Full wwPDB X-ray Structure Validation Report (i)

Oct 16, 2023 – 11:16 PM EDT

PDB ID	:	2CVD
Title	:	Crystal structure analysis of human hematopoietic prostaglandin D synthase complexed with HQL-79
Authors	:	Aritake, K.; Kado, Y.; Inoue, T.; Miyano, M.; Urade, Y.
Deposited on	:	2005-06-02
Resolution	:	1.45 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 (i) 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 (i)) were used in the production of this report:

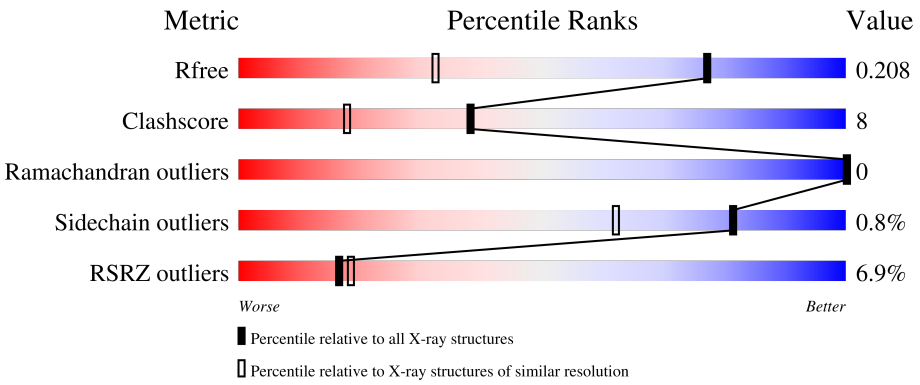
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber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

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.45 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	1156 (1.46-1.46)
Clashscore	141614	1202 (1.46-1.46)
Ramachandran outliers	138981	1178 (1.46-1.46)
Sidechain outliers	138945	1178 (1.46-1.46)
RSRZ outliers	127900	1139 (1.46-1.46)

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

Mol	Chain	Length	Quality of chain
1	A	198	10% 84% 16%
1	B	198	9% 86% 14%
1	C	198	5% 85% 15%
1	D	198	4% 87% 13%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 8172 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 Glutathione-requiring prostaglandin D synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	198	1638	1058	273	298	9	0	0	0
1	B	198	1638	1058	273	298	9	0	0	0
1	C	198	1638	1058	273	298	9	0	0	0
1	D	198	1638	1058	273	298	9	0	0	0

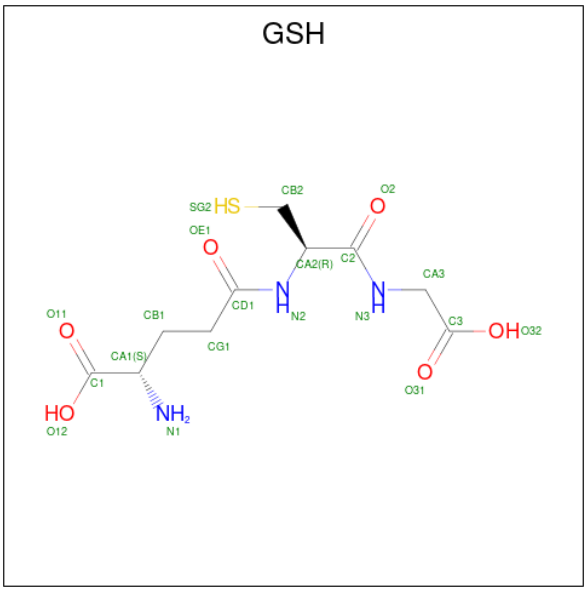
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	144	MET	ASN	conflict	UNP O60760
B	144	MET	ASN	conflict	UNP O60760
C	144	MET	ASN	conflict	UNP O60760
D	144	MET	ASN	conflict	UNP O60760

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

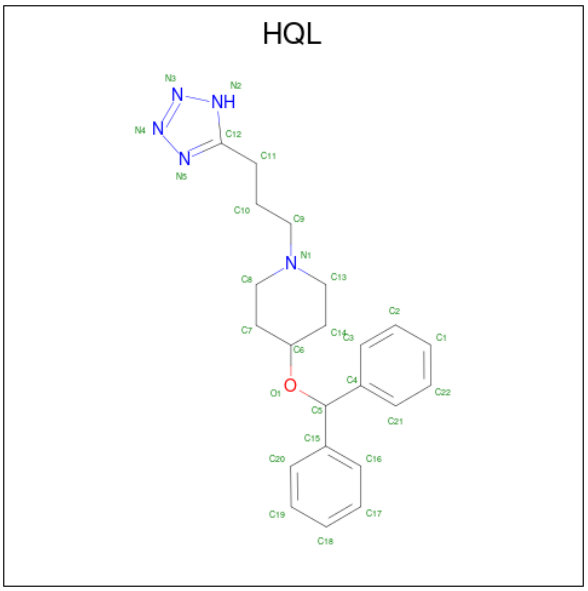
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
2	A	1	1	1	0	0
2	B	1	1	1	0	0

- Molecule 3 is GLUTATHIONE (three-letter code: GSH) (formula: $C_{10}H_{17}N_3O_6S$).



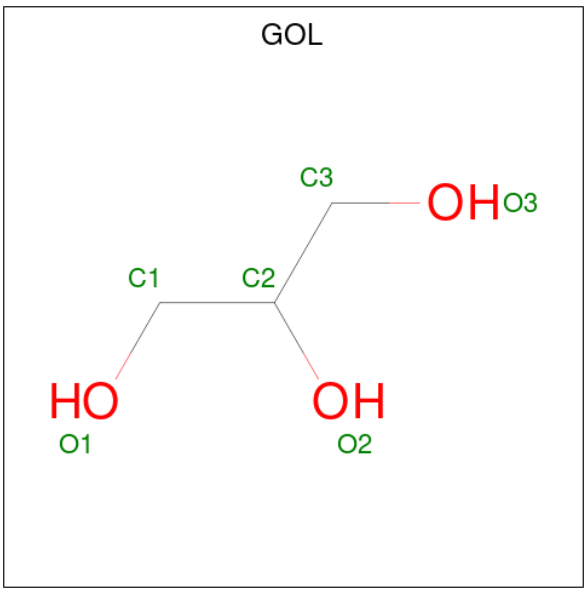
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
3	A	1	20	10	3	6	1	0	0
			Total	C	N	O	S		
3	B	1	20	10	3	6	1	0	0
			Total	C	N	O	S		
3	C	1	20	10	3	6	1	0	0
			Total	C	N	O	S		
3	D	1	20	10	3	6	1	0	0

- Molecule 4 is 4-(BENZHYDRYLOXY)-1-[3-(1H-TETRAAZOL-5-YL)PROPYL]PIPERIDINE (three-letter code: HQL) (formula: $C_{22}H_{27}N_5O$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	28	22	5	1	0	0
4	B	1	28	22	5	1	0	0
4	C	1	28	22	5	1	0	0
4	D	1	28	22	5	1	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	A	1	6	3	3	0	0
5	B	1	6	3	3	0	0
5	B	1	6	3	3	0	0
5	C	1	6	3	3	0	0
5	C	1	6	3	3	0	0
5	C	1	6	3	3	0	0
5	C	1	6	3	3	0	0

- Molecule 6 is water.

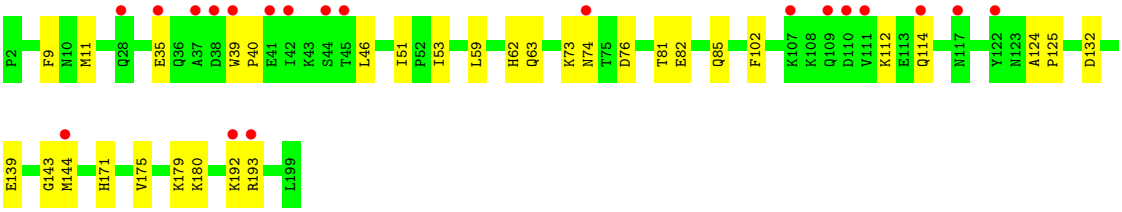
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
6	A	344	344	344	0	0
			Total	O		
6	B	282	282	282	0	0
			Total	O		
6	C	390	390	390	0	0
			Total	O		
6	D	368	368	368	0	0

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.

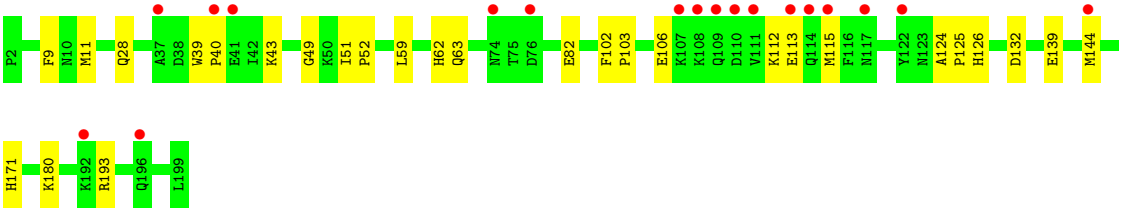
• Molecule 1: Glutathione-requiring prostaglandin D synthase

Chain A:



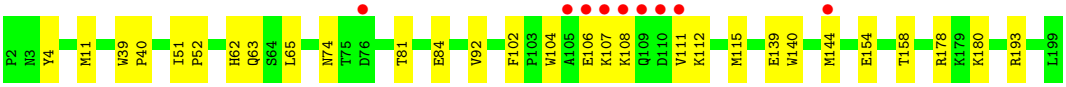
• Molecule 1: Glutathione-requiring prostaglandin D synthase

Chain B:



