



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 4, 2025 – 02:22 PM JST

PDB ID : 9KEK / pdb_00009kek
Title : human glyoxalase I (with C-ter His tag) in complex with piceatannol
Authors : Ando, K.; Yokoyama, H.
Deposited on : 2024-11-05
Resolution : 2.11 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 : 4-5-2 with Phenix2.0
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 2.0
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.46

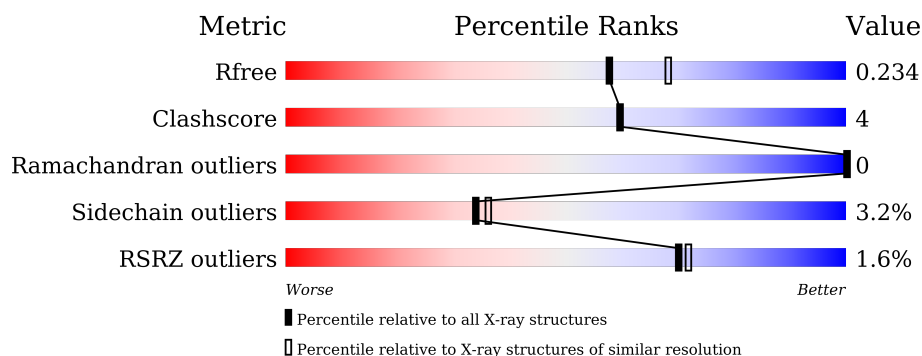
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.11 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}	164625	7689 (2.14-2.10)
Clashscore	180529	8431 (2.14-2.10)
Ramachandran outliers	177936	8366 (2.14-2.10)
Sidechain outliers	177891	8367 (2.14-2.10)
RSRZ outliers	164620	7689 (2.14-2.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	192	<div> <div>2%</div> <div> <div></div> <div>81%</div> <div>9%</div> <div>• 8%</div> </div> </div>
1	B	192	<div> <div>0%</div> <div> <div></div> <div>76%</div> <div>17%</div> <div>• 6%</div> </div> </div>
1	C	192	<div> <div>2%</div> <div> <div></div> <div>79%</div> <div>12%</div> <div>• 8%</div> </div> </div>
1	D	192	<div> <div>0%</div> <div> <div></div> <div>74%</div> <div>13%</div> <div>• 8%</div> </div> </div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11613 atoms, of which 5657 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 Lactoylglutathione lyase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	176	Total	C	H	N	O	S	35	0	0
			2778	892	1379	229	268	10			
1	B	180	Total	C	H	N	O	S	39	0	0
			2848	915	1412	237	274	10			
1	C	176	Total	C	H	N	O	S	35	0	0
			2778	892	1379	229	268	10			
1	D	176	Total	C	H	N	O	S	35	0	0
			2778	892	1379	229	268	10			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	184	LEU	-	expression tag	UNP Q04760
A	185	GLU	-	expression tag	UNP Q04760
A	186	HIS	-	expression tag	UNP Q04760
A	187	HIS	-	expression tag	UNP Q04760
A	188	HIS	-	expression tag	UNP Q04760
A	189	HIS	-	expression tag	UNP Q04760
A	190	HIS	-	expression tag	UNP Q04760
A	191	HIS	-	expression tag	UNP Q04760
B	184	LEU	-	expression tag	UNP Q04760
B	185	GLU	-	expression tag	UNP Q04760
B	186	HIS	-	expression tag	UNP Q04760
B	187	HIS	-	expression tag	UNP Q04760
B	188	HIS	-	expression tag	UNP Q04760
B	189	HIS	-	expression tag	UNP Q04760
B	190	HIS	-	expression tag	UNP Q04760
B	191	HIS	-	expression tag	UNP Q04760
C	184	LEU	-	expression tag	UNP Q04760
C	185	GLU	-	expression tag	UNP Q04760
C	186	HIS	-	expression tag	UNP Q04760
C	187	HIS	-	expression tag	UNP Q04760
C	188	HIS	-	expression tag	UNP Q04760

Continued on next page...

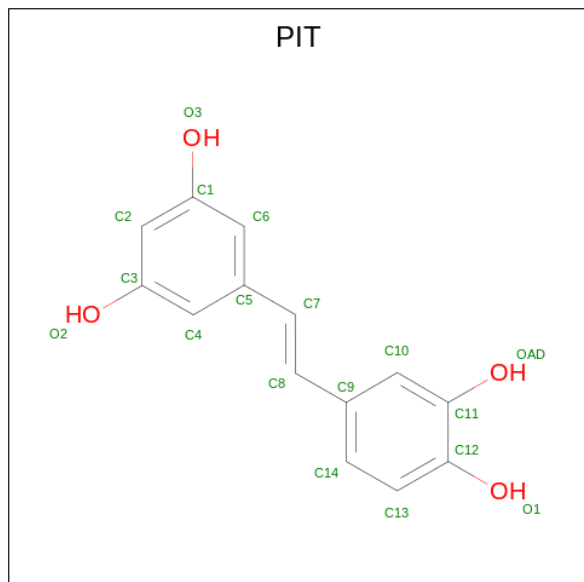
Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	189	HIS	-	expression tag	UNP Q04760
C	190	HIS	-	expression tag	UNP Q04760
C	191	HIS	-	expression tag	UNP Q04760
D	184	LEU	-	expression tag	UNP Q04760
D	185	GLU	-	expression tag	UNP Q04760
D	186	HIS	-	expression tag	UNP Q04760
D	187	HIS	-	expression tag	UNP Q04760
D	188	HIS	-	expression tag	UNP Q04760
D	189	HIS	-	expression tag	UNP Q04760
D	190	HIS	-	expression tag	UNP Q04760
D	191	HIS	-	expression tag	UNP Q04760

