



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 4, 2024 – 08:39 am GMT

PDB ID : 5LL5  
Title : Crystal structure of human carbonic anhydrase isozyme XII with 4-(1H-benzimidazol-1-ylacetyl)benzenesulfonamide  
Authors : Smirnov, A.; Manakova, E.; Grazulis, S.  
Deposited on : 2016-07-26  
Resolution : 1.42 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>.

---

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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

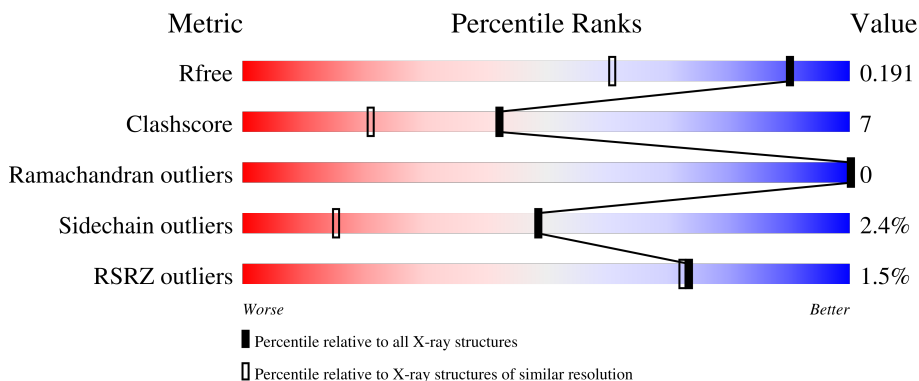
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.42 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	2579 (1.44-1.40)
Clashscore	141614	2696 (1.44-1.40)
Ramachandran outliers	138981	2632 (1.44-1.40)
Sidechain outliers	138945	2631 (1.44-1.40)
RSRZ outliers	127900	2528 (1.44-1.40)

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	263	
1	B	263	
1	C	263	
1	D	263	

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
4	EDO	B	305	-	-	X	-

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 9991 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
			Total	C	N	O	S			
1	A	261	2188	1389	375	416	8	0	11	0
1	B	261	2146	1360	364	415	7	0	7	0
1	C	261	2123	1350	357	408	8	0	7	0
1	D	261	2172	1376	371	418	7	0	9	0

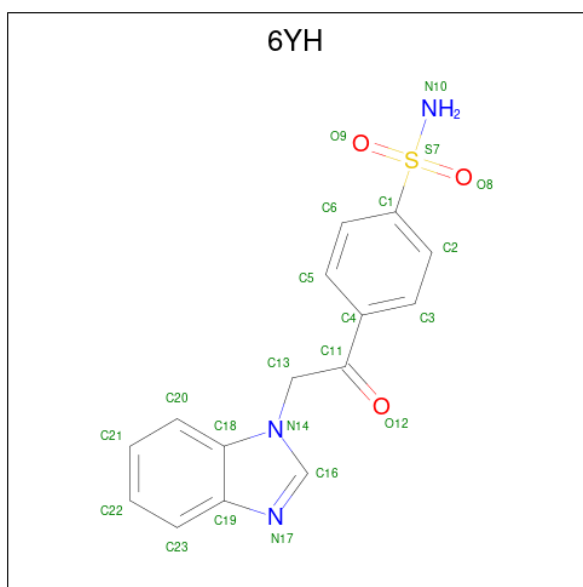
There are 4 discrepancies between the modelled and reference sequences:

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	A	1	Total 1	Zn 1	0	0
2	B	1	Total 1	Zn 1	0	0
2	C	1	Total 1	Zn 1	0	0
2	D	1	Total 1	Zn 1	0	0

- Molecule 3 is 4-[2-(benzimidazol-1-yl)ethanoyl]benzenesulfonamide (three-letter code: 6YH) (formula: C<sub>15</sub>H<sub>13</sub>N<sub>3</sub>O<sub>3</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
3	A	1	22	15	3	3	1	0	0
3	B	1	22	15	3	3	1	0	0
3	C	1	22	15	3	3	1	0	0
3	D	1	44	30	6	6	2	0	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	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	C	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 8 4 4	0	1

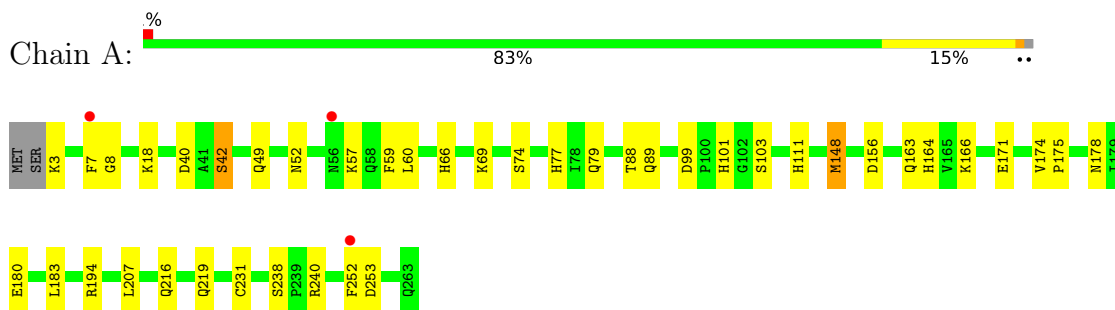
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	273	Total O 273 273	0	0
5	B	324	Total O 324 324	0	0
5	C	276	Total O 276 276	0	0
5	D	327	Total O 327 327	0	0

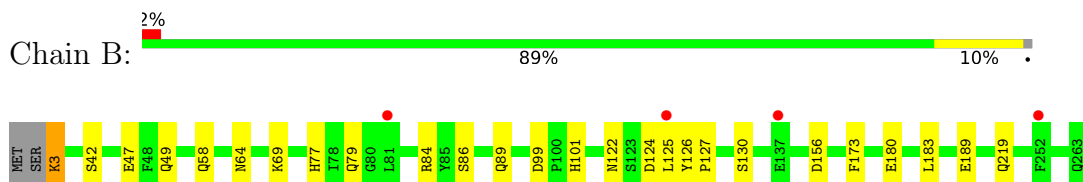
### 3 Residue-property plots [i](#)

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.

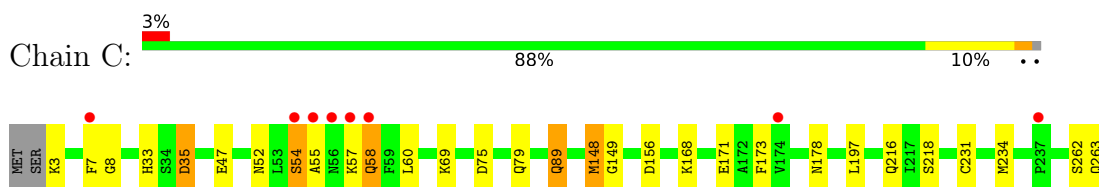
- Molecule 1: Carbonic anhydrase 12



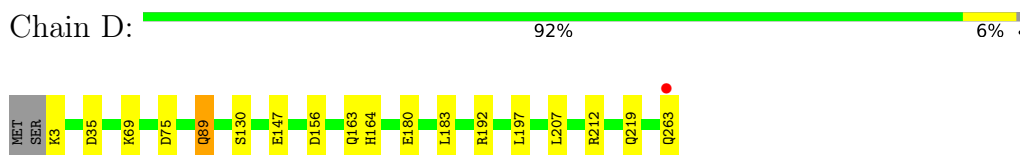
- Molecule 1: Carbonic anhydrase 12



- 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, $\alpha$ , $\beta$ , $\gamma$	77.42Å 73.96Å 91.33Å 90.00° 108.96° 90.00°	Depositor
Resolution (Å)	67.76 – 1.42 67.76 – 1.42	Depositor EDS
% Data completeness (in resolution range)	99.1 (67.76-1.42) 99.1 (67.76-1.42)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.70 (at 1.42Å)	Xtrriage
Refinement program	REFMAC 5.6.0117	Depositor
R, $R_{free}$	0.164 , 0.193 0.162 , 0.191	Depositor DCC
$R_{free}$ test set	18027 reflections (9.92%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	13.0	Xtrriage
Anisotropy	0.172	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 45.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	9991	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	18.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 44.01 % 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 1.6240e-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: ZN, 6YH, 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	1.23	0/2253	1.16	0/3063
1	B	1.29	0/2210	1.22	0/3010
1	C	1.20	0/2187	1.12	0/2980
1	D	1.23	0/2236	1.18	0/3043
All	All	1.24	0/8886	1.17	0/12096

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	2188	0	2064	40	0
1	B	2146	0	2011	22	0
1	C	2123	0	1971	34	0
1	D	2172	0	2048	21	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	22	0	0	0	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	22	0	0	0	0
3	C	22	0	0	3	0
3	D	44	0	0	8	0
4	A	12	0	18	1	0
4	B	12	0	18	6	0
4	C	8	0	12	3	0
4	D	16	0	24	6	0
5	A	273	0	0	11	1
5	B	324	0	0	7	1
5	C	276	0	0	7	0
5	D	327	0	0	2	0
All	All	9991	0	8166	117	1

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 7.

