



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 01:44 AM UTC

PDB ID : 6UJW / pdb\_00006ujw  
Title : P-glycoprotein mutant-Y306A and C952A-with BDE100  
Authors : Aller, S.G.; Le, C.A.  
Deposited on : 2019-10-03  
Resolution : 4.15 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

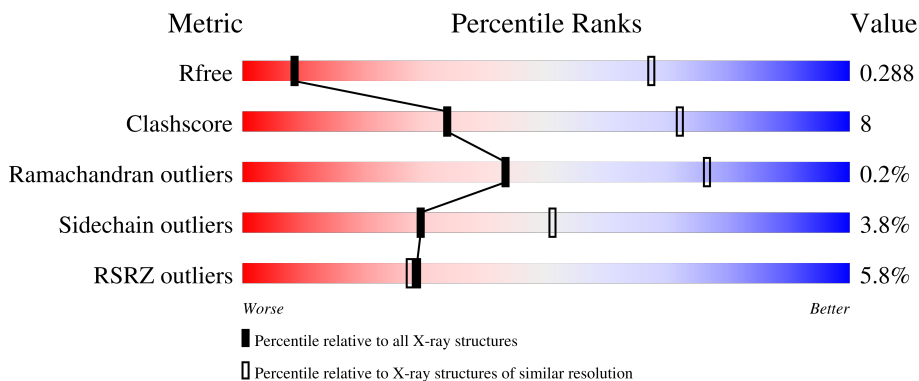
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 4.15 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))
$R_{free}$	180053	1077 (4.50-3.82)
Clashscore	190562	1019 (4.48-3.84)
Ramachandran outliers	187476	1035 (4.50-3.82)
Sidechain outliers	187428	1022 (4.50-3.82)
RSRZ outliers	180081	1074 (4.50-3.82)

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  $\geq 3$ , 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	1282	 5% 73% 18% 8%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 9192 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.

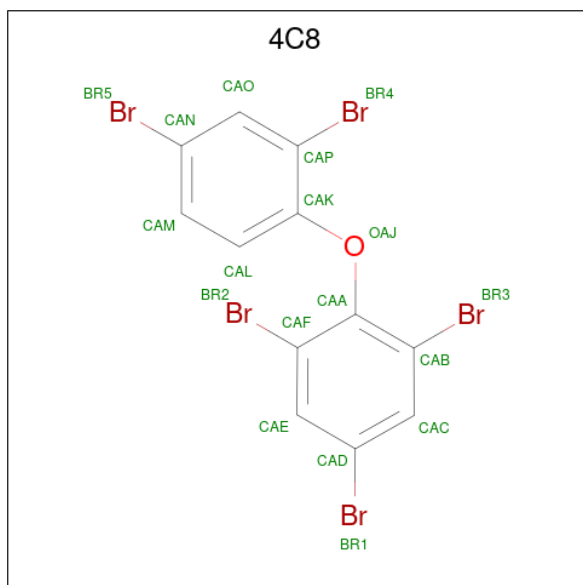
- Molecule 1 is a protein called ATP-dependent translocase ABCB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	1182	9156	5887	1553	1679	37	0	0	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	83	GLN	ASN	engineered mutation	UNP P21447
A	87	GLN	ASN	engineered mutation	UNP P21447
A	90	GLN	ASN	engineered mutation	UNP P21447
A	306	ALA	TYR	engineered mutation	UNP P21447
A	952	ALA	CYS	engineered mutation	UNP P21447
A	1277	HIS	-	expression tag	UNP P21447
A	1278	HIS	-	expression tag	UNP P21447
A	1279	HIS	-	expression tag	UNP P21447
A	1280	HIS	-	expression tag	UNP P21447
A	1281	HIS	-	expression tag	UNP P21447
A	1282	HIS	-	expression tag	UNP P21447

- Molecule 2 is 2,4-dibromophenyl 2,4,6-tribromophenyl ether (CCD ID: 4C8) (formula: C<sub>12</sub>H<sub>5</sub>Br<sub>5</sub>O) (labeled as "Ligand of Interest" by depositor).

