



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 01:50 PM UTC

PDB ID : 4OLH / pdb_00004olh
Title : Human GKRP Bound to AMG5106 and Sorbitol-6-Phosphate
Authors : Jordan, S.R.; Chmait, S.
Deposited on : 2014-01-23
Resolution : 2.40 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

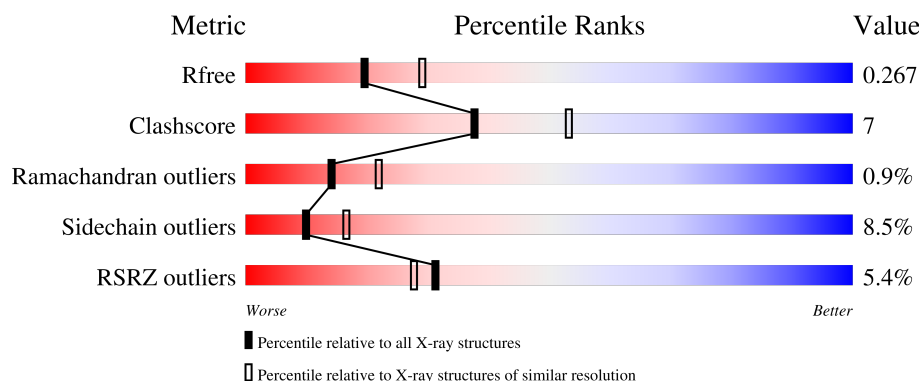
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	638	
1	B	638	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	IOD	A	709	-	-	X	-
4	IOD	A	715	-	-	X	-
4	IOD	B	713	-	-	X	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 9335 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
1	A	585	Total	C	N	O	S	0	0	0
			4521	2882	774	841	24			
1	B	590	Total	C	N	O	S	0	0	0
			4554	2901	781	848	24			

There are 26 discrepancies between the modelled and reference sequences:

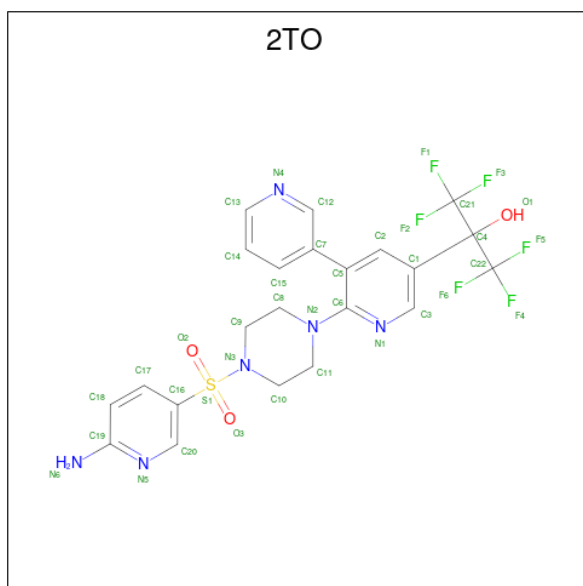
Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MET	-	expression tag	UNP Q14397
A	-10	ALA	-	expression tag	UNP Q14397
A	-9	HIS	-	expression tag	UNP Q14397
A	-8	HIS	-	expression tag	UNP Q14397
A	-7	HIS	-	expression tag	UNP Q14397
A	-6	HIS	-	expression tag	UNP Q14397
A	-5	HIS	-	expression tag	UNP 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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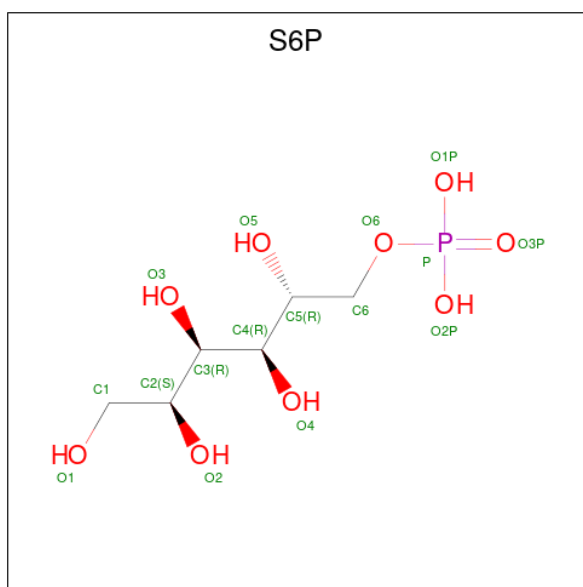
Chain	Residue	Modelled	Actual	Comment	Reference
B	626	GLY	-	expression tag	UNP Q14397

- Molecule 2 is 2-(2-{4-[(6-aminopyridin-3-yl)sulfonyl]piperazin-1-yl}-3,3'-bipyridin-5-yl)-1,1,1,3,3,3-hexafluoropropan-2-ol (CCD ID: 2TO) (formula: C₂₂H₂₀F₆N₆O₃S).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	S	0	0
			38	22	6	6	3	1		
2	B	1	Total	C	F	N	O	S	0	0
			38	22	6	6	3	1		

- Molecule 3 is D-SORBITOL-6-PHOSPHATE (CCD ID: S6P) (formula: C₆H₁₅O₉P).



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 (CCD ID: IOD) (formula: I).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	13	Total	I	0	0
			13	13		
4	B	14	Total	I	0	0
			14	14		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



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

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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		
6	B	1	Total	O	S	0	0
			5	4	1		

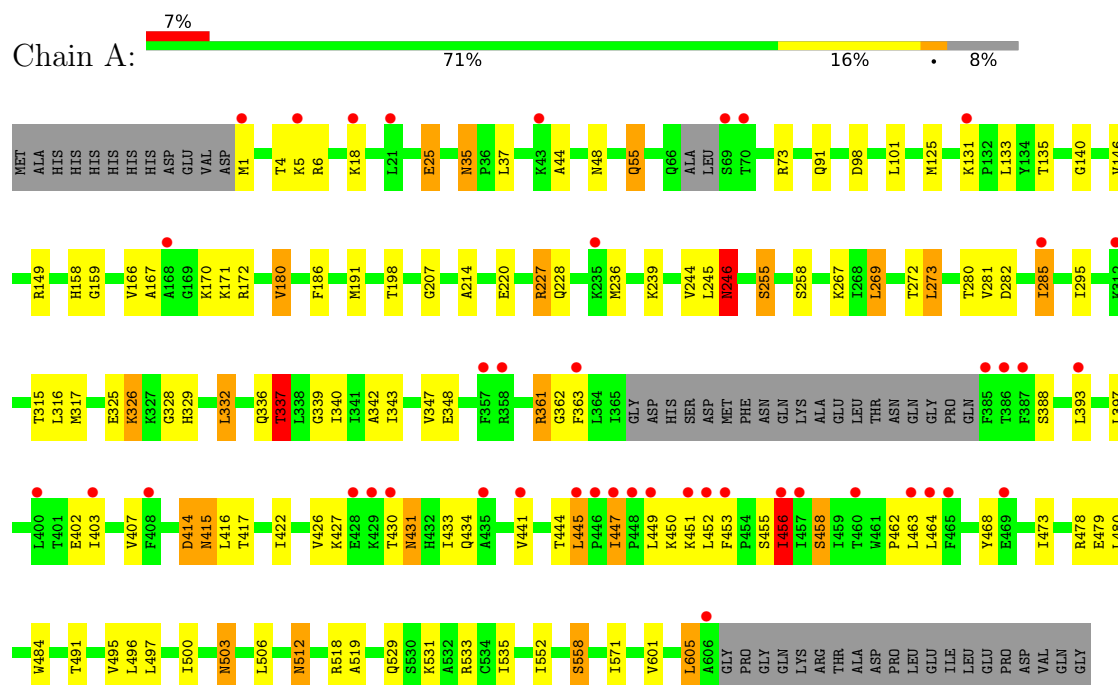
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	37	Total 37	O 37	0	0
7	B	67	Total 67	O 67	0	0

