WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Mar 10, 2026 – 12:10 PM EDT

PDB ID	:	9OBO / pdb_00009obo
Title	:	Crystal structure of Mycobacterium tuberculosis isocitrate lyase 2 fixed in the apo form with disulfide bonds
Authors	:	Huang, E.Y.W.; Leung, I.K.H.; Maher, M.J.
Deposited on	:	2025-04-22
Resolution	:	2.60 Å(reported)

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

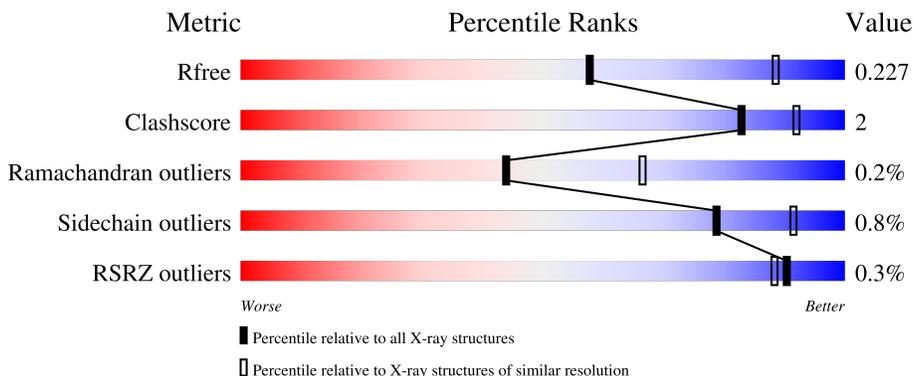|		
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.48.1

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 2.60 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		0.227
Clashscore		2
Ramachandran outliers		0.2%
Sidechain outliers		0.8%
RSRZ outliers		0.3%

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	3775 (2.60-2.60)
Clashscore	180529	4181 (2.60-2.60)
Ramachandran outliers	177936	4129 (2.60-2.60)
Sidechain outliers	177891	4129 (2.60-2.60)
RSRZ outliers	164620	3775 (2.60-2.60)

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	766	92% 5% •
1	B	766	90% 7% •
1	C	766	% 91% 6% •
1	D	766	92% 6% •

2   Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 24231 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 Isocitrate lyase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	743	Total	C	N	O	S	0	1	0
			5840	3683	1045	1088	24			
1	B	744	Total	C	N	O	S	0	2	0
			5856	3694	1048	1090	24			
1	C	741	Total	C	N	O	S	0	3	0
			5835	3677	1049	1085	24			
1	D	754	Total	C	N	O	S	0	3	0
			5937	3742	1067	1104	24			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	635	CYS	GLN	engineered mutation	UNP Q8VJU4
A	708	CYS	VAL	engineered mutation	UNP Q8VJU4
A	734	CYS	VAL	engineered mutation	UNP Q8VJU4
B	635	CYS	GLN	engineered mutation	UNP Q8VJU4
B	708	CYS	VAL	engineered mutation	UNP Q8VJU4
B	734	CYS	VAL	engineered mutation	UNP Q8VJU4
C	635	CYS	GLN	engineered mutation	UNP Q8VJU4
C	708	CYS	VAL	engineered mutation	UNP Q8VJU4
C	734	CYS	VAL	engineered mutation	UNP Q8VJU4
D	635	CYS	GLN	engineered mutation	UNP Q8VJU4
D	708	CYS	VAL	engineered mutation	UNP Q8VJU4
D	734	CYS	VAL	engineered mutation	UNP Q8VJU4

- Molecule 2 is SUCCINIC ACID (CCD ID: SIN) (formula: $C_4H_6O_4$) (labeled as "Ligand of Interest" by depositor).

SIN
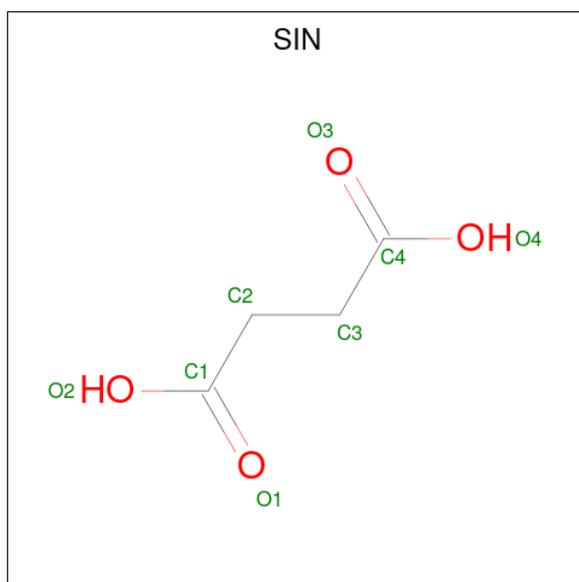
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 8	C 4	O 4	0	0
2	B	1	Total 8	C 4	O 4	0	0
2	C	1	Total 8	C 4	O 4	0	0
2	D	1	Total 8	C 4	O 4	0	0

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).