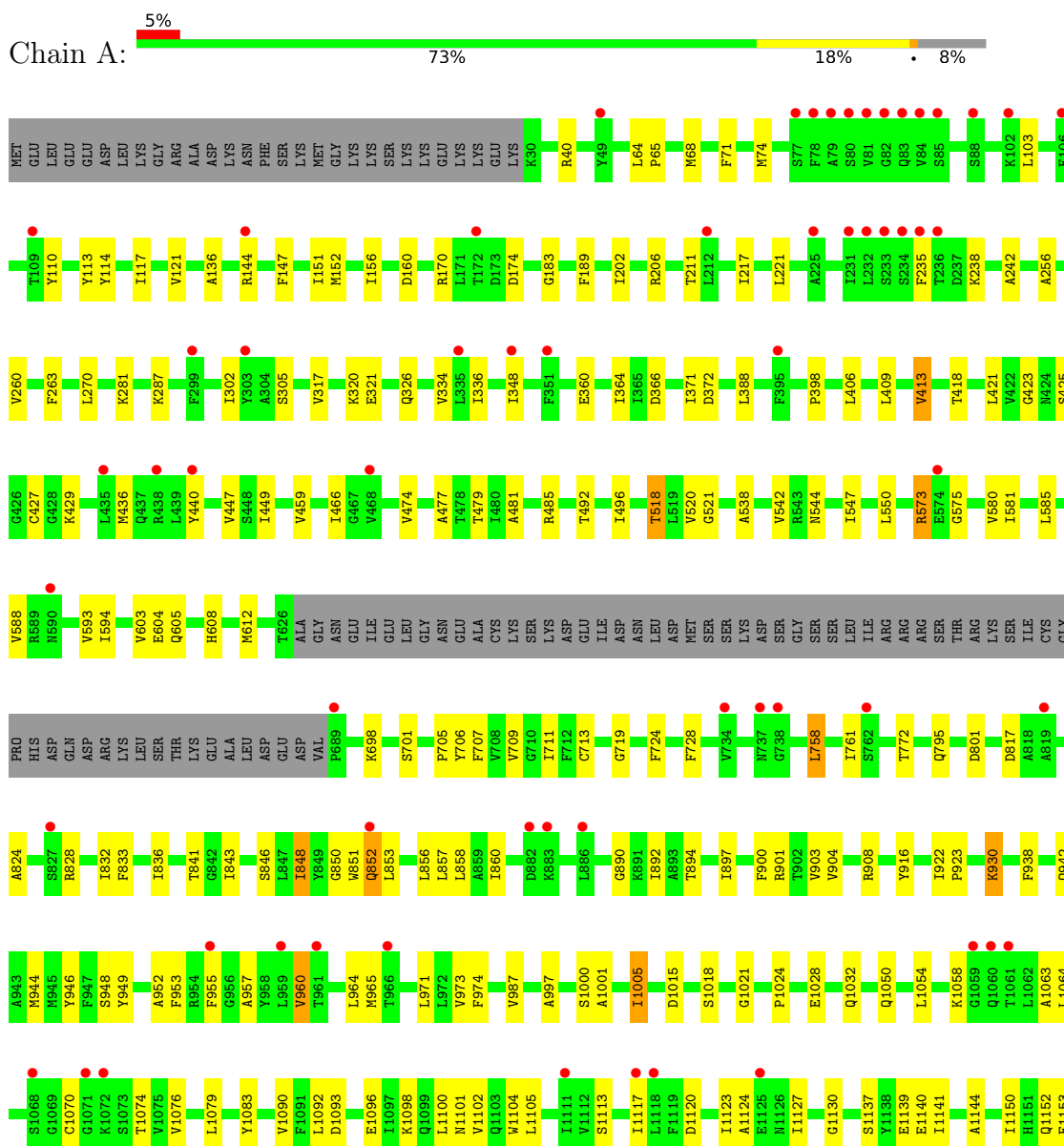


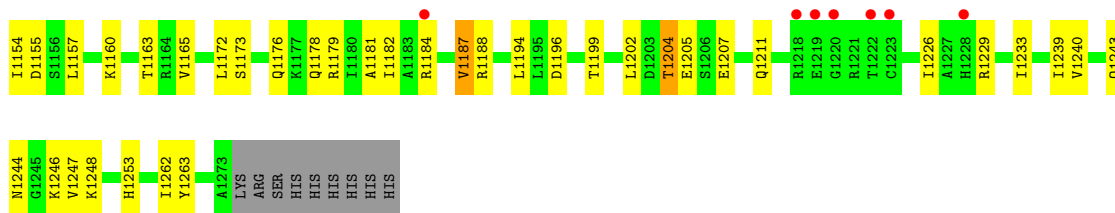
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	Br	C	O		
2	A	1	18	5	12	1	0	0
2	A	1	18	5	12	1	0	0

### 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: ATP-dependent translocase ABCB1





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	90.96Å 138.84Å 196.76Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.98 – 4.15 29.98 – 4.15	Depositor EDS
% Data completeness (in resolution range)	100.0 (29.98-4.15) 92.2 (29.98-4.15)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.38 (at 3.98Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, $R_{free}$	0.251 , 0.286 0.253 , 0.288	Depositor DCC
$R_{free}$ test set	2000 reflections (8.91%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	198.9	Xtrriage
Anisotropy	0.079	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.19 , 108.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	9192	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	232.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.99% of the height of the origin peak. No significant pseudotranslation is detected.*

<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: 4C8

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	0.12	0/9324	0.32	0/12603

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 [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	9156	0	9346	141	0
2	A	36	0	0	6	0
All	All	9192	0	9346	142	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 8.