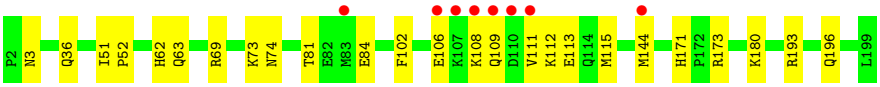
• Molecule 1: Glutathione-requiring prostaglandin D synthase

Chain C:



• Molecule 1: Glutathione-requiring prostaglandin D synthase

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	46.94Å 49.09Å 93.14Å 85.83° 88.71° 89.98°	Depositor
Resolution (Å)	34.98 – 1.45 34.98 – 1.45	Depositor EDS
% Data completeness (in resolution range)	87.0 (34.98-1.45) 87.2 (34.98-1.45)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.02 (at 1.45Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.192 , 0.209 0.190 , 0.208	Depositor DCC
R_{free} test set	6427 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	6.5	Xtriage
Anisotropy	0.291	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 49.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.109 for h,-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	8172	wwPDB-VP
Average B, all atoms (Å^2)	14.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.49% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, HQL, GOL, GSH

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	0.30	0/1681	0.54	0/2283
1	B	0.29	0/1681	0.54	0/2283
1	C	0.31	0/1681	0.57	0/2283
1	D	0.32	0/1681	0.57	0/2283
All	All	0.31	0/6724	0.55	0/9132

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	1638	0	1622	32	0
1	B	1638	0	1622	22	0
1	C	1638	0	1622	31	0
1	D	1638	0	1622	25	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	20	0	15	0	0
3	B	20	0	15	0	0
3	C	20	0	15	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	20	0	15	0	0
4	A	28	0	27	2	0
4	B	28	0	27	1	0
4	C	28	0	27	2	0
4	D	28	0	27	1	0
5	A	6	0	8	1	0
5	B	12	0	16	2	0
5	C	24	0	32	0	0
6	A	344	0	0	8	0
6	B	282	0	0	6	0
6	C	390	0	0	5	0
6	D	368	0	0	4	0
All	All	8172	0	6712	102	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 (102) 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:85:GLN:HE21	1:D:73:LYS:NZ	1.78	0.80
1:A:85:GLN:NE2	1:D:73:LYS:HZ3	1.79	0.79
1:A:143:GLY:H	5:A:3006:GOL:H12	1.48	0.78
1:B:115:MET:HG3	6:B:4247:HOH:O	1.83	0.78
1:C:112:LYS:HA	1:C:115:MET:HE2	1.67	0.75
1:B:139:GLU:HG2	1:B:180:LYS:HE2	1.68	0.75
1:C:4:TYR:H	1:D:196:GLN:HE22	1.33	0.74
1:B:28:GLN:HG3	6:B:4221:HOH:O	1.88	0.73
1:A:85:GLN:HE21	1:D:73:LYS:HZ3	1.33	0.72
1:C:154:GLU:O	1:C:158:THR:HG23	1.90	0.72
1:C:180:LYS:HD2	6:C:3285:HOH:O	1.90	0.71
1:C:139:GLU:HG3	1:C:180:LYS:HE2	1.74	0.69
1:A:76:ASP:HB3	6:A:4291:HOH:O	1.92	0.69
1:B:39:TRP:HB3	1:B:40:PRO:HD3	1.75	0.68
1:D:108:LYS:HZ2	1:D:108:LYS:HB3	1.58	0.68
1:D:180:LYS:HD2	6:D:2894:HOH:O	1.92	0.68
1:B:124:ALA:HB3	1:B:125:PRO:HD3	1.76	0.68
1:C:158:THR:CG2	1:C:178:ARG:HH12	2.08	0.67
1:C:193:ARG:HG3	1:C:193:ARG:HH11	1.60	0.65
1:A:193:ARG:HG2	1:A:193:ARG:HH11	1.60	0.65
1:C:108:LYS:HB3	1:C:108:LYS:NZ	2.13	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:158:THR:HG23	1:C:178:ARG:HH12	1.62	0.63
1:A:114:GLN:HG3	6:A:4301:HOH:O	1.98	0.63
1:A:124:ALA:HB3	1:A:125:PRO:HD3	1.80	0.62
1:B:193:ARG:HH22	5:B:3005:GOL:H11	1.64	0.62
1:A:35:GLU:HG2	6:A:4230:HOH:O	2.00	0.61
1:C:106:GLU:HG2	1:C:115:MET:HE1	1.81	0.60
1:D:108:LYS:HB3	1:D:108:LYS:NZ	2.18	0.59
1:C:4:TYR:H	1:D:196:GLN:NE2	2.02	0.58
1:A:39:TRP:HB3	1:A:40:PRO:HD3	1.86	0.56
1:A:85:GLN:NE2	1:D:73:LYS:NZ	2.44	0.56
1:B:193:ARG:HH22	5:B:3005:GOL:C1	2.19	0.55
1:C:108:LYS:HB3	1:C:108:LYS:HZ2	1.70	0.55
1:A:171:HIS:HE1	6:A:4162:HOH:O	1.89	0.54
1:A:82:GLU:OE1	1:D:74:ASN:ND2	2.41	0.54
1:A:139:GLU:HG2	1:A:180:LYS:HE2	1.91	0.53
1:B:113:GLU:HG3	6:B:4245:HOH:O	2.08	0.53
1:A:114:GLN:NE2	6:A:4299:HOH:O	2.42	0.52
1:B:171:HIS:HE1	6:B:4046:HOH:O	1.92	0.52
1:C:139:GLU:HB2	6:C:3314:HOH:O	2.10	0.51
1:A:193:ARG:HG2	1:A:193:ARG:NH1	2.25	0.51
1:B:103:PRO:HG3	1:B:115:MET:SD	2.51	0.51
1:C:107:LYS:HE2	6:C:3350:HOH:O	2.10	0.51
1:A:192:LYS:HE3	1:A:193:ARG:NH1	2.26	0.50
1:D:112:LYS:HA	1:D:115:MET:HE2	1.92	0.50
1:D:109:GLN:HG2	6:D:3167:HOH:O	2.12	0.50
1:C:112:LYS:HA	1:C:115:MET:CE	2.40	0.49
1:B:106:GLU:HB3	1:B:112:LYS:HB2	1.94	0.49
1:C:158:THR:HG21	6:C:3028:HOH:O	2.13	0.49
1:D:109:GLN:O	1:D:113:GLU:HG3	2.13	0.49
1:A:73:LYS:O	1:A:74:ASN:HB2	2.12	0.49
1:C:106:GLU:HG2	1:C:115:MET:CE	2.43	0.49
1:A:9:PHE:CE1	1:A:51:ILE:HD11	2.48	0.48
1:B:9:PHE:HB2	1:B:11:MET:HE2	1.96	0.48
1:C:81:THR:OG1	1:C:84:GLU:HG3	2.14	0.47
1:D:106:GLU:HG2	1:D:115:MET:CE	2.43	0.47
1:D:108:LYS:HZ2	1:D:111:VAL:HG23	1.80	0.47
1:A:112:LYS:HE2	6:A:4326:HOH:O	2.14	0.47
1:C:139:GLU:HG2	1:C:140:TRP:NE1	2.29	0.47
1:B:59:LEU:HD12	6:B:4165:HOH:O	2.15	0.46
1:A:11:MET:SD	4:A:2201:HQL:H132	2.55	0.46
1:B:180:LYS:HD2	6:B:4144:HOH:O	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:193:ARG:HG3	1:C:193:ARG:NH1	2.28	0.46
1:A:102:PHE:CD1	4:A:2201:HQL:H2	2.51	0.46
1:B:132:ASP:OD1	1:B:171:HIS:HD2	1.99	0.45
1:C:11:MET:SD	4:C:2601:HQL:H132	2.56	0.45
1:A:175:VAL:HG12	1:A:179:LYS:HE2	1.99	0.45
1:D:69:ARG:O	1:D:73:LYS:HG3	2.15	0.45
1:C:139:GLU:HG2	1:C:140:TRP:CD1	2.52	0.45
1:B:43:LYS:NZ	1:B:49:GLY:O	2.45	0.45
1:A:132:ASP:OD1	1:A:171:HIS:HD2	2.00	0.44
1:C:65:LEU:HD13	1:C:92:VAL:HG12	1.98	0.44
1:D:102:PHE:CD1	4:D:2801:HQL:H2	2.53	0.44
1:B:126:HIS:HD2	6:C:3266:HOH:O	2.01	0.43
1:D:193:ARG:HH11	1:D:193:ARG:HG3	1.83	0.43
1:B:51:ILE:HB	1:B:52:PRO:HA	2.00	0.43
1:B:102:PHE:CD1	4:B:2401:HQL:H2	2.53	0.43
1:A:59:LEU:HD12	6:A:4202:HOH:O	2.18	0.43
1:A:192:LYS:HE3	1:A:193:ARG:HH12	1.83	0.43
1:C:104:TRP:HA	1:C:112:LYS:HE3	2.01	0.43
1:D:62:HIS:O	1:D:63:GLN:HB2	2.19	0.43
1:D:81:THR:OG1	1:D:84:GLU:HG3	2.19	0.43
1:C:62:HIS:O	1:C:63:GLN:HB2	2.19	0.42
1:B:62:HIS:O	1:B:63:GLN:HB2	2.19	0.42
1:B:82:GLU:OE1	1:C:74:ASN:ND2	2.53	0.42
1:C:102:PHE:CD1	4:C:2601:HQL:H2	2.55	0.42
1:A:46:LEU:CD2	1:A:53:ILE:HD13	2.49	0.42
1:D:112:LYS:HA	1:D:115:MET:CE	2.49	0.42
1:B:139:GLU:CG	1:B:180:LYS:HE2	2.44	0.42
1:C:39:TRP:HB3	1:C:40:PRO:HD3	2.01	0.42
1:D:173:ARG:NE	6:D:3139:HOH:O	2.52	0.42
1:A:9:PHE:CZ	1:A:51:ILE:HD11	2.56	0.41
1:C:139:GLU:CG	1:C:180:LYS:HE2	2.49	0.41
1:A:62:HIS:O	1:A:63:GLN:HB2	2.21	0.41
1:A:81:THR:O	1:A:85:GLN:HG3	2.21	0.41
1:A:114:GLN:NE2	6:A:4300:HOH:O	2.46	0.41
1:C:51:ILE:HB	1:C:52:PRO:HA	2.03	0.41
1:D:111:VAL:O	1:D:115:MET:HE2	2.21	0.41
1:A:46:LEU:HD21	1:A:53:ILE:HD13	2.03	0.41
1:D:171:HIS:HE1	6:D:2891:HOH:O	2.04	0.40
1:C:111:VAL:O	1:C:115:MET:HG3	2.21	0.40
1:D:51:ILE:HB	1:D:52:PRO:HA	2.04	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	196/198 (99%)	191 (97%)	5 (3%)	0	100	100
1	B	196/198 (99%)	190 (97%)	6 (3%)	0	100	100
1	C	196/198 (99%)	191 (97%)	5 (3%)	0	100	100
1	D	196/198 (99%)	192 (98%)	4 (2%)	0	100	100
All	All	784/792 (99%)	764 (97%)	20 (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	178/178 (100%)	177 (99%)	1 (1%)	86	69
1	B	178/178 (100%)	177 (99%)	1 (1%)	86	69
1	C	178/178 (100%)	177 (99%)	1 (1%)	86	69
1	D	178/178 (100%)	175 (98%)	3 (2%)	60	28
All	All	712/712 (100%)	706 (99%)	6 (1%)	81	62