All (117) 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:42[A]:SER:OG	5:B:401:HOH:O	1.65	1.12
1:B:64:ASN:HD22	4:B:305:EDO:H22	1.15	1.11
1:D:147[B]:GLU:OE2	5:D:401:HOH:O	1.70	1.09
1:C:262:SER:O	1:C:263:GLN:HG2	1.54	1.08
1:C:58:GLN:OE1	5:C:401:HOH:O	1.77	1.03
1:D:130[A]:SER:HA	3:D:302[A]:6YH:N17	1.87	0.90
1:C:168:LYS:HB2	1:C:231[B]:CYS:O	1.71	0.89
1:C:58:GLN:HG2	1:C:173[B]:PHE:HB3	1.55	0.88
1:A:148:MET:SD	1:A:219:GLN:HA	2.13	0.87
1:A:216:GLN:HG3	5:A:618:HOH:O	1.79	0.82
1:A:148:MET:SD	1:A:219:GLN:CA	2.69	0.80
1:C:262:SER:O	1:C:263:GLN:CG	2.31	0.79
1:C:216:GLN:HG3	5:C:550:HOH:O	1.82	0.79
1:B:69:LYS:NZ	4:B:305:EDO:H21	1.97	0.78
1:C:58:GLN:HG2	1:C:173[A]:PHE:HB3	1.64	0.77
1:B:122:ASN:ND2	5:B:403:HOH:O	2.14	0.74
1:B:64:ASN:ND2	4:B:305:EDO:H22	1.99	0.74
5:A:637:HOH:O	1:C:234:MET:HE1	1.87	0.73
1:A:253:ASP:OD2	5:A:401:HOH:O	2.08	0.71
1:B:3:LYS:N	5:B:405:HOH:O	2.26	0.69
1:B:180[B]:GLU:OE2	5:B:402:HOH:O	2.11	0.69
1:C:148:MET:HE2	5:C:598:HOH:O	1.93	0.68

Continued on next page...

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:3[A]:LYS:CG	1:C:3[A]:LYS:O	2.42	0.67
1:D:69:LYS:NZ	4:D:305[A]:EDO:H11	2.11	0.66
1:A:231[B]:CYS:SG	1:A:240:ARG:HB2	2.37	0.64
5:A:637:HOH:O	1:C:234:MET:CE	2.44	0.63
1:B:180[A]:GLU:HG3	1:B:183:LEU:HD12	1.80	0.63
1:C:197:LEU:HD22	3:C:302:6YH:C6	2.29	0.62
1:D:69:LYS:HZ3	4:D:305[A]:EDO:H11	1.65	0.62
1:D:130[A]:SER:CA	3:D:302[A]:6YH:N17	2.62	0.61
1:A:79:GLN:OE1	5:A:402:HOH:O	2.16	0.61
1:A:7[B]:PHE:CZ	1:A:240:ARG:HD2	2.36	0.61
1:A:148:MET:SD	1:A:219:GLN:HB3	2.40	0.61
1:C:75[B]:ASP:OD2	5:C:402:HOH:O	2.17	0.60
1:D:212:ARG:HH22	1:D:263:GLN:HB3	1.66	0.60
1:B:47:GLU:HB2	1:B:79:GLN:HB3	1.84	0.59
1:C:47:GLU:HB2	1:C:79:GLN:HB3	1.85	0.59
1:C:58:GLN:CG	1:C:173[A]:PHE:HB3	2.32	0.59
1:A:74:SER:O	5:A:403:HOH:O	2.18	0.57
1:C:89:GLN:HE22	4:C:303:EDO:H22	1.68	0.57
1:C:33:HIS:CE1	1:C:35:ASP:OD1	2.58	0.57
1:B:69:LYS:HZ3	4:B:305:EDO:H21	1.68	0.57
1:A:3:LYS:HA	5:A:578:HOH:O	2.05	0.56
1:C:7:PHE:CD1	1:C:8:GLY:N	2.74	0.56
1:D:89:GLN:HE21	4:D:305[B]:EDO:H12	1.69	0.56
1:B:77:HIS:CE1	1:B:86:SER:OG	2.59	0.56
1:D:212:ARG:HH12	1:D:263:GLN:CB	2.18	0.56
1:C:148:MET:CE	5:C:598:HOH:O	2.50	0.56
1:A:7[B]:PHE:HZ	1:A:240:ARG:HD2	1.71	0.55
1:B:180[B]:GLU:CD	5:B:402:HOH:O	2.45	0.55
1:D:89:GLN:NE2	4:D:305[B]:EDO:H12	2.23	0.54
1:A:194[A]:ARG:NE	1:A:207:LEU:HD13	2.24	0.53
1:A:148:MET:SD	1:A:219:GLN:CB	2.97	0.53
1:B:77:HIS:CE1	1:B:86:SER:HG	2.27	0.53
1:A:164:HIS:HD2	5:A:468:HOH:O	1.93	0.52
1:C:234:MET:CE	5:C:577:HOH:O	2.57	0.52
1:B:126:TYR:HB3	1:B:127:PRO:HD2	1.92	0.52
1:A:18[B]:LYS:HG2	1:A:18[B]:LYS:O	2.10	0.52
1:C:197:LEU:CD2	3:C:302:6YH:C6	2.89	0.51
1:A:180:GLU:HG3	1:A:183:LEU:HD12	1.93	0.51
1:D:3:LYS:N	5:D:405:HOH:O	2.44	0.51
1:C:60:LEU:HD11	1:C:171:GLU:HB3	1.93	0.50
1:A:57:LYS:HE3	1:A:59:PHE:CZ	2.47	0.50