All (142) 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:960:VAL:HG13	1:A:965:MET:HB3	1.51	0.92
1:A:156:ILE:HD11	1:A:904:VAL:HG11	1.67	0.75

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:160:ASP:OD1	1:A:901:ARG:NH2	2.25	0.70
1:A:850:GLY:HA2	1:A:965:MET:HE2	1.76	0.68
1:A:388:LEU:HD11	1:A:547:ILE:HD12	1.77	0.66
1:A:421:LEU:HB2	1:A:581:ILE:HG13	1.78	0.65
1:A:1050:GLN:NE2	1:A:1244:ASN:O	2.33	0.62
1:A:817:ASP:HA	1:A:1000:SER:HB3	1.84	0.60
1:A:1204:THR:OG1	1:A:1205:GLU:N	2.33	0.60
1:A:1063:ALA:HB3	1:A:1239:ILE:HA	1.84	0.60
1:A:846:SER:HB3	1:A:973:VAL:HG13	1.85	0.59
1:A:1196:ASP:HA	1:A:1226:ILE:HG12	1.85	0.57
1:A:603:VAL:HG12	1:A:604:GLU:HG3	1.87	0.56
1:A:263:PHE:HA	1:A:1188:ARG:HH22	1.71	0.56
1:A:711:ILE:HD12	1:A:833:PHE:HD2	1.70	0.55
1:A:1207:GLU:OE1	1:A:1229:ARG:NH2	2.39	0.55
1:A:170:ARG:HG3	1:A:174:ASP:OD2	2.06	0.55
1:A:1157:LEU:HD13	1:A:1163:THR:HG21	1.87	0.55
1:A:256:ALA:HB2	1:A:1117:ILE:HG12	1.89	0.54
1:A:728:PHE:HE2	2:A:1302:4C8:BR1	2.45	0.54
1:A:832:ILE:HG13	1:A:987:VAL:HG22	1.90	0.54
1:A:698:LYS:O	1:A:701:SER:OG	2.22	0.54
1:A:1120:ASP:HA	1:A:1165:VAL:O	2.08	0.54
1:A:1123:ILE:HD13	1:A:1154:ILE:HD12	1.90	0.54
1:A:388:LEU:HB2	1:A:413:VAL:HG13	1.90	0.54
1:A:955:PHE:O	1:A:960:VAL:HB	2.08	0.53
1:A:1150:ILE:HD13	1:A:1179:ARG:HH11	1.73	0.53
1:A:211:THR:HG22	1:A:334:VAL:HG21	1.91	0.53
1:A:160:ASP:HB2	1:A:398:PRO:HG2	1.91	0.53
1:A:160:ASP:OD2	1:A:440:TYR:OH	2.25	0.53
1:A:1015:ASP:OD2	1:A:1018:SER:HB2	2.08	0.52
1:A:971:LEU:HD11	2:A:1302:4C8:BR1	2.65	0.52
1:A:1092:LEU:HG	1:A:1093:ASP:H	1.74	0.52
1:A:1096:GLU:HG2	1:A:1098:LYS:H	1.73	0.52
1:A:1124:ALA:HB1	1:A:1141:ILE:HD12	1.90	0.52
1:A:1202:LEU:HB3	1:A:1207:GLU:HG2	1.92	0.52
1:A:851:TRP:C	1:A:853:LEU:H	2.15	0.52
1:A:952:ALA:HB1	1:A:974:PHE:CZ	2.44	0.52
1:A:235:PHE:HB3	1:A:287:LYS:HE2	1.91	0.52
1:A:64:LEU:HD12	1:A:336:ILE:HG21	1.90	0.51
1:A:890:GLY:O	1:A:894:THR:OG1	2.29	0.51
1:A:206:ARG:HH11	1:A:326:GLN:HG2	1.76	0.51
1:A:238:LYS:O	1:A:242:ALA:N	2.43	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:711:ILE:HD12	1:A:833:PHE:CD2	2.46	0.51
1:A:1239:ILE:HG21	1:A:1263:TYR:CE1	2.46	0.51
1:A:1173:SER:OG	1:A:1176:GLN:OE1	2.28	0.51
1:A:1199:THR:HG21	1:A:1211:GLN:HG2	1.92	0.51
1:A:1202:LEU:HD23	1:A:1207:GLU:HA	1.93	0.51
1:A:922:ILE:HB	1:A:923:PRO:HD3	1.93	0.50
1:A:1070:CYS:O	1:A:1074:THR:N	2.37	0.50
1:A:1127:ILE:HA	1:A:1184:ARG:HB3	1.94	0.50
1:A:705:PRO:C	1:A:707:PHE:H	2.19	0.50
1:A:544:ASN:O	1:A:544:ASN:ND2	2.45	0.49
1:A:944:MET:O	1:A:948:SER:OG	2.20	0.49
1:A:360:GLU:O	1:A:364:ILE:HG12	2.12	0.49
1:A:856:LEU:O	1:A:860:ILE:HG12	2.13	0.49
1:A:221:LEU:HD22	1:A:302:ILE:HG12	1.95	0.48
1:A:479:THR:HA	1:A:518:THR:O	2.13	0.48
1:A:1050:GLN:O	1:A:1246:LYS:HG3	2.14	0.48
1:A:423:GLY:N	1:A:429:LYS:HD3	2.27	0.48
1:A:719:GLY:HA2	1:A:841:THR:OG1	2.13	0.48
1:A:707:PHE:O	1:A:711:ILE:HG12	2.13	0.48
1:A:263:PHE:CD2	1:A:1130:GLY:HA2	2.48	0.48
1:A:1253:HIS:ND1	1:A:1263:TYR:OH	2.35	0.47
1:A:724:PHE:CE1	1:A:758:LEU:HB3	2.50	0.47
1:A:728:PHE:HB2	2:A:1301:4C8:CAL	2.45	0.47
1:A:1064:LEU:HB3	1:A:1226:ILE:HG22	1.97	0.47
1:A:1139:GLU:H	1:A:1139:GLU:CD	2.22	0.47
1:A:1181:ALA:HA	1:A:1184:ARG:HG2	1.97	0.47
1:A:960:VAL:HG13	1:A:965:MET:CB	2.34	0.47
1:A:1063:ALA:HB3	1:A:1239:ILE:HG13	1.97	0.47
