WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Nov 2, 2025 – 10:04 PM EST

PDB ID	:	9MRH / pdb_00009mrh
Title	:	Fluorescence lifetime-readout citrate sensor
Authors	:	Rosen, P.C.; Yellen, G.; Lim, D.C.
Deposited on	:	2025-01-07
Resolution	:	2.37 Å(reported)

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

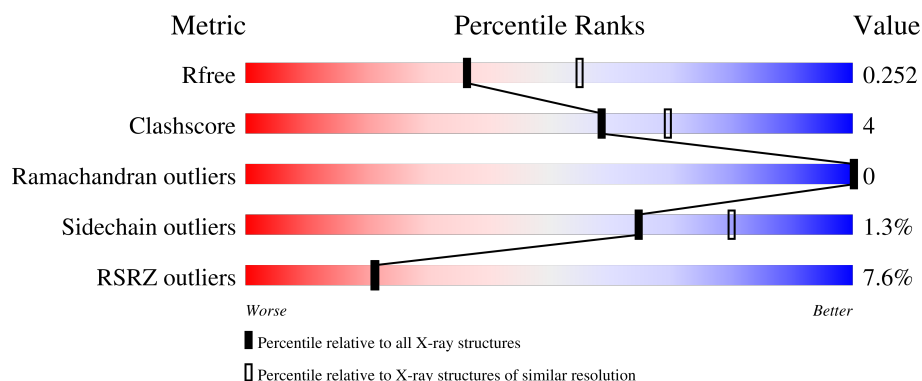|		
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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 2.37 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		0.252
Clashscore		4
Ramachandran outliers		0
Sidechain outliers		1.3%
RSRZ outliers		7.6%

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	6699 (2.40-2.36)
Clashscore	180529	7414 (2.40-2.36)
Ramachandran outliers	177936	7337 (2.40-2.36)
Sidechain outliers	177891	7338 (2.40-2.36)
RSRZ outliers	164620	6699 (2.40-2.36)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	383	7% / 86% 11% · ·
1	B	383	8% / 87% 9% · ·

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 6256 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 Fluorescence lifetime-readout citrate sensor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	372	Total	C	N	O	S	0	0	0
			2905	1831	503	560	11			
1	B	371	Total	C	N	O	S	0	1	0
			2904	1831	501	561	11			

- Molecule 2 is CITRIC ACID (CCD ID: CIT) (formula: $C_6H_8O_7$) (labeled as "Ligand of Interest" by depositor).
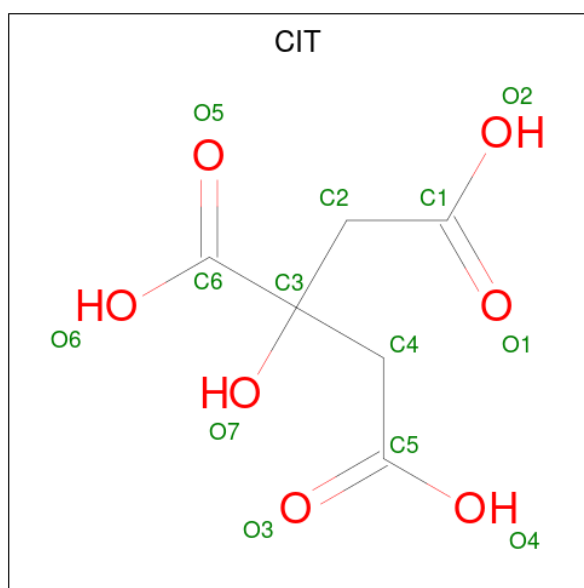
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			13	6	7		
2	B	1	Total	C	O	0	0
			13	6	7		

- Molecule 3 is PENTAETHYLENE GLYCOL (CCD ID: 1PE) (formula: $C_{10}H_{22}O_6$).

1PE
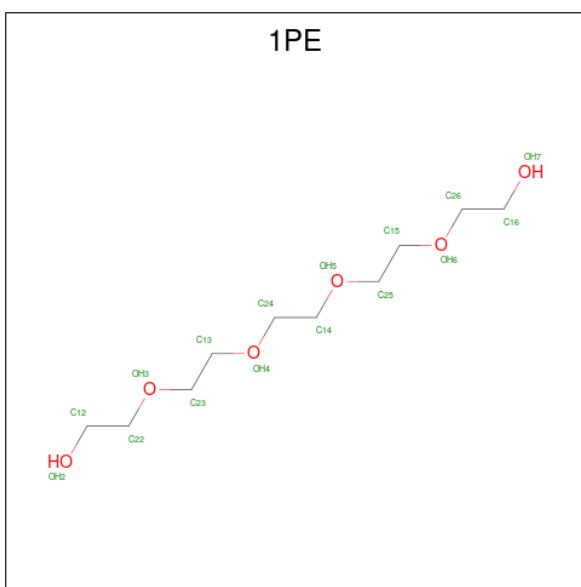
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total 16	C 10	O 6	0	0
3	B	1	Total 16	C 10	O 6	0	0

• Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O_4S).

