



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 9, 2020 – 01:37 AM BST

PDB ID : 3U5Y  
Title : Structures of Alkaloid Biosynthetic Glucosidases Decode Substrate Specificity  
Authors : Xia, L.; Ruppert, M.; Wang, M.; Panjekar, S.; Lin, H.; Rajendran, C.; Barleben, L.; Stoeckigt, J.  
Deposited on : 2011-10-11  
Resolution : 2.30 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) 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 : 2.13.1  
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) : 2.13.1

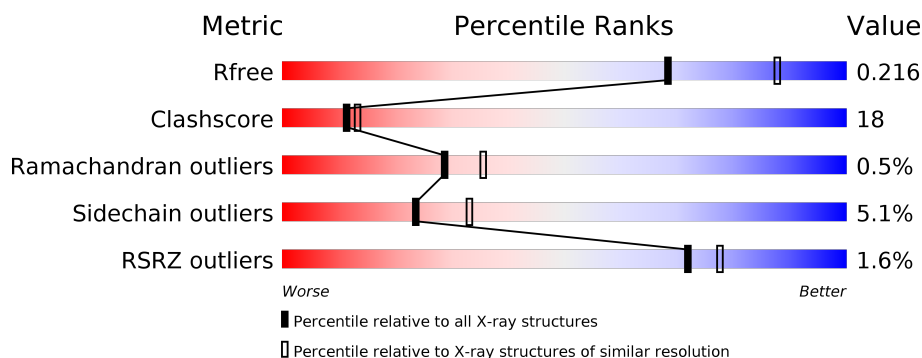
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	513	<div> <div>2%</div> <div> <div></div> <div>71%</div> <div>18%</div> <div>• 8%</div> </div> </div>
1	B	513	<div> <div>%</div> <div> <div></div> <div>67%</div> <div>22%</div> <div>• 8%</div> </div> </div>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7747 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.

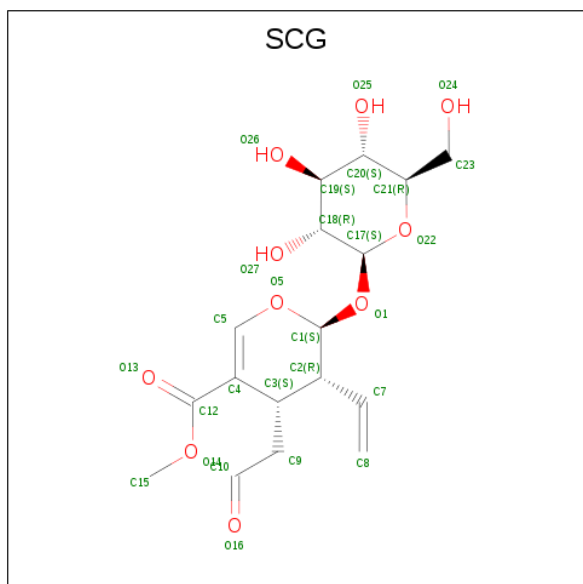
- Molecule 1 is a protein called Raucaffricine-O-beta-D-glucosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	470	Total	C	N	O	S	0	0	0
			3772	2413	643	703	13			
1	B	470	Total	C	N	O	S	0	0	0
			3772	2413	643	703	13			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	186	GLN	GLU	engineered mutation	UNP Q9SPP9
B	186	GLN	GLU	engineered mutation	UNP Q9SPP9

- Molecule 2 is Secologanin (three-letter code: SCG) (formula:  $C_{17}H_{24}O_{10}$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			27	17	10		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	C	O	0	0
			27	17	10		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total	Cl	0	0
			2	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	75	Total	O	0	0
			75	75		
4	B	72	Total	O	0	0
			72	72		

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.

- Chain A:
- 
- 71% 18% 8% 2%
- MET THR GLN SER SER VAL ILE ASP SER ASN D13 T15 R16 I17 S18 R19 R42 T53 R57 R63 A71 V72 D73 H76 L85 K86 R94 K114 L128 I132 L155 C164 E165 G175 D176 R177 V178 K179 T182 I183 I184 H195 Q196 Y200 G203 R204 G205 R206 THR SER PRO GLU HIS VAL ASN HIS PRO THR VAL GLN HIS ARG CYS SER THR VAL ALA PRO GLN CYS ILE CYS T231 T232 P235 E238 H244 H245 H250 L256 S272 T275 Q276 E279 P280 W281 M284 S285 D288 R294 M299 W302 E305 P306 Y312 P313 K314 S315 M316 F319 V320 F327 K333 G343 L344 M345 S350 Y351 A355 S356 THR SER SER GLY SER ASN N364 P365 S366 I371 E376 T377 D378 R379 M380 G381 V382 I395 Y396 P397 E398 G399 I400 R401 V402 I403 L404 K408 K409 M412 L415 L416 Y417 E420 D424 D425 V426 K427 M428 T429 M430 S434 K438 D439 S440 R442 R443 L443 Q447 R454 Q455 A456 M457 N462 V463 K464 Y481 F485 Y499 P500 M508 H512 K513

- Chain B:
- 
- 67% 22% 8%

## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	104.93 Å   129.20 Å   216.80 Å 90.00°   90.00°   90.00°	Depositor
Resolution (Å)	47.68 – 2.30 47.43 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.6 (47.68-2.30) 99.6 (47.43-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.79 (at 2.29 Å)	Xtriage
Refinement program	REFMAC 5.5.0066	Depositor
R, $R_{free}$	0.191   ,   0.231 0.183   ,   0.216	Depositor DCC
$R_{free}$ test set	3271 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	40.7	Xtriage
Anisotropy	0.409	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 42.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7747	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.82% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality ⓘ

### 5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: SCG, CL

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	0.62	1/3883 (0.0%)	0.68	1/5270 (0.0%)
1	B	0.59	0/3883	0.69	1/5270 (0.0%)
All	All	0.61	1/7766 (0.0%)	0.68	2/10540 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	164	CYS	CB-SG	-5.43	1.73	1.81

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	162	ASP	CB-CG-OD2	5.28	123.05	118.30
1	A	425	ASP	CB-CG-OD1	5.15	122.94	118.30

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	3772	0	3577	125	0
1	B	3772	0	3577	127	0
2	A	27	0	16	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	27	0	16	5	0
3	B	2	0	0	0	0
4	A	75	0	0	7	0
4	B	72	0	0	2	0
All	All	7747	0	7186	262	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 18.

