



# Full wwPDB X-ray Structure Validation Report ⓘ

May 22, 2020 – 01:42 pm BST

PDB ID : 6G5L  
Title : Crystal structure of human carbonic anhydrase isozyme XII with 4-chloro-2-(cyclohexylamino)-N-(2-hydroxyethyl)-5-sulfamoyl-benzamide  
Authors : Smirnov, A.; Manakova, E.; Grazulis, S.  
Deposited on : 2018-03-29  
Resolution : 1.21 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](mailto: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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
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) : 2.11

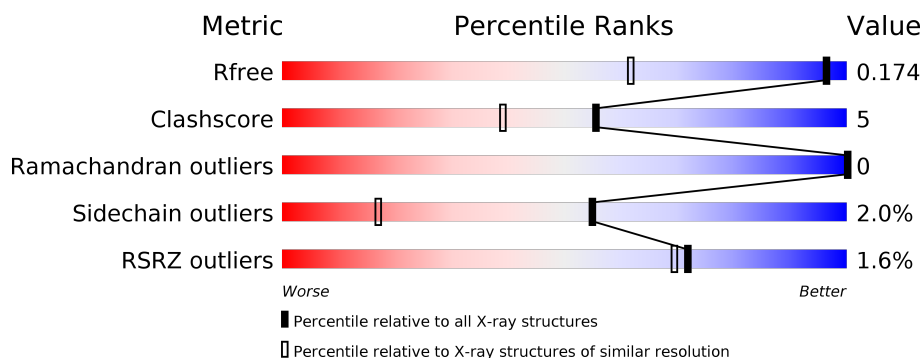
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.21 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	1232 (1.24-1.20)
Clashscore	141614	1294 (1.24-1.20)
Ramachandran outliers	138981	1251 (1.24-1.20)
Sidechain outliers	138945	1250 (1.24-1.20)
RSRZ outliers	127900	1209 (1.24-1.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	263	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 91%, green 91%, grey 100%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>%</span> <span>91%</span> <span>8% •</span> </div> </div>
1	B	263	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 94%, green 94%, grey 100%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>%</span> <span>94%</span> <span>5% •</span> </div> </div>
1	C	263	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 3%, orange 3%, yellow 92%, green 92%, grey 100%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>3%</span> <span>92%</span> <span>7% •</span> </div> </div>
1	D	263	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 2%, orange 2%, yellow 93%, green 93%, grey 100%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>2%</span> <span>93%</span> <span>6% •</span> </div> </div>

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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	EDO	B	306	-	X	-	-
4	EDO	D	303	-	-	X	-
4	EDO	D	308	-	-	X	-

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 9747 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 Carbonic anhydrase 12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	261	Total	C	N	O	S	0	7	0
			2150	1365	365	412	8			
1	B	261	Total	C	N	O	S	0	6	0
			2126	1351	362	406	7			
1	C	261	Total	C	N	O	S	0	4	0
			2108	1345	356	400	7			
1	D	261	Total	C	N	O	S	0	5	0
			2117	1346	357	407	7			

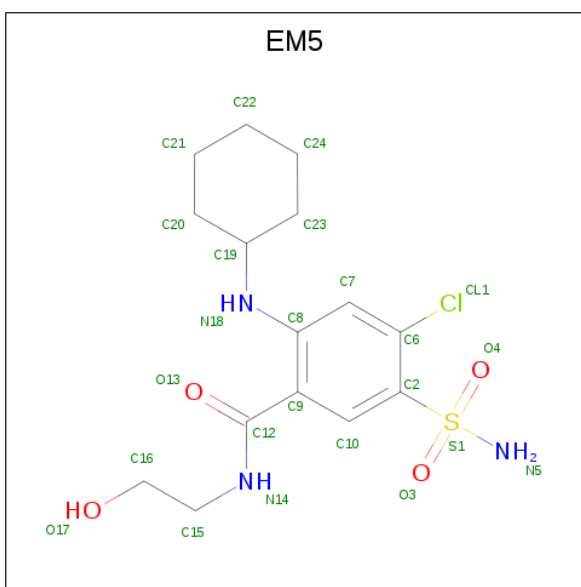
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP O43570
B	1	MET	-	initiating methionine	UNP O43570
C	1	MET	-	initiating methionine	UNP O43570
D	1	MET	-	initiating methionine	UNP O43570

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

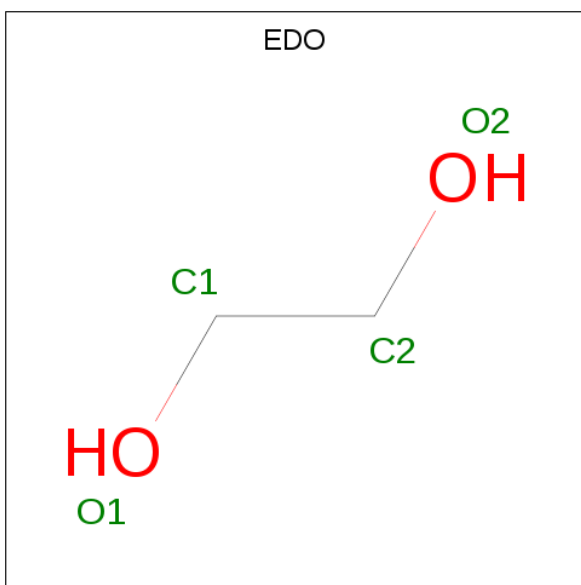
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Zn	0	0
			1	1		
2	A	1	Total	Zn	0	0
			1	1		
2	D	1	Total	Zn	0	0
			1	1		
2	C	1	Total	Zn	0	0
			1	1		

- Molecule 3 is 4-chloranyl-2-(cyclohexylamino)- {N}-(2-hydroxyethyl)-5-sulfamoyl-benzamid e (three-letter code: EM5) (formula: C<sub>15</sub>H<sub>22</sub>ClN<sub>3</sub>O<sub>4</sub>S).



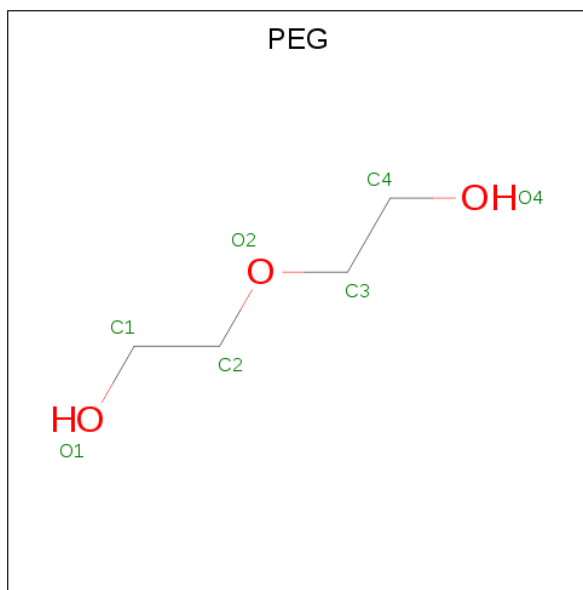
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	Cl	N	O	S	0	1
			48	30	2	6	8	2		
3	B	1	Total	C	Cl	N	O	S	0	1
			48	30	2	6	8	2		
3	C	1	Total	C	Cl	N	O	S	0	0
			24	15	1	3	4	1		
3	D	1	Total	C	Cl	N	O	S	0	0
			24	15	1	3	4	1		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



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

- Molecule 5 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			7	4	3		
5	D	1	Total	C	O	0	0
			7	4	3		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	284	Total	O	0	0
			284	284		
6	B	278	Total	O	0	0
			278	278		
6	C	212	Total	O	0	0
			212	212		
6	D	262	Total	O	0	0
			262	262		

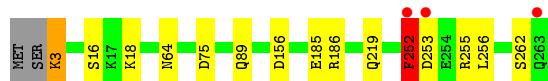
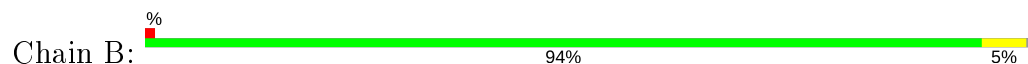
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Carbonic anhydrase 12



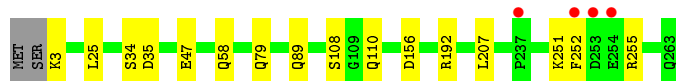
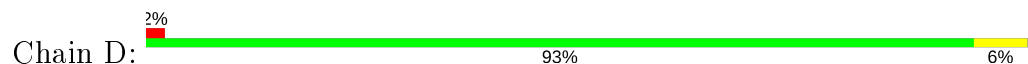
#### • Molecule 1: Carbonic anhydrase 12



#### • Molecule 1: Carbonic anhydrase 12



#### • Molecule 1: Carbonic anhydrase 12



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	77.13Å 74.23Å 91.53Å 90.00° 108.64° 90.00°	Depositor
Resolution (Å)	73.08 – 1.21 73.08 – 1.21	Depositor EDS
% Data completeness (in resolution range)	95.7 (73.08-1.21) 95.7 (73.08-1.21)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.81 (at 1.21Å)	Xtriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.136 , 0.173 0.136 , 0.174	Depositor DCC
$R_{free}$ test set	28370 reflections (9.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	12.6	Xtriage
Anisotropy	0.224	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 50.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	9747	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	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 43.68 % 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 1.7036e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup> Intensities estimated from amplitudes.

