



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 04:26 AM UTC

PDB ID : 1K0D / pdb_00001k0d
Title : Ure2p in Complex with Glutathione
Authors : Bousset, L.; Belrhali, H.; Melki, R.; Morera, S.
Deposited on : 2001-09-19
Resolution : 2.20 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 : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

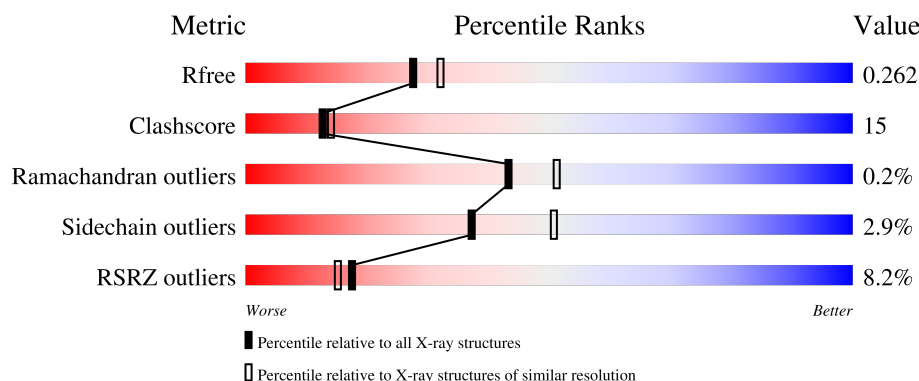
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	260	5% 58% 25% • 15%
1	B	260	6% 62% 26% • 11%
1	C	260	9% 61% 29% • 8%
1	D	260	9% 61% 27% • 9%

2 Entry composition [i](#)

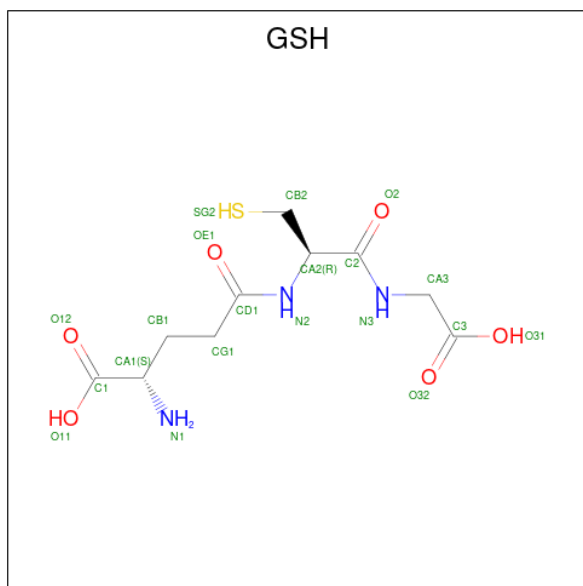
There are 3 unique types of molecules in this entry. The entry contains 7926 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 URE2 PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	221	Total	C	N	O	S	0	0	0
			1797	1169	308	314	6			
1	B	231	Total	C	N	O	S	0	0	0
			1882	1221	326	329	6			
1	C	239	Total	C	N	O	S	0	0	0
			1956	1269	338	343	6			
1	D	237	Total	C	N	O	S	0	0	0
			1941	1263	332	340	6			

- Molecule 2 is GLUTATHIONE (CCD ID: GSH) (formula: C₁₀H₁₇N₃O₆S).



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

Continued on next page...

Continued from previous page...

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

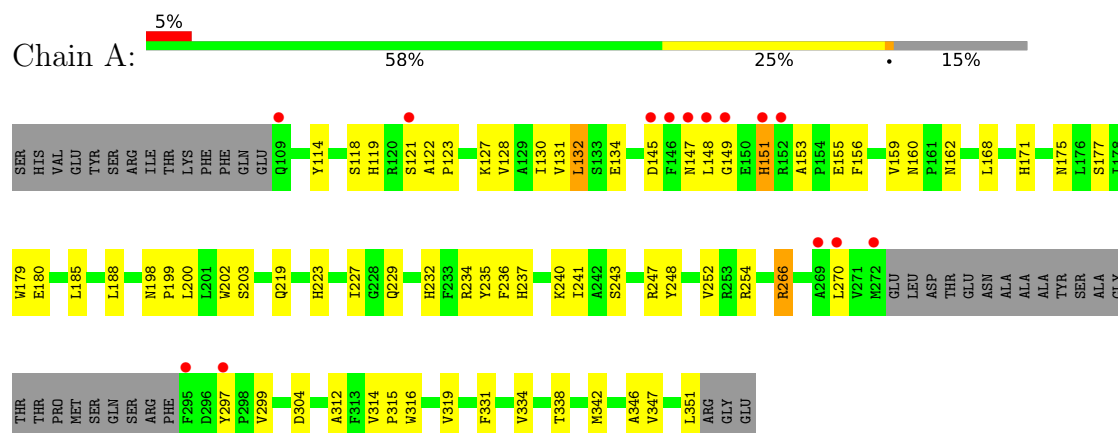
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	71	Total	O	0	0
			71	71		
3	B	66	Total	O	0	0
			66	66		
3	C	80	Total	O	0	0
			80	80		
3	D	73	Total	O	0	0
			73	73		

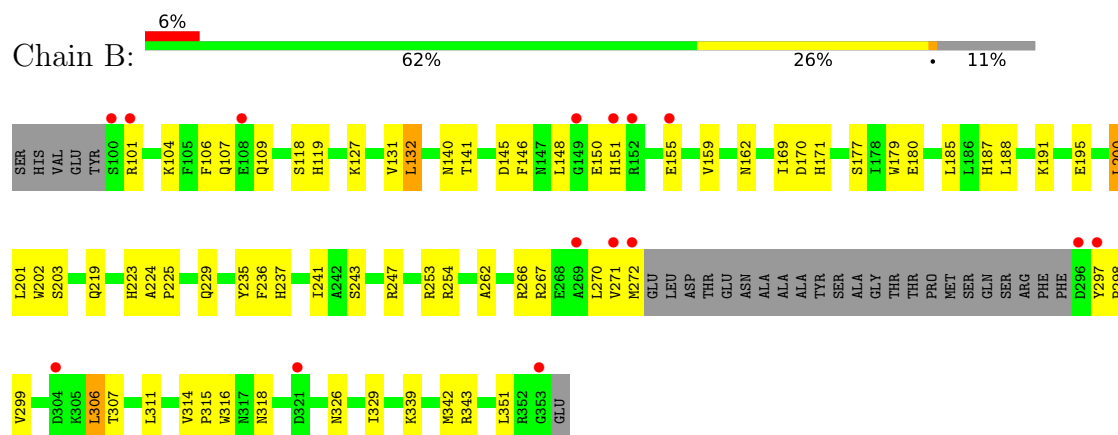
3 Residue-property plots [i](#)

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.