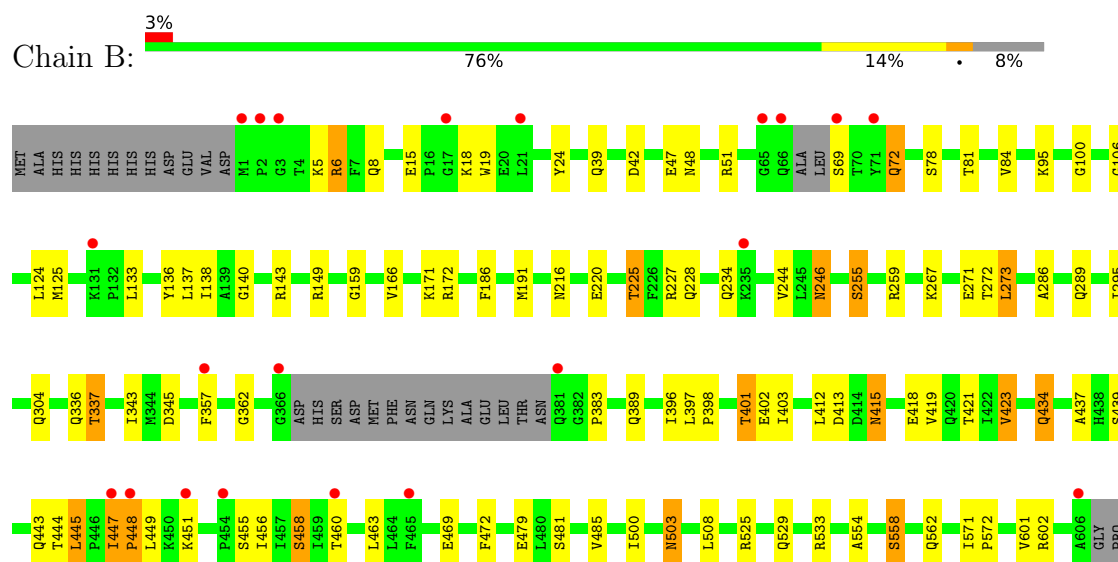
3 Residue-property plots

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



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

4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α , β , γ	149.34Å 149.34Å 133.14Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.40 – 2.40 39.40 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.8 (39.40-2.40) 99.9 (39.40-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.54 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.214 , 0.266 0.218 , 0.267	Depositor DCC
R_{free} test set	3337 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	50.2	Xtriage
Anisotropy	0.058	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 28.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.025 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9335	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.29% 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: S6P, GOL, SO4, IOD, 2TO

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	0.96	2/4603 (0.0%)	1.08	3/6228 (0.0%)
1	B	1.02	2/4637 (0.0%)	1.07	3/6274 (0.0%)
All	All	0.99	4/9240 (0.0%)	1.07	6/12502 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	1
All	All	0	2

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	255	SER	CA-C	-5.67	1.45	1.52
1	A	180	VAL	N-CA	-5.65	1.40	1.46
1	B	244	VAL	C-O	-5.38	1.18	1.24
1	A	244	VAL	C-O	-5.19	1.18	1.24

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	434	GLN	N-CA-C	-6.28	99.13	108.99
1	A	414	ASP	N-CA-C	6.16	119.26	111.69
1	A	246	ASN	N-CA-C	5.71	117.81	109.30
1	B	601	VAL	CB-CA-C	-5.59	104.74	112.24
1	B	336	GLN	CB-CA-C	-5.35	108.84	116.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	552	ILE	N-CA-C	-5.08	105.47	111.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	167	ALA	Peptide
1	B	447	ILE	Peptide

