WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Feb 9, 2026 – 03:32 pm GMT

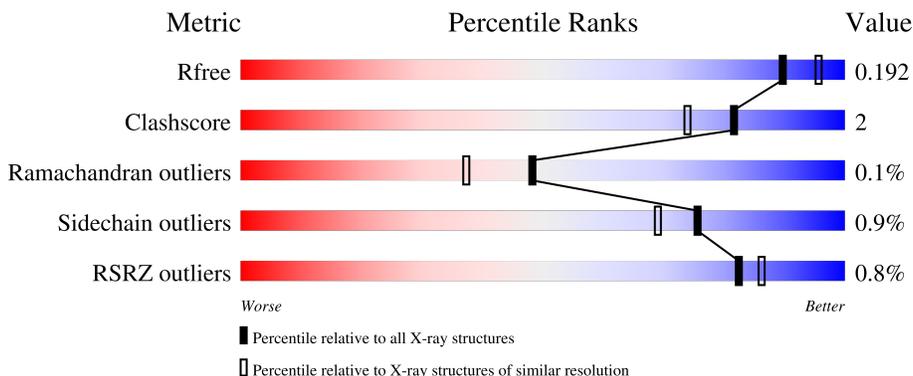|		
PDB ID	:	9SKM / pdb_00009skm
Title	:	Biocatalytic Regioselective C-Formylation of Resorcinol Derivatives (CsATase C88S)
Authors	:	Gal, L.; Rohan, S.; Tittmann, K.; Kroutil, W.
Deposited on	:	2025-09-02
Resolution	:	1.87 Å(reported)

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 1.87 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	Percentile Ranks	Value
Rfree		0.192
Clashscore		2
Ramachandran outliers		0.1%
Sidechain outliers		0.9%
RSRZ outliers		0.8%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	1090 (1.88-1.88)
Clashscore	180529	1144 (1.88-1.88)
Ramachandran outliers	177936	1135 (1.88-1.88)
Sidechain outliers	177891	1135 (1.88-1.88)
RSRZ outliers	164620	1090 (1.88-1.88)

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 <=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	360	94% 5% •
1	B	360	92% 8% •
1	C	360	94% 6%
1	D	360	96% • •
2	E	145	94% • ••

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Mol	Chain	Length	Quality of chain
2	F	145	92% 8%
2	G	145	91% 8%
2	H	145	94% 6%
3	I	398	2% 93% 7%
3	J	398	% 93% 7%
3	K	398	% 93% 6%
3	L	398	2% 92% 7%

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
5	ACT	B	403	-	-	X	-

2 Entry composition ⓘ

There are 7 unique types of molecules in this entry. The entry contains 56670 atoms, of which 26747 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 2,4-diacetylphloroglucinol biosynthesis protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	358	Total 5305	C 1666	H 2640	N 457	O 531	S 11	0	1	0
1	B	358	Total 5296	C 1663	H 2636	N 456	O 530	S 11	0	0	0
1	C	359	Total 5337	C 1674	H 2660	N 461	O 531	S 11	0	1	0
1	D	358	Total 5302	C 1665	H 2639	N 456	O 531	S 11	0	1	0

- Molecule 2 is a protein called 2,4-diacetylphloroglucinol biosynthesis protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	E	144	Total 2299	C 722	H 1154	N 213	O 199	S 11	0	0	0
2	F	144	Total 2298	C 722	H 1153	N 213	O 199	S 11	0	0	0
2	G	144	Total 2316	C 727	H 1163	N 216	O 199	S 11	0	1	0
2	H	144	Total 2317	C 727	H 1164	N 216	O 199	S 11	0	1	0

- Molecule 3 is a protein called 2,4-diacetylphloroglucinol biosynthesis protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
3	I	396	Total 5837	C 1872	H 2853	N 517	O 576	S 19	0	0	0
3	J	396	Total 5837	C 1872	H 2853	N 517	O 576	S 19	0	0	0
3	K	396	Total 5837	C 1872	H 2853	N 517	O 576	S 19	0	0	0
3	L	396	Total 5856	C 1877	H 2864	N 520	O 576	S 19	0	1	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	88	SER	CYS	engineered mutation	UNP A0A1S1X4K0
I	168	VAL	ALA	conflict	UNP A0A1S1X4K0
J	88	SER	CYS	engineered mutation	UNP A0A1S1X4K0
J	168	VAL	ALA	conflict	UNP A0A1S1X4K0
K	88	SER	CYS	engineered mutation	UNP A0A1S1X4K0
K	168	VAL	ALA	conflict	UNP A0A1S1X4K0
L	88	SER	CYS	engineered mutation	UNP A0A1S1X4K0
L	168	VAL	ALA	conflict	UNP A0A1S1X4K0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).
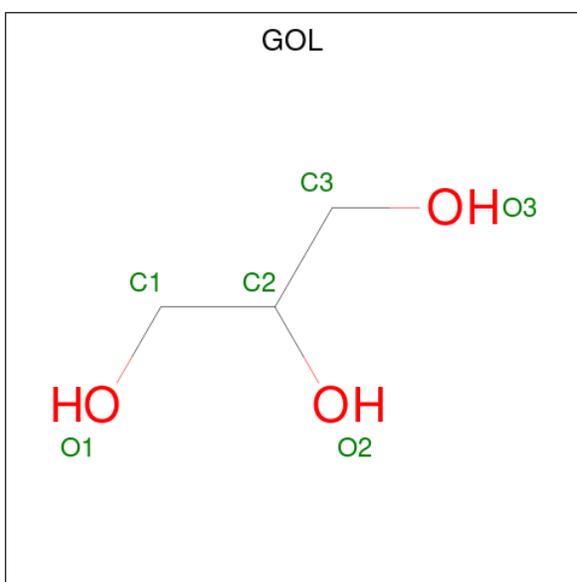
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total 14	C 3	H 8	O 3	0	0
4	B	1	Total 14	C 3	H 8	O 3	0	0
4	C	1	Total 14	C 3	H 8	O 3	0	0
4	D	1	Total 14	C 3	H 8	O 3	0	0
4	I	1	Total 14	C 3	H 8	O 3	0	0
4	J	1	Total 14	C 3	H 8	O 3	0	0
4	J	1	Total 14	C 3	H 8	O 3	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	K	1	Total 14	C 3	H 8	O 3	0	0
4	L	1	Total 14	C 3	H 8	O 3	0	0
4	L	1	Total 14	C 3	H 8	O 3	0	0
4	L	1	Total 14	C 3	H 8	O 3	0	0

- Molecule 5 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).