EDO
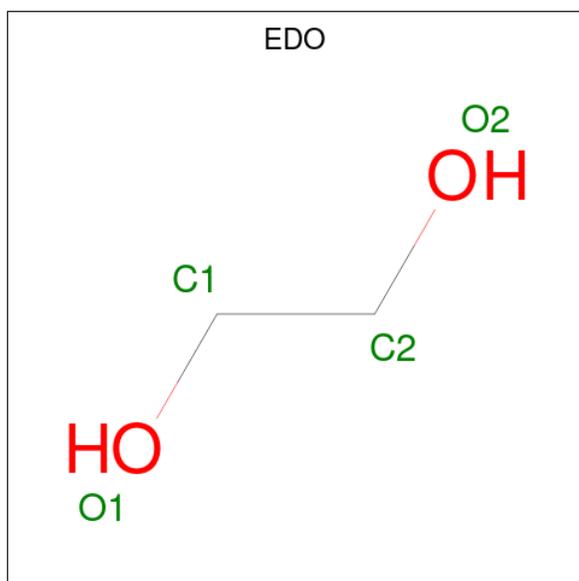
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	A	1	Total 4	C 2	O 2	0	0
3	C	1	Total 4	C 2	O 2	0	0

- Molecule 4 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	196	Total 196	O 196	0	0
4	B	171	Total 171	O 171	0	0
4	C	179	Total 179	O 179	0	0
4	D	169	Total 169	O 169	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.
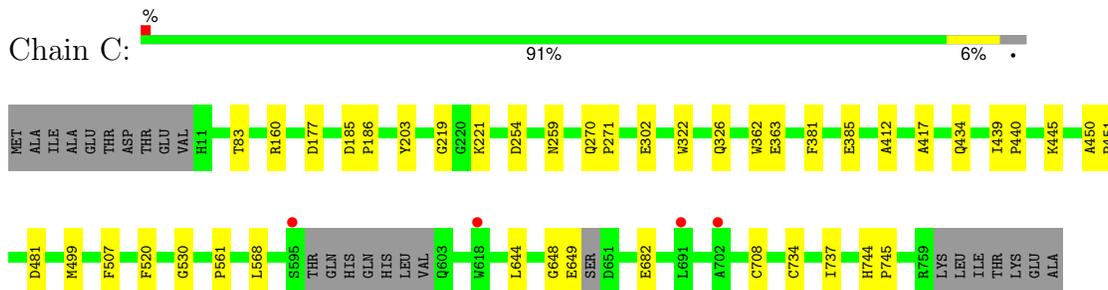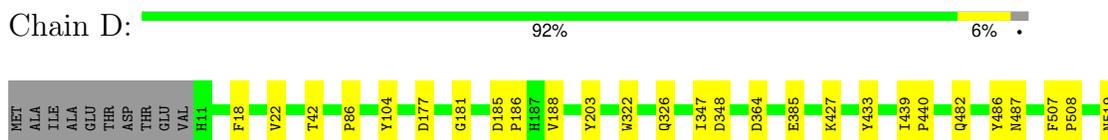
• Molecule 1: Isocitrate lyase 2
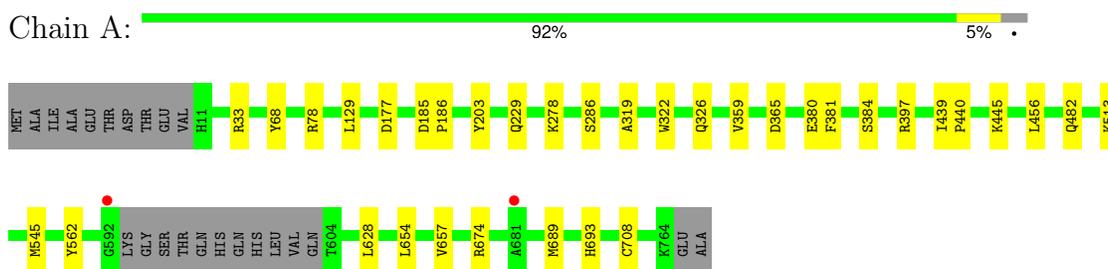
Chain A:

• Molecule 1: Isocitrate lyase 2

Chain B:

• Molecule 1: Isocitrate lyase 2

Chain C:

• Molecule 1: Isocitrate lyase 2

Chain D:
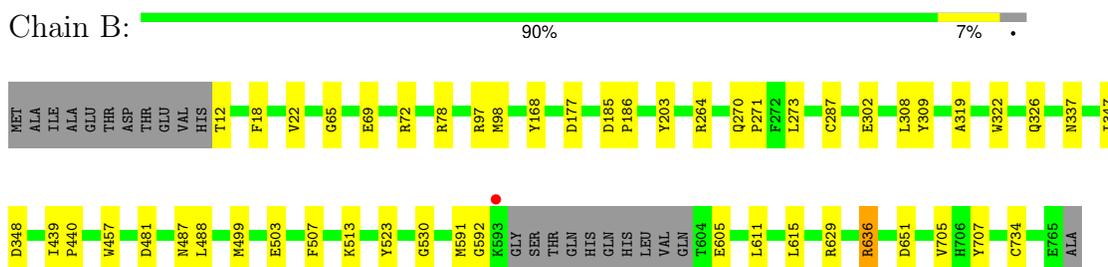
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	103.70Å 170.86Å 104.37Å 90.00° 94.14° 90.00°	Depositor
Resolution (Å)	49.55 – 2.60 49.55 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.7 (49.55-2.60) 99.7 (49.55-2.60)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.38 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.8.0415	Depositor
R, R_{free}	0.172 , 0.224 0.177 , 0.227	Depositor DCC
R_{free} test set	5620 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å^2)	57.6	Xtriage
Anisotropy	0.181	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 37.2	EDS
L-test for twinning [2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.019 for l,-k,h	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	24231	wwPDB-VP
Average B, all atoms (Å^2)	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.81% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[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: EDO, SIN

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	0.46	0/5972	0.83	0/8085
1	B	0.46	0/5990	0.84	0/8106
1	C	0.46	0/5972	0.83	0/8081
1	D	0.46	0/6078	0.84	0/8228
All	All	0.46	0/24012	0.84	0/32500

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
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	397	ARG	Sidechain

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.

