Full wwPDB X-ray Structure Validation Report (i)

Sep 12, 2023 – 01:02 PM EDT

PDB ID	:	4OP2
Title	:	GKRP bound to AMG-0471 and Sorbitol-6-Phosphate
Authors	:	Jordan, S.R.; Chmait, S.
Deposited on	:	2014-02-04
Resolution	:	2.24 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
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 2.24 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	Percentile Ranks	Value
Rfree		0.275
Clashscore		7
Ramachandran outliers		1.4%
Sidechain outliers		7.3%
RSRZ outliers		4.6%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution
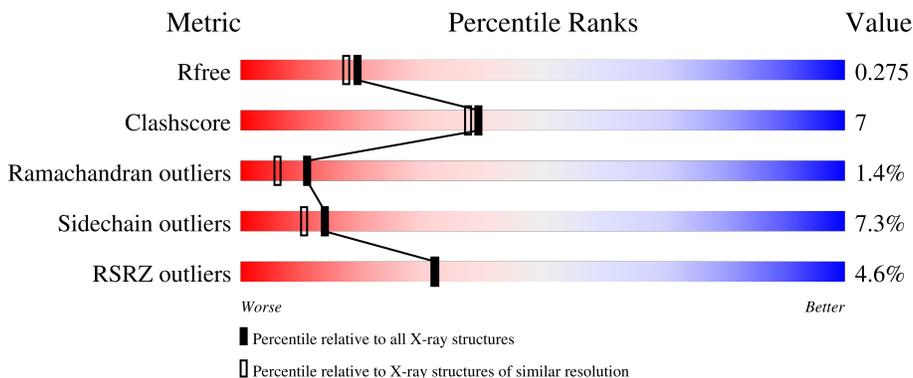
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	2391 (2.26-2.22)
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)
RSRZ outliers	127900	2353 (2.26-2.22)

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

Mol	Chain	Length	Quality of chain
1	A	638	5% 70% 18% •• 8%
1	B	638	4% 76% 13% • 8%

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	B	713	-	-	X	-
4	IOD	B	714	-	-	X	-

2 Entry composition ⓘ

There are 7 unique types of molecules in this entry. The entry contains 9391 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 4521	C 2882	N 774	O 841	S 24	0	0	0
1	B	590	Total 4554	C 2901	N 781	O 848	S 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-{4'-[(6-aminopyridin-3-yl)sulfonyl]biphenyl-4-yl}-1,1,1-trifluoropropan-2-ol (three-letter code: 2UX) (formula: $C_{20}H_{17}F_3N_2O_3S$).

2UX
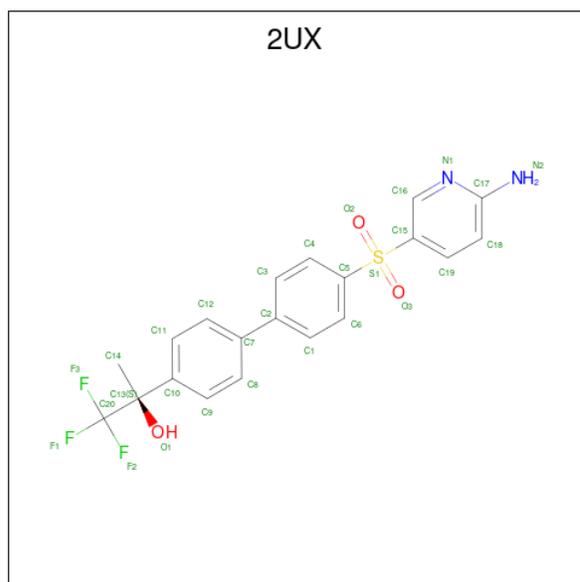
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	S	0	0
			29	20	3	2	3	1		
2	B	1	Total	C	F	N	O	S	0	0
			29	20	3	2	3	1		

- Molecule 3 is D-SORBITOL-6-PHOSPHATE (three-letter code: S6P) (formula: $C_6H_{15}O_9P$).
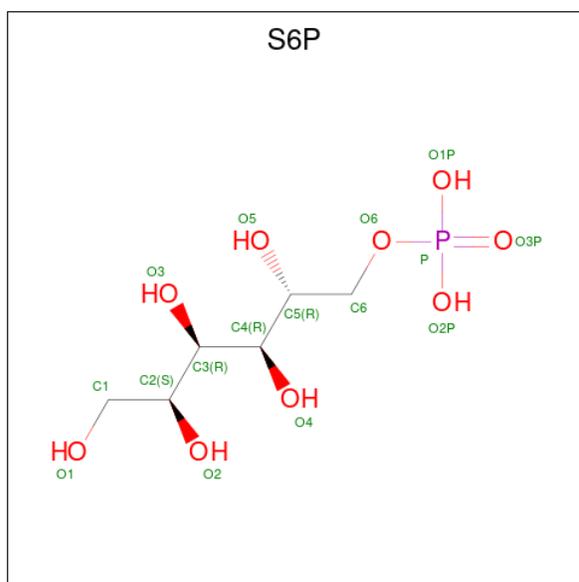
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total 16	C 6	O 9	P 1	0	0
3	B	1	Total 16	C 6	O 9	P 1	0	0

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	12	Total 12	I 12	0	0
4	B	14	Total 14	I 14	0	0

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).
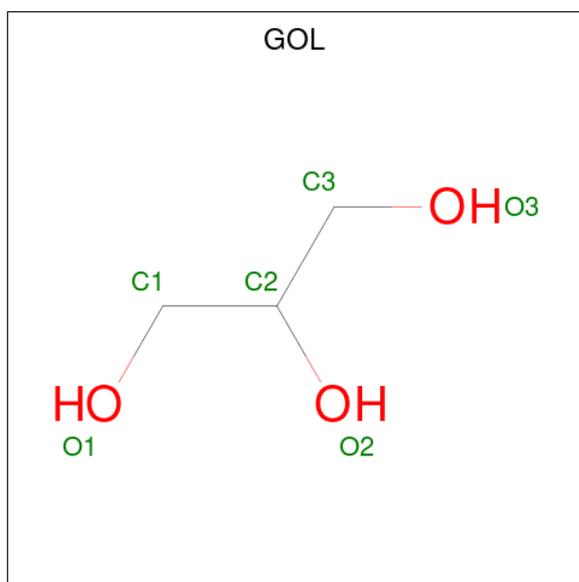
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total 6	C 3	O 3	0	0

• Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O_4S).
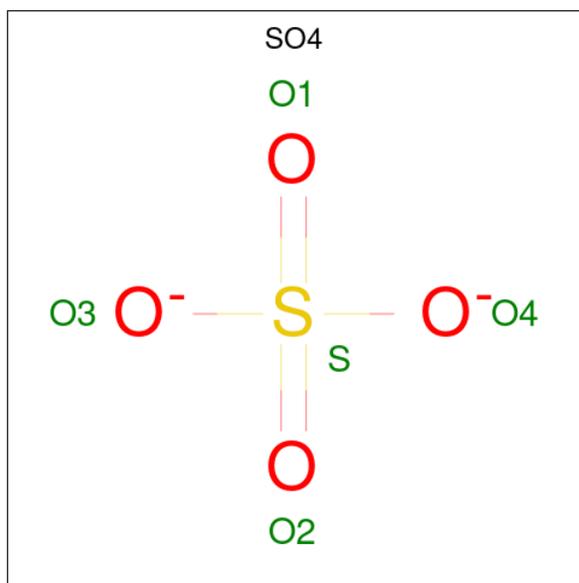
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total 5	O 4	S 1	0	0
6	B	1	Total 5	O 4	S 1	0	0
6	B	1	Total 5	O 4	S 1	0	0

