



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 13, 2023 – 03:35 AM EDT

PDB ID : 4OP3  
Title : Human GKRP bound to AMG-5112 and Sorbitol-6-phosphate  
Authors : Jordan, S.R.; Chmait, S.  
Deposited on : 2014-02-04  
Resolution : 2.82 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 2.35.1  
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) : 2.35.1

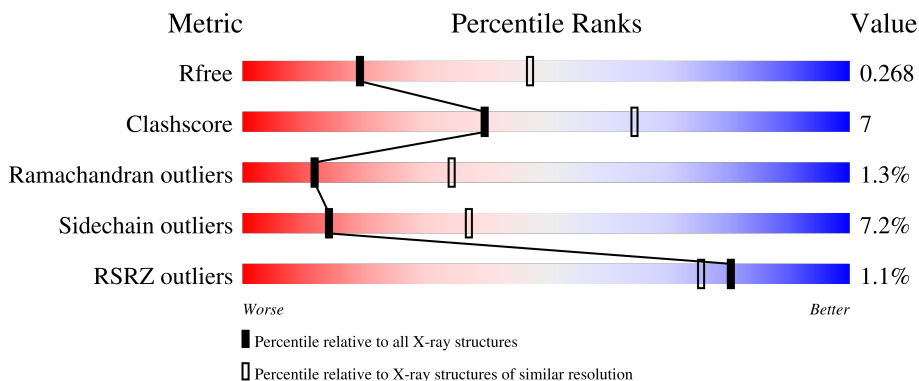
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.82 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	3617 (2.84-2.80)
Clashscore	141614	4060 (2.84-2.80)
Ramachandran outliers	138981	3978 (2.84-2.80)
Sidechain outliers	138945	3980 (2.84-2.80)
RSRZ outliers	127900	3552 (2.84-2.80)

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

Mol	Chain	Length	Quality of chain
1	A	638	
1	B	638	

## 2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 9286 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 Glucokinase Regulatory Protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	585	4521	2882	774	841	24	0	0	0
1	B	590	4554	2901	781	848	24	0	0	0

There are 26 discrepancies between the modelled and reference sequences:

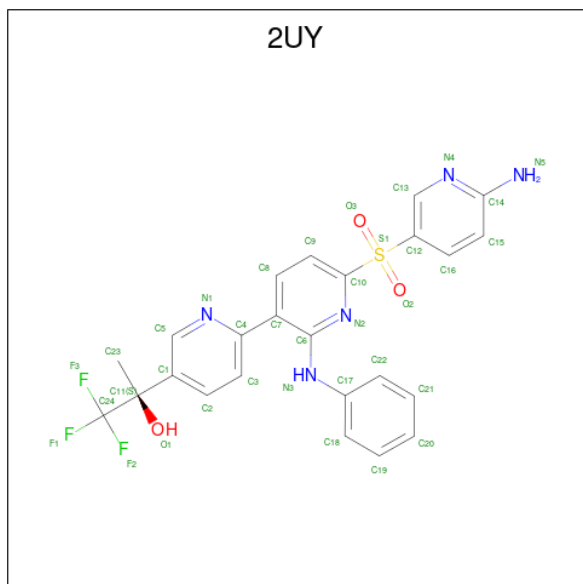
Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MET	-	expression tag	UNP Q14397
A	-10	ALA	-	expression tag	UNP Q14397
A	-9	HIS	-	expression tag	UNP Q14397
A	-8	HIS	-	expression tag	UNP Q14397
A	-7	HIS	-	expression tag	UNP Q14397
A	-6	HIS	-	expression tag	UNP Q14397
A	-5	HIS	-	expression tag	UNP Q14397
A	-4	HIS	-	expression tag	UNP Q14397
A	-3	ASP	-	expression tag	UNP Q14397
A	-2	GLU	-	expression tag	UNP Q14397
A	-1	VAL	-	expression tag	UNP Q14397
A	0	ASP	-	expression tag	UNP Q14397
A	626	GLY	-	expression tag	UNP Q14397
B	-11	MET	-	expression tag	UNP Q14397
B	-10	ALA	-	expression tag	UNP Q14397
B	-9	HIS	-	expression tag	UNP Q14397
B	-8	HIS	-	expression tag	UNP Q14397
B	-7	HIS	-	expression tag	UNP Q14397
B	-6	HIS	-	expression tag	UNP Q14397
B	-5	HIS	-	expression tag	UNP Q14397
B	-4	HIS	-	expression tag	UNP Q14397
B	-3	ASP	-	expression tag	UNP Q14397
B	-2	GLU	-	expression tag	UNP Q14397
B	-1	VAL	-	expression tag	UNP Q14397
B	0	ASP	-	expression tag	UNP Q14397

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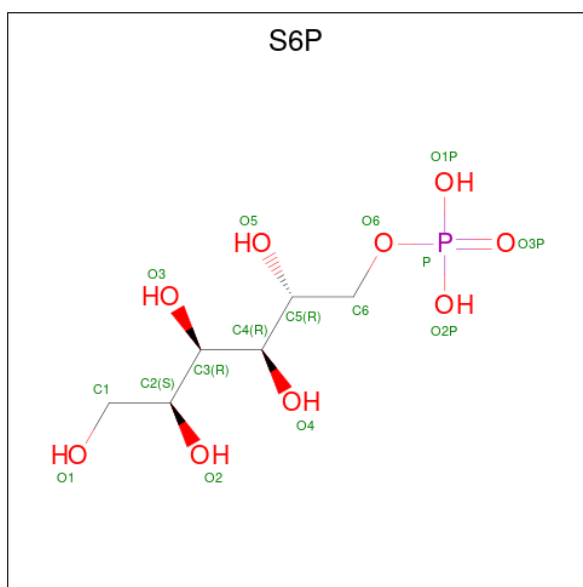
Chain	Residue	Modelled	Actual	Comment	Reference
B	626	GLY	-	expression tag	UNP Q14397

- Molecule 2 is (2S)-2-{6'-[(6-aminopyridin-3-yl)sulfonyl]-2'-(phenylamino)-2,3'-bipyridin-5-yl}-1,1,1-trifluoropropan-2-ol (three-letter code: 2UY) (formula: C<sub>24</sub>H<sub>20</sub>F<sub>3</sub>N<sub>5</sub>O<sub>3</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	F	N	O			S
2	A	1	Total	C	F	N	O	S	0	0
			36	24	3	5	3	1		
2	B	1	Total	C	F	N	O	S	0	0
			36	24	3	5	3	1		

- Molecule 3 is D-SORBITOL-6-PHOSPHATE (three-letter code: S6P) (formula: C<sub>6</sub>H<sub>15</sub>O<sub>9</sub>P).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	P	0	0
			16	6	9	1		
3	B	1	Total	C	O	P	0	0
			16	6	9	1		

- Molecule 4 is IODIDE ION (three-letter code: IOD) (formula: I).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	12	Total	I	0	0
			12	12		
4	B	13	Total	I	0	0
			13	13		