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:89:GLN:HE21	4:D:305[B]:EDO:C1	2.25	0.50
1:B:79:GLN:NE2	5:B:407:HOH:O	2.34	0.49
1:A:148:MET:SD	1:A:219:GLN:N	2.86	0.49
1:D:130[A]:SER:OG	3:D:302[A]:6YH:N17	2.45	0.49
1:A:252[B]:PHE:CG	1:A:252[B]:PHE:O	2.66	0.49
1:D:197[B]:LEU:CD2	3:D:302[B]:6YH:C3	2.91	0.48
1:D:163[B]:GLN:HG3	1:D:164:HIS:CD2	2.48	0.48
1:D:197[B]:LEU:HD22	3:D:302[B]:6YH:C2	2.44	0.48
1:C:263:GLN:OXT	1:C:263:GLN:HG3	2.14	0.47
1:C:55:ALA:C	1:C:57:LYS:H	2.18	0.47
1:D:197[B]:LEU:HD22	3:D:302[B]:6YH:C3	2.45	0.47
1:A:7[B]:PHE:HZ	1:A:240:ARG:CD	2.26	0.47
1:D:130[A]:SER:HA	3:D:302[A]:6YH:C19	2.43	0.47
1:C:197:LEU:HD22	3:C:302:6YH:C1	2.44	0.47
1:C:7:PHE:HD1	1:C:8:GLY:N	2.13	0.46
1:A:103:SER:O	1:A:111:HIS:HD2	1.99	0.46
1:C:69:LYS:NZ	4:C:304:EDO:H21	2.30	0.46
1:A:216:GLN:HG3	5:A:556:HOH:O	2.16	0.46
1:C:55:ALA:O	1:C:57:LYS:N	2.48	0.46
1:B:58:GLN:HG3	1:B:173:PHE:CD1	2.52	0.45
1:B:99:ASP:OD1	1:B:101:HIS:HD2	1.98	0.45
1:A:148:MET:HE2	1:A:148:MET:HB3	1.70	0.45
1:B:189[B]:GLU:OE2	5:B:404:HOH:O	2.20	0.45
1:C:55:ALA:HB2	5:C:429:HOH:O	2.16	0.45
1:A:7[B]:PHE:C	1:A:7[B]:PHE:CD1	2.88	0.45
1:D:197[B]:LEU:CD2	3:D:302[B]:6YH:C2	2.94	0.44
1:A:3:LYS:HE2	1:A:66:HIS:NE2	2.32	0.44
1:A:49:GLN:OE1	1:A:77:HIS:NE2	2.44	0.44
1:A:88:THR:HG23	1:A:89:GLN:HG3	2.00	0.44
1:B:69:LYS:HZ1	4:B:305:EDO:H21	1.79	0.44
1:C:262:SER:O	1:C:263:GLN:CB	2.66	0.44
1:A:166:LYS:HZ2	1:A:166:LYS:HB2	1.82	0.44
1:C:54:SER:C	1:C:55:ALA:O	2.53	0.44
1:C:52:ASN:HA	1:C:178:ASN:HA	2.00	0.43
1:A:18[B]:LYS:O	1:A:18[B]:LYS:CG	2.65	0.43
1:D:180:GLU:HG3	1:D:183:LEU:HD12	2.00	0.43
1:B:49[B]:GLN:NE2	1:B:79:GLN:HB2	2.34	0.43
1:D:69:LYS:HD3	4:D:305[A]:EDO:H12	2.01	0.43
1:A:194[A]:ARG:CZ	1:A:207:LEU:HD13	2.49	0.42
1:A:7[B]:PHE:HD1	1:A:8:GLY:N	2.17	0.42
1:B:122:ASN:OD1	1:B:124:ASP:HB2	2.19	0.42

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:69:LYS:NZ	4:A:305:EDO:H21	2.35	0.42
1:C:149:GLY:O	1:C:218:SER:HA	2.20	0.42
1:A:60:LEU:HD11	1:A:171[A]:GLU:HB3	2.02	0.42
1:D:192:ARG:HD2	1:D:207:LEU:HD11	2.02	0.42
1:A:164:HIS:CD2	5:A:468:HOH:O	2.71	0.41
1:B:69:LYS:CE	4:B:305:EDO:H21	2.48	0.41
1:A:99:ASP:OD1	1:A:101:HIS:HD2	2.03	0.41
1:A:163:GLN:HG2	5:A:579:HOH:O	2.21	0.41
1:A:174:VAL:HA	1:A:175:PRO:HD3	1.92	0.41
1:A:231[B]:CYS:SG	1:A:240:ARG:NH1	2.94	0.40
1:C:69:LYS:HZ3	4:C:304:EDO:H21	1.84	0.40
1:A:52:ASN:HA	1:A:178:ASN:HA	2.04	0.40
1:A:40:ASP:OD1	1:A:42:SER:HB3	2.22	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:A:417:HOH:O	5:B:462:HOH:O[2_555]	2.13	0.07

## 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	270/263 (103%)	265 (98%)	5 (2%)	0	100	100
1	B	266/263 (101%)	260 (98%)	6 (2%)	0	100	100
1	C	265/263 (101%)	254 (96%)	11 (4%)	0	100	100
1	D	268/263 (102%)	262 (98%)	6 (2%)	0	100	100
All	All	1069/1052 (102%)	1041 (97%)	28 (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	243/235 (103%)	239 (98%)	4 (2%)	62	32
1	B	238/235 (101%)	231 (97%)	7 (3%)	42	10
1	C	232/235 (99%)	226 (97%)	6 (3%)	46	13
1	D	242/235 (103%)	237 (98%)	5 (2%)	53	20
All	All	955/940 (102%)	933 (98%)	22 (2%)	49	17

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	42	SER
1	A	148	MET
1	A	156	ASP
1	A	238	SER
1	B	3	LYS
1	B	84	ARG
1	B	89	GLN
1	B	125	LEU
1	B	130	SER
1	B	156	ASP
1	B	219	GLN
1	C	35	ASP
1	C	54	SER
1	C	58	GLN
1	C	89	GLN
1	C	148	MET
1	C	156	ASP
1	D	35	ASP
1	D	75	ASP
1	D	89	GLN
1	D	156	ASP
1	D	219	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	33	HIS
1	A	164	HIS
1	B	101	HIS
1	B	219	GLN
1	C	49	GLN
1	C	58	GLN
1	C	66	HIS
1	C	82	GLN
1	D	101	HIS
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 monosaccharides in this entry.

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

Of 21 ligands modelled in this entry, 4 are monoatomic - leaving 17 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	D	305[A]	-	3,3,3	0.79	0	2,2,2	1.14	0
4	EDO	C	304	-	3,3,3	0.80	0	2,2,2	0.61	0
3	6YH	D	302[B]	2	23,24,24	1.88	7 (30%)	30,35,35	2.26	10 (33%)
4	EDO	C	303	-	3,3,3	0.58	0	2,2,2	0.73	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	EDO	D	305[B]	-	3,3,3	1.16	0	2,2,2	0.87	0
4	EDO	A	304	-	3,3,3	0.56	0	2,2,2	0.62	0
4	EDO	D	304	-	3,3,3	0.68	0	2,2,2	0.41	0
4	EDO	B	304	-	3,3,3	0.34	0	2,2,2	0.51	0
3	6YH	C	302	2	23,24,24	1.80	7 (30%)	30,35,35	2.09	12 (40%)
4	EDO	A	303	-	3,3,3	0.69	0	2,2,2	0.16	0
4	EDO	B	303	-	3,3,3	0.86	0	2,2,2	0.23	0
4	EDO	A	305	-	3,3,3	0.65	0	2,2,2	0.26	0
3	6YH	A	302	2	23,24,24	1.92	7 (30%)	30,35,35	1.91	10 (33%)
4	EDO	D	303	-	3,3,3	0.95	0	2,2,2	0.04	0
3	6YH	D	302[A]	2	23,24,24	2.77	8 (34%)	30,35,35	2.12	9 (30%)
4	EDO	B	305	-	3,3,3	0.80	0	2,2,2	0.99	0
3	6YH	B	302	2	23,24,24	1.71	7 (30%)	30,35,35	2.34	11 (36%)

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	D	305[A]	-	-	0/1/1/1	-
4	EDO	C	304	-	-	1/1/1/1	-
3	6YH	D	302[B]	2	-	4/14/14/14	0/3/3/3
4	EDO	C	303	-	-	0/1/1/1	-
4	EDO	D	305[B]	-	-	0/1/1/1	-
4	EDO	A	304	-	-	0/1/1/1	-
4	EDO	D	304	-	-	0/1/1/1	-
4	EDO	B	304	-	-	0/1/1/1	-
3	6YH	C	302	2	-	5/14/14/14	0/3/3/3
4	EDO	A	303	-	-	0/1/1/1	-
4	EDO	B	303	-	-	0/1/1/1	-
4	EDO	A	305	-	-	1/1/1/1	-
3	6YH	A	302	2	-	2/14/14/14	0/3/3/3
4	EDO	D	303	-	-	0/1/1/1	-
3	6YH	D	302[A]	2	-	6/14/14/14	0/3/3/3
4	EDO	B	305	-	-	1/1/1/1	-
3	6YH	B	302	2	-	2/14/14/14	0/3/3/3