• Molecule 7 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	73	Total O 73 73		0	0
7	B	106	Total O 106 106		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
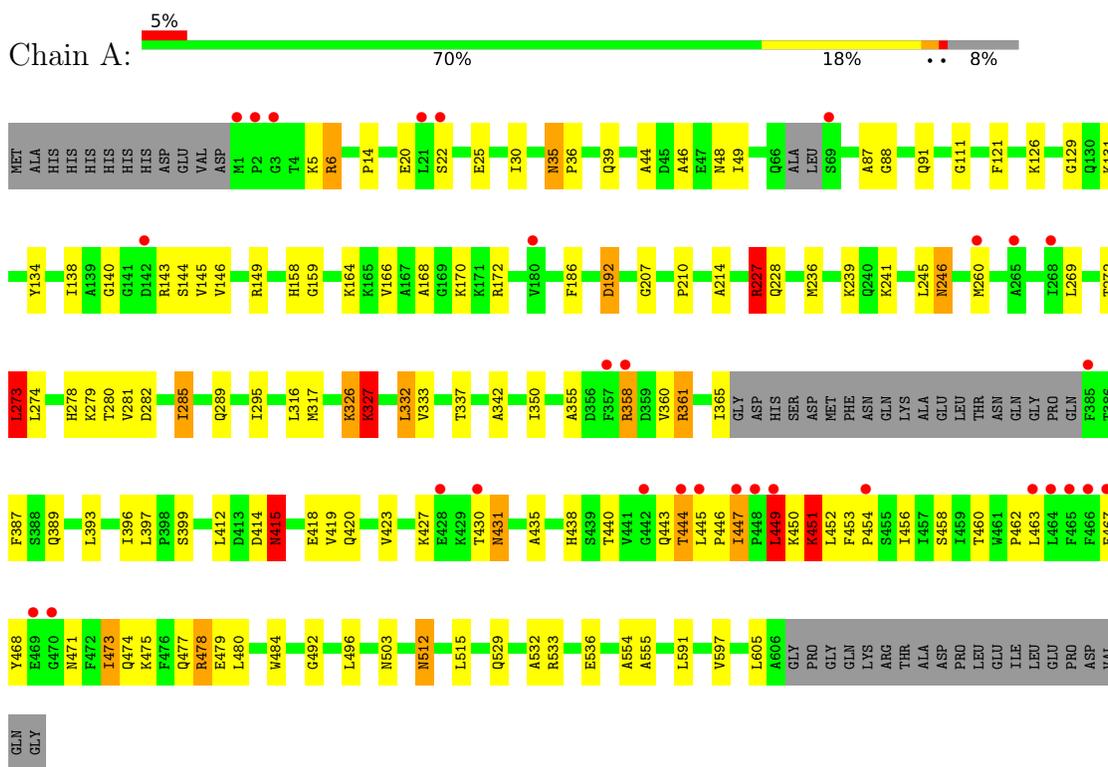
• Molecule 1: Glucokinase Regulatory Protein
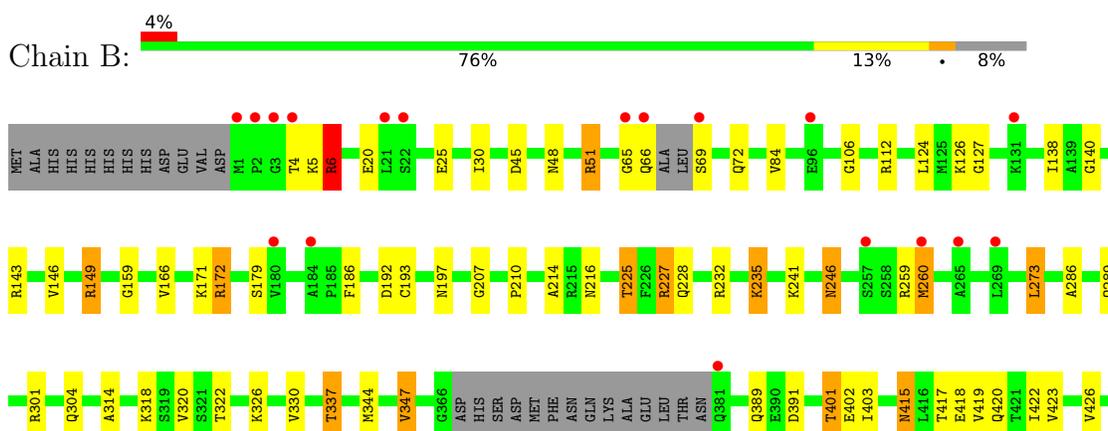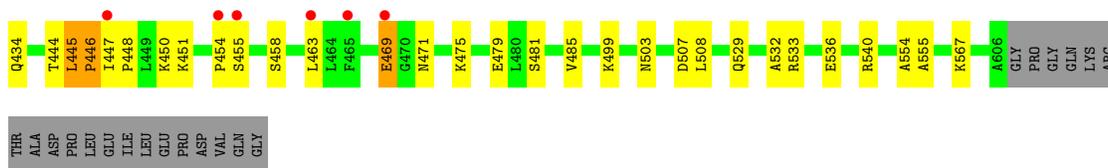
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α, β, γ	149.05Å 149.05Å 131.83Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	36.32 – 2.24 36.32 – 2.24	Depositor EDS
% Data completeness (in resolution range)	93.9 (36.32-2.24) 93.9 (36.32-2.24)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.44 (at 2.24Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.219 , 0.270 0.227 , 0.275	Depositor DCC
R_{free} test set	3786 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	39.9	Xtriage
Anisotropy	0.042	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 38.6	EDS
L-test for twinning[2]	$< |L| > = 0.52, < L^2 > = 0.36$	Xtriage
Estimated twinning fraction	0.022 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	9391	wwPDB-VP
Average B, all atoms (Å^2)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.64% of the height of the origin peak. No significant pseudotranslation is detected.*

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

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	0.79	0/4603	0.92	11/6228 (0.2%)
1	B	0.82	1/4637 (0.0%)	0.96	11/6274 (0.2%)
All	All	0.81	1/9240 (0.0%)	0.94	22/12502 (0.2%)

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	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	179	SER	CA-CB	5.16	1.60	1.52