All (262) 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)
2:B:1001:SCG:C8	2:B:1001:SCG:H92	1.41	1.32
2:A:1001:SCG:C8	2:A:1001:SCG:H92	1.30	1.31
2:A:1001:SCG:C8	2:A:1001:SCG:C9	2.10	1.27
2:B:1001:SCG:C8	2:B:1001:SCG:C9	2.18	1.19
1:A:313:PRO:HD2	1:A:316:MET:HE2	1.25	1.17
1:B:313:PRO:HD2	1:B:316:MET:HE3	1.12	1.10
1:A:313:PRO:HD2	1:A:316:MET:CE	1.83	1.08
1:A:276:GLN:H	1:A:299:MET:HE1	1.20	1.06
1:A:276:GLN:N	1:A:299:MET:HE1	1.71	1.05
1:A:379:ARG:O	1:A:380:ASN:HB2	1.55	1.03
1:B:16:ARG:HH11	1:B:16:ARG:HG2	0.87	1.02
1:B:155:LEU:O	1:B:245:HIS:CE1	2.13	1.02
1:B:53:THR:HG22	1:B:57:ARG:HD2	1.40	1.01
1:B:16:ARG:NH1	1:B:16:ARG:HG2	1.67	1.00
1:B:313:PRO:CD	1:B:316:MET:HE3	1.92	0.99
1:B:16:ARG:HH11	1:B:16:ARG:CG	1.75	0.99
1:A:313:PRO:CD	1:A:316:MET:CE	2.41	0.98
1:A:313:PRO:CD	1:A:316:MET:HE2	1.94	0.95
1:B:186:GLN:HE21	1:B:345:ASN:HD22	1.11	0.94
1:B:313:PRO:HD2	1:B:316:MET:CE	2.00	0.92
1:B:319:PHE:CD1	1:B:372:HIS:HD2	1.87	0.91
1:A:182:MET:CE	4:A:584:HOH:O	2.21	0.89
1:A:281:TRP:CD1	1:A:376:GLU:HG3	2.08	0.89
1:B:276:GLN:H	1:B:299:MET:HE1	1.38	0.87
1:A:281:TRP:HD1	1:A:376:GLU:HG3	1.41	0.86
2:B:1001:SCG:H10	2:B:1001:SCG:O13	1.76	0.86
1:A:63:ARG:HH21	1:A:427:LYS:HE3	1.40	0.84
1:B:137:THR:OG1	1:B:182:MET:HE3	1.78	0.83
2:A:1001:SCG:H151	4:A:538:HOH:O	1.77	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:276:GLN:N	1:B:299:MET:HE1	1.92	0.83
1:B:155:LEU:O	1:B:245:HIS:HE1	1.57	0.81
1:B:313:PRO:CD	1:B:316:MET:CE	2.59	0.81
1:A:185:ASN:HD22	1:A:272:SER:HB2	1.46	0.80
1:B:319:PHE:CD1	1:B:372:HIS:CD2	2.69	0.79
1:B:73:ASP:OD1	1:B:76:HIS:HD2	1.64	0.78
1:B:183:THR:OG1	1:B:250:HIS:HD2	1.67	0.78
1:B:319:PHE:HD1	1:B:372:HIS:CD2	2.02	0.78
1:A:512:HIS:O	1:A:513:LYS:HD3	1.84	0.76
1:A:276:GLN:NE2	1:A:350:SER:HB2	2.01	0.76
1:A:73:ASP:OD1	1:A:76:HIS:HD2	1.68	0.75
1:A:185:ASN:HD22	1:A:272:SER:CB	2.01	0.74
1:A:382:VAL:O	4:A:575:HOH:O	2.06	0.74
2:B:1001:SCG:H151	4:B:517:HOH:O	1.86	0.74
1:B:454:ARG:HD2	1:B:454:ARG:O	1.87	0.74
1:A:53:THR:HG22	1:A:57:ARG:HD2	1.69	0.73
1:B:204:ARG:NH1	1:B:238:GLU:OE1	2.23	0.72
1:A:443:LEU:HD11	1:A:447:GLN:HE21	1.53	0.72
1:A:443:LEU:CD1	1:A:447:GLN:HE21	2.03	0.71
1:A:398:GLU:H	1:A:398:GLU:CD	1.92	0.71
1:A:183:THR:OG1	1:A:250:HIS:HD2	1.75	0.70
1:B:333:LYS:NZ	1:B:333:LYS:HB3	2.04	0.70
1:A:276:GLN:HE21	1:A:350:SER:HB2	1.56	0.70
1:B:13:ASP:HB3	1:B:16:ARG:HD2	1.74	0.70
1:B:186:GLN:NE2	1:B:345:ASN:HD22	1.87	0.69
1:A:313:PRO:CD	1:A:316:MET:HE3	2.23	0.69
1:A:379:ARG:O	1:A:380:ASN:CB	2.39	0.69
1:B:205:GLY:O	1:B:206:ARG:C	2.29	0.69
1:A:499:TYR:CD2	1:A:500:PRO:HD2	2.28	0.68
2:A:1001:SCG:H10	2:A:1001:SCG:O13	1.94	0.68
1:A:128:LEU:HD11	1:A:177:ARG:HB3	1.77	0.67
1:B:451:PHE:CZ	1:B:455:GLN:NE2	2.63	0.67
1:A:155:LEU:O	1:A:245:HIS:HE1	1.78	0.66
2:B:1001:SCG:C10	2:B:1001:SCG:O13	2.42	0.66
1:B:451:PHE:CE2	1:B:455:GLN:NE2	2.63	0.66
1:B:313:PRO:HG2	1:B:316:MET:CE	2.25	0.66