ACT
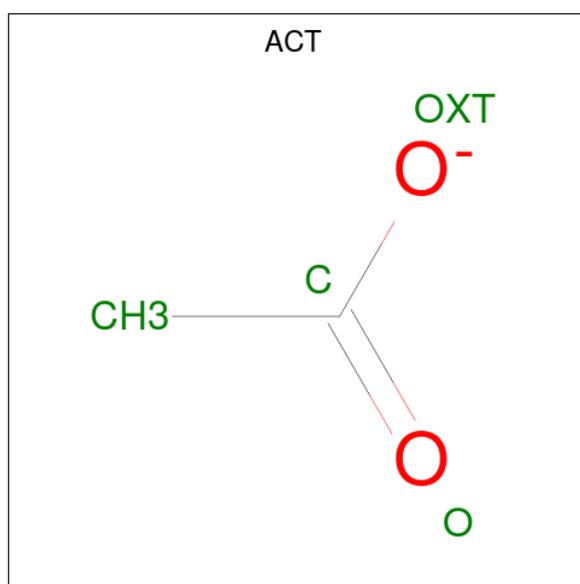
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	B	1	Total 7	C 2	H 3	O 2	0	0
5	B	1	Total 7	C 2	H 3	O 2	0	0
5	B	1	Total 7	C 2	H 3	O 2	0	0
5	D	1	Total 7	C 2	H 3	O 2	0	0
5	D	1	Total 7	C 2	H 3	O 2	0	0
5	G	1	Total 7	C 2	H 3	O 2	0	0
5	H	1	Total 7	C 2	H 3	O 2	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	I	1	Total	C	H	O	0	0
			7	2	3	2		
5	L	1	Total	C	H	O	0	0
			7	2	3	2		

- Molecule 6 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	E	1	Total	Zn	0	0
			1	1		
6	F	1	Total	Zn	0	0
			1	1		
6	G	1	Total	Zn	0	0
			1	1		
6	H	1	Total	Zn	0	0
			1	1		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	259	Total	O	0	0
			259	259		
7	B	250	Total	O	0	0
			250	250		
7	C	278	Total	O	0	0
			278	278		
7	D	254	Total	O	0	0
			254	254		
7	E	137	Total	O	0	0
			137	137		
7	F	134	Total	O	0	0
			134	134		
7	G	137	Total	O	0	0
			137	137		
7	H	139	Total	O	0	0
			139	139		
7	I	235	Total	O	0	0
			235	235		
7	J	272	Total	O	0	0
			272	272		
7	K	267	Total	O	0	0
			267	267		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	L	250	Total 250	O 250	0	0

3 Residue-property plots ⓘ

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: 2,4-diacetylphloroglucinol biosynthesis protein
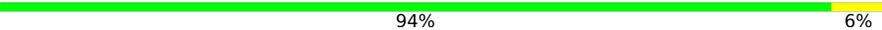
Chain A:
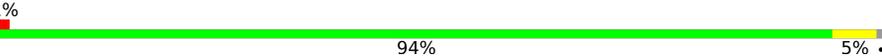
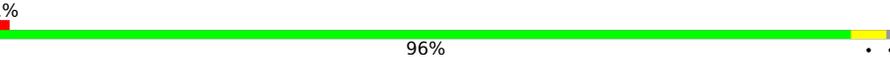- Molecule 1: 2,4-diacetylphloroglucinol biosynthesis protein

Chain B:

- Molecule 1: 2,4-diacetylphloroglucinol biosynthesis protein
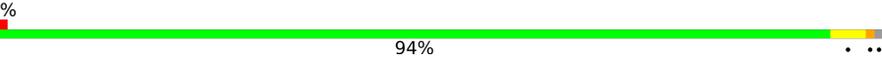
Chain C:

- Molecule 1: 2,4-diacetylphloroglucinol biosynthesis protein

Chain D:

- Molecule 2: 2,4-diacetylphloroglucinol biosynthesis protein

Chain E:

- Molecule 2: 2,4-diacetylphloroglucinol biosynthesis protein

Chain F:

92%   8%

MET S2 M11 F41 R45 C48 N52 R72 A73 E74 P88 D108 R120 R126 E145

• Molecule 2: 2,4-diacetylphloroglucinol biosynthesis protein

Chain G:

91%   8%

MET S2 H9 R33 E36 R45 S46 V47 C48 N52 E57 R72 A73 E74 P88 A119 E145

• Molecule 2: 2,4-diacetylphloroglucinol biosynthesis protein

Chain H:

94%   6%

MET S2 F41 R45 C48 N52 E74 A86 V87 P88 I125 E145

• Molecule 3: 2,4-diacetylphloroglucinol biosynthesis protein

2%

Chain I:

93%   7%

MET SER A3 R21 H44 P45 R46 A52 Y55 T89 C112 Y127 T132 E133 A162 A186 L209 T250 R251 N254 Y259 L262 P263 Q264 D265 V266 M280 T288 A289 K290 D339 R345 G346 H347 D352 L383 E398

• Molecule 3: 2,4-diacetylphloroglucinol biosynthesis protein

%

Chain J:

93%   7%

MET SER A3 R21 V51 A52 Y55 G59 P78 T89 V102 Y107 L111 C112 M118 Y124 Y127 T132 E133 R164 P263 Q264 D265 V266 V297 Q307 M311 M324 L336 H347 D352 L360 A378 Q381

E398

• Molecule 3: 2,4-diacetylphloroglucinol biosynthesis protein

%

Chain K:

93%   6%

MET SER A3 V51 A52 Y55 E58 M97 V102 Y107 L111 C112 M118 T119 Y124 Y127 T132 E133 A162 G163 R164 H171 T187 L196 P263 Q264 D265 V266 L270 M324 Q333 L360 A378 E398

• Molecule 3: 2,4-diacetylphloroglucinol biosynthesis protein

2%

Chain L:

92%   7%

MET SER A3 R4 R5 V31 V51 A52 Y55 M97 V102 Y107 L111 C112 M118 Y124 Y127 T132 H171 G261 L262 P263 Q264 D265 V266 Q307 M311 M324 H347 D352 T358 E359 L360 F361 R362 K373 A378 Y386

E398

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	93.73Å 184.36Å 120.78Å 90.00° 103.66° 90.00°	Depositor
Resolution (Å)	64.92 – 1.87 64.92 – 1.87	Depositor EDS
% Data completeness (in resolution range)	97.4 (64.92-1.87) 97.9 (64.92-1.87)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.30 (at 1.87Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.165 , 0.193 0.165 , 0.192	Depositor DCC
R_{free} test set	16005 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å^2)	17.6	Xtriage
Anisotropy	0.223	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 38.5	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	56670	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.09% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1] Intensities estimated from amplitudes.
[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: GOL, ZN, ACT

