Full wwPDB X-ray Structure Validation Report ⓘ

Nov 14, 2023 – 12:22 PM JST

PDB ID	:	5Z9O
Title	:	The crystal structure of Cyclopropane-fatty-acyl-phospholipid synthase from Lactobacillus acidophilus
Authors	:	Pan, C.L.; Ma, Y.L.; Wang, Q.H.
Deposited on	:	2018-02-04
Resolution	:	2.70 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:

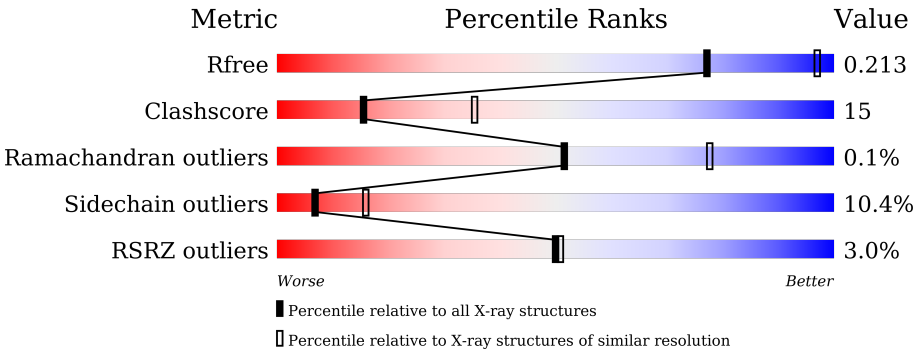
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 2.70 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	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	399	3% 70% 18% 5% • 7%
1	B	399	3% 73% 15% 5% 7%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	CO3	B	401	-	-	X	-

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6376 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.

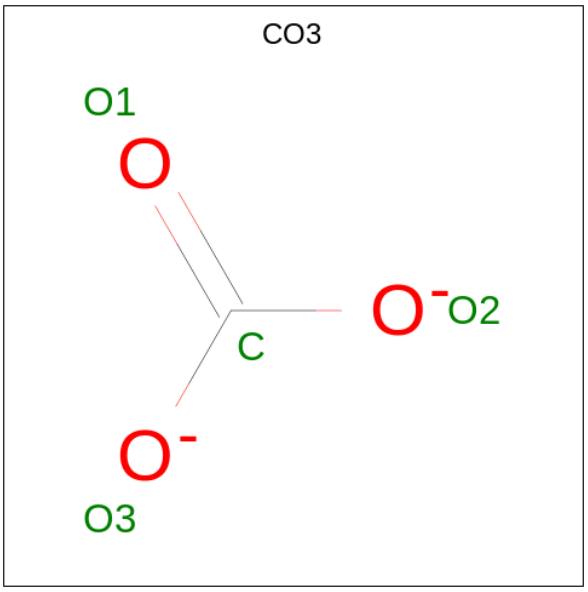
- Molecule 1 is a protein called Cyclopropane-fatty-acyl-phospholipid synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	373	Total	C	N	O	S	0	0	0
			3009	1922	496	574	17			
1	B	372	Total	C	N	O	S	0	0	0
			3003	1922	494	570	17			

There are 12 discrepancies between the modelled and reference sequences:

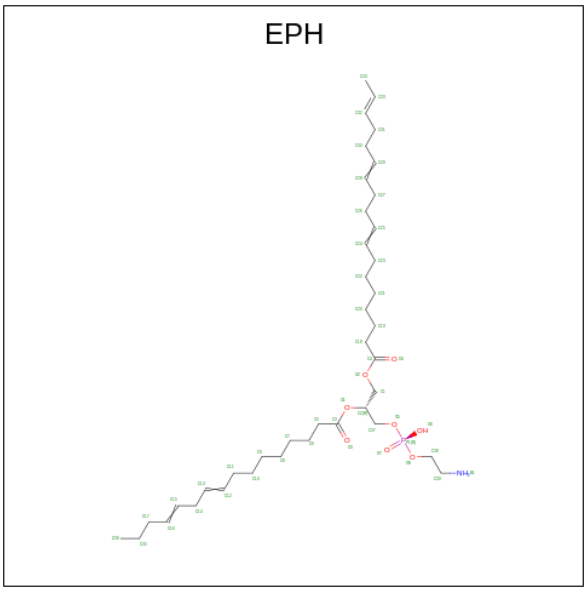
Chain	Residue	Modelled	Actual	Comment	Reference
A	394	HIS	-	expression tag	UNP Q5FJM0
A	395	HIS	-	expression tag	UNP Q5FJM0
A	396	HIS	-	expression tag	UNP Q5FJM0
A	397	HIS	-	expression tag	UNP Q5FJM0
A	398	HIS	-	expression tag	UNP Q5FJM0
A	399	HIS	-	expression tag	UNP Q5FJM0
B	394	HIS	-	expression tag	UNP Q5FJM0
B	395	HIS	-	expression tag	UNP Q5FJM0
B	396	HIS	-	expression tag	UNP Q5FJM0
B	397	HIS	-	expression tag	UNP Q5FJM0
B	398	HIS	-	expression tag	UNP Q5FJM0
B	399	HIS	-	expression tag	UNP Q5FJM0

- Molecule 2 is CARBONATE ION (three-letter code: CO3) (formula: CO_3).



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

- Molecule 3 is L-ALPHA-PHOSPHATIDYL-BETA-OLEOYL-GAMMA-PALMITOYL-PHOSPHATIDYLETHANOLAMINE (three-letter code: EPH) (formula: $C_{39}H_{68}NO_8P$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O P 47 38 8 1	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	B	1	Total	C	O	P	0	0
			47	38	8	1		

- Molecule 4 is water.