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	4521	0	4618	65	0
1	B	4554	0	4647	59	0
2	A	38	0	20	3	0
2	B	38	0	20	3	0
3	A	16	0	13	1	0
3	B	16	0	13	0	0
4	A	13	0	0	8	0
4	B	14	0	0	4	0
5	B	6	0	8	0	0
6	B	15	0	0	0	0
7	A	37	0	0	2	0
7	B	67	0	0	1	0
All	All	9335	0	9339	130	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 (130) 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	1.81	0.80
1:A:228:GLN:HE22	1:B:228:GLN:HE22	1.29	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:5:LYS:HB3	4:A:709:IOD:I	2.55	0.76
2:B:701:2TO:H12	2:B:701:2TO:C12	2.17	0.74
1:A:315:THR:HG22	1:A:434:GLN:HE22	1.52	0.74
1:B:259:ARG:NH2	1:B:345:ASP:OD1	2.21	0.73
1:A:125:MET:HE1	1:A:133:LEU:HG	1.70	0.71
1:B:267:LYS:NZ	1:B:271:GLU:OE1	2.24	0.70
1:B:220:GLU:OE1	1:B:558:SER:OG	2.10	0.69
1:B:469:GLU:HG2	4:B:716:IOD:I	2.64	0.68
1:B:419:VAL:O	1:B:423:VAL:HG12	1.94	0.67
2:B:701:2TO:H12	2:B:701:2TO:C7	2.25	0.66
1:A:25:GLU:OE2	4:A:710:IOD:I	2.84	0.66
1:B:445:LEU:HG	4:B:713:IOD:I	2.67	0.65
1:B:508:LEU:C	1:B:508:LEU:HD12	2.23	0.64
1:B:5:LYS:HB2	4:B:710:IOD:I	2.69	0.63
3:A:702:S6P:O1P	7:A:828:HOH:O	2.16	0.63
1:B:389:GLN:HE21	1:B:418:GLU:HG3	1.63	0.63
1:A:348:GLU:OE1	7:A:823:HOH:O	2.16	0.63
1:A:44:ALA:HB1	1:A:48:ASN:HB3	1.83	0.60
1:A:317:MET:HE2	1:A:496:LEU:HD11	1.83	0.60
1:B:286:ALA:HA	1:B:289:GLN:HE21	1.65	0.60
2:A:701:2TO:C12	2:A:701:2TO:H12	2.33	0.58
1:A:273:LEU:C	1:A:273:LEU:HD23	2.29	0.58
1:A:414:ASP:O	1:A:415:ASN:CB	2.52	0.58
1:A:5:LYS:CB	4:A:709:IOD:I	3.23	0.57
1:A:339:GLY:O	1:A:342:ALA:HB3	2.04	0.57
1:B:48:ASN:HD22	1:B:51:ARG:HE	1.53	0.57
1:B:136:TYR:O	1:B:137:LEU:HD23	2.05	0.56
1:A:456:ILE:HD13	1:A:458:SER:HB2	1.87	0.56
1:B:389:GLN:OE1	1:B:421:THR:HG21	2.06	0.56
1:A:146:VAL:HG12	1:A:146:VAL:O	2.05	0.55
4:A:705:IOD:I	4:A:715:IOD:I	3.64	0.55
1:A:220:GLU:OE1	1:A:558:SER:OG	2.25	0.54
1:A:451:LYS:N	1:A:452:LEU:HB2	2.23	0.54
1:A:414:ASP:O	1:A:415:ASN:HB2	2.06	0.54
1:B:503:ASN:HD22	1:B:503:ASN:H	1.54	0.54
1:A:4:THR:HA	4:A:711:IOD:I	2.78	0.54
1:A:214:ALA:O	1:A:227:ARG:HD3	2.08	0.53
1:A:512:ASN:C	1:A:512:ASN:HD22	2.17	0.53
2:A:701:2TO:H12	2:A:701:2TO:C7	2.38	0.53
1:A:140:GLY:O	1:A:149:ARG:NH1	2.42	0.53
1:A:255:SER:HB2	1:A:518:ARG:HH21	1.73	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:146:VAL:O	1:A:347:VAL:HG21	2.10	0.52
1:B:286:ALA:HA	1:B:289:GLN:NE2	2.23	0.52
1:A:447:ILE:HG22	1:A:449:LEU:C	2.35	0.52
1:B:246:ASN:HD22	1:B:246:ASN:N	2.07	0.52
1:B:15:GLU:HB2	1:B:18:LYS:HD3	1.92	0.51
1:B:159:GLY:HA2	1:B:186:PHE:CE1	2.45	0.51
1:B:447:ILE:O	1:B:448:PRO:C	2.53	0.51
1:A:228:GLN:HE22	1:B:228:GLN:NE2	2.04	0.50
1:B:140:GLY:O	1:B:149:ARG:NH2	2.45	0.50
1:B:448:PRO:HA	1:B:449:LEU:C	2.36	0.50
1:A:337:THR:CG2	1:A:479:GLU:HG2	2.41	0.49
1:A:101:LEU:HD11	1:A:135:THR:HG22	1.93	0.49
1:B:72:GLN:HG2	1:B:78:SER:OG	2.11	0.49
1:B:529:GLN:NE2	1:B:533:ARG:HE	2.11	0.49
1:A:332:LEU:HD12	1:A:407:VAL:HB	1.94	0.48
1:A:246:ASN:H	1:A:246:ASN:HD22	1.61	0.48
1:A:37:LEU:HD22	1:A:55:GLN:HE21	1.78	0.48
1:A:73:ARG:NH2	4:A:715:IOD:I	3.17	0.48
1:B:481:SER:O	1:B:485:VAL:HG23	2.13	0.48
1:A:246:ASN:HD22	1:A:246:ASN:N	2.12	0.48
1:B:191:MET:HE2	1:B:191:MET:HA	1.96	0.48
1:B:448:PRO:HD3	1:B:451:LYS:HB2	1.94	0.47
1:B:273:LEU:C	1:B:273:LEU:HD23	2.40	0.47
1:B:437:ALA:CB	1:B:456:ILE:HD11	2.45	0.47
1:A:531:LYS:O	1:A:535:ILE:HG13	2.13	0.47
1:B:69:SER:O	7:B:849:HOH:O	2.21	0.47
1:A:140:GLY:H	1:A:158:HIS:HE1	1.62	0.47
1:A:361:ARG:HD2	1:A:363:PHE:CZ	2.50	0.46
1:A:191:MET:HA	1:A:191:MET:HE2	1.98	0.46
1:A:519:ALA:HB2	1:A:571:ILE:HD11	1.97	0.46
1:B:412:LEU:HD12	1:B:443:GLN:HB3	1.97	0.46
1:B:272:THR:HA	1:B:295:ILE:HG21	1.98	0.46
1:A:328:GLY:O	1:A:329:HIS:CD2	2.69	0.46
1:A:315:THR:CG2	1:A:434:GLN:HE22	2.22	0.46
1:A:447:ILE:HG22	1:A:450:LYS:N	2.30	0.46
1:B:447:ILE:HB	1:B:448:PRO:HD2	1.98	0.46
1:A:245:LEU:HD13	1:A:269:LEU:CD2	2.46	0.45
1:A:159:GLY:HA2	1:A:186:PHE:CE1	2.52	0.45
1:B:125:MET:HE1	1:B:133:LEU:HG	1.98	0.45
1:B:48:ASN:ND2	1:B:51:ARG:HE	2.14	0.45
2:B:701:2TO:C12	2:B:701:2TO:C8	2.91	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:220:GLU:CD	1:B:558:SER:OG	2.59	0.45
1:A:315:THR:HG22	1:A:434:GLN:NE2	2.27	0.45
1:A:91:GLN:HG2	1:A:281:VAL:HG13	1.99	0.45
1:B:437:ALA:HB2	1:B:456:ILE:HD11	1.99	0.45
1:B:529:GLN:HE21	1:B:533:ARG:HE	1.65	0.44
1:A:272:THR:HA	1:A:295:ILE:HG21	1.99	0.44
1:A:503:ASN:HD22	1:A:503:ASN:H	1.65	0.44
1:B:337:THR:HG21	1:B:479:GLU:OE1	2.17	0.44
1:B:503:ASN:HD22	1:B:503:ASN:N	2.14	0.44
2:A:701:2TO:C12	2:A:701:2TO:C8	2.95	0.44
1:A:468:TYR:HB2	4:A:703:IOD:I	2.88	0.44
1:B:6:ARG:HD2	1:B:554:ALA:O	2.18	0.44
1:B:397:LEU:N	1:B:398:PRO:CD	2.81	0.44
1:A:491:THR:O	1:A:495:VAL:HG23	2.18	0.44
1:A:430:THR:O	1:A:431:ASN:ND2	2.43	0.44
1:B:343:ILE:HA	1:B:362:GLY:HA3	1.99	0.43
1:A:343:ILE:HA	1:A:362:GLY:HA3	2.01	0.43
1:A:332:LEU:HB3	1:A:342:ALA:HB1	2.00	0.43
1:B:447:ILE:HB	1:B:448:PRO:CD	2.49	0.43
1:A:207:GLY:O	1:A:246:ASN:HA	2.19	0.43
1:A:480:LEU:HD21	1:A:484:TRP:CH2	2.54	0.43
1:A:422:ILE:O	1:A:426:VAL:HG23	2.19	0.43
1:A:506:LEU:HD23	4:A:704:IOD:I	2.89	0.42
1:B:106:GLY:O	1:B:138:ILE:HA	2.18	0.42
1:B:458:SER:HB3	4:B:713:IOD:I	2.89	0.42
1:B:357:PHE:CZ	1:B:383:PRO:CG	3.03	0.42
1:B:124:LEU:HD12	1:B:472:PHE:CD2	2.54	0.42
1:B:225:THR:HB	1:B:228:GLN:HE21	1.84	0.42
1:B:225:THR:HG22	1:B:228:GLN:H	1.84	0.42
1:B:19:TRP:HZ3	1:B:24:TYR:CE1	2.38	0.42
1:A:601:VAL:HG12	1:A:605:LEU:HD23	2.02	0.42
1:B:42:ASP:OD2	1:B:602:ARG:NH2	2.52	0.42
1:B:81:THR:O	1:B:84:VAL:HG12	2.20	0.42
1:A:180:VAL:HG11	1:A:258:SER:HB2	2.01	0.41
1:A:433:ILE:HD12	1:A:453:PHE:CE1	2.54	0.41
1:A:35:ASN:C	1:A:35:ASN:HD22	2.28	0.41
1:A:280:THR:HB	1:A:285:ILE:O	2.21	0.41
1:A:393:LEU:O	1:A:397:LEU:HB3	2.20	0.41
1:A:325:GLU:O	1:A:326:LYS:O	2.38	0.41
1:A:529:GLN:HE21	1:A:533:ARG:HE	1.69	0.41
1:A:35:ASN:HD22	1:A:37:LEU:H	1.68	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:396:ILE:O	1:B:397:LEU:C	2.63	0.41
1:B:401:THR:HG22	1:B:403:ILE:H	1.85	0.41
1:B:571:ILE:HB	1:B:572:PRO:HD3	2.03	0.41
1:B:100:GLY:HA2	1:B:172:ARG:O	2.21	0.40
1:A:445:LEU:HD22	1:A:450:LYS:HE2	2.03	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	579/638 (91%)	534 (92%)	37 (6%)	8 (1%)	9	13
1	B	584/638 (92%)	569 (97%)	13 (2%)	2 (0%)	36	50
All	All	1163/1276 (91%)	1103 (95%)	50 (4%)	10 (1%)	14	22

All (10) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	326	LYS
1	A	337	THR
1	A	415	ASN
1	B	415	ASN
1	B	448	PRO
1	A	456	ILE
1	A	462	PRO
1	A	336	GLN
1	A	447	ILE
1	A	497	LEU