<sup>2</sup> Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: EM5, ZN, PEG, EDO

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	1.30	0/2213	1.17	0/3012
1	B	1.36	0/2190	1.23	3/2983 (0.1%)
1	C	1.45	0/2172	1.33	0/2959
1	D	1.32	0/2180	1.22	0/2969
All	All	1.36	0/8755	1.24	3/11923 (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
1	B	0	1
1	C	0	1
All	All	0	2

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	256	LEU	CB-CG-CD1	-6.83	99.39	111.00
1	B	75	ASP	CB-CG-OD1	5.23	123.00	118.30
1	B	252	PHE	N-CA-CB	5.12	119.81	110.60

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	262	SER	Peptide

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Mol	Chain	Res	Type	Group
1	C	158	ILE	Mainchain

## 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	2150	0	2027	15	0
1	B	2126	0	2005	37	0
1	C	2108	0	1980	12	0
1	D	2117	0	1986	16	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	48	0	0	1	0
3	B	48	0	0	0	0
3	C	24	0	0	0	0
3	D	24	0	0	0	0
4	A	8	0	12	0	0
4	B	16	0	24	7	0
4	C	4	0	5	0	0
4	D	20	0	30	9	0
5	A	7	0	10	1	0
5	D	7	0	10	0	0
6	A	284	0	0	10	0
6	B	278	0	0	10	0
6	C	212	0	0	3	0
6	D	262	0	0	7	0
All	All	9747	0	8089	85	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 5.

All (85) 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:252:PHE:CZ	1:B:255:ARG:HB3	1.81	1.16
6:A:633:HOH:O	1:C:234:MET:HE2	1.50	1.08
1:B:252:PHE:CZ	1:B:255:ARG:CB	2.38	1.06
1:B:252:PHE:CE2	1:B:255:ARG:HB2	1.91	1.04
1:D:34:SER:H	4:D:303:EDO:H11	1.22	1.01
1:B:252:PHE:CE2	1:B:255:ARG:CB	2.48	0.95
1:B:252:PHE:CD2	1:B:255:ARG:HB2	2.05	0.90
1:C:253[A]:ASP:OD2	6:C:401:HOH:O	1.93	0.85
1:B:252:PHE:CE2	1:B:255:ARG:NE	2.50	0.80
1:B:252:PHE:CE2	1:B:255:ARG:CD	2.64	0.79
1:B:252:PHE:CZ	1:B:255:ARG:HB2	2.12	0.79
1:B:252:PHE:CD1	1:B:255:ARG:O	2.36	0.78
1:A:194:ARG:NE	1:A:207:LEU:HD13	2.00	0.77
1:B:252:PHE:CE1	1:B:255:ARG:C	2.59	0.75
1:D:34:SER:N	4:D:303:EDO:H11	2.01	0.71
1:A:164:HIS:HD2	6:A:424:HOH:O	1.73	0.71
1:B:255:ARG:CD	6:B:510:HOH:O	2.38	0.71
1:C:7:PHE:CD1	1:C:8:GLY:N	2.60	0.70
1:B:252:PHE:CE2	1:B:255:ARG:HD2	2.28	0.69
1:D:108:SER:OG	4:D:303:EDO:H12	1.93	0.69
1:D:34:SER:H	4:D:303:EDO:C1	2.04	0.69
1:B:252:PHE:CD2	1:B:255:ARG:NE	2.61	0.68
1:B:16:SER:OG	6:B:401:HOH:O	2.11	0.68
1:A:57:LYS:HD2	6:A:684:HOH:O	1.94	0.67
1:B:252:PHE:CE1	1:B:255:ARG:CB	2.78	0.66
1:B:255:ARG:HG2	6:B:510:HOH:O	1.94	0.66
1:B:253:ASP:OD2	6:B:402:HOH:O	2.14	0.65
1:A:111:HIS:HE1	6:A:628:HOH:O	1.78	0.65
1:D:255:ARG:CD	6:D:532:HOH:O	2.44	0.65
1:A:219:GLN:NE2	6:A:403:HOH:O	2.30	0.64
1:B:3:LYS:HE3	1:B:18:LYS:NZ	2.13	0.64
1:C:3:LYS:N	6:C:402:HOH:O	2.32	0.63
1:B:252:PHE:HE2	1:B:255:ARG:HD2	1.63	0.63
1:A:219:GLN:HG3	1:A:220:GLU:N	2.14	0.62
1:A:9:PRO:HB2	6:A:419:HOH:O	2.00	0.61
1:B:255:ARG:CG	6:B:510:HOH:O	2.49	0.61
1:B:252:PHE:HE2	1:B:255:ARG:CD	2.14	0.58
1:C:8:GLY:HA2	1:D:25[B]:LEU:HD21	1.85	0.58
1:B:252:PHE:CG	1:B:255:ARG:HB2	2.40	0.56
1:B:64:ASN:HD22	4:B:306:EDO:C2	2.18	0.56
1:D:252:PHE:H	4:D:308:EDO:C2	2.20	0.55
1:D:255:ARG:HG2	6:D:532:HOH:O	2.06	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:7:PHE:HD1	1:C:8:GLY:N	2.04	0.53
4:D:308:EDO:H11	6:D:461:HOH:O	2.08	0.53
1:B:252:PHE:CE1	1:B:255:ARG:O	2.60	0.53
1:B:252:PHE:CE1	1:B:255:ARG:HB2	2.43	0.53
1:B:186:ARG:HH11	1:B:186:ARG:HG3	1.74	0.53
1:B:185:GLU:HG2	4:B:303:EDO:O2	2.09	0.53
3:A:302[A]:EM5:O17	6:A:401:HOH:O	2.19	0.52
1:C:167:TYR:CE2	1:C:234:MET:HG3	2.45	0.52
4:B:305:EDO:H11	6:B:564:HOH:O	2.08	0.51
1:D:255:ARG:CG	6:D:532:HOH:O	2.59	0.51
1:A:49:GLN:NE2	6:A:408:HOH:O	2.44	0.50
1:B:186:ARG:HG3	1:B:186:ARG:NH1	2.26	0.50
1:B:3:LYS:HE3	1:B:18:LYS:HZ2	1.75	0.50
1:C:18[A]:LYS:NZ	6:C:404:HOH:O	2.37	0.48
1:B:64:ASN:HD22	4:B:306:EDO:H21	1.79	0.48
1:A:133:SER:OG	5:A:304:PEG:C1	2.62	0.48
1:D:47:GLU:HB2	1:D:79:GLN:HB2	1.95	0.48
1:B:252:PHE:HE2	1:B:255:ARG:NE	2.06	0.48
1:A:166:LYS:HB2	1:A:166:LYS:HE2	1.77	0.47
1:C:49:GLN:OE1	1:C:79:GLN:NE2	2.48	0.47
1:A:69[A]:LYS:NZ	6:A:406:HOH:O	2.40	0.47
4:B:305:EDO:H11	6:B:510:HOH:O	2.15	0.46
1:C:58:GLN:HG3	1:C:173:PHE:CD1	2.51	0.46
1:B:3:LYS:HE3	1:B:18:LYS:HZ3	1.81	0.46
1:B:252:PHE:CE1	1:B:255:ARG:HB3	2.40	0.45
1:A:231:CYS:SG	1:A:240:ARG:NH1	2.90	0.45
1:C:110:GLN:NE2	1:D:110:GLN:NE2	2.66	0.44
1:A:148[A]:MET:HE1	6:A:472:HOH:O	2.18	0.44
1:D:3:LYS:N	6:D:406:HOH:O	2.52	0.43
1:D:252:PHE:HB2	4:D:308:EDO:H11	2.00	0.43
1:B:252:PHE:CD2	1:B:252:PHE:O	2.72	0.42
1:D:255:ARG:HD2	6:D:532:HOH:O	2.11	0.42
4:B:305:EDO:C1	6:B:564:HOH:O	2.65	0.42
1:A:52:ASN:HA	1:A:178:ASN:HA	2.02	0.42
1:D:192:ARG:HD2	1:D:207:LEU:HD11	2.02	0.42
1:C:168:LYS:O	1:C:233:HIS:CD2	2.72	0.42
4:D:308:EDO:C1	6:D:461:HOH:O	2.68	0.42
1:B:252:PHE:CD1	1:B:255:ARG:C	2.90	0.41
4:B:303:EDO:C1	6:B:544:HOH:O	2.69	0.41
1:B:252:PHE:CD1	1:B:255:ARG:HB2	2.54	0.41
1:B:255:ARG:HD2	6:B:510:HOH:O	2.10	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:103:SER:O	1:A:111:HIS:HD2	2.05	0.40
1:D:251:LYS:HA	4:D:308:EDO:H22	2.02	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	266/263 (101%)	260 (98%)	6 (2%)	0	100	100
1	B	265/263 (101%)	259 (98%)	6 (2%)	0	100	100
1	C	263/263 (100%)	251 (95%)	12 (5%)	0	100	100
1	D	264/263 (100%)	257 (97%)	7 (3%)	0	100	100
All	All	1058/1052 (101%)	1027 (97%)	31 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	238/235 (101%)	233 (98%)	5 (2%)	53	16
1	B	235/235 (100%)	230 (98%)	5 (2%)	53	16
1	C	230/235 (98%)	226 (98%)	4 (2%)	60	24