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

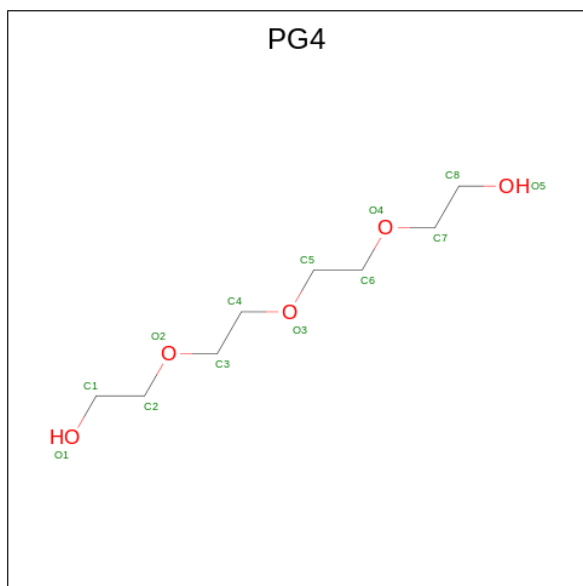
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0
2	B	1	Total Zn 1 1	0	0
2	C	1	Total Zn 1 1	0	0
2	D	1	Total Zn 1 1	0	0

- Molecule 3 is PICEATANNOL (CCD ID: PIT) (formula: C₁₄H₁₂O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	H	O	4	0
			30	14	12	4		
3	B	1	Total	C	H	O	4	0
			30	14	12	4		
3	C	1	Total	C	H	O	4	0
			30	14	12	4		

- Molecule 4 is TETRAETHYLENE GLYCOL (CCD ID: PG4) (formula: $C_8H_{18}O_5$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	H	O	2	0
			31	8	18	5		
4	B	1	Total	C	H	O	2	0
			31	8	18	5		
4	C	1	Total	C	H	O	2	0
			31	8	18	5		
4	D	1	Total	C	H	O	2	0
			31	8	18	5		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	55	Total	O	0	0
			55	55		
5	B	58	Total	O	0	0
			58	58		
5	C	45	Total	O	0	0
			45	45		

Continued on next page...

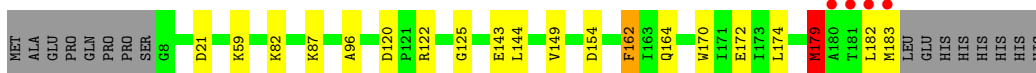
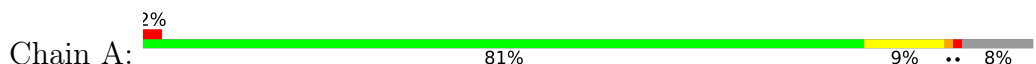
Continued from previous page...

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	D	55	Total	O	0	0
			55	55		

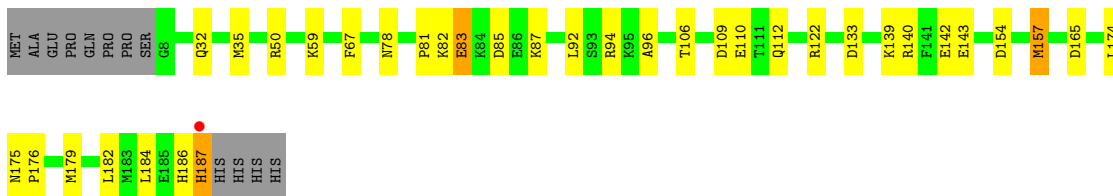
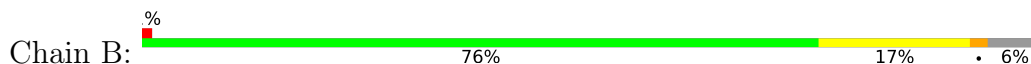
3 Residue-property plots [i](#)

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.