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	144	MET
1	B	144	MET

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Mol	Chain	Res	Type
1	C	144	MET
1	D	3	ASN
1	D	36	GLN
1	D	144	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (30) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	GLN
1	A	85	GLN
1	A	170	ASN
1	A	171	HIS
1	A	182	GLN
1	B	3	ASN
1	B	28	GLN
1	B	36	GLN
1	B	126	HIS
1	B	170	ASN
1	B	171	HIS
1	B	182	GLN
1	B	196	GLN
1	C	28	GLN
1	C	32	HIS
1	C	80	ASN
1	C	114	GLN
1	C	170	ASN
1	C	171	HIS
1	C	182	GLN
1	D	3	ASN
1	D	36	GLN
1	D	80	ASN
1	D	109	GLN
1	D	114	GLN
1	D	126	HIS
1	D	170	ASN
1	D	171	HIS
1	D	182	GLN
1	D	196	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 17 ligands modelled in this entry, 2 are monoatomic - leaving 15 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	$\#\|Z\| > 2$
3	GSH	A	2001	-	18,19,19	0.96	1 (5%)	23,24,24	1.12	2 (8%)
3	GSH	C	2003	-	18,19,19	0.98	1 (5%)	23,24,24	1.14	2 (8%)
5	GOL	C	3002	-	5,5,5	0.91	0	5,5,5	0.43	0
4	HQL	D	2801	-	31,31,31	4.46	20 (64%)	35,40,40	2.81	11 (31%)
5	GOL	C	3001	-	5,5,5	0.87	0	5,5,5	0.40	0
5	GOL	C	3003	-	5,5,5	0.94	0	5,5,5	0.35	0
5	GOL	C	3004	-	5,5,5	0.91	0	5,5,5	0.46	0
5	GOL	A	3006	-	5,5,5	0.89	0	5,5,5	0.34	0
3	GSH	B	2002	-	18,19,19	1.00	1 (5%)	23,24,24	1.14	2 (8%)
4	HQL	C	2601	-	31,31,31	4.27	17 (54%)	35,40,40	2.52	12 (34%)
5	GOL	B	3005	-	5,5,5	0.77	0	5,5,5	0.55	0
5	GOL	B	3007	-	5,5,5	0.91	0	5,5,5	0.43	0
4	HQL	A	2201	-	31,31,31	4.57	23 (74%)	35,40,40	2.45	8 (22%)
3	GSH	D	2004	-	18,19,19	0.95	1 (5%)	23,24,24	1.17	2 (8%)
4	HQL	B	2401	-	31,31,31	4.59	19 (61%)	35,40,40	2.37	9 (25%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GSH	A	2001	-	-	1/24/24/24	-
3	GSH	C	2003	-	-	1/24/24/24	-
5	GOL	C	3002	-	-	0/4/4/4	-
4	HQL	D	2801	-	-	4/18/28/28	0/4/4/4
5	GOL	C	3001	-	-	2/4/4/4	-
5	GOL	C	3003	-	-	0/4/4/4	-
5	GOL	C	3004	-	-	4/4/4/4	-
5	GOL	A	3006	-	-	0/4/4/4	-
3	GSH	B	2002	-	-	3/24/24/24	-
4	HQL	C	2601	-	-	3/18/28/28	0/4/4/4
5	GOL	B	3005	-	-	2/4/4/4	-
5	GOL	B	3007	-	-	2/4/4/4	-
4	HQL	A	2201	-	-	3/18/28/28	0/4/4/4
3	GSH	D	2004	-	-	2/24/24/24	-
4	HQL	B	2401	-	-	2/18/28/28	0/4/4/4

All (83) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	2801	HQL	C21-C4	9.45	1.54	1.39
4	A	2201	HQL	C21-C4	9.33	1.54	1.39
4	B	2401	HQL	C21-C4	8.95	1.53	1.39
4	C	2601	HQL	C21-C4	8.83	1.53	1.39
4	B	2401	HQL	C20-C15	8.42	1.52	1.39
4	C	2601	HQL	C16-C15	8.08	1.52	1.39
4	B	2401	HQL	C16-C15	8.01	1.52	1.39
4	D	2801	HQL	C20-C15	7.99	1.52	1.39
4	D	2801	HQL	C16-C15	7.82	1.51	1.39
4	D	2801	HQL	C9-N1	7.75	1.65	1.47
4	A	2201	HQL	C20-C15	7.74	1.51	1.39
4	A	2201	HQL	C16-C15	7.59	1.51	1.39
4	C	2601	HQL	C20-C15	7.32	1.50	1.39
4	C	2601	HQL	C9-N1	7.26	1.64	1.47
4	B	2401	HQL	C8-N1	7.23	1.66	1.46
4	B	2401	HQL	C3-C4	7.02	1.50	1.39
4	A	2201	HQL	C12-N5	6.79	1.39	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	2401	HQL	C9-N1	6.63	1.62	1.47
4	A	2201	HQL	C3-C4	6.56	1.49	1.39
4	C	2601	HQL	C7-C6	6.51	1.68	1.51
4	B	2401	HQL	C22-C21	6.37	1.52	1.38
4	D	2801	HQL	C7-C6	6.23	1.67	1.51
4	C	2601	HQL	C3-C4	6.22	1.49	1.39
4	A	2201	HQL	C22-C21	6.21	1.52	1.38
4	B	2401	HQL	C7-C6	6.04	1.67	1.51
4	C	2601	HQL	C22-C21	5.86	1.51	1.38
4	A	2201	HQL	C17-C16	5.68	1.50	1.38
4	D	2801	HQL	C22-C21	5.47	1.50	1.38
4	D	2801	HQL	C8-N1	5.46	1.62	1.46
4	C	2601	HQL	C8-N1	5.42	1.61	1.46
4	A	2201	HQL	C7-C6	5.40	1.65	1.51
4	D	2801	HQL	C3-C4	5.40	1.47	1.39
4	D	2801	HQL	C19-C20	5.37	1.50	1.38
4	B	2401	HQL	C19-C20	5.33	1.50	1.38
4	D	2801	HQL	C17-C16	5.28	1.50	1.38
4	B	2401	HQL	C17-C16	5.26	1.50	1.38
4	A	2201	HQL	C19-C20	5.18	1.49	1.38
4	A	2201	HQL	C18-C17	5.18	1.51	1.38
4	D	2801	HQL	C19-C18	5.08	1.51	1.38
4	D	2801	HQL	C2-C1	5.07	1.51	1.38
4	A	2201	HQL	C2-C1	5.05	1.51	1.38
4	C	2601	HQL	C18-C17	5.03	1.51	1.38
4	B	2401	HQL	C18-C17	4.97	1.51	1.38
4	A	2201	HQL	C8-N1	4.91	1.60	1.46
4	D	2801	HQL	C18-C17	4.91	1.51	1.38
4	B	2401	HQL	C2-C1	4.90	1.51	1.38
4	C	2601	HQL	C19-C20	4.84	1.49	1.38
4	C	2601	HQL	C2-C1	4.80	1.50	1.38
4	B	2401	HQL	C22-C1	4.79	1.50	1.38
4	C	2601	HQL	C19-C18	4.75	1.50	1.38
4	B	2401	HQL	C12-N5	4.73	1.37	1.33
4	D	2801	HQL	C22-C1	4.73	1.50	1.38
4	B	2401	HQL	C19-C18	4.68	1.50	1.38
4	A	2201	HQL	C12-N2	-4.64	1.29	1.33
4	C	2601	HQL	C17-C16	4.56	1.48	1.38
4	A	2201	HQL	C11-C12	-4.42	1.45	1.50
4	A	2201	HQL	C22-C1	4.42	1.49	1.38
4	A	2201	HQL	C19-C18	4.08	1.48	1.38
4	C	2601	HQL	C22-C1	3.89	1.48	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	2201	HQL	C13-N1	3.70	1.57	1.46
4	A	2201	HQL	N2-N3	-3.48	1.29	1.34
4	D	2801	HQL	C2-C3	3.41	1.46	1.38
4	B	2401	HQL	C2-C3	3.38	1.46	1.38
4	A	2201	HQL	C2-C3	3.37	1.46	1.38
4	D	2801	HQL	C12-N2	3.06	1.36	1.33
4	D	2801	HQL	C14-C6	3.02	1.59	1.51
4	C	2601	HQL	C2-C3	2.92	1.45	1.38
4	A	2201	HQL	N5-N4	-2.90	1.30	1.34
4	B	2401	HQL	C14-C6	2.90	1.58	1.51
3	C	2003	GSH	CG1-CD1	2.90	1.56	1.51
4	C	2601	HQL	N2-N3	-2.75	1.30	1.34
3	D	2004	GSH	CG1-CD1	2.69	1.56	1.51
3	B	2002	GSH	CG1-CD1	2.62	1.56	1.51
4	A	2201	HQL	C7-C8	2.58	1.59	1.52
4	A	2201	HQL	C14-C6	2.56	1.58	1.51
4	B	2401	HQL	C7-C8	2.53	1.59	1.52
4	D	2801	HQL	N2-N3	-2.49	1.31	1.34
3	A	2001	GSH	CG1-CD1	2.48	1.56	1.51
4	D	2801	HQL	C15-C5	2.39	1.55	1.52
4	D	2801	HQL	N5-N4	-2.28	1.31	1.34
4	C	2601	HQL	C12-N2	2.18	1.35	1.33
4	A	2201	HQL	C15-C5	2.16	1.55	1.52
4	B	2401	HQL	C15-C5	2.06	1.54	1.52