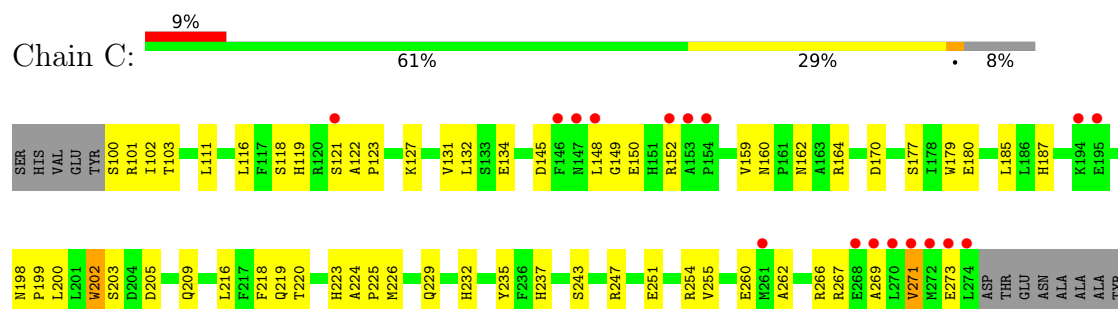
• Molecule 1: URE2 PROTEIN

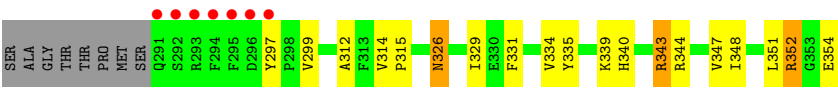


• Molecule 1: URE2 PROTEIN

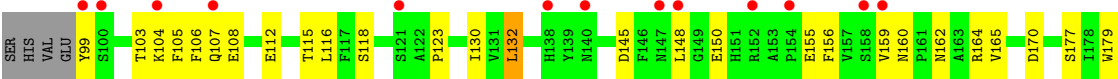


• Molecule 1: URE2 PROTEIN





● Molecule 1: URE2 PROTEIN



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	54.68Å 122.28Å 166.93Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.20 20.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.7 (20.00-2.20) 99.1 (20.00-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.28 (at 2.19Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.213 , 0.262 0.214 , 0.262	Depositor DCC
R_{free} test set	2891 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	29.3	Xtriage
Anisotropy	0.280	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 45.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7926	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.03% 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: 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	0.40	0/1849	0.86	4/2514 (0.2%)
1	B	0.40	0/1935	0.84	2/2627 (0.1%)
1	C	0.40	0/2011	0.87	1/2728 (0.0%)
1	D	0.40	1/1997 (0.1%)	0.86	4/2711 (0.1%)
All	All	0.40	1/7792 (0.0%)	0.86	11/10580 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	314	VAL	CA-CB	5.01	1.56	1.54

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	235	TYR	N-CA-C	6.79	122.47	114.04
1	B	235	TYR	N-CA-C	6.37	121.94	114.04
1	D	314	VAL	N-CA-C	5.79	119.91	112.67
1	D	236	PHE	N-CA-C	5.67	120.90	113.30
1	A	331	PHE	CA-C-N	5.66	125.12	119.24
1	A	331	PHE	C-N-CA	5.66	125.12	119.24
1	D	329	ILE	N-CA-C	5.42	116.91	111.00
1	A	227	ILE	N-CA-C	-5.33	105.19	110.62
1	A	236	PHE	N-CA-C	5.18	120.24	112.94
1	B	236	PHE	N-CA-C	5.16	121.34	113.61
1	D	321	ASP	N-CA-C	-5.03	105.98	111.82

There are no chirality outliers.

There are no planarity outliers.

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	1797	0	1767	64	0
1	B	1882	0	1855	63	0
1	C	1956	0	1922	60	0
1	D	1941	0	1903	62	0
2	A	20	0	15	0	0
2	B	20	0	15	0	0
2	C	20	0	15	0	0
3	A	71	0	0	1	0
3	B	66	0	0	1	0
3	C	80	0	0	1	0
3	D	73	0	0	2	0
All	All	7926	0	7492	230	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 15.

All (230) 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:C:226:MET:HE2	1:C:251:GLU:HG2	1.48	0.95
1:B:200:LEU:HD22	1:B:201:LEU:HG	1.59	0.84
1:D:314:VAL:HG13	1:D:315:PRO:HD3	1.64	0.80
1:C:226:MET:CE	1:C:251:GLU:HG2	2.12	0.79
1:A:254:ARG:HH22	1:B:162:ASN:HD21	1.32	0.78
1:C:149:GLY:HA3	1:C:152:ARG:HH11	1.48	0.78
1:B:342:MET:HE1	1:B:351:LEU:HD11	1.64	0.77
1:A:342:MET:HE2	1:A:342:MET:HA	1.64	0.77
1:D:266:ARG:NH2	1:D:304:ASP:H	1.83	0.77
1:C:352:ARG:HH21	1:C:352:ARG:HB3	1.49	0.76
1:C:352:ARG:HH21	1:C:352:ARG:CB	1.98	0.76
1:D:314:VAL:CG1	1:D:315:PRO:HD3	2.18	0.74
1:B:342:MET:HE2	1:B:342:MET:HA	1.71	0.72
1:B:127:LYS:NZ	1:B:219:GLN:HE22	1.88	0.72
1:A:247:ARG:HH21	1:B:229:GLN:HE22	1.35	0.70
1:B:127:LYS:HZ1	1:B:219:GLN:HE22	1.40	0.69