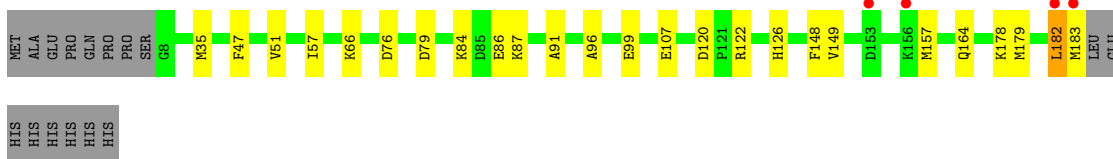
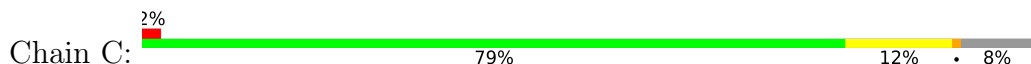
- Molecule 1: Lactoylglutathione lyase



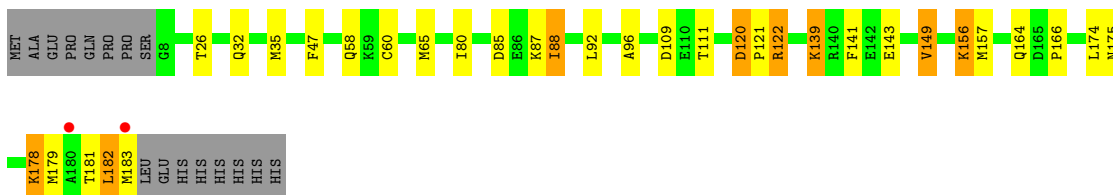
- Molecule 1: Lactoylglutathione lyase



- Molecule 1: Lactoylglutathione lyase



- Molecule 1: Lactoylglutathione lyase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	73.96Å 65.76Å 69.63Å 90.00° 96.22° 90.00°	Depositor
Resolution (Å)	19.93 – 2.11 19.93 – 2.11	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.93-2.11) 99.8 (19.93-2.11)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.14 (at 2.11Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.166 , 0.233 0.168 , 0.234	Depositor DCC
R_{free} test set	1897 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	21.0	Xtriage
Anisotropy	0.139	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.45 , 38.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11613	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.79% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PIT, ZN, PG4

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	0.97	0/1431	1.44	9/1930 (0.5%)
1	B	1.01	1/1470 (0.1%)	1.52	17/1983 (0.9%)
1	C	1.03	2/1431 (0.1%)	1.38	3/1930 (0.2%)
1	D	1.02	0/1431	1.45	10/1930 (0.5%)
All	All	1.01	3/5763 (0.1%)	1.45	39/7773 (0.5%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	2
1	C	0	1
1	D	0	1
All	All	0	4

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	81	PRO	CA-CB	5.86	1.61	1.53
1	C	126	HIS	CE1-NE2	-5.26	1.27	1.32
1	C	79	ASP	C-O	-5.14	1.17	1.24

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	162	PHE	CA-CB-CG	7.79	121.59	113.80
1	A	21	ASP	CA-CB-CG	7.30	119.90	112.60
1	A	179	MET	N-CA-C	-7.18	103.78	112.54

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	154	ASP	CA-CB-CG	6.90	119.50	112.60
1	A	120	ASP	CA-CB-CG	6.84	119.44	112.60
1	B	110	GLU	CB-CG-CD	6.66	123.92	112.60
1	B	133	ASP	CA-CB-CG	6.41	119.01	112.60
1	D	122	ARG	NE-CZ-NH1	-6.41	115.09	121.50
1	B	109	ASP	CB-CA-C	6.29	120.72	110.22
1	B	67	PHE	CA-CB-CG	6.28	120.08	113.80
1	D	65	MET	CG-SD-CE	6.13	114.39	100.90
1	D	109	ASP	CA-CB-CG	6.12	118.72	112.60
1	B	110	GLU	CB-CA-C	-5.96	100.90	110.79
1	B	139	LYS	N-CA-CB	5.88	118.77	110.12
1	D	157	MET	CG-SD-CE	5.87	113.80	100.90
1	D	26	THR	N-CA-C	-5.83	105.82	113.17
1	A	122	ARG	CD-NE-CZ	5.75	132.45	124.40
1	D	141	PHE	CA-CB-CG	5.69	119.49	113.80
1	B	143	GLU	N-CA-CB	5.56	118.40	110.06
1	B	186	HIS	CA-CB-CG	5.52	119.32	113.80
1	B	140	ARG	CB-CA-C	5.49	119.57	110.90
1	B	67	PHE	N-CA-CB	5.48	120.81	111.66
1	B	142	GLU	CB-CG-CD	5.48	121.92	112.60
1	A	183	MET	CG-SD-CE	5.44	112.87	100.90
1	A	143	GLU	N-CA-CB	5.42	118.58	110.22
1	D	111	THR	OG1-CB-CG2	-5.40	98.51	109.30
1	B	157	MET	CG-SD-CE	-5.34	89.15	100.90
1	D	120	ASP	O-C-N	-5.30	117.03	121.38
1	C	76	ASP	O-C-N	-5.30	116.70	123.06
1	C	120	ASP	CA-CB-CG	5.29	117.89	112.60
1	B	182	LEU	CA-C-N	5.23	129.15	120.94
1	B	182	LEU	C-N-CA	5.23	129.15	120.94
1	C	148	PHE	CA-CB-CG	-5.23	108.57	113.80
1	B	154	ASP	CA-CB-CG	5.18	117.78	112.60
1	D	149	VAL	N-CA-C	-5.15	106.12	111.58
1	B	112	GLN	CB-CA-C	5.11	117.51	109.84
1	B	83	GLU	CB-CA-C	5.08	118.62	110.29
1	D	32	GLN	N-CA-CB	-5.08	102.71	110.33
1	A	143	GLU	CB-CA-C	-5.02	101.35	110.63