SO4
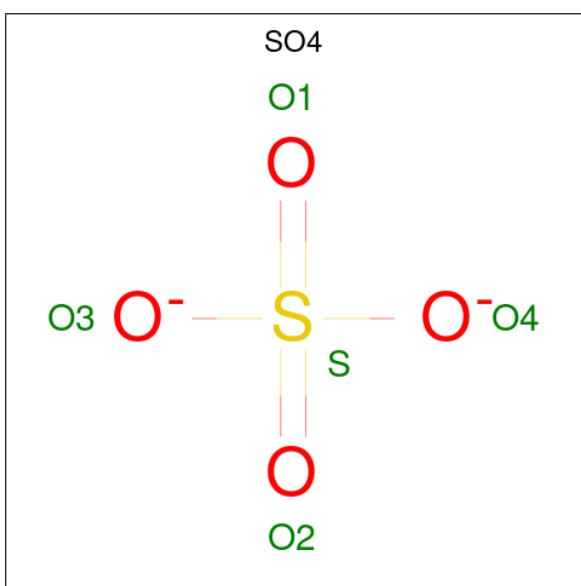
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total 5	O 4	S 1	0	0
4	B	1	Total 5	O 4	S 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	182	Total O 182 182		0	0
5	B	197	Total O 197 197		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: Fluorescence lifetime-readout citrate sensor

Chain A:

• Molecule 1: Fluorescence lifetime-readout citrate sensor

Chain B:
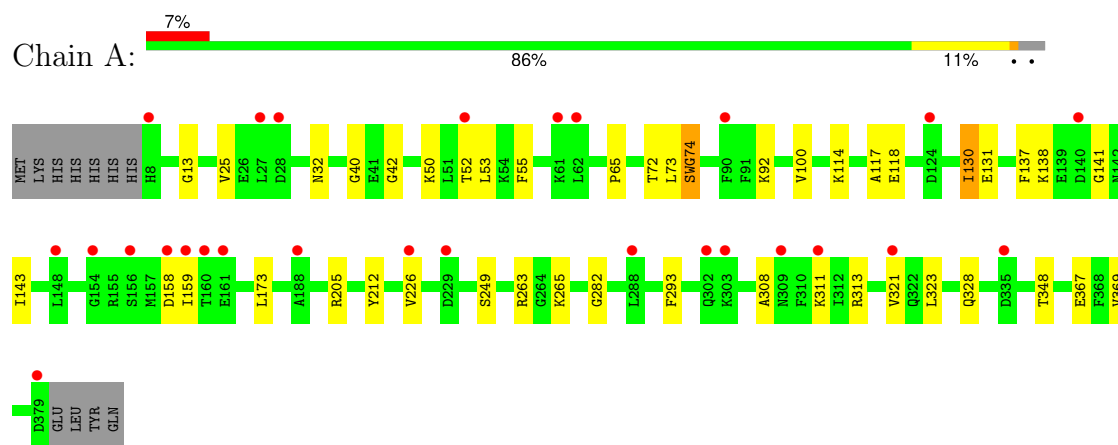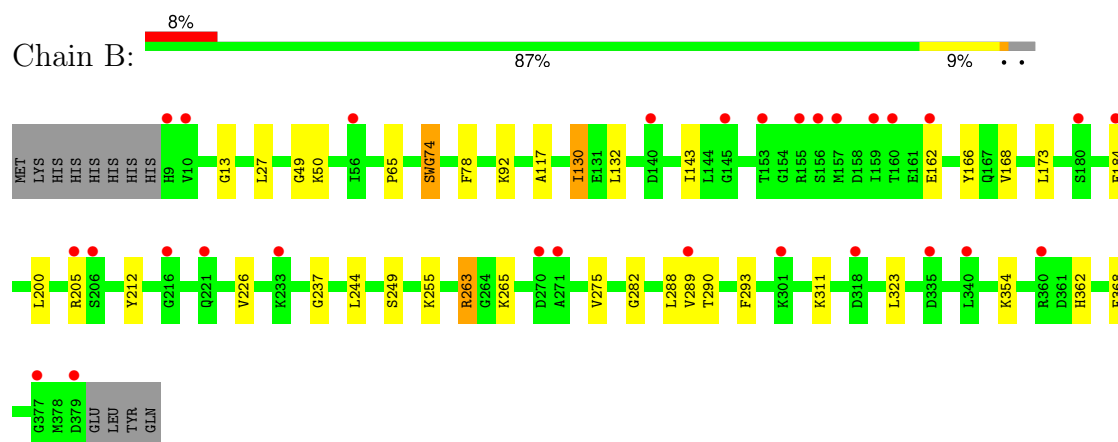
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α, β, γ	75.44Å 96.19Å 144.48Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.55 – 2.37 40.55 – 2.37	Depositor EDS
% Data completeness (in resolution range)	99.4 (40.55-2.37) 91.2 (40.55-2.37)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.85 (at 2.37Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.221 , 0.252 0.221 , 0.252	Depositor DCC
R_{free} test set	1967 reflections (4.55%)	wwPDB-VP
Wilson B-factor (Å^2)	28.2	Xtriage
Anisotropy	0.228	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 40.5	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	6256	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.98% 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 ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: SWG, 1PE, SO4, CIT

