Full wwPDB X-ray Structure Validation Report ⓘ

Sep 14, 2023 – 01:53 pm BST

PDB ID	:	8CEJ
Title	:	Succinyl-CoA Reductase from Clostridium kluyveri (SucD) with Mesaconyl-C1-CoA
Authors	:	Pfister, P.; Diehl, C.; Erb, T.J.
Deposited on	:	2023-02-02
Resolution	:	2.10 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:

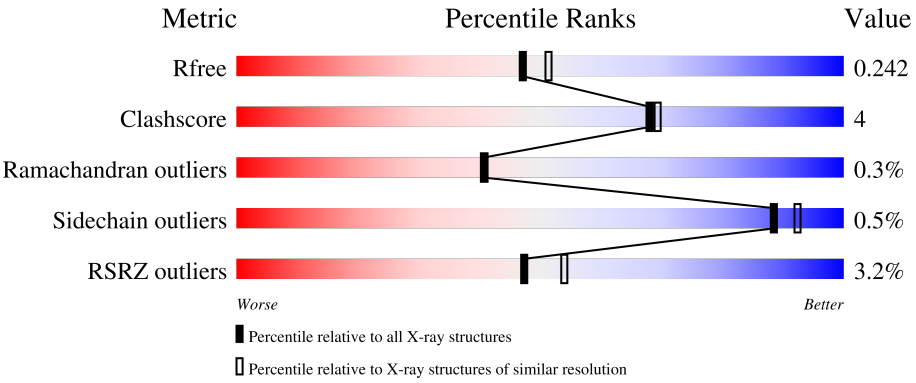
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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}	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	453	3% 89% 9% .
1	B	453	3% 91% 8% .
1	C	453	4% 89% 10% .
1	D	453	3% 87% 12% .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	MEZ	A	501	-	X	-	-
2	MEZ	D	501	-	X	-	-

2 Entry composition

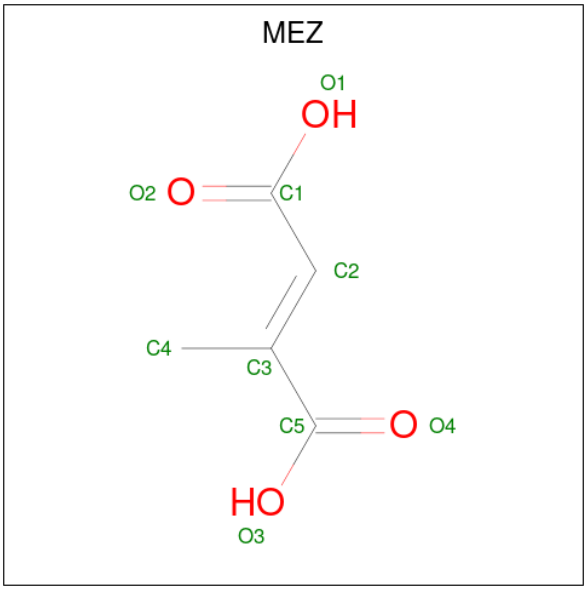
There are 4 unique types of molecules in this entry. The entry contains 15100 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Succinate-semialdehyde dehydrogenase (acetylating).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	449	Total	C	N	O	S	0	0	0
			3408	2157	575	661	15			
1	B	449	Total	C	N	O	S	0	0	0
			3408	2157	575	661	15			
1	C	449	Total	C	N	O	S	0	0	0
			3408	2157	575	661	15			
1	D	449	Total	C	N	O	S	0	0	0
			3408	2157	575	661	15			

- Molecule 2 is (2E)-2-METHYLBUT-2-ENEDIOIC ACID (three-letter code: MEZ) (formula: $C_5H_6O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	O		0	0
			8	5	3			
2	B	1	Total	C	O		0	0
			8	5	3			

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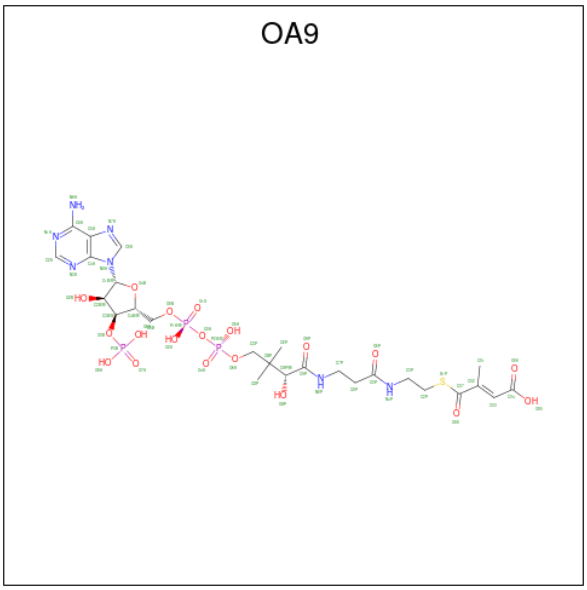
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	D	1	Total C O 8 5 3	0	0

- Molecule 3 is Mesaconyl Coenzme A (three-letter code: OA9) (formula: $C_{26}H_{40}N_7O_{19}P_3S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total C N O P S 56 26 7 19 3 1	0	0

- Molecule 4 is water.

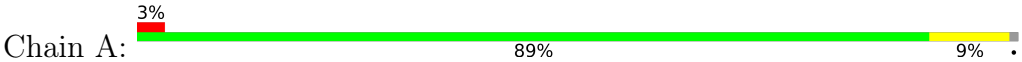
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	293	Total O 293 293	0	0
4	B	378	Total O 378 378	0	0
4	C	335	Total O 335 335	0	0
4	D	382	Total O 382 382	0	0

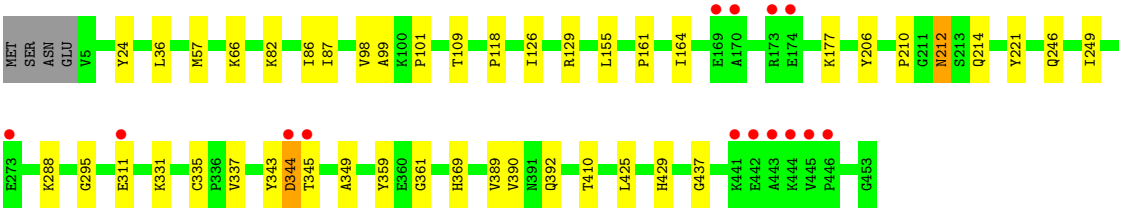
3 Residue-property plots (i)

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: Succinate-semialdehyde dehydrogenase (acetylating)

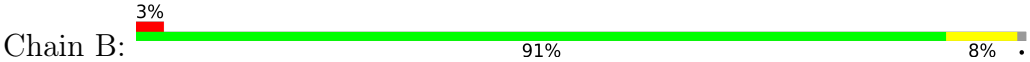
Chain A:

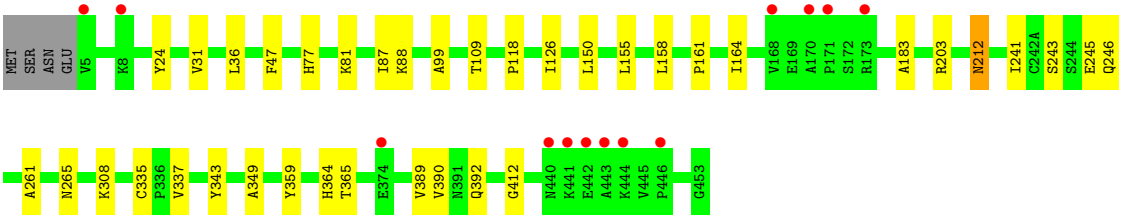




• Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)

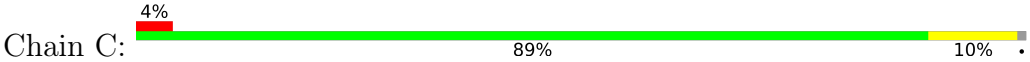
Chain B:

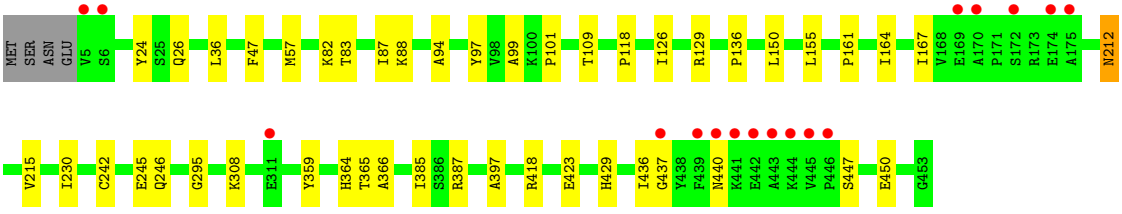




• Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)

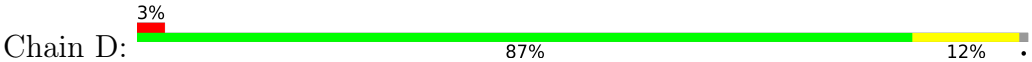
Chain C:

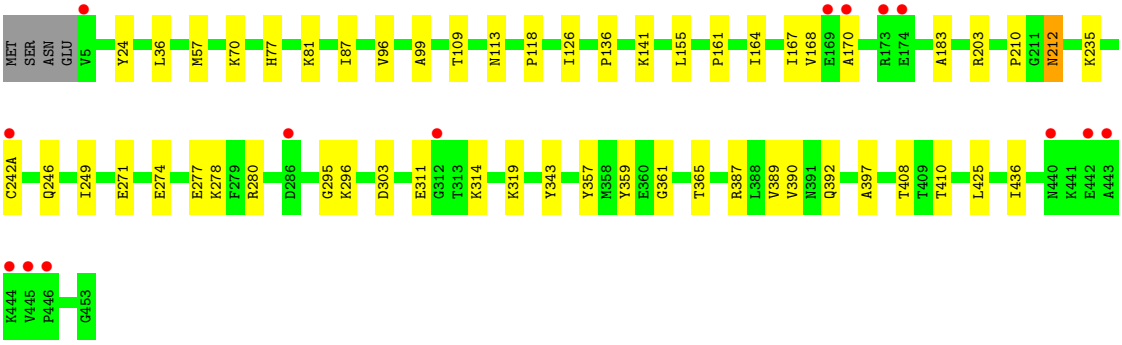




• Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)

Chain D:




MET
SER
ASN
GLU
V5
Y24
L36
M57
K70
H77
K81
I87
V96
A99
T109
N113
P118
I126
P136
K141
L155
P161
I164
I167
V168
E169
A170
R173
E174
A183
R203
P210
G211
N212
K235
C242A
Q246
I249
E271
E274
E277
K278
F279
R280
D286
G295
K296
D303
E311
G312
T313
K314
K319
Y343
Y357
M358
Y359
E360
G361
T365
R387
L388
V389
V390
N391
Q392
A397
T408
T409
T410
L425
T436
N440
K441
E442
A443
K444
V445
P446
G453

4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α, β, γ	141.89Å 190.65Å 190.33Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 2.10 25.00 – 2.10	Depositor EDS
% Data completeness (in resolution range)	100.0 (25.00-2.10) 99.5 (25.00-2.10)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.32 (at 2.10Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.211 , 0.242 0.215 , 0.242	Depositor DCC
R_{free} test set	2011 reflections (1.35%)	wwPDB-VP
Wilson B-factor (Å^2)	28.5	Xtriage
Anisotropy	0.292	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 28.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.387 for -h,-l,-k	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	15100	wwPDB-VP
Average B, all atoms (Å^2)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 29.74 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.4720e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[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: MEZ, OA9

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	0.25	0/3465	0.43	0/4685
1	B	0.24	0/3465	0.43	0/4685
1	C	0.24	0/3465	0.43	0/4685
1	D	0.24	0/3465	0.43	0/4685
All	All	0.24	0/13860	0.43	0/18740

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	3408	0	3454	26	1
1	B	3408	0	3454	21	0
1	C	3408	0	3455	26	0
1	D	3408	0	3454	33	0
2	A	8	0	4	0	0
2	B	8	0	4	0	0
2	D	8	0	4	2	0
3	C	56	0	0	0	0
4	A	293	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	378	0	0	3	1
4	C	335	0	0	3	0
4	D	382	0	0	3	1
All	All	15100	0	13829	104	2

