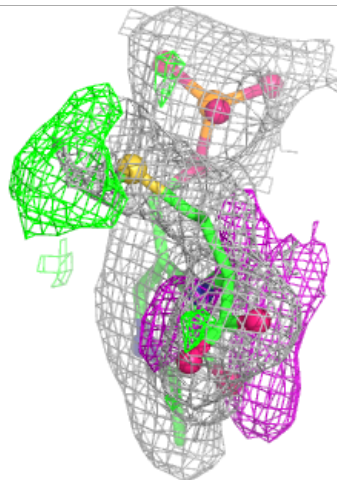
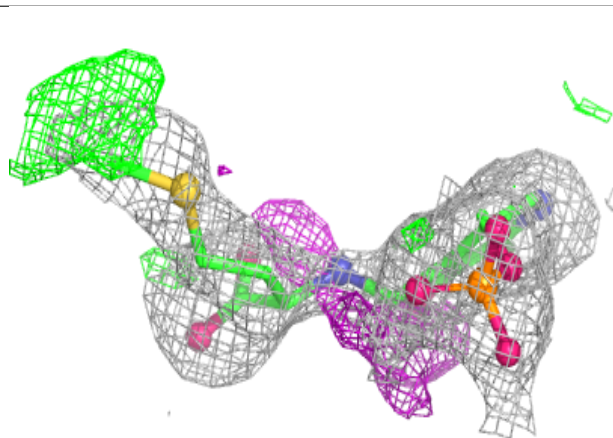
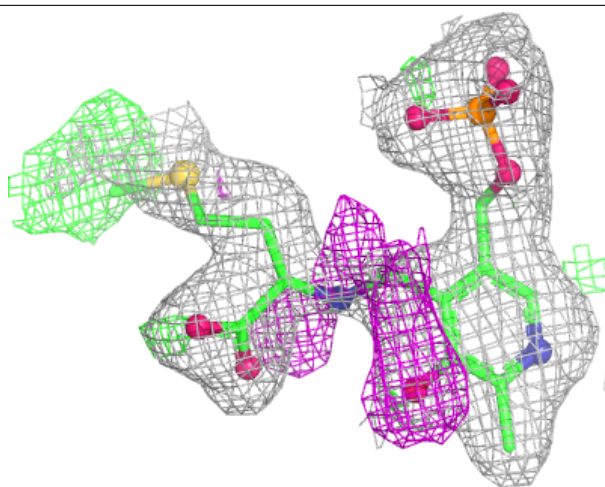
Electron density around LPI E 501:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around LPI C 501:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers [i](#)

There are no such residues in this entry.