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	0.08	0/2936	0.25	0/3966
1	B	0.09	0/2937	0.26	0/3966
All	All	0.09	0/5873	0.26	0/7932

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2905	0	2859	24	0
1	B	2904	0	2868	26	0
2	A	13	0	5	0	0
2	B	13	0	5	0	0
3	A	16	0	22	2	0
3	B	16	0	22	5	0
4	B	10	0	0	0	0
5	A	182	0	0	2	0
5	B	197	0	0	0	0
All	All	6256	0	5781	50	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 4.

All (50) 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:B:184:GLU:HG3	1:B:200:LEU:HD11	1.73	0.70
1:B:289:VAL:HG23	1:B:290:THR:HG23	1.74	0.67
1:B:50:LYS:HZ2	3:B:402:1PE:H222	1.63	0.63
1:A:25:VAL:HB	1:A:40:GLY:HA3	1.81	0.63
1:B:205:ARG:HD2	1:B:226:VAL:HG12	1.84	0.60
1:A:311:LYS:HE3	1:A:313:ARG:HH22	1.67	0.58
1:A:308:ALA:HB3	1:A:328:GLN:HB3	1.85	0.58
1:A:212:TYR:CZ	1:A:282:GLY:HA3	2.38	0.58
1:A:32:ASN:ND2	1:A:137:PHE:O	2.36	0.57
1:B:168:VAL:HG11	1:B:288:LEU:HD21	1.86	0.57
1:A:173:LEU:HD11	1:A:249:SER:HB3	1.90	0.53
1:B:173:LEU:HD11	1:B:249:SER:HB3	1.90	0.53
1:B:212:TYR:CZ	1:B:282:GLY:HA3	2.44	0.53
1:A:205:ARG:HD2	1:A:226:VAL:HG12	1.94	0.50
1:B:368:PHE:HZ	3:B:402:1PE:H132	1.77	0.50
1:A:74:SWG:HH2	1:A:293:PHE:CG	2.47	0.49
1:A:117:ALA:HB2	1:A:130:ILE:HG23	1.95	0.49
1:B:263:ARG:HG3	1:B:265:LYS:HE2	1.95	0.49
1:A:114:LYS:NZ	5:A:520:HOH:O	2.44	0.49
1:A:263:ARG:HD3	1:A:265:LYS:HE2	1.95	0.48
1:A:367:GLU:OE2	5:A:501:HOH:O	2.19	0.48
1:B:354:LYS:NZ	1:B:362:HIS:O	2.46	0.46
1:A:65:PRO:HD3	1:A:143:ILE:O	2.15	0.46
1:B:65:PRO:HD3	1:B:143:ILE:O	2.16	0.46
1:B:50:LYS:NZ	3:B:402:1PE:H222	2.30	0.46
1:B:74:SWG:HH2	1:B:293:PHE:CG	2.51	0.46
1:A:50:LYS:HE3	3:A:402:1PE:H131	1.99	0.45
1:A:42:GLY:HA3	1:A:53:LEU:HD23	1.98	0.45
1:B:27:LEU:HD11	1:B:132:LEU:HB2	1.99	0.45
1:B:13:GLY:HA2	1:B:92:LYS:O	2.16	0.44
1:B:311:LYS:HB3	1:B:323:LEU:HD11	1.98	0.44
1:A:138:LYS:HG3	1:A:141:GLY:HA3	1.99	0.44
1:A:348:THR:HG23	1:A:369:VAL:HG22	1.99	0.44
1:B:237:GLY:HA3	1:B:263:ARG:NH2	2.33	0.44
1:B:27:LEU:HD13	1:B:130:ILE:HB	2.00	0.43
1:B:50:LYS:NZ	3:B:402:1PE:H142	2.33	0.43
1:A:55:PHE:CE1	1:A:73:LEU:HB3	2.53	0.43
1:B:117:ALA:HB2	1:B:130:ILE:HG23	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:311:LYS:HB3	1:A:323:LEU:HD11	2.01	0.42
1:A:263:ARG:HA	1:A:282:GLY:HA2	2.01	0.42
1:B:184:GLU:HG2	1:B:200:LEU:HD21	2.00	0.42
1:B:49:GLY:HA2	1:B:78:PHE:O	2.19	0.42
1:B:255:LYS:HE3	1:B:255:LYS:HB2	1.80	0.42
1:B:244:LEU:HA	1:B:275:VAL:HG11	2.02	0.41
1:A:72:THR:HG23	1:A:130:ILE:HG21	2.03	0.41
1:A:50:LYS:NZ	3:A:402:1PE:H222	2.36	0.41
1:A:100:VAL:HG22	1:A:118:GLU:HG2	2.02	0.40
1:B:50:LYS:HE3	3:B:402:1PE:H131	2.02	0.40
1:A:13:GLY:HA2	1:A:92:LYS:O	2.22	0.40
1:B:162:GLU:O	1:B:166:TYR:HD1	2.05	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	367/383 (96%)	359 (98%)	8 (2%)	0	100	100
1	B	367/383 (96%)	361 (98%)	6 (2%)	0	100	100
All	All	734/766 (96%)	720 (98%)	14 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	313/326 (96%)	307 (98%)	6 (2%)	52	70
1	B	314/326 (96%)	312 (99%)	2 (1%)	84	92
All	All	627/652 (96%)	619 (99%)	8 (1%)	65	80