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 (104) 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:C:215:VAL:HG21	1:C:245:GLU:HG3	1.70	0.73
1:B:389:VAL:HG12	1:B:392:GLN:HG3	1.74	0.68
1:B:183:ALA:O	1:B:203:ARG:NH1	2.30	0.65
1:D:36:LEU:HD11	1:D:126:ILE:HD12	1.79	0.65
1:A:36:LEU:HD11	1:A:126:ILE:HD12	1.78	0.64
1:B:308:LYS:NZ	4:B:622:HOH:O	2.34	0.61
1:A:177:LYS:NZ	4:A:617:HOH:O	2.34	0.61
1:C:36:LEU:HD11	1:C:126:ILE:HD12	1.84	0.60
1:C:101:PRO:HG3	1:C:129:ARG:HB2	1.83	0.59
1:A:66:LYS:NZ	4:A:608:HOH:O	2.33	0.59
1:D:212:ASN:HA	1:D:246:GLN:HG3	1.85	0.58
1:D:271:GLU:HG3	1:D:319:LYS:HD3	1.87	0.57
1:A:109:THR:HG21	1:A:118:PRO:HG3	1.87	0.56
1:D:235:LYS:NZ	4:D:630:HOH:O	2.37	0.56
1:A:87:ILE:HD13	1:A:99:ALA:HB2	1.87	0.56
1:C:418:ARG:NH1	4:C:630:HOH:O	2.39	0.55
1:D:77:HIS:O	1:D:81:LYS:NZ	2.32	0.55
1:C:212:ASN:HA	1:C:246:GLN:HG3	1.87	0.55
1:B:155:LEU:HD13	1:B:164:ILE:HD11	1.89	0.54
1:A:389:VAL:HG12	1:A:392:GLN:HG3	1.89	0.54
1:C:87:ILE:HD13	1:C:99:ALA:HB2	1.90	0.53
1:D:141:LYS:HE3	1:D:170:ALA:HB2	1.91	0.53
1:C:440:ASN:ND2	4:C:619:HOH:O	2.33	0.53
1:B:31:VAL:HG12	1:B:158:LEU:HD13	1.92	0.51
1:A:331:LYS:NZ	4:A:634:HOH:O	2.43	0.51
1:D:183:ALA:O	1:D:203:ARG:NH1	2.43	0.51
1:A:311:GLU:HG2	1:D:311:GLU:HG3	1.93	0.50
1:D:136:PRO:HG3	1:D:167:ILE:HD11	1.93	0.50
1:D:277:GLU:OE1	1:D:280:ARG:NH1	2.42	0.50
1:C:109:THR:HG21	1:C:118:PRO:HG3	1.92	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:308:LYS:NZ	4:C:616:HOH:O	2.32	0.50
1:D:87:ILE:HD13	1:D:99:ALA:HB2	1.94	0.50
1:D:96:VAL:HB	1:D:436:ILE:HB	1.93	0.50
1:B:36:LEU:HD11	1:B:126:ILE:HD12	1.94	0.49
1:C:366:ALA:HB3	1:C:385:ILE:HD13	1.94	0.49
1:B:212:ASN:HA	1:B:246:GLN:HG3	1.95	0.49
1:B:109:THR:HG21	1:B:118:PRO:HG3	1.94	0.49
1:C:423:GLU:OE2	1:C:429:HIS:NE2	2.40	0.49
1:D:109:THR:HG21	1:D:118:PRO:HG3	1.94	0.48
1:D:296:LYS:NZ	4:D:640:HOH:O	2.44	0.48
1:A:82:LYS:NZ	4:A:638:HOH:O	2.45	0.48
1:C:57:MET:HB2	1:C:295:GLY:HA3	1.96	0.48
1:B:261:ALA:O	1:B:265:ASN:ND2	2.42	0.48
1:D:249:ILE:HG22	1:D:343:TYR:HD2	1.80	0.47
1:A:212:ASN:HA	1:A:246:GLN:HG3	1.97	0.47
1:D:155:LEU:HD13	1:D:164:ILE:HD11	1.95	0.47
1:A:101:PRO:HG3	1:A:129:ARG:HB2	1.96	0.47
1:B:412:GLY:N	4:B:648:HOH:O	2.47	0.47
1:C:155:LEU:HD13	1:C:164:ILE:HD11	1.97	0.46
1:B:390:VAL:O	1:B:392:GLN:HG2	2.16	0.46
1:A:210:PRO:O	1:A:361:GLY:HA2	2.15	0.46
1:C:88:LYS:HB3	1:C:97:TYR:HB2	1.97	0.46
1:C:447:SER:H	1:C:450:GLU:HB2	1.81	0.46
1:D:303:ASP:OD2	4:D:601:HOH:O	2.20	0.46
1:C:94:ALA:O	1:C:437:GLY:HA2	2.16	0.45
1:A:155:LEU:HD13	1:A:164:ILE:HD11	1.97	0.45
1:A:390:VAL:O	1:A:392:GLN:HG2	2.16	0.45
1:C:387:ARG:HD2	1:C:397:ALA:HB1	1.99	0.44
1:B:245:GLU:OE1	1:B:245:GLU:N	2.44	0.44
1:C:136:PRO:HG3	1:C:167:ILE:HD11	1.99	0.44
1:C:230:ILE:HG23	1:C:245:GLU:HG2	1.99	0.44
1:D:235:LYS:HD3	1:D:314:LYS:HB3	2.00	0.44
1:D:410:THR:HB	1:D:425:LEU:HB3	1.99	0.44
1:D:57:MET:HB2	1:D:295:GLY:HA3	1.98	0.44
1:D:389:VAL:HG13	1:D:392:GLN:HG3	1.98	0.43
1:A:343:TYR:CG	1:A:349:ALA:HB2	2.53	0.43
1:B:343:TYR:CG	1:B:349:ALA:HB2	2.53	0.43
1:B:335:CYS:O	1:B:337:VAL:N	2.47	0.43
1:D:387:ARG:HD2	1:D:397:ALA:HB1	1.99	0.43
1:A:221:TYR:CE2	1:A:369:HIS:HB3	2.54	0.43
1:A:311:GLU:CG	1:D:311:GLU:HG3	2.49	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:242(A):CYS:H	2:D:501:MEZ:C5	2.32	0.43
1:C:24:TYR:OH	1:C:161:PRO:HD3	2.18	0.43
1:A:410:THR:HB	1:A:425:LEU:HB3	2.01	0.43
1:D:390:VAL:O	1:D:392:GLN:HG2	2.18	0.43
1:D:24:TYR:OH	1:D:161:PRO:HD3	2.19	0.42
1:D:113:ASN:ND2	2:D:501:MEZ:H42	2.34	0.42
1:D:249:ILE:HG22	1:D:343:TYR:CD2	2.54	0.42
1:A:24:TYR:OH	1:A:161:PRO:HD3	2.19	0.42
1:A:57:MET:HB2	1:A:295:GLY:HA3	2.00	0.42
1:D:70:LYS:NZ	1:D:408:THR:O	2.50	0.42
1:D:357:TYR:OH	1:D:365:THR:O	2.31	0.42
1:B:87:ILE:HD13	1:B:99:ALA:HB2	2.01	0.42
1:B:241:ILE:HG22	1:B:243:SER:H	1.84	0.42
1:C:245:GLU:OE1	1:C:245:GLU:N	2.47	0.42
1:D:210:PRO:O	1:D:361:GLY:HA2	2.20	0.42
1:C:47:PHE:CZ	1:C:150:LEU:HD12	2.55	0.42
1:C:26:GLN:OE1	1:C:83:THR:N	2.38	0.42
1:A:206:TYR:CZ	1:A:429:HIS:HB3	2.55	0.41
1:B:364:HIS:HB3	1:B:365:THR:H	1.68	0.41
1:B:47:PHE:CZ	1:B:150:LEU:HD12	2.56	0.41
1:A:86:ILE:HG12	1:A:98:VAL:HG22	2.02	0.41
1:A:212:ASN:O	1:A:214:GLN:NE2	2.54	0.41
1:B:88:LYS:NZ	4:B:665:HOH:O	2.53	0.41
1:D:389:VAL:CG1	1:D:392:GLN:HG3	2.50	0.41
1:A:288:LYS:HA	1:A:288:LYS:HD2	1.84	0.41
1:C:242:CYS:SG	1:C:364:HIS:NE2	2.92	0.41
1:B:77:HIS:O	1:B:81:LYS:NZ	2.41	0.41
1:A:335:CYS:O	1:A:337:VAL:N	2.51	0.41
1:B:24:TYR:OH	1:B:161:PRO:HD3	2.20	0.41
1:C:82:LYS:HA	1:C:82:LYS:HD3	1.88	0.41
1:D:274:GLU:O	1:D:278:LYS:HG3	2.21	0.41
1:A:249:ILE:HG22	1:A:343:TYR:HD2	1.85	0.40
1:C:364:HIS:HB3	1:C:365:THR:H	1.68	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:863:HOH:O	4:D:863:HOH:O[3_455]	2.15	0.05
1:A:344:ASP:O	4:B:898:HOH:O[8_544]	2.19	0.01