All (36) bond length outliers are listed below:



Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	302[A]	6YH	O9-S7	8.81	1.60	1.43
3	D	302[B]	6YH	O9-S7	4.71	1.52	1.43
3	D	302[A]	6YH	O8-S7	4.65	1.52	1.43
3	A	302	6YH	O8-S7	4.62	1.52	1.43
3	D	302[A]	6YH	C13-C11	4.42	1.56	1.52
3	A	302	6YH	O9-S7	4.13	1.51	1.43
3	D	302[A]	6YH	C1-S7	3.64	1.82	1.77
3	D	302[B]	6YH	O8-S7	3.52	1.50	1.43
3	C	302	6YH	C1-S7	3.42	1.82	1.77
3	C	302	6YH	C2-C3	3.40	1.44	1.38
3	D	302[A]	6YH	S7-N10	3.36	1.67	1.60
3	B	302	6YH	C2-C3	3.22	1.44	1.38
3	B	302	6YH	O9-S7	3.20	1.49	1.43
3	C	302	6YH	O8-S7	3.12	1.49	1.43
3	C	302	6YH	O9-S7	3.05	1.49	1.43
3	B	302	6YH	C1-S7	2.94	1.81	1.77
3	D	302[B]	6YH	C18-N14	-2.91	1.35	1.39
3	B	302	6YH	C21-C20	2.74	1.42	1.36
3	A	302	6YH	C21-C20	2.57	1.42	1.36
3	B	302	6YH	C22-C23	2.57	1.42	1.36
3	C	302	6YH	O12-C11	2.56	1.26	1.22
3	C	302	6YH	C18-N14	-2.54	1.36	1.39
3	D	302[B]	6YH	C1-S7	2.41	1.80	1.77
3	D	302[B]	6YH	C22-C23	2.40	1.42	1.36
3	D	302[A]	6YH	C18-N14	-2.29	1.36	1.39
3	D	302[A]	6YH	C22-C23	2.27	1.41	1.36
3	A	302	6YH	S7-N10	-2.27	1.55	1.60
3	C	302	6YH	C21-C20	2.25	1.41	1.36
3	D	302[A]	6YH	C21-C20	2.22	1.41	1.36
3	D	302[B]	6YH	C6-C5	2.22	1.42	1.38
3	A	302	6YH	C16-N17	2.17	1.38	1.34
3	A	302	6YH	C6-C1	2.12	1.42	1.38
3	B	302	6YH	C18-N14	-2.12	1.36	1.39
3	A	302	6YH	C2-C1	-2.11	1.35	1.38
3	D	302[B]	6YH	C21-C20	2.04	1.41	1.36
3	B	302	6YH	C22-C21	2.01	1.43	1.38

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	302[A]	6YH	C11-C13-N14	6.84	120.45	110.95
3	D	302[B]	6YH	C2-C1-S7	-6.03	110.99	119.73
3	D	302[B]	6YH	O12-C11-C13	5.24	126.27	120.43

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	302	6YH	O9-S7-N10	4.93	114.67	107.36
3	B	302	6YH	C6-C1-C2	4.75	127.08	120.44
3	D	302[B]	6YH	C6-C1-S7	4.71	126.57	119.73
3	C	302	6YH	C13-C11-C4	4.70	123.76	117.34
3	D	302[A]	6YH	O12-C11-C13	4.65	125.62	120.43
3	A	302	6YH	O9-S7-N10	4.37	113.85	107.36
3	B	302	6YH	C3-C2-C1	-4.36	114.93	119.45
3	B	302	6YH	C5-C6-C1	-3.85	115.46	119.45
3	C	302	6YH	O12-C11-C4	-3.69	115.52	120.74
3	B	302	6YH	C5-C4-C3	3.64	123.78	118.59
3	C	302	6YH	O8-S7-N10	3.59	112.69	107.36
3	B	302	6YH	O12-C11-C4	-3.56	115.70	120.74
3	A	302	6YH	O8-S7-O9	-3.53	112.95	118.76
3	A	302	6YH	C13-N14-C16	3.47	129.75	125.66
3	B	302	6YH	C13-C11-C4	3.37	121.95	117.34
3	C	302	6YH	O8-S7-C1	-3.22	103.75	107.35
3	C	302	6YH	O8-S7-O9	-3.20	113.49	118.76
3	D	302[A]	6YH	O9-S7-N10	3.17	112.06	107.36
3	C	302	6YH	C5-C4-C11	-3.10	113.62	120.61
3	D	302[A]	6YH	O12-C11-C4	-3.05	116.42	120.74
3	D	302[B]	6YH	O8-S7-O9	-3.02	113.80	118.76
3	D	302[A]	6YH	C13-N14-C16	2.83	129.00	125.66
3	A	302	6YH	O12-C11-C4	-2.82	116.75	120.74
3	C	302	6YH	C6-C1-S7	-2.77	115.71	119.73
3	A	302	6YH	C2-C1-S7	-2.76	115.73	119.73
3	D	302[B]	6YH	O8-S7-C1	-2.71	104.32	107.35
3	D	302[A]	6YH	O8-S7-O9	-2.69	114.33	118.76
3	A	302	6YH	C6-C1-C2	2.66	124.16	120.44
3	D	302[B]	6YH	O8-S7-N10	2.61	111.24	107.36
3	A	302	6YH	C13-C11-C4	2.54	120.81	117.34
3	A	302	6YH	C11-C13-N14	2.50	114.43	110.95
3	D	302[B]	6YH	O9-S7-N10	2.46	111.01	107.36
3	B	302	6YH	O9-S7-C1	-2.39	104.68	107.35
3	C	302	6YH	C3-C2-C1	-2.36	117.00	119.45
3	B	302	6YH	C2-C1-S7	-2.35	116.32	119.73
3	D	302[B]	6YH	C5-C4-C3	2.34	121.92	118.59
3	D	302[A]	6YH	C1-S7-N10	-2.30	105.13	108.38
3	C	302	6YH	O9-S7-C1	2.27	109.88	107.35
3	B	302	6YH	C6-C1-S7	-2.27	116.45	119.73
3	D	302[A]	6YH	O8-S7-N10	2.25	110.70	107.36
3	C	302	6YH	C3-C4-C11	2.23	125.64	120.61
3	C	302	6YH	C13-N14-C16	2.22	128.28	125.66

*Continued on next page...*

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	302	6YH	C6-C1-C2	2.20	123.51	120.44
3	D	302[B]	6YH	C11-C13-N14	2.17	113.97	110.95
3	B	302	6YH	C1-S7-N10	-2.17	105.31	108.38
3	A	302	6YH	C6-C5-C4	-2.16	118.26	120.78
3	D	302[B]	6YH	O12-C11-C4	-2.10	117.77	120.74
3	D	302[A]	6YH	O8-S7-C1	-2.05	105.07	107.35
3	A	302	6YH	C5-C4-C3	2.00	121.44	118.59

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	D	302[A]	6YH	C11-C13-N14-C16
4	A	305	EDO	O1-C1-C2-O2
4	B	305	EDO	O1-C1-C2-O2
3	C	302	6YH	C6-C1-S7-N10
3	D	302[B]	6YH	C2-C1-S7-N10
3	D	302[B]	6YH	C6-C1-S7-N10
3	C	302	6YH	C6-C1-S7-O9
3	C	302	6YH	C2-C1-S7-N10
3	D	302[B]	6YH	C2-C1-S7-O9
3	D	302[A]	6YH	C6-C1-S7-O9
3	C	302	6YH	C2-C1-S7-O9
3	D	302[B]	6YH	C6-C1-S7-O9
3	D	302[A]	6YH	C11-C13-N14-C18
4	C	304	EDO	O1-C1-C2-O2
3	D	302[A]	6YH	C2-C1-S7-O9
3	A	302	6YH	C2-C1-S7-O9
3	A	302	6YH	C6-C1-S7-O9
3	B	302	6YH	C6-C1-S7-O9
3	D	302[A]	6YH	C6-C1-S7-N10
3	C	302	6YH	O12-C11-C4-C3
3	B	302	6YH	C2-C1-S7-O9
3	D	302[A]	6YH	C13-C11-C4-C5

There are no ring outliers.