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:352:ARG:HB3	1:C:352:ARG:NH2	2.08	0.68
1:C:127:LYS:NZ	1:C:219:GLN:HE22	1.93	0.67
1:A:229:GLN:HE22	1:B:247:ARG:HH21	1.43	0.66
1:A:153:ALA:HB1	1:A:155:GLU:OE1	1.95	0.66
1:D:311:LEU:O	1:D:314:VAL:HG12	1.95	0.66
1:C:348:ILE:HG22	1:C:352:ARG:HD2	1.78	0.66
1:A:179:TRP:O	1:A:180:GLU:HB2	1.95	0.66
1:C:179:TRP:O	1:C:180:GLU:HB2	1.96	0.65
1:B:179:TRP:O	1:B:180:GLU:HB2	1.95	0.65
1:A:314:VAL:HB	1:A:315:PRO:HD3	1.79	0.65
1:A:160:ASN:ND2	1:A:162:ASN:H	1.94	0.64
1:B:306:LEU:HD21	1:B:311:LEU:HG	1.80	0.64
1:A:155:GLU:CD	1:A:155:GLU:H	2.06	0.63
1:A:130:ILE:HD11	1:A:351:LEU:HD11	1.80	0.62
1:C:159:VAL:HG13	1:C:177:SER:OG	1.99	0.62
1:D:130:ILE:HD11	1:D:351:LEU:HD11	1.80	0.62
1:C:121:SER:O	1:C:123:PRO:HD3	1.99	0.62
1:B:342:MET:HE1	1:B:351:LEU:CD1	2.30	0.62
1:D:272:MET:C	1:D:274:LEU:H	2.08	0.62
1:D:179:TRP:O	1:D:180:GLU:HB2	1.98	0.62
1:D:273:GLU:O	1:D:274:LEU:HD23	2.00	0.61
1:C:267:ARG:O	1:C:271:VAL:HG23	2.00	0.61
1:C:145:ASP:CG	1:C:148:LEU:HD13	2.24	0.61
1:C:347:VAL:O	1:C:351:LEU:HD13	2.01	0.61
1:B:253:ARG:NH2	3:B:370:HOH:O	2.32	0.61
1:A:132:LEU:HD13	1:A:188:LEU:CD1	2.31	0.60
1:B:223:HIS:HE1	1:B:316:TRP:HB2	1.66	0.60
1:C:254:ARG:HH12	1:D:162:ASN:ND2	2.00	0.60
1:D:314:VAL:HG13	1:D:315:PRO:CD	2.31	0.60
1:C:134:GLU:OE1	1:C:344:ARG:HD3	2.01	0.60
1:A:171:HIS:HA	1:A:175:ASN:HD22	1.68	0.59
1:A:266:ARG:HB3	1:A:299:VAL:CG1	2.32	0.59
1:D:266:ARG:HH22	1:D:304:ASP:H	1.47	0.59
1:B:131:VAL:HG21	1:B:185:LEU:HD22	1.84	0.59
1:C:237:HIS:HE1	1:D:243:SER:OG	1.86	0.58
1:A:132:LEU:HD13	1:A:188:LEU:HD13	1.84	0.58
1:D:159:VAL:HG13	1:D:177:SER:OG	2.04	0.57
1:C:131:VAL:HG21	1:C:185:LEU:HD22	1.86	0.57
1:C:229:GLN:HE22	1:D:247:ARG:HH21	1.51	0.57
1:C:326:ASN:C	1:C:326:ASN:HD22	2.12	0.57
1:C:314:VAL:HB	1:C:315:PRO:HD3	1.86	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:314:VAL:CG1	1:A:342:MET:HE3	2.35	0.56
1:B:306:LEU:HD23	1:B:307:THR:N	2.21	0.56
1:C:224:ALA:HB3	1:C:225:PRO:HD3	1.88	0.56
1:C:101:ARG:NH2	3:C:388:HOH:O	2.39	0.56
1:D:339:LYS:HA	1:D:339:LYS:HZ3	1.71	0.56
1:B:339:LYS:O	1:B:343:ARG:HG3	2.07	0.55
1:A:145:ASP:C	1:A:147:ASN:H	2.13	0.55
1:A:247:ARG:HH21	1:B:229:GLN:NE2	2.03	0.55
1:B:201:LEU:HD22	1:B:306:LEU:HD22	1.89	0.55
1:B:297:TYR:CD1	1:B:298:PRO:HD2	2.41	0.55
1:D:224:ALA:HB3	1:D:225:PRO:HD3	1.89	0.55
1:C:243:SER:OG	1:D:237:HIS:HE1	1.88	0.55
1:C:352:ARG:NH2	1:C:354:GLU:CD	2.65	0.55
1:A:237:HIS:HE1	1:B:243:SER:OG	1.88	0.55
1:D:106:PHE:HE2	1:D:159:VAL:HG21	1.70	0.55
1:A:127:LYS:HD2	1:A:312:ALA:HA	1.88	0.54
1:A:342:MET:HE1	1:A:351:LEU:CD2	2.37	0.54
1:A:127:LYS:NZ	1:A:219:GLN:HE22	2.06	0.54
1:A:219:GLN:O	1:A:223:HIS:HB3	2.08	0.54
1:B:101:ARG:HD3	1:B:150:GLU:OE2	2.08	0.54
1:C:340:HIS:HA	1:C:343:ARG:NH1	2.22	0.54
1:A:160:ASN:C	1:A:160:ASN:HD22	2.15	0.54
1:A:243:SER:OG	1:B:237:HIS:HE1	1.91	0.54
1:D:326:ASN:C	1:D:326:ASN:HD22	2.17	0.53
1:C:162:ASN:HD21	1:D:254:ARG:HH22	1.55	0.53
1:B:266:ARG:HB2	1:B:299:VAL:HG11	1.90	0.53
1:C:254:ARG:HH22	1:D:162:ASN:HD21	1.55	0.53
1:D:145:ASP:CG	1:D:148:LEU:HG	2.33	0.53
1:B:326:ASN:OD1	1:B:329:ILE:HD12	2.08	0.53
1:A:134:GLU:OE2	1:A:346:ALA:HB3	2.08	0.53
1:C:260:GLU:OE1	1:C:334:VAL:HG23	2.09	0.53
1:A:202:TRP:CG	1:A:203:SER:H	2.27	0.53
1:A:128:VAL:HG12	1:A:132:LEU:HD22	1.91	0.53
1:B:262:ALA:O	1:B:266:ARG:HG2	2.09	0.53
1:B:314:VAL:CG1	1:B:342:MET:HE3	2.39	0.53
1:B:202:TRP:CG	1:B:203:SER:H	2.28	0.52
1:B:266:ARG:HB2	1:B:299:VAL:CG1	2.39	0.52
1:B:326:ASN:C	1:B:326:ASN:HD22	2.17	0.52
1:A:232:HIS:NE2	1:A:237:HIS:HD2	2.07	0.52
1:B:132:LEU:HD13	1:B:188:LEU:HD11	1.91	0.52
1:D:347:VAL:O	1:D:351:LEU:HD13	2.10	0.52