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	0.36	0/2708	0.57	2/3673 (0.1%)
1	B	0.38	1/2700 (0.0%)	0.59	2/3662 (0.1%)
1	C	0.36	0/2720	0.57	2/3687 (0.1%)
1	D	0.36	1/2706 (0.0%)	0.58	2/3670 (0.1%)
2	E	0.36	0/1169	0.52	0/1570
2	F	0.35	0/1169	0.54	0/1570
2	G	0.38	0/1180	0.55	0/1584
2	H	0.34	0/1180	0.52	0/1584
3	I	0.33	0/3051	0.54	0/4128
3	J	0.34	0/3051	0.54	0/4128
3	K	0.33	0/3051	0.55	0/4128
3	L	0.34	0/3062	0.57	1/4142 (0.0%)
All	All	0.35	2/27747 (0.0%)	0.56	9/37526 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
3	I	0	1
3	J	0	1
3	K	0	1
All	All	0	3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	70	SER	C-O	-6.26	1.21	1.23
1	D	78	LEU	C-N	5.13	1.36	1.33

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	303	GLY	CA-C-N	9.32	138.47	121.70
1	B	303	GLY	C-N-CA	9.32	138.47	121.70
1	C	303	GLY	CA-C-N	7.69	135.54	121.70
1	C	303	GLY	C-N-CA	7.69	135.54	121.70
1	D	303	GLY	CA-C-N	7.50	135.21	121.70
1	D	303	GLY	C-N-CA	7.50	135.21	121.70
1	A	303	GLY	CA-C-N	6.63	133.64	121.70
1	A	303	GLY	C-N-CA	6.63	133.64	121.70
3	L	386	TYR	CA-CB-CG	-5.29	104.38	113.90

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	I	133	GLU	Peptide
3	J	133	GLU	Peptide
3	K	133	GLU	Peptide

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	2665	2640	2647	10	0
1	B	2660	2636	2641	18	0
1	C	2677	2660	2667	13	0
1	D	2663	2639	2646	7	0
2	E	1145	1154	1156	4	0
2	F	1145	1153	1156	7	0
2	G	1153	1163	1169	8	0
2	H	1153	1164	1169	5	0
3	I	2984	2853	2871	16	0
3	J	2984	2853	2871	12	0
3	K	2984	2853	2871	15	0
3	L	2992	2864	2884	16	0
4	A	6	8	8	0	0
4	B	6	8	8	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	C	6	8	8	3	0
4	D	6	8	8	0	0
4	I	6	8	8	0	0
4	J	12	16	16	1	0
4	K	6	8	8	2	0
4	L	18	24	24	1	0
5	B	12	9	9	3	0
5	D	8	6	6	1	0
5	G	4	3	3	1	0
5	H	4	3	3	1	0
5	I	4	3	3	0	0
5	L	4	3	3	0	0
6	E	1	0	0	0	0
6	F	1	0	0	0	0
6	G	1	0	0	0	0
6	H	1	0	0	0	0
7	A	259	0	0	0	0
7	B	250	0	0	4	0
7	C	278	0	0	2	0
7	D	254	0	0	1	0
7	E	137	0	0	1	0
7	F	134	0	0	0	0
7	G	137	0	0	0	0
7	H	139	0	0	2	0
7	I	235	0	0	3	0
7	J	272	0	0	1	0
7	K	267	0	0	2	0
7	L	250	0	0	1	0
All	All	29923	26747	26863	128	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 2.