All (48) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	D	2801	HQL	C9-N1-C8	-7.65	91.68	111.23
4	C	2601	HQL	C9-N1-C8	-7.18	92.86	111.23
4	D	2801	HQL	C8-C7-C6	7.16	118.19	110.32
4	B	2401	HQL	C9-N1-C8	-7.11	93.05	111.23
4	D	2801	HQL	C13-N1-C8	6.63	123.75	108.83
4	B	2401	HQL	C13-N1-C8	6.46	123.36	108.83
4	A	2201	HQL	C13-N1-C8	6.27	122.94	108.83
4	A	2201	HQL	C9-N1-C8	-6.20	95.38	111.23
4	C	2601	HQL	C13-N1-C8	5.90	122.11	108.83
4	A	2201	HQL	C7-C8-N1	-5.32	102.86	111.11
4	C	2601	HQL	C8-C7-C6	5.07	115.90	110.32
4	B	2401	HQL	C8-C7-C6	4.58	115.36	110.32
4	D	2801	HQL	C14-C6-C7	4.53	120.50	111.74
4	A	2201	HQL	C9-C10-C11	-4.47	100.93	113.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	C	2601	HQL	C14-C6-C7	4.27	119.99	111.74
4	D	2801	HQL	C9-N1-C13	4.26	122.14	111.23
4	A	2201	HQL	C9-N1-C13	4.17	121.89	111.23
4	B	2401	HQL	C9-N1-C13	4.12	121.76	111.23
4	A	2201	HQL	C12-N2-N3	4.09	108.46	104.33
4	C	2601	HQL	O1-C6-C14	-4.02	97.98	109.11
4	D	2801	HQL	C13-C14-C6	3.83	114.53	110.32
4	D	2801	HQL	O1-C6-C14	-3.77	98.68	109.11
4	C	2601	HQL	C13-C14-C6	3.58	114.26	110.32
4	C	2601	HQL	C12-N2-N3	3.34	107.70	104.33
4	A	2201	HQL	C13-C14-C6	3.29	113.94	110.32
4	B	2401	HQL	C12-N2-N3	3.21	107.58	104.33
4	C	2601	HQL	C9-N1-C13	3.19	119.40	111.23
4	D	2801	HQL	C12-N5-N4	3.15	107.51	104.33
4	B	2401	HQL	C14-C6-C7	3.12	117.77	111.74
4	D	2801	HQL	C12-N2-N3	3.10	107.46	104.33
3	D	2004	GSH	CB2-CA2-C2	-3.08	103.40	109.76
3	B	2002	GSH	CB1-CG1-CD1	-3.02	106.30	113.04
4	C	2601	HQL	C12-N5-N4	2.98	107.34	104.33
4	B	2401	HQL	O1-C6-C14	-2.88	101.14	109.11
3	A	2001	GSH	CB1-CG1-CD1	-2.87	106.62	113.04
4	D	2801	HQL	C16-C15-C5	-2.79	115.73	120.61
3	C	2003	GSH	CB2-CA2-C2	-2.72	104.16	109.76
4	B	2401	HQL	C12-N5-N4	2.67	107.03	104.33
3	C	2003	GSH	CB1-CG1-CD1	-2.67	107.08	113.04
3	D	2004	GSH	CB1-CG1-CD1	-2.63	107.17	113.04
4	C	2601	HQL	C16-C15-C5	-2.43	116.38	120.61
4	C	2601	HQL	C20-C15-C16	2.37	121.25	118.29
3	B	2002	GSH	CB2-CA2-C2	-2.36	104.90	109.76
3	A	2001	GSH	CB2-CA2-C2	-2.34	104.93	109.76
4	B	2401	HQL	C16-C15-C5	-2.28	116.63	120.61
4	A	2201	HQL	O1-C6-C14	-2.16	103.14	109.11
4	D	2801	HQL	C3-C4-C5	-2.13	116.89	120.61
4	C	2601	HQL	O1-C6-C7	2.09	114.90	109.11

There are no chirality outliers.

All (29) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	2201	HQL	C10-C11-C12-N2
5	B	3007	GOL	O1-C1-C2-O2
5	B	3007	GOL	O1-C1-C2-C3

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Mol	Chain	Res	Type	Atoms
5	C	3001	GOL	C1-C2-C3-O3
4	B	2401	HQL	C10-C9-N1-C13
4	C	2601	HQL	C10-C9-N1-C13
4	D	2801	HQL	C10-C9-N1-C13
3	B	2002	GSH	O2-C2-N3-CA3
5	C	3001	GOL	O2-C2-C3-O3
5	C	3004	GOL	O1-C1-C2-O2
4	A	2201	HQL	C10-C9-N1-C13
4	D	2801	HQL	C11-C10-C9-N1
4	C	2601	HQL	C11-C10-C9-N1
3	D	2004	GSH	O2-C2-N3-CA3
5	B	3005	GOL	C1-C2-C3-O3
5	C	3004	GOL	O1-C1-C2-C3
3	A	2001	GSH	O2-C2-N3-CA3
4	B	2401	HQL	C11-C10-C9-N1
5	B	3005	GOL	O2-C2-C3-O3
5	C	3004	GOL	O2-C2-C3-O3
3	C	2003	GSH	O2-C2-N3-CA3
4	A	2201	HQL	C11-C10-C9-N1
4	C	2601	HQL	C10-C11-C12-N5
4	D	2801	HQL	C10-C11-C12-N5
5	C	3004	GOL	C1-C2-C3-O3
4	D	2801	HQL	C15-C5-O1-C6
3	B	2002	GSH	O32-C3-CA3-N3
3	D	2004	GSH	O32-C3-CA3-N3
3	B	2002	GSH	O31-C3-CA3-N3

There are no ring outliers.

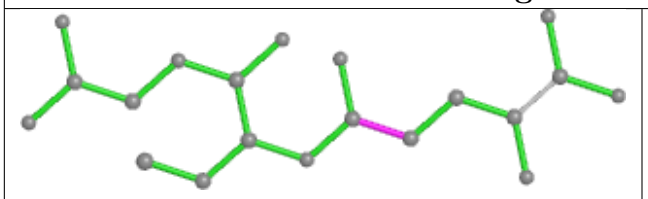
6 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	2801	HQL	1	0
5	A	3006	GOL	1	0
4	C	2601	HQL	2	0
5	B	3005	GOL	2	0
4	A	2201	HQL	2	0
4	B	2401	HQL	1	0

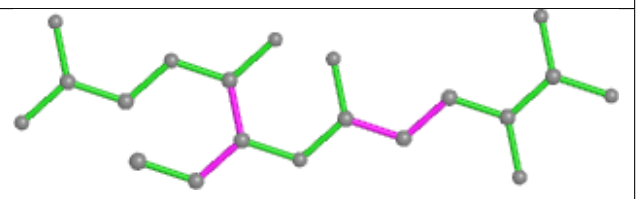
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is