1:A:1100:LEU:HD23	1:A:1105:LEU:HB2	1.97	0.46
1:A:843:ILE:HD11	1:A:858:LEU:HD21	1.97	0.46
1:A:953:PHE:O	1:A:957:ALA:N	2.45	0.46
1:A:1054:LEU:HD11	1:A:1240:VAL:HG11	1.97	0.46
1:A:418:THR:HG21	1:A:573:ARG:HE	1.79	0.46
1:A:466:ILE:HG12	1:A:547:ILE:HB	1.96	0.46
1:A:217:ILE:HD12	1:A:305:SER:HB3	1.97	0.46
1:A:824:ALA:HA	1:A:828:ARG:HD3	1.98	0.46
1:A:833:PHE:HA	1:A:836:ILE:HG12	1.97	0.46
1:A:170:ARG:O	1:A:174:ASP:HB2	2.16	0.46
1:A:1144:ALA:HB2	1:A:1187:VAL:HG23	1.98	0.46
1:A:152:MET:HA	1:A:900:PHE:HE2	1.81	0.45
1:A:1001:ALA:O	1:A:1005:ILE:HD12	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:136:ALA:HB2	1:A:183:GLY:HA2	1.97	0.45
1:A:1137:SER:HB2	1:A:1140:GLU:HB2	1.99	0.45
1:A:949:TYR:CD2	2:A:1302:4C8:BR4	3.25	0.45
1:A:113:TYR:O	1:A:117:ILE:HG12	2.15	0.45
1:A:114:TYR:HE2	1:A:953:PHE:HD2	1.65	0.45
1:A:189:PHE:CE1	1:A:348:ILE:HD11	2.52	0.45
1:A:852:GLN:HB3	1:A:955:PHE:HZ	1.81	0.45
1:A:938:PHE:O	1:A:942:GLN:HG2	2.17	0.45
1:A:1028:GLU:HB2	1:A:1058:LYS:HD2	1.98	0.45
1:A:585:LEU:HD12	1:A:588:VAL:HG11	1.98	0.45
1:A:1076:VAL:HG13	1:A:1194:LEU:HD13	1.99	0.45
1:A:1079:LEU:HD23	1:A:1194:LEU:HD21	1.99	0.44
1:A:65:PRO:HB2	1:A:202:ILE:HD12	1.99	0.44
1:A:74:MET:HG2	1:A:110:TYR:CD2	2.53	0.44
1:A:857:LEU:HD12	1:A:973:VAL:HG12	1.98	0.44
1:A:40:ARG:NH1	1:A:366:ASP:OD1	2.44	0.44
1:A:550:LEU:HB2	1:A:580:VAL:HG23	1.99	0.44
1:A:709:VAL:O	1:A:713:CYS:HB2	2.17	0.44
1:A:900:PHE:O	1:A:903:VAL:HG12	2.18	0.43
1:A:1248:LYS:HG2	1:A:1262:ILE:HD12	2.00	0.43
1:A:848:ILE:HD12	1:A:848:ILE:HA	1.75	0.43
1:A:930:LYS:NZ	1:A:930:LYS:HB3	2.33	0.43
1:A:477:ALA:HA	1:A:520:VAL:O	2.18	0.43
1:A:481:ALA:O	1:A:485:ARG:HB2	2.19	0.43
1:A:1021:GLY:HA3	1:A:1101:ASN:HB2	2.01	0.43
1:A:851:TRP:C	1:A:853:LEU:N	2.77	0.43
1:A:1113:SER:O	1:A:1178:GLN:NE2	2.47	0.43
1:A:1176:GLN:OE1	1:A:1176:GLN:N	2.47	0.43
1:A:147:PHE:O	1:A:151:ILE:HG12	2.18	0.43
1:A:908:ARG:HA	1:A:908:ARG:HD3	1.84	0.43
1:A:1150:ILE:HB	1:A:1179:ARG:HB3	2.00	0.43
1:A:1150:ILE:CD1	1:A:1179:ARG:HH11	2.31	0.42
1:A:71:PHE:HE1	1:A:953:PHE:HZ	1.67	0.42
1:A:573:ARG:C	1:A:575:GLY:H	2.27	0.42
1:A:1144:ALA:CB	1:A:1187:VAL:HG23	2.49	0.42
1:A:68:MET:SD	2:A:1302:4C8:BR2	3.32	0.42
1:A:388:LEU:HB2	1:A:413:VAL:CG1	2.50	0.42
1:A:1150:ILE:O	1:A:1154:ILE:HG12	2.19	0.42
1:A:892:ILE:HD11	1:A:916:TYR:HA	2.02	0.42
1:A:1024:PRO:HD2	1:A:1104:TRP:CH2	2.54	0.42
1:A:706:TYR:O	1:A:772:THR:HB	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:520:VAL:HG12	1:A:521:GLY:N	2.35	0.41
1:A:1243:GLN:HB3	1:A:1248:LYS:HB2	2.02	0.41
1:A:997:ALA:O	1:A:1001:ALA:N	2.51	0.41
1:A:1154:ILE:HA	1:A:1157:LEU:HD12	2.02	0.41
1:A:1092:LEU:CG	1:A:1093:ASP:H	2.33	0.41
1:A:371:ILE:O	1:A:459:VAL:HG21	2.20	0.41
1:A:436:MET:HE1	1:A:449:ILE:HB	2.03	0.41
1:A:121:VAL:HG21	1:A:946:TYR:CD1	2.54	0.41
1:A:608:HIS:O	1:A:612:MET:HG2	2.20	0.41
1:A:235:PHE:O	1:A:287:LYS:NZ	2.54	0.41
1:A:1152:GLN:HG3	1:A:1153:PHE:N	2.36	0.41
1:A:425:SER:C	1:A:427:CYS:H	2.29	0.41
1:A:1154:ILE:O	1:A:1160:LYS:HA	2.21	0.40
2:A:1301:4C8:BR3	2:A:1301:4C8:CAK	3.25	0.40
1:A:538:ALA:O	1:A:542:VAL:HG23	2.20	0.40
1:A:594:ILE:O	1:A:605:GLN:HA	2.20	0.40
1:A:801:ASP:OD2	1:A:1083:TYR:OH	2.39	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	1178/1282 (92%)	1123 (95%)	53 (4%)	2 (0%)	43 76