All (128) 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)
3:I:263:PRO:O	7:I:501:HOH:O	1.92	0.85
3:K:164:ARG:NH2	3:K:324:MET:HE1	2.00	0.77
2:G:33:ARG:NH2	2:G:57:GLU:OE2	2.19	0.76
1:B:178:THR:N	5:B:402:ACT:OXT	2.19	0.75
3:K:263:PRO:O	7:K:501:HOH:O	2.08	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:I:347:HIS:ND1	3:I:352:ASP:OD2	2.32	0.60
3:I:280:MET:HE1	3:J:78:PRO:HG2	1.84	0.58
3:L:5:ARG:NH2	3:L:398:GLU:O	2.35	0.58
1:C:248[A]:ARG:NH1	7:C:502:HOH:O	2.37	0.57
2:F:108:ASP:OD2	2:F:126:ARG:NH2	2.36	0.55
2:F:72:ARG:NH1	2:F:74:GLU:OE1	2.39	0.55
1:B:245:SER:HB2	5:B:403:ACT:H1	1.90	0.53
3:J:164:ARG:NH2	3:J:324:MET:HE1	2.24	0.53
1:C:111:PHE:CD2	1:C:114:LYS:HE3	2.44	0.53
2:E:11:MET:HE2	7:E:351:HOH:O	2.09	0.52
2:G:45:ARG:NE	2:G:47:VAL:O	2.39	0.52
1:A:95:LEU:C	1:A:95:LEU:HD23	2.37	0.50
3:K:333:GLN:HG3	7:K:676:HOH:O	2.10	0.50
1:A:88:ARG:HD2	1:B:189:ILE:HG22	1.94	0.49
3:J:118:MET:HB2	3:J:124:TYR:CG	2.47	0.49
2:E:41:PHE:CG	2:E:45:ARG:HD3	2.47	0.49
2:H:48:CYS:O	2:H:52:ASN:HA	2.12	0.49
3:L:307:GLN:O	3:L:311:MET:HG3	2.13	0.49
3:L:52:ALA:O	3:L:112:CYS:HA	2.12	0.49
3:K:263:PRO:HG2	3:K:270:LEU:HD21	1.95	0.49
1:D:246:THR:HB	1:D:247:PRO:HD3	1.95	0.48
1:B:111:PHE:CD2	1:B:114:LYS:HE3	2.48	0.48
1:C:99:GLY:HA2	4:C:401:GOL:C1	2.43	0.48
2:G:9:HIS:ND1	5:H:901:ACT:H1	2.29	0.48
2:F:48:CYS:O	2:F:52:ASN:HA	2.14	0.48
2:F:74:GLU:HB3	2:F:88:PRO:HB3	1.96	0.48
1:D:238:VAL:CG1	1:D:297:LEU:HD13	2.43	0.48
1:C:262:GLU:N	1:C:263:PRO:CD	2.77	0.47
2:G:47:VAL:HG23	3:L:31:VAL:HG11	1.95	0.47
1:A:266:PHE:CE1	1:A:270:ILE:HD11	2.49	0.47
1:C:99:GLY:C	4:C:401:GOL:H11	2.39	0.47
3:K:118:MET:HB2	3:K:124:TYR:CG	2.50	0.47
3:K:360:LEU:HD22	3:K:378:ALA:HB1	1.98	0.46
3:K:119:THR:HG22	4:K:401:GOL:H31	1.96	0.46
1:C:99:GLY:HA2	4:C:401:GOL:H11	1.98	0.46
3:J:52:ALA:O	3:J:112:CYS:HA	2.16	0.46
1:D:262:GLU:N	1:D:263:PRO:CD	2.78	0.45
2:F:11:MET:HE1	3:J:59:GLY:HA2	1.98	0.45
3:I:288:THR:OG1	3:I:290:LYS:HG2	2.17	0.45
1:B:62:GLN:HG2	7:B:725:HOH:O	2.16	0.45
3:J:51:VAL:HA	3:J:111:LEU:O	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:K:164:ARG:HH22	3:K:324:MET:HE1	1.76	0.45
3:L:171:HIS:CE1	3:L:324:MET:HE3	2.51	0.45
1:D:95:LEU:HD23	1:D:95:LEU:C	2.43	0.44
2:H:41:PHE:CG	2:H:45:ARG:HD3	2.52	0.44
3:J:297:VAL:HG22	3:J:336:LEU:HD21	1.99	0.44
1:B:95:LEU:C	1:B:95:LEU:HD23	2.43	0.44
3:I:250:THR:O	3:I:254:ASN:HB2	2.18	0.44
5:D:402:ACT:H3	7:D:673:HOH:O	2.17	0.44
3:L:118:MET:HB2	3:L:124:TYR:CG	2.53	0.44
2:G:72:ARG:HD3	2:G:74:GLU:CD	2.43	0.44
1:A:188:ASN:HB2	1:A:302:PHE:CG	2.53	0.43
1:B:343:ILE:HG23	1:B:348:LYS:HB2	2.00	0.43
3:L:358:THR:O	3:L:362:ARG:HG3	2.18	0.43
2:G:48:CYS:O	2:G:52:ASN:HA	2.18	0.43
3:I:259:TYR:CE1	3:I:280:MET:HE3	2.53	0.43
4:J:402:GOL:H11	7:J:706:HOH:O	2.18	0.43
3:K:51:VAL:HA	3:K:111:LEU:O	2.18	0.43
3:K:58:GLU:OE2	3:L:127:TYR:OH	2.18	0.43
3:K:119:THR:HG22	4:K:401:GOL:C3	2.49	0.43
1:B:258:ALA:O	1:B:262:GLU:HG3	2.18	0.43
1:A:9:TYR:CE1	1:A:283:ILE:HG23	2.54	0.43
1:A:266:PHE:HE1	1:A:270:ILE:HD11	1.83	0.43
3:I:89:THR:HG23	3:I:383:LEU:C	2.43	0.43
3:J:307:GLN:O	3:J:311:MET:HG3	2.17	0.43
2:H:74:GLU:HB3	2:H:88:PRO:HB3	2.00	0.43
3:I:251:ARG:O	3:I:266:VAL:HG22	2.18	0.43
3:K:52:ALA:O	3:K:112:CYS:HA	2.18	0.43
3:I:259:TYR:CD1	3:I:280:MET:HE3	2.54	0.42
3:I:266:VAL:HG21	7:I:680:HOH:O	2.18	0.42
3:J:297:VAL:HA	3:J:381:GLN:O	2.18	0.42
1:B:28:LYS:NZ	7:B:509:HOH:O	2.45	0.42
1:C:290:LYS:HD3	7:C:528:HOH:O	2.19	0.42
3:L:51:VAL:HA	3:L:111:LEU:O	2.19	0.42
1:A:246:THR:HB	1:A:247:PRO:HD3	2.00	0.42
3:K:102:VAL:HA	3:K:107:TYR:O	2.18	0.42
3:L:102:VAL:HA	3:L:107:TYR:O	2.19	0.42
2:F:41:PHE:CG	2:F:45:ARG:HD3	2.54	0.42
2:H:125:ILE:HD11	7:H:1022:HOH:O	2.19	0.42
3:K:171:HIS:CD2	3:K:324:MET:HE3	2.54	0.42
3:I:186:ALA:HB1	3:I:345:ARG:HA	2.01	0.42
1:C:31:ASP:OD2	1:C:33:ASP:HB3	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:213:GLU:OE1	7:B:501:HOH:O	2.22	0.42
1:C:38:HIS:O	1:C:245:SER:HB3	2.20	0.42
1:D:139:ALA:CB	1:D:279:LEU:HD12	2.50	0.42
3:I:44:HIS:HE1	3:I:46:ARG:HG3	1.84	0.42
3:I:52:ALA:O	3:I:112:CYS:HA	2.20	0.41
3:I:209:LEU:C	3:I:209:LEU:HD12	2.45	0.41
1:A:139:ALA:CB	1:A:279:LEU:HD12	2.49	0.41
1:A:262:GLU:N	1:A:263:PRO:CD	2.83	0.41
3:L:373:LYS:NZ	7:L:507:HOH:O	2.48	0.41
1:B:139:ALA:CB	1:B:279:LEU:HD12	2.50	0.41
2:G:74:GLU:HB3	2:G:88:PRO:HB3	2.02	0.41
3:L:347:HIS:ND1	3:L:352:ASP:OD2	2.48	0.41
1:B:262:GLU:N	1:B:263:PRO:CD	2.84	0.41
2:H:86:ALA:HB3	7:H:1111:HOH:O	2.20	0.41
3:I:339:ASP:OD2	3:I:345:ARG:HD3	2.21	0.41
3:L:360:LEU:HD22	3:L:378:ALA:HB1	2.02	0.41
3:I:262:LEU:HB3	7:I:501:HOH:O	2.21	0.41
1:C:188:ASN:HB2	1:C:302:PHE:CG	2.55	0.41
2:E:106:VAL:HA	2:E:142:PHE:O	2.20	0.41
3:J:360:LEU:HD22	3:J:378:ALA:HB1	2.01	0.41
1:B:266:PHE:CD1	1:B:266:PHE:C	2.99	0.41
3:J:347:HIS:ND1	3:J:352:ASP:OD2	2.48	0.41
1:B:175:ILE:HG12	1:B:311:LEU:CD1	2.51	0.41
1:B:188:ASN:HB2	1:B:302:PHE:CG	2.56	0.41
1:B:248:ARG:HH12	1:B:262:GLU:CD	2.29	0.41
1:C:297:LEU:C	1:C:297:LEU:HD23	2.45	0.41
2:E:48:CYS:O	2:E:52:ASN:HA	2.21	0.41
3:J:102:VAL:HA	3:J:107:TYR:O	2.21	0.41
3:K:97:MET:HE3	3:L:97:MET:HE3	2.02	0.41
5:B:403:ACT:H2	7:B:675:HOH:O	2.21	0.41
1:C:244:VAL:O	1:C:247:PRO:HD2	2.21	0.40
1:C:343:ILE:HG23	1:C:348:LYS:HB2	2.03	0.40
1:B:61:ALA:HB1	1:B:136:LEU:HD21	2.03	0.40
1:D:266:PHE:CD1	1:D:266:PHE:C	3.00	0.40
2:G:119:ALA:HA	5:G:201:ACT:H2	2.03	0.40
3:L:171:HIS:ND1	3:L:324:MET:HE3	2.37	0.40
1:A:76:LEU:O	1:A:106:CYS:HA	2.22	0.40
1:B:261:LEU:C	1:B:261:LEU:HD12	2.46	0.40
1:D:261:LEU:HD12	1:D:261:LEU:C	2.47	0.40
2:F:108:ASP:CG	2:F:126:ARG:HH22	2.27	0.40
3:L:124:TYR:HB3	4:L:402:GOL:H31	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	357/360 (99%)	346 (97%)	10 (3%)	1 (0%)	37	26
1	B	356/360 (99%)	346 (97%)	9 (2%)	1 (0%)	37	26
1	C	358/360 (99%)	347 (97%)	10 (3%)	1 (0%)	37	26
1	D	357/360 (99%)	346 (97%)	10 (3%)	1 (0%)	37	26
2	E	142/145 (98%)	138 (97%)	4 (3%)	0	100	100
2	F	142/145 (98%)	138 (97%)	4 (3%)	0	100	100
2	G	143/145 (99%)	140 (98%)	3 (2%)	0	100	100
2	H	143/145 (99%)	139 (97%)	4 (3%)	0	100	100
3	I	394/398 (99%)	381 (97%)	13 (3%)	0	100	100
3	J	394/398 (99%)	377 (96%)	17 (4%)	0	100	100
3	K	394/398 (99%)	382 (97%)	12 (3%)	0	100	100
3	L	395/398 (99%)	379 (96%)	15 (4%)	1 (0%)	37	26
All	All	3575/3612 (99%)	3459 (97%)	111 (3%)	5 (0%)	48	37