9 monomers are involved in 27 short contacts:

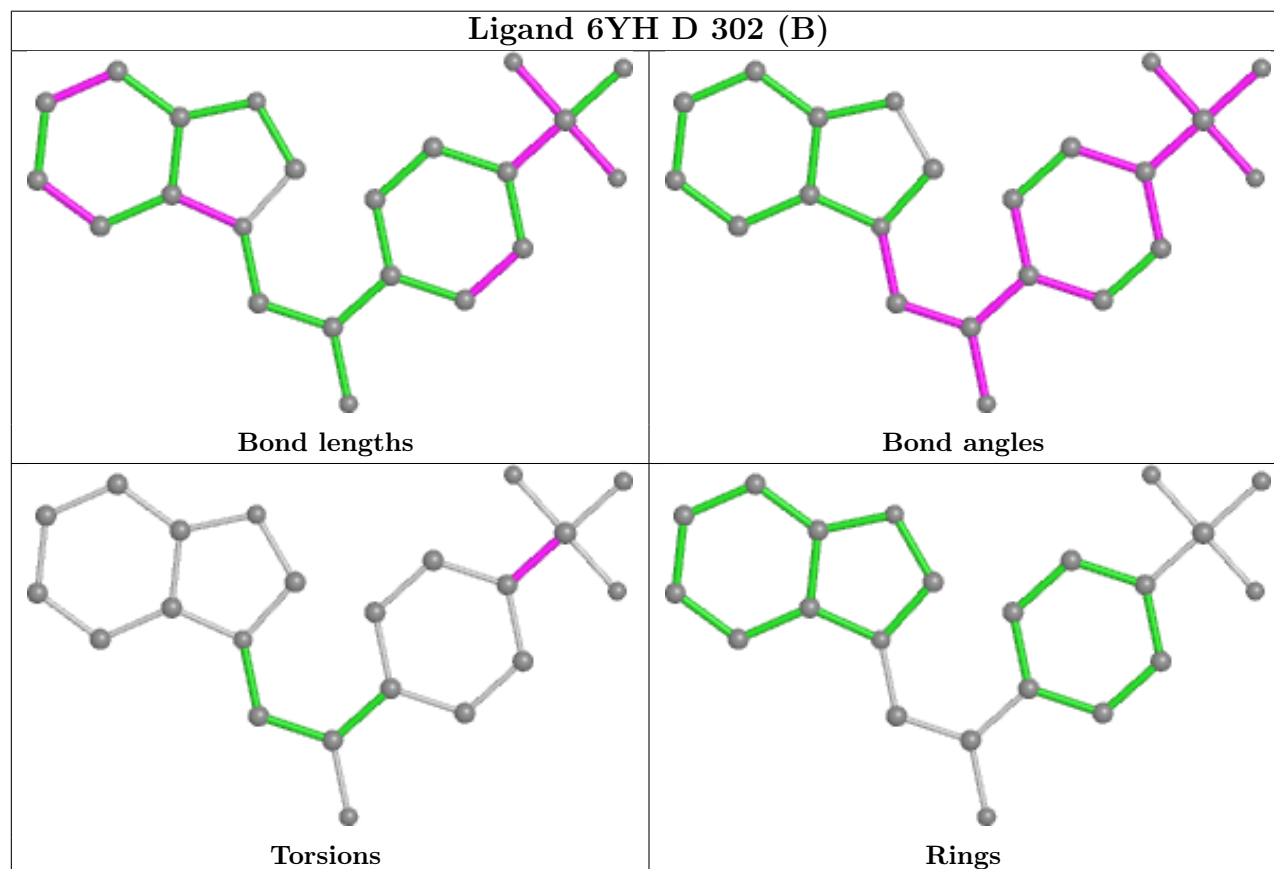
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	305[A]	EDO	3	0
4	C	304	EDO	2	0

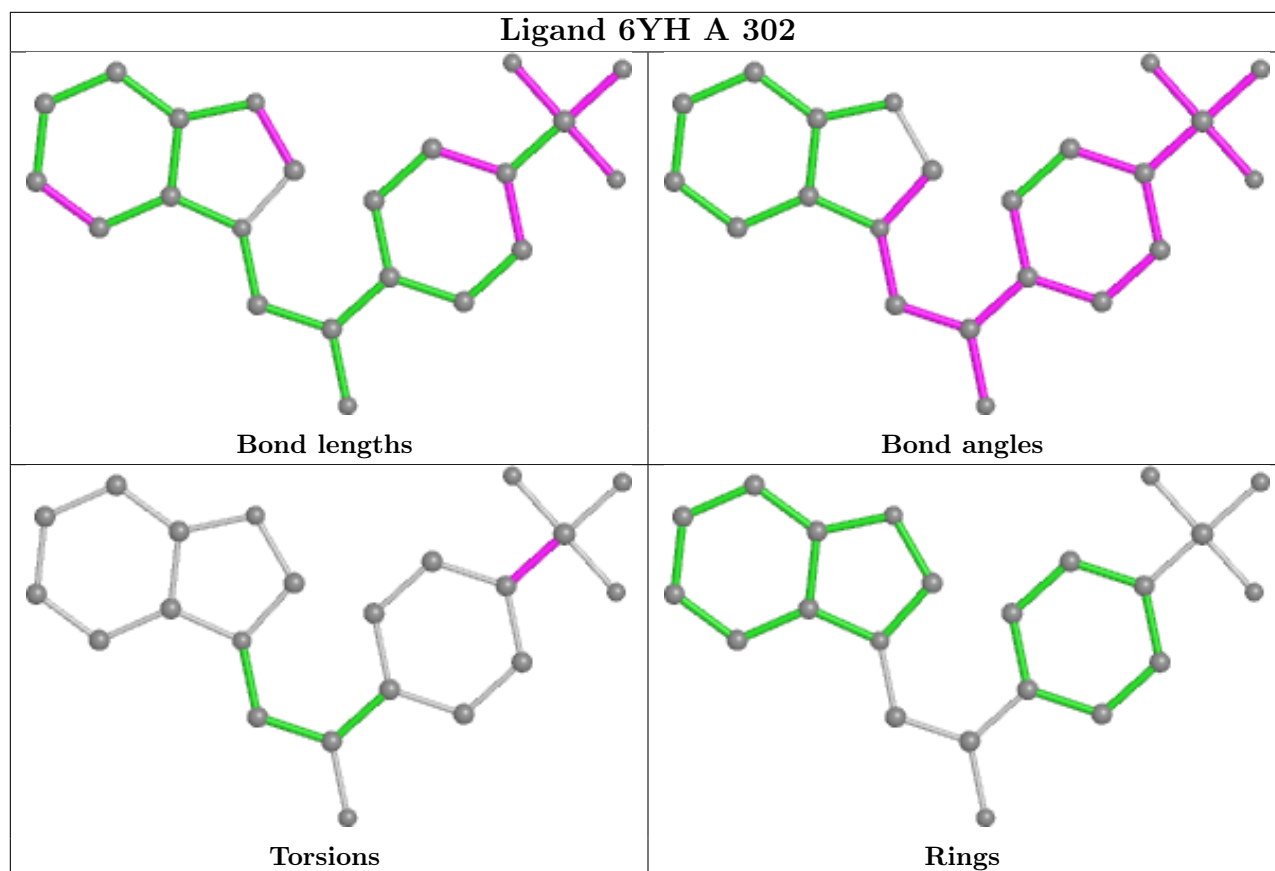
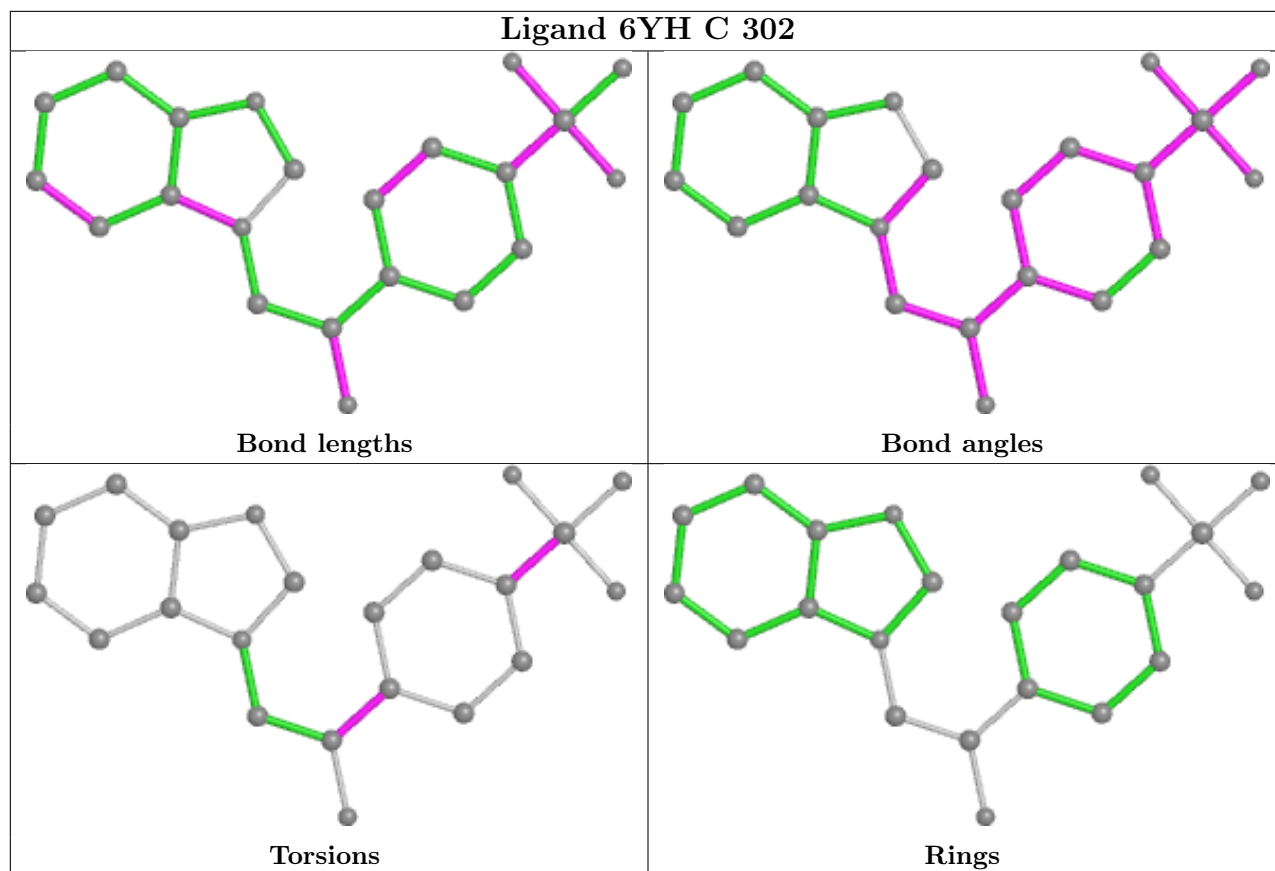
Continued on next page...