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1204	THR
1	A	573	ARG

### 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	971/1061 (92%)	934 (96%)	37 (4%)	29 51

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	103	LEU
1	A	144	ARG
1	A	260	VAL
1	A	270	LEU
1	A	281	LYS
1	A	317	VAL
1	A	320	LYS
1	A	321	GLU
1	A	372	ASP
1	A	406	LEU
1	A	409	LEU
1	A	413	VAL
1	A	447	VAL
1	A	474	VAL
1	A	492	THR
1	A	496	ILE
1	A	518	THR
1	A	593	VAL
1	A	758	LEU
1	A	761	ILE
1	A	795	GLN
1	A	848	ILE
1	A	852	GLN
1	A	897	ILE
1	A	930	LYS
1	A	960	VAL
1	A	964	LEU
1	A	1005	ILE
1	A	1032	GLN
1	A	1090	VAL

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Mol	Chain	Res	Type
1	A	1102	VAL
1	A	1155	ASP
1	A	1172	LEU
1	A	1182	ILE
1	A	1187	VAL
1	A	1233	ILE
1	A	1247	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	145	GLN
1	A	153	ASN
1	A	154	GLN
1	A	379	HIS
1	A	387	ASN
1	A	452	GLN
1	A	515	GLN
1	A	544	ASN
1	A	721	GLN
1	A	834	GLN
1	A	942	GLN
1	A	1108	GLN
1	A	1114	GLN
1	A	1151	HIS
1	A	1211	GLN
1	A	1243	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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