WORLDWIDE

PDB

PROTEIN DATA BANK

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5840	0	5739	26	0
1	B	5856	0	5766	32	0
1	C	5835	0	5734	28	0
1	D	5937	0	5845	35	0
2	A	8	0	4	1	0
2	B	8	0	4	1	0
2	C	8	0	4	1	0
2	D	8	0	4	1	0
3	A	12	0	18	3	0
3	C	4	0	6	2	0
4	A	196	0	0	0	0
4	B	171	0	0	1	0
4	C	179	0	0	2	0
4	D	169	0	0	2	0
All	All	24231	0	23124	107	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 (107) 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:A:177:ASP:OD2	2:A:1001:SIN:C1	2.33	0.76
1:C:302:GLU:HG3	4:C:1267:HOH:O	1.91	0.69
1:B:177:ASP:OD2	2:B:1001:SIN:C1	2.44	0.66
1:D:603:GLN:O	1:D:605:GLU:N	2.28	0.66
1:D:666:ARG:HH11	1:D:668:ARG:HH12	1.43	0.66
1:D:666:ARG:NH1	1:D:668:ARG:HH12	2.00	0.60
1:D:177:ASP:OD2	2:D:1001:SIN:C4	2.52	0.58
1:A:445:LYS:HD2	3:A:1002:EDO:H12	1.86	0.56
1:C:177:ASP:OD2	2:C:1001:SIN:C1	2.54	0.55
1:C:185:ASP:N	1:C:186:PRO:HD2	2.22	0.54
1:C:561:PRO:HB2	1:C:568:LEU:HD13	1.89	0.54
1:C:385:GLU:O	1:D:608:ARG:NH2	2.40	0.54
1:A:381:PHE:CD1	1:B:605[B]:GLU:HG3	2.45	0.52
1:D:486:TYR:O	1:D:519:ASN:HA	2.10	0.52
1:B:78:ARG:HB3	1:B:513:LYS:HA	1.92	0.51
1:D:657:VAL:HG22	1:D:689:MET:HE1	1.91	0.51
1:A:185:ASP:CG	1:A:186:PRO:HD3	2.36	0.50
1:D:385:GLU:HG2	4:D:1107:HOH:O	2.11	0.50
1:B:302:GLU:HB2	1:D:42:THR:CG2	2.41	0.50
1:D:439:ILE:N	1:D:440:PRO:CD	2.74	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:499:MET:HE1	1:B:507:PHE:HD2	1.76	0.49
1:C:744:HIS:N	1:C:745:PRO:CD	2.76	0.48
1:C:160:ARG:NH2	4:C:1105:HOH:O	2.46	0.48
1:D:604:THR:O	1:D:605:GLU:HB3	2.13	0.48
1:C:412:ALA:HB1	1:C:417:ALA:O	2.14	0.48
1:A:359:VAL:HG13	1:B:591:MET:HE2	1.95	0.47
1:B:499:MET:HE2	1:B:503:GLU:HB3	1.96	0.47
1:D:604:THR:O	1:D:605:GLU:CB	2.62	0.47
1:A:322:TRP:CZ2	1:A:326:GLN:HG3	2.50	0.47
1:A:129:LEU:C	1:A:129:LEU:HD12	2.39	0.47
1:C:439:ILE:N	1:C:440:PRO:CD	2.77	0.47
1:A:657:VAL:CG2	1:A:689:MET:HE1	2.44	0.47
1:B:523:TYR:HA	4:B:1134:HOH:O	2.14	0.47
1:D:18:PHE:O	1:D:22:VAL:HG23	2.15	0.46
1:A:33:ARG:HD2	1:A:68:TYR:CE2	2.51	0.46
1:A:545:MET:SD	1:B:488:LEU:HD13	2.56	0.46
1:A:708:CYS:HB3	1:C:708:CYS:HB3	1.98	0.46
1:C:185:ASP:CG	1:C:186:PRO:HD3	2.41	0.46
1:B:636:ARG:NH1	1:D:733:GLU:OE2	2.49	0.46
1:B:308:LEU:HD23	1:B:309:TYR:CE2	2.51	0.46
1:B:439:ILE:N	1:B:440:PRO:CD	2.80	0.45
1:B:629[A]:ARG:NH2	1:B:651:ASP:OD1	2.46	0.45
1:A:322:TRP:CE2	1:A:326:GLN:HG3	2.51	0.45
1:B:18:PHE:O	1:B:22:VAL:HG23	2.17	0.45
1:C:221:LYS:HD3	1:C:254:ASP:HB3	1.98	0.45
1:A:78:ARG:HB3	1:A:513:LYS:HA	1.98	0.45
1:A:689:MET:CE	1:A:693:HIS:CE1	3.00	0.45
1:A:278:LYS:NZ	1:A:365:ASP:OD1	2.37	0.45
1:B:705:VAL:HG12	1:B:707:TYR:CE1	2.52	0.45
1:C:644:LEU:C	1:C:644:LEU:HD23	2.42	0.45
1:B:185:ASP:N	1:B:186:PRO:HD2	2.32	0.44
1:D:507:PHE:HB3	1:D:508:PRO:HD3	1.98	0.44
1:C:322:TRP:CE2	1:C:326:GLN:HG3	2.51	0.44
1:D:185:ASP:CG	1:D:186:PRO:HD3	2.42	0.44
1:A:439:ILE:N	1:A:440:PRO:CD	2.80	0.44
1:B:457:TRP:CZ2	1:B:487:ASN:HB3	2.52	0.44
1:C:270:GLN:N	1:C:271:PRO:CD	2.81	0.44
1:D:185:ASP:N	1:D:186:PRO:HD2	2.32	0.44
1:B:322:TRP:CE2	1:B:326:GLN:HG3	2.53	0.44
1:C:362:TRP:CE3	1:D:591:MET:HE1	2.52	0.44
1:D:650:SER:O	1:D:651:ASP:C	2.61	0.44

Continued on next page...