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	88	ARG
1	B	88	ARG
1	D	88	ARG
1	C	88	ARG
3	L	263	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	A	278/279 (100%)	276 (99%)	2 (1%)	81	77
1	B	277/279 (99%)	277 (100%)	0	100	100
1	C	279/279 (100%)	277 (99%)	2 (1%)	81	77
1	D	278/279 (100%)	278 (100%)	0	100	100
2	E	120/121 (99%)	119 (99%)	1 (1%)	79	74
2	F	120/121 (99%)	119 (99%)	1 (1%)	79	74
2	G	121/121 (100%)	120 (99%)	1 (1%)	79	74
2	H	121/121 (100%)	121 (100%)	0	100	100
3	I	304/306 (99%)	300 (99%)	4 (1%)	65	55
3	J	304/306 (99%)	299 (98%)	5 (2%)	58	45
3	K	304/306 (99%)	299 (98%)	5 (2%)	58	45
3	L	305/306 (100%)	301 (99%)	4 (1%)	65	55
All	All	2811/2824 (100%)	2786 (99%)	25 (1%)	75	69

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	62	GLN
1	A	284	GLN
1	C	284	GLN
1	C	311	LEU
2	E	45	ARG
2	F	120	ARG
2	G	36	GLU
3	I	21	ARG
3	I	55	TYR
3	I	127	TYR
3	I	132	THR
3	J	21	ARG
3	J	55	TYR
3	J	89	THR

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Mol	Chain	Res	Type
3	J	127	TYR
3	J	132	THR
3	K	55	TYR
3	K	127	TYR
3	K	132	THR
3	K	187	THR
3	K	196	LEU
3	L	5	ARG
3	L	55	TYR
3	L	132	THR
3	L	373	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	62	GLN
1	A	215	GLN
1	A	322	GLN
1	B	215	GLN
1	B	288	GLN
1	C	121	GLN
1	C	134	HIS
1	C	288	GLN
1	C	330	GLN
3	I	157	HIS
3	I	318	GLN
3	J	318	GLN
3	J	333	GLN
3	K	318	GLN
3	L	100	GLN
3	L	227	HIS
3	L	318	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 24 ligands modelled in this entry, 4 are monoatomic - leaving 20 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
4	GOL	C	401	-	5,5,5	0.81	0	5,5,5	0.78	0
5	ACT	B	402	-	3,3,3	1.24	0	3,3,3	1.18	0
4	GOL	B	401	-	5,5,5	0.59	0	5,5,5	1.15	1 (20%)
4	GOL	I	401	-	5,5,5	0.97	0	5,5,5	0.78	0
4	GOL	A	401	-	5,5,5	0.85	0	5,5,5	0.79	0
5	ACT	B	403	-	3,3,3	1.68	1 (33%)	3,3,3	1.24	0
4	GOL	L	401	-	5,5,5	1.27	1 (20%)	5,5,5	0.76	0
4	GOL	J	401	-	5,5,5	0.95	0	5,5,5	1.03	0
5	ACT	L	403	-	3,3,3	1.26	0	3,3,3	1.49	0
4	GOL	D	401	-	5,5,5	0.78	0	5,5,5	1.14	1 (20%)
5	ACT	H	901	-	3,3,3	1.42	1 (33%)	3,3,3	1.34	0
4	GOL	L	402	-	5,5,5	1.18	1 (20%)	5,5,5	1.08	0
5	ACT	I	402	-	3,3,3	1.28	0	3,3,3	1.40	0
4	GOL	L	404	-	5,5,5	0.76	0	5,5,5	0.83	0
5	ACT	D	403	-	3,3,3	1.50	1 (33%)	3,3,3	1.20	0
5	ACT	B	404	-	3,3,3	1.27	0	3,3,3	1.36	0
5	ACT	G	201	-	3,3,3	1.50	1 (33%)	3,3,3	1.24	0
4	GOL	J	402	-	5,5,5	0.82	0	5,5,5	0.85	0
5	ACT	D	402	-	3,3,3	1.50	0	3,3,3	1.35	0
4	GOL	K	401	-	5,5,5	0.99	0	5,5,5	1.39	1 (20%)

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
4	GOL	C	401	-	-	2/4/4/4	-
4	GOL	D	401	-	-	0/4/4/4	-
4	GOL	B	401	-	-	2/4/4/4	-
4	GOL	L	402	-	-	2/4/4/4	-
4	GOL	I	401	-	-	0/4/4/4	-
4	GOL	A	401	-	-	3/4/4/4	-
4	GOL	L	401	-	-	0/4/4/4	-
4	GOL	L	404	-	-	0/4/4/4	-
4	GOL	J	402	-	-	2/4/4/4	-
4	GOL	K	401	-	-	2/4/4/4	-
4	GOL	J	401	-	-	2/4/4/4	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	403	ACT	CH3-C	2.59	1.60	1.49
4	L	402	GOL	C3-C2	2.45	1.61	1.51
5	G	201	ACT	CH3-C	2.23	1.58	1.49
5	H	901	ACT	CH3-C	2.19	1.58	1.49
5	D	403	ACT	CH3-C	2.17	1.58	1.49
4	L	401	GOL	O2-C2	-2.16	1.37	1.43

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	K	401	GOL	C3-C2-C1	-2.48	102.07	111.70
4	B	401	GOL	C3-C2-C1	-2.18	103.22	111.70
4	D	401	GOL	C3-C2-C1	-2.03	103.82	111.70

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	401	GOL	O1-C1-C2-O2
4	C	401	GOL	O1-C1-C2-C3
4	J	402	GOL	C1-C2-C3-O3
4	K	401	GOL	O1-C1-C2-C3
4	A	401	GOL	O1-C1-C2-C3
4	A	401	GOL	C1-C2-C3-O3
4	B	401	GOL	C1-C2-C3-O3
4	J	401	GOL	C1-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
4	L	402	GOL	C1-C2-C3-O3
4	B	401	GOL	O2-C2-C3-O3
4	J	401	GOL	O2-C2-C3-O3
4	J	402	GOL	O2-C2-C3-O3
4	K	401	GOL	O1-C1-C2-O2
4	A	401	GOL	O2-C2-C3-O3
4	L	402	GOL	O2-C2-C3-O3

There are no ring outliers.