1:B:53:THR:HG22	1:B:57:ARG:CD	2.21	0.66
1:B:305:GLU:HB3	1:B:306:PRO:HD3	1.78	0.65
1:B:73:ASP:OD1	1:B:76:HIS:CD2	2.48	0.65
1:B:368:ASN:O	1:B:371:ILE:HG13	1.96	0.65
1:A:256:LEU:HD23	1:A:256:LEU:C	2.16	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:281:TRP:HD1	1:A:376:GLU:CG	2.09	0.65
1:B:175:GLY:O	1:B:179:LYS:HE3	1.96	0.65
1:B:256:LEU:C	1:B:256:LEU:HD23	2.17	0.64
1:A:235:PRO:HB2	1:A:366:SER:HB2	1.78	0.64
1:A:313:PRO:CG	1:A:316:MET:HE2	2.26	0.64
1:B:302:TRP:HA	1:B:316:MET:HE1	1.80	0.64
1:A:409:LYS:HB3	1:A:409:LYS:NZ	2.13	0.64
1:B:204:ARG:HH12	1:B:238:GLU:CD	1.99	0.64
1:B:179:LYS:HE2	1:B:265:GLN:O	1.98	0.63
1:A:276:GLN:H	1:A:299:MET:CE	2.05	0.63
1:A:313:PRO:HD2	1:A:316:MET:HE3	1.75	0.63
1:A:313:PRO:CG	1:A:316:MET:CE	2.77	0.63
1:A:313:PRO:HG2	1:A:316:MET:CE	2.28	0.63
1:A:63:ARG:HH21	1:A:427:LYS:CE	2.12	0.62
1:A:294:ARG:HD2	1:A:371:ILE:O	1.98	0.62
1:B:443:LEU:HD11	1:B:447:GLN:HE21	1.64	0.62
1:B:186:GLN:HE21	1:B:345:ASN:ND2	1.91	0.62
1:A:155:LEU:O	1:A:245:HIS:CE1	2.53	0.61
1:A:256:LEU:HD23	1:A:256:LEU:O	2.00	0.61
1:A:345:ASN:HB3	1:A:420:GLU:HB2	1.83	0.61
1:B:294:ARG:HD2	1:B:371:ILE:O	2.01	0.61
1:A:73:ASP:OD1	1:A:76:HIS:CD2	2.53	0.60
1:B:469:TRP:CD2	1:B:470:SER:HB3	2.37	0.60
1:A:244:HIS:HD2	1:A:312:TYR:OH	1.85	0.60
1:B:294:ARG:NH1	1:B:372:HIS:O	2.35	0.59
1:B:512:HIS:ND1	1:B:513:LYS:HD3	2.17	0.59
1:A:204:ARG:NH1	1:A:238:GLU:OE1	2.36	0.59
1:A:409:LYS:HB3	1:A:409:LYS:HZ2	1.66	0.59
1:B:255:GLU:HG3	1:B:259:ASN:ND2	2.18	0.58
1:A:305:GLU:N	1:A:306:PRO:CD	2.66	0.58
1:B:204:ARG:NH1	1:B:238:GLU:CD	2.56	0.58
1:B:258:LYS:HG3	1:B:262:GLN:OE1	2.03	0.58
1:B:333:LYS:HZ3	1:B:333:LYS:HB3	1.69	0.57
1:B:351:TYR:HB2	1:B:376:GLU:O	2.04	0.57
1:B:185:ASN:HD21	1:B:345:ASN:HD21	1.53	0.57
1:B:313:PRO:CG	1:B:316:MET:CE	2.82	0.57
1:A:279:GLU:O	1:A:351:TYR:HA	2.04	0.57
1:A:415:LEU:HD12	1:A:462:ASN:ND2	2.20	0.57
1:B:378:ASP:HB3	1:B:382:VAL:C	2.25	0.56
1:B:53:THR:HG21	1:B:57:ARG:NH1	2.20	0.56
1:A:512:HIS:O	1:A:513:LYS:CD	2.53	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:328:SER:OG	1:B:330:GLU:HG2	2.04	0.56
1:A:409:LYS:CB	1:A:409:LYS:NZ	2.68	0.56
1:B:244:HIS:HD2	1:B:312:TYR:OH	1.88	0.56
1:B:305:GLU:HG3	1:B:311:ASP:O	2.05	0.56
1:B:168:GLU:HB2	1:B:256:LEU:HD11	1.88	0.56
1:A:175:GLY:O	1:A:179:LYS:HE3	2.06	0.56
1:A:443:LEU:HD12	1:A:443:LEU:O	2.05	0.56
1:B:244:HIS:NE2	1:B:327:PHE:CE1	2.74	0.56
1:B:37:ILE:HG13	1:B:38:GLU:N	2.21	0.56
1:A:185:ASN:HD21	1:A:345:ASN:HD21	1.53	0.55
1:A:396:TYR:OH	1:A:402:LYS:NZ	2.40	0.55
1:B:15:THR:HG22	1:B:447:GLN:OE1	2.06	0.55
1:A:14:ALA:O	1:A:17:ILE:HG22	2.07	0.55
1:A:313:PRO:HG2	1:A:316:MET:HE2	1.89	0.55
1:B:155:LEU:O	1:B:245:HIS:ND1	2.38	0.55
1:B:256:LEU:O	1:B:256:LEU:HD23	2.07	0.55
1:A:53:THR:HG22	1:A:57:ARG:CD	2.37	0.54
1:B:313:PRO:HG2	1:B:316:MET:HE2	1.90	0.54
1:B:243:THR:HG23	1:B:303:PHE:CE1	2.42	0.54
1:A:302:TRP:HA	1:A:316:MET:CE	2.38	0.54
1:A:19:ARG:O	1:A:19:ARG:HG2	2.08	0.54