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:202:TRP:CG	1:D:203:SER:H	2.27	0.51
1:C:262:ALA:O	1:C:266:ARG:HG2	2.10	0.51
1:D:272:MET:C	1:D:274:LEU:N	2.69	0.51
1:C:119:HIS:HB3	1:C:122:ALA:HB2	1.93	0.51
1:D:274:LEU:HB3	1:D:294:PHE:CE1	2.46	0.51
1:D:156:PHE:O	1:D:159:VAL:HB	2.11	0.51
1:B:109:GLN:HE22	1:B:169:ILE:HG21	1.76	0.50
1:C:335:TYR:OH	1:C:339:LYS:NZ	2.43	0.50
1:C:260:GLU:OE1	1:C:331:PHE:HB3	2.12	0.50
1:A:149:GLY:HA2	1:A:151:HIS:CE1	2.47	0.50
1:A:314:VAL:HG11	1:A:342:MET:HE3	1.92	0.50
1:B:145:ASP:OD1	1:B:148:LEU:HD13	2.12	0.50
1:C:247:ARG:HH21	1:D:229:GLN:HE22	1.59	0.50
1:A:131:VAL:HG21	1:A:185:LEU:HD22	1.94	0.49
1:D:270:LEU:HD21	1:D:297:TYR:HB3	1.92	0.49
1:D:123:PRO:HB2	1:D:316:TRP:CE2	2.47	0.49
1:B:145:ASP:CG	1:B:148:LEU:HD13	2.38	0.49
1:A:229:GLN:NE2	1:B:247:ARG:HH21	2.08	0.49
1:C:205:ASP:O	1:C:209:GLN:HG3	2.13	0.49
1:A:266:ARG:HB3	1:A:299:VAL:HG11	1.94	0.49
1:B:109:GLN:HE21	1:B:171:HIS:HE1	1.61	0.48
1:C:150:GLU:C	1:C:152:ARG:H	2.21	0.48
1:C:232:HIS:NE2	1:C:237:HIS:HD2	2.11	0.48
1:C:127:LYS:HZ2	1:C:219:GLN:HE22	1.60	0.48
1:C:198:ASN:HD22	1:C:199:PRO:HD2	1.78	0.48
1:D:272:MET:O	1:D:274:LEU:N	2.46	0.48
1:C:267:ARG:NH1	1:C:297:TYR:O	2.46	0.48
1:D:253:ARG:NH2	3:D:380:HOH:O	2.40	0.48
1:C:343:ARG:HH11	1:C:343:ARG:HB2	1.79	0.48
1:D:218:PHE:CZ	1:D:255:VAL:HG13	2.48	0.48
1:A:121:SER:O	1:A:123:PRO:HD3	2.14	0.48
1:A:304:ASP:HA	3:A:409:HOH:O	2.14	0.48
1:C:101:ARG:HH11	1:C:101:ARG:HG3	1.78	0.48
1:A:347:VAL:O	1:A:351:LEU:HD13	2.14	0.48
1:B:267:ARG:NH1	1:B:297:TYR:O	2.46	0.48
1:C:216:LEU:O	1:C:220:THR:HG23	2.13	0.48
1:B:170:ASP:OD2	1:B:187:HIS:HE1	1.96	0.47
1:A:151:HIS:HA	1:A:156:PHE:CD2	2.48	0.47
1:B:104:LYS:O	1:B:107:GLN:HB2	2.15	0.47
1:A:334:VAL:O	1:A:338:THR:HG22	2.15	0.47
1:A:248:TYR:O	1:A:252:VAL:HG23	2.15	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:100:SER:HB2	1:C:103:THR:HB	1.97	0.47
1:A:342:MET:HE1	1:A:351:LEU:HD22	1.98	0.46
1:B:201:LEU:CD2	1:B:306:LEU:HD22	2.45	0.46
1:C:118:SER:OG	1:C:119:HIS:N	2.48	0.46
1:D:245:VAL:O	1:D:249:THR:HG23	2.16	0.46
1:A:145:ASP:C	1:A:147:ASN:N	2.71	0.46
1:A:266:ARG:HB3	1:A:299:VAL:HG13	1.97	0.46
1:A:316:TRP:O	1:A:319:VAL:HG12	2.15	0.46
1:A:240:LYS:C	1:A:241:ILE:HG13	2.40	0.46
1:D:260:GLU:OE1	1:D:334:VAL:HG23	2.16	0.46
1:B:159:VAL:HG13	1:B:177:SER:OG	2.16	0.45
1:A:162:ASN:ND2	1:B:254:ARG:HH22	2.15	0.45
1:B:224:ALA:HB3	1:B:225:PRO:HD3	1.97	0.45
1:B:316:TRP:C	1:B:318:ASN:N	2.75	0.45
1:C:202:TRP:CG	1:C:203:SER:H	2.35	0.45
1:D:266:ARG:HD3	3:D:384:HOH:O	2.16	0.45
1:D:326:ASN:ND2	1:D:329:ILE:H	2.14	0.45
1:A:342:MET:HE1	1:A:351:LEU:HD21	1.99	0.45
1:B:267:ARG:O	1:B:271:VAL:HG23	2.17	0.44
1:C:127:LYS:HD2	1:C:312:ALA:HA	1.99	0.44
1:D:103:THR:O	1:D:107:GLN:HG3	2.17	0.44
1:B:314:VAL:HG13	1:B:342:MET:HE3	2.00	0.44
1:A:234:ARG:HG2	1:A:235:TYR:CE1	2.53	0.44
1:A:342:MET:HA	1:A:342:MET:CE	2.42	0.44
1:C:160:ASN:ND2	1:C:164:ARG:O	2.48	0.44
1:B:106:PHE:CD1	1:B:155:GLU:HB3	2.53	0.44
1:D:248:TYR:O	1:D:252:VAL:HG23	2.17	0.44
1:B:146:PHE:HA	1:B:151:HIS:HD2	1.82	0.44