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	THR
1	A	130	ILE
1	A	131	GLU
1	A	158	ASP
1	A	159	ILE
1	A	321	VAL
1	B	130	ILE
1	B	263	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	165	HIS
1	A	329	GLN
1	B	175	GLN
1	B	178	GLN
1	B	221	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 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	SWG	B	74	1	22,25,26	1.57	7 (31%)	27,35,37	2.29	8 (29%)
1	SWG	A	74	1	22,25,26	1.55	5 (22%)	27,35,37	2.35	11 (40%)

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	SWG	B	74	1	-	2/8/29/30	0/3/3/3
1	SWG	A	74	1	-	1/8/29/30	0/3/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	74	SWG	CB2-CA2	2.85	1.37	1.35
1	B	74	SWG	CG-CD2	2.79	1.47	1.41
1	A	74	SWG	CG-CD2	2.78	1.47	1.41
1	B	74	SWG	CB2-CA2	2.69	1.37	1.35
1	B	74	SWG	CA2-C2	-2.47	1.45	1.48
1	B	74	SWG	CA3-N3	-2.47	1.42	1.47
1	A	74	SWG	CA2-C2	-2.31	1.46	1.48
1	B	74	SWG	C1-N2	2.30	1.35	1.32
1	A	74	SWG	C1-N2	2.28	1.35	1.32
1	A	74	SWG	CA3-N3	-2.26	1.43	1.47
1	B	74	SWG	C2-N3	-2.06	1.35	1.40
1	B	74	SWG	C1-N3	-2.05	1.33	1.37

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	74	SWG	C3-CA3-N3	5.56	125.09	112.43
1	B	74	SWG	C3-CA3-N3	5.09	124.02	112.43
1	B	74	SWG	C2-N3-C1	4.95	110.36	108.07
1	A	74	SWG	CG-CB2-CA2	-4.94	121.32	130.86
1	B	74	SWG	CG-CB2-CA2	-4.91	121.38	130.86
1	A	74	SWG	C2-N3-C1	4.15	109.99	108.07
1	A	74	SWG	CB2-CA2-C2	3.77	126.93	122.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	74	SWG	CB2-CA2-C2	3.50	126.60	122.36
1	A	74	SWG	C2-CA2-N2	-3.24	106.63	108.95
1	B	74	SWG	C2-CA2-N2	-3.05	106.76	108.95
1	A	74	SWG	CH2-CZ2-CE2	-2.72	116.37	120.09
1	A	74	SWG	CZ3-CH2-CZ2	2.69	124.00	120.40
1	B	74	SWG	CH2-CZ2-CE2	-2.66	116.45	120.09
1	B	74	SWG	CZ3-CH2-CZ2	2.49	123.74	120.40
1	B	74	SWG	CG-CD1-NE1	2.30	112.46	108.59
1	A	74	SWG	CG-CD1-NE1	2.29	112.45	108.59
1	A	74	SWG	CA2-C2-N3	2.25	105.39	103.50
1	A	74	SWG	CA1-C1-N3	2.19	127.69	124.84
1	A	74	SWG	CA2-N2-C1	2.12	107.46	105.80