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	233/235 (99%)	229 (98%)	4 (2%)	60	24
All	All	936/940 (100%)	918 (98%)	18 (2%)	55	19

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	82	GLN
1	A	89	GLN
1	A	128	ASP
1	A	156	ASP
1	A	219	GLN
1	B	3	LYS
1	B	89	GLN
1	B	156	ASP
1	B	219	GLN
1	B	252	PHE
1	C	54	SER
1	C	89	GLN
1	C	128	ASP
1	C	156	ASP
1	D	35	ASP
1	D	58	GLN
1	D	89	GLN
1	D	156	ASP

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

Mol	Chain	Res	Type
1	A	33	HIS
1	A	58	GLN
1	A	79	GLN
1	A	111	HIS
1	A	164	HIS
1	A	219	GLN
1	B	101	HIS
1	B	110	GLN
1	C	49	GLN
1	C	79	GLN
1	C	110	GLN
1	C	170	GLN
1	C	233	HIS

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Mol	Chain	Res	Type
1	D	101	HIS
1	D	110	GLN
1	D	164	HIS
1	D	219	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

### 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

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	EDO	C	303	-	3,3,3	0.67	0	2,2,2	1.10	0
4	EDO	B	305	-	3,3,3	1.23	0	2,2,2	1.31	0
4	EDO	D	306	-	3,3,3	0.94	0	2,2,2	0.66	0
3	EM5	B	302[B]	2	25,25,25	0.97	1 (4%)	34,35,35	1.44	7 (20%)
4	EDO	B	303	-	3,3,3	1.66	1 (33%)	2,2,2	0.46	0
4	EDO	B	306	-	3,3,3	2.97	2 (66%)	2,2,2	3.24	1 (50%)
3	EM5	B	302[A]	2	25,25,25	1.03	0	34,35,35	1.31	5 (14%)
3	EM5	A	302[A]	2	25,25,25	1.32	3 (12%)	34,35,35	1.15	2 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	EM5	A	302[B]	2	25,25,25	1.23	2 (8%)	34,35,35	1.29	5 (14%)
5	PEG	D	307	-	6,6,6	0.92	0	5,5,5	1.73	2 (40%)
4	EDO	A	305	-	3,3,3	0.48	0	2,2,2	2.36	2 (100%)
4	EDO	D	303	-	3,3,3	0.93	0	2,2,2	0.77	0
3	EM5	D	302	2	25,25,25	1.28	3 (12%)	34,35,35	1.33	2 (5%)
4	EDO	D	304	-	3,3,3	1.40	0	2,2,2	1.09	0
4	EDO	D	308	-	3,3,3	1.06	0	2,2,2	2.32	1 (50%)
4	EDO	B	304	-	3,3,3	1.33	0	2,2,2	0.22	0
4	EDO	D	305	-	3,3,3	0.71	0	2,2,2	0.76	0
5	PEG	A	304	-	6,6,6	1.25	0	5,5,5	2.57	2 (40%)
3	EM5	C	302	2	25,25,25	1.78	5 (20%)	34,35,35	2.02	15 (44%)
4	EDO	A	303	-	3,3,3	0.44	0	2,2,2	0.66	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
4	EDO	C	303	-	-	0/1/1/1	-
4	EDO	B	305	-	-	0/1/1/1	-
4	EDO	D	306	-	-	1/1/1/1	-
3	EM5	B	302[B]	2	-	1/18/26/26	0/2/2/2
4	EDO	B	303	-	-	1/1/1/1	-
4	EDO	B	306	-	-	1/1/1/1	-
3	EM5	B	302[A]	2	-	1/18/26/26	0/2/2/2
3	EM5	A	302[A]	2	-	1/18/26/26	0/2/2/2
3	EM5	A	302[B]	2	-	1/18/26/26	0/2/2/2
5	PEG	D	307	-	-	3/4/4/4	-
4	EDO	A	305	-	-	0/1/1/1	-
4	EDO	D	303	-	-	0/1/1/1	-
3	EM5	D	302	2	-	1/18/26/26	0/2/2/2
4	EDO	D	304	-	-	0/1/1/1	-
4	EDO	D	308	-	-	1/1/1/1	-
4	EDO	B	304	-	-	1/1/1/1	-
4	EDO	D	305	-	-	1/1/1/1	-
5	PEG	A	304	-	-	1/4/4/4	-
3	EM5	C	302	2	-	2/18/26/26	0/2/2/2
4	EDO	A	303	-	-	1/1/1/1	-

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	302	EM5	O3-S1	-4.71	1.35	1.43
4	B	306	EDO	O1-C1	4.12	1.63	1.42
3	C	302	EM5	C12-N14	-3.51	1.26	1.33
3	C	302	EM5	O13-C12	3.47	1.30	1.23
3	A	302[A]	EM5	C12-N14	-3.04	1.27	1.33
3	C	302	EM5	C7-C8	2.93	1.44	1.39
3	A	302[A]	EM5	O13-C12	2.84	1.29	1.23
3	A	302[B]	EM5	C12-N14	-2.53	1.28	1.33
3	A	302[B]	EM5	O13-C12	2.48	1.28	1.23
3	D	302	EM5	C10-C9	-2.48	1.35	1.39
4	B	306	EDO	C2-C1	2.38	1.64	1.48
4	B	303	EDO	O1-C1	2.27	1.53	1.42
3	D	302	EM5	C8-N18	2.19	1.42	1.37
3	B	302[B]	EM5	O13-C12	2.18	1.27	1.23
3	A	302[A]	EM5	C10-C2	-2.15	1.36	1.39
3	D	302	EM5	C12-N14	-2.09	1.29	1.33
3	C	302	EM5	C15-N14	2.02	1.50	1.46

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	302	EM5	C16-C15-N14	4.51	121.79	111.64
4	B	306	EDO	O1-C1-C2	4.41	143.63	111.91
3	C	302	EM5	C2-C6-CL1	-4.33	118.32	121.49
5	A	304	PEG	O2-C2-C1	4.20	128.50	110.07
3	C	302	EM5	C7-C6-C2	3.59	125.00	121.38
5	A	304	PEG	O1-C1-C2	3.43	131.72	111.81
3	D	302	EM5	C23-C19-N18	-3.25	105.54	110.60
3	B	302[B]	EM5	O17-C16-C15	-3.22	99.82	111.59
4	D	308	EDO	O2-C2-C1	3.19	134.83	111.91
3	C	302	EM5	O3-S1-O4	-2.95	113.91	118.76
3	D	302	EM5	C10-C2-S1	2.93	121.84	118.34
3	C	302	EM5	C10-C2-C6	-2.77	115.32	118.27
3	B	302[B]	EM5	C10-C2-S1	2.73	121.61	118.34
5	D	307	PEG	O2-C3-C4	2.67	121.80	110.07
3	C	302	EM5	O13-C12-N14	-2.67	117.29	122.61
5	D	307	PEG	O1-C1-C2	-2.67	96.34	111.81
3	C	302	EM5	C24-C23-C19	-2.61	106.20	111.11
3	B	302[A]	EM5	C10-C2-S1	2.59	121.44	118.34
4	A	305	EDO	O2-C2-C1	2.50	129.91	111.91
3	C	302	EM5	C8-N18-C19	2.47	128.92	124.69
3	A	302[B]	EM5	C15-N14-C12	2.46	127.69	122.08
3	C	302	EM5	C15-N14-C12	2.45	127.67	122.08