within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

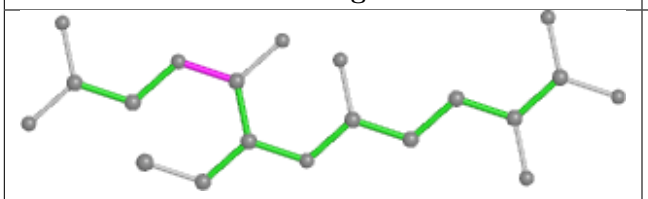
Ligand GSH A 2001



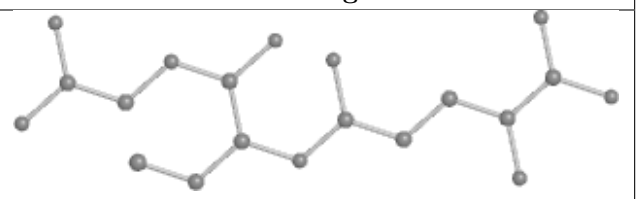
Bond lengths



Bond angles

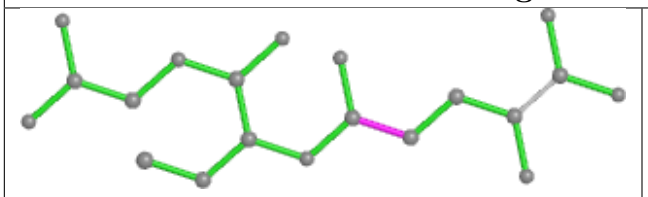


Torsions

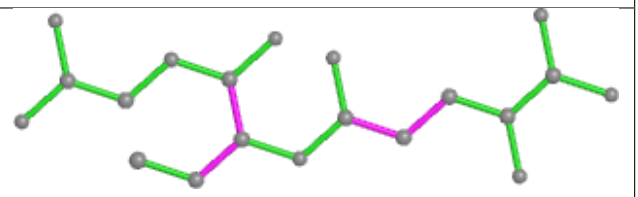


Rings

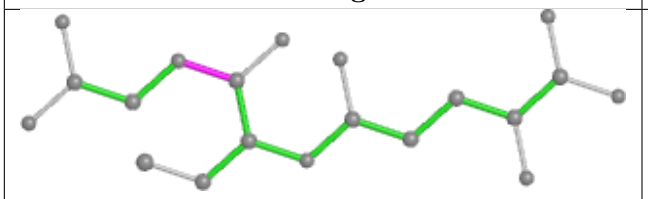
Ligand GSH C 2003



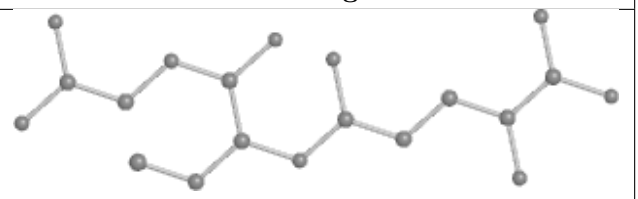
Bond lengths



Bond angles

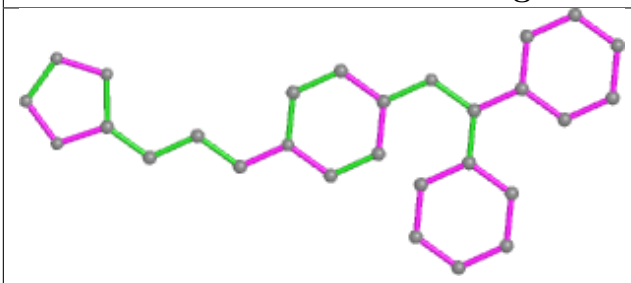


Torsions

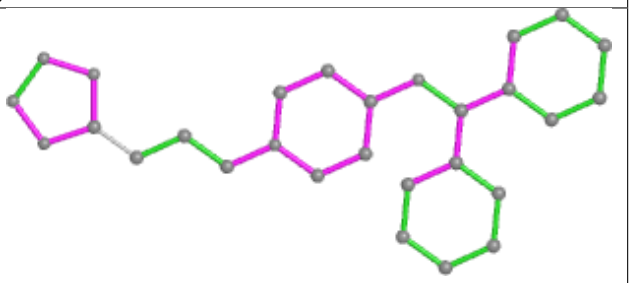


Rings

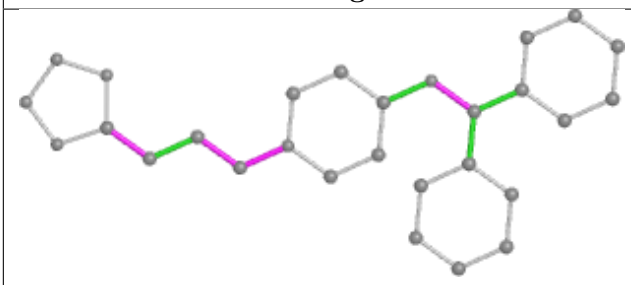
Ligand HQL D 2801



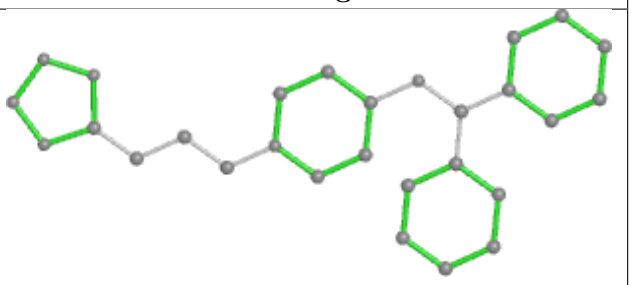
Bond lengths



Bond angles

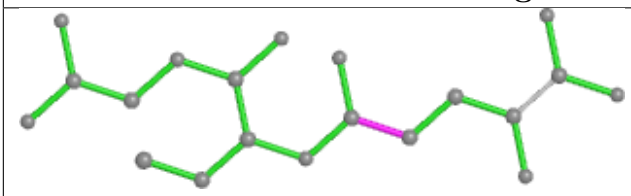


Torsions

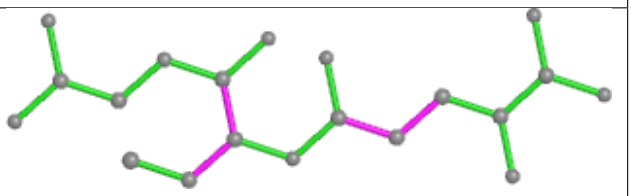


Rings

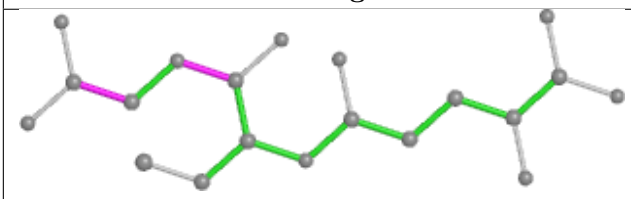
Ligand GSH B 2002



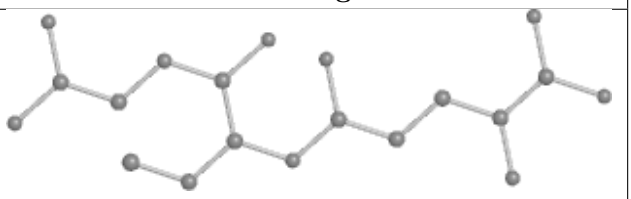
Bond lengths



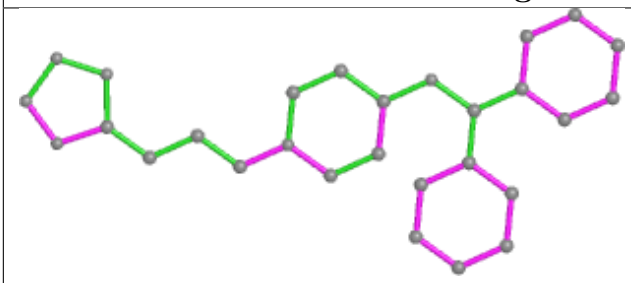
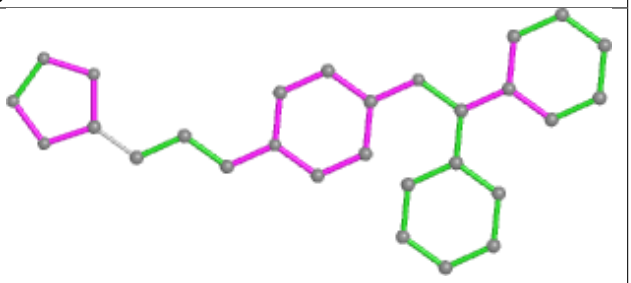
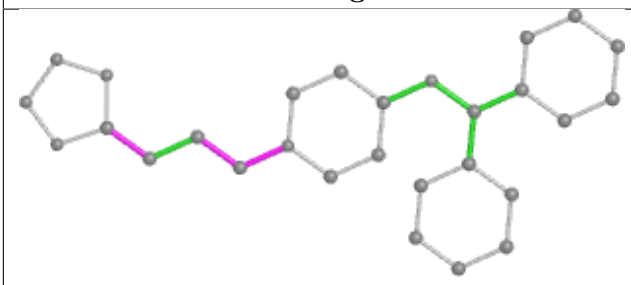
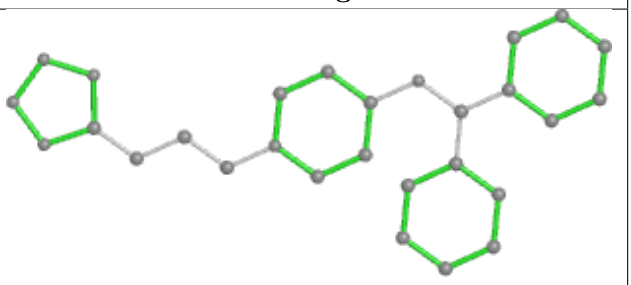
Bond angles

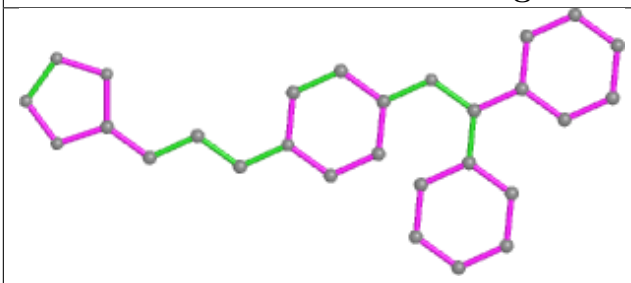
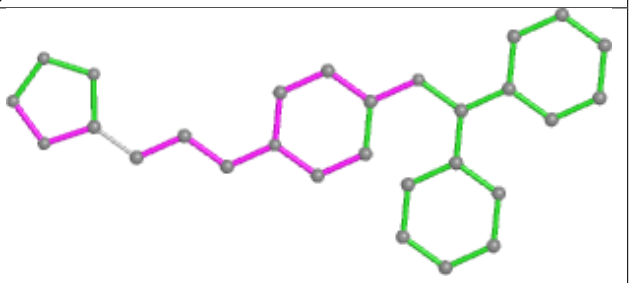
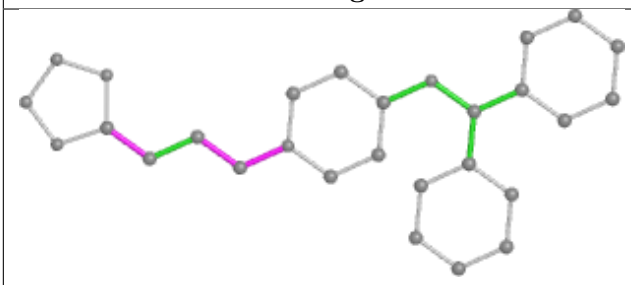
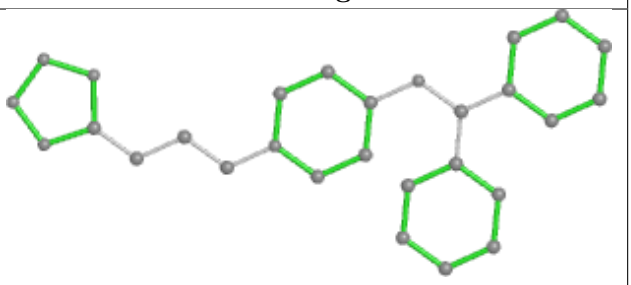