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	74	SWG	N1-CA1-CB1-OG1
1	B	74	SWG	N1-CA1-CB1-OG1
1	B	74	SWG	N2-CA2-CB2-CG

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	74	SWG	1	0
1	A	74	SWG	1	0

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

6 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	CIT	B	401	-	12,12,12	1.09	0	17,17,17	1.52	2 (11%)
3	1PE	B	402	-	15,15,15	0.11	0	14,14,14	0.09	0
2	CIT	A	401	-	12,12,12	1.10	0	17,17,17	1.49	2 (11%)
3	1PE	A	402	-	15,15,15	0.12	0	14,14,14	0.07	0
4	SO4	B	403	-	4,4,4	0.23	0	6,6,6	0.06	0
4	SO4	B	404	-	4,4,4	0.24	0	6,6,6	0.07	0

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
3	1PE	A	402	-	-	9/13/13/13	-
2	CIT	A	401	-	-	5/16/16/16	-
3	1PE	B	402	-	-	6/13/13/13	-
2	CIT	B	401	-	-	5/16/16/16	-

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	401	CIT	O6-C6-C3	3.74	120.31	113.14
2	A	401	CIT	O6-C6-C3	3.72	120.28	113.14
2	B	401	CIT	O2-C1-C2	2.31	121.67	114.35
2	A	401	CIT	O2-C1-C2	2.24	121.45	114.35

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	1PE	OH6-C15-C25-OH5
3	A	402	1PE	OH4-C13-C23-OH3
3	B	402	1PE	OH4-C13-C23-OH3
3	B	402	1PE	OH6-C15-C25-OH5
3	A	402	1PE	OH7-C16-C26-OH6

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Mol	Chain	Res	Type	Atoms
2	A	401	CIT	C6-C3-C4-C5
2	B	401	CIT	C6-C3-C4-C5
3	A	402	1PE	OH2-C12-C22-OH3
2	A	401	CIT	O7-C3-C4-C5
2	B	401	CIT	O7-C3-C4-C5
3	B	402	1PE	OH5-C14-C24-OH4
3	A	402	1PE	C24-C14-OH5-C25
3	A	402	1PE	C15-C25-OH5-C14
2	A	401	CIT	C2-C3-C4-C5
2	B	401	CIT	C2-C3-C4-C5
3	A	402	1PE	C14-C24-OH4-C13
3	A	402	1PE	C25-C15-OH6-C26
3	A	402	1PE	C12-C22-OH3-C23
3	B	402	1PE	C15-C25-OH5-C14
3	B	402	1PE	C14-C24-OH4-C13
2	A	401	CIT	C3-C4-C5-O3
3	B	402	1PE	C13-C23-OH3-C22
2	B	401	CIT	C3-C4-C5-O3
2	B	401	CIT	C3-C4-C5-O4
2	A	401	CIT	C3-C4-C5-O4

There are no ring outliers.

2 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	402	1PE	5	0
3	A	402	1PE	2	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 then 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.