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	302[B]	EM5	C7-C6-CL1	-2.42	114.58	118.49
3	C	302	EM5	O4-S1-N5	2.37	110.88	107.36
3	A	302[B]	EM5	C24-C23-C19	2.35	115.54	111.11
3	B	302[A]	EM5	O4-S1-N5	2.34	110.83	107.36
3	B	302[A]	EM5	C7-C6-CL1	-2.32	114.75	118.49
3	B	302[B]	EM5	C8-N18-C19	-2.27	120.78	124.69
3	C	302	EM5	C8-C7-C6	-2.25	116.45	120.05
4	A	305	EDO	O1-C1-C2	-2.21	95.98	111.91
3	B	302[A]	EM5	C16-C15-N14	-2.19	106.71	111.64
3	B	302[B]	EM5	C23-C19-N18	-2.16	107.24	110.60
3	C	302	EM5	C9-C12-N14	2.16	121.59	117.36
3	A	302[B]	EM5	O4-S1-N5	2.15	110.55	107.36
3	B	302[B]	EM5	O4-S1-N5	2.12	110.51	107.36
3	C	302	EM5	C21-C20-C19	-2.11	107.13	111.11
3	B	302[B]	EM5	C7-C6-C2	2.10	123.50	121.38
3	A	302[A]	EM5	O13-C12-N14	-2.09	118.44	122.61
3	C	302	EM5	C20-C19-N18	-2.08	107.35	110.60
3	B	302[A]	EM5	C7-C6-C2	2.06	123.46	121.38
3	A	302[B]	EM5	O13-C12-N14	-2.04	118.53	122.61
3	C	302	EM5	C10-C2-S1	2.03	120.77	118.34
3	A	302[B]	EM5	C8-N18-C19	-2.01	121.23	124.69
3	A	302[A]	EM5	O3-S1-C2	-2.01	104.35	107.29

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	303	EDO	O1-C1-C2-O2
3	C	302	EM5	C16-C15-N14-C12
4	B	306	EDO	O1-C1-C2-O2
4	D	305	EDO	O1-C1-C2-O2
5	A	304	PEG	O2-C3-C4-O4
4	D	306	EDO	O1-C1-C2-O2
4	B	303	EDO	O1-C1-C2-O2
5	D	307	PEG	C4-C3-O2-C2
5	D	307	PEG	O1-C1-C2-O2
4	D	308	EDO	O1-C1-C2-O2
5	D	307	PEG	C1-C2-O2-C3
4	B	304	EDO	O1-C1-C2-O2
3	D	302	EM5	C6-C2-S1-N5
3	B	302[B]	EM5	C6-C2-S1-N5
3	B	302[A]	EM5	C6-C2-S1-N5

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Mol	Chain	Res	Type	Atoms
3	A	302[A]	EM5	C6-C2-S1-N5
3	A	302[B]	EM5	C6-C2-S1-N5
3	C	302	EM5	C10-C2-S1-N5

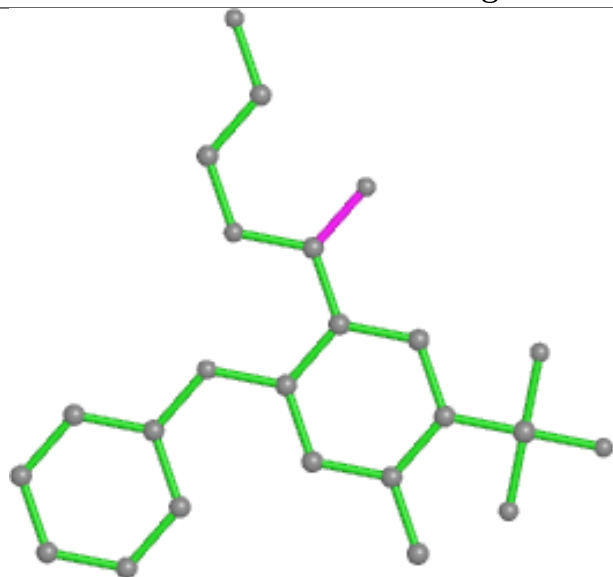
There are no ring outliers.

7 monomers are involved in 18 short contacts:

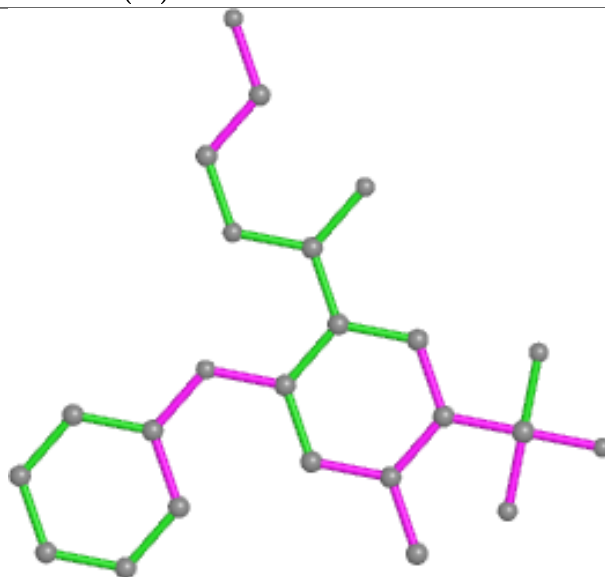
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	305	EDO	3	0
4	B	303	EDO	2	0
4	B	306	EDO	2	0
3	A	302[A]	EM5	1	0
4	D	303	EDO	4	0
4	D	308	EDO	5	0
5	A	304	PEG	1	0

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

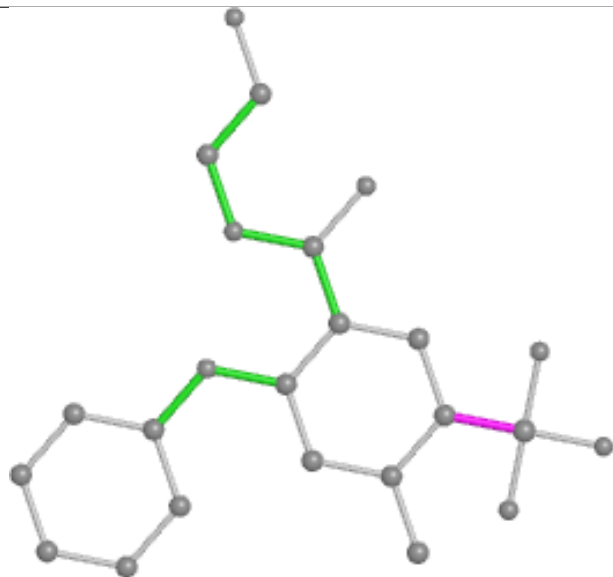
## Ligand EM5 B 302 (B)