1:A:53:THR:CG2	1:A:57:ARG:CZ	2.86	0.54
1:A:63:ARG:NH2	1:A:427:LYS:CE	2.71	0.53
1:A:425:ASP:OD1	1:A:442:ARG:NH1	2.39	0.53
1:A:398:GLU:OE1	1:A:398:GLU:N	2.39	0.53
1:A:53:THR:HG21	1:A:57:ARG:NH1	2.23	0.53
1:B:185:ASN:ND2	1:B:345:ASN:HD21	2.06	0.53
1:A:185:ASN:ND2	1:A:272:SER:CB	2.71	0.53
1:B:185:ASN:HD22	1:B:272:SER:HB3	1.73	0.53
1:A:355:ALA:O	1:A:356:SER:C	2.47	0.52
1:A:63:ARG:NH2	1:A:427:LYS:HE3	2.15	0.52
1:A:351:TYR:HB2	1:A:376:GLU:O	2.09	0.51
1:B:339:TYR:C	1:B:339:TYR:CD1	2.84	0.51
1:B:186:GLN:N	1:B:187:PRO:CD	2.73	0.51
1:A:281:TRP:O	1:A:281:TRP:CE3	2.63	0.51
1:A:454:ARG:NH1	1:A:457:MET:HB2	2.25	0.51
1:A:512:HIS:O	1:A:513:LYS:CB	2.58	0.51
1:B:401:ARG:HD2	4:B:560:HOH:O	2.10	0.51
1:B:279:GLU:O	1:B:351:TYR:HA	2.10	0.51
1:A:281:TRP:C	1:A:281:TRP:CE3	2.84	0.51
1:A:343:GLY:HA2	1:A:417:TYR:O	2.11	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:1001:SCG:O13	2:A:1001:SCG:C10	2.59	0.50
1:B:315:SER:O	1:B:319:PHE:HD2	1.94	0.50
1:B:278:MET:HE3	1:B:295:ALA:HB1	1.94	0.50
1:A:165:GLU:HA	1:A:165:GLU:OE1	2.12	0.50
1:B:243:THR:HG23	1:B:303:PHE:CZ	2.47	0.50
1:B:411:TYR:O	1:B:412:ASN:HB3	2.11	0.50
1:A:182:MET:HE3	4:A:584:HOH:O	2.01	0.50
1:A:281:TRP:HE3	1:A:281:TRP:C	2.15	0.49
1:B:284:ASN:O	1:B:286:ALA:N	2.45	0.49
1:B:288:ASP:OD1	1:B:353:THR:OG1	2.26	0.49
1:A:185:ASN:ND2	1:A:272:SER:HB3	2.27	0.49
1:B:443:LEU:CD1	1:B:447:GLN:HE21	2.23	0.49
1:A:315:SER:O	1:A:319:PHE:HD2	1.95	0.49
1:A:114:LYS:HE2	4:A:564:HOH:O	2.13	0.49
1:B:183:THR:OG1	1:B:250:HIS:CD2	2.57	0.49
1:A:275:THR:HA	1:A:299:MET:HE3	1.94	0.49
1:B:415:LEU:HD12	1:B:462:ASN:ND2	2.27	0.49
1:B:508:MET:O	1:B:512:HIS:HB2	2.14	0.48
1:B:16:ARG:NH1	1:B:16:ARG:CG	2.48	0.48
1:B:256:LEU:C	1:B:256:LEU:CD2	2.81	0.48
1:B:298:PHE:O	1:B:367:TYR:OH	2.31	0.48
1:B:53:THR:CG2	1:B:57:ARG:CZ	2.92	0.48
1:A:53:THR:HG21	1:A:57:ARG:CZ	2.43	0.48
1:B:128:LEU:HD11	1:B:177:ARG:HB3	1.95	0.48
1:B:316:MET:O	1:B:320:VAL:HG23	2.14	0.48
1:A:281:TRP:CD1	1:A:376:GLU:CG	2.89	0.47
1:A:345:ASN:CB	1:A:420:GLU:HB2	2.43	0.47
1:A:313:PRO:HG2	1:A:316:MET:HE1	1.95	0.47
1:A:316:MET:O	1:A:320:VAL:HG23	2.15	0.47
1:A:443:LEU:CD1	1:A:447:GLN:NE2	2.76	0.47
1:B:56:HIS:HE1	1:B:69:ASP:OD1	1.97	0.46
1:B:403:ILE:CG2	1:B:404:LEU:N	2.77	0.46
1:B:378:ASP:CB	1:B:382:VAL:O	2.64	0.46
1:A:85:LEU:HB3	1:A:132:ILE:HD13	1.98	0.46
1:B:284:ASN:O	1:B:285:SER:C	2.54	0.46
1:B:244:HIS:CD2	1:B:327:PHE:CE1	3.04	0.46
1:B:421:ASN:ND2	1:B:466:TYR:OH	2.46	0.46
1:B:254:VAL:O	1:B:258:LYS:HB2	2.16	0.46
1:B:186:GLN:HG2	1:B:345:ASN:ND2	2.31	0.46
1:B:121:ASN:OD1	1:B:177:ARG:NH2	2.33	0.46
1:B:71:ALA:HA	1:B:481:TYR:OH	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:19:ARG:O	1:A:19:ARG:CG	2.63	0.46
1:A:395:ILE:HG22	1:A:397:PRO:HD3	1.97	0.46
1:B:178:VAL:O	1:B:179:LYS:HD2	2.15	0.45
1:B:251:ALA:HB2	1:B:335:LEU:HD23	1.97	0.45
1:A:305:GLU:N	1:A:306:PRO:HD2	2.31	0.45
1:A:302:TRP:HA	1:A:316:MET:HE3	1.98	0.45