2 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	4C8	A	1301	-	19,19,19	1.11	3 (15%)	27,27,27	1.08	2 (7%)
2	4C8	A	1302	-	19,19,19	1.08	2 (10%)	27,27,27	1.11	2 (7%)

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	4C8	A	1301	-	-	0/4/4/4	0/2/2/2
2	4C8	A	1302	-	-	0/4/4/4	0/2/2/2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1301	4C8	BR3-CAB	2.18	1.94	1.89
2	A	1302	4C8	BR4-CAP	2.12	1.94	1.89
2	A	1301	4C8	BR4-CAP	2.09	1.94	1.89
2	A	1301	4C8	BR1-CAD	2.07	1.94	1.90
2	A	1302	4C8	BR3-CAB	2.03	1.94	1.89

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1302	4C8	CAK-OAJ-CAA	-3.77	109.84	117.94
2	A	1301	4C8	CAK-OAJ-CAA	-3.18	111.10	117.94
2	A	1302	4C8	BR4-CAP-CAK	2.17	122.29	119.62
2	A	1301	4C8	BR3-CAB-CAA	2.09	121.49	118.50

There are no chirality outliers.

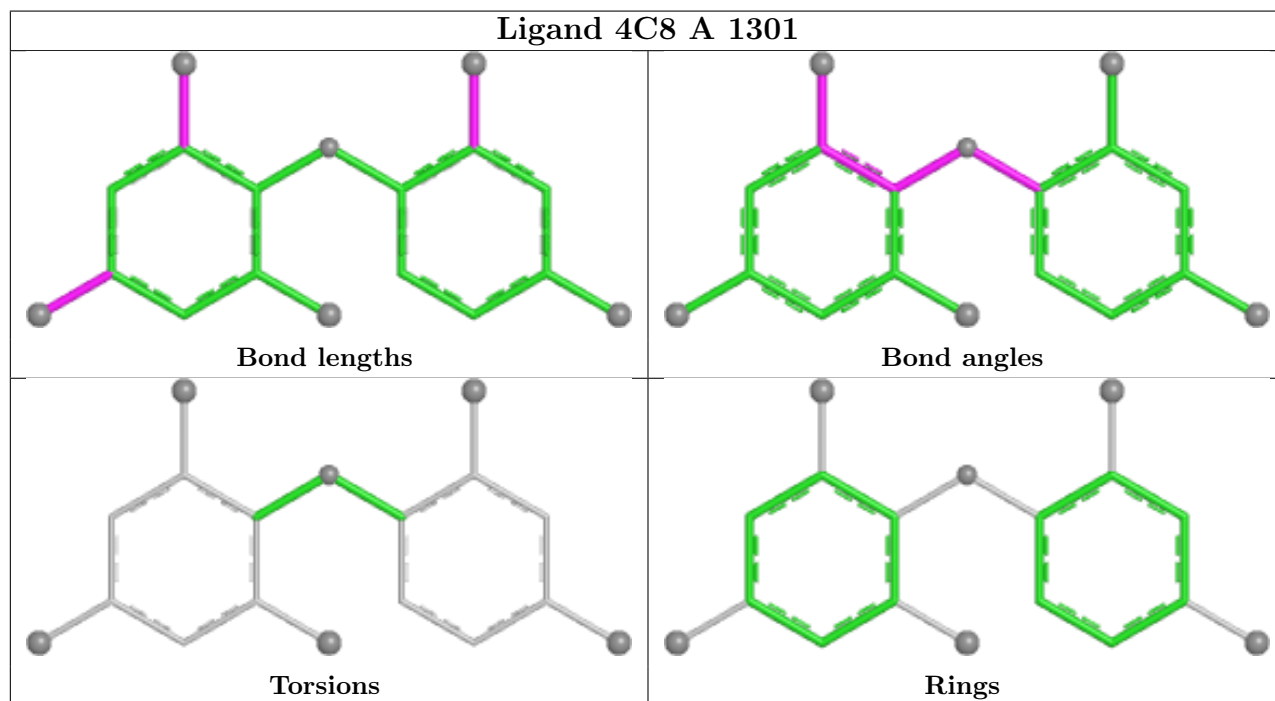
There are no torsion outliers.