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	122	ARG	Sidechain

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Group
1	B	94	ARG	Sidechain
1	C	122	ARG	Sidechain
1	D	122	ARG	Sidechain

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1399	1379	1375	11	0
1	B	1436	1412	1406	15	0
1	C	1399	1379	1375	10	0
1	D	1399	1379	1375	16	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	1	0
2	D	1	0	0	0	0
3	A	18	12	12	2	0
3	B	18	12	11	1	0
3	C	18	12	12	3	0
4	A	13	18	18	2	0
4	B	13	18	18	3	0
4	C	13	18	18	1	0
4	D	13	18	18	3	0
5	A	55	0	0	0	0
5	B	58	0	0	2	0
5	C	45	0	0	0	0
5	D	55	0	0	0	0
All	All	5956	5657	5638	48	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 4.

All (48) 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:D:87:LYS:HZ1	4:D:202:PG4:H31	1.55	0.71

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:179:MET:HE3	3:B:202:PIT:O1	1.89	0.71
1:C:183:MET:SD	1:D:60:CYS:SG	2.90	0.69
1:B:82:LYS:HD2	4:B:203:PG4:H82	1.75	0.69
1:D:85:ASP:O	1:D:88:ILE:HG22	1.94	0.68
3:C:202:PIT:H4	1:D:35:MET:HE2	1.80	0.64
1:D:149:VAL:HG23	1:D:164:GLN:HG3	1.83	0.60
1:B:106:THR:HG21	5:B:302:HOH:O	2.04	0.57
1:C:87:LYS:HZ1	4:C:203:PG4:H31	1.70	0.56
1:A:59:LYS:HB3	4:A:203:PG4:H82	1.88	0.56
1:C:149:VAL:HG23	1:C:164:GLN:HG3	1.89	0.55
1:C:179:MET:HG3	1:D:92:LEU:HD23	1.90	0.52
1:B:83:GLU:OE1	1:B:85:ASP:HB2	2.10	0.52
1:C:47:PHE:O	1:C:51:VAL:HB	2.10	0.52
1:A:179:MET:HG3	1:B:92:LEU:HD23	1.91	0.52
1:A:162:PHE:CE1	3:A:202:PIT:H4	2.46	0.51
3:C:202:PIT:H14	3:C:202:PIT:H6	1.92	0.50
1:D:175:ASN:O	1:D:179:MET:HG2	2.12	0.49
1:A:149:VAL:HG23	1:A:164:GLN:HG3	1.96	0.47
1:B:184:LEU:HB3	1:B:187:HIS:CD2	2.50	0.47
1:A:96:ALA:HB2	1:B:96:ALA:HB2	1.96	0.46
1:B:32:GLN:HG3	1:B:92:LEU:O	2.14	0.46
1:A:162:PHE:CE2	1:A:172:GLU:HB2	2.50	0.46
1:D:87:LYS:NZ	4:D:202:PG4:H31	2.28	0.46
1:C:157:MET:HG3	1:C:182:LEU:HD13	1.97	0.46
1:B:165:ASP:OD1	1:B:165:ASP:C	2.59	0.45
1:C:96:ALA:HB2	1:D:96:ALA:HB2	1.98	0.45
1:A:87:LYS:HD2	4:A:203:PG4:H22	1.97	0.45
1:D:120:ASP:HA	1:D:121:PRO:HA	1.85	0.45
1:D:80:ILE:HD13	4:D:202:PG4:H21	1.97	0.45
1:B:59:LYS:H	4:B:203:PG4:H22	1.82	0.44
1:A:170:TRP:HZ3	3:A:202:PIT:H2	1.84	0.43
1:D:156:LYS:HE3	1:D:156:LYS:HB2	1.83	0.43
1:C:57:ILE:HD12	1:C:91:ALA:HA	2.01	0.43
1:A:125:GLY:HA3	1:B:35:MET:HE3	2.01	0.42
1:B:87:LYS:NZ	4:B:203:PG4:H32	2.33	0.42
1:A:82:LYS:H	1:A:82:LYS:HG2	1.73	0.42
1:B:50:ARG:NH1	5:B:301:HOH:O	2.39	0.42
1:D:47:PHE:CG	1:D:166:PRO:HD3	2.55	0.42
1:B:175:ASN:O	1:B:176:PRO:C	2.61	0.41
1:C:107:GLU:OE1	1:C:107:GLU:N	2.46	0.41
1:A:144:LEU:HA	1:A:144:LEU:HD23	1.83	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:32:GLN:NE2	1:B:92:LEU:HA	2.36	0.41
1:C:35:MET:HA	1:C:99:GLU:O	2.20	0.41
1:D:139:LYS:O	1:D:143:GLU:HG3	2.21	0.41
1:D:58:GLN:OE1	1:D:87:LYS:HG2	2.21	0.41
1:D:178:LYS:O	1:D:182:LEU:HG	2.21	0.40
2:C:201:ZN:ZN	3:C:202:PIT:H10	1.52	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	174/192 (91%)	168 (97%)	6 (3%)	0	100	100
1	B	178/192 (93%)	170 (96%)	8 (4%)	0	100	100
1	C	174/192 (91%)	163 (94%)	11 (6%)	0	100	100
1	D	174/192 (91%)	167 (96%)	7 (4%)	0	100	100
All	All	700/768 (91%)	668 (95%)	32 (5%)	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	153/168 (91%)	150 (98%)	3 (2%)	50	56
1	B	157/168 (94%)	153 (98%)	4 (2%)	42	46
1	C	153/168 (91%)	148 (97%)	5 (3%)	33	35
1	D	153/168 (91%)	145 (95%)	8 (5%)	19	18
All	All	616/672 (92%)	596 (97%)	20 (3%)	34	36