1:A:403:ILE:CG2	1:A:404:LEU:N	2.80	0.45
1:A:179:LYS:HD2	1:A:179:LYS:N	2.31	0.45
1:B:185:ASN:HD22	1:B:272:SER:CB	2.30	0.45
1:A:244:HIS:HE1	4:A:578:HOH:O	1.98	0.45
1:B:378:ASP:HB3	1:B:383:PRO:N	2.32	0.45
1:A:256:LEU:C	1:A:256:LEU:CD2	2.84	0.44
1:A:464:LYS:HD3	1:A:464:LYS:HA	1.57	0.44
1:B:469:TRP:HA	1:B:470:SER:HA	1.47	0.44
1:A:244:HIS:NE2	1:A:327:PHE:CE1	2.85	0.44
1:B:232:THR:HG23	1:B:232:THR:O	2.16	0.44
1:A:71:ALA:HA	1:A:481:TYR:OH	2.18	0.44
1:B:378:ASP:HB3	1:B:383:PRO:HA	1.99	0.44
1:A:428:ASN:OD1	1:A:430:ASN:HB2	2.17	0.44
1:A:186:GLN:CG	1:A:345:ASN:HD22	2.30	0.44
1:A:42:ARG:HH11	1:A:42:ARG:HG3	1.83	0.44
1:A:200:TYR:O	1:A:203:GLY:N	2.51	0.43
1:A:397:PRO:O	1:A:400:ILE:HG22	2.18	0.43
1:A:204:ARG:HH12	1:A:238:GLU:CD	2.21	0.43
1:A:305:GLU:HB3	1:A:306:PRO:HD3	2.00	0.43
1:B:512:HIS:O	1:B:513:LYS:CB	2.66	0.43
1:B:56:HIS:CE1	1:B:69:ASP:OD1	2.71	0.43
1:B:250:HIS:CE1	1:B:338:SER:O	2.72	0.43
1:A:455:GLN:HA	1:A:455:GLN:OE1	2.18	0.43
1:A:513:LYS:HD2	1:A:513:LYS:HA	1.26	0.43
1:A:86:LYS:HB3	1:A:86:LYS:HE3	1.76	0.43
1:B:244:HIS:CD2	1:B:312:TYR:OH	2.71	0.43
1:A:512:HIS:O	1:A:513:LYS:HB2	2.18	0.43
1:B:255:GLU:HG3	1:B:259:ASN:HD21	1.82	0.43
1:A:42:ARG:HG3	1:A:42:ARG:NH1	2.34	0.43
1:B:408:LYS:O	1:B:412:ASN:HA	2.19	0.43
1:B:469:TRP:CE2	1:B:470:SER:HB3	2.53	0.43
1:B:513:LYS:HD2	1:B:513:LYS:HA	1.38	0.43
1:B:186:GLN:HG2	1:B:345:ASN:HD22	1.84	0.43
1:A:438:LYS:HB2	1:A:438:LYS:HE3	1.61	0.42
1:B:255:GLU:CG	1:B:259:ASN:ND2	2.82	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:86:LYS:HB3	1:B:86:LYS:HE3	1.86	0.42
1:B:155:LEU:HA	1:B:155:LEU:HD23	1.71	0.42
1:B:378:ASP:CB	1:B:382:VAL:C	2.87	0.42
1:B:473:ASP:OD2	1:B:484:ARG:NH1	2.45	0.42
1:B:333:LYS:HE2	1:B:333:LYS:O	2.19	0.42
1:B:512:HIS:O	1:B:513:LYS:HD3	2.19	0.42
1:A:285:SER:HB3	1:A:288:ASP:HB2	2.02	0.42
1:B:94:ARG:HA	1:B:135:PHE:O	2.18	0.42
1:A:15:THR:HG22	1:A:447:GLN:OE1	2.20	0.42
1:A:508:MET:O	1:A:512:HIS:HB2	2.19	0.42
1:B:355:ALA:O	1:B:356:SER:C	2.57	0.42
1:B:403:ILE:HA	1:B:403:ILE:HD12	1.74	0.42
1:A:443:LEU:HD11	1:A:447:GLN:NE2	2.29	0.41
1:A:114:LYS:HD3	1:A:114:LYS:HA	1.83	0.41
1:A:408:LYS:O	1:A:412:ASN:HA	2.19	0.41
1:A:206:ARG:HB3	1:A:206:ARG:HE	1.40	0.41
1:A:403:ILE:HD12	1:A:403:ILE:HA	1.85	0.41
1:A:454:ARG:HA	1:A:454:ARG:HD2	1.83	0.41
1:B:206:ARG:HB2	1:B:206:ARG:HE	1.18	0.41
1:B:413:VAL:HA	1:B:414:PRO:HD3	1.90	0.41
1:B:423:VAL:HG22	1:B:424:ASP:N	2.36	0.41
1:A:427:LYS:O	1:A:428:ASN:HB2	2.21	0.40
1:A:424:ASP:HB3	1:A:485:PHE:CE2	2.56	0.40
1:A:182:MET:HE2	4:A:584:HOH:O	2.06	0.40
1:B:378:ASP:HB3	1:B:383:PRO:CA	2.50	0.40
1:B:179:LYS:HD2	1:B:179:LYS:HA	1.73	0.40
1:A:275:THR:HA	1:A:299:MET:CE	2.52	0.40
1:B:234:ASN:HA	1:B:235:PRO:HD2	1.86	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	464/513 (90%)	442 (95%)	18 (4%)	4 (1%)	17	20
1	B	464/513 (90%)	431 (93%)	32 (7%)	1 (0%)	47	58
All	All	928/1026 (90%)	873 (94%)	50 (5%)	5 (0%)	29	35