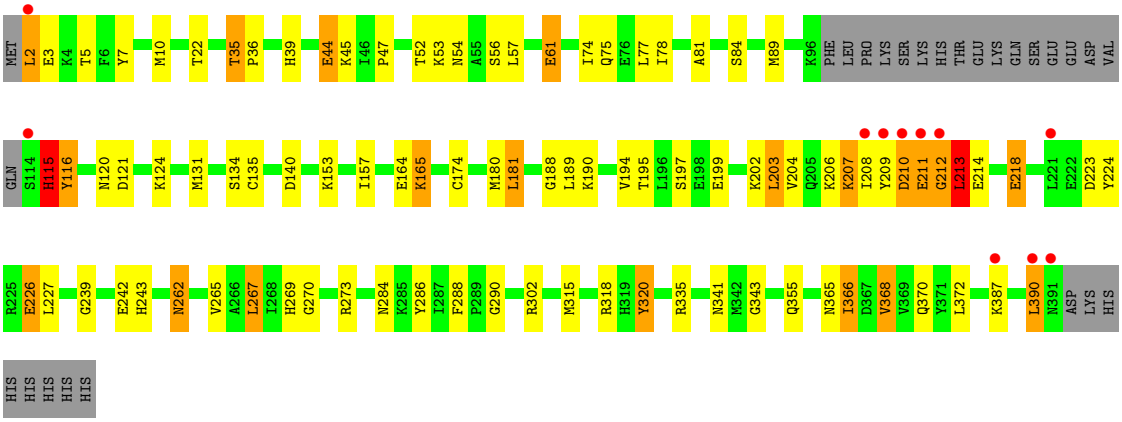
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	140	Total	O	0	0
			140	140		
4	B	122	Total	O	0	0
			122	122		

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.

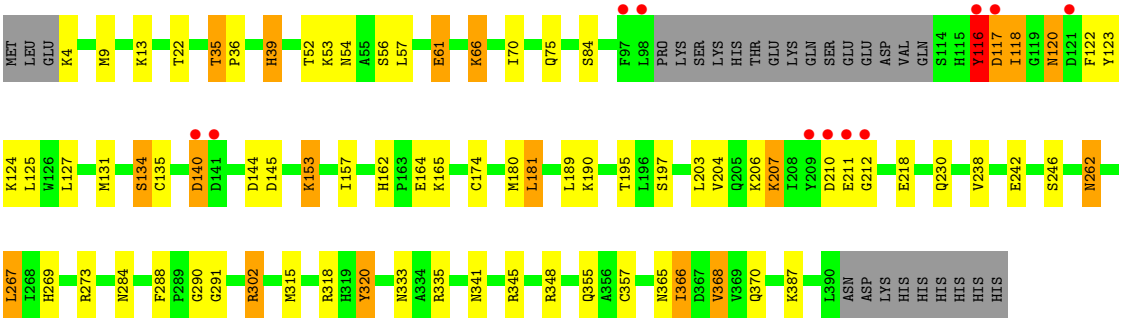
• Molecule 1: Cyclopropane-fatty-acyl-phospholipid synthase

Chain A:



• Molecule 1: Cyclopropane-fatty-acyl-phospholipid synthase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α, β, γ	120.98Å 120.98Å 163.49Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.11 – 2.70 44.11 – 2.70	Depositor EDS
% Data completeness (in resolution range)	99.9 (44.11-2.70) 99.9 (44.11-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	6.61 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.8.0189	Depositor
R, R_{free}	0.175 , 0.213 0.176 , 0.213	Depositor DCC
R_{free} test set	1852 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	44.0	Xtriage
Anisotropy	0.091	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 36.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.036 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	6376	wwPDB-VP
Average B, all atoms (Å^2)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.34% 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: CO3, EPH

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	0.65	0/3076	0.93	10/4149 (0.2%)
1	B	0.68	1/3071 (0.0%)	0.88	9/4142 (0.2%)
All	All	0.67	1/6147 (0.0%)	0.91	19/8291 (0.2%)

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
1	B	0	2
All	All	0	3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	116	TYR	C-N	-9.08	1.13	1.34

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	212	GLY	N-CA-C	-16.62	71.55	113.10
1	A	211	GLU	N-CA-C	-13.77	73.83	111.00
1	B	116	TYR	O-C-N	-13.31	101.41	122.70
1	A	211	GLU	CB-CA-C	10.24	130.88	110.40
1	B	117	ASP	N-CA-CB	-9.12	94.19	110.60
1	B	116	TYR	CA-C-N	8.41	135.70	117.20
1	A	115	HIS	CB-CA-C	6.84	124.08	110.40
1	A	213	LEU	N-CA-C	-6.60	93.17	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	267	LEU	CA-CB-CG	-6.29	100.84	115.30
1	A	267	LEU	CA-CB-CG	-5.93	101.66	115.30
1	A	368	VAL	CB-CA-C	-5.89	100.21	111.40
1	B	118	ILE	CB-CA-C	-5.87	99.86	111.60
1	B	302	ARG	NE-CZ-NH1	5.86	123.23	120.30
1	A	302	ARG	NE-CZ-NH1	5.70	123.15	120.30
1	B	212	GLY	N-CA-C	-5.65	98.97	113.10
1	B	368	VAL	CB-CA-C	-5.59	100.78	111.40
1	A	116	TYR	CB-CA-C	-5.47	99.46	110.40
1	A	390	LEU	CA-CB-CG	5.18	127.21	115.30
1	B	117	ASP	CB-CA-C	5.14	120.69	110.40

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	203	LEU	Peptide
1	B	116	TYR	Mainchain
1	B	203	LEU	Peptide

5.2 Too-close contacts (i)

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	3009	0	2944	104	0
1	B	3003	0	2940	72	0
2	A	4	0	0	1	0
2	B	4	0	0	2	0
3	A	47	0	61	7	0
3	B	47	0	61	9	0
4	A	140	0	0	40	0
4	B	122	0	0	28	0
All	All	6376	0	6006	179	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 15.