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	259	ARG	NE-CZ-NH2	-17.20	111.70	120.30
1	B	259	ARG	NE-CZ-NH1	12.51	126.56	120.30
1	A	227	ARG	NE-CZ-NH1	9.66	125.13	120.30
1	A	478	ARG	NE-CZ-NH1	9.18	124.89	120.30
1	A	6	ARG	NE-CZ-NH1	8.67	124.64	120.30
1	B	6	ARG	NE-CZ-NH1	8.56	124.58	120.30
1	A	227	ARG	NE-CZ-NH2	-8.50	116.05	120.30
1	B	51	ARG	NE-CZ-NH1	6.83	123.71	120.30
1	A	361	ARG	NE-CZ-NH1	6.42	123.51	120.30
1	B	260	MET	CG-SD-CE	-6.39	89.98	100.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	478	ARG	NE-CZ-NH2	-6.11	117.25	120.30
1	A	273	LEU	CA-CB-CG	5.95	128.98	115.30
1	B	391	ASP	CB-CG-OD2	5.89	123.60	118.30
1	A	449	LEU	CA-CB-CG	5.75	128.54	115.30
1	A	358	ARG	NE-CZ-NH1	5.71	123.16	120.30
1	B	6	ARG	NE-CZ-NH2	-5.59	117.51	120.30
1	B	540	ARG	NE-CZ-NH1	5.40	123.00	120.30
1	B	507	ASP	CB-CG-OD1	5.35	123.12	118.30
1	A	192	ASP	CB-CG-OD1	5.21	122.98	118.30
1	A	260	MET	CG-SD-CE	-5.17	91.92	100.20
1	B	259	ARG	CG-CD-NE	-5.06	101.17	111.80
1	B	45	ASP	CB-CG-OD1	5.04	122.83	118.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	326	LYS	Peptide
1	A	451	LYS	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	81	0
1	B	4554	0	4647	56	0
2	A	29	0	17	0	0
2	B	29	0	17	1	0
3	A	16	0	13	0	0
3	B	16	0	13	0	0
4	A	12	0	0	2	0
4	B	14	0	0	8	0
5	B	6	0	8	0	0
6	B	15	0	0	0	0
7	A	73	0	0	1	0
7	B	106	0	0	2	0
All	All	9391	0	9333	137	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 (137) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:337:THR:HG21	1:A:479:GLU:OE2	1.65	0.96
1:B:216:ASN:OD1	1:B:225:THR:HG21	1.74	0.87
1:B:140:GLY:O	1:B:149:ARG:NH2	2.09	0.86
1:A:447:ILE:O	1:A:450:LYS:HB2	1.86	0.75
1:A:447:ILE:HG22	1:A:449:LEU:C	2.08	0.73
1:A:36:PRO:O	1:A:39:GLN:HG2	1.90	0.71
1:A:140:GLY:H	1:A:158:HIS:HE1	1.38	0.71
1:A:6:ARG:HD3	1:A:555:ALA:O	1.91	0.71
1:A:529:GLN:HE22	1:A:533:ARG:HH21	1.39	0.69
1:A:430:THR:O	1:A:431:ASN:ND2	2.24	0.68
1:A:419:VAL:O	1:A:423:VAL:HG23	1.93	0.67
1:B:447:ILE:HD12	1:B:448:PRO:HD3	1.76	0.66
1:B:337:THR:HG21	1:B:479:GLU:OE1	1.96	0.65
1:B:532:ALA:O	1:B:536:GLU:HG3	1.99	0.63
1:B:389:GLN:HE21	1:B:418:GLU:HG3	1.63	0.62
1:A:46:ALA:HA	1:A:317:MET:HE1	1.82	0.62
1:A:532:ALA:O	1:A:536:GLU:HG3	2.00	0.62
1:A:46:ALA:HA	1:A:317:MET:CE	2.30	0.61
1:A:474:GLN:HA	1:A:477:GLN:HE21	1.65	0.61
1:A:447:ILE:O	1:A:450:LYS:CB	2.49	0.60
1:B:420:GLN:HA	1:B:423:VAL:CG1	2.32	0.60
1:A:6:ARG:HD2	1:A:554:ALA:O	2.02	0.59
1:A:512:ASN:C	1:A:512:ASN:HD22	2.07	0.58
1:A:145:VAL:HG12	1:A:146:VAL:HG23	1.85	0.57
4:A:712:IOD:I	4:B:714:IOD:I	3.63	0.56
1:A:228:GLN:HE22	1:B:228:GLN:HE22	1.53	0.56
1:B:419:VAL:O	1:B:423:VAL:HG12	2.07	0.55
1:A:474:GLN:O	1:A:478:ARG:HD3	2.06	0.55
1:A:414:ASP:O	1:A:415:ASN:CB	2.55	0.54
1:A:412:LEU:HD23	1:A:412:LEU:N	2.22	0.54
1:B:246:ASN:HD22	1:B:246:ASN:N	2.06	0.54
1:B:6:ARG:HD3	1:B:555:ALA:O	2.07	0.54
1:A:246:ASN:N	1:A:246:ASN:HD22	2.05	0.54
1:B:214:ALA:O	1:B:227:ARG:HD3	2.09	0.53
1:A:332:LEU:HB3	1:A:342:ALA:HB1	1.90	0.53
1:A:140:GLY:H	1:A:158:HIS:CE1	2.24	0.53
1:A:529:GLN:NE2	1:A:533:ARG:HH21	2.06	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:447:ILE:HA	1:B:450:LYS:HB3	1.91	0.52
1:B:445:LEU:HG	4:B:713:IOD:I	2.80	0.52
1:A:512:ASN:ND2	1:A:515:LEU:H	2.08	0.52
1:A:159:GLY:HA2	1:A:186:PHE:CE1	2.44	0.52
1:B:320:VAL:HG13	1:B:330:VAL:HG21	1.91	0.52
1:B:469:GLU:HG2	4:B:716:IOD:I	2.80	0.51
1:B:232:ARG:HA	1:B:235:LYS:HD3	1.91	0.51
1:B:322:THR:HG22	1:B:326:LYS:HE2	1.92	0.51
1:A:317:MET:HE2	1:A:496:LEU:HD11	1.94	0.50
1:B:401:THR:CG2	1:B:403:ILE:HG12	2.41	0.50
1:B:529:GLN:HE22	1:B:533:ARG:HH21	1.60	0.50
1:B:447:ILE:CD1	1:B:448:PRO:HD3	2.42	0.50
1:B:458:SER:HB3	4:B:713:IOD:I	2.82	0.50
1:A:207:GLY:O	1:A:246:ASN:HA	2.12	0.49
1:A:246:ASN:HD22	1:A:246:ASN:H	1.60	0.49
1:A:327:LYS:CG	1:A:327:LYS:O	2.61	0.49
1:A:35:ASN:C	1:A:35:ASN:HD22	2.16	0.49