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	380	ASN
1	B	285	SER
1	A	232	THR
1	A	285	SER
1	A	428	ASN

### 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	396/435 (91%)	379 (96%)	17 (4%)	29	40
1	B	396/435 (91%)	373 (94%)	23 (6%)	20	27
All	All	792/870 (91%)	752 (95%)	40 (5%)	24	33

All (40) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	ASP
1	A	53	THR
1	A	63	ARG
1	A	94	ARG
1	A	179	LYS
1	A	182	MET
1	A	206	ARG
1	A	281	TRP
1	A	333	LYS
1	A	350	SER
1	A	366	SER

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Mol	Chain	Res	Type
1	A	398	GLU
1	A	409	LYS
1	A	434	SER
1	A	438	LYS
1	A	440	SER
1	A	513	LYS
1	B	16	ARG
1	B	53	THR
1	B	63	ARG
1	B	86	LYS
1	B	164	CYS
1	B	179	LYS
1	B	182	MET
1	B	206	ARG
1	B	232	THR
1	B	287	SER
1	B	307	ILE
1	B	316	MET
1	B	330	GLU
1	B	333	LYS
1	B	354	ASN
1	B	366	SER
1	B	371	ILE
1	B	378	ASP
1	B	390	SER
1	B	403	ILE
1	B	409	LYS
1	B	415	LEU
1	B	513	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	76	HIS
1	A	83	ASN
1	A	140	HIS
1	A	185	ASN
1	A	244	HIS
1	A	250	HIS
1	A	273	HIS
1	A	276	GLN
1	A	284	ASN

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Mol	Chain	Res	Type
1	A	372	HIS
1	A	421	ASN
1	A	447	GLN
1	B	76	HIS
1	B	140	HIS
1	B	185	ASN
1	B	186	GLN
1	B	244	HIS
1	B	250	HIS
1	B	259	ASN
1	B	273	HIS
1	B	276	GLN
1	B	372	HIS
1	B	421	ASN
1	B	447	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 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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
2	SCG	A	1001	-	27,28,28	1.33	5 (18%)	34,39,39	1.90	9 (26%)
2	SCG	B	1001	-	27,28,28	1.63	7 (25%)	34,39,39	1.82	9 (26%)

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	SCG	A	1001	-	-	5/17/54/54	0/2/2/2
2	SCG	B	1001	-	-	5/17/54/54	0/2/2/2

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1001	SCG	C12-C4	3.45	1.54	1.48
2	A	1001	SCG	C12-C4	2.90	1.53	1.48
2	B	1001	SCG	C5-C4	2.78	1.40	1.33
2	B	1001	SCG	C2-C7	2.62	1.54	1.50
2	A	1001	SCG	C2-C7	2.44	1.54	1.50
2	A	1001	SCG	C5-C4	2.43	1.39	1.33
2	B	1001	SCG	O14-C15	2.39	1.50	1.45
2	B	1001	SCG	C3-C4	2.38	1.55	1.51
2	A	1001	SCG	C3-C4	2.16	1.54	1.51
2	B	1001	SCG	C8-C7	2.15	1.40	1.29
2	B	1001	SCG	C9-C10	2.12	1.55	1.49
2	A	1001	SCG	C8-C7	2.03	1.40	1.29

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1001	SCG	O14-C12-C4	5.33	119.58	112.64
2	A	1001	SCG	O14-C12-C4	4.83	118.93	112.64
2	B	1001	SCG	O1-C1-O5	-4.02	99.72	107.98
2	A	1001	SCG	O1-C1-O5	-3.54	100.71	107.98
2	A	1001	SCG	C15-O14-C12	-3.48	109.29	115.86
2	A	1001	SCG	O22-C17-C18	3.40	117.55	110.35
2	A	1001	SCG	O1-C17-O22	-3.20	101.72	110.67
2	A	1001	SCG	C1-O5-C5	-3.13	110.59	116.40
2	B	1001	SCG	O1-C17-O22	-3.05	102.14	110.67
2	B	1001	SCG	O13-C12-C4	-2.69	120.96	124.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1001	SCG	C15-O14-C12	-2.68	110.79	115.86
2	A	1001	SCG	O13-C12-C4	-2.59	121.10	124.34
2	B	1001	SCG	O22-C17-C18	2.55	115.75	110.35
2	B	1001	SCG	C17-C18-C19	2.54	115.29	110.00
2	A	1001	SCG	C17-C18-C19	2.28	114.74	110.00
2	B	1001	SCG	C1-O5-C5	-2.18	112.35	116.40
2	B	1001	SCG	O14-C12-O13	-2.13	119.44	123.53
2	A	1001	SCG	C2-C7-C8	-2.08	120.51	125.33

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1001	SCG	C2-C3-C9-C10
2	A	1001	SCG	C4-C12-O14-C15
2	A	1001	SCG	O13-C12-O14-C15
2	B	1001	SCG	C4-C12-O14-C15
2	B	1001	SCG	O13-C12-O14-C15
2	A	1001	SCG	C4-C3-C9-C10
2	B	1001	SCG	C4-C3-C9-C10
2	A	1001	SCG	C3-C2-C7-C8
2	B	1001	SCG	C3-C2-C7-C8
2	B	1001	SCG	C2-C3-C9-C10