All (179) 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:212:GLY:HA3	1:A:214:GLU:OE2	1.17	1.29
1:A:212:GLY:CA	1:A:214:GLU:OE2	1.88	1.19
1:A:390:LEU:HB2	4:A:627:HOH:O	1.43	1.18
1:A:211:GLU:OE1	4:A:501:HOH:O	1.65	1.13
1:B:267:LEU:HD23	4:B:548:HOH:O	1.52	1.07
1:B:207:LYS:HB3	4:B:523:HOH:O	1.60	0.99
1:B:127:LEU:HG	4:B:511:HOH:O	1.63	0.97
1:B:162:HIS:HD2	4:B:551:HOH:O	1.48	0.97
1:A:115:HIS:CE1	4:A:537:HOH:O	2.15	0.97
1:A:115:HIS:HE1	4:A:537:HOH:O	1.50	0.94
1:B:116:TYR:O	1:B:117:ASP:C	2.12	0.85
1:B:269:HIS:HD2	1:B:370:GLN:HE21	1.23	0.84
1:A:269:HIS:HD2	1:A:370:GLN:HE21	1.25	0.84
1:B:13:LYS:HE3	4:B:585:HOH:O	1.78	0.83
1:B:66:LYS:HE3	4:B:558:HOH:O	1.80	0.82
2:B:401:CO3:C	4:B:506:HOH:O	2.26	0.82
1:A:10:MET:SD	4:A:638:HOH:O	2.37	0.81
1:B:333:ASN:HB2	4:B:614:HOH:O	1.80	0.81
1:A:54:ASN:HD22	1:A:57:LEU:H	1.28	0.80
1:A:2:LEU:HD11	1:A:7:TYR:HE1	1.46	0.80
1:A:239:GLY:HA2	4:A:502:HOH:O	1.81	0.80
1:A:2:LEU:CG	1:A:3:GLU:H	1.96	0.79
1:A:77:LEU:HD23	4:A:514:HOH:O	1.82	0.79
2:A:401:CO3:O1	4:A:502:HOH:O	2.01	0.79
1:A:206:LYS:O	1:A:210:ASP:HB2	1.82	0.79
1:B:54:ASN:HD22	1:B:57:LEU:H	1.28	0.79
1:A:2:LEU:HG	1:A:3:GLU:H	1.48	0.78
1:B:118:ILE:HB	4:B:510:HOH:O	1.83	0.77
1:A:2:LEU:HD12	4:A:539:HOH:O	1.85	0.74
1:A:210:ASP:HB3	1:A:213:LEU:HD22	1.70	0.74
1:A:2:LEU:N	1:A:45:LYS:HZ3	1.85	0.74
1:A:2:LEU:HD22	1:A:45:LYS:HD2	1.69	0.72
1:A:116:TYR:CD2	1:A:116:TYR:O	2.42	0.72
1:B:269:HIS:CD2	1:B:370:GLN:HE21	2.08	0.71
1:A:269:HIS:CD2	1:A:370:GLN:HE21	2.09	0.70
1:A:227:LEU:HG	4:A:503:HOH:O	1.91	0.70
1:A:207:LYS:O	1:A:211:GLU:O	2.09	0.70
1:B:123:TYR:HA	4:B:507:HOH:O	1.93	0.69
1:A:2:LEU:HD23	1:A:3:GLU:N	2.07	0.69
1:A:227:LEU:HD12	4:A:505:HOH:O	1.91	0.69
1:A:226:GLU:OE1	4:A:504:HOH:O	2.11	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:284:ASN:HD21	1:A:290:GLY:H	1.41	0.68
1:A:284:ASN:ND2	1:A:290:GLY:H	1.91	0.68
1:B:284:ASN:ND2	1:B:290:GLY:H	1.90	0.68
1:A:223:ASP:O	4:A:503:HOH:O	2.11	0.68
1:B:262:ASN:HB3	4:B:590:HOH:O	1.94	0.68
1:B:54:ASN:HD21	1:B:56:SER:HB2	1.58	0.68
1:B:269:HIS:HB2	4:B:548:HOH:O	1.92	0.67
1:A:116:TYR:CE2	4:A:537:HOH:O	2.47	0.66
1:B:284:ASN:HD21	1:B:290:GLY:H	1.42	0.66
1:A:54:ASN:HD21	1:A:56:SER:HB2	1.59	0.66
1:A:224:TYR:CE2	4:A:532:HOH:O	2.48	0.66
1:A:204:VAL:HA	1:A:207:LYS:HZ2	1.62	0.65
1:B:366:ILE:HD13	3:B:402:EPH:H2	1.79	0.65
1:A:224:TYR:HE2	4:A:532:HOH:O	1.80	0.64
1:A:262:ASN:HB3	4:A:584:HOH:O	1.98	0.64
1:A:343:GLY:HA3	4:A:574:HOH:O	1.98	0.64
1:B:116:TYR:OH	1:B:345:ARG:NH1	2.27	0.64
1:A:265:VAL:HG11	4:A:507:HOH:O	1.97	0.63
1:B:134:SER:HB2	4:B:506:HOH:O	1.98	0.63
1:B:273:ARG:NH1	1:B:365:ASN:ND2	2.47	0.63
1:A:174:CYS:HB2	1:A:180:MET:HE2	1.82	0.61
1:A:2:LEU:CD2	1:A:3:GLU:H	2.13	0.61
1:B:122:PHE:CD2	4:B:507:HOH:O	2.51	0.61
1:A:242:GLU:CB	3:A:402:EPH:H312	2.30	0.60
1:A:273:ARG:NH1	1:A:365:ASN:ND2	2.49	0.60
1:B:174:CYS:HB2	1:B:180:MET:HE2	1.85	0.59
1:B:273:ARG:HH12	1:B:365:ASN:ND2	2.01	0.59
1:A:2:LEU:HD23	1:A:3:GLU:H	1.69	0.58
1:A:318:ARG:HG3	4:A:526:HOH:O	2.03	0.58
1:A:22:THR:OG1	1:A:39:HIS:HE1	1.87	0.58
1:B:269:HIS:HD2	1:B:370:GLN:NE2	2.00	0.58
1:B:140:ASP:OD2	4:B:501:HOH:O	2.17	0.58
1:B:122:PHE:HE2	4:B:565:HOH:O	1.87	0.57
1:A:78:ILE:HD13	4:A:630:HOH:O	2.04	0.57
1:A:89:MET:HG3	4:A:508:HOH:O	2.03	0.57
1:B:22:THR:OG1	1:B:39:HIS:HE1	1.87	0.57
1:A:273:ARG:HH12	1:A:365:ASN:ND2	2.01	0.56
1:B:320:TYR:OH	3:B:402:EPH:H261	2.05	0.56
1:B:57:LEU:O	1:B:61:GLU:HG2	2.05	0.56
1:B:242:GLU:CB	3:B:402:EPH:H312	2.36	0.56
1:B:207:LYS:H	1:B:207:LYS:NZ	2.04	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:GLU:HB2	3:A:402:EPH:H312	1.88	0.56
1:A:2:LEU:HB3	1:A:45:LYS:NZ	2.21	0.55
1:A:124:LYS:HA	1:A:131:MET:CE	2.36	0.55
1:B:66:LYS:HD2	4:B:558:HOH:O	2.05	0.55
1:A:57:LEU:O	1:A:61:GLU:HG2	2.07	0.55
1:A:366:ILE:HD13	3:A:402:EPH:H2	1.88	0.55
1:B:124:LYS:HA	1:B:131:MET:CE	2.36	0.54
1:A:270:GLY:HA2	4:A:502:HOH:O	2.07	0.54
1:A:2:LEU:CG	1:A:3:GLU:N	2.69	0.54
1:A:204:VAL:HA	1:A:207:LYS:NZ	2.23	0.54