1:A:447:ILE:HG22	1:A:450:LYS:N	2.28	0.49
1:B:225:THR:H	1:B:228:GLN:HE21	1.61	0.49
1:B:286:ALA:HA	1:B:289:GLN:HE21	1.78	0.49
1:A:327:LYS:O	1:A:327:LYS:HG2	2.14	0.48
1:B:207:GLY:O	1:B:246:ASN:HA	2.13	0.48
1:A:30:ILE:HD12	1:A:210:PRO:HD3	1.96	0.48
1:A:387:PHE:CD2	1:A:396:ILE:HD11	2.49	0.47
1:B:314:ALA:O	1:B:318:LYS:HG3	2.13	0.47
1:A:440:THR:N	1:A:443:GLN:OE1	2.47	0.47
1:A:49:ILE:HB	1:A:317:MET:HE1	1.97	0.47
1:A:280:THR:HB	1:A:285:ILE:O	2.15	0.47
1:A:450:LYS:C	1:A:452:LEU:H	2.17	0.47
1:A:44:ALA:HB1	1:A:48:ASN:HB3	1.97	0.47
1:A:164:LYS:HD3	1:A:164:LYS:HA	1.74	0.47
1:A:228:GLN:HE22	1:B:228:GLN:NE2	2.12	0.47
1:B:420:GLN:HA	1:B:423:VAL:HG13	1.96	0.47
1:B:301:ARG:HG2	7:B:836:HOH:O	2.15	0.46
1:A:140:GLY:N	1:A:158:HIS:HE1	2.11	0.46
1:A:214:ALA:O	1:A:227:ARG:HD3	2.15	0.46
1:A:444:THR:O	1:A:446:PRO:HD3	2.14	0.46
1:A:126:LYS:O	1:A:129:GLY:N	2.38	0.46
1:B:48:ASN:ND2	1:B:51:ARG:HH21	2.14	0.46
1:A:146:VAL:CG1	1:A:146:VAL:O	2.63	0.46
1:A:591:LEU:HD11	1:A:597:VAL:HA	1.96	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:393:LEU:O	1:A:397:LEU:HB3	2.15	0.46
1:B:529:GLN:NE2	1:B:533:ARG:HH21	2.13	0.46
1:A:473:ILE:HD13	1:A:473:ILE:O	2.15	0.46
1:A:529:GLN:HE21	1:A:533:ARG:HE	1.63	0.45
1:B:246:ASN:HD22	1:B:246:ASN:H	1.64	0.45
1:A:435:ALA:HB2	1:A:453:PHE:CE1	2.52	0.45
1:A:438:HIS:CG	1:A:478:ARG:HG2	2.51	0.45
1:B:4:THR:HG23	4:B:712:IOD:I	2.87	0.45
1:A:146:VAL:O	1:A:146:VAL:HG12	2.16	0.45
1:A:111:GLY:HA3	1:A:138:ILE:HG13	1.99	0.45
1:A:350:ILE:HA	1:A:355:ALA:O	2.17	0.45
1:B:25:GLU:OE2	4:B:711:IOD:I	3.05	0.45
1:A:452:LEU:H	1:A:452:LEU:HD12	1.82	0.44
1:B:48:ASN:HD22	1:B:51:ARG:HH21	1.65	0.44
1:A:273:LEU:C	1:A:273:LEU:HD23	2.38	0.44
1:A:278:HIS:O	1:A:281:VAL:HG22	2.18	0.44
1:A:450:LYS:HD2	1:A:452:LEU:HD13	1.99	0.44
1:B:422:ILE:O	1:B:426:VAL:HG23	2.18	0.44
1:B:508:LEU:C	1:B:508:LEU:HD12	2.38	0.44
1:A:396:ILE:O	1:A:399:SER:OG	2.34	0.44
1:A:245:LEU:HD13	1:A:269:LEU:HD21	1.99	0.43
1:B:451:LYS:HD3	1:B:451:LYS:HA	1.88	0.43
1:B:529:GLN:HE21	1:B:533:ARG:HE	1.65	0.43
1:A:480:LEU:HD21	1:A:484:TRP:CH2	2.52	0.43
1:B:481:SER:O	1:B:485:VAL:HG23	2.18	0.43
1:B:193:CYS:HA	4:B:714:IOD:I	2.89	0.43
1:A:121:PHE:HB3	1:A:134:TYR:CE1	2.53	0.43
1:A:144:SER:OG	1:A:149:ARG:NH1	2.51	0.43
1:A:449:LEU:O	1:A:449:LEU:HG	2.18	0.43
1:A:475:LYS:HE2	1:A:479:GLU:OE2	2.19	0.43
1:A:317:MET:SD	1:A:492:GLY:HA3	2.58	0.43
1:B:445:LEU:O	1:B:446:PRO:C	2.57	0.43
1:A:91:GLN:NE2	1:A:280:THR:OG1	2.52	0.42
1:A:14:PRO:HB3	1:A:22:SER:HB3	2.02	0.42
1:B:124:LEU:C	1:B:124:LEU:HD23	2.40	0.42
1:A:317:MET:CE	1:A:496:LEU:HD11	2.49	0.42
1:A:389:GLN:NE2	1:A:418:GLU:HG3	2.35	0.42
1:A:445:LEU:HD11	7:A:872:HOH:O	2.19	0.42
1:B:5:LYS:HB2	4:B:710:IOD:I	2.90	0.42
1:B:273:LEU:C	1:B:273:LEU:HD23	2.40	0.42
1:A:274:LEU:HD23	1:A:274:LEU:HA	1.92	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:65:GLY:O	1:B:66:GLN:HG2	2.20	0.41
1:B:475:LYS:HE2	1:B:479:GLU:OE1	2.20	0.41
1:B:567:LYS:NZ	7:B:872:HOH:O	2.53	0.41
1:B:159:GLY:HA2	1:B:186:PHE:CE1	2.56	0.41
1:A:46:ALA:HA	1:A:317:MET:HE2	2.01	0.41
1:A:236:MET:HE3	1:A:241:LYS:HB2	2.03	0.41
1:A:468:TYR:HB2	4:A:703:IOD:I	2.91	0.41
1:B:146:VAL:O	1:B:347:VAL:HG21	2.21	0.41
1:A:272:THR:HA	1:A:295:ILE:HG21	2.01	0.41
1:B:6:ARG:HD2	1:B:554:ALA:O	2.21	0.41
1:A:87:ALA:O	1:A:88:GLY:C	2.59	0.40
1:A:333:VAL:HG13	1:A:365:ILE:HD11	2.03	0.40
1:B:112:ARG:HD3	1:B:344:MET:HG2	2.02	0.40
1:B:445:LEU:HA	1:B:446:PRO:HD2	2.01	0.40
2:B:701:2UX:H13	2:B:701:2UX:F2	2.10	0.40
1:B:106:GLY:O	1:B:138:ILE:HA	2.20	0.40
1:B:172:ARG:HD2	1:B:172:ARG:HA	1.76	0.40
1:B:30:ILE:HD12	1:B:210:PRO:HD3	2.03	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%)	541 (93%)	27 (5%)	11 (2%)	8	3
1	B	584/638 (92%)	563 (96%)	16 (3%)	5 (1%)	17	13
All	All	1163/1276 (91%)	1104 (95%)	43 (4%)	16 (1%)	11	6