9 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	401	GOL	3	0
5	B	402	ACT	1	0
5	B	403	ACT	2	0
5	H	901	ACT	1	0
4	L	402	GOL	1	0
5	G	201	ACT	1	0
4	J	402	GOL	1	0
5	D	402	ACT	1	0
4	K	401	GOL	2	0

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	358/360 (99%)	-0.40	2 (0%)	85	89	14, 22, 37, 64	1 (0%)
1	B	358/360 (99%)	-0.44	0	100	100	12, 21, 36, 57	0
1	C	359/360 (99%)	-0.39	1 (0%)	90	93	13, 22, 37, 66	1 (0%)
1	D	358/360 (99%)	-0.39	2 (0%)	85	89	14, 23, 38, 60	1 (0%)
2	E	144/145 (99%)	-0.31	1 (0%)	84	87	14, 24, 44, 58	0
2	F	144/145 (99%)	-0.32	0	100	100	15, 23, 43, 55	0
2	G	144/145 (99%)	-0.32	0	100	100	14, 22, 42, 56	1 (0%)
2	H	144/145 (99%)	-0.31	0	100	100	14, 22, 44, 63	1 (0%)
3	I	396/398 (99%)	-0.21	6 (1%)	71	77	16, 26, 44, 89	0
3	J	396/398 (99%)	-0.34	5 (1%)	74	79	16, 24, 41, 75	0
3	K	396/398 (99%)	-0.29	5 (1%)	74	79	15, 24, 43, 80	0
3	L	396/398 (99%)	-0.28	6 (1%)	71	77	12, 24, 43, 84	1 (0%)
All	All	3593/3612 (99%)	-0.33	28 (0%)	82	86	12, 23, 41, 89	6 (0%)

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	L	265	ASP	4.6
3	J	265	ASP	3.7
3	L	263	PRO	3.6
3	L	264	GLN	3.5
3	K	265	ASP	3.4
3	I	263	PRO	3.4
3	J	263	PRO	3.4
3	K	263	PRO	3.2
3	I	266	VAL	3.0
3	K	162	ALA	2.9
3	K	264	GLN	2.9

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Mol	Chain	Res	Type	RSRZ
3	K	266	VAL	2.9
1	C	322	GLN	2.8
3	L	266	VAL	2.8
3	I	265	ASP	2.7
3	I	162	ALA	2.7
3	L	261	GLY	2.7
3	J	264	GLN	2.7
3	I	264	GLN	2.6
1	D	3	LYS	2.6
3	J	3	ALA	2.5
3	L	262	LEU	2.4
3	I	44	HIS	2.4
1	D	322	GLN	2.4
3	J	266	VAL	2.3
1	A	3	LYS	2.2
1	A	38	HIS	2.2
2	E	38	GLU	2.0

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. 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
5	ACT	B	404	4/4	0.63	0.21	35,42,46,49	0
5	ACT	D	403	4/4	0.71	0.20	38,46,56,57	0
4	GOL	J	401	6/6	0.78	0.13	31,38,46,54	0
5	ACT	B	403	4/4	0.78	0.19	30,37,44,57	0
5	ACT	B	402	4/4	0.79	0.17	31,37,39,44	0
5	ACT	G	201	4/4	0.79	0.16	39,46,49,57	0

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	ACT	I	402	4/4	0.81	0.13	38,46,46,47	0
4	GOL	L	404	6/6	0.84	0.12	41,50,57,60	0
4	GOL	C	401	6/6	0.86	0.13	26,35,46,48	0
5	ACT	L	403	4/4	0.86	0.14	29,35,37,40	0
4	GOL	D	401	6/6	0.87	0.13	25,33,40,41	0
5	ACT	H	901	4/4	0.87	0.13	25,30,31,32	0
4	GOL	B	401	6/6	0.88	0.14	20,32,42,42	0
4	GOL	A	401	6/6	0.89	0.12	22,32,41,41	0
5	ACT	D	402	4/4	0.90	0.10	30,36,43,43	0
4	GOL	K	401	6/6	0.90	0.13	18,27,36,36	0
4	GOL	L	401	6/6	0.91	0.13	27,34,43,43	0
4	GOL	L	402	6/6	0.92	0.10	15,28,34,39	0
4	GOL	J	402	6/6	0.95	0.10	15,30,43,43	0
4	GOL	I	401	6/6	0.95	0.10	15,24,28,28	0
6	ZN	E	201	1/1	0.99	0.03	31,31,31,31	1
6	ZN	F	201	1/1	0.99	0.02	26,26,26,26	1
6	ZN	G	202	1/1	0.99	0.02	25,25,25,25	1
6	ZN	H	902	1/1	0.99	0.03	30,30,30,30	1