1:A:81:ALA:HB2	4:A:514:HOH:O	2.07	0.53
1:B:54:ASN:ND2	1:B:56:SER:HB2	2.24	0.53
1:B:122:PHE:HB3	4:B:510:HOH:O	2.09	0.53
1:B:75:GLN:H	1:B:355:GLN:NE2	2.07	0.53
1:A:211:GLU:O	1:A:213:LEU:N	2.42	0.52
1:A:211:GLU:CB	1:A:213:LEU:HD13	2.39	0.52
1:A:75:GLN:H	1:A:355:GLN:NE2	2.07	0.52
1:B:144:ASP:HB2	4:B:582:HOH:O	2.08	0.52
1:A:135:CYS:HB2	1:A:320:TYR:CE2	2.45	0.51
1:A:269:HIS:HD2	1:A:370:GLN:NE2	2.02	0.51
1:B:267:LEU:CD2	4:B:548:HOH:O	2.30	0.51
1:A:224:TYR:O	4:A:505:HOH:O	2.19	0.51
1:B:135:CYS:HB2	1:B:320:TYR:CE2	2.45	0.51
1:A:212:GLY:C	1:A:214:GLU:H	2.11	0.50
1:A:54:ASN:ND2	1:A:56:SER:HB2	2.25	0.50
1:A:194:VAL:HG21	1:A:227:LEU:HD11	1.94	0.50
1:B:206:LYS:O	1:B:210:ASP:HB2	2.10	0.50
1:A:212:GLY:CA	1:A:214:GLU:CD	2.73	0.50
1:B:206:LYS:O	1:B:210:ASP:CB	2.59	0.50
1:B:318:ARG:HG3	4:B:535:HOH:O	2.12	0.49
1:B:207:LYS:H	1:B:207:LYS:HZ2	1.61	0.49
1:A:47:PRO:HA	4:A:539:HOH:O	2.13	0.49
1:B:123:TYR:CE1	4:B:565:HOH:O	2.65	0.49
1:A:22:THR:OG1	1:A:39:HIS:CE1	2.66	0.48
1:A:157:ILE:HG23	1:A:267:LEU:HD22	1.95	0.48
1:B:134:SER:CB	4:B:506:HOH:O	2.60	0.48
1:A:75:GLN:H	1:A:355:GLN:HE21	1.62	0.48
1:A:227:LEU:CD1	4:A:505:HOH:O	2.58	0.48
1:A:44:GLU:HG2	4:A:619:HOH:O	2.13	0.47
1:A:203:LEU:O	1:A:207:LYS:NZ	2.33	0.47
1:A:208:ILE:HD12	4:A:610:HOH:O	2.13	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:242:GLU:HB3	3:A:402:EPH:H312	1.96	0.47
1:B:135:CYS:HB2	1:B:320:TYR:CD2	2.49	0.47
1:A:288:PHE:CD2	3:A:402:EPH:H32	2.49	0.47
1:A:2:LEU:HD11	1:A:7:TYR:CE1	2.37	0.47
1:A:211:GLU:HB3	1:A:213:LEU:HD13	1.97	0.47
1:B:22:THR:OG1	1:B:39:HIS:CE1	2.66	0.47
1:B:157:ILE:HG23	1:B:267:LEU:HD22	1.97	0.46
1:B:75:GLN:H	1:B:355:GLN:HE21	1.61	0.46
1:B:288:PHE:CD2	3:B:402:EPH:H32	2.51	0.46
1:B:348:ARG:NE	4:B:502:HOH:O	2.21	0.46
1:A:211:GLU:C	1:A:213:LEU:N	2.64	0.46
1:A:214:GLU:HB2	4:A:546:HOH:O	2.16	0.46
1:A:204:VAL:HG13	4:A:610:HOH:O	2.15	0.46
1:A:61:GLU:OE1	1:A:286:TYR:OH	2.25	0.46
1:B:153:LYS:HZ1	1:B:238:VAL:HG11	1.81	0.46
1:A:135:CYS:HB2	1:A:320:TYR:CD2	2.51	0.46
1:A:2:LEU:CD1	4:A:539:HOH:O	2.55	0.45
1:A:74:ILE:HG12	4:A:585:HOH:O	2.17	0.45
1:A:3:GLU:CG	1:A:5:THR:HB	2.48	0.44
1:B:122:PHE:CE2	4:B:565:HOH:O	2.57	0.44
1:B:124:LYS:HA	1:B:131:MET:HE1	1.99	0.44
1:B:357:CYS:SG	3:B:402:EPH:H202	2.58	0.44
1:A:121:ASP:HB2	4:A:618:HOH:O	2.18	0.44
1:B:162:HIS:CD2	4:B:551:HOH:O	2.38	0.44
3:A:402:EPH:H271	4:A:522:HOH:O	2.19	0.43
1:A:3:GLU:HG3	1:A:5:THR:HB	2.00	0.43
1:B:125:LEU:HB2	4:B:505:HOH:O	2.18	0.43
1:A:212:GLY:C	1:A:214:GLU:N	2.69	0.43
1:B:35:THR:HA	1:B:36:PRO:HD3	1.91	0.43
1:A:78:ILE:CD1	4:A:630:HOH:O	2.66	0.43
1:A:199:GLU:H	1:A:199:GLU:CD	2.21	0.43
1:A:218:GLU:HG2	4:A:570:HOH:O	2.19	0.43
1:A:372:LEU:HD11	4:A:507:HOH:O	2.18	0.43
1:A:35:THR:HA	1:A:36:PRO:HD3	1.93	0.42
1:B:242:GLU:HB2	3:B:402:EPH:H312	1.99	0.42
1:B:123:TYR:HA	4:B:511:HOH:O	2.19	0.42
1:B:204:VAL:HA	1:B:207:LYS:NZ	2.35	0.42
1:B:181:LEU:HD11	1:B:207:LYS:HE3	2.00	0.42
1:A:116:TYR:CD1	1:A:116:TYR:N	2.79	0.42
1:B:302:ARG:HD3	1:B:302:ARG:HA	1.88	0.42
1:A:181:LEU:HD11	1:A:207:LYS:HE2	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:165:LYS:HD3	1:A:188:GLY:HA3	2.00	0.42
1:B:269:HIS:HE1	2:B:401:CO3:O2	2.03	0.41
1:A:284:ASN:ND2	1:A:290:GLY:N	2.65	0.41
1:B:273:ARG:HG3	1:B:365:ASN:O	2.21	0.41
1:A:124:LYS:HA	1:A:131:MET:HE1	2.00	0.41
1:A:243:HIS:CE1	3:A:402:EPH:H301	2.56	0.41
1:A:355:GLN:NE2	4:A:516:HOH:O	2.53	0.41
1:B:120:ASN:O	1:B:124:LYS:HB2	2.21	0.41
1:B:291:GLY:HA3	3:B:402:EPH:H342	2.03	0.41
1:B:204:VAL:HA	1:B:207:LYS:HZ2	1.86	0.40
1:A:227:LEU:CG	4:A:505:HOH:O	2.69	0.40
1:A:2:LEU:HB3	1:A:45:LYS:HZ2	1.86	0.40
1:A:213:LEU:HD12	1:A:213:LEU:HA	2.01	0.40
1:B:70:ILE:HD11	3:B:402:EPH:H16	2.04	0.40
1:B:242:GLU:HB3	3:B:402:EPH:H312	2.03	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	369/399 (92%)	358 (97%)	11 (3%)	0	100 100
1	B	368/399 (92%)	353 (96%)	14 (4%)	1 (0%)	41 66
All	All	737/798 (92%)	711 (96%)	25 (3%)	1 (0%)	51 78