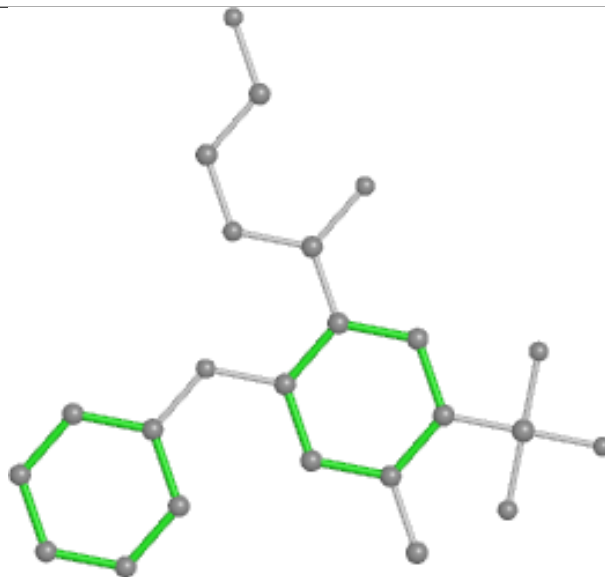
Bond lengths



Bond angles

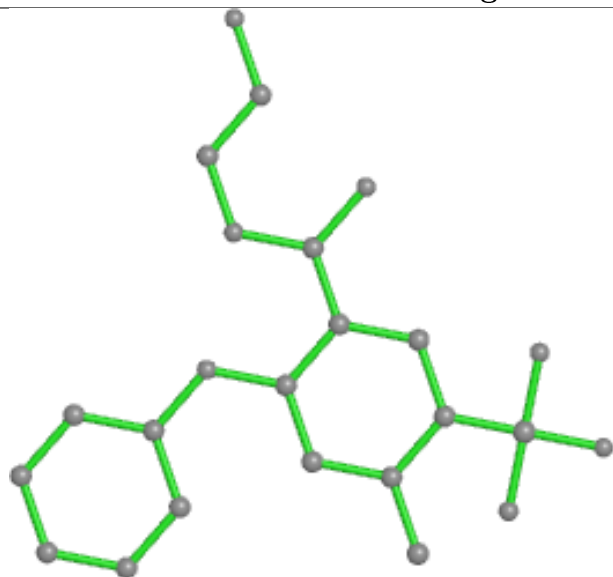


Torsions

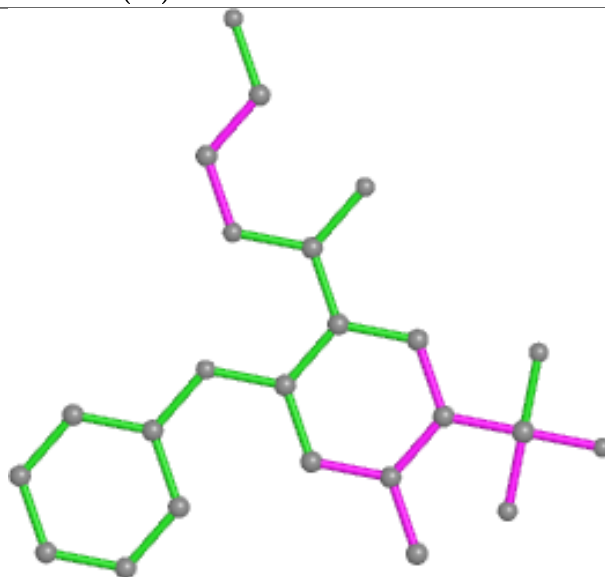


Rings

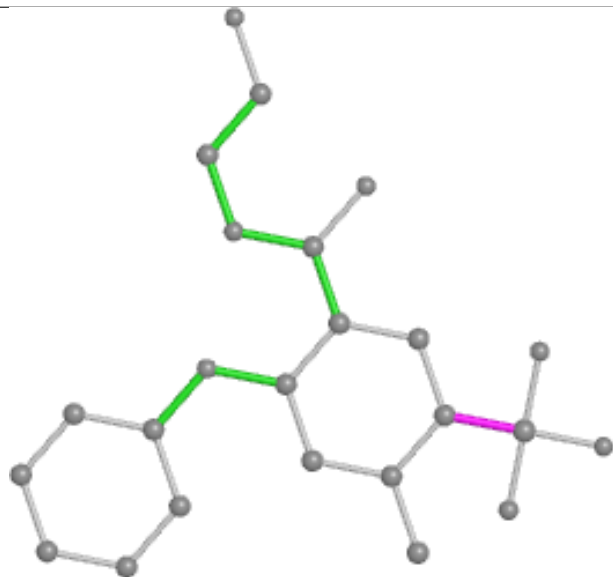
## Ligand EM5 B 302 (A)



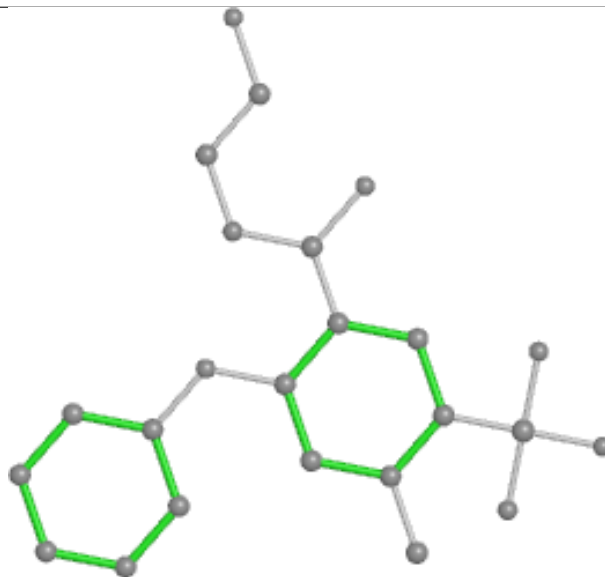
Bond lengths



Bond angles

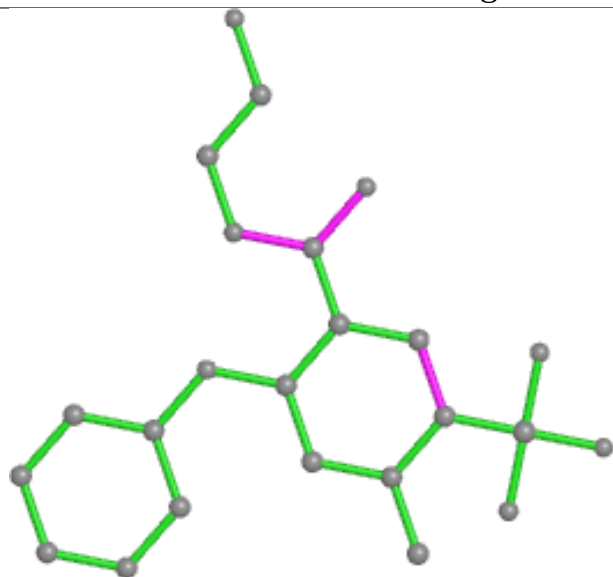


Torsions

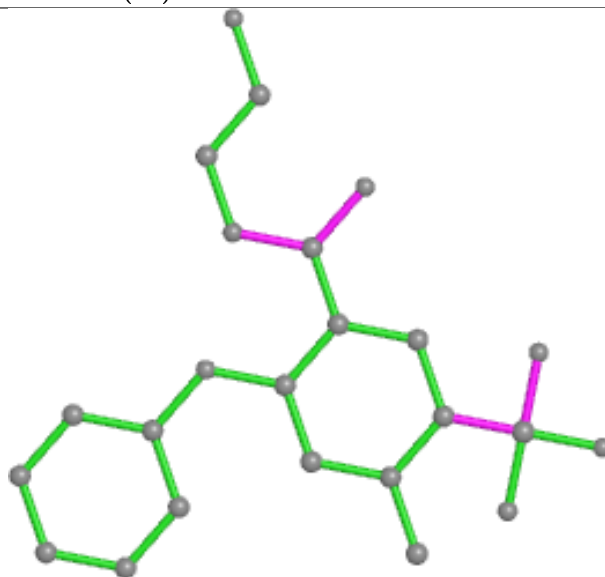


Rings

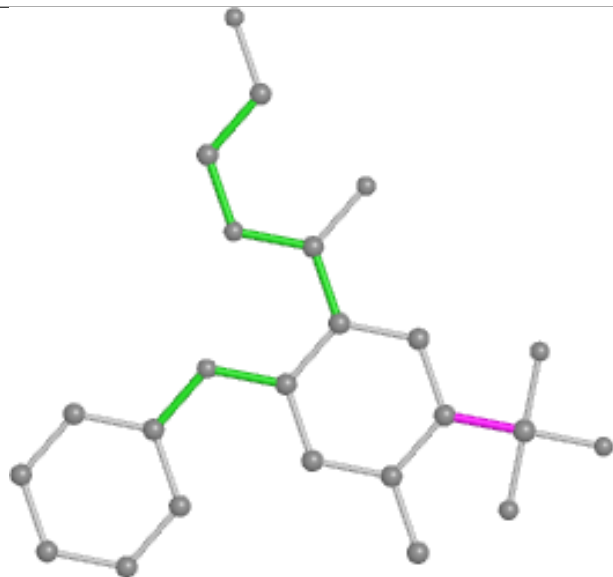
## Ligand EM5 A 302 (A)