Ligand CIT B 401

Bond lengths

Bond angles

Torsions

Rings

Ligand CIT A 401

Bond lengths

Bond angles

Torsions

Rings
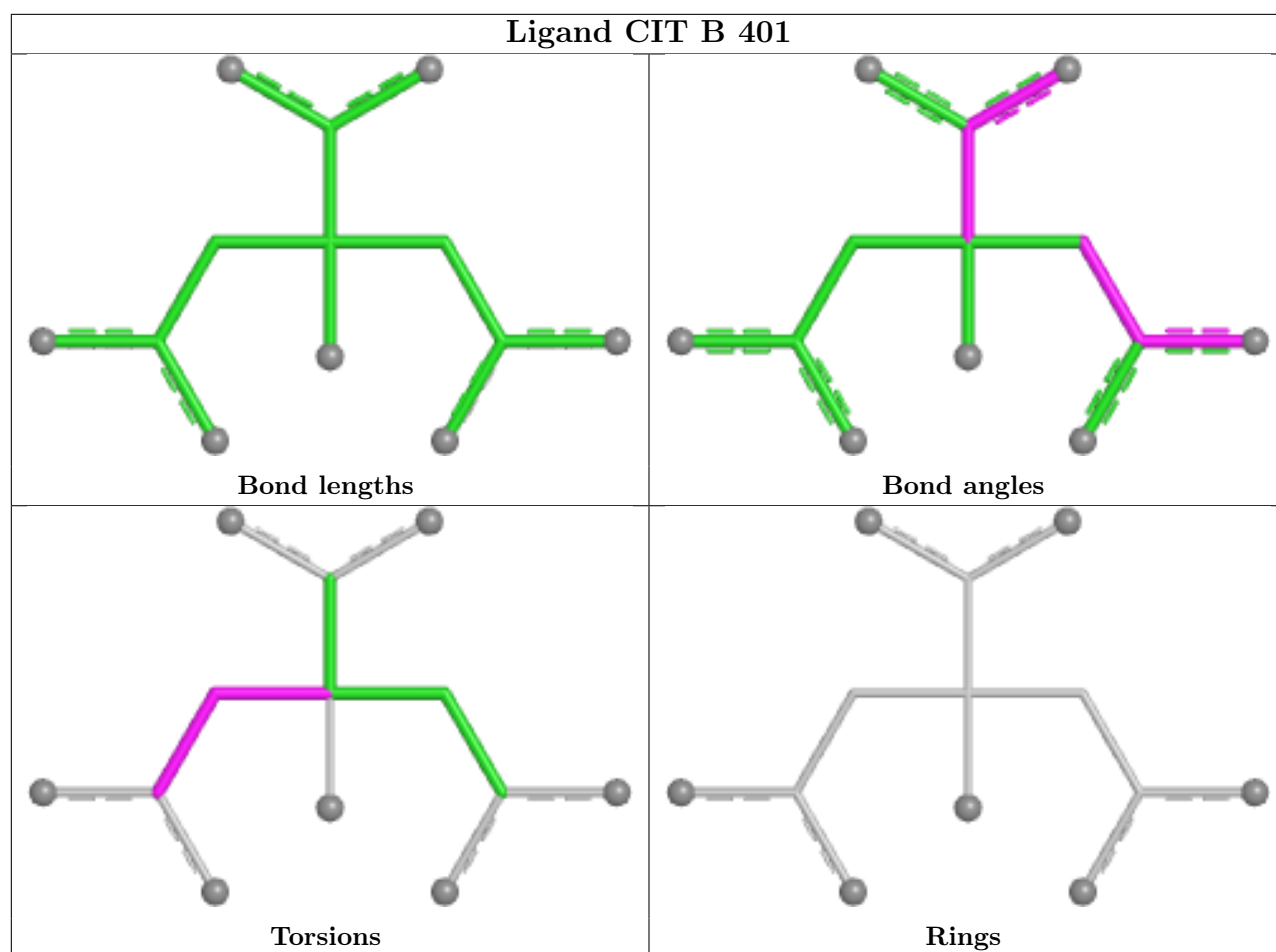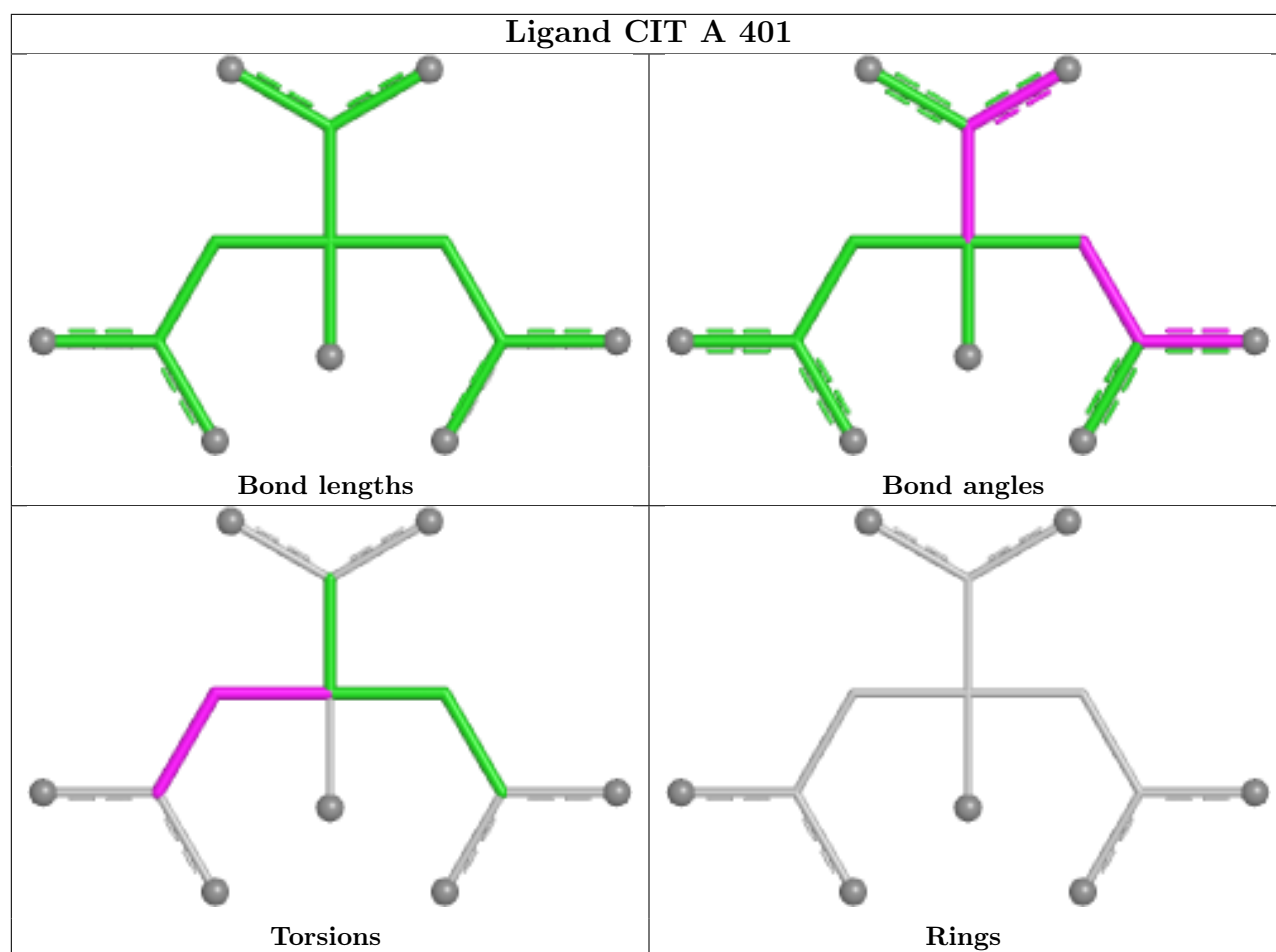
5.7 Other polymers (i)