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	498/542 (92%)	448 (90%)	50 (10%)	7	11
1	B	501/542 (92%)	466 (93%)	35 (7%)	14	24
All	All	999/1084 (92%)	914 (92%)	85 (8%)	10	16

All (85) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	6	ARG
1	A	18	LYS
1	A	25	GLU
1	A	35	ASN
1	A	55	GLN
1	A	98	ASP
1	A	131	LYS
1	A	166	VAL
1	A	170	LYS
1	A	171	LYS
1	A	172	ARG
1	A	198	THR
1	A	227	ARG
1	A	236	MET
1	A	239	LYS
1	A	246	ASN
1	A	255	SER
1	A	267	LYS
1	A	269	LEU
1	A	273	LEU
1	A	282	ASP
1	A	285	ILE
1	A	316	LEU
1	A	332	LEU
1	A	337	THR
1	A	340	ILE

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Mol	Chain	Res	Type
1	A	361	ARG
1	A	388	SER
1	A	402	GLU
1	A	403	ILE
1	A	416	LEU
1	A	417	THR
1	A	427	LYS
1	A	431	ASN
1	A	441	VAL
1	A	444	THR
1	A	445	LEU
1	A	455	SER
1	A	456	ILE
1	A	458	SER
1	A	463	LEU
1	A	464	LEU
1	A	473	ILE
1	A	478	ARG
1	A	500	ILE
1	A	503	ASN
1	A	512	ASN
1	A	558	SER
1	A	605	LEU
1	B	6	ARG
1	B	8	GLN
1	B	39	GLN
1	B	47	GLU
1	B	72	GLN
1	B	95	LYS
1	B	143	ARG
1	B	166	VAL
1	B	171	LYS
1	B	225	THR
1	B	227	ARG
1	B	234	GLN
1	B	246	ASN
1	B	255	SER
1	B	273	LEU
1	B	304	GLN
1	B	337	THR
1	B	401	THR
1	B	402	GLU

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Mol	Chain	Res	Type
1	B	413	ASP
1	B	415	ASN
1	B	423	VAL
1	B	434	GLN
1	B	439	SER
1	B	444	THR
1	B	445	LEU
1	B	455	SER
1	B	458	SER
1	B	460	THR
1	B	463	LEU
1	B	500	ILE
1	B	503	ASN
1	B	525	ARG
1	B	558	SER
1	B	562	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (35) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	35	ASN
1	A	55	GLN
1	A	72	GLN
1	A	91	GLN
1	A	123	GLN
1	A	158	HIS
1	A	190	GLN
1	A	196	ASN
1	A	216	ASN
1	A	246	ASN
1	A	329	HIS
1	A	389	GLN
1	A	415	ASN
1	A	420	GLN
1	A	434	GLN
1	A	503	ASN
1	A	512	ASN
1	A	524	GLN
1	A	529	GLN
1	B	39	GLN
1	B	48	ASN
1	B	85	GLN

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Mol	Chain	Res	Type
1	B	228	GLN
1	B	246	ASN
1	B	289	GLN
1	B	309	GLN
1	B	336	GLN
1	B	389	GLN
1	B	420	GLN
1	B	425	GLN
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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 35 ligands modelled in this entry, 27 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	$\# Z > 2$
6	SO4	B	719	-	4,4,4	0.49	0	6,6,6	0.49	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	S6P	A	702	-	15,15,15	1.31	3 (20%)	20,21,21	1.32	4 (20%)
6	SO4	B	718	-	4,4,4	0.72	0	6,6,6	0.50	0
2	2TO	A	701	-	41,41,41	1.46	4 (9%)	62,64,64	1.97	17 (27%)
6	SO4	B	720	-	4,4,4	0.41	0	6,6,6	0.47	0
2	2TO	B	701	-	41,41,41	1.33	5 (12%)	62,64,64	1.90	12 (19%)
5	GOL	B	717	-	5,5,5	0.58	0	5,5,5	0.62	0
3	S6P	B	702	-	15,15,15	1.47	2 (13%)	20,21,21	1.33	4 (20%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	S6P	A	702	-	-	0/20/20/20	-
2	2TO	A	701	-	-	3/44/54/54	0/4/4/4
2	2TO	B	701	-	-	2/44/54/54	0/4/4/4
5	GOL	B	717	-	-	2/4/4/4	-
3	S6P	B	702	-	-	0/20/20/20	-

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	2TO	O3-S1	5.78	1.49	1.43
2	A	701	2TO	C5-C7	-4.77	1.40	1.49
2	B	701	2TO	O2-S1	4.00	1.47	1.43
2	B	701	2TO	C5-C7	-3.67	1.42	1.49
3	A	702	S6P	P-O3P	3.34	1.60	1.50
3	B	702	S6P	P-O2P	3.00	1.66	1.54
2	A	701	2TO	C9-N3	-2.50	1.45	1.47
3	A	702	S6P	P-O2P	2.40	1.63	1.54
2	B	701	2TO	C3-C1	2.26	1.41	1.38
3	A	702	S6P	C2-C3	-2.21	1.49	1.53
2	B	701	2TO	C4-C1	2.20	1.56	1.53
3	B	702	S6P	C2-C3	-2.16	1.49	1.53
2	B	701	2TO	O1-C4	-2.11	1.37	1.41
2	A	701	2TO	C10-N3	-2.05	1.45	1.47

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	701	2TO	O3-S1-O2	-6.20	109.92	119.59
2	B	701	2TO	O3-S1-N3	6.17	112.50	106.69
2	B	701	2TO	C10-N3-S1	-5.65	106.55	117.06
2	B	701	2TO	O3-S1-C16	-4.99	101.90	108.10
2	B	701	2TO	C9-N3-S1	-4.78	108.16	117.06
2	A	701	2TO	C10-N3-S1	-4.59	108.51	117.06
2	A	701	2TO	C9-N3-S1	-4.55	108.59	117.06
2	A	701	2TO	C8-C9-N3	-3.87	104.85	108.97
2	B	701	2TO	C16-S1-N3	3.68	111.72	107.28
2	A	701	2TO	O2-S1-C16	3.63	112.62	108.10
2	A	701	2TO	C2-C1-C3	-3.63	115.95	118.78
2	A	701	2TO	C8-N2-C11	3.60	119.66	111.57
2	A	701	2TO	C13-N4-C12	3.27	122.58	116.85
2	B	701	2TO	C2-C1-C3	-3.17	116.31	118.78
2	A	701	2TO	F3-C21-C4	-2.88	106.42	111.84
2	B	701	2TO	O2-S1-N3	-2.81	104.04	106.69
3	A	702	S6P	O2P-P-O6	2.79	113.95	106.67
3	B	702	S6P	O6-P-O3P	2.78	113.96	106.44
2	B	701	2TO	C8-N2-C11	2.61	117.43	111.57
3	A	702	S6P	O1-C1-C2	-2.59	105.71	111.16
2	A	701	2TO	C5-C6-N2	2.46	126.62	122.54
3	B	702	S6P	O2P-P-O6	-2.42	100.37	106.67
2	B	701	2TO	C22-C4-C1	2.39	114.47	110.42
2	A	701	2TO	C3-N1-C6	2.39	122.57	115.19
3	B	702	S6P	O2P-P-O1P	2.28	116.36	107.80
2	B	701	2TO	C3-N1-C6	2.23	122.09	115.19
2	A	701	2TO	C5-C6-N1	-2.21	119.07	122.71
2	A	701	2TO	C11-C10-N3	2.16	111.26	108.97
2	A	701	2TO	F3-C21-F2	2.13	114.01	107.54
2	A	701	2TO	C9-N3-C10	-2.13	109.67	112.12
3	A	702	S6P	C5-C4-C3	-2.12	109.22	112.48
2	A	701	2TO	O1-C4-C22	-2.12	101.21	106.08
3	A	702	S6P	O2P-P-O3P	-2.09	102.70	110.83
3	B	702	S6P	C1-C2-C3	-2.08	107.93	112.17
2	A	701	2TO	C7-C5-C6	2.07	125.69	122.71
2	B	701	2TO	O1-C4-C22	-2.05	101.37	106.08
2	B	701	2TO	F3-C21-C4	-2.01	108.06	111.84