Full wwPDB X-ray Structure Validation Report

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:270:GLN:N	1:B:271:PRO:CD	2.81	0.43
1:B:347:ILE:O	1:B:348:ASP:C	2.61	0.43
1:B:734:CYS:O	1:D:674:ARG:NH1	2.51	0.43
1:A:229:GLN:HG2	3:A:1002:EDO:H11	2.01	0.43
1:D:347:ILE:O	1:D:348:ASP:C	2.61	0.43
1:C:83:THR:O	1:C:520:PHE:HA	2.18	0.43
1:A:456:LEU:HD12	1:A:482:GLN:HG2	2.01	0.43
1:B:185:ASP:CG	1:B:186:PRO:HD3	2.44	0.43
1:A:381:PHE:CE1	1:B:605[B]:GLU:HG3	2.52	0.43
1:A:657:VAL:HG22	1:A:689:MET:HE1	2.01	0.43
1:C:530:GLY:HA3	1:D:562:TYR:CZ	2.54	0.43
1:A:286:SER:HB3	1:A:319:ALA:HB2	2.00	0.42
1:B:97:ARG:C	1:B:98:MET:HE2	2.44	0.42
1:C:445:LYS:HD2	3:C:1002:EDO:H22	2.01	0.42
1:A:185:ASP:N	1:A:186:PRO:HD2	2.34	0.42
1:A:628:LEU:HD22	1:A:654:LEU:HD12	2.00	0.42
1:D:605:GLU:HG2	1:D:606:VAL:HG23	2.01	0.42
1:C:381:PHE:CD1	1:D:603:GLN:HB3	2.55	0.42
1:D:86:PRO:HD2	1:D:104:TYR:O	2.19	0.42
1:D:657:VAL:CG2	1:D:689:MET:HE1	2.49	0.42
1:B:287:CYS:HA	1:B:319:ALA:HB1	2.02	0.42
1:B:605[A]:GLU:HA	1:B:605[A]:GLU:OE1	2.19	0.42
1:C:450:ALA:N	1:C:451:PRO:CD	2.83	0.42
1:D:689:MET:CE	1:D:693:HIS:CE1	3.03	0.42
1:C:185:ASP:N	1:C:186:PRO:CD	2.83	0.41
1:B:97:ARG:HG2	1:B:168:TYR:CE2	2.55	0.41
1:A:674:ARG:HD3	1:C:737:ILE:HG13	2.03	0.41
1:C:648:GLY:O	1:C:649:GLU:C	2.63	0.41
1:B:264:ARG:HB2	1:B:273:LEU:HD11	2.01	0.41
1:C:363:GLU:HB2	1:D:591:MET:HE3	2.01	0.41
1:A:562:TYR:CZ	1:B:530:GLY:HA3	2.56	0.41
1:B:65:GLY:O	1:B:69:GLU:HG2	2.21	0.41
1:B:611:LEU:O	1:B:615:LEU:HG	2.21	0.41
1:B:629[B]:ARG:HG3	1:B:629[B]:ARG:HH21	1.85	0.41
1:D:482:GLN:OE1	4:D:1101:HOH:O	2.22	0.41
1:D:322:TRP:CZ2	1:D:326:GLN:HG3	2.56	0.41
1:D:427:LYS:HD2	1:D:433:TYR:CE2	2.56	0.41
1:A:689:MET:HE3	1:A:693:HIS:HD1	1.85	0.41
3:A:1002:EDO:O1	3:A:1004:EDO:H12	2.20	0.41
1:C:499:MET:HE1	1:C:507:PHE:HD2	1.86	0.41
1:D:644:LEU:HD13	1:D:645:GLY:N	2.36	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:445:LYS:HD2	3:C:1002:EDO:C2	2.51	0.40
1:C:219:GLY:HA2	1:C:259:ASN:HD21	1.87	0.40
1:D:181:GLY:HA3	1:D:188:VAL:HG22	2.03	0.40
1:D:668:ARG:HG3	1:D:703:GLN:HG3	2.03	0.40
1:D:551:LEU:HG	1:D:555:MET:HE3	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	740/766 (97%)	724 (98%)	16 (2%)	0	100	100
1	B	742/766 (97%)	729 (98%)	12 (2%)	1 (0%)	48	71
1	C	738/766 (96%)	710 (96%)	27 (4%)	1 (0%)	48	71
1	D	755/766 (99%)	727 (96%)	25 (3%)	3 (0%)	30	52
All	All	2975/3064 (97%)	2890 (97%)	80 (3%)	5 (0%)	44	66

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	604	THR
1	D	597	GLN
1	D	605	GLU
1	B	592	GLY
1	C	734	CYS

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	597/615 (97%)	594 (100%)	3 (0%)	86	95
1	B	599/615 (97%)	593 (99%)	6 (1%)	73	88
1	C	596/615 (97%)	592 (99%)	4 (1%)	81	93
1	D	609/615 (99%)	602 (99%)	7 (1%)	70	86
All	All	2401/2460 (98%)	2381 (99%)	20 (1%)	79	91

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	203	TYR
1	A	380	GLU
1	A	384	SER
1	B	12	THR
1	B	72	ARG
1	B	203	TYR
1	B	337	ASN
1	B	481	ASP
1	B	636	ARG
1	C	203	TYR
1	C	434	GLN
1	C	481	ASP
1	C	682	GLU
1	D	203	TYR
1	D	364	ASP
1	D	487	ASN
1	D	574[A]	SER
1	D	574[B]	SER
1	D	603	GLN
1	D	635	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	161	GLN
1	A	259	ASN
1	A	542	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	663	GLN
1	A	731	ASN
1	B	703	GLN
1	C	208	GLN
1	D	161	GLN
1	D	647	HIS
1	D	656	ASN
1	D	677	ASN
1	D	698	HIS
1	D	731	ASN