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	174	LEU
1	A	179	MET
1	A	182	LEU
1	B	78	ASN
1	B	157	MET
1	B	174	LEU
1	B	187	HIS
1	C	66	LYS
1	C	84	LYS
1	C	86	GLU
1	C	178	LYS
1	C	182	LEU
1	D	88	ILE
1	D	139	LYS
1	D	156	LYS
1	D	174	LEU
1	D	178	LYS
1	D	181	THR
1	D	182	LEU
1	D	183	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	58	GLN
1	B	103	ASN
1	C	58	GLN
1	C	115	HIS
1	D	103	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 11 ligands modelled in this entry, 4 are monoatomic - leaving 7 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	PG4	A	203	-	12,12,12	0.51	0	11,11,11	0.52	0
3	PIT	B	202	2	19,19,19	1.23	2 (10%)	26,26,26	0.90	1 (3%)
3	PIT	A	202	2	19,19,19	1.02	1 (5%)	26,26,26	1.47	6 (23%)
4	PG4	D	202	-	12,12,12	0.37	0	11,11,11	0.54	0
4	PG4	C	203	-	12,12,12	0.43	0	11,11,11	0.40	0
4	PG4	B	203	-	12,12,12	0.28	0	11,11,11	0.39	0
3	PIT	C	202	-	19,19,19	0.66	0	26,26,26	1.93	3 (11%)

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	PG4	A	203	-	-	7/10/10/10	-
3	PIT	B	202	2	-	4/5/5/5	0/2/2/2

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PIT	A	202	2	-	3/5/5/5	0/2/2/2
4	PG4	D	202	-	-	6/10/10/10	-
4	PG4	C	203	-	-	4/10/10/10	-
4	PG4	B	203	-	-	6/10/10/10	-
3	PIT	C	202	-	-	4/5/5/5	0/2/2/2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	202	PIT	OAD-C11	3.42	1.43	1.36
3	B	202	PIT	OAD-C11	3.37	1.43	1.36
3	B	202	PIT	C10-C11	3.12	1.43	1.38

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	202	PIT	OAD-C11-C12	6.27	135.15	118.45
3	C	202	PIT	OAD-C11-C10	-5.16	105.64	119.46
3	A	202	PIT	C10-C11-C12	-2.98	117.22	119.86
3	A	202	PIT	OAD-C11-C10	2.85	127.10	119.46
3	A	202	PIT	O2-C3-C2	2.63	126.69	119.84
3	C	202	PIT	O1-C12-C11	2.54	125.22	118.45
3	A	202	PIT	O2-C3-C4	-2.28	113.90	119.84
3	A	202	PIT	C13-C12-C11	2.23	122.12	119.67
3	A	202	PIT	C4-C5-C7	-2.09	114.39	120.60
3	B	202	PIT	C10-C11-C12	-2.06	118.04	119.86

There are no chirality outliers.