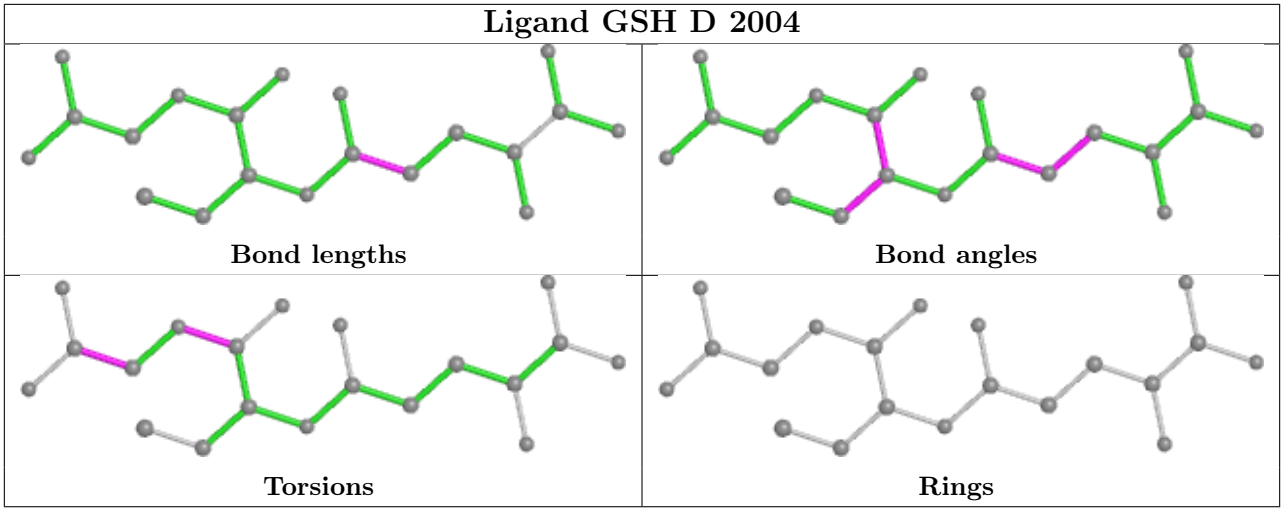
Torsions

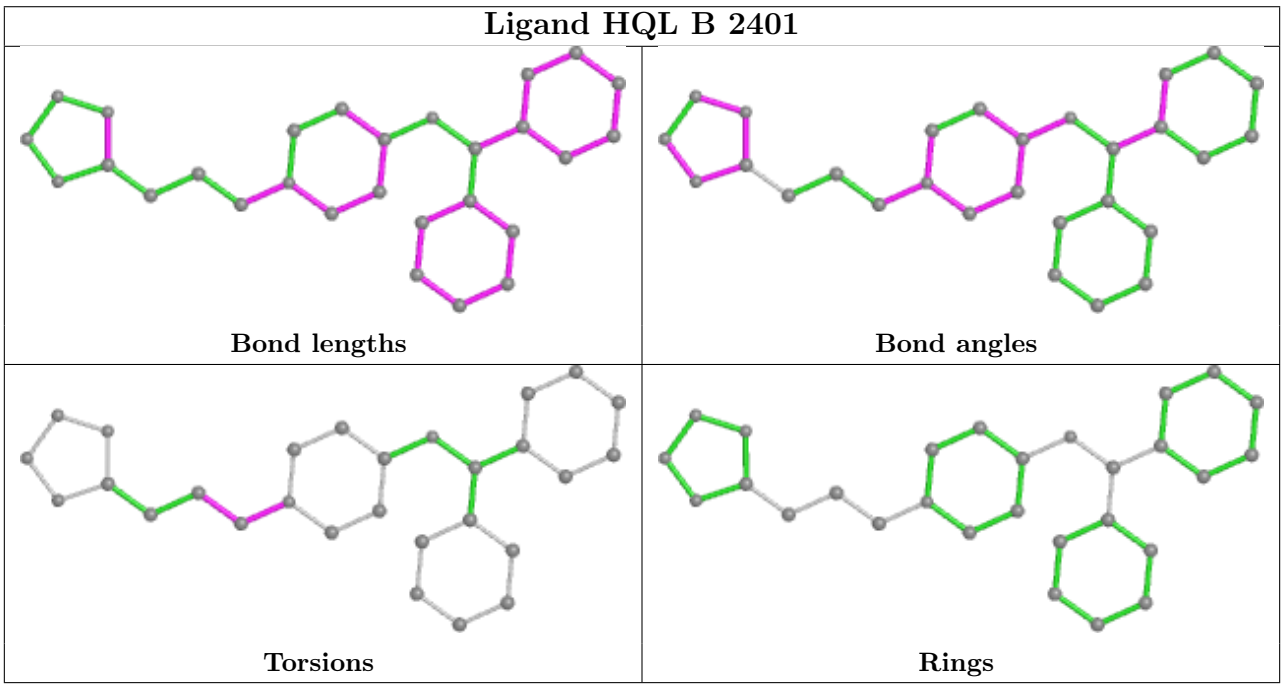


Rings

Ligand HQL C 2601	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand HQL A 2201	
 Bond lengths	 Bond angles
 Torsions	 Rings





5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data (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	198/198 (100%)	0.46	20 (10%) 7 8	3, 13, 27, 30	0
1	B	198/198 (100%)	0.47	18 (9%) 9 11	3, 13, 27, 33	0
1	C	198/198 (100%)	0.15	9 (4%) 33 36	1, 8, 18, 30	0
1	D	198/198 (100%)	0.11	8 (4%) 38 40	2, 8, 18, 30	0
All	All	792/792 (100%)	0.30	55 (6%) 16 18	1, 10, 26, 33	0

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	110	ASP	5.4
1	A	110	ASP	5.2
1	B	122	TYR	5.1
1	B	110	ASP	5.0
1	D	108	LYS	5.0
1	D	110	ASP	4.8
1	C	107	LYS	4.6
1	A	122	TYR	4.0
1	C	108	LYS	4.0
1	D	107	LYS	4.0
1	B	109	GLN	3.6
1	B	41	GLU	3.5
1	A	35	GLU	3.4
1	B	115	MET	3.4
1	A	41	GLU	3.3
1	A	38	ASP	3.3
1	B	40	PRO	3.2
1	C	144	MET	3.2
1	A	114	GLN	3.2
1	B	117	ASN	3.1
1	C	105	ALA	3.1

Continued on next page...

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Mol	Chain	Res	Type	RSRZ
1	A	37	ALA	3.0
1	A	117	ASN	2.9
1	C	109	GLN	2.8
1	A	109	GLN	2.6
1	B	107	LYS	2.6
1	A	107	LYS	2.6
1	B	108	LYS	2.6
1	A	44	SER	2.5
1	B	111	VAL	2.5
1	A	144	MET	2.4
1	B	74	ASN	2.4
1	D	144	MET	2.4
1	D	109	GLN	2.3
1	B	196	GLN	2.3
1	C	106	GLU	2.3
1	A	193	ARG	2.3
1	B	144	MET	2.3
1	C	111	VAL	2.3
1	A	74	ASN	2.3
1	A	39	TRP	2.3
1	B	76	ASP	2.3
1	A	42	ILE	2.2
1	C	76	ASP	2.2
1	D	111	VAL	2.2
1	A	45	THR	2.2
1	A	111	VAL	2.1
1	B	192	LYS	2.1
1	B	37	ALA	2.1
1	B	114	GLN	2.1
1	D	106	GLU	2.1
1	A	28	GLN	2.0
1	B	113	GLU	2.0
1	A	192	LYS	2.0
1	D	83	MET	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)

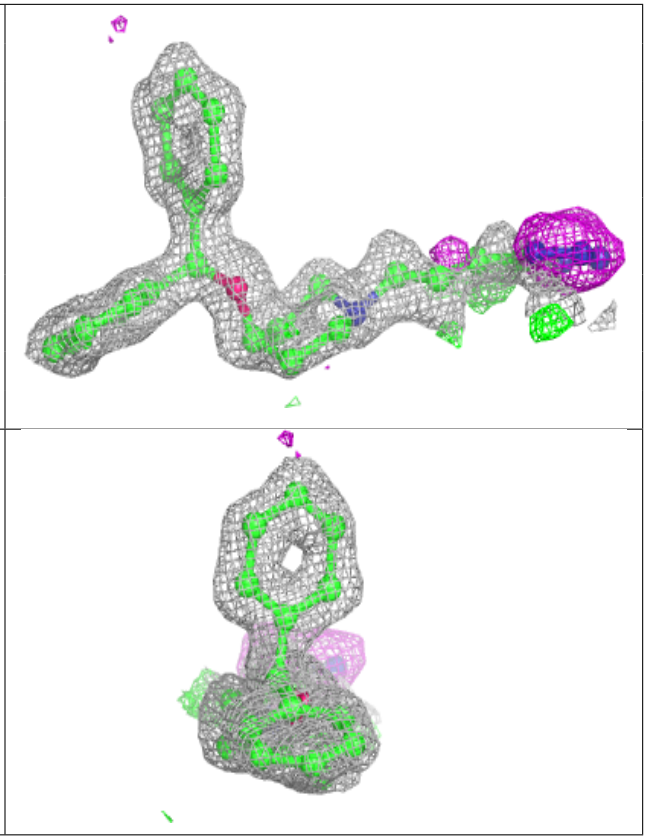
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