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 ⓘ

8 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	SIN	A	1001	-	7,7,7	1.13	0	8,8,8	1.07	0
2	SIN	C	1001	-	7,7,7	1.12	0	8,8,8	0.98	0
3	EDO	A	1003	-	3,3,3	0.09	0	2,2,2	0.08	0
3	EDO	A	1004	-	3,3,3	0.09	0	2,2,2	0.35	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\lvert Z \rvert > 2$	Counts	RMSZ	$\#\lvert Z \rvert > 2$
3	EDO	A	1002	-	3,3,3	0.11	0	2,2,2	0.23	0
2	SIN	D	1001	-	7,7,7	1.08	0	8,8,8	1.15	1 (12%)
3	EDO	C	1002	-	3,3,3	0.11	0	2,2,2	0.24	0
2	SIN	B	1001	-	7,7,7	1.16	0	8,8,8	1.02	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
2	SIN	A	1001	-	-	1/5/5/5	-
2	SIN	C	1001	-	-	3/5/5/5	-
3	EDO	A	1003	-	-	0/1/1/1	-
3	EDO	A	1004	-	-	1/1/1/1	-
3	EDO	A	1002	-	-	1/1/1/1	-
2	SIN	D	1001	-	-	3/5/5/5	-
3	EDO	C	1002	-	-	1/1/1/1	-
2	SIN	B	1001	-	-	3/5/5/5	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	1001	SIN	O1-C1-C2	-2.05	116.60	123.09

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1001	SIN	C1-C2-C3-C4
2	B	1001	SIN	C1-C2-C3-C4
2	D	1001	SIN	C1-C2-C3-C4
3	A	1002	EDO	O1-C1-C2-O2
3	C	1002	EDO	O1-C1-C2-O2
3	A	1004	EDO	O1-C1-C2-O2
2	A	1001	SIN	C1-C2-C3-C4
2	B	1001	SIN	O2-C1-C2-C3
2	C	1001	SIN	O2-C1-C2-C3
2	D	1001	SIN	C2-C3-C4-O4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
2	B	1001	SIN	O1-C1-C2-C3
2	C	1001	SIN	O1-C1-C2-C3
2	D	1001	SIN	C2-C3-C4-O3

There are no ring outliers.

7 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1001	SIN	1	0
2	C	1001	SIN	1	0
3	A	1004	EDO	1	0
3	A	1002	EDO	3	0
2	D	1001	SIN	1	0
3	C	1002	EDO	2	0
2	B	1001	SIN	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 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 SIN A 1001