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(Å²)	Q<0.9
1	A	371/383 (96%)	0.84	27 (7%)	22	23	24, 35, 53, 96	0
1	B	370/383 (96%)	0.88	29 (7%)	20	20	23, 35, 56, 83	1 (0%)
All	All	741/766 (96%)	0.86	56 (7%)	21	21	23, 35, 55, 96	1 (0%)

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	160	THR	8.0
1	B	10	VAL	6.6
1	A	159	ILE	5.0
1	B	9	HIS	4.4
1	B	160	THR	4.2
1	A	379	ASP	4.0
1	B	379	ASP	3.9
1	A	309	ASN	3.6
1	A	158	ASP	3.5
1	A	8	HIS	3.5
1	B	216	GLY	3.3
1	B	56	ILE	3.1
1	B	140	ASP	3.1
1	A	321	VAL	3.0
1	B	153	THR	2.9
1	B	145	GLY	2.9
1	B	162	GLU	2.8
1	B	159	ILE	2.8
1	B	301	LYS	2.8
1	B	184	GLU	2.8
1	B	206	SER	2.7
1	A	302	GLN	2.7
1	A	161	GLU	2.6
1	A	61	LYS	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	377	GLY	2.6
1	A	90	PHE	2.6
1	B	289	VAL	2.5
1	A	52	THR	2.5
1	A	154	GLY	2.4
1	A	335	ASP	2.4
1	B	335	ASP	2.4
1	B	233	LYS	2.3
1	B	360	ARG	2.3
1	A	156	SER	2.3
1	B	205	ARG	2.3
1	B	340	LEU	2.3
1	A	311	LYS	2.2
1	A	226	VAL	2.2
1	A	140	ASP	2.2
1	A	62	LEU	2.2
1	A	229	ASP	2.2
1	B	270	ASP	2.2
1	A	28	ASP	2.2
1	B	156	SER	2.1
1	A	27	LEU	2.1
1	A	148	LEU	2.1
1	A	188	ALA	2.1
1	A	288	LEU	2.1
1	B	180	SER	2.1
1	B	271	ALA	2.1
1	A	303	LYS	2.1
1	B	221	GLN	2.1
1	A	124	ASP	2.0
1	B	318	ASP	2.0
1	B	155	ARG	2.0
1	B	157	MET	2.0

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

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(Å²)	Q<0.9
1	SWG	A	74	23/24	0.91	0.11	27,32,36,36	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
1	SWG	B	74	23/24	0.94	0.09	21,27,33,35	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.