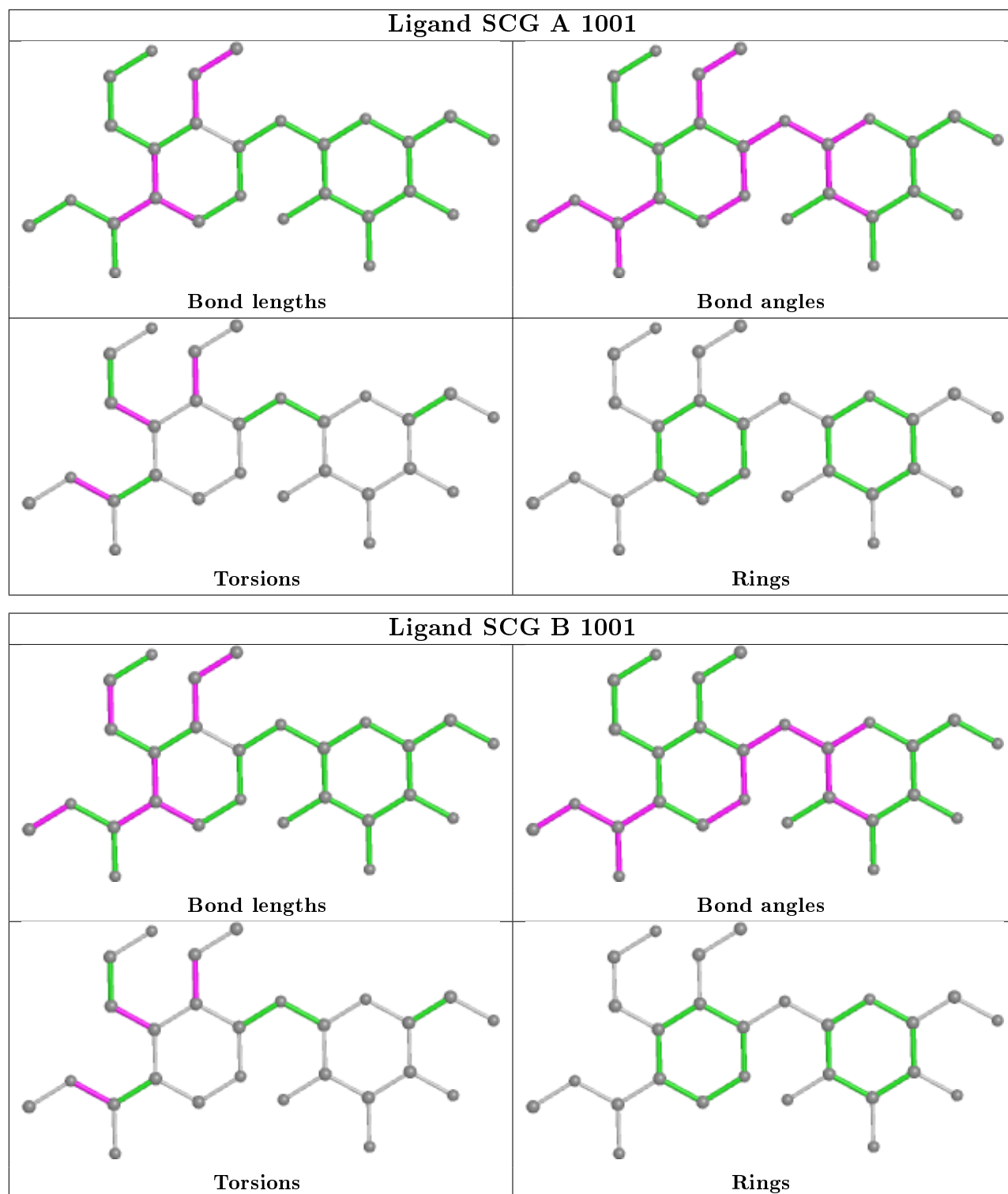
There are no ring outliers.

2 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1001	SCG	5	0
2	B	1001	SCG	5	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 ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

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

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	470/513 (91%)	-0.35	8 (1%) 70 76	21, 37, 60, 72	0
1	B	470/513 (91%)	-0.43	7 (1%) 73 79	23, 39, 60, 69	0
All	All	940/1026 (91%)	-0.39	15 (1%) 72 77	21, 38, 60, 72	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	206	ARG	6.6
1	A	206	ARG	5.7
1	A	380	ASN	3.8
1	A	381	GLY	3.8
1	A	284	ASN	3.7
1	B	364	ASN	3.7
1	A	382	VAL	3.7
1	A	281	TRP	3.7
1	B	356	SER	3.0
1	B	365	PHE	2.8
1	B	232	THR	2.7
1	A	231	SER	2.4
1	B	231	SER	2.4
1	B	16	ARG	2.1
1	A	378	ASP	2.0

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

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

### 6.3 Carbohydrates [i](#)

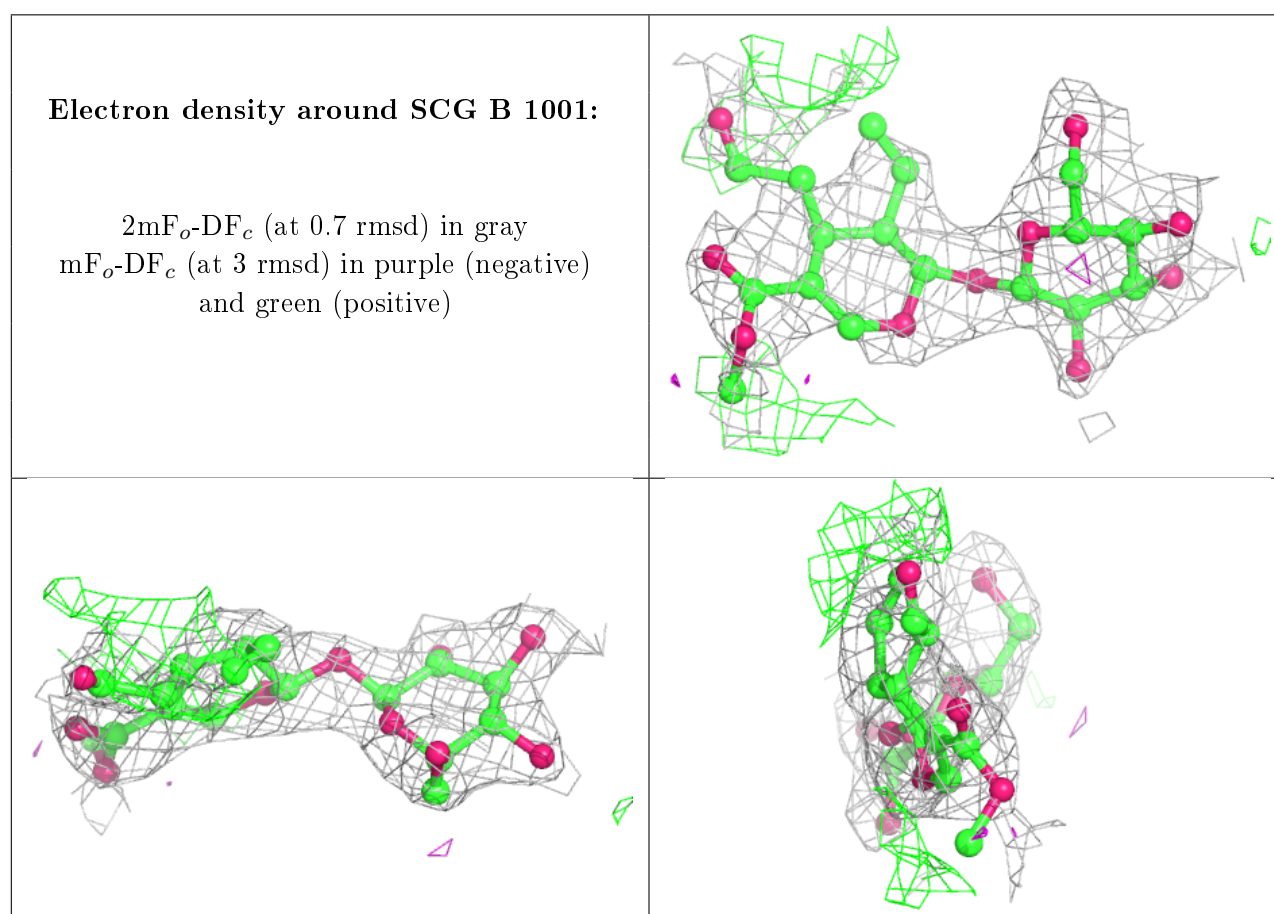
There are no monosaccharides in this entry.