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	447/453 (99%)	436 (98%)	9 (2%)	2 (0%)	34	32
1	B	447/453 (99%)	436 (98%)	10 (2%)	1 (0%)	47	49
1	C	447/453 (99%)	432 (97%)	13 (3%)	2 (0%)	34	32
1	D	447/453 (99%)	439 (98%)	7 (2%)	1 (0%)	47	49
All	All	1788/1812 (99%)	1743 (98%)	39 (2%)	6 (0%)	41	41

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	437	GLY
1	C	436	ILE
1	A	212	ASN
1	D	212	ASN
1	C	212	ASN
1	B	212	ASN

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	362/366 (99%)	359 (99%)	3 (1%)	81	86
1	B	362/366 (99%)	361 (100%)	1 (0%)	92	95
1	C	362/366 (99%)	361 (100%)	1 (0%)	92	95
1	D	362/366 (99%)	360 (99%)	2 (1%)	86	90

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1448/1464 (99%)	1441 (100%)	7 (0%)	88 92

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	344	ASP
1	A	345	THR
1	A	359	TYR
1	B	359	TYR
1	C	359	TYR
1	D	168	VAL
1	D	359	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry

4 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	MEZ	B	501	1	7,7,8	2.72	3 (42%)	7,8,10	2.81	3 (42%)
3	OA9	C	501	-	50,58,58	2.71	16 (32%)	62,86,86	2.48	11 (17%)
2	MEZ	D	501	1	7,7,8	2.69	2 (28%)	7,8,10	2.68	3 (42%)
2	MEZ	A	501	1	7,7,8	2.66	3 (42%)	7,8,10	2.64	4 (57%)

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	MEZ	B	501	1	-	2/6/6/8	-
3	OA9	C	501	-	-	8/52/75/75	0/3/3/3
2	MEZ	D	501	1	-	4/6/6/8	-
2	MEZ	A	501	1	-	4/6/6/8	-

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	501	OA9	C9P-N8P	6.97	1.48	1.33
3	C	501	OA9	C2A-N3A	6.64	1.42	1.32
3	C	501	OA9	C8A-N7A	-6.55	1.23	1.34
3	C	501	OA9	O4B-C1B	6.49	1.50	1.41
3	C	501	OA9	C5P-N4P	6.40	1.47	1.33
2	B	501	MEZ	C5-C3	6.02	1.53	1.46
2	D	501	MEZ	C5-C3	5.95	1.53	1.46
2	A	501	MEZ	C5-C3	5.85	1.53	1.46
3	C	501	OA9	P3B-O3B	3.87	1.66	1.59
3	C	501	OA9	C2B-C1B	-3.52	1.48	1.53
3	C	501	OA9	C6A-N6A	3.35	1.46	1.34
3	C	501	OA9	C6A-C5A	-3.31	1.31	1.43
3	C	501	OA9	C5A-C4A	3.14	1.49	1.40
3	C	501	OA9	C07-C02	3.03	1.55	1.46
3	C	501	OA9	C2B-C3B	-2.85	1.46	1.52
3	C	501	OA9	C03-C04	2.58	1.54	1.47
3	C	501	OA9	O4B-C4B	2.48	1.50	1.45
3	C	501	OA9	C2A-N1A	2.42	1.38	1.33
2	D	501	MEZ	C2-C1	2.13	1.53	1.47
2	A	501	MEZ	C2-C1	2.10	1.53	1.47
2	B	501	MEZ	C2-C1	2.08	1.53	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	MEZ	C2-C3	-2.02	1.32	1.35
2	A	501	MEZ	C2-C3	-2.01	1.32	1.35
3	C	501	OA9	C07-S1P	2.00	1.83	1.77

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	501	OA9	C04-C03-C02	-11.98	96.03	126.81
3	C	501	OA9	C2P-S1P-C07	8.93	111.02	99.80
3	C	501	OA9	N3A-C2A-N1A	-5.52	120.05	128.68
2	D	501	MEZ	O4-C5-C3	-5.23	119.84	125.16
2	B	501	MEZ	O4-C5-C3	-5.14	119.93	125.16
2	A	501	MEZ	O4-C5-C3	-5.03	120.05	125.16
3	C	501	OA9	C01-C02-C07	-4.73	104.23	116.04
3	C	501	OA9	C1B-N9A-C4A	-4.45	118.81	126.64
2	B	501	MEZ	C1-C2-C3	-4.10	122.09	128.50
3	C	501	OA9	C2A-N1A-C6A	3.46	124.67	118.75
3	C	501	OA9	C4A-C5A-N7A	-3.03	106.24	109.40
2	D	501	MEZ	C1-C2-C3	-2.94	123.90	128.50
2	A	501	MEZ	C1-C2-C3	-2.75	124.19	128.50
3	C	501	OA9	P1A-O3A-P2A	-2.53	124.13	132.83
3	C	501	OA9	O05-C04-C03	2.52	121.33	113.50
2	D	501	MEZ	O1-C1-C2	2.49	121.24	113.50
2	A	501	MEZ	O1-C1-C2	2.48	121.19	113.50
3	C	501	OA9	C01-C02-C03	2.38	130.53	123.87
2	A	501	MEZ	C4-C3-C5	2.32	119.61	117.18
3	C	501	OA9	O05-C04-O06	-2.19	118.12	122.67
2	B	501	MEZ	C4-C3-C5	2.06	119.34	117.18

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	MEZ	C4-C3-C5-O4
2	A	501	MEZ	C2-C3-C5-O4
2	A	501	MEZ	O1-C1-C2-C3
2	A	501	MEZ	O2-C1-C2-C3
2	D	501	MEZ	C4-C3-C5-O4
2	D	501	MEZ	C2-C3-C5-O4
2	D	501	MEZ	O1-C1-C2-C3
2	D	501	MEZ	O2-C1-C2-C3
3	C	501	OA9	O08-C07-S1P-C2P

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Mol	Chain	Res	Type	Atoms
3	C	501	OA9	S1P-C2P-C3P-N4P
3	C	501	OA9	CCP-O6A-P2A-O5A
3	C	501	OA9	CCP-O6A-P2A-O3A
2	B	501	MEZ	O2-C1-C2-C3
3	C	501	OA9	C02-C03-C04-O05
3	C	501	OA9	C02-C03-C04-O06
2	B	501	MEZ	O1-C1-C2-C3
3	C	501	OA9	C01-C02-C07-O08
3	C	501	OA9	C03-C02-C07-O08

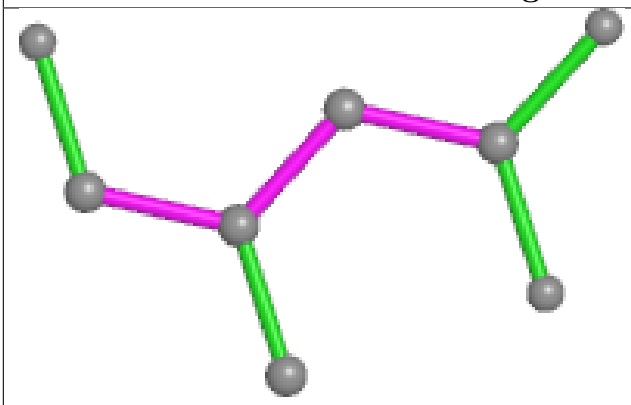
There are no ring outliers.