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



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

- Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		

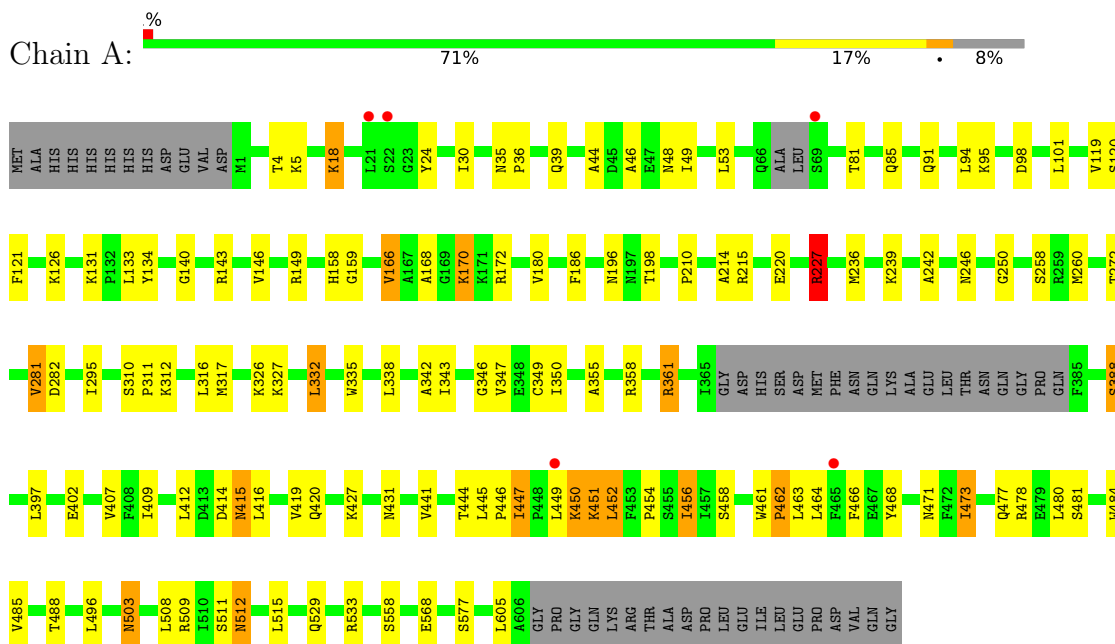
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	26	Total 26	O 26	0	0
7	B	34	Total 34	O 34	0	0

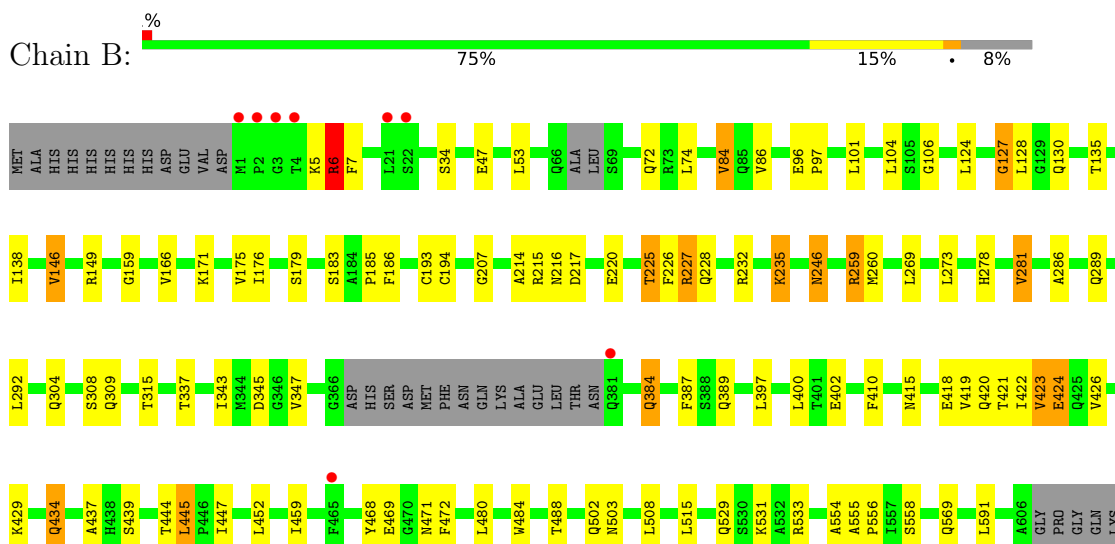
### 3 Residue-property plots [i](#)

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: Glucokinase Regulatory Protein



#### • Molecule 1: Glucokinase Regulatory Protein





ARG  
THR  
ALA  
ASP  
PRO  
LEU  
GLU  
ILE  
LEU  
GLU  
PRO  
ASP  
VAL  
GLN  
GLY

## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	148.91Å 148.91Å 132.40Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.59 – 2.82 29.59 – 2.82	Depositor EDS
% Data completeness (in resolution range)	99.5 (29.59-2.82) 99.6 (29.59-2.82)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.28 (at 2.80Å)	Xtrriage
Refinement program	REFMAC 5.8.0049	Depositor
R, $R_{free}$	0.199 , 0.266 0.204 , 0.268	Depositor DCC
$R_{free}$ test set	2007 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	43.6	Xtrriage
Anisotropy	0.090	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 36.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	0.028 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	9286	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	43.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.49% 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 i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: IOD, 2UY, S6P, GOL, SO4

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	0.63	0/4603	0.79	4/6228 (0.1%)
1	B	0.63	0/4637	0.80	4/6274 (0.1%)
All	All	0.63	0/9240	0.80	8/12502 (0.1%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	361	ARG	NE-CZ-NH1	7.59	124.10	120.30
1	B	259	ARG	NE-CZ-NH1	6.31	123.46	120.30
1	B	6	ARG	NE-CZ-NH1	5.56	123.08	120.30
1	B	149	ARG	NE-CZ-NH1	5.43	123.02	120.30
1	A	478	ARG	NE-CZ-NH1	5.28	122.94	120.30
1	B	259	ARG	NE-CZ-NH2	-5.25	117.67	120.30
1	A	227	ARG	NE-CZ-NH1	5.13	122.87	120.30
1	A	361	ARG	NE-CZ-NH2	-5.06	117.77	120.30

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	4521	0	4618	69	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	4554	0	4647	58	0
2	A	36	0	20	6	0
2	B	36	0	20	4	0
3	A	16	0	13	0	0
3	B	16	0	13	1	0
4	A	12	0	0	4	0
4	B	13	0	0	2	0
5	B	12	0	16	0	0
6	B	10	0	0	0	0
7	A	26	0	0	0	0
7	B	34	0	0	1	0
All	All	9286	0	9347	135	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 7.