All (34) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	202	PIT	C5-C7-C8-C9
3	A	202	PIT	C5-C7-C8-C9
3	A	202	PIT	C7-C8-C9-C14
4	B	203	PG4	O2-C3-C4-O3
3	C	202	PIT	C7-C8-C9-C10
3	C	202	PIT	C7-C8-C9-C14
4	D	202	PG4	O3-C5-C6-O4
4	C	203	PG4	O3-C5-C6-O4
4	D	202	PG4	O1-C1-C2-O2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	A	202	PIT	C7-C8-C9-C10
3	B	202	PIT	C6-C5-C7-C8
4	A	203	PG4	O3-C5-C6-O4
3	B	202	PIT	C7-C8-C9-C10
3	B	202	PIT	C7-C8-C9-C14
4	A	203	PG4	O2-C3-C4-O3
4	B	203	PG4	O1-C1-C2-O2
3	B	202	PIT	C4-C5-C7-C8
4	B	203	PG4	O4-C7-C8-O5
4	B	203	PG4	C4-C3-O2-C2
4	B	203	PG4	C3-C4-O3-C5
3	C	202	PIT	C6-C5-C7-C8
4	C	203	PG4	C8-C7-O4-C6
4	A	203	PG4	C1-C2-O2-C3
4	B	203	PG4	C8-C7-O4-C6
4	A	203	PG4	C6-C5-O3-C4
4	A	203	PG4	O1-C1-C2-O2
4	C	203	PG4	O1-C1-C2-O2
4	C	203	PG4	C1-C2-O2-C3
4	D	202	PG4	C6-C5-O3-C4
4	A	203	PG4	C4-C3-O2-C2
4	D	202	PG4	O4-C7-C8-O5
4	A	203	PG4	C5-C6-O4-C7
4	D	202	PG4	C1-C2-O2-C3
4	D	202	PG4	O2-C3-C4-O3

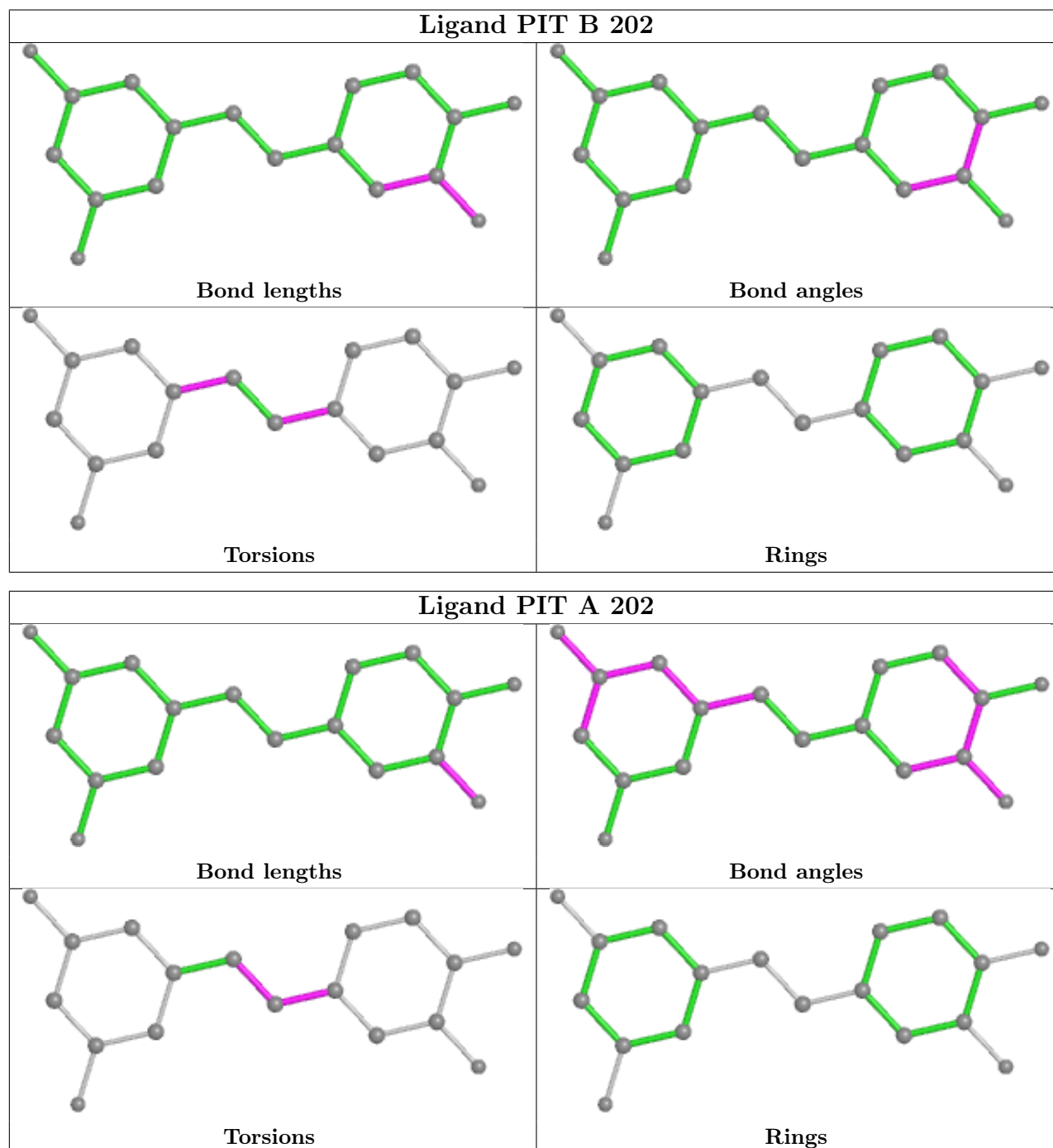
There are no ring outliers.