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	701	2TO	C10-N3-S1-O2

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Mol	Chain	Res	Type	Atoms
2	B	701	2TO	C10-N3-S1-O2
2	B	701	2TO	C10-N3-S1-C16
5	B	717	GOL	O1-C1-C2-C3
5	B	717	GOL	O1-C1-C2-O2
2	A	701	2TO	C10-N3-S1-C16
2	A	701	2TO	N1-C6-N2-C11

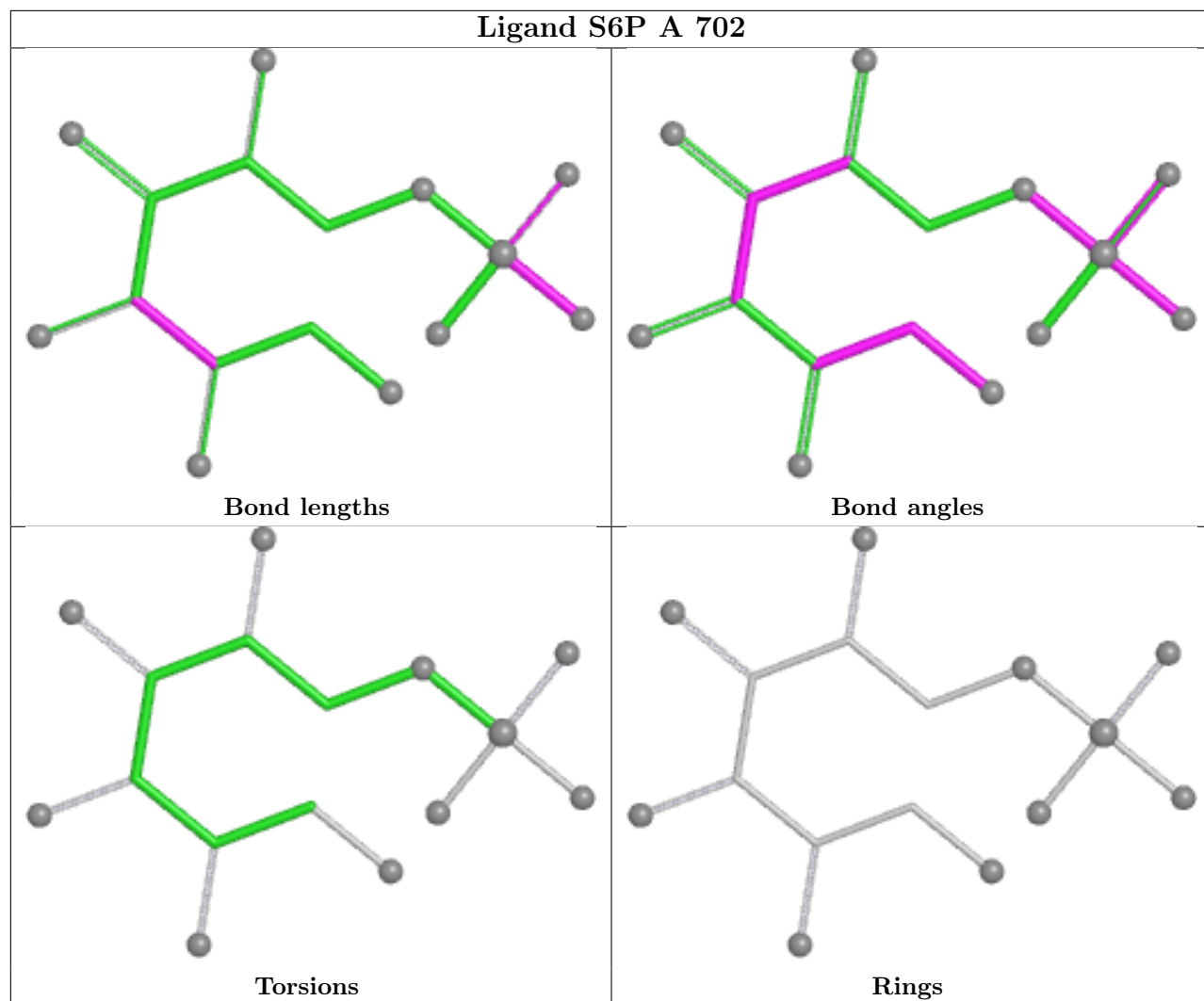
There are no ring outliers.

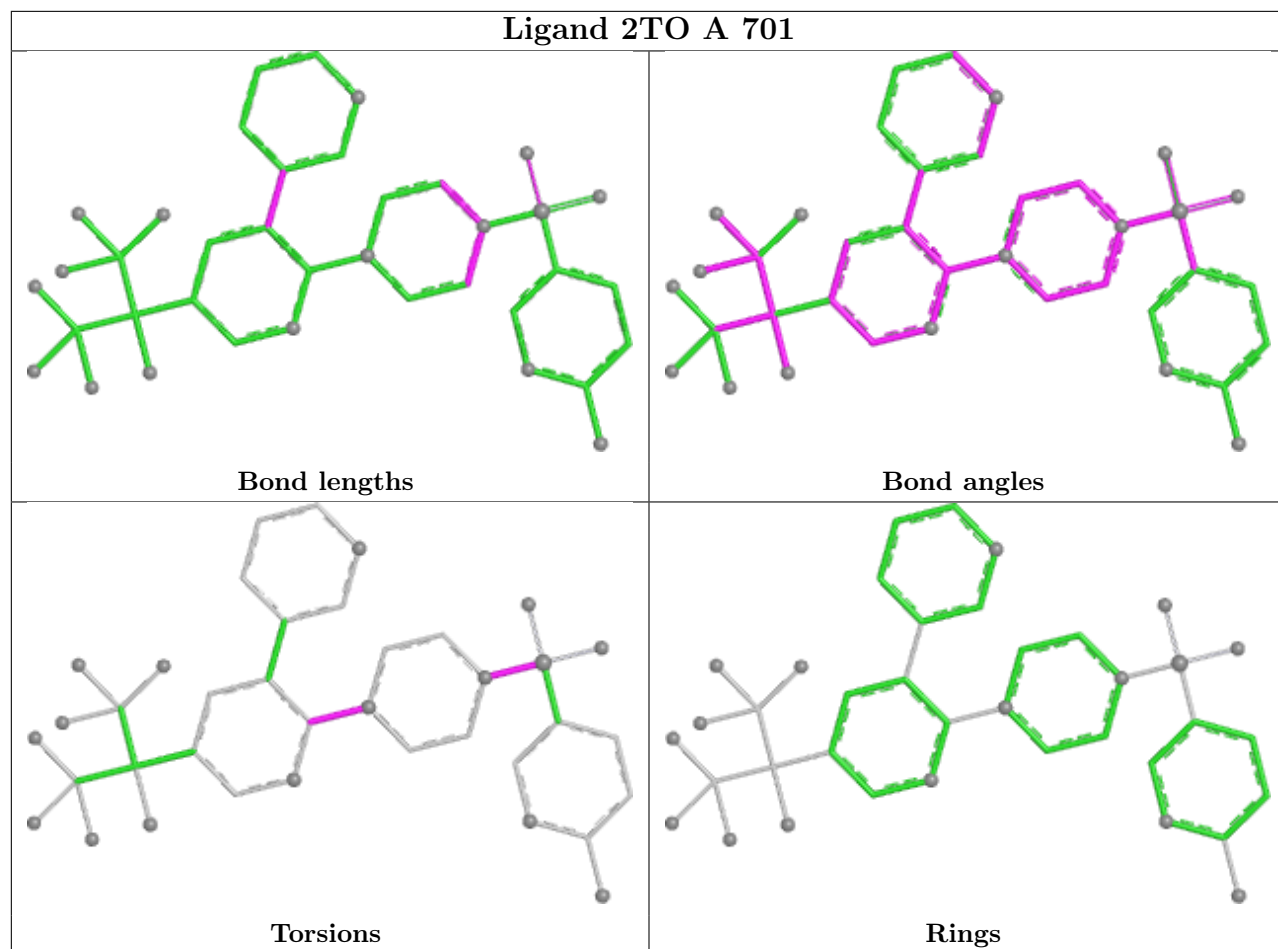
3 monomers are involved in 7 short contacts:

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

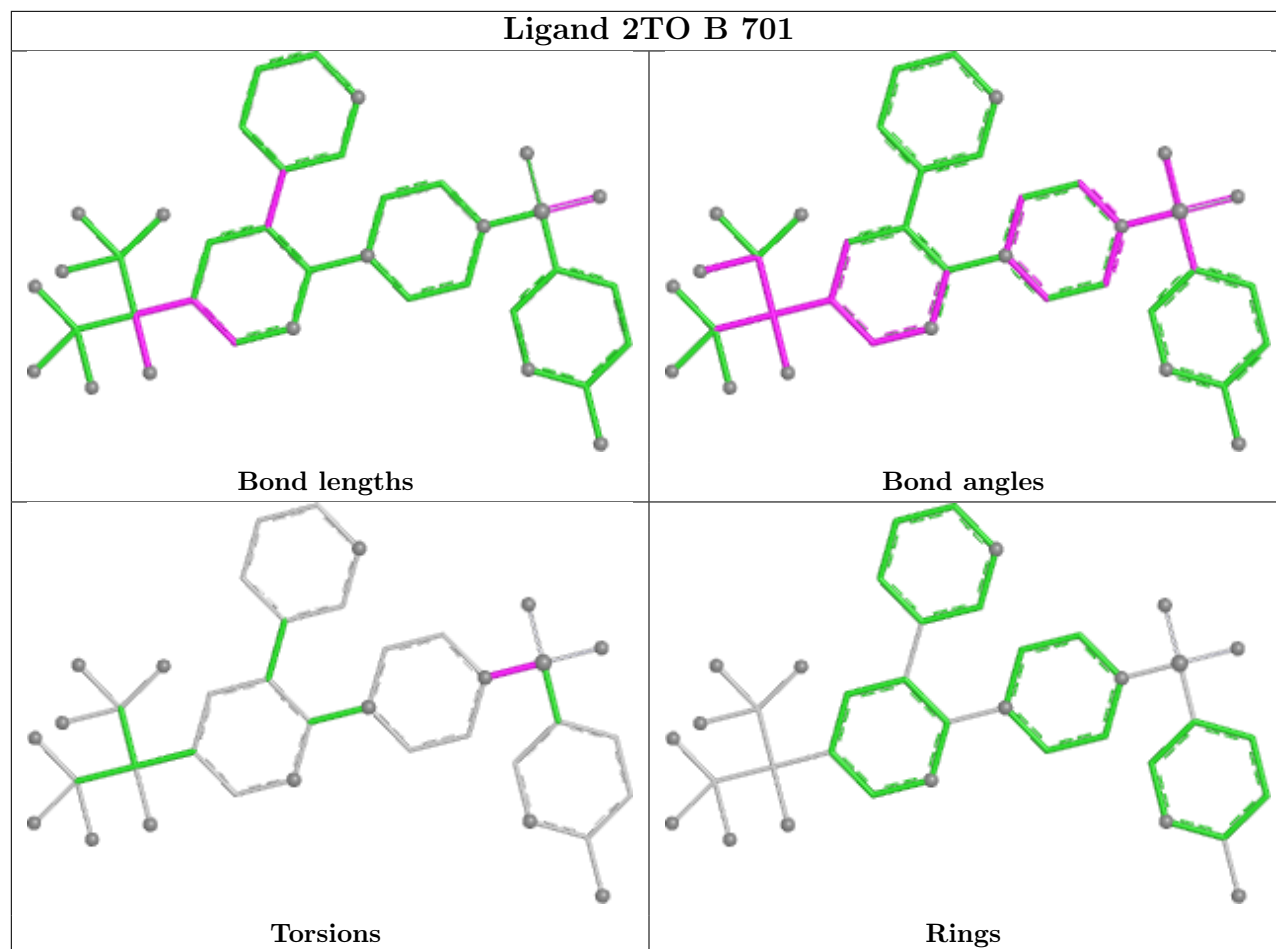
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

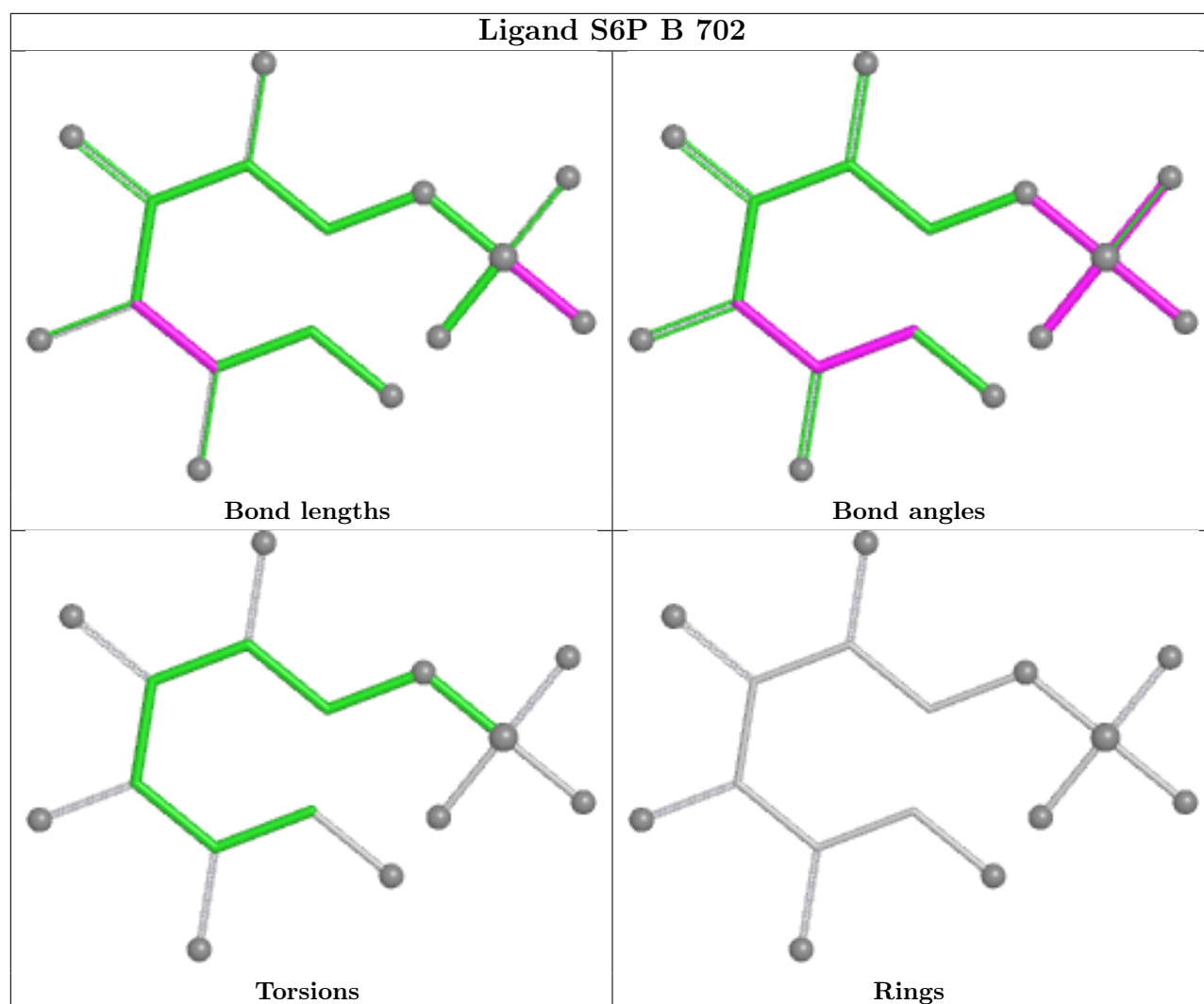
Ligand S6P A 702





Ligand 2TO B 701





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(Å ²)	Q<0.9
1	A	585/638 (91%)	0.48	43 (7%)	20 17	31, 56, 100, 133	0
1	B	590/638 (92%)	0.09	21 (3%)	46 42	28, 49, 78, 120	0
All	All	1175/1276 (92%)	0.28	64 (5%)	31 28	28, 52, 91, 133	0