All (135) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:216:ASN:OD1	1:B:225:THR:HG21	1.69	0.92
1:B:389:GLN:OE1	1:B:421:THR:HG21	1.89	0.72
1:A:508:LEU:HD13	1:A:515:LEU:HD22	1.74	0.69
2:A:701:2UY:N2	2:A:701:2UY:H5	2.05	0.69
1:A:447:ILE:HG22	1:A:449:LEU:C	2.14	0.68
1:A:450:LYS:HA	1:A:452:LEU:HD12	1.78	0.65
1:A:140:GLY:H	1:A:158:HIS:HE1	1.42	0.64
2:A:701:2UY:F3	2:A:701:2UY:H15	1.87	0.64
2:B:701:2UY:N2	2:B:701:2UY:H5	2.14	0.63
1:B:86:VAL:HG12	1:B:273:LEU:HD21	1.81	0.61
1:A:414:ASP:O	1:A:415:ASN:CB	2.48	0.60
1:A:503:ASN:HD22	1:A:503:ASN:C	2.05	0.60
1:A:146:VAL:O	1:A:347:VAL:HG21	2.02	0.60
1:A:220:GLU:OE2	1:A:558:SER:OG	2.21	0.58
1:A:159:GLY:HA2	1:A:186:PHE:CE1	2.38	0.57
1:B:410:PHE:O	1:B:437:ALA:HA	2.03	0.57
1:A:412:LEU:HD23	1:A:412:LEU:N	2.19	0.57
1:A:480:LEU:HD21	1:A:484:TRP:CH2	2.40	0.57
2:A:701:2UY:N2	2:A:701:2UY:C22	2.67	0.57
1:B:397:LEU:HA	1:B:400:LEU:HD12	1.85	0.57
1:B:220:GLU:OE2	1:B:558:SER:OG	2.17	0.56
1:A:46:ALA:HA	1:A:317:MET:HE1	1.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:140:GLY:N	1:A:158:HIS:HE1	2.04	0.55
1:B:384:GLN:HB3	1:B:387:PHE:CZ	2.42	0.55
1:B:246:ASN:HD22	1:B:246:ASN:N	2.03	0.55
1:B:215:ARG:HG2	1:B:217:ASP:OD1	2.07	0.55
1:A:18:LYS:O	1:A:18:LYS:CG	2.54	0.54
1:A:481:SER:O	1:A:485:VAL:HG23	2.07	0.54
1:A:140:GLY:H	1:A:158:HIS:CE1	2.25	0.54
1:A:180:VAL:HG11	1:A:258:SER:HB2	1.89	0.53
1:A:461:TRP:O	1:A:462:PRO:O	2.26	0.53
2:B:701:2UY:N1	2:B:701:2UY:N3	2.56	0.53
1:A:53:LEU:HD12	1:A:488:THR:HG23	1.91	0.53
1:B:419:VAL:O	1:B:423:VAL:HG12	2.07	0.53
1:B:146:VAL:O	1:B:347:VAL:HG21	2.09	0.53
1:B:84:VAL:HG23	1:B:292:LEU:HD11	1.89	0.52
1:A:146:VAL:O	1:A:146:VAL:HG12	2.08	0.52
1:B:469:GLU:HG2	7:B:801:HOH:O	2.10	0.52
1:B:124:LEU:HD12	1:B:472:PHE:CD2	2.44	0.52
1:B:480:LEU:HD21	1:B:484:TRP:CH2	2.44	0.52
1:A:196:ASN:OD1	4:A:712:IOD:I	2.98	0.52
1:B:259:ARG:NH2	1:B:345:ASP:OD1	2.43	0.52
1:A:449:LEU:HD12	1:A:449:LEU:O	2.09	0.52
1:B:53:LEU:HD12	1:B:488:THR:HG23	1.92	0.51
1:A:447:ILE:HG22	1:A:450:LYS:N	2.25	0.51
1:A:450:LYS:HA	1:A:452:LEU:CD1	2.39	0.51
1:B:232:ARG:HA	1:B:235:LYS:HD3	1.93	0.51
1:A:272:THR:HA	1:A:295:ILE:HG21	1.91	0.51
1:A:146:VAL:O	1:A:146:VAL:CG1	2.58	0.51
1:A:473:ILE:O	1:A:477:GLN:HG3	2.10	0.51
2:A:701:2UY:F3	2:A:701:2UY:C2	2.48	0.50
1:B:246:ASN:HD22	1:B:246:ASN:H	1.59	0.50
1:A:44:ALA:HB1	1:A:48:ASN:HB3	1.93	0.49
1:A:512:ASN:C	1:A:512:ASN:HD22	2.15	0.49
1:A:214:ALA:O	1:A:227:ARG:HD3	2.12	0.49
2:A:701:2UY:N1	2:A:701:2UY:N3	2.57	0.49
1:B:127:GLY:O	1:B:128:LEU:HD23	2.12	0.48
1:A:18:LYS:O	1:A:18:LYS:HG3	2.13	0.48
1:A:140:GLY:O	1:A:149:ARG:NH1	2.43	0.48
1:A:529:GLN:HE21	1:A:533:ARG:HE	1.60	0.48
1:B:215:ARG:HG3	2:B:701:2UY:C13	2.43	0.48
1:B:128:LEU:HD21	1:B:468:TYR:CD1	2.49	0.47
1:B:207:GLY:O	1:B:246:ASN:HA	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:215:ARG:HG3	2:A:701:2UY:C14	2.45	0.47
1:B:555:ALA:HB1	1:B:556:PRO:HD2	1.96	0.47
1:B:315:THR:HG22	1:B:434:GLN:NE2	2.30	0.47
1:A:121:PHE:HB3	1:A:134:TYR:CE2	2.50	0.47
1:A:416:LEU:N	1:A:416:LEU:HD12	2.30	0.47
1:B:420:GLN:O	1:B:424:GLU:HB2	2.15	0.47
1:A:146:VAL:HG13	1:A:343:ILE:CG2	2.45	0.47
1:A:332:LEU:HB3	1:A:342:ALA:HB1	1.96	0.47
1:B:146:VAL:HG12	1:B:343:ILE:HG21	1.98	0.46
2:B:701:2UY:N2	2:B:701:2UY:C22	2.79	0.46
1:B:74:LEU:CD1	1:B:269:LEU:HD13	2.45	0.46
1:A:420:GLN:NE2	1:A:447:ILE:HD11	2.30	0.46
1:A:332:LEU:HD12	1:A:407:VAL:HB	1.98	0.46
1:B:101:LEU:HD11	1:B:135:THR:CG2	2.46	0.46
1:A:414:ASP:O	1:A:415:ASN:HB3	2.16	0.46
1:A:447:ILE:HG23	1:A:449:LEU:HG	1.99	0.45
1:A:4:THR:HA	4:A:711:IOD:I	2.86	0.45
1:A:101:LEU:HD21	1:A:166:VAL:HG13	1.99	0.45
1:B:529:GLN:HE21	1:B:533:ARG:HE	1.63	0.45
1:B:96:GLU:N	1:B:97:PRO:HD3	2.32	0.45
1:A:466:PHE:C	1:A:466:PHE:CD1	2.90	0.44
1:B:106:GLY:O	1:B:138:ILE:HA	2.18	0.44
1:B:128:LEU:HD12	1:B:130:GLN:NE2	2.32	0.44
1:B:422:ILE:O	1:B:426:VAL:HG23	2.17	0.44
1:A:250:GLY:HA2	4:A:705:IOD:I	2.88	0.44
1:B:529:GLN:NE2	1:B:533:ARG:HE	2.15	0.44
1:B:175:VAL:HG21	1:B:194:CYS:SG	2.57	0.44
1:B:193:CYS:HA	4:B:714:IOD:I	2.88	0.44
1:B:445:LEU:HG	4:B:713:IOD:I	2.87	0.44
1:B:225:THR:HG22	1:B:228:GLN:HG3	1.99	0.44
1:B:397:LEU:HD23	1:B:429:LYS:HE2	1.98	0.44
1:B:423:VAL:HG22	1:B:452:LEU:HD13	1.99	0.44
1:B:214:ALA:O	1:B:227:ARG:HD3	2.18	0.44
1:B:128:LEU:HD12	1:B:130:GLN:HE21	1.83	0.43
1:A:447:ILE:O	1:A:450:LYS:N	2.48	0.43
1:B:508:LEU:C	1:B:508:LEU:HD12	2.39	0.43
1:B:508:LEU:HD13	1:B:515:LEU:HD22	1.99	0.43
1:A:509:ARG:NH2	1:A:568:GLU:OE2	2.51	0.43
1:B:183:SER:O	1:B:185:PRO:HD3	2.19	0.43
1:A:119:VAL:O	1:A:120:SER:C	2.58	0.43
1:B:179:SER:OG	3:B:702:S6P:O3P	2.20	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:310:SER:HB2	1:A:311:PRO:HD3	2.00	0.43
1:A:509:ARG:HG2	1:A:511:SER:OG	2.18	0.43
1:B:6:ARG:HD2	1:B:554:ALA:O	2.19	0.42
1:B:7:PHE:O	1:B:531:LYS:NZ	2.52	0.42
1:B:309:GLN:HG3	1:B:459:ILE:HD13	2.00	0.42
1:A:327:LYS:HG2	1:A:327:LYS:O	2.19	0.42
1:B:104:LEU:CD2	1:B:176:ILE:HD12	2.50	0.42
1:B:569:GLN:HG2	1:B:591:LEU:HD21	2.01	0.42
1:A:236:MET:HB2	1:A:242:ALA:HB3	2.01	0.42
1:A:350:ILE:HA	1:A:355:ALA:O	2.20	0.41
1:B:315:THR:HG22	1:B:434:GLN:HE22	1.85	0.41
1:A:36:PRO:O	1:A:39:GLN:HG2	2.21	0.41
1:A:46:ALA:HA	1:A:317:MET:CE	2.50	0.41
1:B:286:ALA:HA	1:B:289:GLN:NE2	2.35	0.41
1:A:95:LYS:HE3	1:A:281:VAL:HG12	2.03	0.41
1:B:159:GLY:HA2	1:B:186:PHE:CE1	2.56	0.41
1:A:81:THR:HG22	1:A:85:GLN:OE1	2.20	0.41
1:A:91:GLN:HG2	1:A:281:VAL:HG13	2.01	0.41
1:A:449:LEU:C	1:A:451:LYS:H	2.24	0.41
1:B:278:HIS:O	1:B:281:VAL:HG23	2.21	0.41
1:B:84:VAL:HG23	1:B:292:LEU:CD1	2.50	0.41
1:A:468:TYR:HB2	4:A:703:IOD:I	2.90	0.41
1:A:30:ILE:HD12	1:A:210:PRO:HD3	2.03	0.41
1:A:101:LEU:HB2	1:A:170:LYS:HG2	2.03	0.41
1:A:49:ILE:HD12	1:A:317:MET:HE1	2.03	0.40
1:A:335:TRP:CZ2	1:A:419:VAL:HG22	2.56	0.40
1:A:317:MET:HE2	1:A:496:LEU:HD11	2.04	0.40
1:A:338:LEU:HB3	1:A:409:ILE:HG22	2.03	0.40
1:A:346:GLY:O	1:A:349:CYS:HB2	2.21	0.40
1:A:94:LEU:HD23	1:A:133:LEU:HD12	2.03	0.40
1:B:286:ALA:HA	1:B:289:GLN:HE21	1.87	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	579/638 (91%)	529 (91%)	39 (7%)	11 (2%)	8	24
1	B	584/638 (92%)	553 (95%)	27 (5%)	4 (1%)	22	51
All	All	1163/1276 (91%)	1082 (93%)	66 (6%)	15 (1%)	12	34