1:B:270:LEU:C	1:B:272:MET:N	2.75	0.44
1:D:232:HIS:NE2	1:D:237:HIS:HD2	2.16	0.44
1:A:118:SER:OG	1:A:119:HIS:N	2.51	0.44
1:A:270:LEU:HD21	1:A:297:TYR:HB2	1.99	0.44
1:C:100:SER:O	1:C:102:ILE:N	2.49	0.44
1:C:271:VAL:C	1:C:273:GLU:H	2.26	0.44
1:D:132:LEU:HD13	1:D:188:LEU:CD1	2.48	0.44
1:D:132:LEU:HD13	1:D:188:LEU:HD11	2.00	0.43
1:D:145:ASP:OD1	1:D:148:LEU:HG	2.18	0.43
1:D:118:SER:HA	1:D:165:VAL:HB	2.00	0.43
1:D:160:ASN:ND2	1:D:164:ARG:O	2.51	0.43
1:A:198:ASN:HD22	1:A:199:PRO:HD2	1.84	0.43
1:A:254:ARG:NH2	1:B:162:ASN:HD21	2.07	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:232:HIS:NE2	1:A:237:HIS:CD2	2.86	0.43
1:C:170:ASP:OD2	1:C:187:HIS:HE1	2.01	0.43
1:A:132:LEU:HD13	1:A:188:LEU:HD11	2.01	0.43
1:D:106:PHE:CG	1:D:155:GLU:HB3	2.54	0.43
1:A:119:HIS:HB3	1:A:122:ALA:HB2	2.00	0.43
1:C:326:ASN:OD1	1:C:329:ILE:HD12	2.19	0.43
1:D:170:ASP:OD2	1:D:191:LYS:NZ	2.45	0.43
1:C:218:PHE:CZ	1:C:255:VAL:HG13	2.54	0.43
1:B:109:GLN:NE2	1:B:169:ILE:HG21	2.33	0.42
1:B:118:SER:OG	1:B:119:HIS:N	2.52	0.42
1:C:127:LYS:HZ2	1:C:219:GLN:NE2	2.17	0.42
1:B:219:GLN:O	1:B:223:HIS:HB3	2.18	0.42
1:D:99:TYR:HB3	1:D:150:GLU:HA	2.00	0.42
1:C:219:GLN:O	1:C:223:HIS:HB3	2.19	0.42
1:A:254:ARG:HH12	1:B:162:ASN:ND2	2.17	0.42
1:A:127:LYS:CD	1:A:312:ALA:HA	2.49	0.42
1:B:314:VAL:HB	1:B:315:PRO:HD3	2.02	0.42
1:D:270:LEU:HD21	1:D:297:TYR:CD2	2.55	0.42
1:D:104:LYS:O	1:D:108:GLU:HG2	2.20	0.42
1:D:300:TRP:CZ3	1:D:306:LEU:HD13	2.54	0.42
1:A:160:ASN:ND2	1:A:160:ASN:C	2.75	0.42
1:B:132:LEU:HD13	1:B:188:LEU:CD1	2.50	0.42
1:D:270:LEU:O	1:D:274:LEU:HG	2.19	0.42
1:C:269:ALA:O	1:C:273:GLU:HB2	2.19	0.41
1:B:191:LYS:O	1:B:195:GLU:HG3	2.20	0.41
1:D:185:LEU:O	1:D:189:VAL:HG22	2.20	0.41
1:D:339:LYS:O	1:D:343:ARG:HG3	2.20	0.41
1:A:159:VAL:HG13	1:A:177:SER:OG	2.20	0.41
1:C:340:HIS:HA	1:C:343:ARG:HH12	1.86	0.41
1:D:99:TYR:O	1:D:99:TYR:HD1	2.03	0.41
1:D:105:PHE:CZ	1:D:115:THR:HG21	2.56	0.41
1:A:114:TYR:HB3	1:A:168:LEU:HD11	2.02	0.41
1:C:254:ARG:NH2	1:D:162:ASN:HD21	2.17	0.41
1:A:241:ILE:HD13	1:B:241:ILE:HG21	2.01	0.41
1:D:339:LYS:HA	1:D:339:LYS:NZ	2.36	0.41
1:A:145:ASP:CG	1:A:148:LEU:HD13	2.46	0.41
1:B:271:VAL:O	1:B:271:VAL:HG12	2.21	0.41
1:B:270:LEU:C	1:B:272:MET:H	2.28	0.40
1:B:223:HIS:HE1	1:B:316:TRP:CB	2.32	0.40
1:C:339:LYS:HD3	1:C:339:LYS:HA	1.82	0.40
1:D:179:TRP:CD1	1:D:179:TRP:H	2.39	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:140:ASN:HD22	1:B:141:THR:N	2.20	0.40
1:B:306:LEU:HD21	1:B:311:LEU:CG	2.51	0.40
1:C:127:LYS:HZ3	1:C:219:GLN:HE22	1.64	0.40
1:D:186:LEU:HD23	1:D:186:LEU:HA	1.92	0.40
1:D:219:GLN:O	1:D:223:HIS:HB3	2.21	0.40
1:D:352:ARG:HG2	1:D:352:ARG:HH11	1.86	0.40
1:A:145:ASP:OD1	1:A:145:ASP:O	2.40	0.40
1:A:148:LEU:HD12	1:A:148:LEU:N	2.37	0.40
1:B:339:LYS:HD3	1:B:339:LYS:HA	1.88	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	217/260 (84%)	207 (95%)	10 (5%)	0	100	100
1	B	227/260 (87%)	219 (96%)	8 (4%)	0	100	100
1	C	235/260 (90%)	222 (94%)	12 (5%)	1 (0%)	30	34
1	D	233/260 (90%)	223 (96%)	9 (4%)	1 (0%)	30	34
All	All	912/1040 (88%)	871 (96%)	39 (4%)	2 (0%)	43	51