All (16) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	415	ASN
1	A	451	LYS
1	A	456	ILE
1	B	415	ASN
1	A	326	LYS
1	A	454	PRO
1	A	168	ALA
1	A	327	LYS
1	B	454	PRO
1	B	127	GLY
1	B	260	MET
1	B	446	PRO
1	A	447	ILE
1	A	449	LEU
1	A	462	PRO
1	A	360	VAL

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%)	460 (92%)	38 (8%)	13	9
1	B	501/542 (92%)	466 (93%)	35 (7%)	15	12
All	All	999/1084 (92%)	926 (93%)	73 (7%)	14	10

All (73) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	LYS
1	A	20	GLU
1	A	25	GLU
1	A	35	ASN
1	A	131	LYS
1	A	143	ARG
1	A	166	VAL
1	A	170	LYS

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Mol	Chain	Res	Type
1	A	172	ARG
1	A	192	ASP
1	A	227	ARG
1	A	239	LYS
1	A	246	ASN
1	A	273	LEU
1	A	279	LYS
1	A	282	ASP
1	A	285	ILE
1	A	289	GLN
1	A	316	LEU
1	A	327	LYS
1	A	332	LEU
1	A	358	ARG
1	A	361	ARG
1	A	415	ASN
1	A	420	GLN
1	A	427	LYS
1	A	431	ASN
1	A	444	THR
1	A	451	LYS
1	A	458	SER
1	A	460	THR
1	A	463	LEU
1	A	467	GLU
1	A	471	ASN
1	A	473	ILE
1	A	503	ASN
1	A	512	ASN
1	A	605	LEU
1	B	6	ARG
1	B	20	GLU
1	B	69	SER
1	B	72	GLN
1	B	84	VAL
1	B	126	LYS
1	B	143	ARG
1	B	149	ARG
1	B	166	VAL
1	B	171	LYS
1	B	172	ARG
1	B	192	ASP

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Mol	Chain	Res	Type
1	B	197	ASN
1	B	225	THR
1	B	227	ARG
1	B	235	LYS
1	B	241	LYS
1	B	246	ASN
1	B	273	LEU
1	B	304	GLN
1	B	337	THR
1	B	347	VAL
1	B	401	THR
1	B	402	GLU
1	B	415	ASN
1	B	417	THR
1	B	434	GLN
1	B	444	THR
1	B	445	LEU
1	B	455	SER
1	B	463	LEU
1	B	469	GLU
1	B	471	ASN
1	B	499	LYS
1	B	503	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (33) 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	130	GLN
1	A	158	HIS
1	A	190	GLN
1	A	196	ASN
1	A	246	ASN
1	A	309	GLN
1	A	415	ASN
1	A	420	GLN
1	A	471	ASN
1	A	477	GLN
1	A	503	ASN

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Mol	Chain	Res	Type
1	A	512	ASN
1	A	529	GLN
1	B	9	HIS
1	B	39	GLN
1	B	48	ASN
1	B	55	GLN
1	B	196	ASN
1	B	197	ASN
1	B	228	GLN
1	B	246	ASN
1	B	289	GLN
1	B	309	GLN
1	B	384	GLN
1	B	389	GLN
1	B	431	ASN
1	B	471	ASN
1	B	503	ASN
1	B	529	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 34 ligands modelled in this entry, 26 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	0.39	0	6,6,6	0.42	0
6	SO4	B	720	-	4,4,4	0.29	0	6,6,6	0.71	0
3	S6P	A	702	-	15,15,15	1.21	1 (6%)	21,21,21	1.77	5 (23%)
6	SO4	B	718	-	4,4,4	0.51	0	6,6,6	0.31	0
2	2UX	B	701	-	31,31,31	1.94	5 (16%)	41,48,48	1.63	8 (19%)
2	2UX	A	701	-	31,31,31	1.48	3 (9%)	41,48,48	1.20	3 (7%)
5	GOL	B	717	-	5,5,5	0.66	0	5,5,5	0.87	0
3	S6P	B	702	-	15,15,15	1.51	3 (20%)	21,21,21	1.35	3 (14%)

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	2UX	B	701	-	-	4/31/31/31	0/3/3/3
2	2UX	A	701	-	-	4/31/31/31	0/3/3/3
5	GOL	B	717	-	-	2/4/4/4	-
3	S6P	B	702	-	-	1/20/20/20	-

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	701	2UX	C5-S1	-7.20	1.65	1.77
2	A	701	2UX	C5-S1	-5.70	1.68	1.77
2	B	701	2UX	O2-S1	4.10	1.51	1.44
3	B	702	S6P	P-O3P	3.29	1.61	1.50
3	B	702	S6P	C2-C3	-3.28	1.47	1.53
2	A	701	2UX	O2-S1	3.08	1.49	1.44
2	B	701	2UX	C7-C2	-2.99	1.41	1.49
3	A	702	S6P	C2-C3	-2.54	1.48	1.53
2	A	701	2UX	C7-C2	-2.41	1.43	1.49
2	B	701	2UX	C4-C5	-2.40	1.35	1.38
3	B	702	S6P	P-O1P	-2.09	1.46	1.54
2	B	701	2UX	C14-C13	2.08	1.58	1.52

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	701	2UX	O3-S1-C5	5.33	113.98	107.97
2	A	701	2UX	O1-C13-C20	-4.42	99.64	106.18
3	A	702	S6P	O1-C1-C2	-3.91	102.54	111.07
3	A	702	S6P	O6-P-O3P	3.76	117.02	106.47
2	B	701	2UX	C1-C6-C5	3.58	123.16	119.45
3	B	702	S6P	O2P-P-O6	3.51	116.06	106.73
2	B	701	2UX	C4-C5-S1	3.42	123.87	119.52
2	B	701	2UX	F3-C20-F2	2.97	116.60	107.53
3	A	702	S6P	C5-C4-C3	-2.91	107.91	112.47
3	B	702	S6P	O1-C1-C2	-2.76	105.06	111.07
2	B	701	2UX	O2-S1-C15	-2.74	104.89	107.97
2	B	701	2UX	O1-C13-C14	2.51	114.63	108.47
2	A	701	2UX	O1-C13-C14	2.37	114.29	108.47
3	B	702	S6P	C5-C4-C3	-2.31	108.85	112.47
2	B	701	2UX	C12-C7-C2	2.29	125.32	121.36
3	A	702	S6P	O2P-P-O3P	-2.23	101.95	110.68
2	A	701	2UX	C18-C17-N2	-2.19	117.33	121.14
3	A	702	S6P	O5-C5-C4	-2.16	103.86	109.10
2	B	701	2UX	C6-C5-S1	-2.13	116.80	119.52

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	717	GOL	O1-C1-C2-C3
5	B	717	GOL	O1-C1-C2-O2
2	A	701	2UX	C9-C10-C13-C20
2	B	701	2UX	C11-C10-C13-C20
2	B	701	2UX	C9-C10-C13-C20
2	A	701	2UX	C9-C10-C13-C14
2	B	701	2UX	C9-C10-C13-C14
2	A	701	2UX	C11-C10-C13-C20
2	A	701	2UX	C11-C10-C13-C14
2	B	701	2UX	C11-C10-C13-C14
3	B	702	S6P	O1-C1-C2-O2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	701	2UX	1	0