All (15) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	388	SER
1	A	415	ASN
1	A	456	ILE
1	A	462	PRO
1	A	260	MET
1	B	127	GLY
1	B	418	GLU
1	A	168	ALA
1	A	402	GLU
1	B	502	GLN
1	A	326	LYS
1	A	454	PRO
1	B	260	MET
1	A	446	PRO
1	A	447	ILE

### 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	498/542 (92%)	456 (92%)	42 (8%)	11	30
1	B	501/542 (92%)	471 (94%)	30 (6%)	19	47
All	All	999/1084 (92%)	927 (93%)	72 (7%)	14	37

All (72) residues with a non-rotameric sidechain are listed below:



Mol	Chain	Res	Type
1	A	5	LYS
1	A	18	LYS
1	A	24	TYR
1	A	35	ASN
1	A	98	ASP
1	A	126	LYS
1	A	131	LYS
1	A	143	ARG
1	A	166	VAL
1	A	170	LYS
1	A	172	ARG
1	A	198	THR
1	A	227	ARG
1	A	239	LYS
1	A	246	ASN
1	A	281	VAL
1	A	282	ASP
1	A	312	LYS
1	A	316	LEU
1	A	332	LEU
1	A	358	ARG
1	A	361	ARG
1	A	388	SER
1	A	397	LEU
1	A	427	LYS
1	A	431	ASN
1	A	441	VAL
1	A	444	THR
1	A	445	LEU
1	A	450	LYS
1	A	451	LYS
1	A	452	LEU
1	A	456	ILE
1	A	458	SER
1	A	463	LEU
1	A	464	LEU
1	A	471	ASN
1	A	473	ILE
1	A	503	ASN
1	A	512	ASN
1	A	577	SER
1	A	605	LEU
1	B	5	LYS

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Mol	Chain	Res	Type
1	B	6	ARG
1	B	34	SER
1	B	47	GLU
1	B	72	GLN
1	B	84	VAL
1	B	146	VAL
1	B	166	VAL
1	B	171	LYS
1	B	225	THR
1	B	226	PHE
1	B	227	ARG
1	B	235	LYS
1	B	246	ASN
1	B	281	VAL
1	B	304	GLN
1	B	308	SER
1	B	337	THR
1	B	384	GLN
1	B	402	GLU
1	B	415	ASN
1	B	423	VAL
1	B	424	GLU
1	B	434	GLN
1	B	439	SER
1	B	444	THR
1	B	445	LEU
1	B	447	ILE
1	B	471	ASN
1	B	503	ASN

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	9	HIS
1	A	35	ASN
1	A	91	GLN
1	A	123	GLN
1	A	158	HIS
1	A	190	GLN
1	A	196	ASN
1	A	246	ASN
1	A	289	GLN