1 monomer is involved in 2 short contacts:

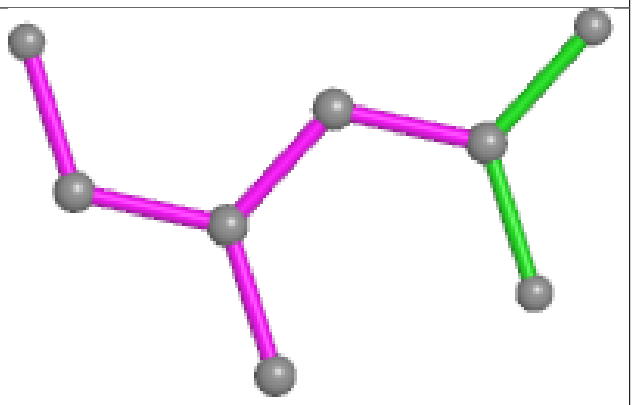
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	501	MEZ	2	0

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.

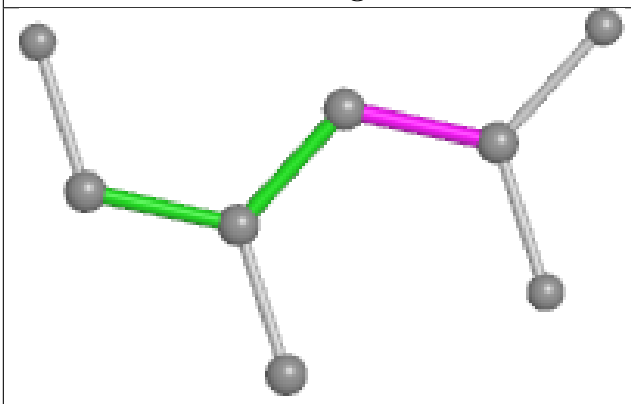
Ligand MEZ B 501



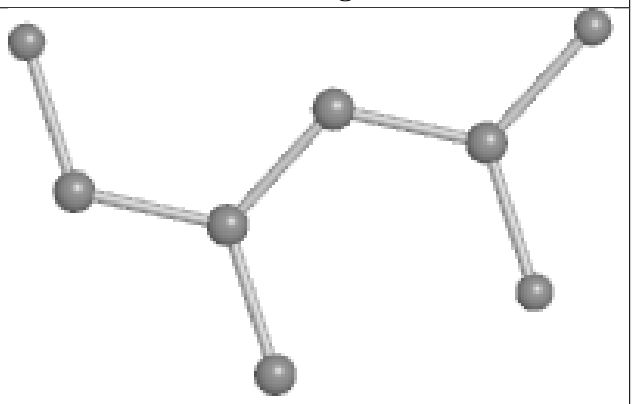
Bond lengths



Bond angles

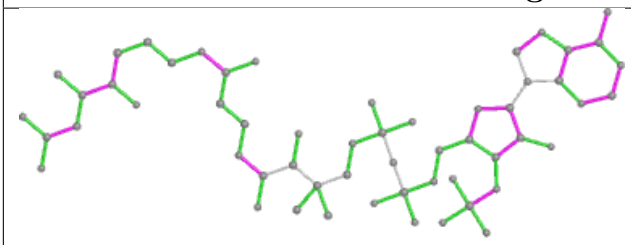


Torsions

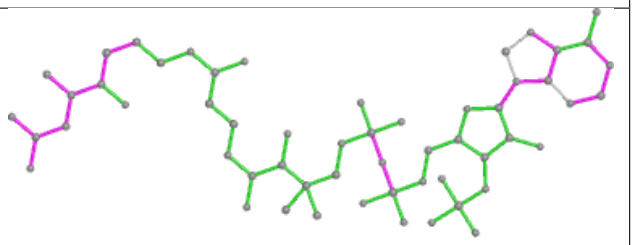


Rings

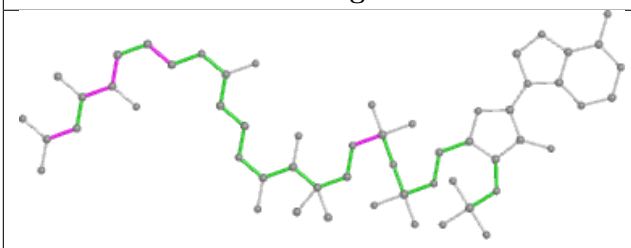
Ligand OA9 C 501



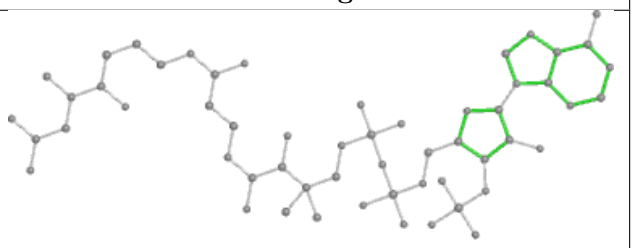
Bond lengths



Bond angles

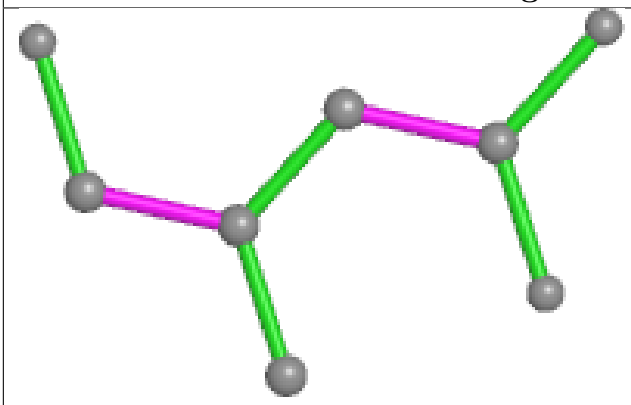


Torsions

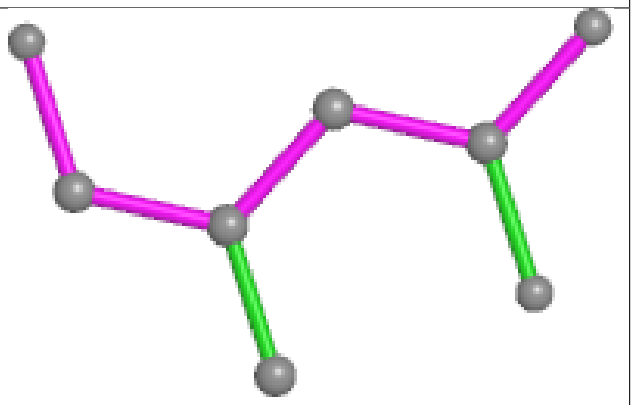


Rings

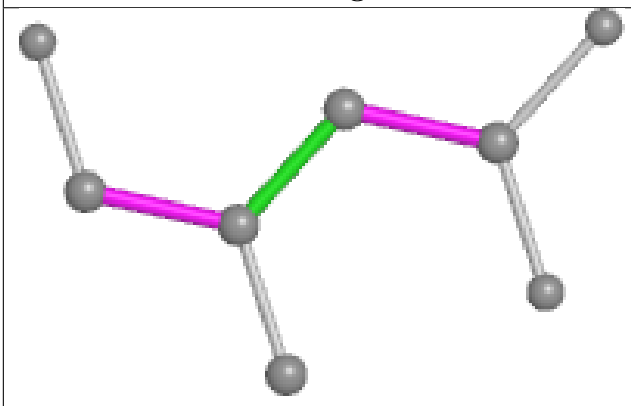
Ligand MEZ D 501



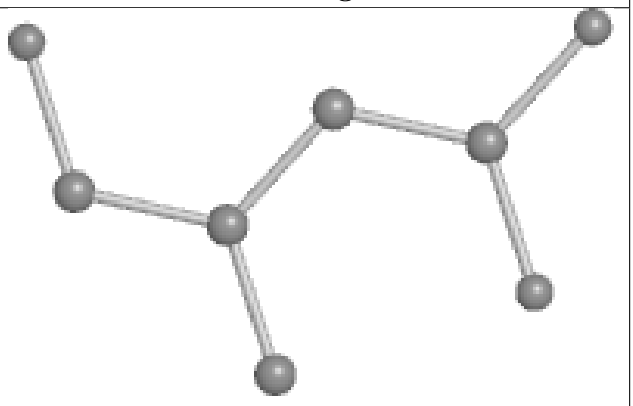
Bond lengths



Bond angles

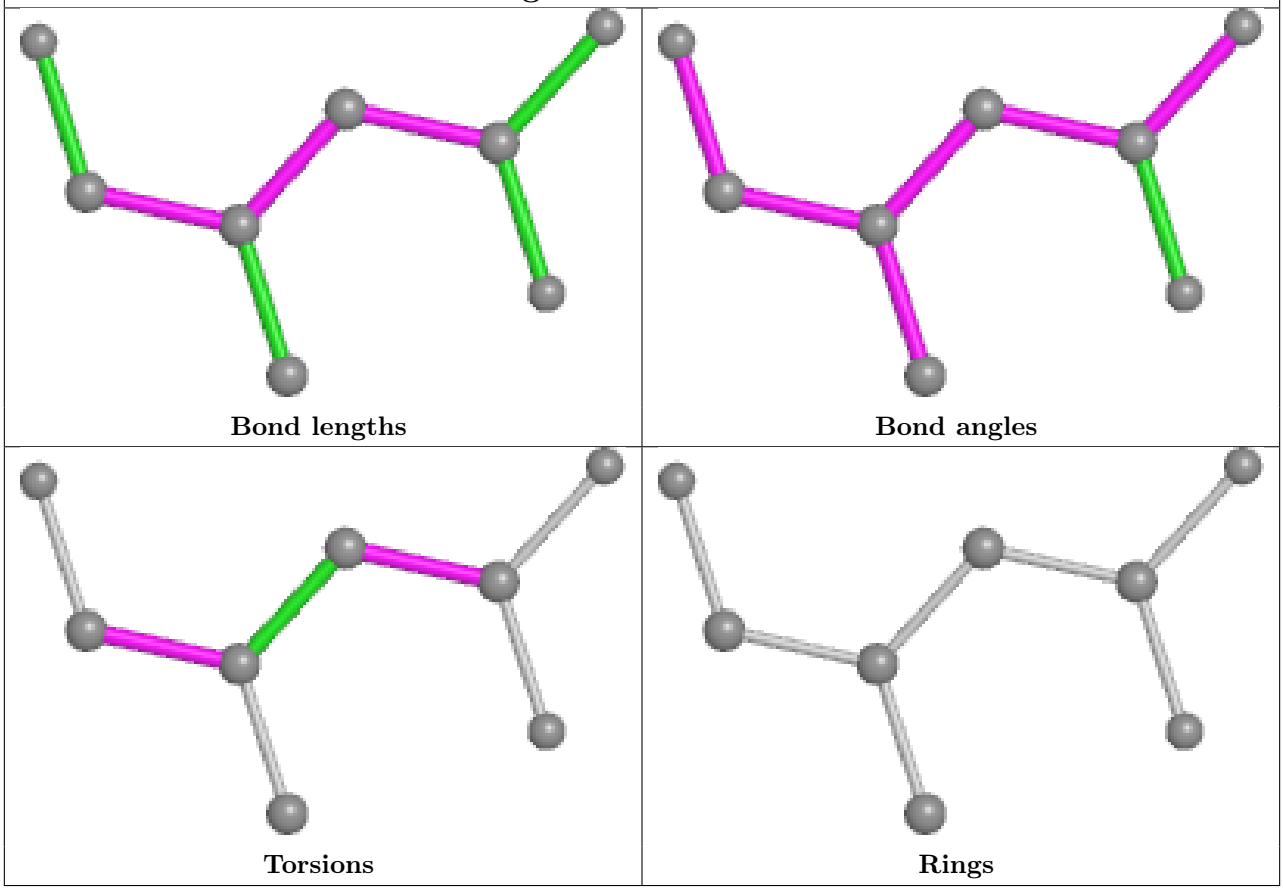


Torsions



Rings

Ligand MEZ A 501



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, 95^{th} 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	449/453 (99%)	0.07	14 (3%)	49	55	21, 27, 43, 135	0
1	B	449/453 (99%)	0.26	13 (2%)	51	57	18, 25, 49, 181	0
1	C	449/453 (99%)	0.32	17 (3%)	40	46	18, 26, 46, 171	0
1	D	449/453 (99%)	0.16	14 (3%)	49	55	20, 28, 47, 126	1 (0%)