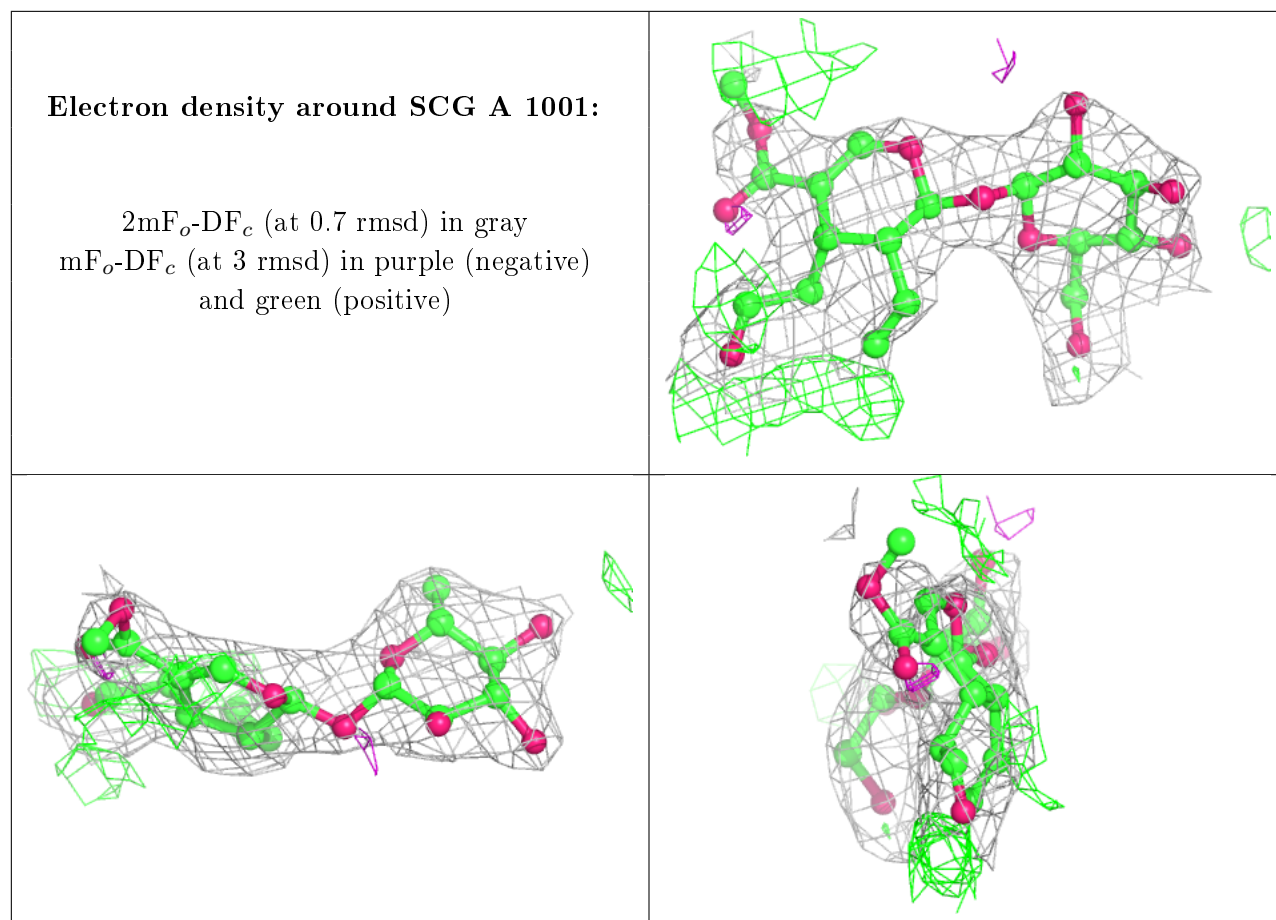
## 6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SCG	B	1001	27/27	0.86	0.18	67,79,84,84	0
2	SCG	A	1001	27/27	0.88	0.16	64,79,86,87	0
3	CL	B	515	1/1	0.97	0.25	48,48,48,48	0
3	CL	B	514	1/1	0.99	0.26	40,40,40,40	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.





## 6.5 Other polymers ⓘ

There are no such residues in this entry.