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Mol	Chain	Res	Type
1	A	309	GLN
1	A	471	ASN
1	A	503	ASN
1	A	512	ASN
1	A	529	GLN
1	B	9	HIS
1	B	48	ASN
1	B	130	GLN
1	B	196	ASN
1	B	197	ASN
1	B	228	GLN
1	B	246	ASN
1	B	289	GLN
1	B	304	GLN
1	B	384	GLN
1	B	415	ASN
1	B	431	ASN
1	B	434	GLN
1	B	471	ASN
1	B	503	ASN
1	B	529	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 33 ligands modelled in this entry, 25 are monoatomic - leaving 8 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	2UY	B	701	-	39,39,39	1.46	4 (10%)	46,59,59	1.86	13 (28%)
6	SO4	B	719	-	4,4,4	0.27	0	6,6,6	0.44	0
5	GOL	B	717	-	5,5,5	0.36	0	5,5,5	1.11	0
5	GOL	B	716	-	5,5,5	0.48	0	5,5,5	0.54	0
6	SO4	B	718	-	4,4,4	0.44	0	6,6,6	0.45	0
2	2UY	A	701	-	39,39,39	1.59	6 (15%)	46,59,59	1.70	9 (19%)
3	S6P	B	702	-	15,15,15	1.21	2 (13%)	21,21,21	0.98	2 (9%)
3	S6P	A	702	-	15,15,15	1.34	1 (6%)	21,21,21	1.36	5 (23%)

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	2UY	B	701	-	-	5/35/35/35	0/4/4/4
5	GOL	B	717	-	-	1/4/4/4	-
5	GOL	B	716	-	-	2/4/4/4	-
2	2UY	A	701	-	-	5/35/35/35	0/4/4/4
3	S6P	B	702	-	-	1/20/20/20	-
3	S6P	A	702	-	-	3/20/20/20	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	2UY	O2-S1	4.91	1.53	1.44
2	B	701	2UY	O2-S1	4.28	1.51	1.44
3	A	702	S6P	P-O3P	4.23	1.64	1.50
2	A	701	2UY	C10-S1	-4.21	1.74	1.78
2	A	701	2UY	O3-S1	3.91	1.51	1.44
2	B	701	2UY	C10-S1	-3.60	1.74	1.78
2	B	701	2UY	O3-S1	3.58	1.50	1.44
3	B	702	S6P	P-O2P	2.86	1.65	1.54
2	B	701	2UY	C7-C4	-2.55	1.42	1.48
2	A	701	2UY	C7-C4	-2.39	1.42	1.48
2	A	701	2UY	C12-S1	-2.35	1.73	1.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	2UY	C17-N3	-2.35	1.35	1.40
3	B	702	S6P	P-O3P	2.02	1.57	1.50

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	701	2UY	S1-C10-N2	4.80	119.61	115.03
2	A	701	2UY	O2-S1-C10	4.59	112.75	107.92
2	B	701	2UY	C9-C10-N2	-4.57	120.38	125.32
2	B	701	2UY	O3-S1-O2	-4.46	110.72	119.23
2	B	701	2UY	S1-C10-N2	4.30	119.13	115.03
2	B	701	2UY	O3-S1-C10	4.27	112.42	107.92
2	A	701	2UY	C5-N1-C4	3.90	123.04	117.90
3	A	702	S6P	O1-C1-C2	-3.68	103.05	111.07
2	B	701	2UY	C5-N1-C4	3.49	122.50	117.90
2	A	701	2UY	C9-C10-N2	-3.35	121.69	125.32
2	A	701	2UY	C1-C5-N1	-3.21	120.28	123.34
2	B	701	2UY	O2-S1-C10	2.96	111.04	107.92
2	B	701	2UY	C1-C5-N1	-2.76	120.71	123.34
2	B	701	2UY	C6-N2-C10	2.53	123.28	115.86
2	B	701	2UY	O2-S1-C12	2.45	110.73	107.97
2	A	701	2UY	O3-S1-O2	-2.45	114.55	119.23
2	A	701	2UY	C3-C4-N1	-2.42	118.66	122.26
3	A	702	S6P	C5-C4-C3	-2.25	108.94	112.47
2	A	701	2UY	C6-N2-C10	2.25	122.45	115.86
3	A	702	S6P	O2P-P-O1P	2.19	116.01	107.64
2	B	701	2UY	C16-C12-S1	2.17	122.28	119.52
2	B	701	2UY	C3-C4-N1	-2.16	119.05	122.26
2	B	701	2UY	C7-C4-N1	2.15	120.37	116.58
2	B	701	2UY	O1-C11-C23	2.14	113.73	108.47
2	A	701	2UY	C7-C4-N1	2.07	120.24	116.58
3	B	702	S6P	O1-C1-C2	-2.06	106.58	111.07
3	A	702	S6P	C2-C3-C4	-2.02	109.30	112.47
3	A	702	S6P	O3-C3-C4	-2.01	104.79	109.47
3	B	702	S6P	O6-P-O3P	2.01	112.10	106.47

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	702	S6P	O1-C1-C2-C3
3	A	702	S6P	O1-C1-C2-O2

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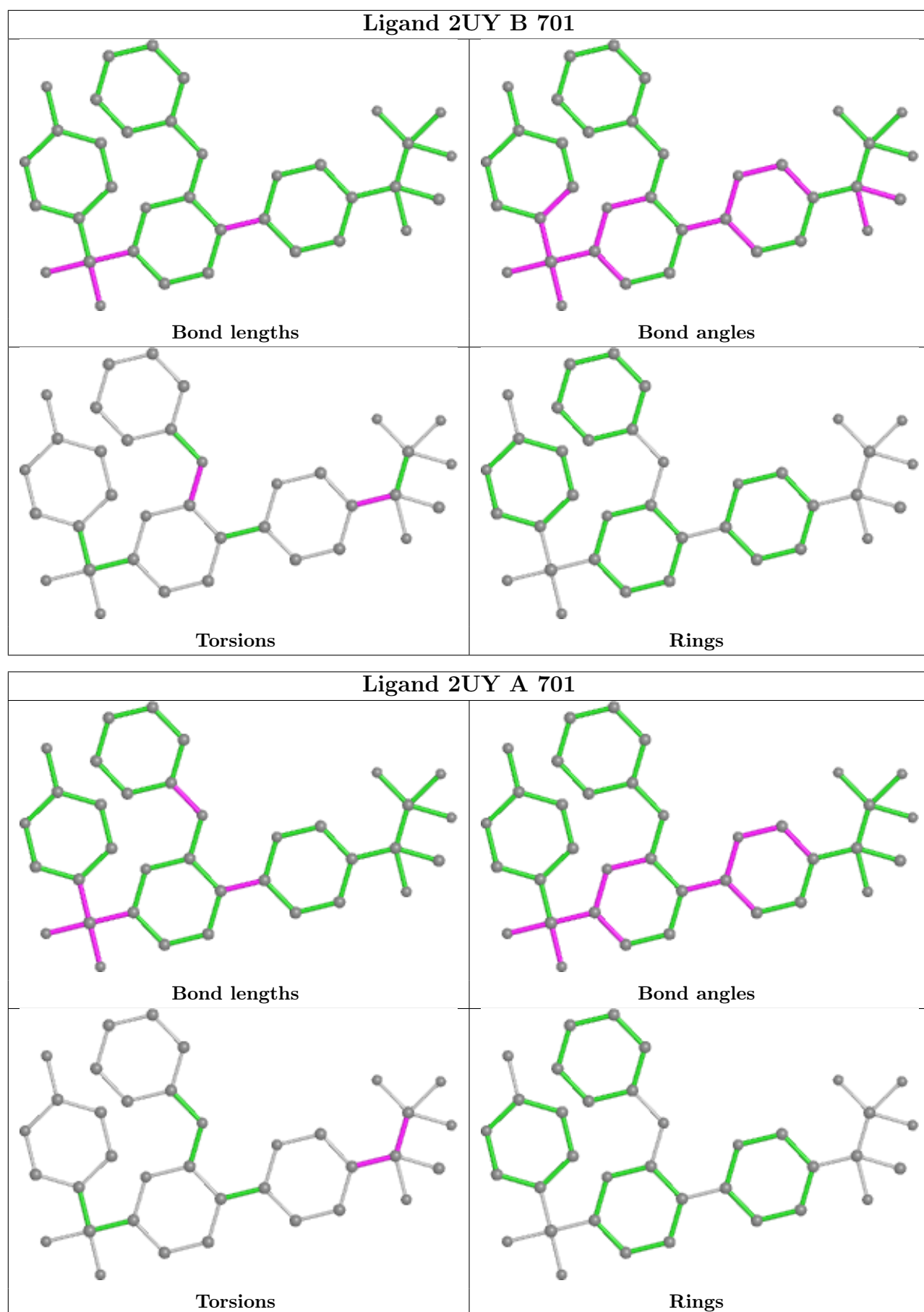
Mol	Chain	Res	Type	Atoms
5	B	716	GOL	O1-C1-C2-C3
5	B	716	GOL	O1-C1-C2-O2
2	A	701	2UY	C2-C1-C11-C24
2	A	701	2UY	C5-C1-C11-C24
2	B	701	2UY	C5-C1-C11-C24
2	A	701	2UY	C5-C1-C11-C23
5	B	717	GOL	O1-C1-C2-O2
2	B	701	2UY	C2-C1-C11-C24
2	A	701	2UY	C2-C1-C11-C23
2	B	701	2UY	C2-C1-C11-C23
2	A	701	2UY	C23-C11-C24-F3
2	B	701	2UY	C5-C1-C11-C23
3	B	702	S6P	C1-C2-C3-O3
3	A	702	S6P	O5-C5-C6-O6
2	B	701	2UY	N2-C6-N3-C17