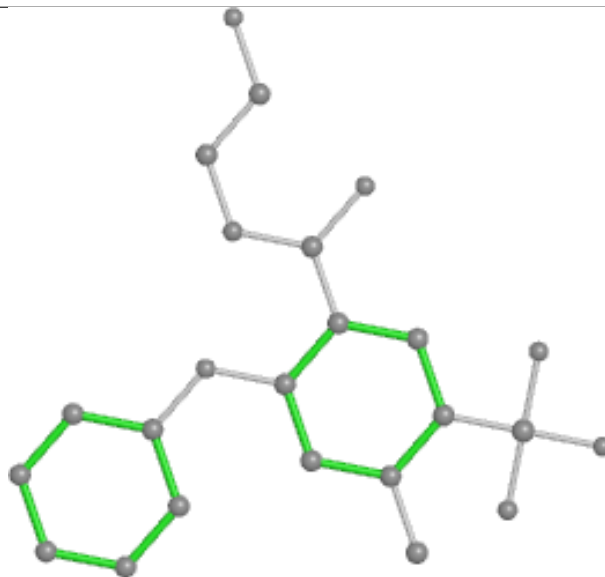
Bond lengths



Bond angles

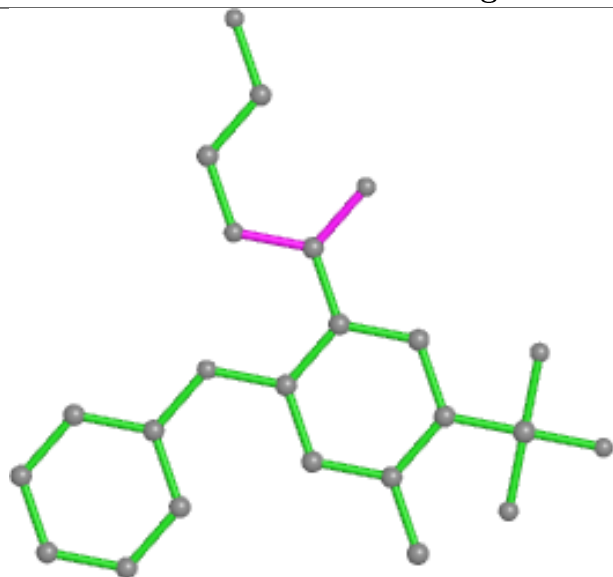


Torsions

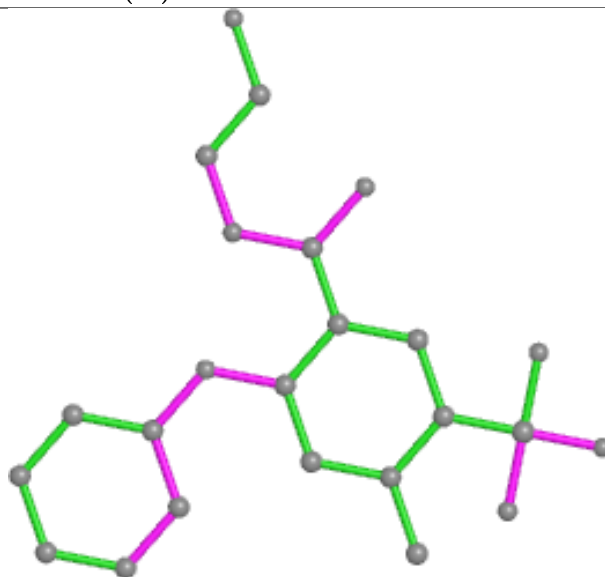


Rings

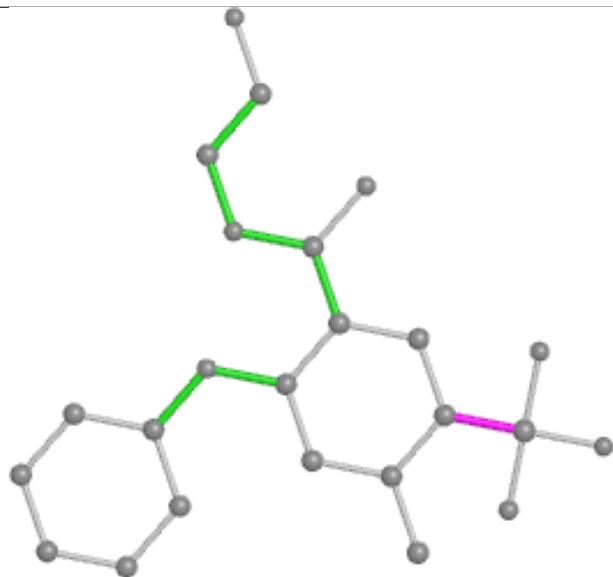
## Ligand EM5 A 302 (B)