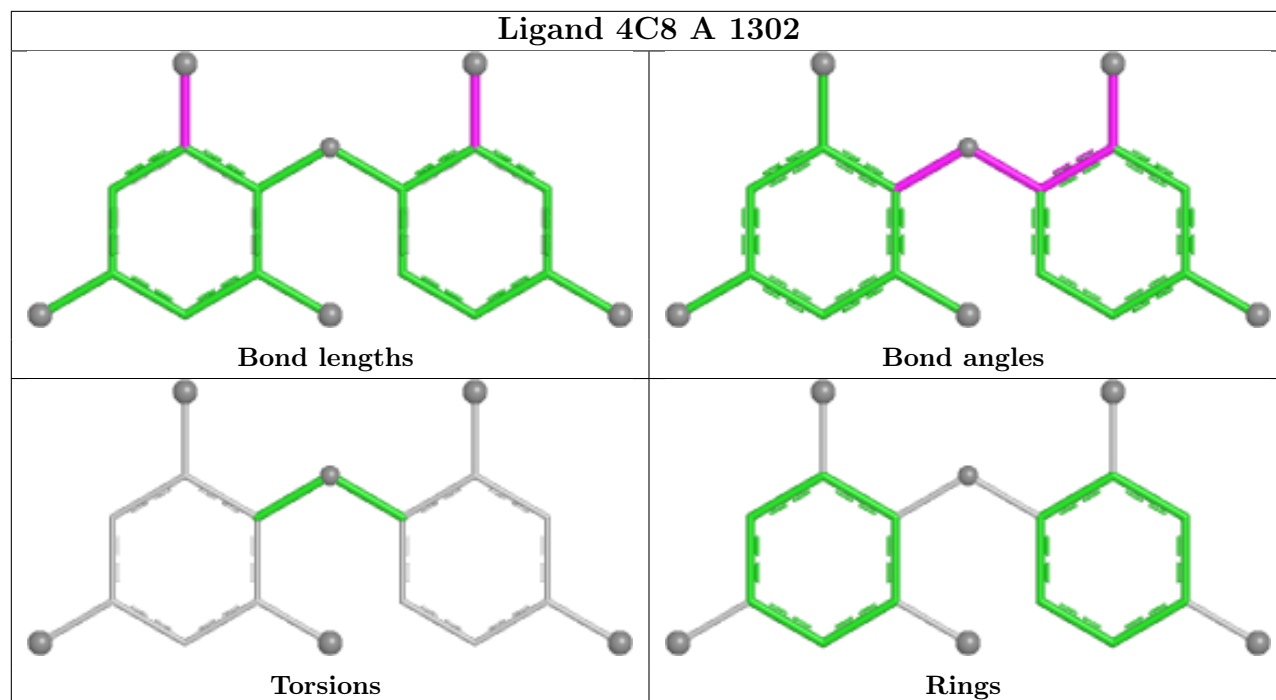
There are no ring outliers.

2 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1301	4C8	2	0
2	A	1302	4C8	4	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.





## 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	1182/1282 (92%)	0.35	68 (5%) <span style="border: 1px solid red; padding: 2px;">29</span> <span style="border: 1px solid red; padding: 2px;">27</span>	169, 226, 297, 360	0

All (68) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1219	GLU	10.1
1	A	1059	GLY	6.9
1	A	819	ALA	6.2
1	A	80	SER	5.9
1	A	574	GLU	5.7
1	A	81	VAL	5.4
1	A	235	PHE	5.3
1	A	85	SER	4.9
1	A	234	SER	4.8
1	A	1218	ARG	4.7
1	A	1223	CYS	4.6
1	A	348	ILE	4.2
1	A	737	ASN	4.0
1	A	231	ILE	3.8
1	A	351	PHE	3.8
1	A	468	VAL	3.6
1	A	82	GLY	3.6
1	A	77	SER	3.6
1	A	1222	THR	3.5
1	A	961	THR	3.5
1	A	689	PRO	3.5
1	A	236	THR	3.4
1	A	232	LEU	3.3
1	A	959	LEU	3.2
1	A	882	ASP	3.2
1	A	827	SER	3.1
1	A	1220	GLY	3.1

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	299	PHE	3.0
1	A	738	GLY	2.9
1	A	102	LYS	2.9
1	A	886	LEU	2.9
1	A	335	LEU	2.8
1	A	1118	LEU	2.8
1	A	1117	ILE	2.8
1	A	212	LEU	2.7
1	A	84	VAL	2.7
1	A	1060	GLN	2.6
1	A	1125	GLU	2.4
1	A	106	GLU	2.4
1	A	303	TYR	2.4
1	A	233	SER	2.3
1	A	1061	THR	2.3
1	A	1111	ILE	2.3
1	A	172	THR	2.3
1	A	144	ARG	2.3
1	A	109	THR	2.3
1	A	435	LEU	2.2
1	A	438	ARG	2.2
1	A	1184	ARG	2.2
1	A	1068	SER	2.2
1	A	395	PHE	2.2
1	A	590	ASN	2.2
1	A	225	ALA	2.1
1	A	883	LYS	2.1
1	A	1072	LYS	2.1
1	A	734	VAL	2.1
1	A	762	SER	2.1
1	A	79	ALA	2.1
1	A	955	PHE	2.1
1	A	1071	GLY	2.1
1	A	440	TYR	2.1
1	A	83	GLN	2.1
1	A	1228	HIS	2.0
1	A	88	SER	2.0
1	A	852	GLN	2.0
1	A	49	TYR	2.0
1	A	78	PHE	2.0
1	A	966	THR	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 oligosaccharides in this entry.