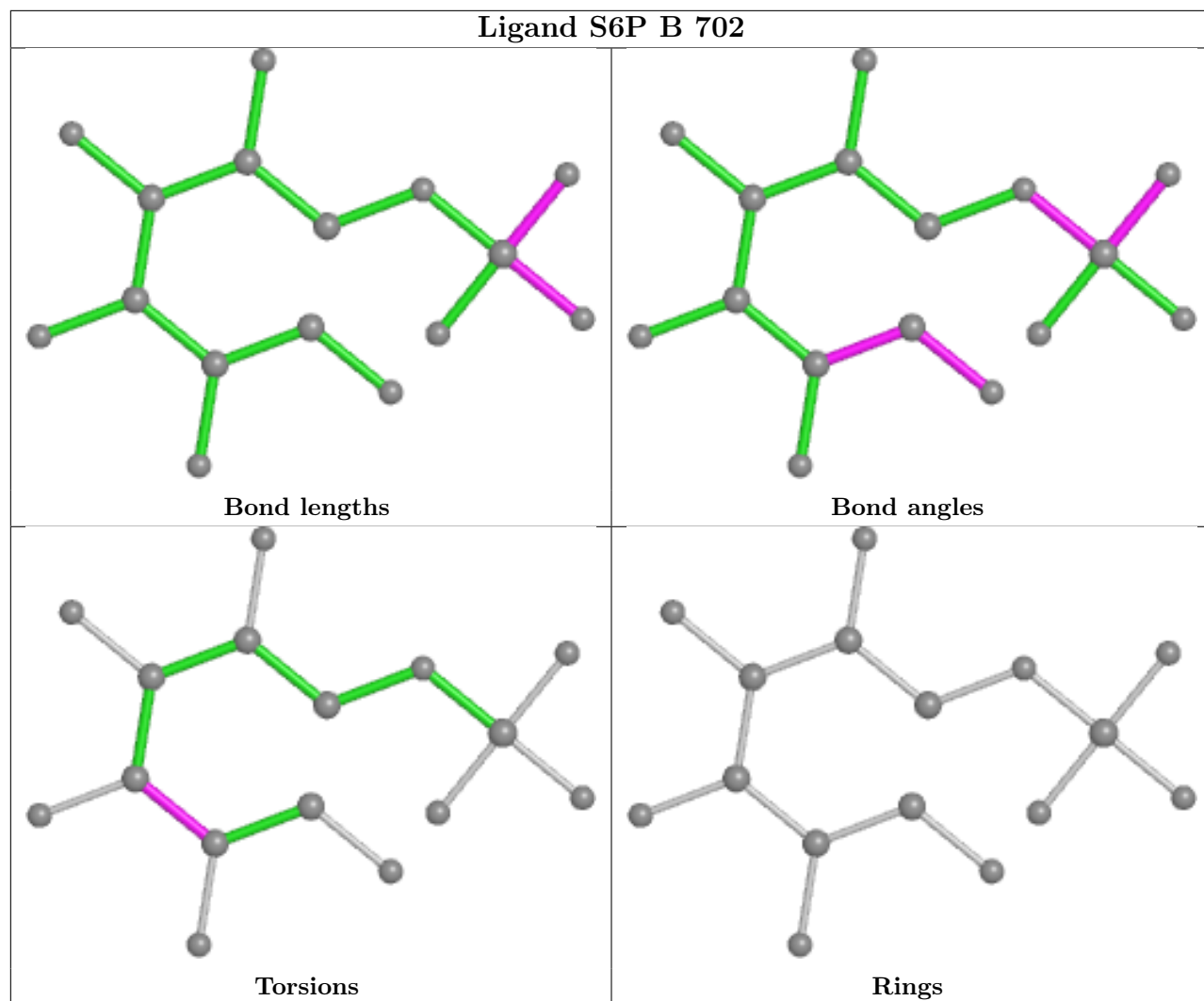
There are no ring outliers.

3 monomers are involved in 11 short contacts:

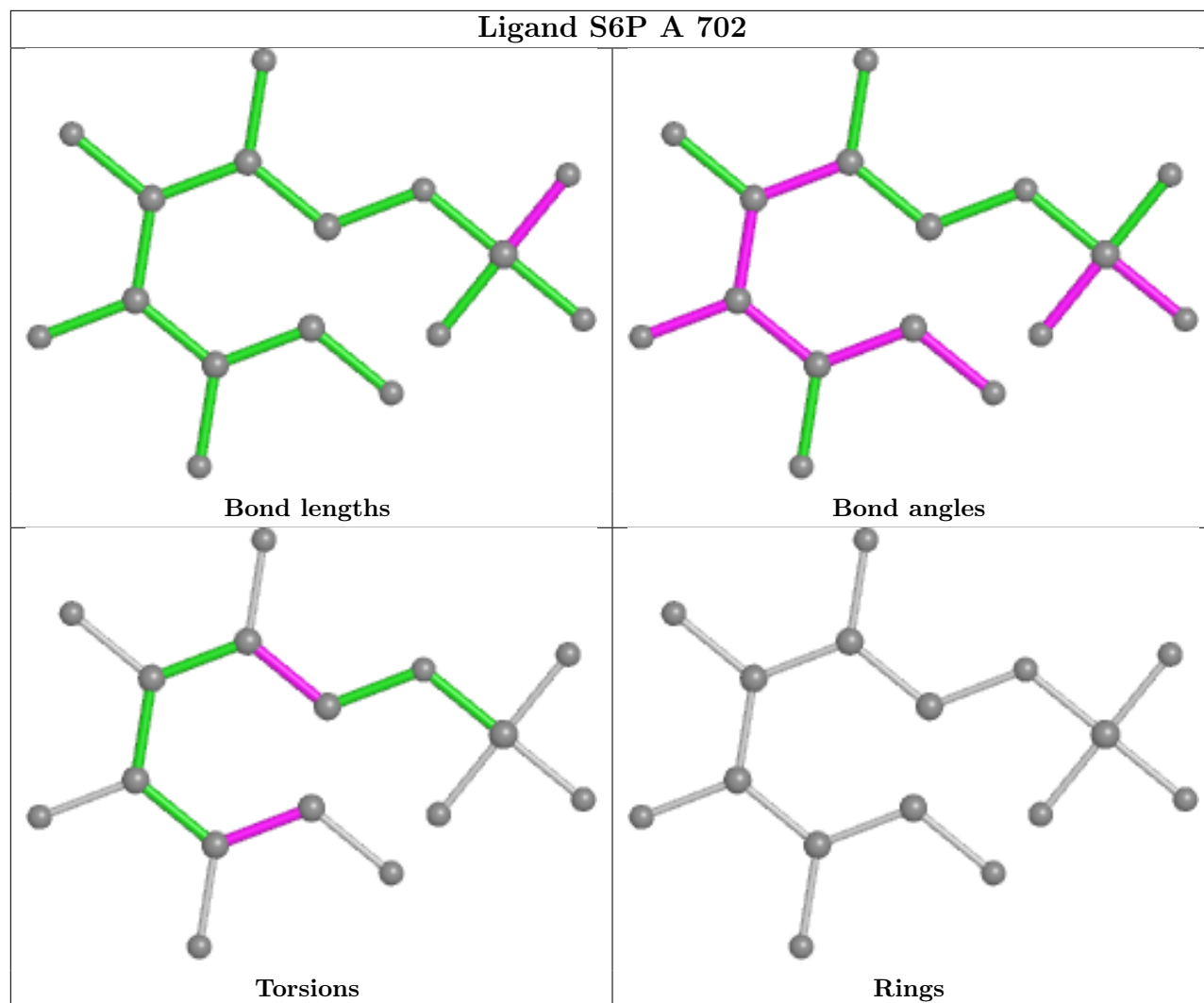
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	701	2UY	4	0
2	A	701	2UY	6	0
3	B	702	S6P	1	0

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 than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

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

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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	585/638 (91%)	-0.39	5 (0%) 84 80	21, 41, 82, 117	0
1	B	590/638 (92%)	-0.49	8 (1%) 75 69	20, 36, 67, 110	0
All	All	1175/1276 (92%)	-0.44	13 (1%) 80 75	20, 39, 77, 117	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	21	LEU	3.6
1	B	21	LEU	3.6
1	A	449	LEU	3.6
1	B	1	MET	3.5
1	B	22	SER	3.2
1	B	381	GLN	3.0
1	B	2	PRO	2.7
1	A	465	PHE	2.7
1	A	22	SER	2.6
1	A	69	SER	2.5
1	B	4	THR	2.2
1	B	3	GLY	2.1
1	B	465	PHE	2.1