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.
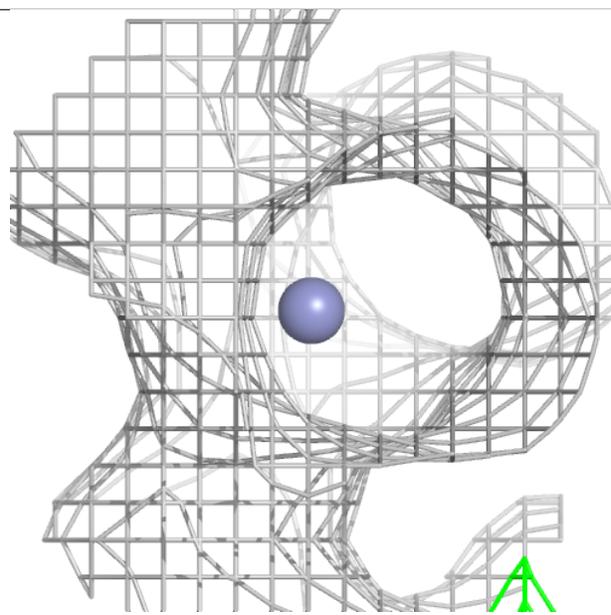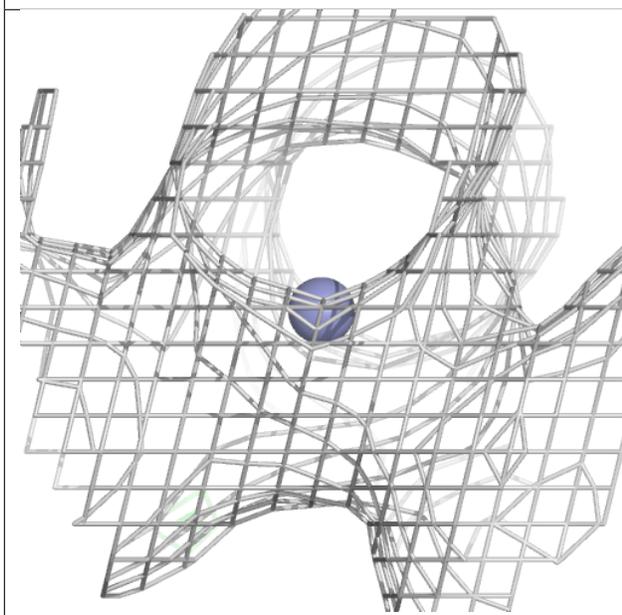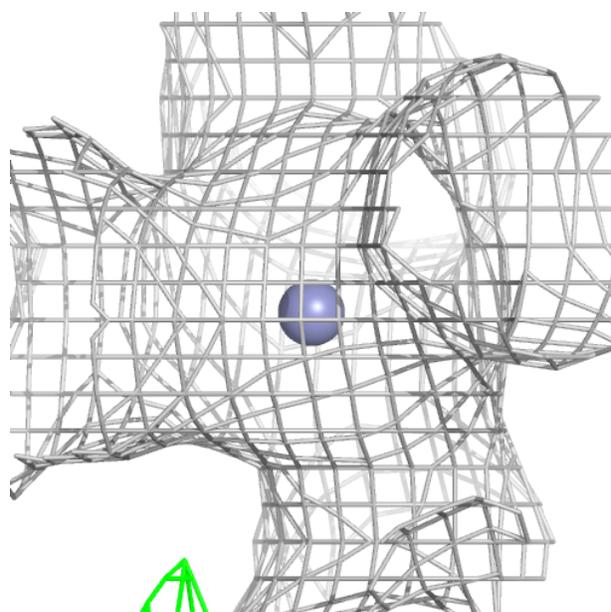
Electron density around ZN E 201:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
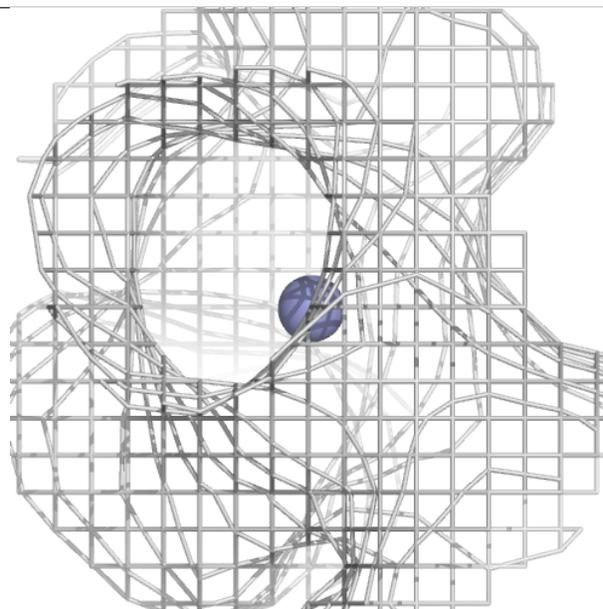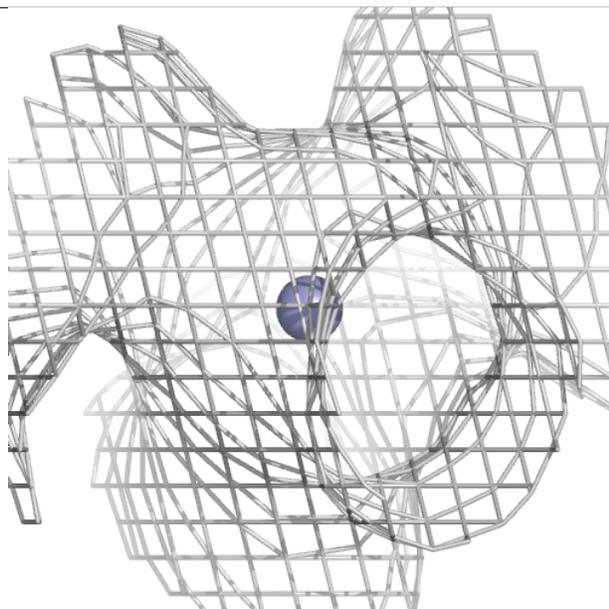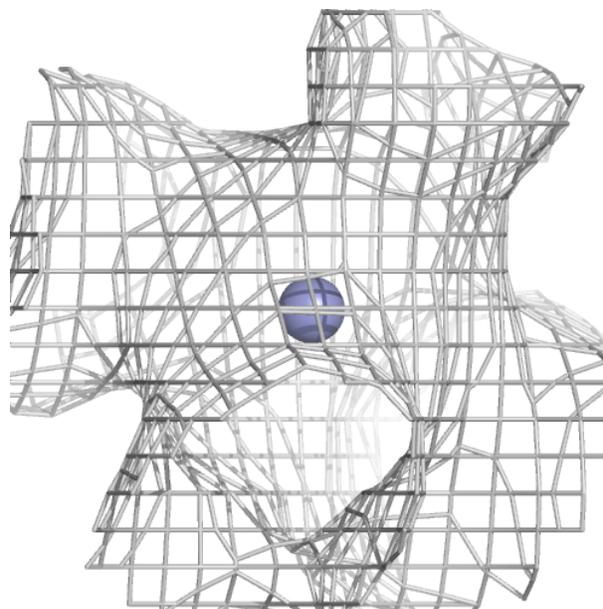