Bond lengths

Bond angles

Torsions

Rings

Ligand SIN C 1001

Bond lengths

Bond angles

Torsions

Rings

Ligand SIN D 1001

Bond lengths

Bond angles

Torsions

Rings

Ligand SIN B 1001

Bond lengths

Bond angles

Torsions

Rings
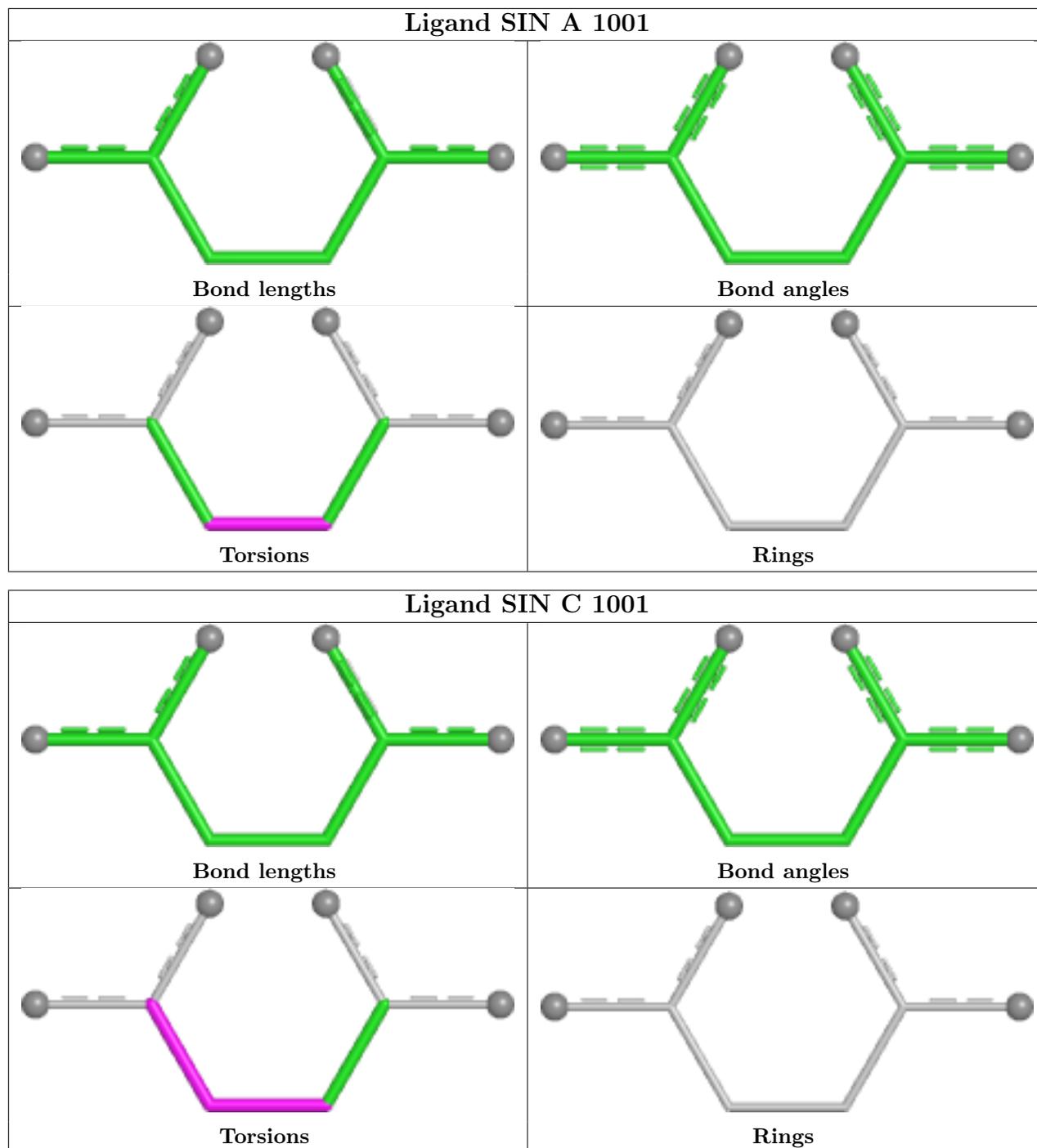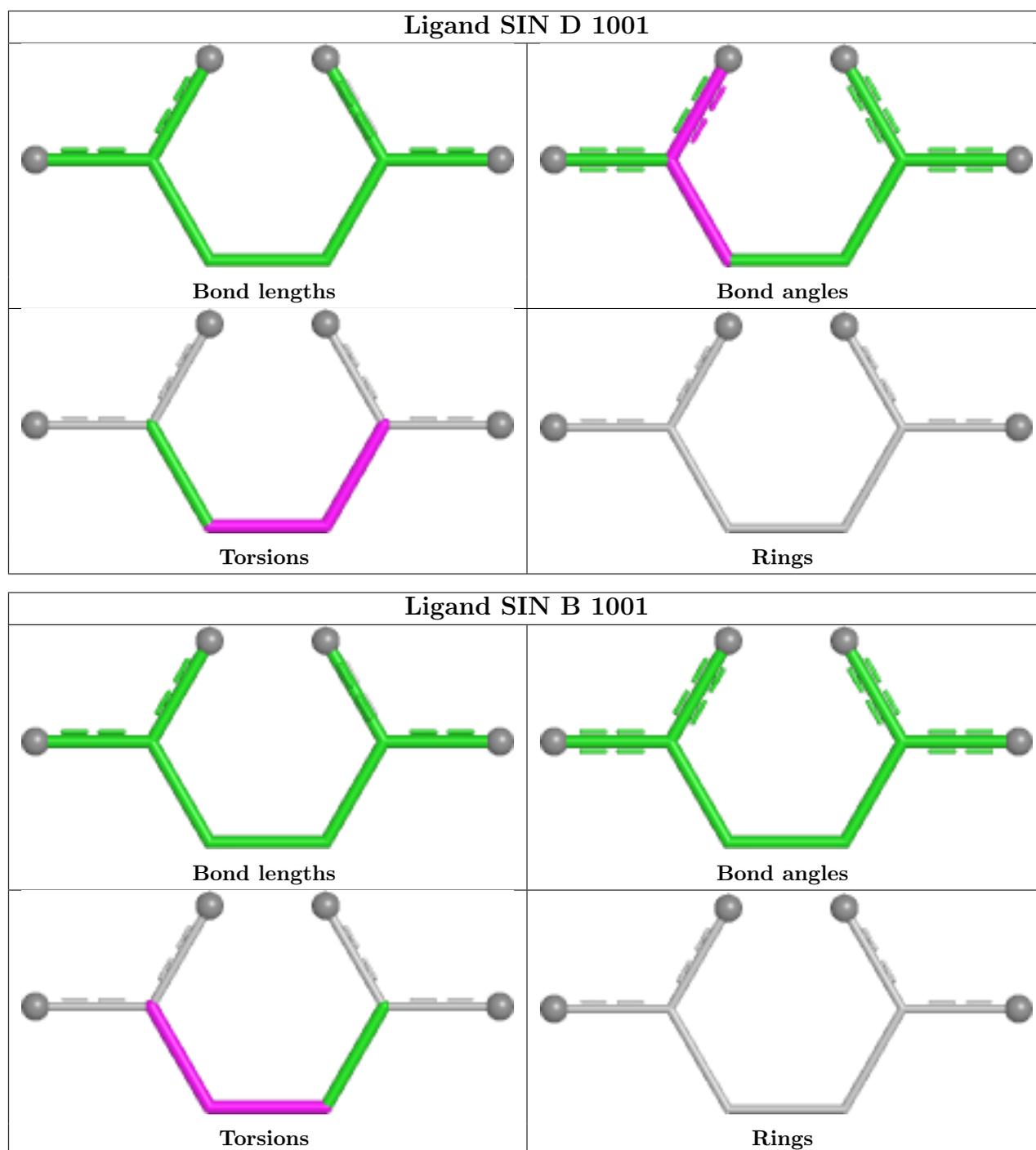
5.7 Other polymers (i)

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 (i)

6.1 Protein, DNA and RNA chains (i)

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	743/766 (96%)	-0.53	2 (0%)	90	88	42, 64, 108, 150	1 (0%)
1	B	744/766 (97%)	-0.51	1 (0%)	92	91	42, 67, 109, 150	2 (0%)
1	C	741/766 (96%)	-0.38	4 (0%)	87	84	35, 67, 154, 199	3 (0%)
1	D	754/766 (98%)	-0.41	1 (0%)	92	91	35, 73, 133, 187	3 (0%)
All	All	2982/3064 (97%)	-0.46	8 (0%)	90	88	35, 68, 133, 199	9 (0%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	702	ALA	3.2
1	A	592	GLY	3.2
1	D	604	THR	2.8
1	C	691	LEU	2.8
1	C	618	TRP	2.8
1	C	595	SER	2.6
1	A	681	ALA	2.4
1	B	593	LYS	2.3