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

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

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

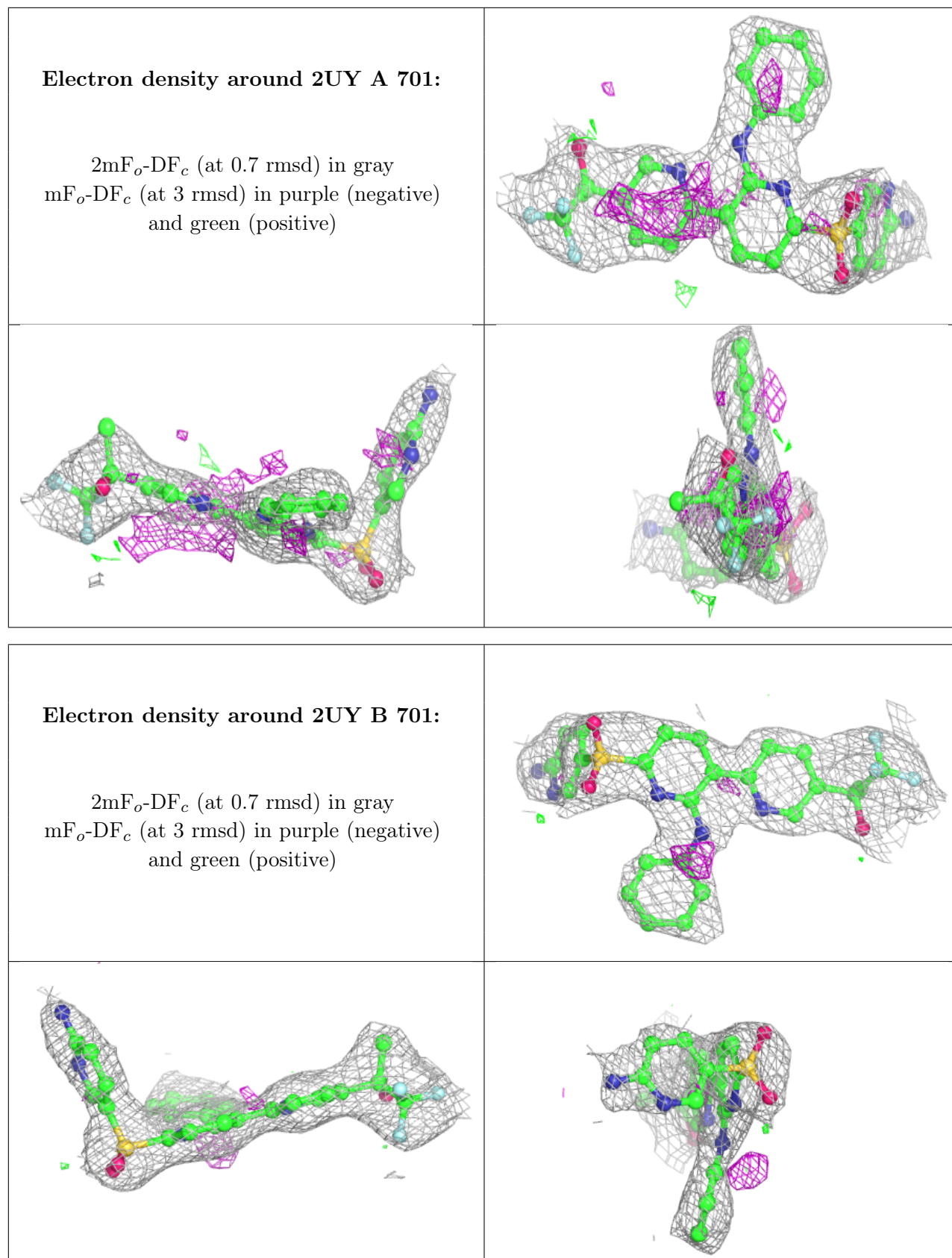
## 6.4 Ligands i

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	IOD	B	712	1/1	0.72	0.32	109,109,109,109	1
4	IOD	B	715	1/1	0.78	0.23	87,87,87,87	1
4	IOD	A	711	1/1	0.80	0.27	133,133,133,133	1
6	SO4	B	718	5/5	0.87	0.27	69,76,86,87	0
4	IOD	B	713	1/1	0.90	0.08	63,63,63,63	1
4	IOD	B	710	1/1	0.91	0.21	100,100,100,100	1
4	IOD	A	712	1/1	0.92	0.10	54,54,54,54	1
5	GOL	B	716	6/6	0.93	0.18	46,51,57,60	0
5	GOL	B	717	6/6	0.93	0.14	30,31,33,33	0
4	IOD	A	714	1/1	0.93	0.09	59,59,59,59	1
2	2UY	A	701	36/36	0.94	0.21	39,50,64,66	0
2	2UY	B	701	36/36	0.94	0.19	46,51,60,61	0
4	IOD	A	708	1/1	0.96	0.12	83,83,83,83	1
4	IOD	A	709	1/1	0.96	0.13	81,81,81,81	1
4	IOD	A	707	1/1	0.96	0.05	53,53,53,53	1
4	IOD	A	703	1/1	0.97	0.05	60,60,60,60	0
4	IOD	B	714	1/1	0.97	0.07	52,52,52,52	1
4	IOD	B	708	1/1	0.97	0.08	51,51,51,51	1
6	SO4	B	719	5/5	0.97	0.17	18,18,19,19	5
4	IOD	B	706	1/1	0.98	0.06	44,44,44,44	0
3	S6P	B	702	16/16	0.98	0.14	17,18,20,20	0
4	IOD	B	709	1/1	0.98	0.09	60,60,60,60	1
4	IOD	A	713	1/1	0.98	0.06	47,47,47,47	1
3	S6P	A	702	16/16	0.98	0.16	19,24,30,32	0
4	IOD	B	703	1/1	0.98	0.07	45,45,45,45	0
4	IOD	B	704	1/1	0.99	0.04	45,45,45,45	0
4	IOD	B	705	1/1	0.99	0.04	50,50,50,50	0
4	IOD	A	705	1/1	0.99	0.02	44,44,44,44	1
4	IOD	B	707	1/1	0.99	0.04	62,62,62,62	0
4	IOD	A	706	1/1	0.99	0.04	73,73,73,73	0
4	IOD	A	710	1/1	0.99	0.05	32,32,32,32	1
4	IOD	A	704	1/1	0.99	0.05	54,54,54,54	0
4	IOD	B	711	1/1	0.99	0.10	30,30,30,30	1

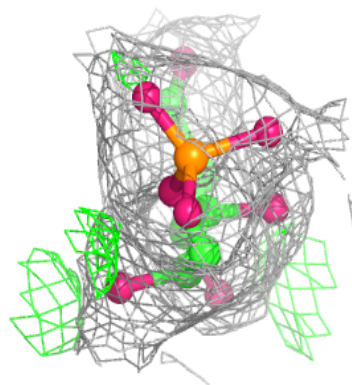
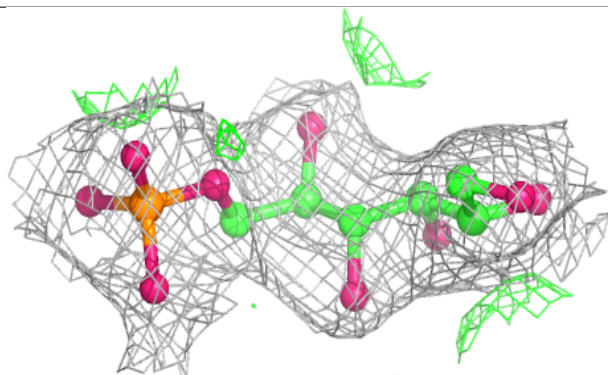
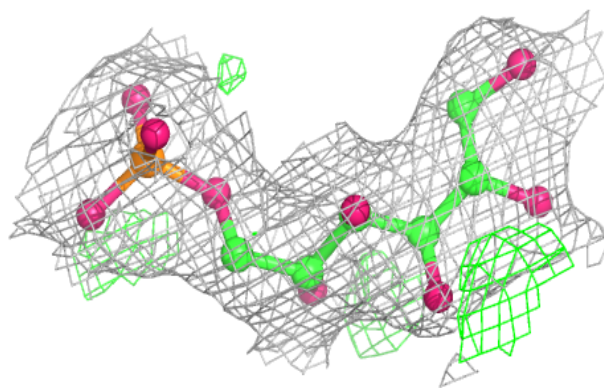
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different

orientation to approximate a three-dimensional view.

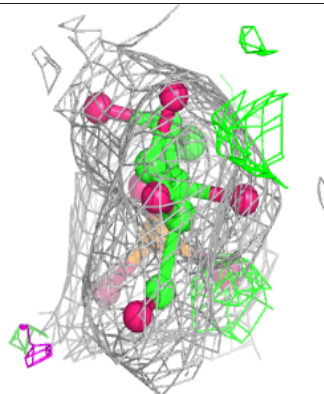
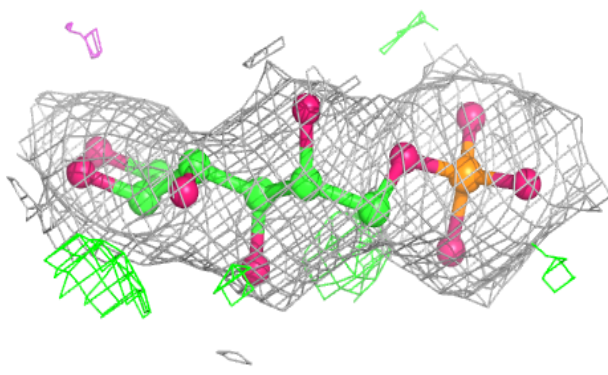
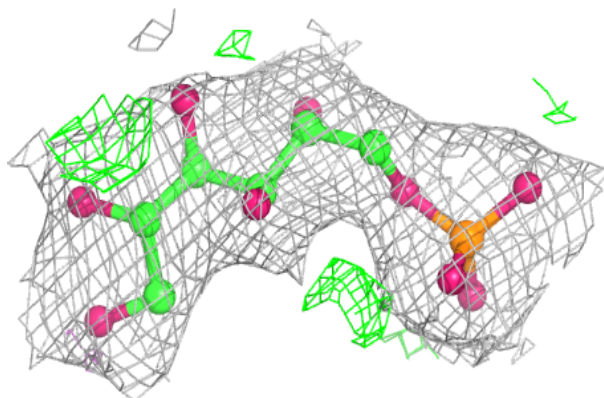


**Electron density around S6P B 702:**

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

**Electron density around S6P A 702:**

$2mF_o-DF_c$  (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.