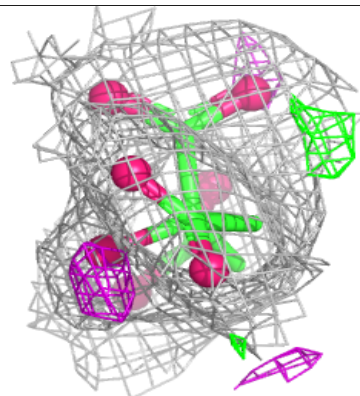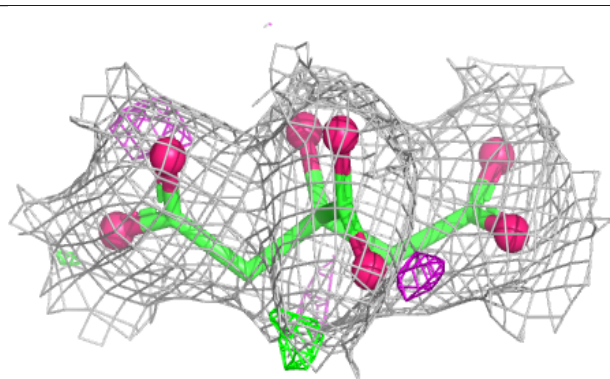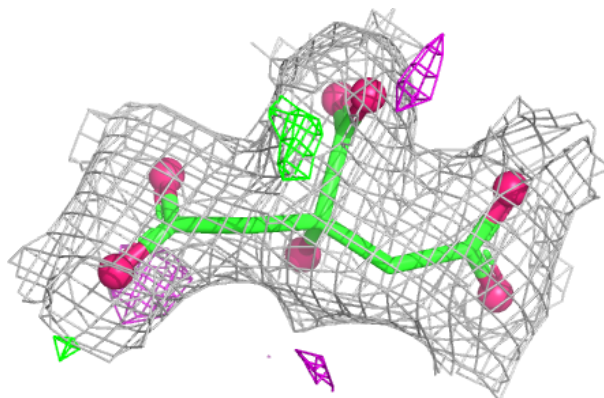| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	SO4	B	403	5/5	0.73	0.20	49,56,72,85	0
2	CIT	B	401	13/13	0.88	0.13	30,34,39,39	0
3	1PE	B	402	16/16	0.89	0.12	28,34,49,57	0
2	CIT	A	401	13/13	0.89	0.11	24,30,31,32	0
3	1PE	A	402	16/16	0.90	0.14	29,39,51,65	0
4	SO4	B	404	5/5	0.95	0.13	42,43,57,60	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 CIT B 401:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
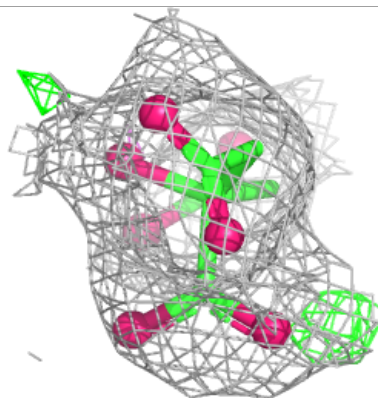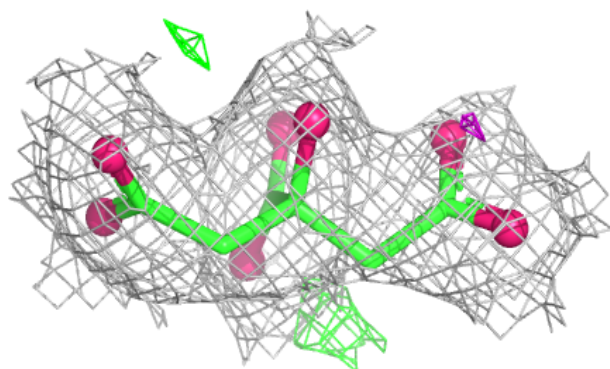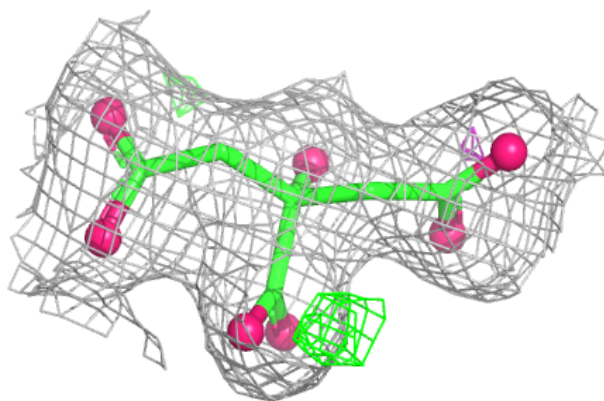
Electron density around CIT A 401:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.