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

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

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

WORLDWIDE
wwPDB
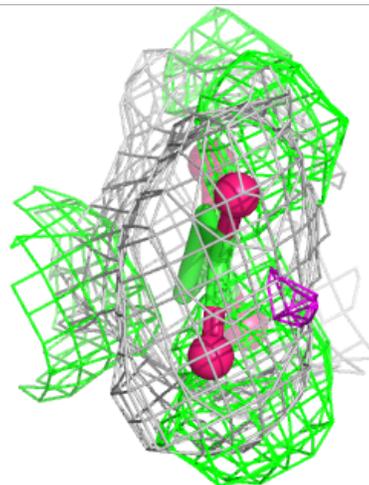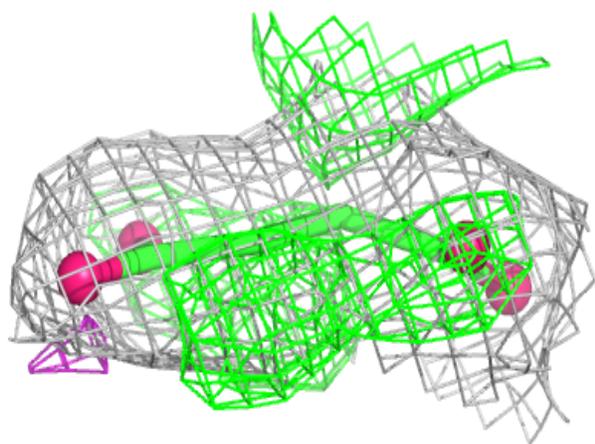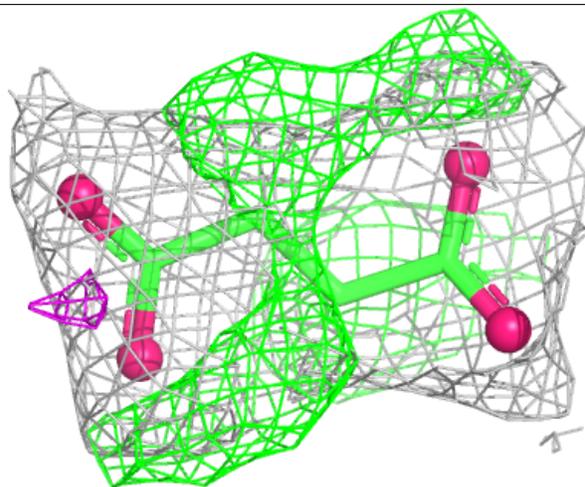PROTEIN DATA BANK