All	All	1796/1812 (99%)	0.20	58 (3%)	47	54	18, 26, 46, 181	1 (0%)

All (58) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	443	ALA	12.4
1	B	442	GLU	9.5
1	B	443	ALA	7.6
1	A	442	GLU	7.3
1	D	442	GLU	7.0
1	A	443	ALA	7.0
1	D	446	PRO	6.2
1	C	444	LYS	5.9
1	C	442	GLU	5.7
1	C	440	ASN	5.6
1	D	173	ARG	5.5
1	B	374	GLU	5.1
1	A	441	LYS	5.0
1	B	170	ALA	4.8
1	C	437	GLY	4.8
1	C	443	ALA	4.6
1	B	440	ASN	4.5
1	C	441	LYS	4.5
1	C	169	GLU	4.2
1	B	446	PRO	3.9
1	C	446	PRO	3.9

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Mol	Chain	Res	Type	RSRZ
1	B	441	LYS	3.8
1	C	5	VAL	3.7
1	D	242(A)	CYS	3.7
1	B	171	PRO	3.5
1	A	170	ALA	3.4
1	B	168	VAL	3.3
1	A	445	VAL	3.3
1	A	311	GLU	3.2
1	C	172	SER	3.2
1	B	5	VAL	3.1
1	D	170	ALA	3.0
1	D	174	GLU	2.9
1	D	312	GLY	2.8
1	A	446	PRO	2.8
1	D	444	LYS	2.7
1	C	6	SER	2.7
1	C	170	ALA	2.7
1	D	169	GLU	2.6
1	B	444	LYS	2.6
1	C	445	VAL	2.6
1	C	311	GLU	2.6
1	D	445	VAL	2.5
1	A	169	GLU	2.5
1	A	273	GLU	2.5
1	A	173	ARG	2.5
1	A	344	ASP	2.5
1	A	444	LYS	2.5
1	C	174	GLU	2.4
1	C	175	ALA	2.4
1	D	440	ASN	2.4
1	C	439	PHE	2.3
1	D	286	ASP	2.3
1	B	8	LYS	2.3
1	B	173	ARG	2.3
1	D	5	VAL	2.2
1	A	345	THR	2.1
1	A	174	GLU	2.1

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 monosaccharides in this entry.