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

Ligand S6P A 702

Bond lengths

Bond angles

Torsions

Rings

Ligand 2UX B 701

Bond lengths

Bond angles

Torsions

Rings

Ligand 2UX A 701

Bond lengths

Bond angles

Torsions

Rings

Ligand S6P B 702

Bond lengths

Bond angles

Torsions

Rings
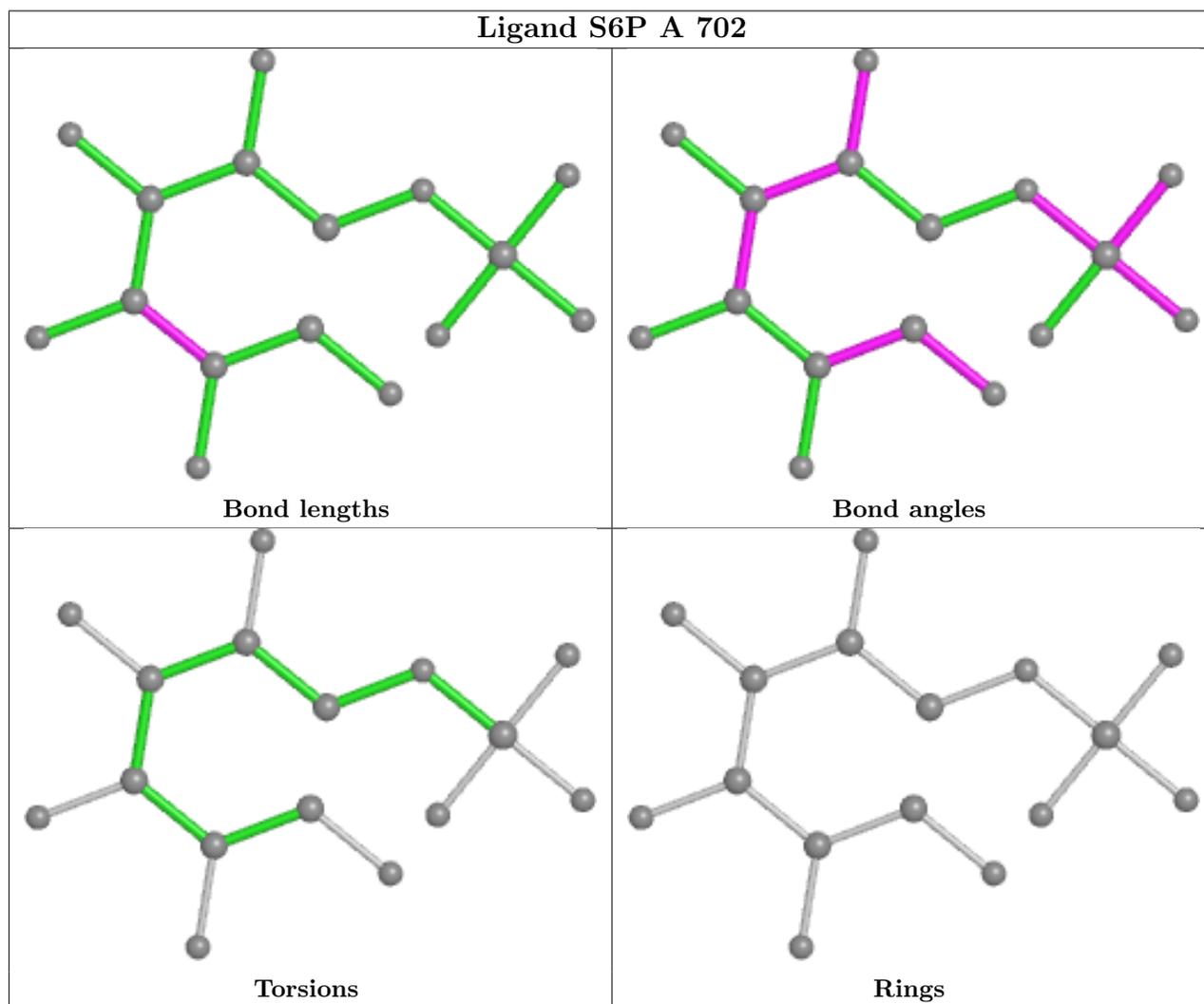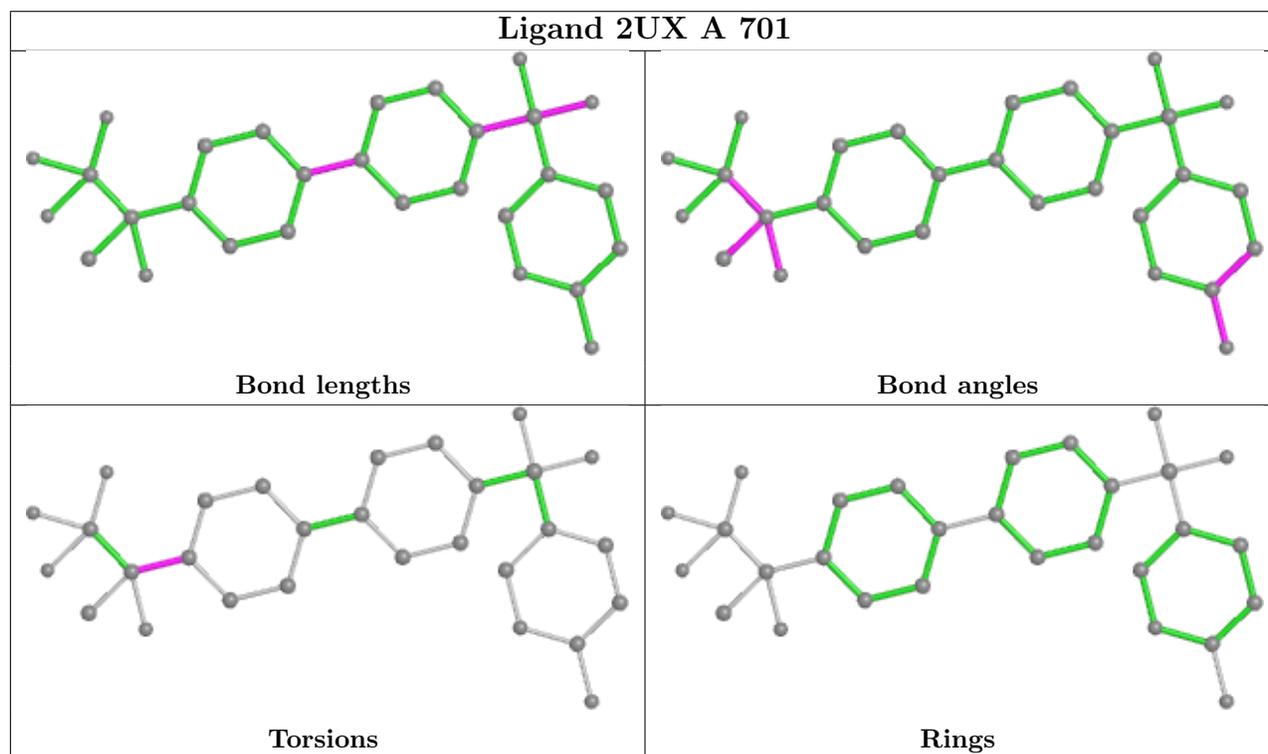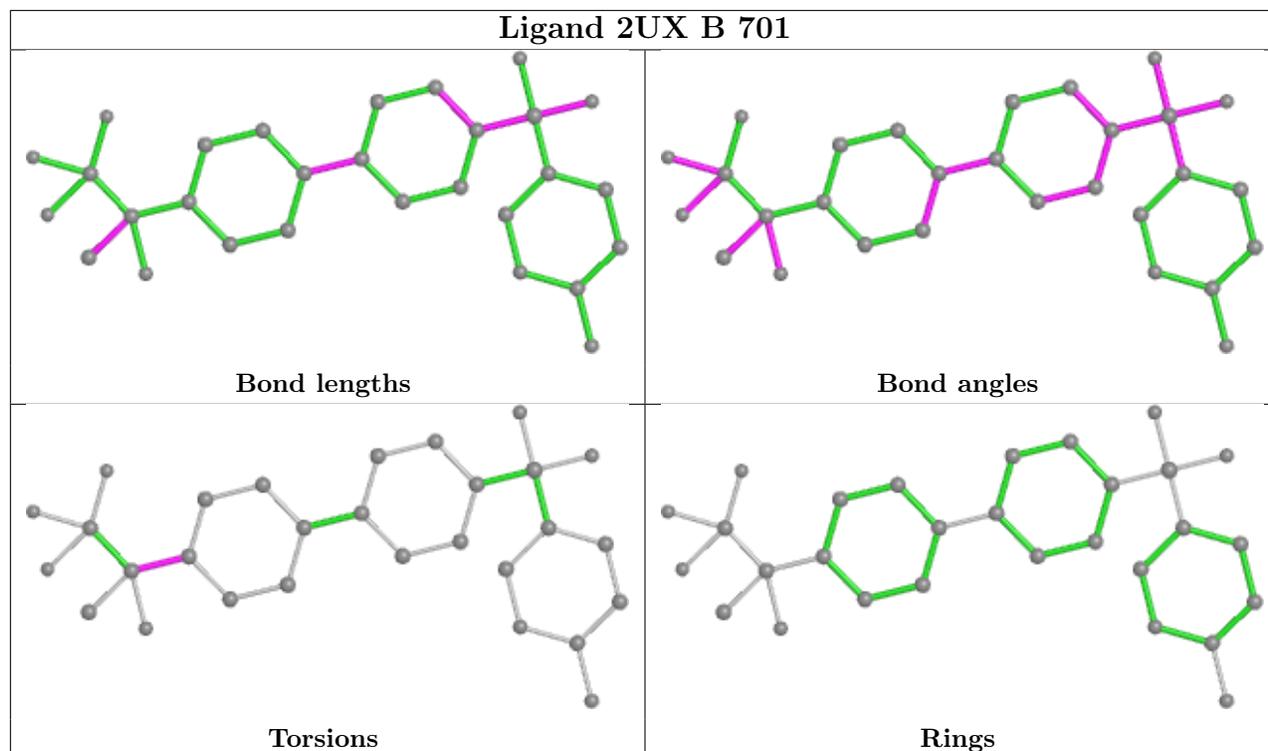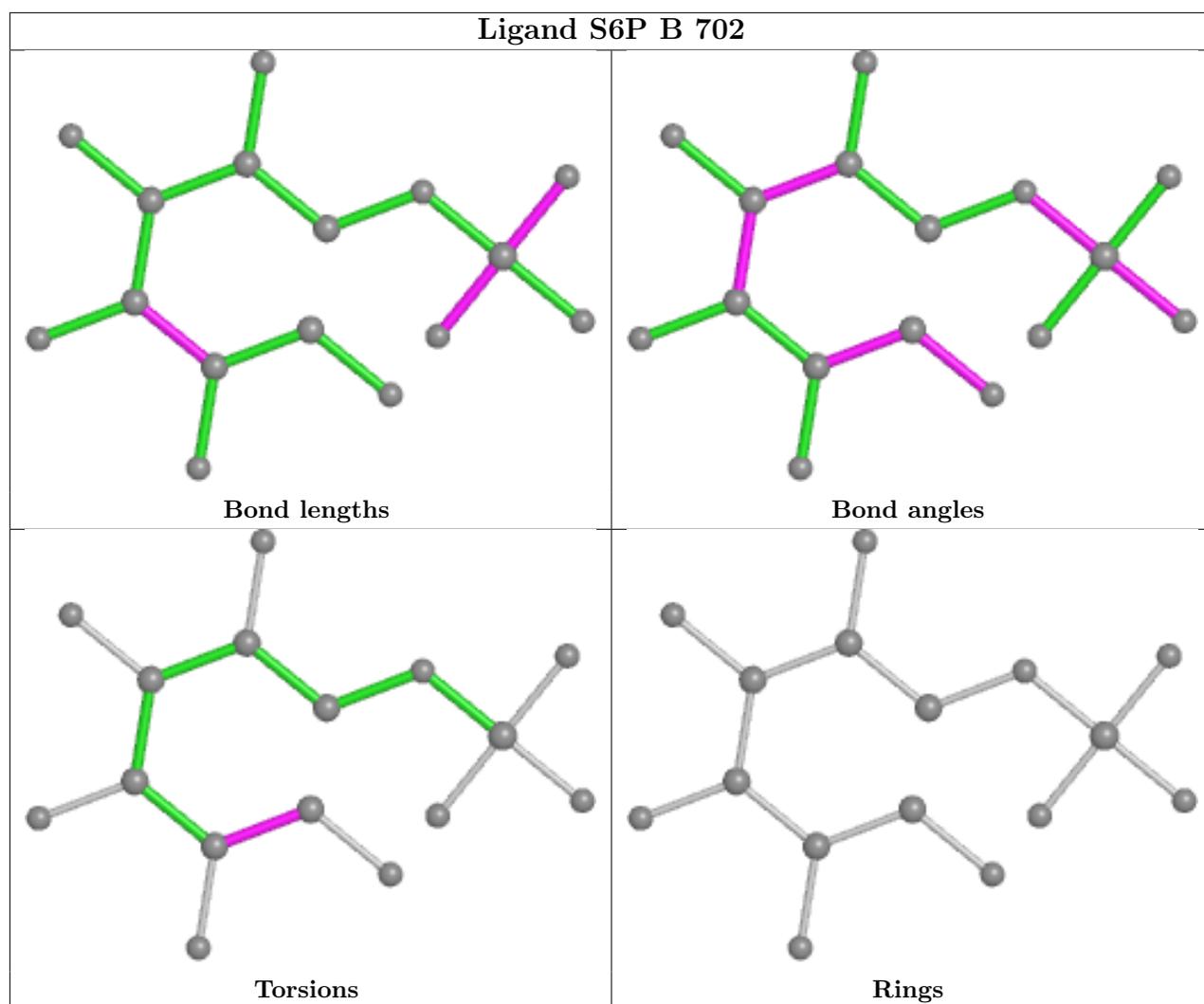
5.7 Other polymers ⓘ