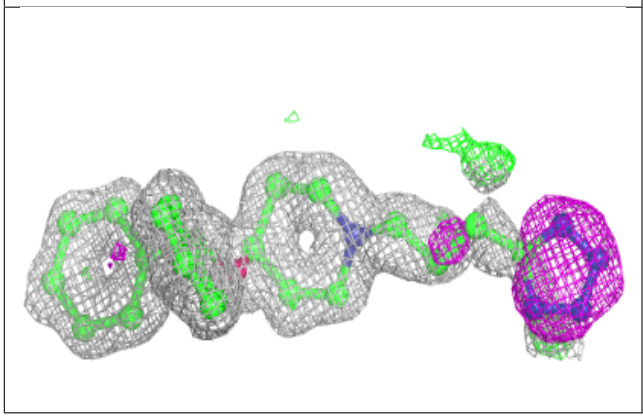
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	GOL	B	3007	6/6	0.48	0.26	40,40,40,40	0
4	HQL	A	2201	28/28	0.56	0.22	16,18,27,27	0
4	HQL	B	2401	28/28	0.57	0.21	16,18,26,27	0
5	GOL	A	3006	6/6	0.58	0.25	38,38,39,39	0
5	GOL	B	3005	6/6	0.67	0.24	38,38,39,39	0
4	HQL	D	2801	28/28	0.71	0.20	12,14,23,24	0
4	HQL	C	2601	28/28	0.72	0.20	11,13,22,23	0
5	GOL	C	3002	6/6	0.74	0.21	21,22,22,22	0
5	GOL	C	3004	6/6	0.79	0.18	19,20,20,21	0
5	GOL	C	3001	6/6	0.86	0.12	24,24,24,24	0
3	GSH	B	2002	20/20	0.89	0.13	8,12,18,18	0
5	GOL	C	3003	6/6	0.90	0.10	18,19,19,19	0
3	GSH	A	2001	20/20	0.91	0.13	8,12,19,19	0
3	GSH	D	2004	20/20	0.94	0.12	5,9,15,15	0
3	GSH	C	2003	20/20	0.95	0.10	6,9,13,13	0
2	MG	B	4002	1/1	1.00	0.02	6,6,6,6	0
2	MG	A	4001	1/1	1.00	0.03	6,6,6,6	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 HQL A 2201:

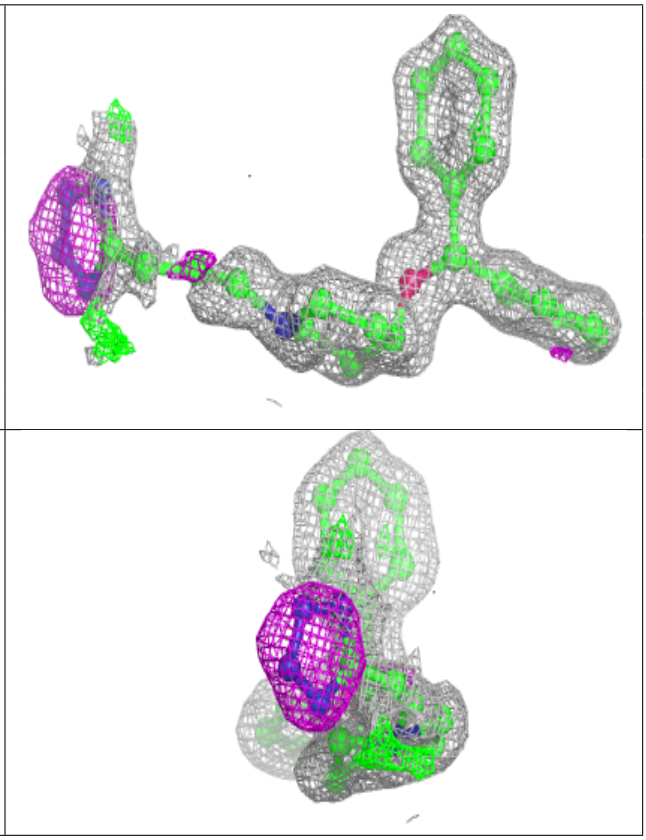
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

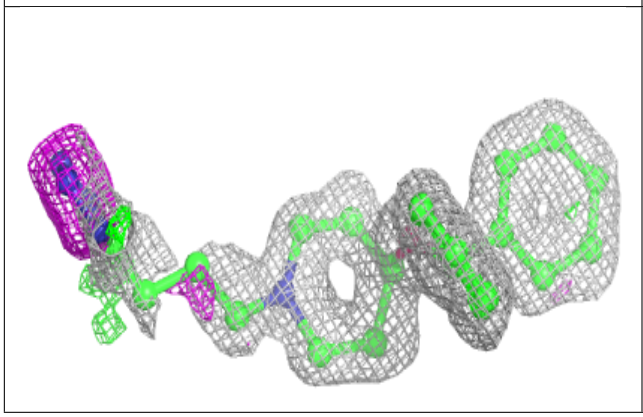




Electron density around HQL B 2401:

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





Electron density around HQL D 2801:

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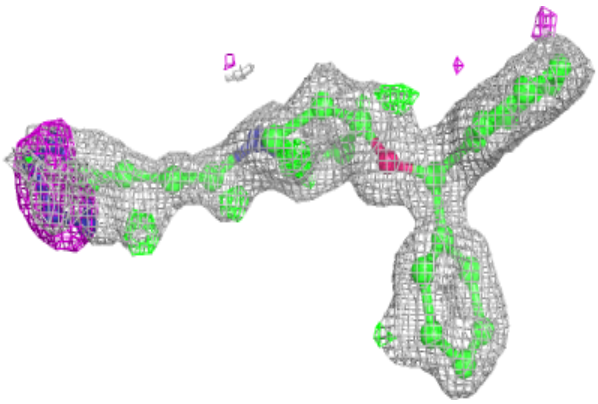
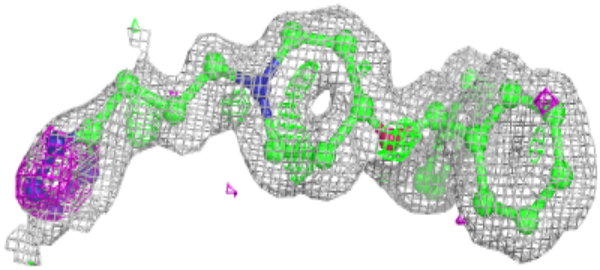
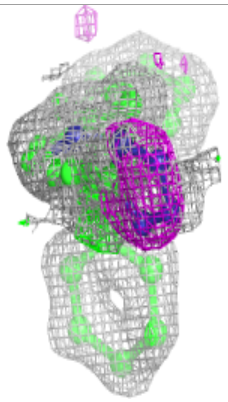
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)







Electron density around HQL C 2601:

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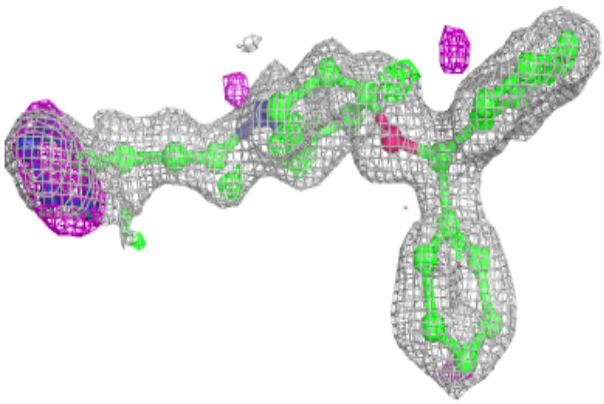
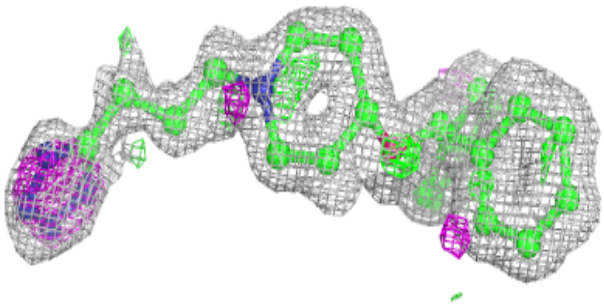
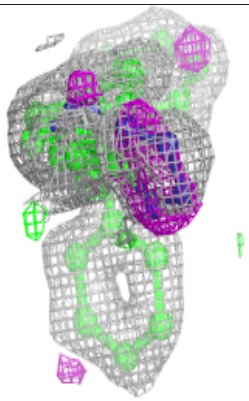
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