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	271	VAL
1	D	273	GLU

5.3.2 Protein sidechains ⓘ

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	190/223 (85%)	186 (98%)	4 (2%)	47	63
1	B	199/223 (89%)	196 (98%)	3 (2%)	57	73
1	C	207/223 (93%)	198 (96%)	9 (4%)	26	35
1	D	205/223 (92%)	198 (97%)	7 (3%)	32	44
All	All	801/892 (90%)	778 (97%)	23 (3%)	37	51

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	132	LEU
1	A	151	HIS
1	A	200	LEU
1	A	266	ARG
1	B	132	LEU
1	B	200	LEU
1	B	306	LEU
1	C	111	LEU
1	C	116	LEU
1	C	132	LEU
1	C	200	LEU
1	C	202	TRP
1	C	299	VAL
1	C	326	ASN
1	C	343	ARG
1	C	352	ARG
1	D	112	GLU
1	D	116	LEU
1	D	132	LEU
1	D	200	LEU
1	D	202	TRP
1	D	326	ASN
1	D	339	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (56) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	147	ASN
1	A	160	ASN
1	A	162	ASN
1	A	175	ASN
1	A	187	HIS
1	A	190	ASN
1	A	198	ASN
1	A	209	GLN
1	A	211	GLN
1	A	213	ASN
1	A	219	GLN
1	A	229	GLN
1	A	237	HIS
1	A	317	ASN
1	A	318	ASN
1	B	109	GLN
1	B	140	ASN
1	B	147	ASN
1	B	151	HIS
1	B	162	ASN
1	B	187	HIS
1	B	209	GLN
1	B	211	GLN
1	B	213	ASN
1	B	219	GLN
1	B	229	GLN
1	B	237	HIS
1	B	239	GLN
1	B	318	ASN
1	B	340	HIS
1	C	109	GLN
1	C	119	HIS
1	C	162	ASN
1	C	187	HIS
1	C	190	ASN
1	C	198	ASN
1	C	213	ASN
1	C	219	GLN
1	C	229	GLN
1	C	237	HIS
1	C	239	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	C	291	GLN
1	C	317	ASN
1	C	318	ASN
1	C	326	ASN
1	D	109	GLN
1	D	147	ASN
1	D	162	ASN
1	D	187	HIS
1	D	209	GLN
1	D	211	GLN
1	D	213	ASN
1	D	219	GLN
1	D	229	GLN
1	D	237	HIS
1	D	326	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	GSH	A	355	-	18,19,19	1.53	3 (16%)	21,24,24	0.74	0
2	GSH	B	356	-	18,19,19	1.53	2 (11%)	21,24,24	0.72	0
2	GSH	C	357	-	18,19,19	1.57	3 (16%)	21,24,24	0.69	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GSH	A	355	-	-	2/24/24/24	-
2	GSH	B	356	-	-	2/24/24/24	-
2	GSH	C	357	-	-	2/24/24/24	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	356	GSH	O12-C1	3.21	1.31	1.22
2	C	357	GSH	O12-C1	3.14	1.31	1.22
2	A	355	GSH	O12-C1	3.12	1.31	1.22
2	C	357	GSH	CB2-CA2	2.65	1.55	1.53
2	B	356	GSH	CG1-CD1	2.54	1.56	1.51
2	A	355	GSH	CB2-CA2	2.32	1.55	1.53
2	C	357	GSH	CG1-CD1	2.20	1.55	1.51
2	A	355	GSH	CG1-CD1	2.14	1.55	1.51

There are no bond angle outliers.

There are no chirality outliers.

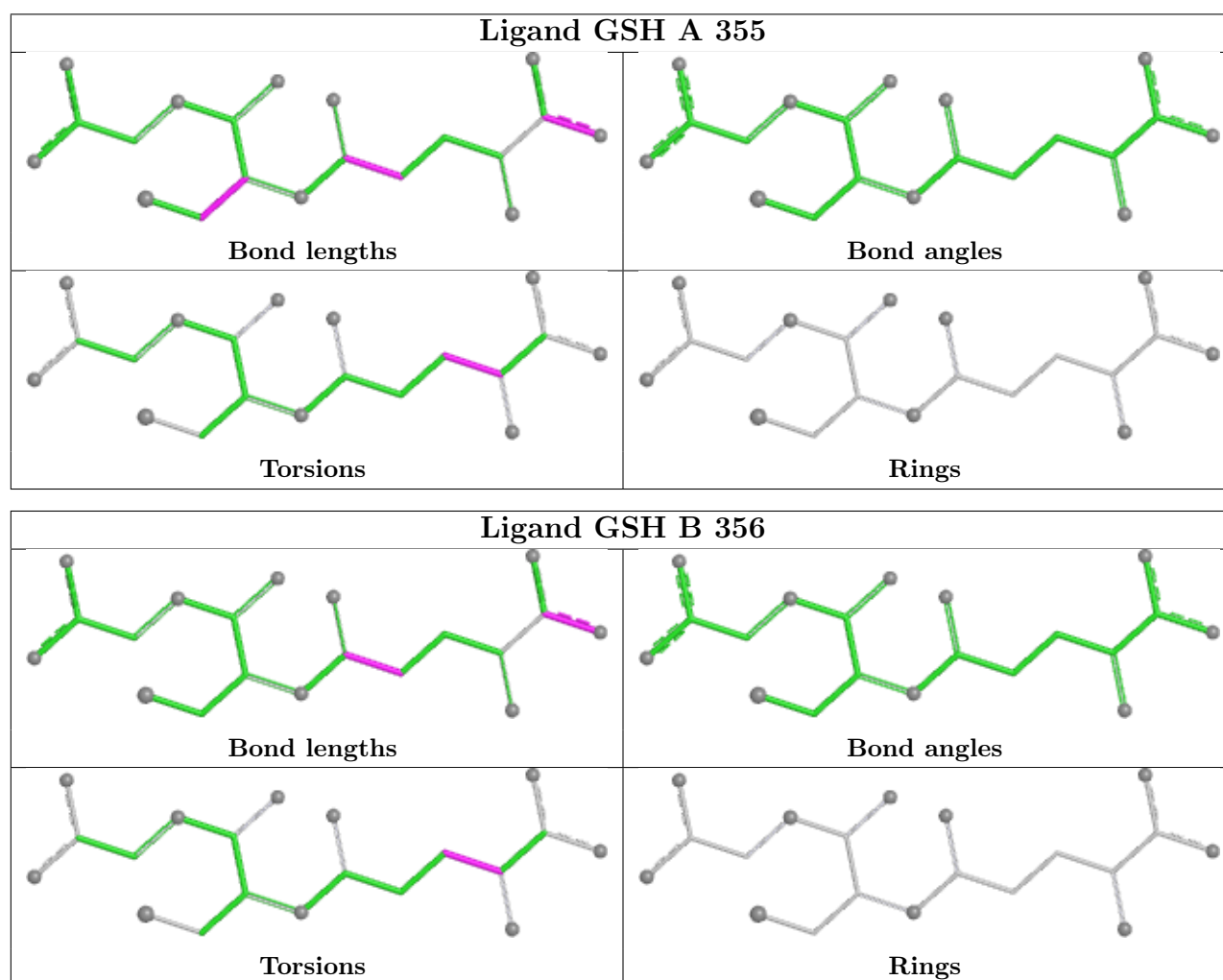
All (6) torsion outliers are listed below:

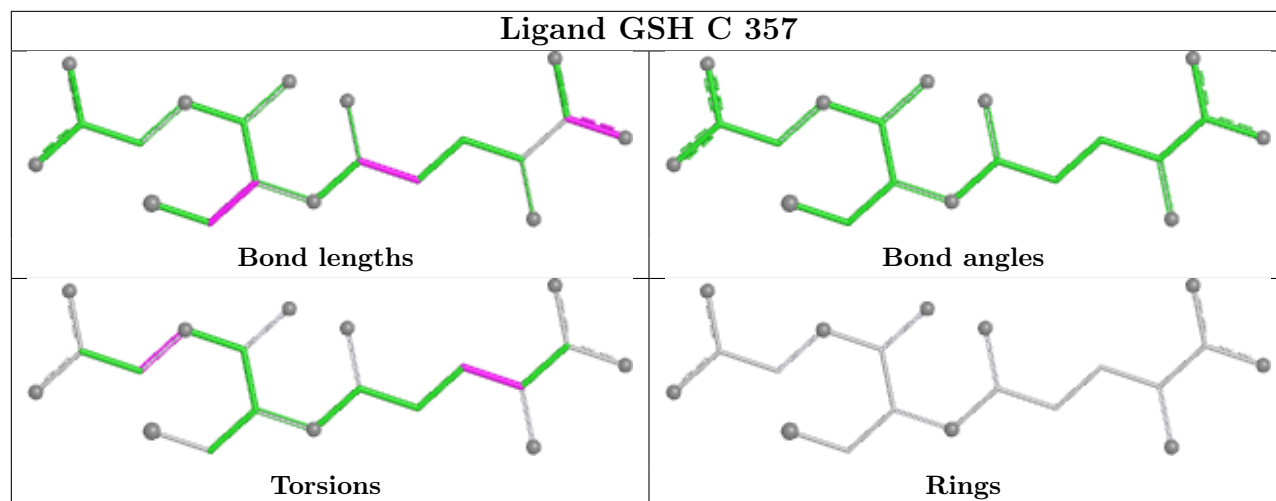
Mol	Chain	Res	Type	Atoms
2	A	355	GSH	N1-CA1-CB1-CG1
2	B	356	GSH	N1-CA1-CB1-CG1
2	C	357	GSH	N1-CA1-CB1-CG1
2	C	357	GSH	C3-CA3-N3-C2
2	A	355	GSH	C1-CA1-CB1-CG1
2	B	356	GSH	C1-CA1-CB1-CG1

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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(Å²)	Q<0.9
1	A	221/260 (85%)	0.22	14 (6%)	26	23	18, 30, 63, 77	0
1	B	231/260 (88%)	0.29	15 (6%)	25	22	15, 31, 63, 76	0
1	C	239/260 (91%)	0.17	24 (10%)	12	10	16, 27, 67, 80	0
1	D	237/260 (91%)	0.34	23 (9%)	13	10	17, 31, 67, 79	0
All	All	928/1040 (89%)	0.25	76 (8%)	17	15	15, 30, 66, 80	0

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	148	LEU	5.0
1	D	295	PHE	4.9
1	A	269	ALA	4.5
1	C	294	PHE	4.4
1	D	294	PHE	4.4
1	C	270	LEU	4.3
1	C	146	PHE	4.1
1	D	297	TYR	4.0
1	A	145	ASP	3.9
1	C	271	VAL	3.7
1	B	297	TYR	3.7
1	B	149	GLY	3.6
1	A	149	GLY	3.5
1	C	152	ARG	3.5
1	B	269	ALA	3.4
1	A	147	ASN	3.3
1	D	100	SER	3.3
1	C	269	ALA	3.2
1	D	148	LEU	3.2
1	C	291	GLN	3.2
1	C	297	TYR	3.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	152	ARG	3.1
1	D	272	MET	3.2
1	A	295	PHE	3.1
1	C	292	SER	3.1
1	B	296	ASP	3.1
1	C	153	ALA	3.0
1	D	274	LEU	3.0
1	C	273	GLU	3.0
1	C	194	LYS	2.8
1	A	297	TYR	2.8
1	A	270	LEU	2.8
1	A	272	MET	2.8
1	D	121	SER	2.8
1	D	104	LYS	2.7
1	B	304	ASP	2.7
1	D	154	PRO	2.7
1	A	109	GLN	2.7
1	A	121	SER	2.7
1	D	270	LEU	2.7
1	B	151	HIS	2.6
1	D	152	ARG	2.6
1	A	152	ARG	2.6
1	C	272	MET	2.6
1	D	138	HIS	2.6
1	B	101	ARG	2.6
1	A	146	PHE	2.6
1	B	271	VAL	2.6
1	B	272	MET	2.5
1	D	296	ASP	2.5
1	D	159	VAL	2.5
1	C	274	LEU	2.5
1	D	158	SER	2.4
1	D	275	ASP	2.4
1	B	321	ASP	2.4
1	C	293	ARG	2.4
1	C	295	PHE	2.3
1	D	269	ALA	2.3
1	C	296	ASP	2.3
1	D	140	ASN	2.3
1	A	151	HIS	2.2
1	B	155	GLU	2.2
1	C	268	GLU	2.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	147	ASN	2.2
1	B	108	GLU	2.2
1	C	148	LEU	2.2
1	D	99	TYR	2.1
1	C	261	MET	2.1
1	C	195	GLU	2.1
1	B	353	GLY	2.1
1	C	121	SER	2.1
1	D	147	ASN	2.1
1	B	100	SER	2.0
1	D	265	GLU	2.0
1	D	107	GLN	2.0
1	C	154	PRO	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