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.
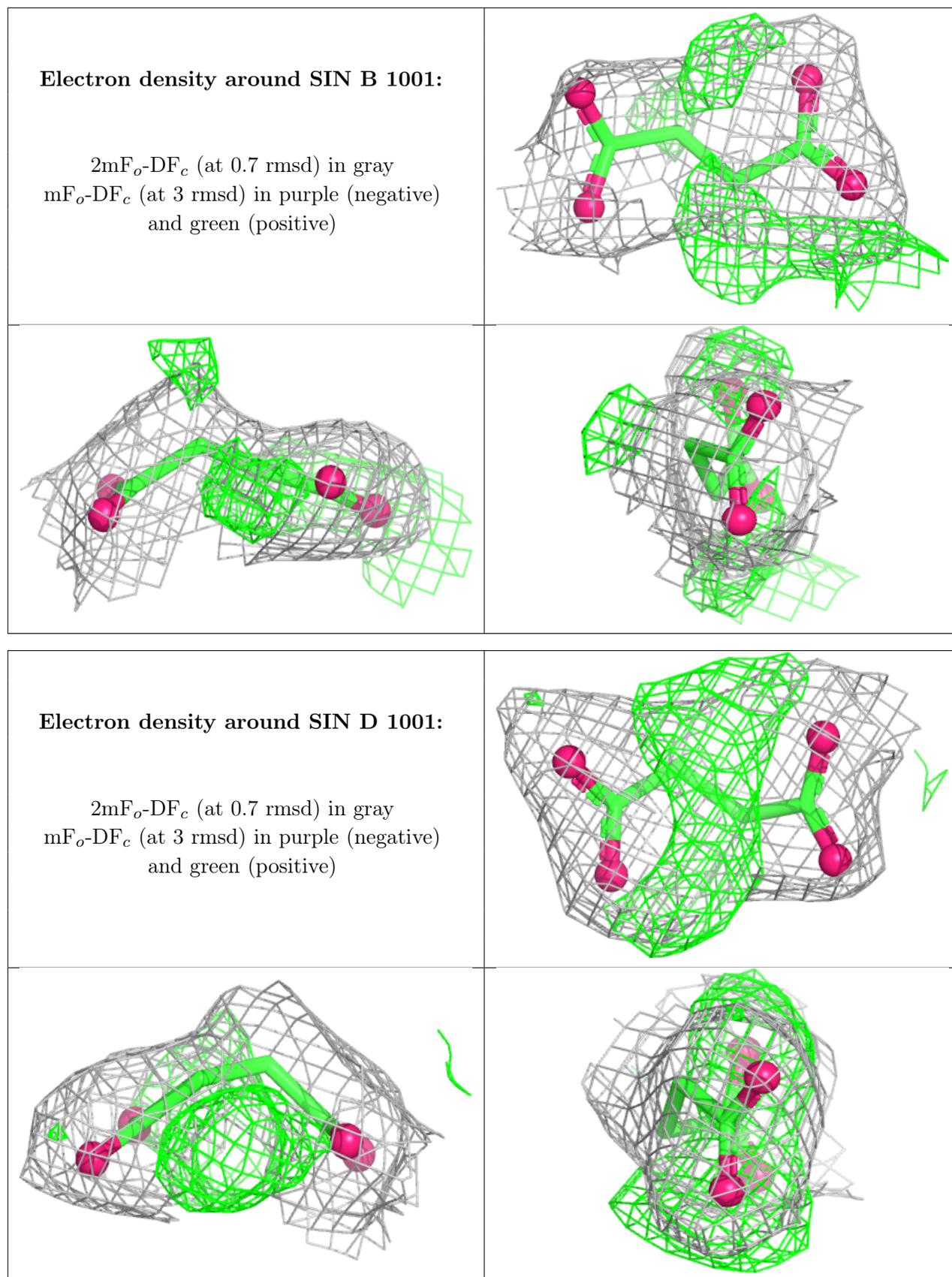
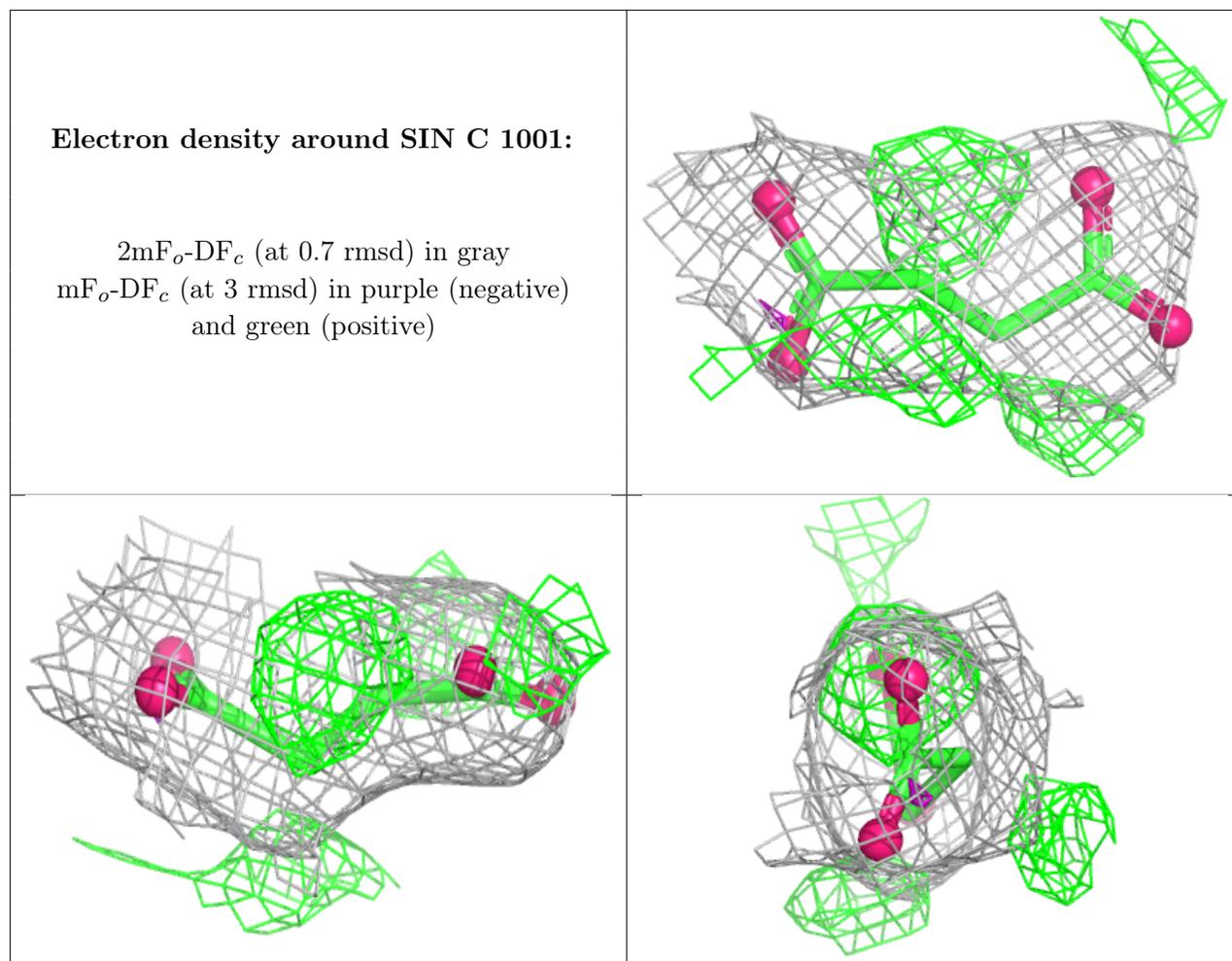| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	SIN	A	1001	8/8	0.77	0.15	55,56,58,59	0
2	SIN	B	1001	8/8	0.84	0.15	59,63,65,66	0
2	SIN	D	1001	8/8	0.84	0.16	61,66,70,70	0
2	SIN	C	1001	8/8	0.86	0.17	62,68,74,80	0
3	EDO	C	1002	4/4	0.91	0.36	68,73,73,73	0
3	EDO	A	1004	4/4	0.92	0.33	64,67,67,68	0
3	EDO	A	1002	4/4	0.95	0.28	64,65,66,66	0
3	EDO	A	1003	4/4	0.95	0.18	74,76,78,80	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 SIN A 1001:

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

Electron density around SIN B 1001:

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

Electron density around SIN D 1001:

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

Electron density around SIN C 1001:

$2mF_o$-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.