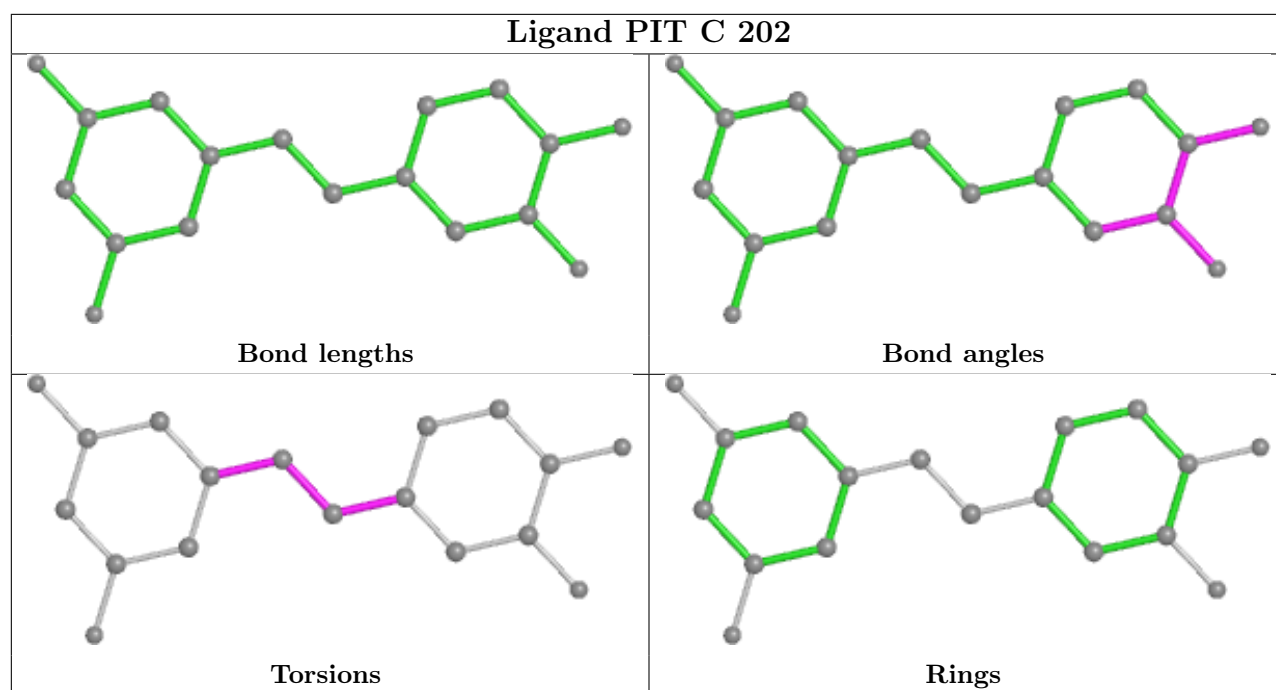
7 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	203	PG4	2	0
3	B	202	PIT	1	0
3	A	202	PIT	2	0
4	D	202	PG4	3	0
4	C	203	PG4	1	0
4	B	203	PG4	3	0
3	C	202	PIT	3	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, 95th 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	176/192 (91%)	-0.79	4 (2%) 61 63	12, 21, 48, 93	0
1	B	180/192 (93%)	-0.67	1 (0%) 85 87	13, 21, 51, 79	0
1	C	176/192 (91%)	-0.66	4 (2%) 61 63	13, 22, 62, 111	0
1	D	176/192 (91%)	-0.78	2 (1%) 77 79	12, 21, 48, 90	0
All	All	708/768 (92%)	-0.72	11 (1%) 70 72	12, 21, 51, 111	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	183	MET	3.8
1	A	182	LEU	3.7
1	A	180	ALA	3.6
1	C	182	LEU	3.5
1	C	183	MET	2.7
1	B	187	HIS	2.7
1	A	183	MET	2.4
1	C	153	ASP	2.3
1	A	181	THR	2.3
1	C	156	LYS	2.2
1	D	180	ALA	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 ⓘ