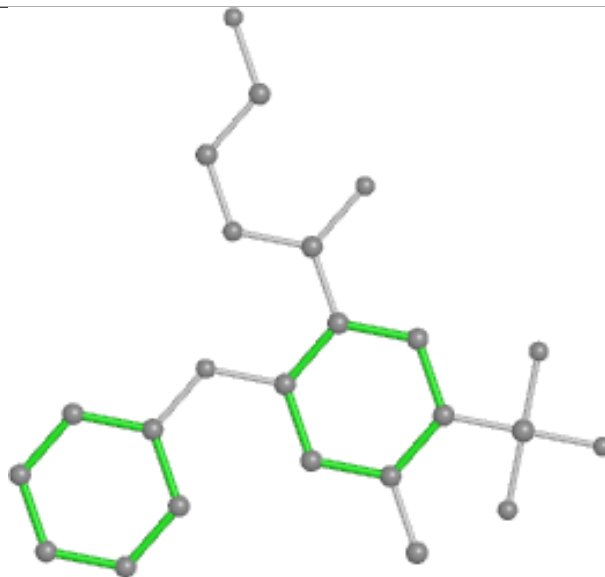
Bond lengths



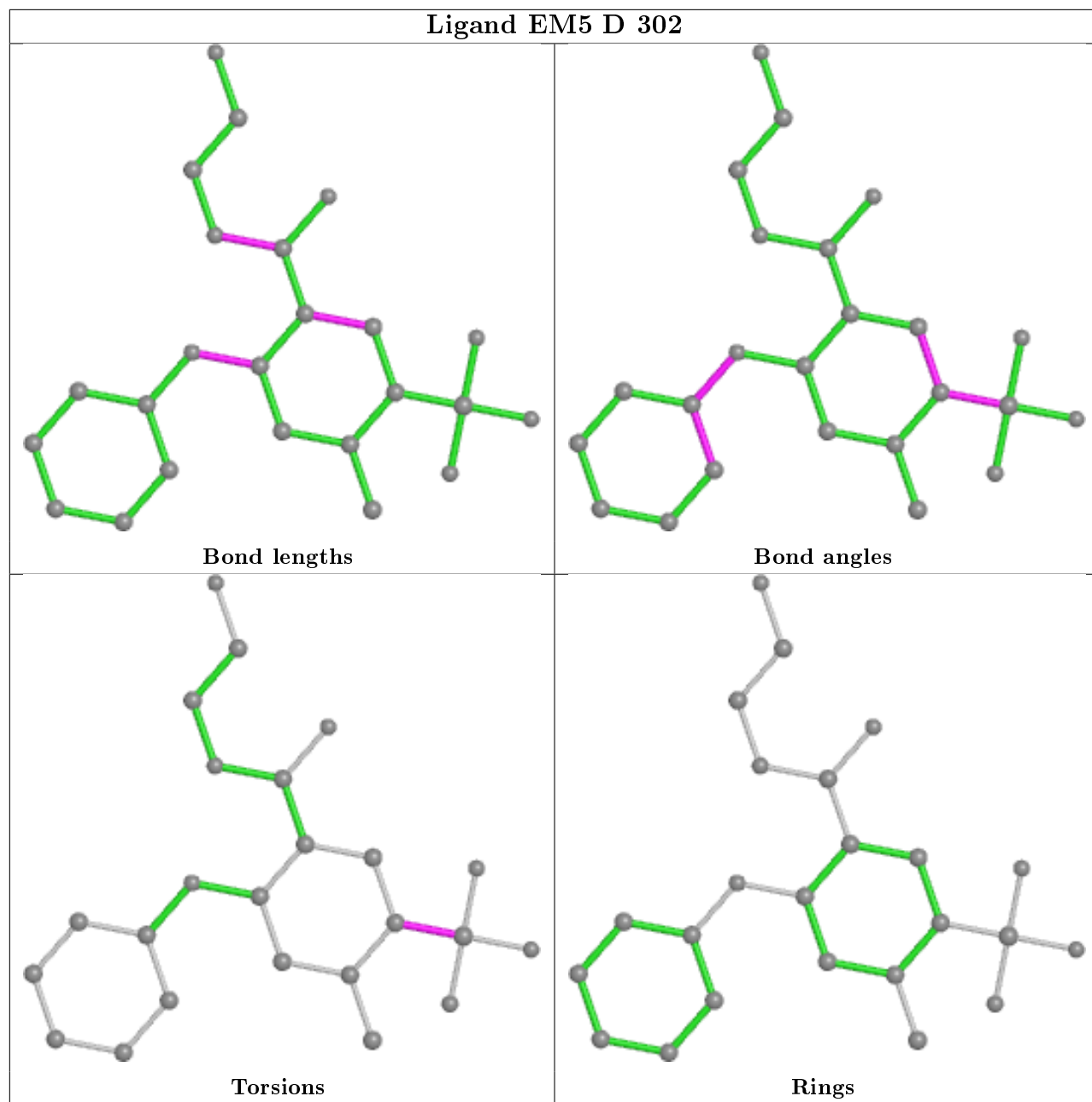
Bond angles

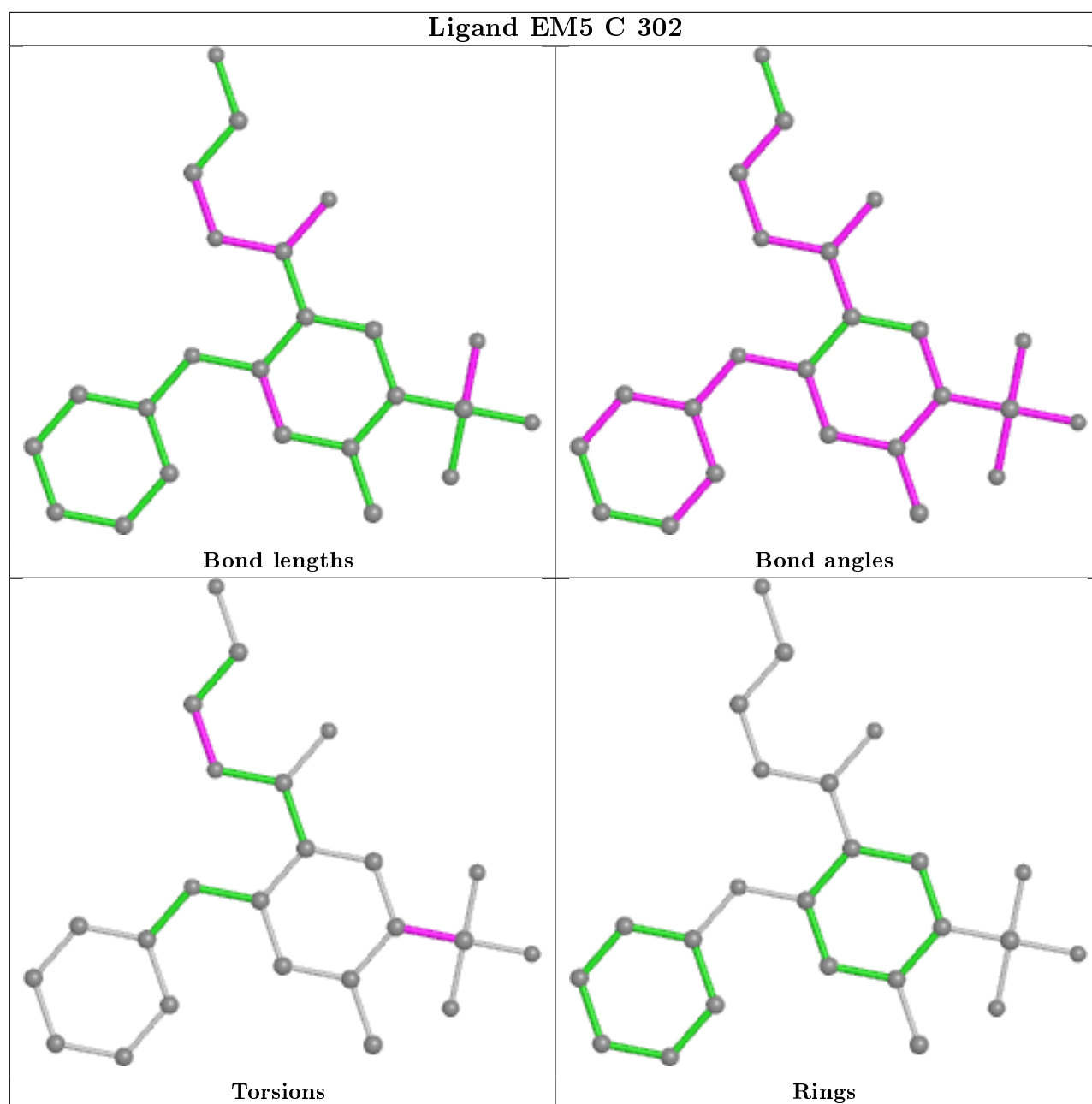


Torsions



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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	261/263 (99%)	-0.27	2 (0%) 86 85	9, 16, 33, 61	0
1	B	261/263 (99%)	-0.21	3 (1%) 80 78	8, 14, 28, 58	0
1	C	261/263 (99%)	0.04	8 (3%) 49 46	10, 21, 41, 70	0
1	D	261/263 (99%)	-0.30	4 (1%) 73 71	9, 16, 31, 66	0
All	All	1044/1052 (99%)	-0.18	17 (1%) 72 69	8, 17, 34, 70	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	252	PHE	9.2
1	B	253	ASP	4.4
1	C	55	ALA	4.3
1	D	252	PHE	3.7
1	D	253	ASP	3.4
1	B	263	GLN	3.2
1	A	263	GLN	3.2
1	C	262	SER	2.4
1	C	8	GLY	2.4
1	C	7	PHE	2.4
1	C	3	LYS	2.4
1	C	165	VAL	2.3
1	D	237	PRO	2.2
1	A	82	GLN	2.2
1	C	58	GLN	2.2
1	C	230	TYR	2.1
1	D	254	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 carbohydrates in this entry.

## 6.4 Ligands ⓘ

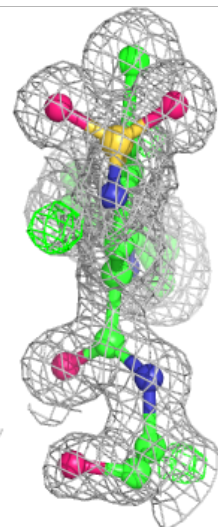
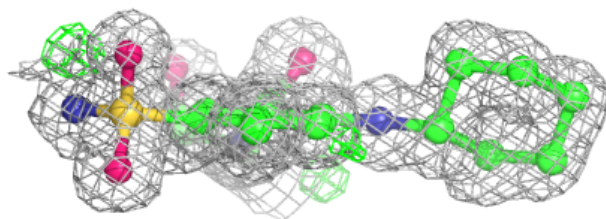
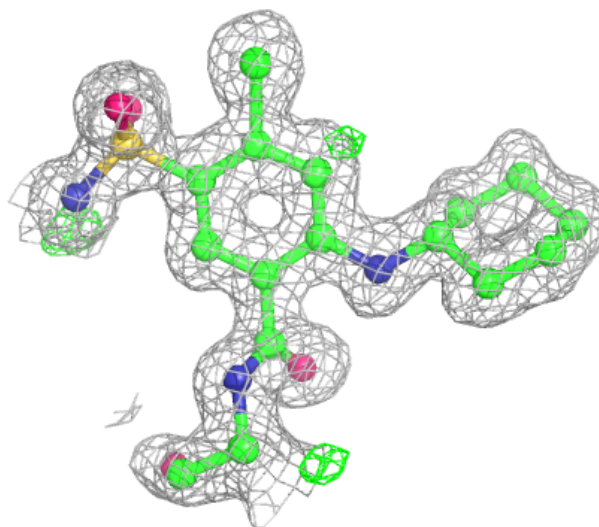
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	EDO	D	304	4/4	0.86	0.22	21,26,37,37	0
4	EDO	D	306	4/4	0.88	0.18	31,44,44,64	0
4	EDO	C	303	4/4	0.92	0.09	20,25,32,37	0
4	EDO	B	305	4/4	0.92	0.12	21,28,30,62	0
4	EDO	D	308	4/4	0.92	0.18	26,28,31,34	0
5	PEG	A	304	7/7	0.92	0.22	27,41,75,76	0
4	EDO	D	303	4/4	0.93	0.13	18,22,37,58	0
4	EDO	D	305	4/4	0.94	0.09	25,37,42,58	0
4	EDO	B	303	4/4	0.94	0.29	22,23,31,51	0
4	EDO	A	305	4/4	0.94	0.14	22,25,29,42	0
4	EDO	B	304	4/4	0.94	0.16	22,49,50,68	0
5	PEG	D	307	7/7	0.94	0.23	27,48,59,63	0
4	EDO	A	303	4/4	0.95	0.09	45,49,57,62	0
4	EDO	B	306	4/4	0.96	0.15	24,25,26,40	0
3	EM5	B	302[A]	24/24	0.99	0.07	8,12,18,23	24
3	EM5	A	302[A]	24/24	0.99	0.07	9,12,20,29	24
3	EM5	A	302[B]	24/24	0.99	0.07	9,15,24,30	24
3	EM5	C	302	24/24	0.99	0.07	12,17,29,47	0
3	EM5	D	302	24/24	0.99	0.07	9,13,22,34	0
3	EM5	B	302[B]	24/24	0.99	0.07	7,13,21,27	24
2	ZN	C	301	1/1	1.00	0.04	13,13,13,13	0
2	ZN	A	301	1/1	1.00	0.06	9,9,9,9	0
2	ZN	B	301	1/1	1.00	0.06	7,7,7,7	0
2	ZN	D	301	1/1	1.00	0.05	9,9,9,9	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.

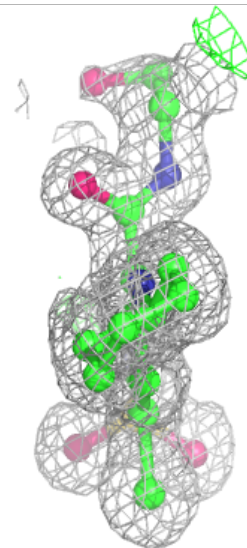
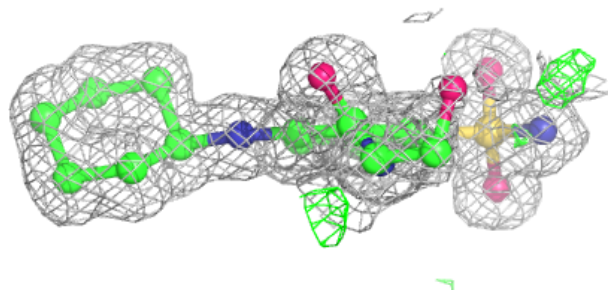
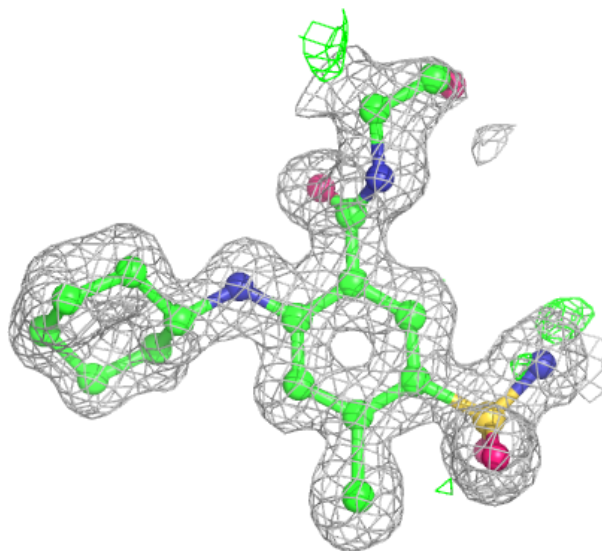
**Electron density around EM5 B 302 (A):**