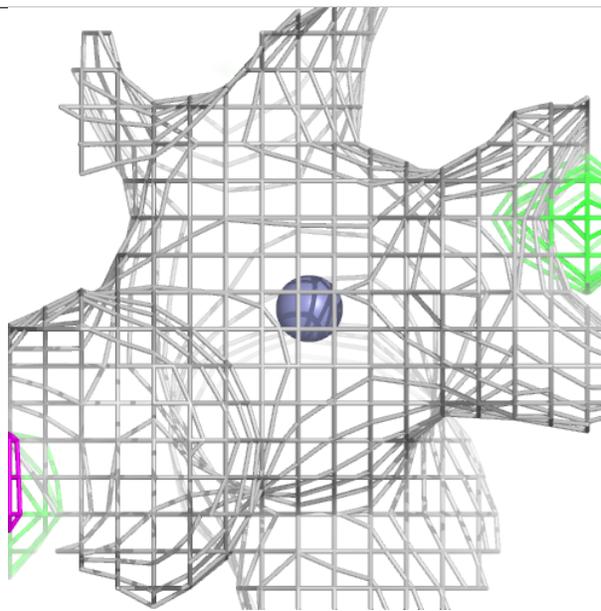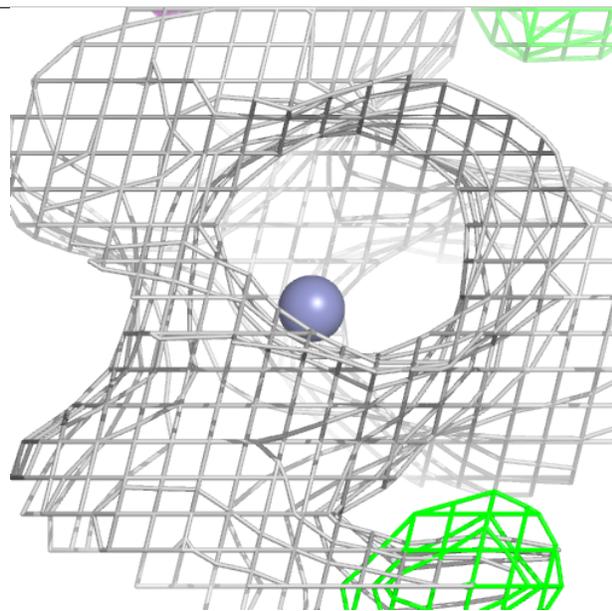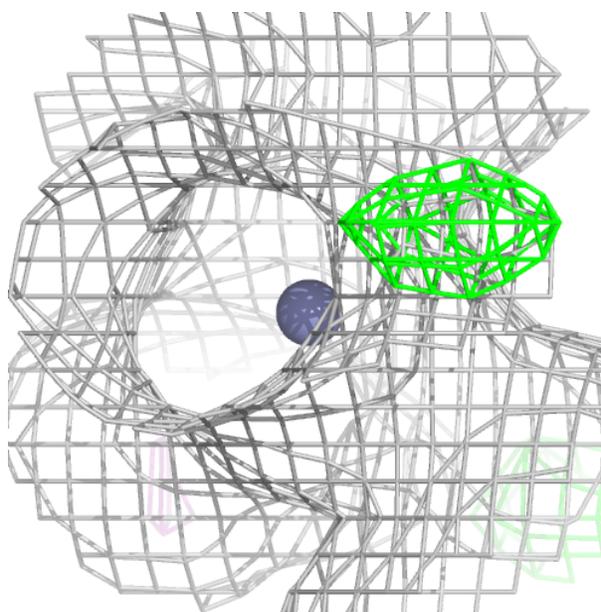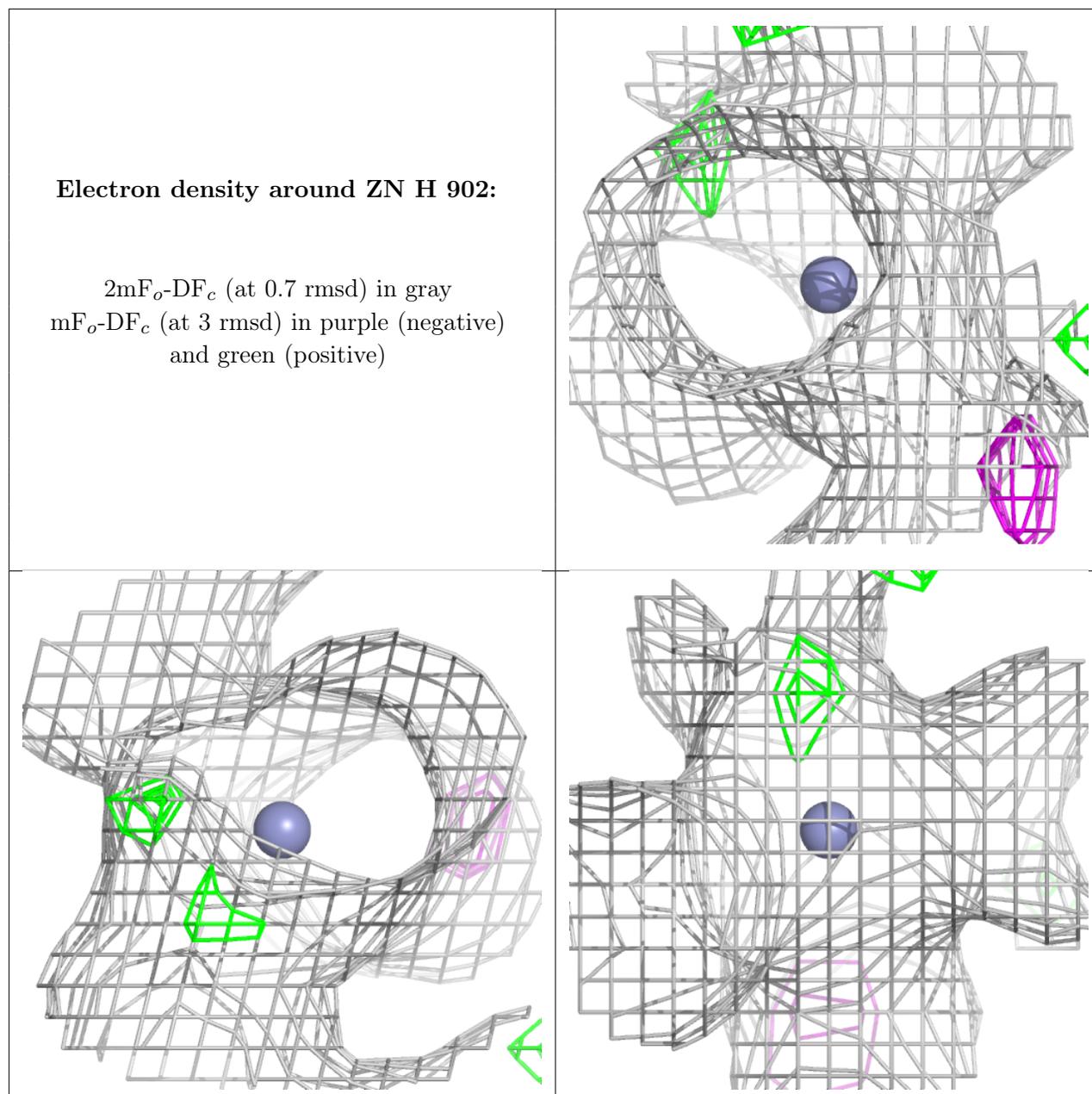**Electron density around ZN F 201:**

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

Electron density around ZN G 202:

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

Electron density around ZN H 902:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.