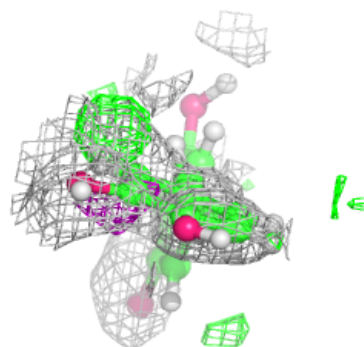
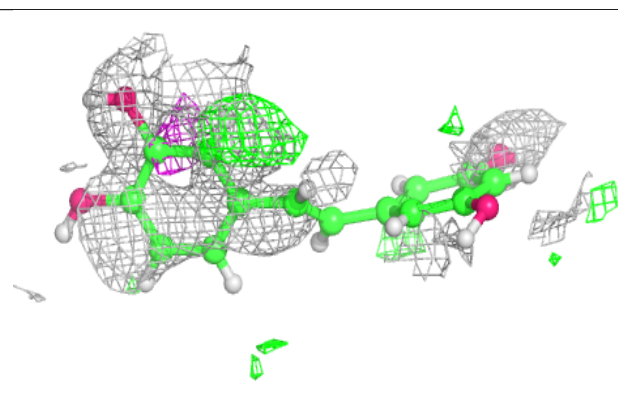
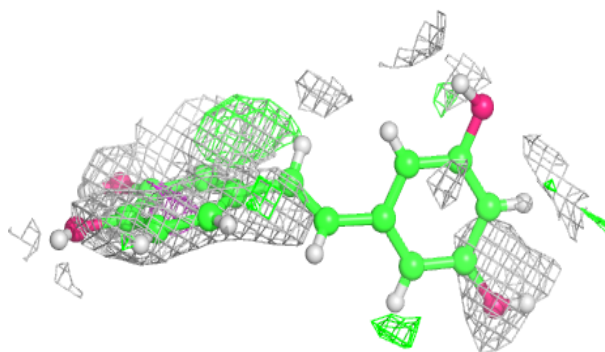
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	PIT	B	202	18/18	0.69	0.22	24,75,118,122	4
3	PIT	C	202	18/18	0.78	0.18	42,71,92,96	4
3	PIT	A	202	18/18	0.83	0.15	30,59,83,86	4
4	PG4	A	203	13/13	0.89	0.09	32,45,54,56	2
4	PG4	B	203	13/13	0.89	0.09	32,42,53,54	2
4	PG4	D	202	13/13	0.89	0.11	32,39,66,67	2
4	PG4	C	203	13/13	0.91	0.08	30,41,48,54	2
2	ZN	D	201	1/1	0.99	0.06	38,38,38,38	0
2	ZN	A	201	1/1	0.99	0.03	36,36,36,36	0
2	ZN	B	201	1/1	0.99	0.05	37,37,37,37	0
2	ZN	C	201	1/1	0.99	0.05	43,43,43,43	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.

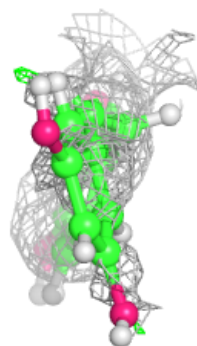
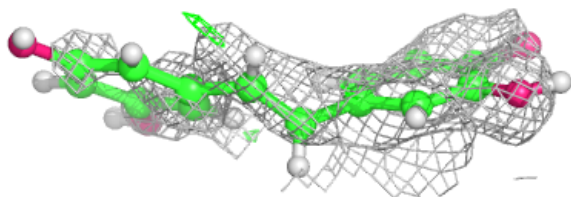
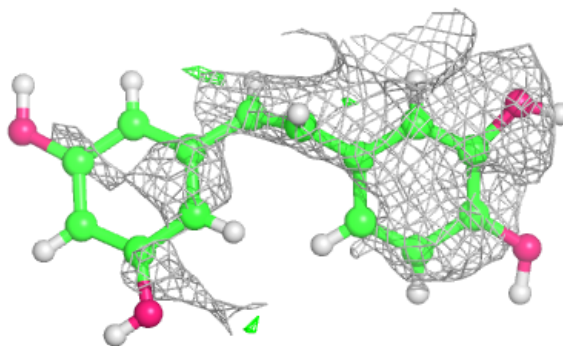
Electron density around PIT B 202:

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

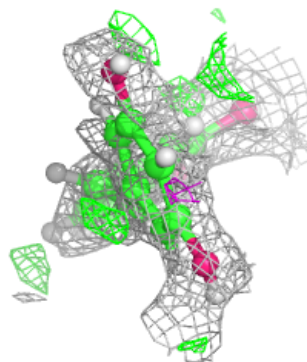
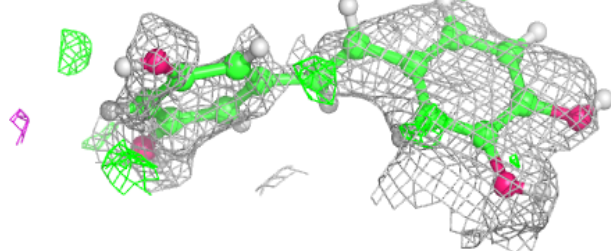
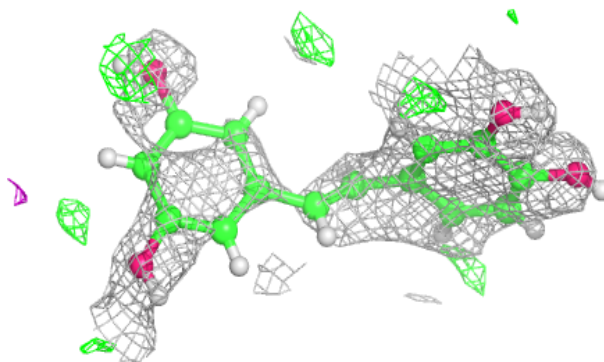


Electron density around PIT C 202:

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

**Electron density around PIT A 202:**

$2mF_o-DF_c$ (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.