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	145	ASP

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	324/350 (93%)	290 (90%)	34 (10%)	7	16
1	B	323/350 (92%)	290 (90%)	33 (10%)	7	17
All	All	647/700 (92%)	580 (90%)	67 (10%)	7	16

All (67) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	LEU
1	A	35	THR
1	A	44	GLU
1	A	52	THR
1	A	53	LYS
1	A	61	GLU
1	A	84	SER
1	A	115	HIS
1	A	120	ASN
1	A	134	SER
1	A	140	ASP
1	A	153	LYS
1	A	164	GLU
1	A	165	LYS
1	A	181	LEU
1	A	189	LEU
1	A	190	LYS
1	A	195	THR
1	A	197	SER
1	A	202	LYS
1	A	207	LYS
1	A	209	TYR
1	A	210	ASP
1	A	213	LEU
1	A	218	GLU
1	A	226	GLU
1	A	262	ASN

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Mol	Chain	Res	Type
1	A	315	MET
1	A	320	TYR
1	A	335	ARG
1	A	341	ASN
1	A	366	ILE
1	A	368	VAL
1	A	387	LYS
1	B	4	LYS
1	B	9	MET
1	B	35	THR
1	B	39	HIS
1	B	52	THR
1	B	53	LYS
1	B	61	GLU
1	B	66	LYS
1	B	84	SER
1	B	120	ASN
1	B	134	SER
1	B	140	ASP
1	B	153	LYS
1	B	164	GLU
1	B	165	LYS
1	B	181	LEU
1	B	189	LEU
1	B	190	LYS
1	B	195	THR
1	B	197	SER
1	B	207	LYS
1	B	211	GLU
1	B	218	GLU
1	B	230	GLN
1	B	246	SER
1	B	262	ASN
1	B	315	MET
1	B	320	TYR
1	B	335	ARG
1	B	341	ASN
1	B	366	ILE
1	B	368	VAL
1	B	387	LYS

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	39	HIS
1	A	54	ASN
1	A	269	HIS
1	A	284	ASN
1	A	355	GLN
1	A	365	ASN
1	B	39	HIS
1	B	54	ASN
1	B	230	GLN
1	B	269	HIS
1	B	284	ASN
1	B	355	GLN
1	B	365	ASN