All (64) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	449	LEU	6.5
1	A	387	PHE	5.5
1	A	464	LEU	5.3
1	A	465	PHE	5.0
1	A	452	LEU	4.2
1	B	448	PRO	4.2
1	A	606	ALA	3.6
1	B	447	ILE	3.6
1	A	456	ILE	3.5
1	B	381	GLN	3.5
1	A	463	LEU	3.4
1	B	366	GLY	3.4
1	A	447	ILE	3.3
1	A	430	THR	3.1
1	B	606	ALA	3.1
1	A	448	PRO	3.1
1	B	235	LYS	3.0
1	A	393	LEU	3.0
1	B	1	MET	3.0
1	A	469	GLU	2.9
1	A	441	VAL	2.8
1	B	66	GLN	2.8
1	A	235	LYS	2.8
1	A	357	PHE	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	403	ILE	2.7
1	A	400	LEU	2.7
1	A	386	THR	2.7
1	A	69	SER	2.6
1	B	69	SER	2.6
1	B	454	PRO	2.6
1	A	363	PHE	2.6
1	A	168	ALA	2.6
1	A	131	LYS	2.6
1	B	71	TYR	2.6
1	B	465	PHE	2.5
1	A	358	ARG	2.5
1	B	21	LEU	2.5
1	A	429	LYS	2.4
1	A	18	LYS	2.4
1	A	460	THR	2.4
1	B	460	THR	2.4
1	B	357	PHE	2.3
1	A	5	LYS	2.3
1	A	446	PRO	2.3
1	B	65	GLY	2.3
1	B	2	PRO	2.3
1	A	408	PHE	2.3
1	B	131	LYS	2.2
1	B	451	LYS	2.2
1	A	1	MET	2.2
1	B	17	GLY	2.2
1	A	43	LYS	2.2
1	A	312	LYS	2.2
1	A	21	LEU	2.1
1	A	453	PHE	2.1
1	B	3	GLY	2.1
1	A	428	GLU	2.1
1	A	451	LYS	2.1
1	A	435	ALA	2.1
1	A	445	LEU	2.1
1	A	70	THR	2.1
1	A	285	ILE	2.0
1	A	385	PHE	2.0
1	A	457	ILE	2.0

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	IOD	A	710	1/1	0.76	0.26	116,116,116,116	1
6	SO4	B	718	5/5	0.82	0.11	65,75,84,104	0
6	SO4	B	719	5/5	0.84	0.10	70,82,88,107	0
4	IOD	B	715	1/1	0.87	0.14	110,110,110,110	1
4	IOD	A	712	1/1	0.90	0.11	78,78,78,78	1
5	GOL	B	717	6/6	0.90	0.13	60,67,76,78	0
4	IOD	B	711	1/1	0.91	0.18	96,96,96,96	1
4	IOD	B	716	1/1	0.92	0.12	93,93,93,93	1
4	IOD	A	714	1/1	0.92	0.12	75,75,75,75	1
4	IOD	A	708	1/1	0.93	0.15	120,120,120,120	1
4	IOD	B	713	1/1	0.93	0.08	70,70,70,70	1
4	IOD	B	714	1/1	0.93	0.08	74,74,74,74	1
4	IOD	A	715	1/1	0.93	0.27	92,92,92,92	1
6	SO4	B	720	5/5	0.93	0.10	36,43,45,47	5
4	IOD	A	713	1/1	0.94	0.11	68,68,68,68	1
4	IOD	A	706	1/1	0.94	0.09	94,94,94,94	0
4	IOD	B	709	1/1	0.95	0.07	75,75,75,75	1
4	IOD	A	703	1/1	0.95	0.08	86,86,86,86	0
4	IOD	A	711	1/1	0.96	0.06	74,74,74,74	1
4	IOD	B	712	1/1	0.96	0.09	69,69,69,69	1
4	IOD	B	703	1/1	0.96	0.06	60,60,60,60	0
4	IOD	B	708	1/1	0.96	0.13	86,86,86,86	1
4	IOD	A	707	1/1	0.96	0.08	67,67,67,67	1
2	2TO	B	701	38/38	0.97	0.06	30,37,43,45	0
4	IOD	B	707	1/1	0.97	0.08	74,74,74,74	0
3	S6P	B	702	16/16	0.97	0.06	27,34,36,37	0
4	IOD	A	709	1/1	0.97	0.10	93,93,93,93	1

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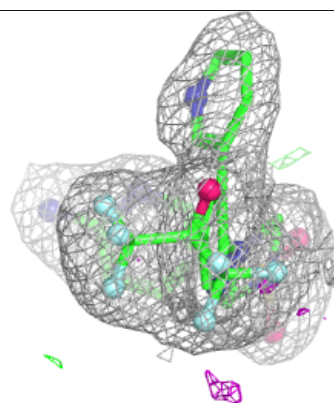
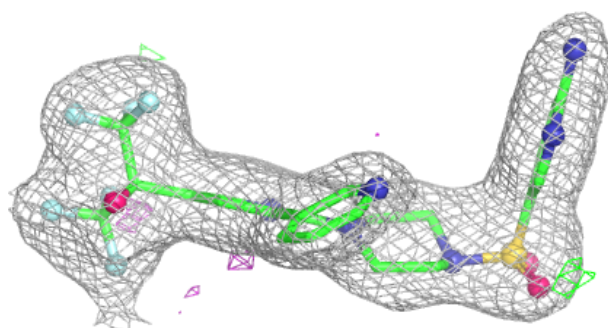
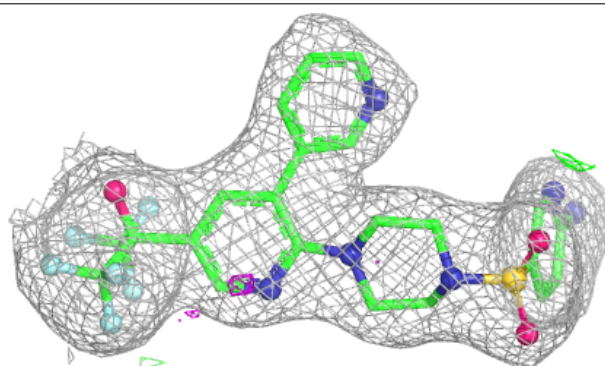
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	IOD	B	710	1/1	0.97	0.14	90,90,90,90	1
3	S6P	A	702	16/16	0.98	0.06	35,44,49,52	0
4	IOD	A	704	1/1	0.98	0.07	73,73,73,73	0
4	IOD	B	705	1/1	0.98	0.09	68,68,68,68	0
4	IOD	B	706	1/1	0.98	0.04	56,56,56,56	0
4	IOD	A	705	1/1	0.98	0.11	66,66,66,66	1
2	2TO	A	701	38/38	0.98	0.06	36,40,45,47	0
4	IOD	B	704	1/1	1.00	0.06	63,63,63,63	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.