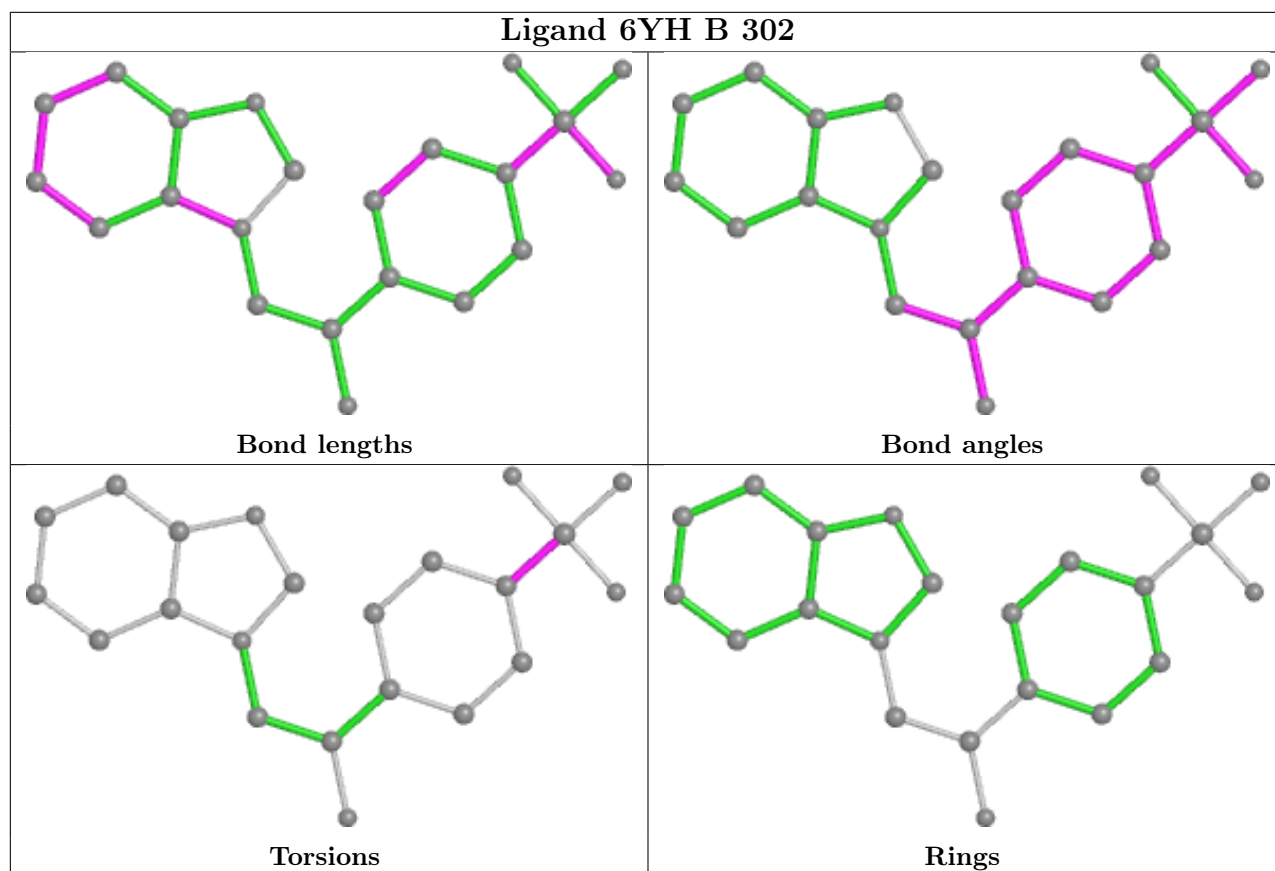
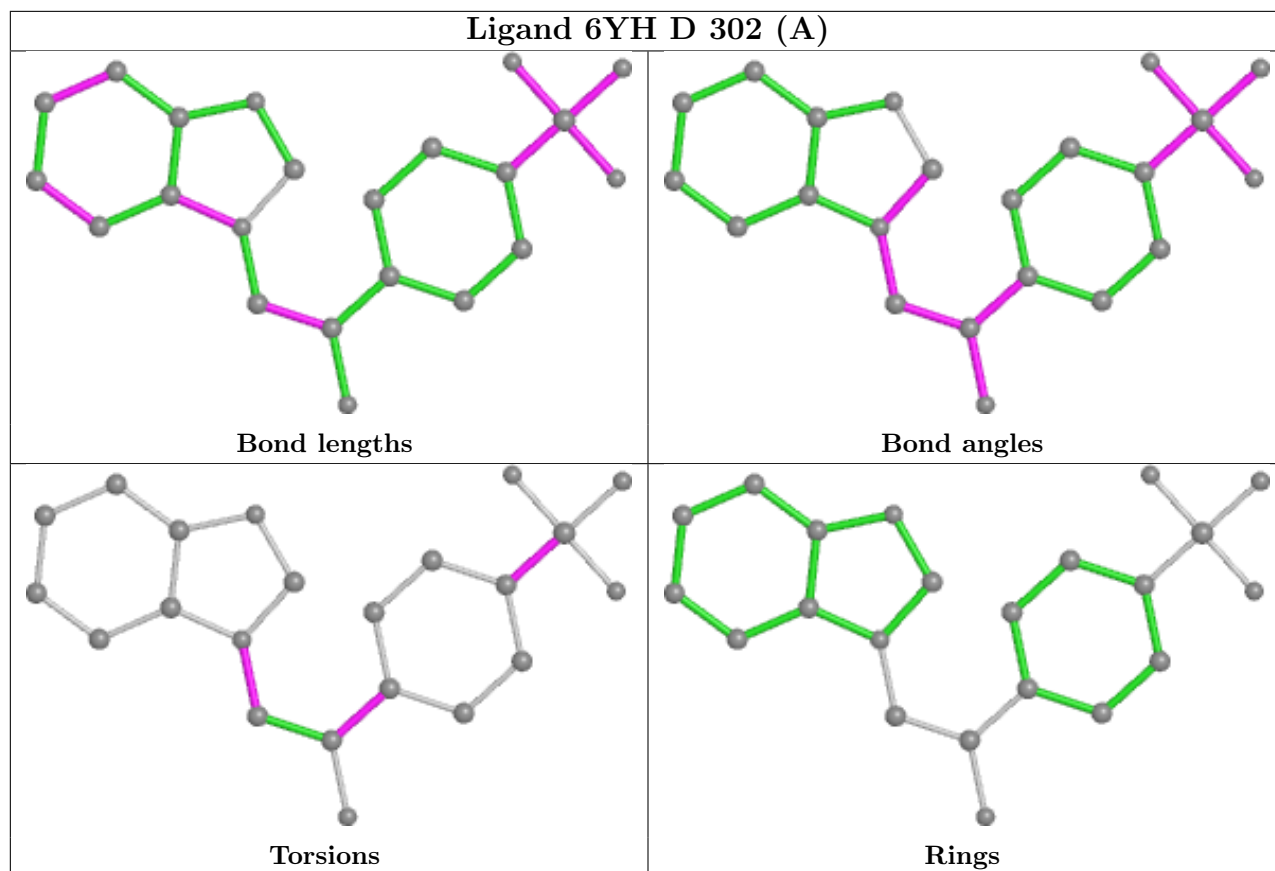
Continued from previous page...