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

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	$\#\|Z\| > 2$
3	EPH	A	402	-	46,46,48	1.08	4 (8%)	49,51,53	1.35	7 (14%)
2	CO3	B	401	-	2,3,3	1.35	0	2,3,3	0.30	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	CO3	A	401	-	2,3,3	1.44	0	2,3,3	1.33	0
3	EPH	B	402	-	46,46,48	1.05	3 (6%)	49,51,53	1.20	4 (8%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EPH	A	402	-	-	20/50/50/52	-
3	EPH	B	402	-	-	23/50/50/52	-

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	EPH	O2-C4	4.52	1.46	1.33
3	B	402	EPH	O1-C3	4.17	1.46	1.34
3	B	402	EPH	O2-C4	4.13	1.45	1.33
3	A	402	EPH	O1-C3	3.59	1.44	1.34
3	A	402	EPH	O1-C2	-2.45	1.40	1.46
3	A	402	EPH	P1-O8	2.11	1.66	1.59
3	B	402	EPH	P1-O8	2.05	1.66	1.59

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	402	EPH	O2-C1-C2	-3.63	97.87	108.43
3	A	402	EPH	O2-C4-C18	3.59	123.17	111.91
3	B	402	EPH	O2-C4-C18	3.47	122.81	111.91
3	A	402	EPH	O5-P1-O7	-2.97	97.48	109.07
3	B	402	EPH	O2-C4-O4	-2.89	116.29	123.59
3	B	402	EPH	O5-P1-O7	-2.80	98.11	109.07
3	A	402	EPH	O2-C4-O4	-2.76	116.61	123.59
3	A	402	EPH	O1-C3-C5	2.45	116.78	111.50
3	B	402	EPH	O1-C3-C5	2.35	116.56	111.50
3	A	402	EPH	P1-O8-C38	2.30	134.75	121.97
3	A	402	EPH	O1-C3-O3	-2.17	118.47	123.70

There are no chirality outliers.

All (43) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	EPH	C29-C30-C31-C32
3	A	402	EPH	C38-O8-P1-O6
3	B	402	EPH	C29-C30-C31-C32
3	B	402	EPH	C16-C17-C35-C36
3	B	402	EPH	C38-O8-P1-O6
3	A	402	EPH	C18-C4-O2-C1
3	B	402	EPH	C5-C6-C7-C8
3	B	402	EPH	C18-C19-C20-C21
3	A	402	EPH	O2-C1-C2-C37
3	A	402	EPH	O4-C4-O2-C1
3	A	402	EPH	C5-C6-C7-C8
3	A	402	EPH	C18-C19-C20-C21
3	A	402	EPH	C5-C3-O1-C2
3	A	402	EPH	O3-C3-O1-C2
3	B	402	EPH	C5-C3-O1-C2
3	B	402	EPH	C18-C4-O2-C1
3	B	402	EPH	C9-C10-C11-C12
3	A	402	EPH	C16-C17-C35-C36
3	B	402	EPH	O2-C1-C2-C37
3	B	402	EPH	O1-C2-C37-O5
3	A	402	EPH	C9-C10-C11-C12
3	B	402	EPH	O4-C4-O2-C1
3	A	402	EPH	C20-C21-C22-C23
3	A	402	EPH	C6-C7-C8-C9
3	B	402	EPH	O3-C3-O1-C2
3	A	402	EPH	O2-C1-C2-O1
3	B	402	EPH	C20-C21-C22-C23
3	A	402	EPH	C2-C37-O5-P1
3	A	402	EPH	C26-C27-C28-C29
3	B	402	EPH	C2-C37-O5-P1
3	A	402	EPH	C10-C11-C12-C13
3	B	402	EPH	O2-C1-C2-O1
3	B	402	EPH	C10-C11-C12-C13
3	B	402	EPH	C1-C2-C37-O5
3	B	402	EPH	C25-C26-C27-C28
3	B	402	EPH	C22-C23-C24-C25
3	A	402	EPH	C22-C23-C24-C25
3	B	402	EPH	C38-O8-P1-O5
3	B	402	EPH	C30-C31-C32-C33
3	B	402	EPH	C11-C10-C9-C8
3	B	402	EPH	C15-C16-C17-C35
3	A	402	EPH	C30-C31-C32-C33
3	A	402	EPH	O1-C3-C5-C6

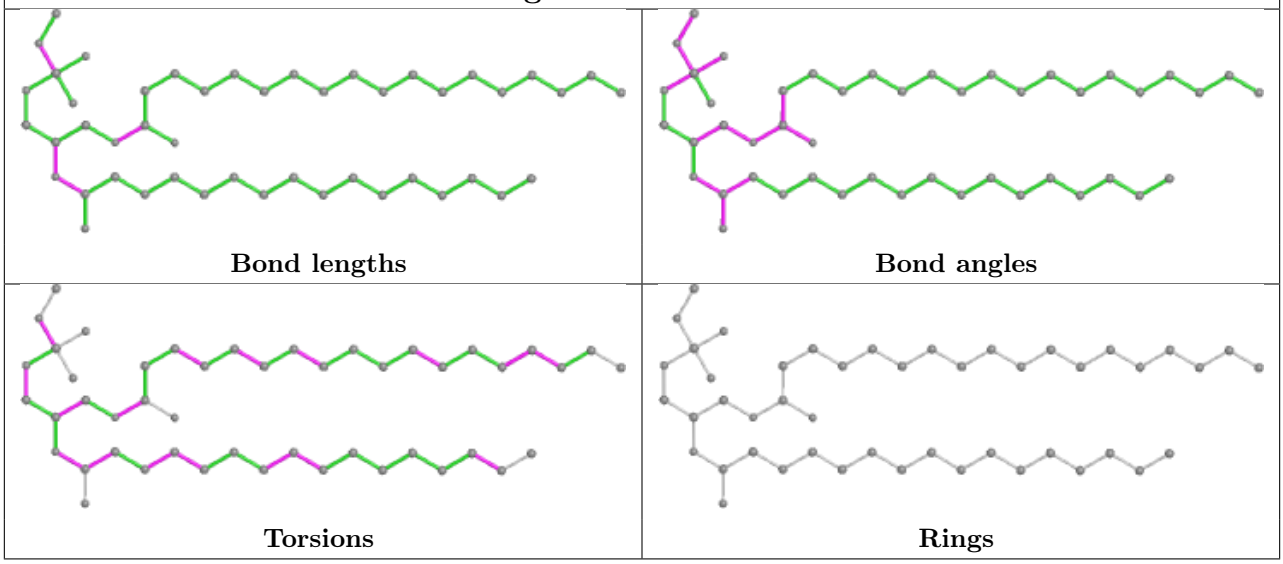
There are no ring outliers.