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



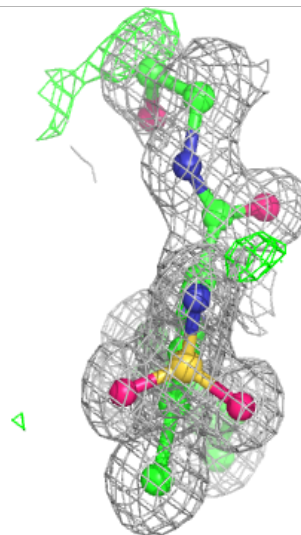
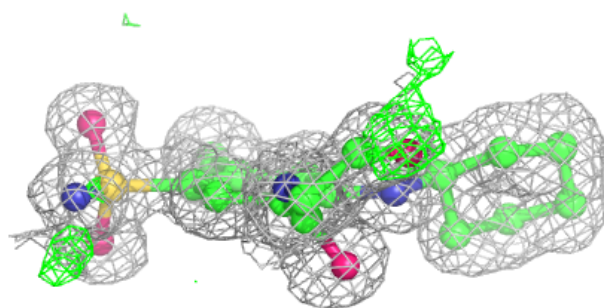
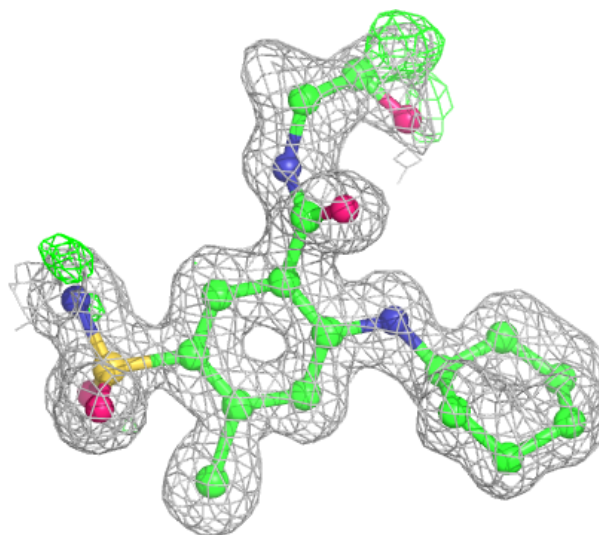
**Electron density around EM5 A 302 (A):**

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



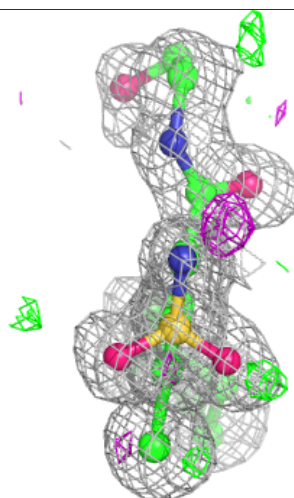
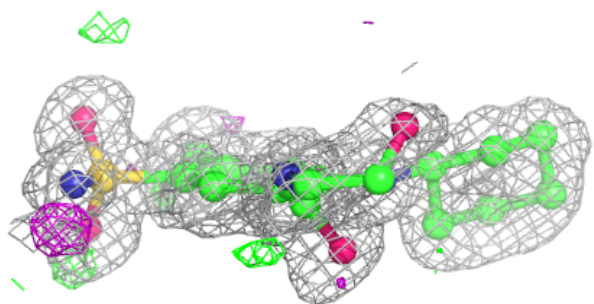
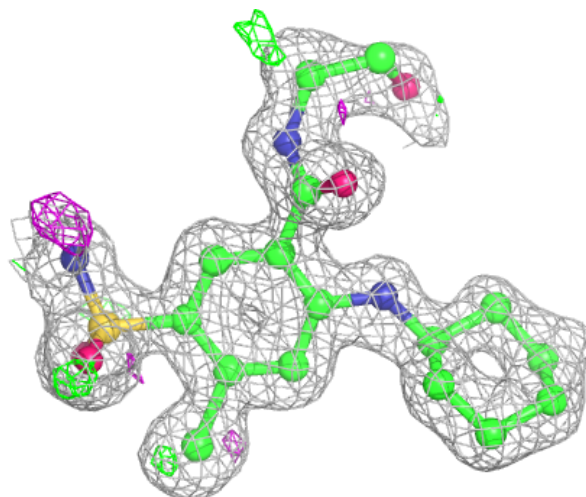
**Electron density around EM5 A 302 (B):**

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



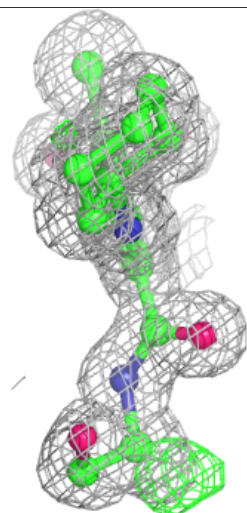
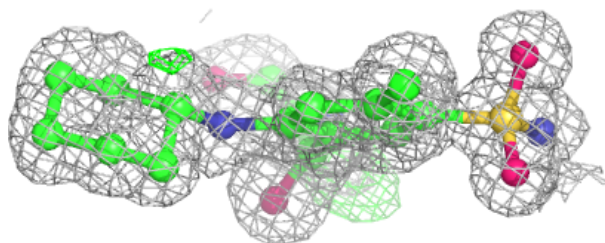
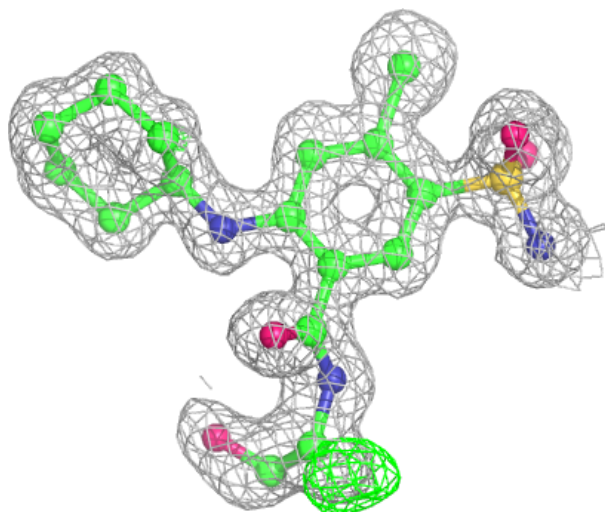
**Electron density around EM5 C 302:**

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



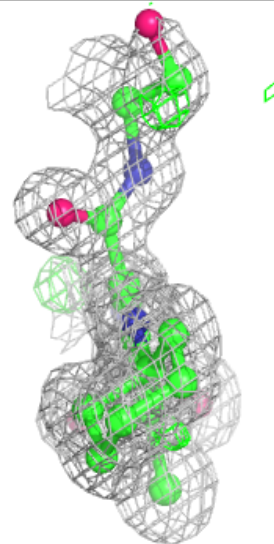
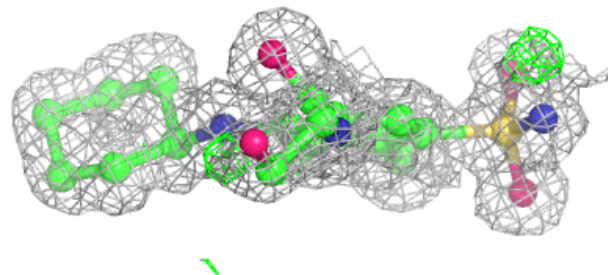
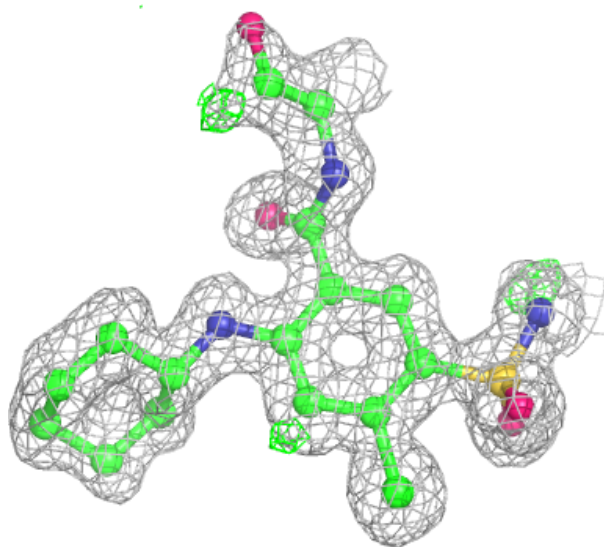
**Electron density around EM5 D 302:**

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



**Electron density around EM5 B 302 (B):**

$2mF_o-DF_c$  (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.