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	302[B]	6YH	4	0
4	C	303	EDO	1	0
4	D	305[B]	EDO	3	0
3	C	302	6YH	3	0
4	A	305	EDO	1	0
3	D	302[A]	6YH	4	0
4	B	305	EDO	6	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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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%)	-0.20	3 (1%) 80 79	8, 16, 32, 49	0
1	B	261/263 (99%)	-0.16	4 (1%) 73 72	7, 12, 31, 45	0
1	C	261/263 (99%)	-0.03	8 (3%) 49 48	8, 18, 34, 61	0
1	D	261/263 (99%)	-0.32	1 (0%) 92 91	7, 12, 24, 62	0
All	All	1044/1052 (99%)	-0.18	16 (1%) 73 72	7, 14, 31, 62	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	56	ASN	6.2
1	C	55	ALA	4.2
1	A	7[A]	PHE	3.9
1	C	7	PHE	3.4
1	C	58	GLN	3.0
1	C	54	SER	2.8
1	D	263	GLN	2.8
1	C	237	PRO	2.6
1	C	174	VAL	2.6
1	A	56	ASN	2.4
1	B	252	PHE	2.3
1	B	137	GLU	2.3
1	B	81	LEU	2.2
1	B	125	LEU	2.1
1	A	252[A]	PHE	2.1
1	C	57	LYS	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](#)

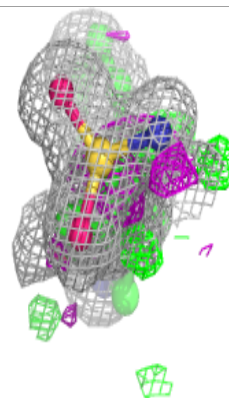
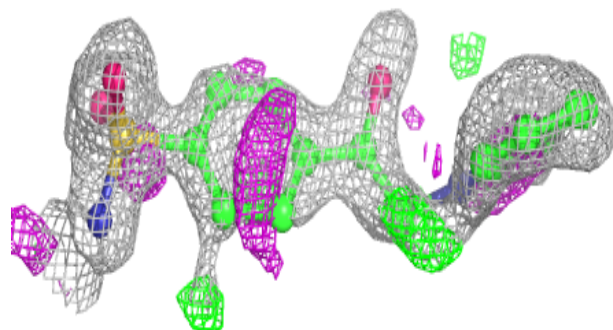
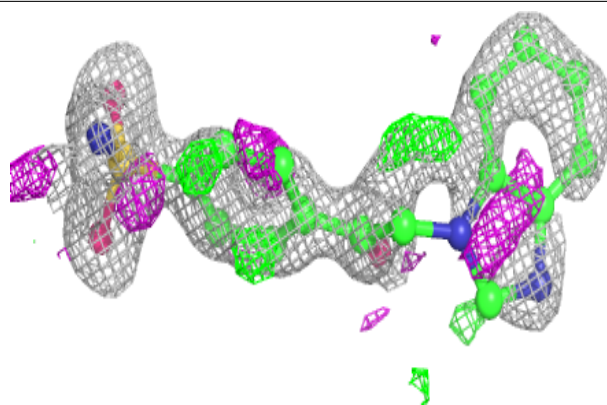
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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	305[A]	4/4	0.68	0.23	20,20,26,32	4
4	EDO	D	305[B]	4/4	0.68	0.23	19,20,22,22	4
4	EDO	C	304	4/4	0.80	0.11	39,40,44,46	0
4	EDO	B	305	4/4	0.84	0.11	20,24,25,29	0
4	EDO	C	303	4/4	0.86	0.20	32,36,38,41	0
4	EDO	A	305	4/4	0.86	0.10	34,37,40,42	0
4	EDO	D	303	4/4	0.88	0.12	23,23,24,31	0
4	EDO	A	304	4/4	0.92	0.14	25,25,28,28	0
4	EDO	A	303	4/4	0.92	0.09	27,28,28,29	0
4	EDO	B	303	4/4	0.92	0.10	23,27,29,31	0
3	6YH	C	302	22/22	0.95	0.21	13,37,53,57	0
3	6YH	D	302[A]	22/22	0.96	0.20	13,34,50,54	22
4	EDO	D	304	4/4	0.96	0.08	18,19,20,20	0
3	6YH	D	302[B]	22/22	0.96	0.20	8,17,19,19	22
3	6YH	A	302	22/22	0.96	0.20	11,31,44,44	0
3	6YH	B	302	22/22	0.97	0.15	9,26,55,56	0
4	EDO	B	304	4/4	0.98	0.07	15,15,17,18	0
2	ZN	B	301	1/1	1.00	0.07	6,6,6,6	0
2	ZN	C	301	1/1	1.00	0.06	10,10,10,10	0
2	ZN	D	301	1/1	1.00	0.06	7,7,7,7	0
2	ZN	A	301	1/1	1.00	0.06	8,8,8,8	0