4 monomers are involved in 19 short contacts:

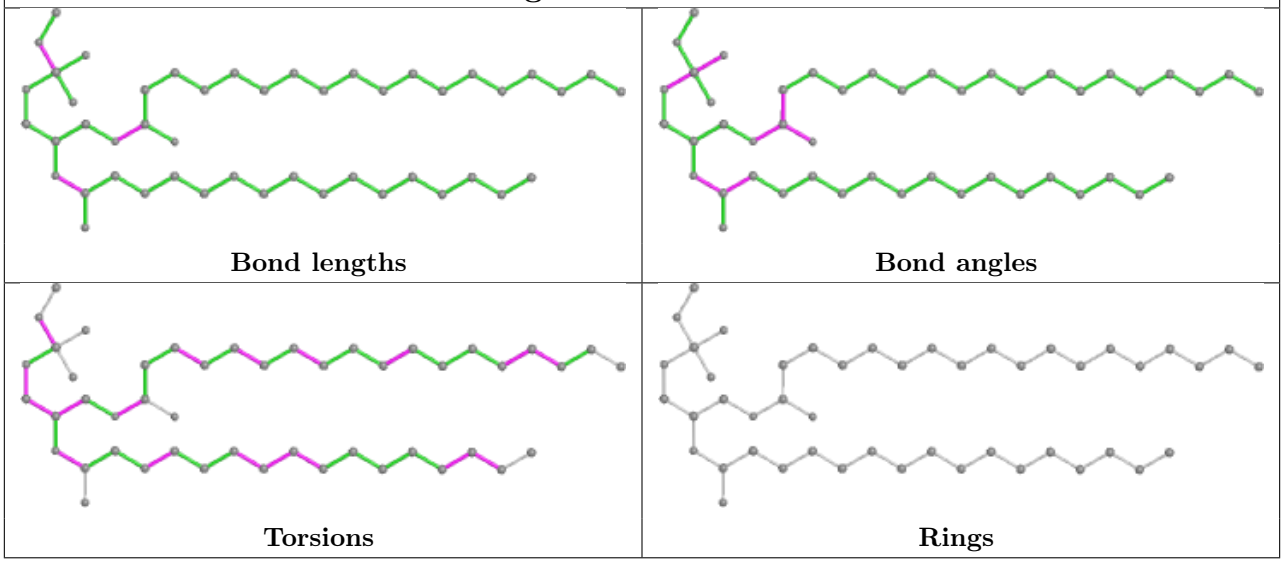
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	402	EPH	7	0
2	B	401	CO3	2	0
2	A	401	CO3	1	0
3	B	402	EPH	9	0

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 EPH A 402



Ligand EPH B 402



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	116:TYR	C	117:ASP	N	1.13

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	373/399 (93%)	-0.13	11 (2%) 51 52	26, 42, 87, 137	0
1	B	372/399 (93%)	-0.16	11 (2%) 50 51	24, 43, 84, 118	0
All	All	745/798 (93%)	-0.15	22 (2%) 50 51	24, 42, 86, 137	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2	LEU	6.6
1	A	391	ASN	5.5
1	A	212	GLY	4.8
1	A	209	TYR	4.7
1	B	210	ASP	4.4
1	B	97	PHE	4.0
1	A	211	GLU	3.8
1	B	212	GLY	3.3
1	A	390	LEU	3.1
1	A	210	ASP	3.0
1	B	209	TYR	2.8
1	B	98	LEU	2.7
1	B	116	TYR	2.4
1	A	114	SER	2.4
1	A	387	LYS	2.4
1	B	211	GLU	2.2
1	A	208	ILE	2.2
1	B	121	ASP	2.2
1	B	117	ASP	2.1
1	B	141	ASP	2.1
1	B	140	ASP	2.0
1	A	221	LEU	2.0

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)

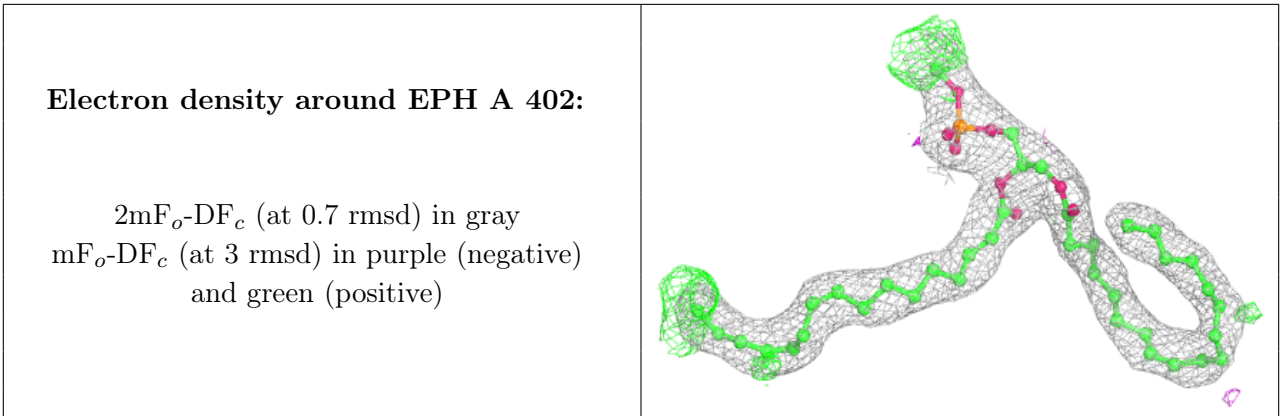
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