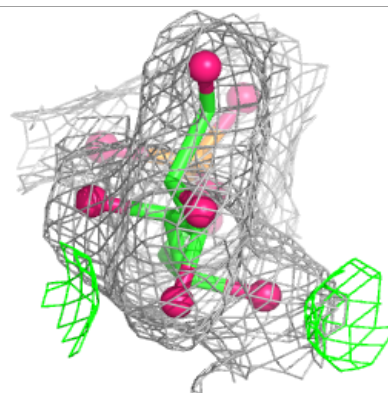
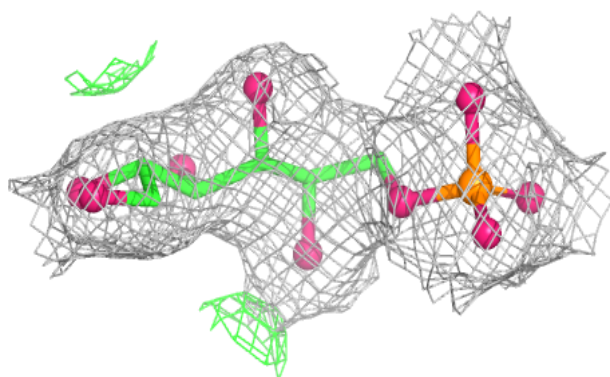
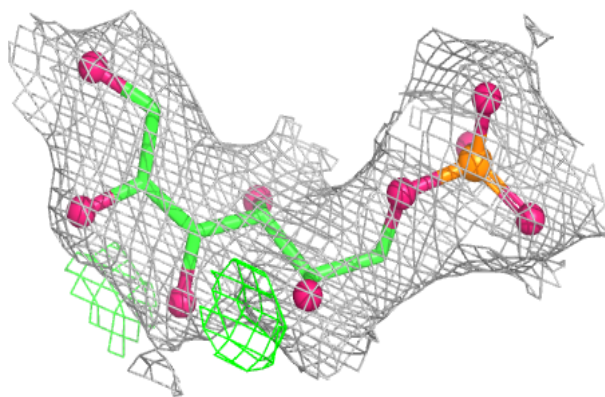
Electron density around 2TO B 701:

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

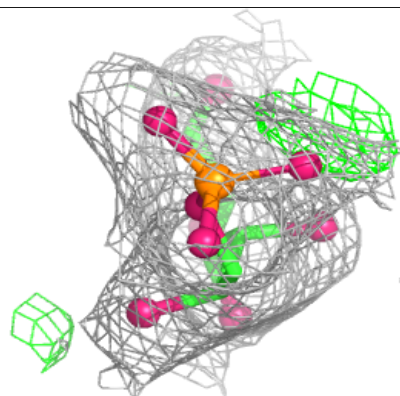
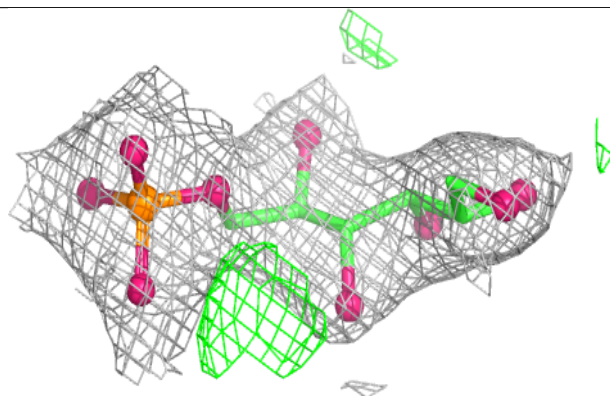
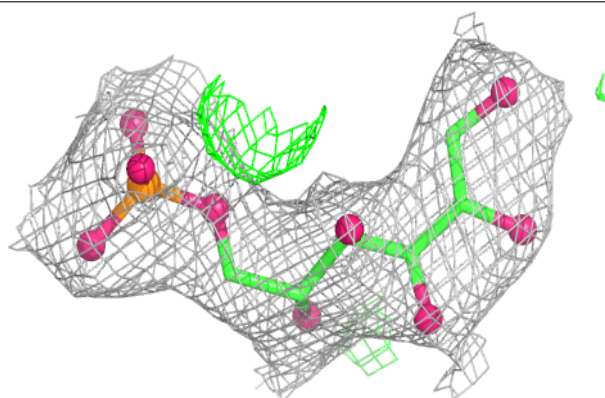


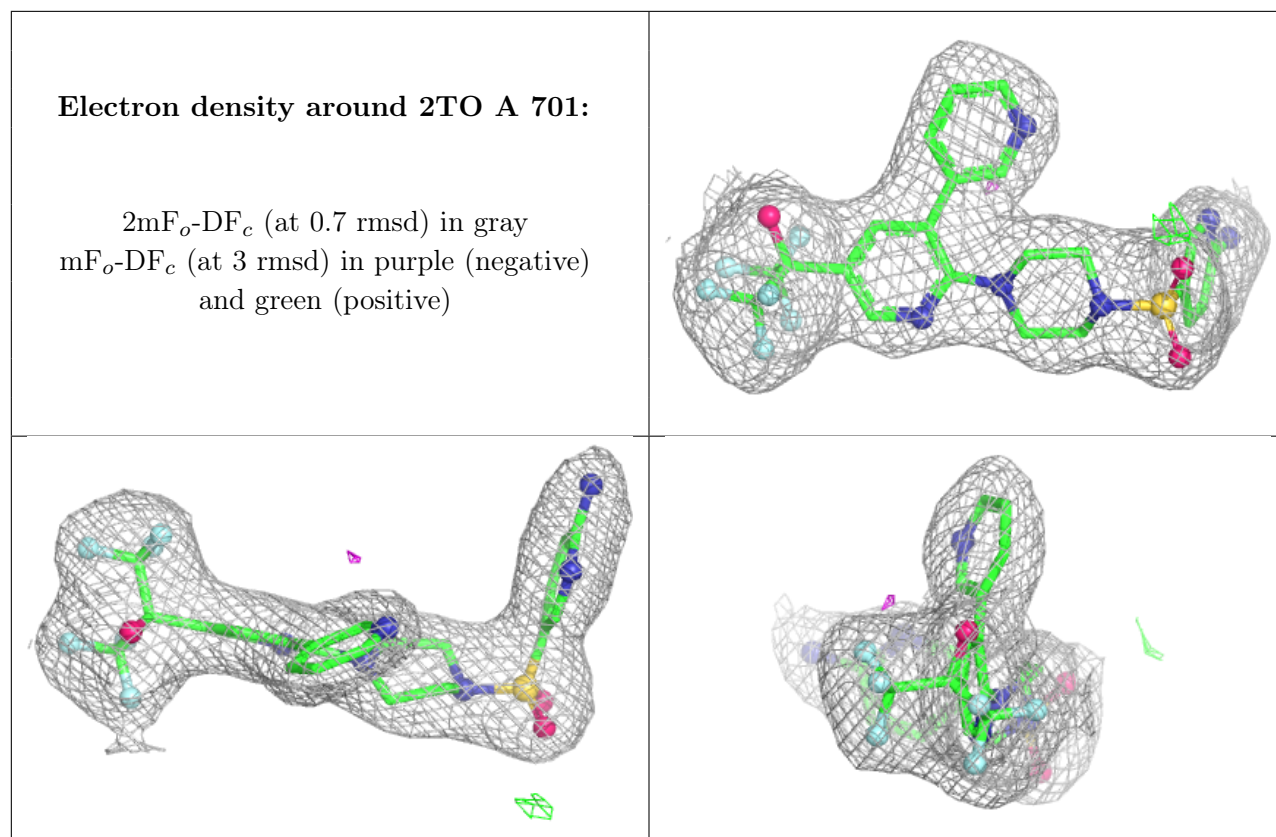
Electron density around S6P B 702:

$2mF_o-DF_c$ (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.