6.4 Ligands (i)

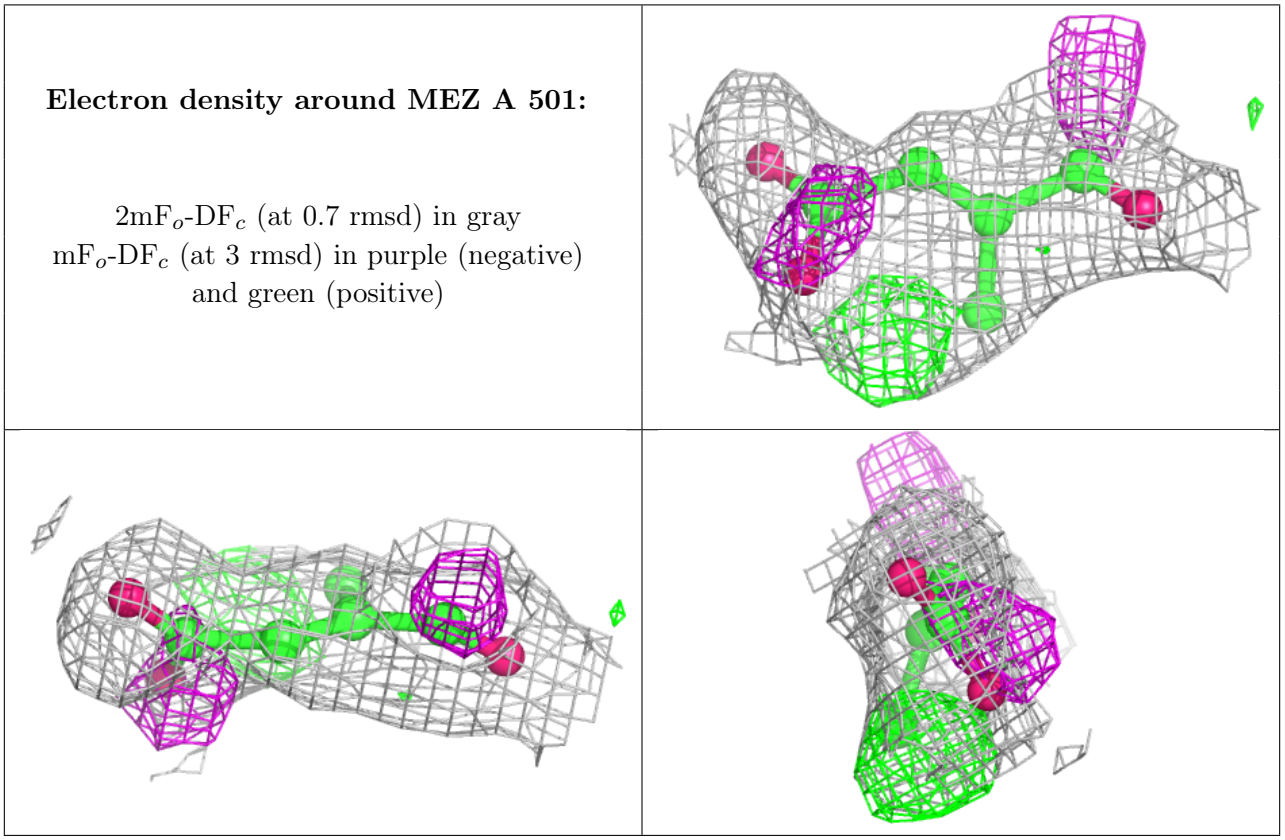
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	MEZ	A	501	8/9	0.69	0.19	26,29,31,32	0
2	MEZ	B	501	8/9	0.75	0.32	26,28,30,30	0
2	MEZ	D	501	8/9	0.75	0.27	27,27,28,28	8
3	OA9	C	501	56/56	0.80	0.30	31,40,46,48	56

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.

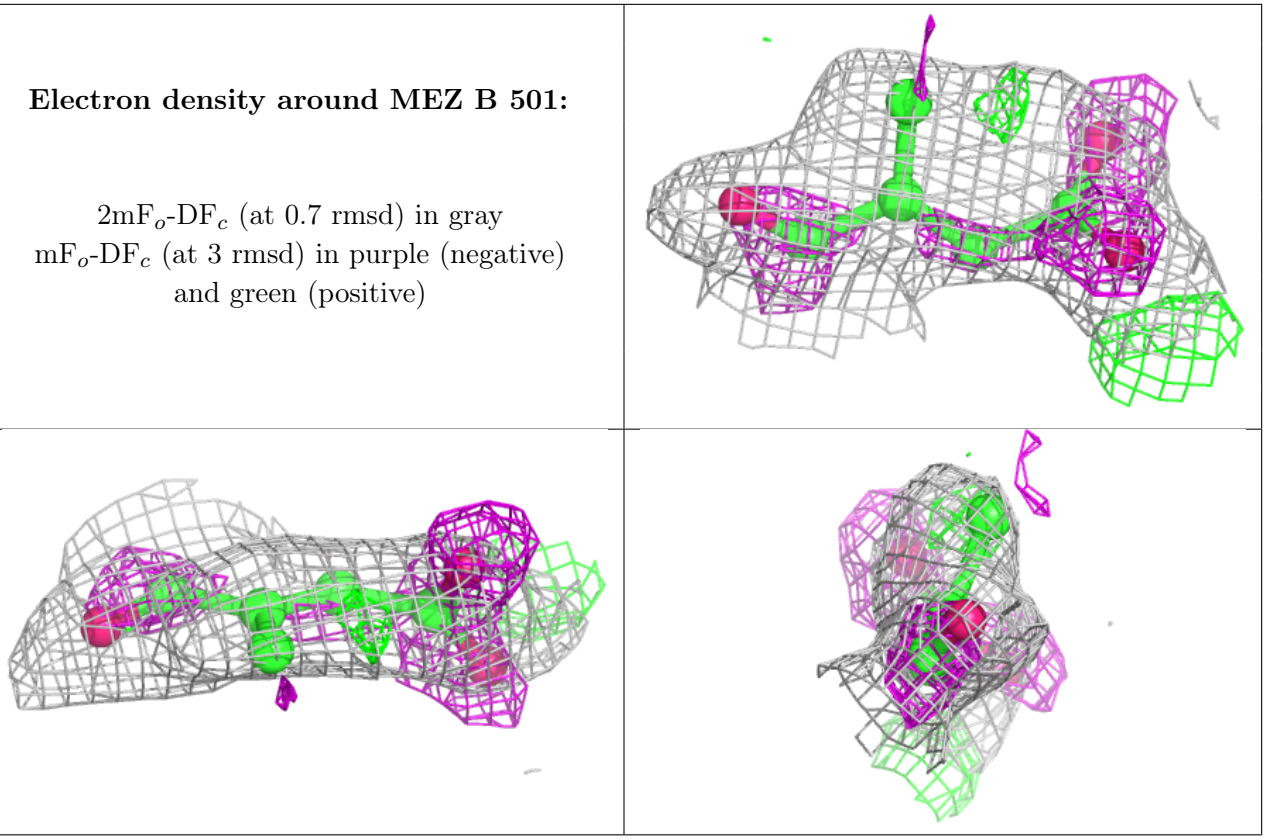
Electron density around MEZ A 501:

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



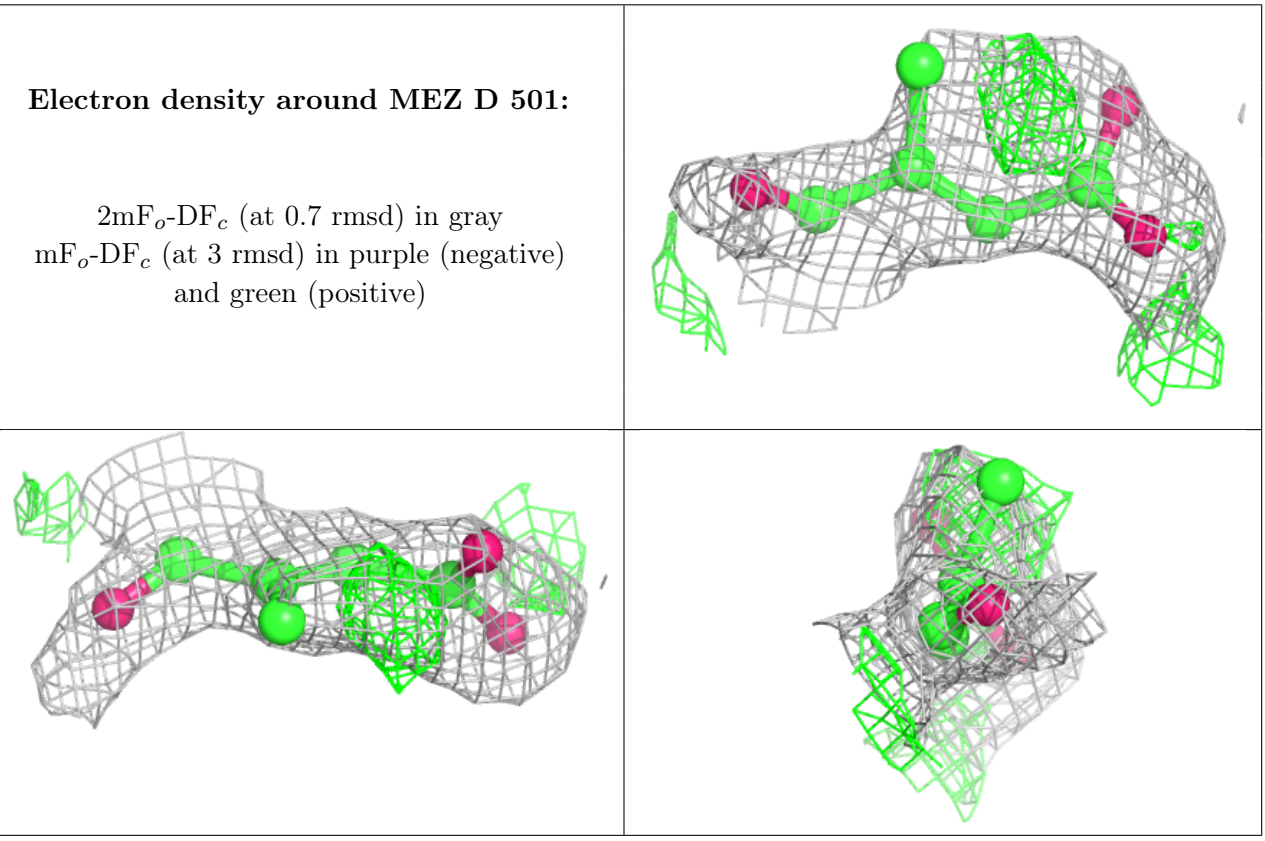
Electron density around MEZ B 501:

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



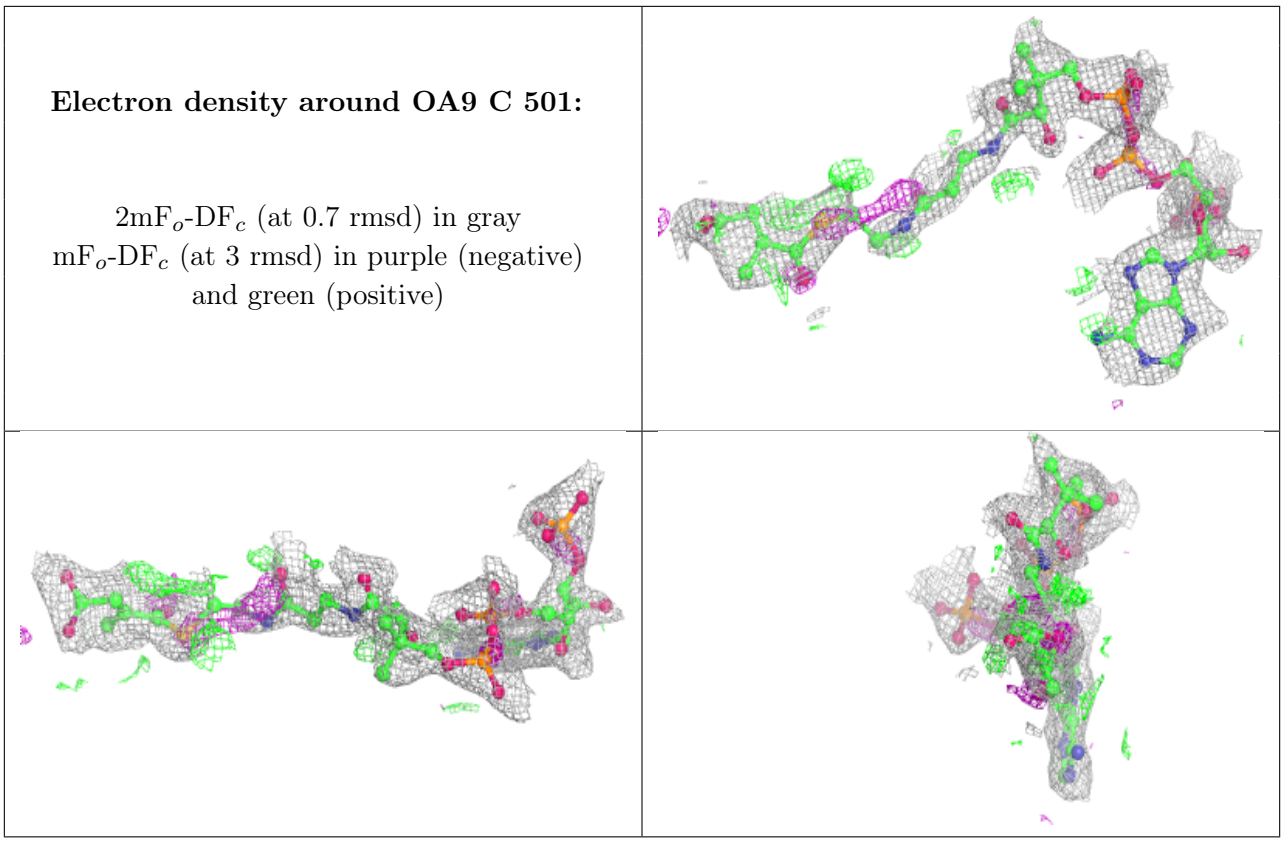
Electron density around MEZ D 501:

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



Electron density around OA9 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.