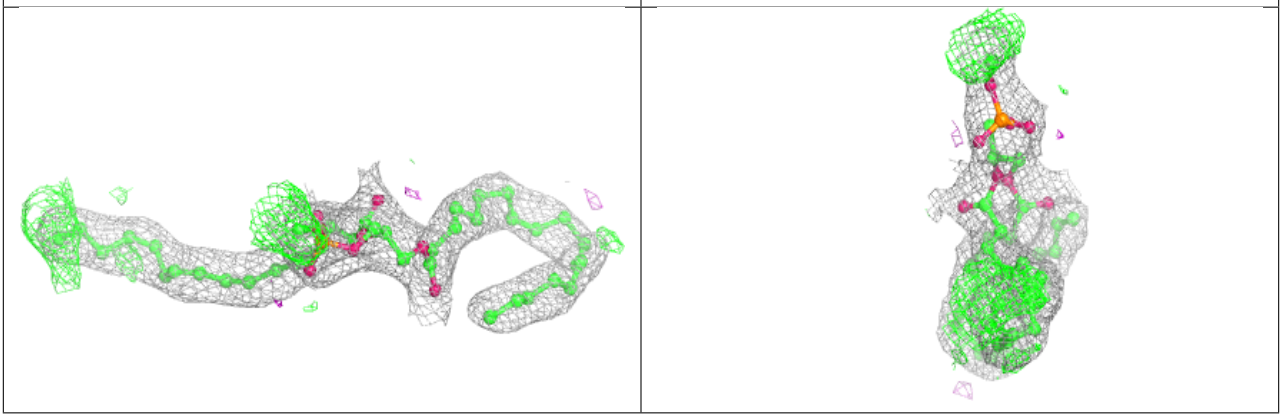
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	EPH	A	402	47/49	0.96	0.18	34,41,51,60	0
3	EPH	B	402	47/49	0.96	0.17	37,47,58,66	0
2	CO3	A	401	4/4	0.98	0.16	32,35,38,39	0
2	CO3	B	401	4/4	0.99	0.14	33,33,34,40	0

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 EPH A 402:

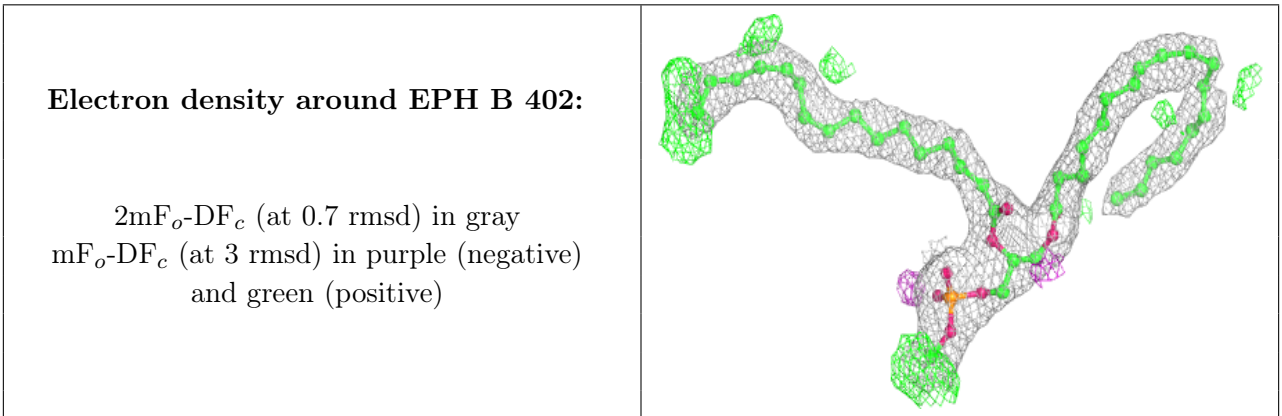
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

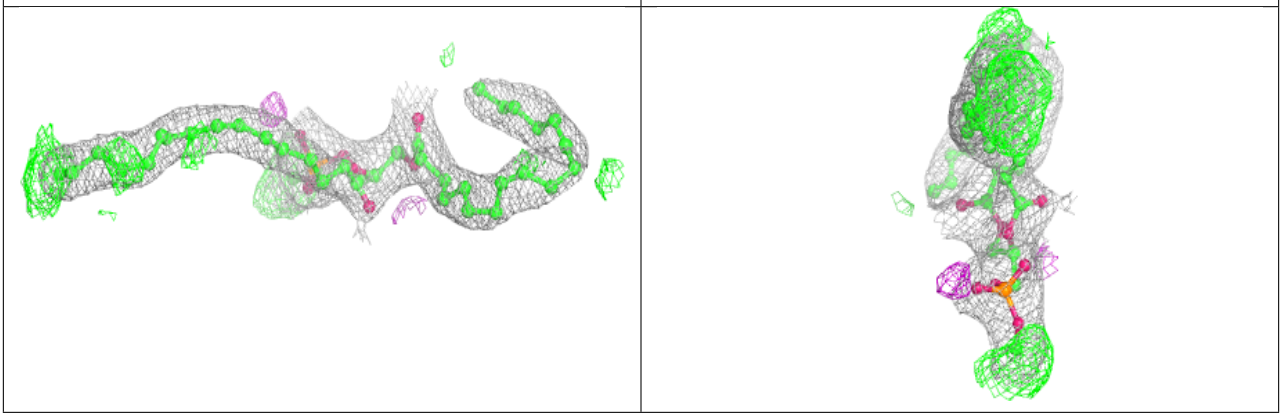




Electron density around EPH B 402:

$2mF_o$-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.