## 6.4 Ligands [i](#)

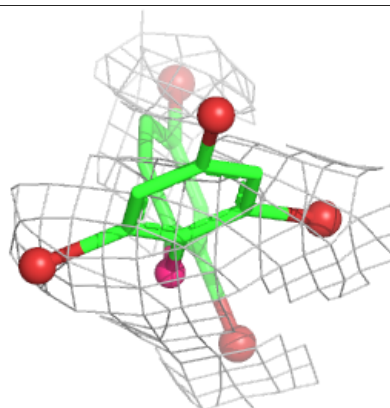
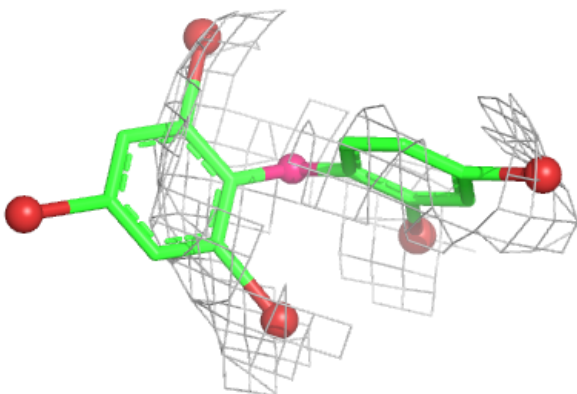
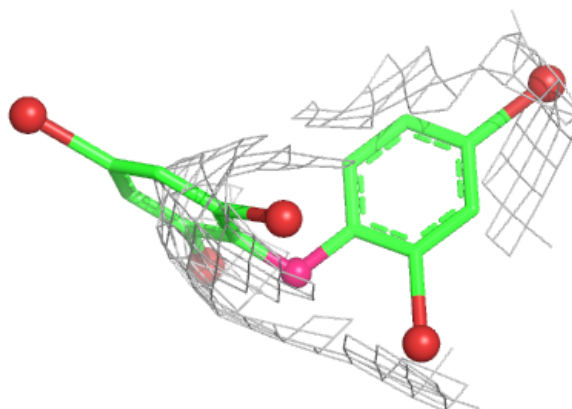
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	4C8	A	1301	18/18	0.85	0.15	234,239,251,257	18
2	4C8	A	1302	18/18	0.88	0.57	258,265,290,296	18

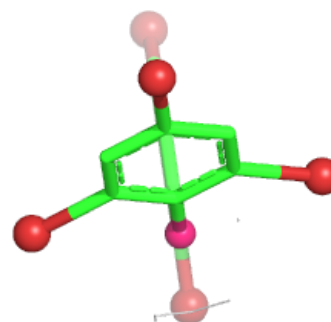
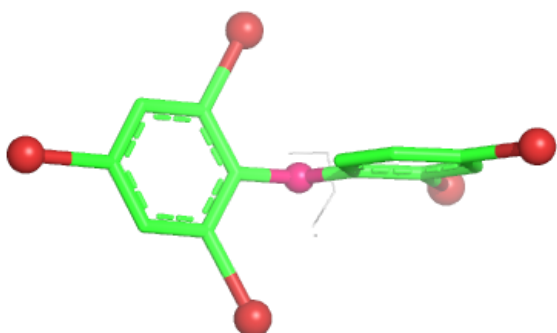
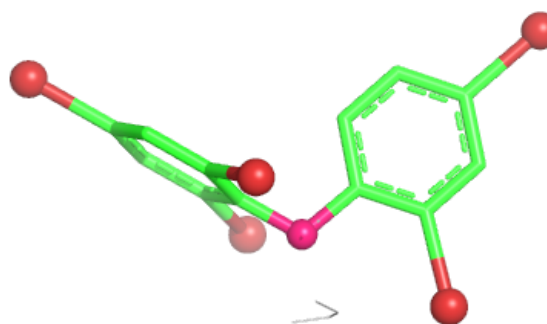
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around 4C8 A 1301:**

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

**Electron density around 4C8 A 1302:**

$2mF_o-DF_c$  (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.