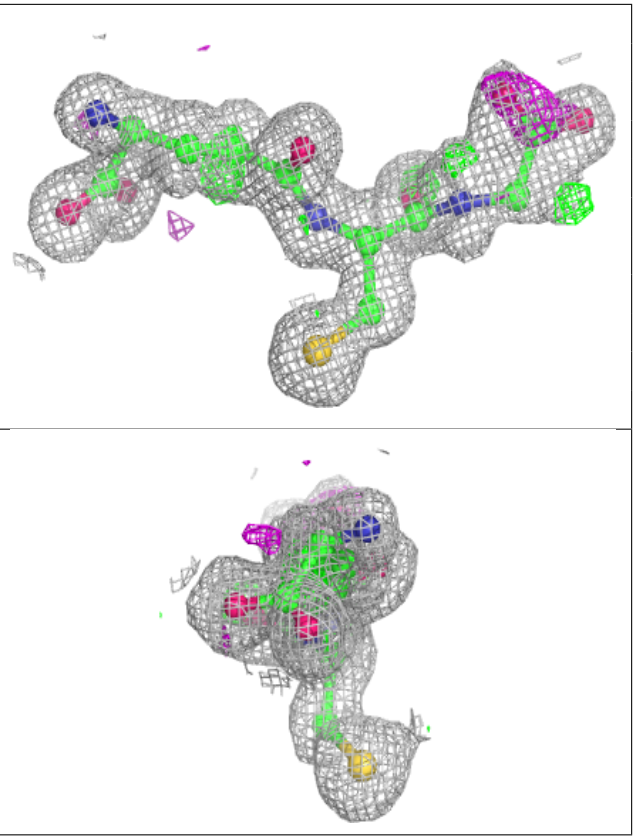






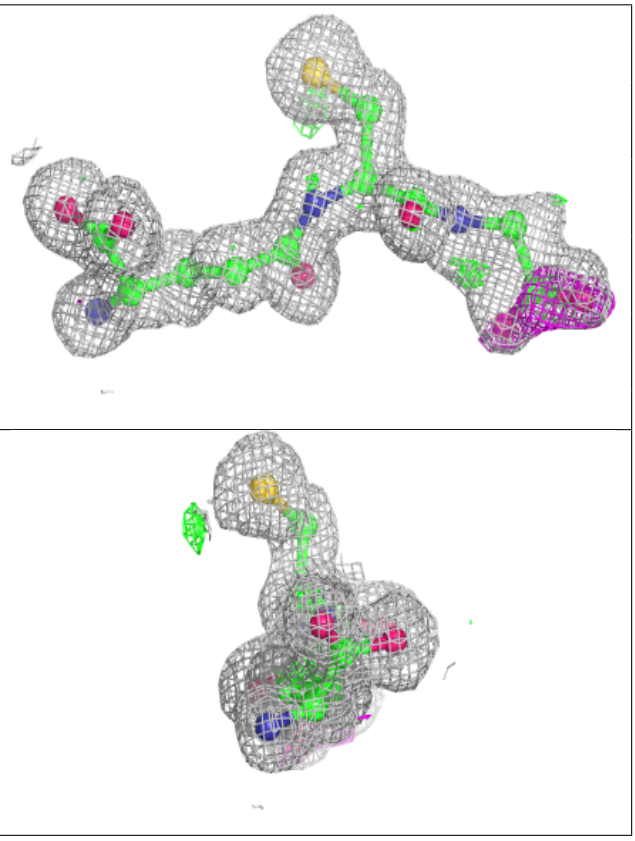
Electron density around GSH B 2002:

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



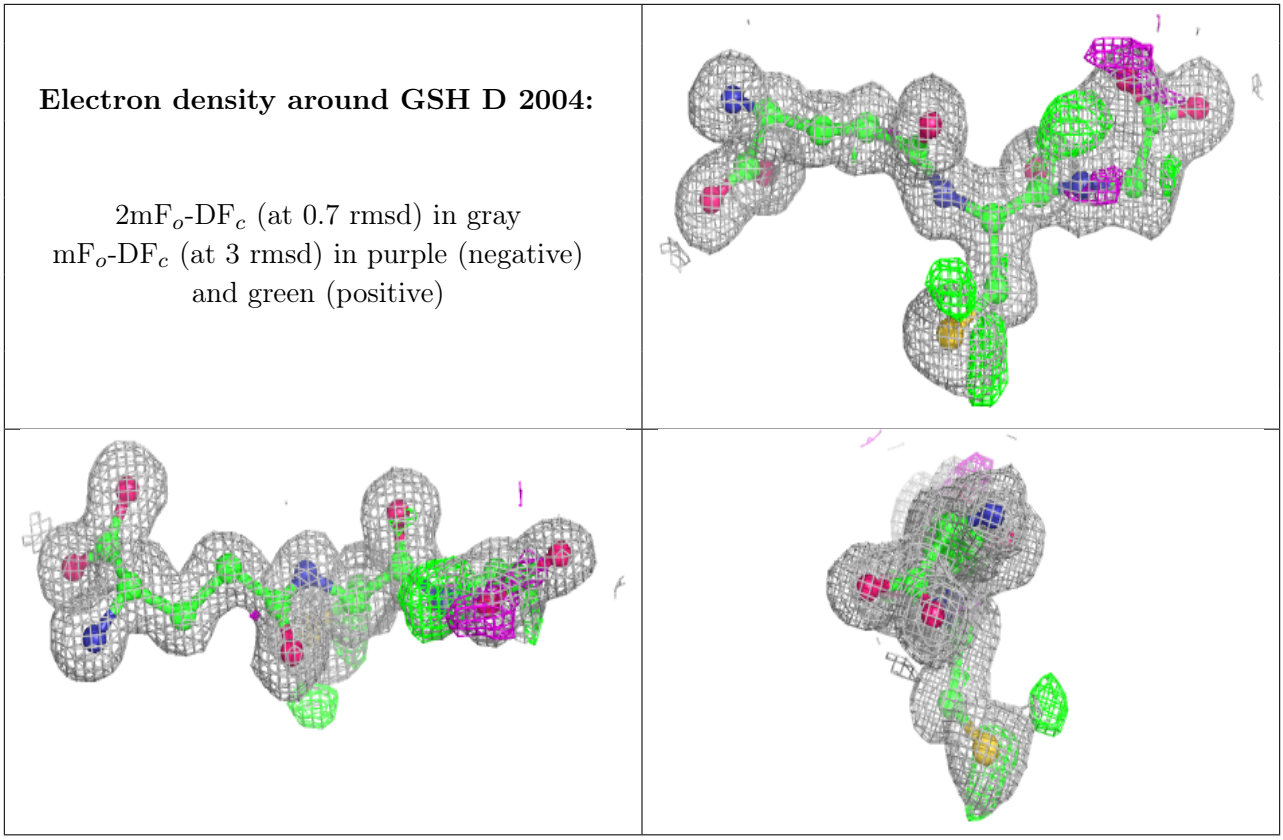
Electron density around GSH A 2001:

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



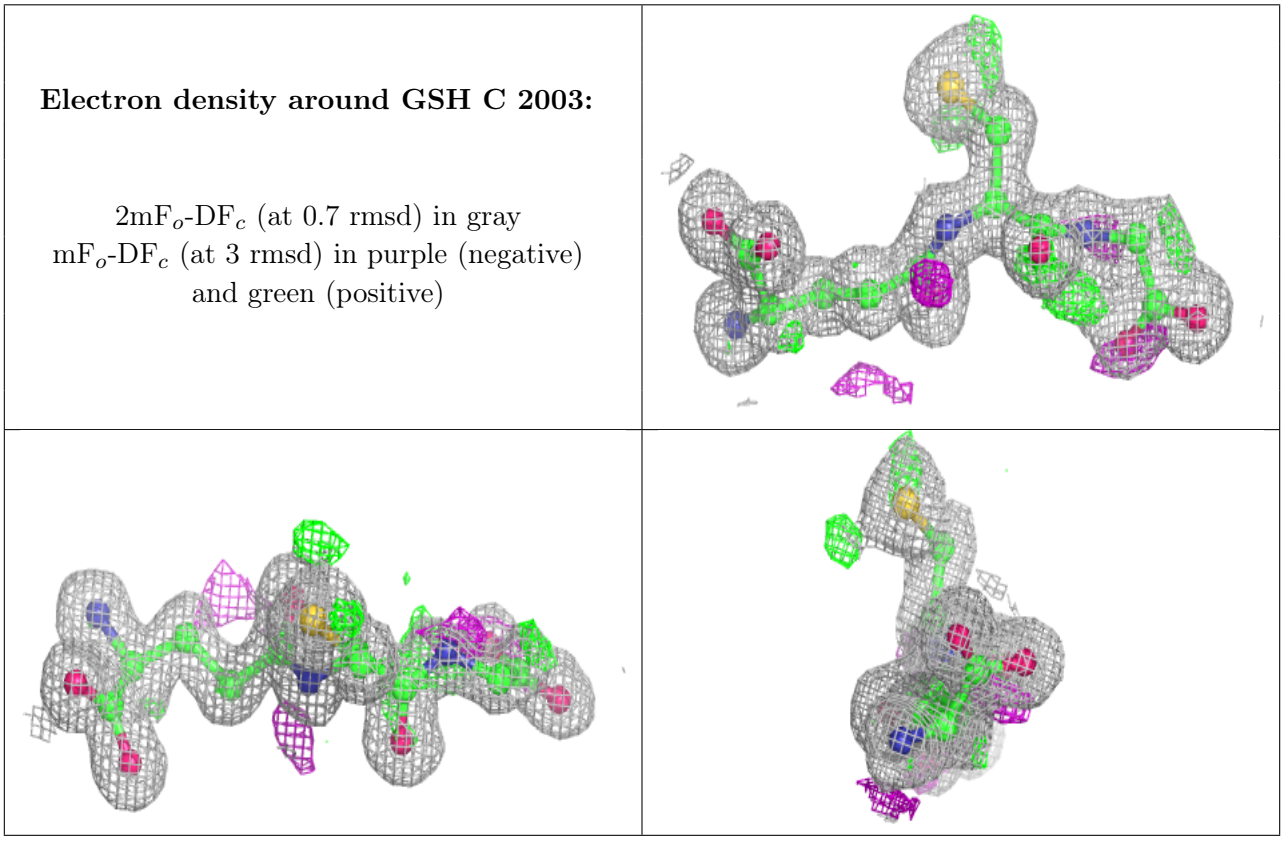
Electron density around GSH D 2004:

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



Electron density around GSH C 2003:

$2mF_o$-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.