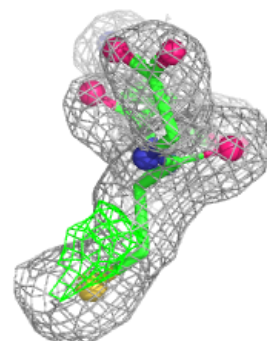
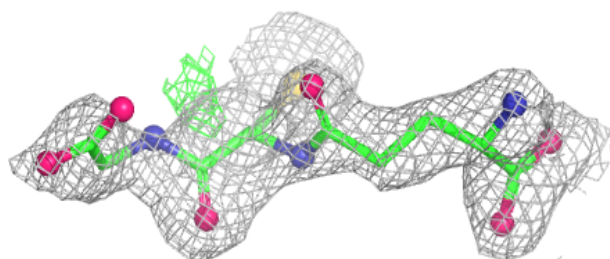
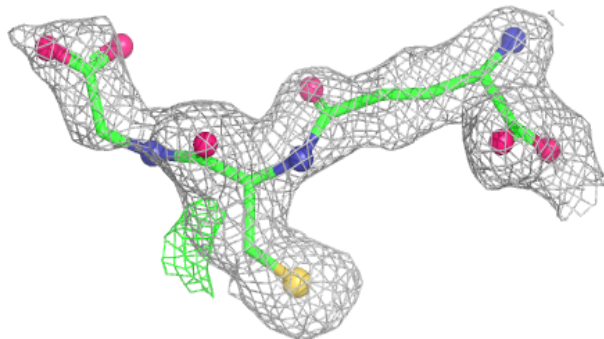
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	GSH	B	356	20/20	0.85	0.12	29,50,65,65	0
2	GSH	A	355	20/20	0.86	0.12	32,45,59,61	0
2	GSH	C	357	20/20	0.92	0.10	23,39,47,49	0

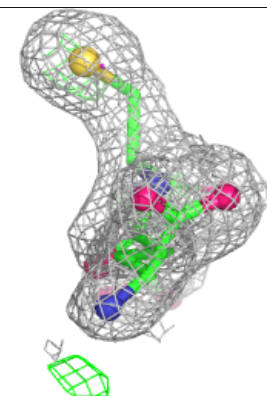
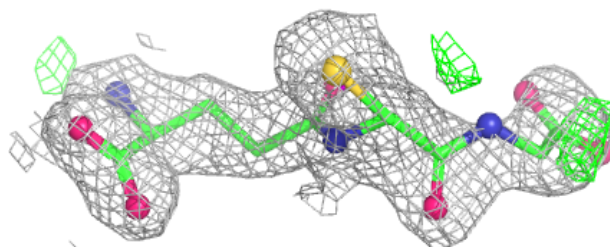
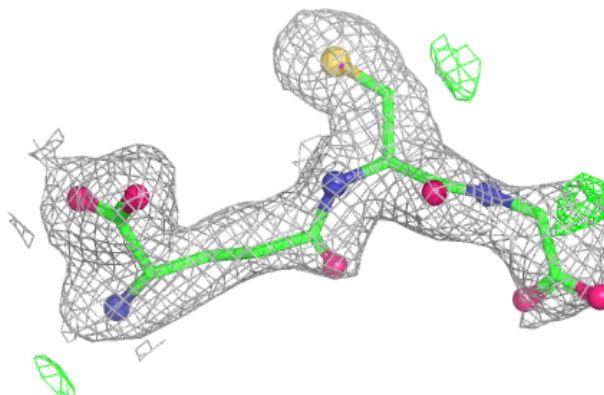
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

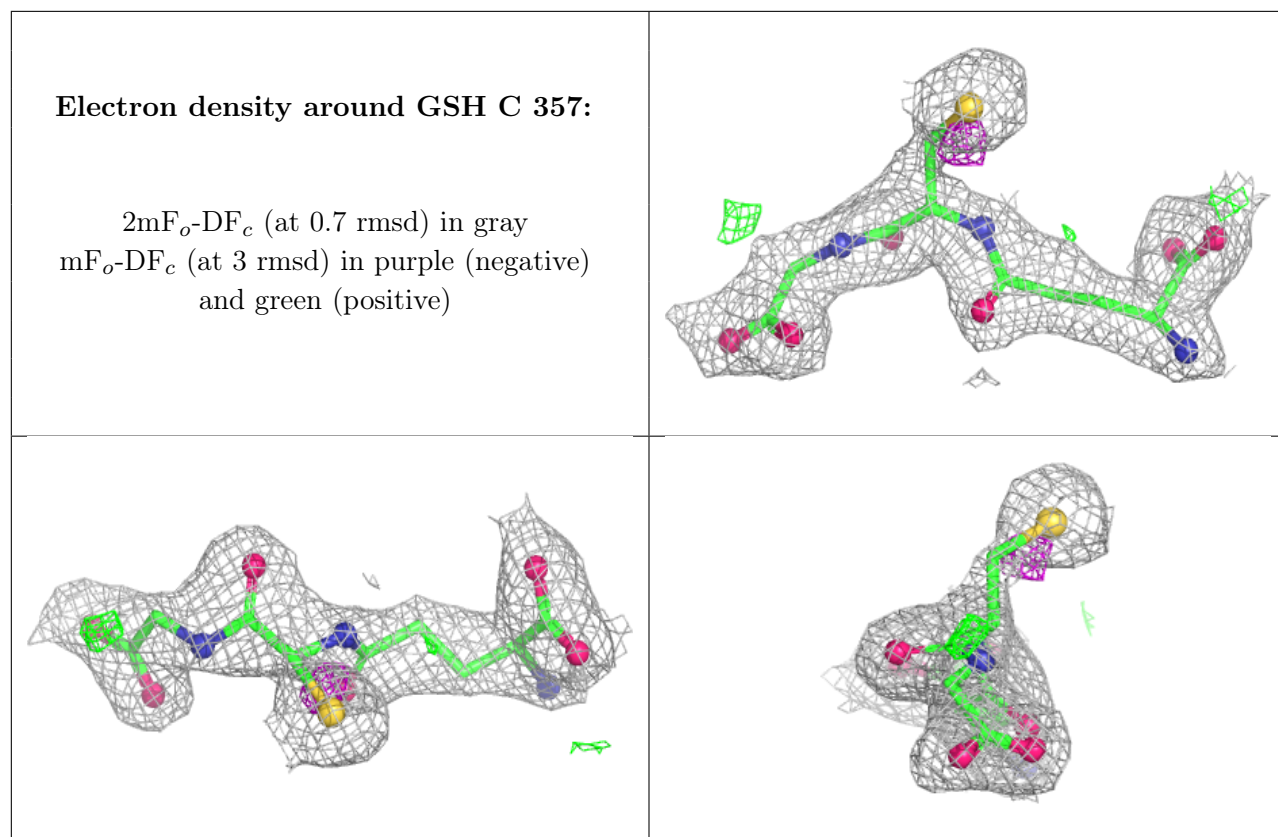
Electron density around GSH B 356:

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

**Electron density around GSH A 355:**

$2mF_o-DF_c$ (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.