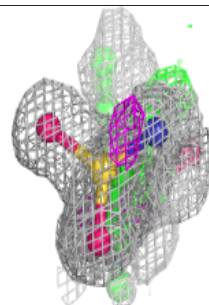
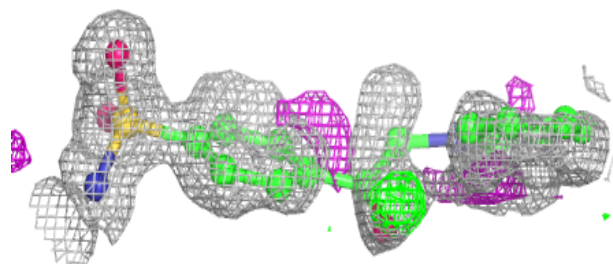
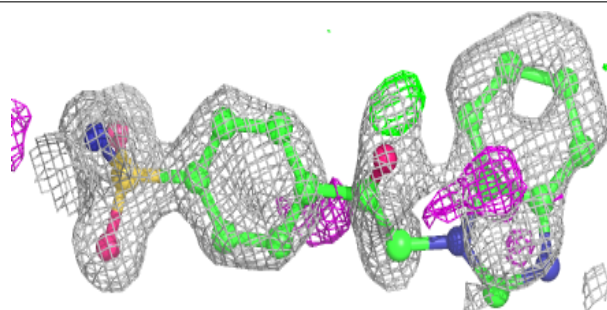
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around 6YH 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)

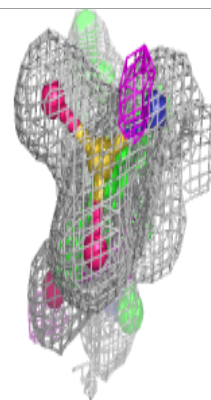
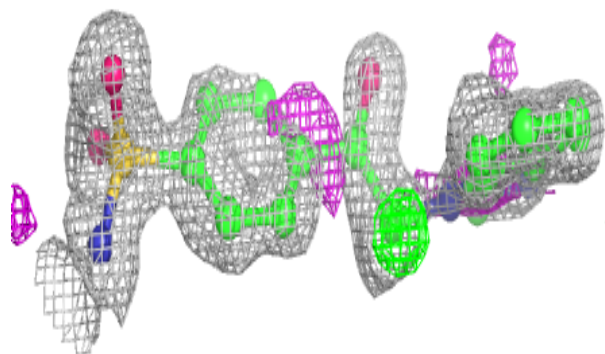
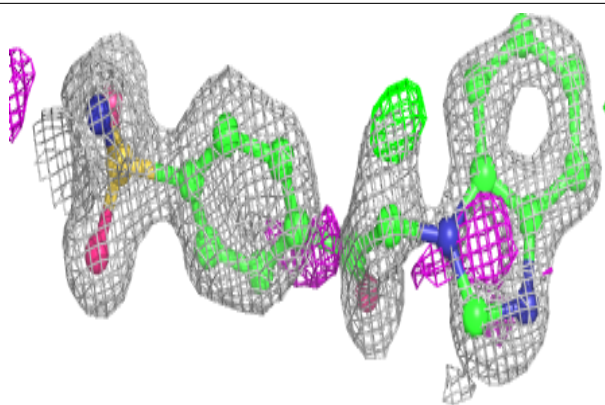
**Electron density around 6YH D 302 (A):**

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

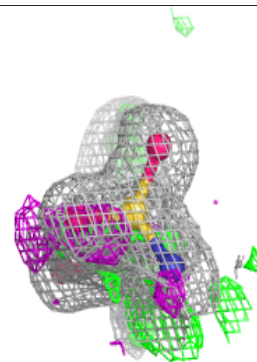
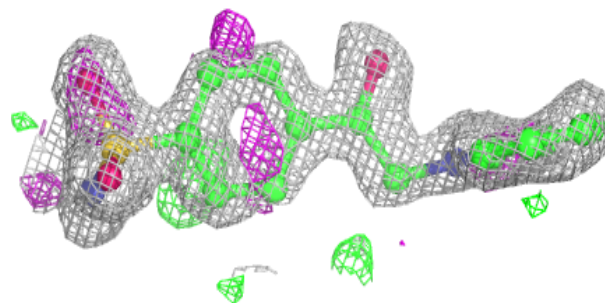
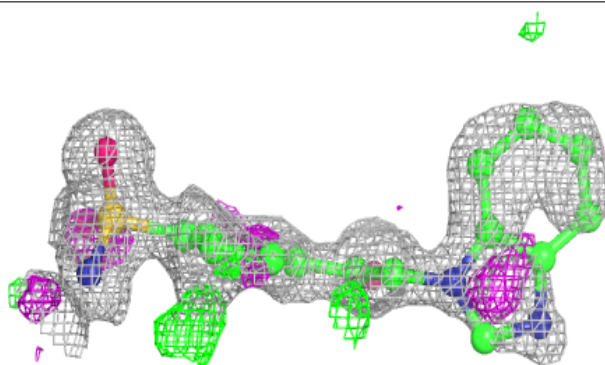


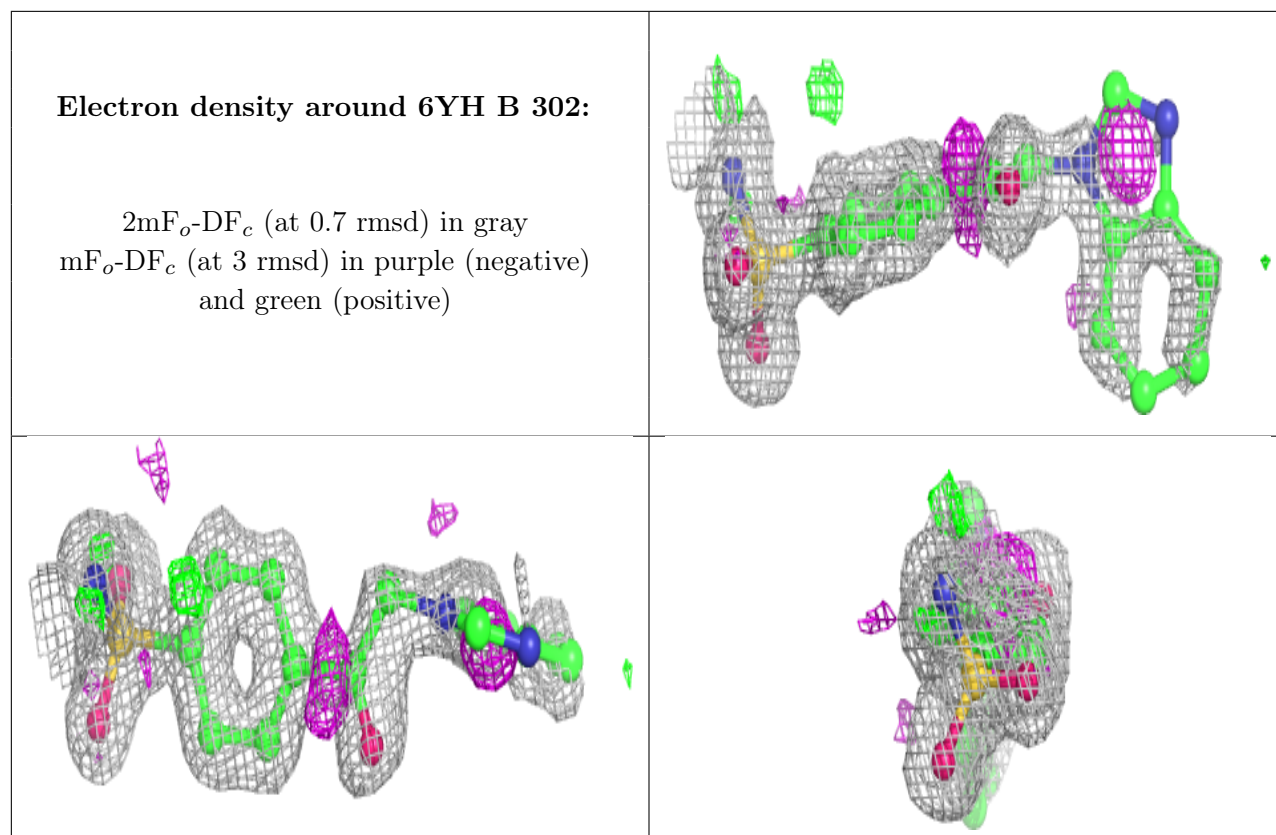
**Electron density around 6YH D 302 (B):**

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

**Electron density around 6YH A 302:**

$2mF_o-DF_c$  (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.