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 ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å²)	Q<0.9
1	A	585/638 (91%)	0.13	30 (5%)	28	27	27, 47, 82, 116	0
1	B	590/638 (92%)	-0.05	24 (4%)	37	37	24, 41, 68, 108	0
All	All	1175/1276 (92%)	0.04	54 (4%)	32	32	24, 44, 78, 116	0

All (54) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	449	LEU	9.7
1	A	21	LEU	7.6
1	A	465	PHE	6.9
1	B	1	MET	6.2
1	B	21	LEU	5.7
1	A	466	PHE	4.4
1	A	469	GLU	3.9
1	B	66	GLN	3.8
1	B	2	PRO	3.8
1	B	381	GLN	3.6
1	A	1	MET	3.5
1	B	4	THR	3.4
1	B	65	GLY	3.3
1	A	22	SER	3.1
1	A	69	SER	3.1
1	A	357	PHE	3.0
1	A	447	ILE	3.0
1	A	442	GLY	3.0
1	A	428	GLU	3.0
1	B	69	SER	2.9
1	B	465	PHE	2.9
1	A	448	PRO	2.8
1	A	268	ILE	2.7
1	A	454	PRO	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	470	GLY	2.7
1	B	180	VAL	2.6
1	B	131	LYS	2.6
1	A	180	VAL	2.6
1	B	22	SER	2.5
1	A	430	THR	2.5
1	B	96	GLU	2.5
1	A	2	PRO	2.5
1	A	445	LEU	2.5
1	B	454	PRO	2.5
1	A	260	MET	2.4
1	A	464	LEU	2.3
1	B	3	GLY	2.3
1	B	265	ALA	2.3
1	B	260	MET	2.2
1	B	463	LEU	2.2
1	A	358	ARG	2.2
1	B	455	SER	2.2
1	B	447	ILE	2.1
1	A	463	LEU	2.1
1	B	269	LEU	2.1
1	A	142	ASP	2.1
1	A	444	THR	2.1
1	A	467	GLU	2.1
1	A	3	GLY	2.0
1	B	184	ALA	2.0
1	B	469	GLU	2.0
1	A	265	ALA	2.0
1	B	257	SER	2.0
1	A	385	PHE	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 monosaccharides 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
5	GOL	B	717	6/6	0.81	0.12	37,48,54,56	0
6	SO4	B	718	5/5	0.81	0.18	67,77,84,99	0
4	IOD	B	712	1/1	0.85	0.20	100,100,100,100	1
4	IOD	A	711	1/1	0.86	0.13	100,100,100,100	1
6	SO4	B	719	5/5	0.90	0.40	73,86,98,102	0
4	IOD	B	715	1/1	0.91	0.06	84,84,84,84	1
4	IOD	A	712	1/1	0.92	0.05	73,73,73,73	1
4	IOD	B	714	1/1	0.92	0.05	73,73,73,73	1
4	IOD	B	713	1/1	0.93	0.05	73,73,73,73	1
4	IOD	B	703	1/1	0.93	0.08	53,53,53,53	0
4	IOD	A	703	1/1	0.93	0.05	64,64,64,64	0
6	SO4	B	720	5/5	0.93	0.14	36,38,46,52	5
4	IOD	A	706	1/1	0.94	0.04	78,78,78,78	0
2	2UX	B	701	29/29	0.94	0.15	25,30,50,60	0
4	IOD	A	708	1/1	0.95	0.04	71,71,71,71	1
4	IOD	B	709	1/1	0.95	0.07	72,72,72,72	1
4	IOD	A	714	1/1	0.95	0.08	63,63,63,63	1
4	IOD	B	716	1/1	0.95	0.18	84,84,84,84	1
4	IOD	A	713	1/1	0.96	0.04	60,60,60,60	1
2	2UX	A	701	29/29	0.96	0.12	29,33,58,68	0
4	IOD	B	710	1/1	0.96	0.15	94,94,94,94	1
4	IOD	B	708	1/1	0.97	0.06	49,49,49,49	1
4	IOD	A	707	1/1	0.97	0.07	54,54,54,54	1
4	IOD	B	707	1/1	0.98	0.04	63,63,63,63	0
4	IOD	A	704	1/1	0.98	0.05	58,58,58,58	0
4	IOD	A	705	1/1	0.98	0.08	44,44,44,44	1
4	IOD	A	709	1/1	0.98	0.12	92,92,92,92	1
4	IOD	B	711	1/1	0.98	0.08	47,47,47,47	1
3	S6P	B	702	16/16	0.98	0.23	22,25,28,28	0
4	IOD	B	706	1/1	0.98	0.07	52,52,52,52	1
4	IOD	B	705	1/1	0.99	0.07	43,43,43,43	1
4	IOD	A	710	1/1	0.99	0.08	45,45,45,45	1
3	S6P	A	702	16/16	0.99	0.16	26,29,34,35	0
4	IOD	B	704	1/1	0.99	0.05	48,48,48,48	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 2UX B 701:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
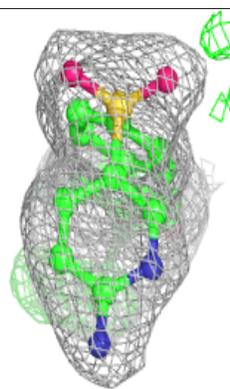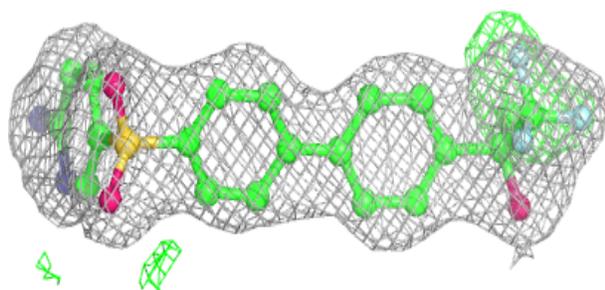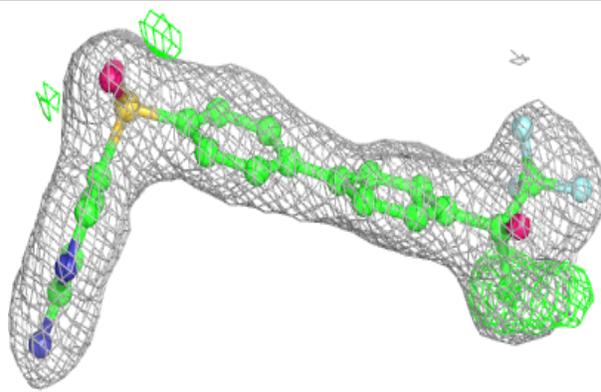
Electron density around 2UX A 701:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
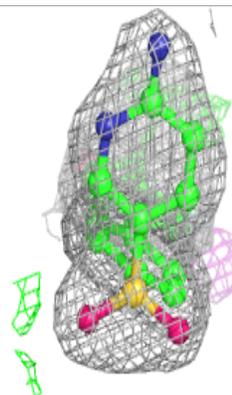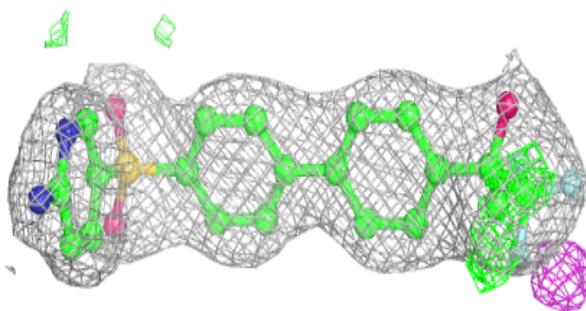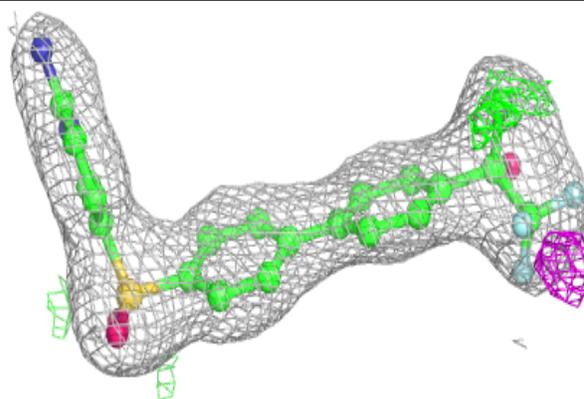
Electron density around S6P B 702:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
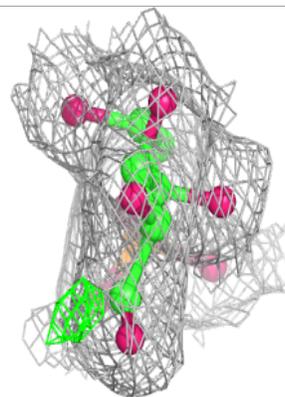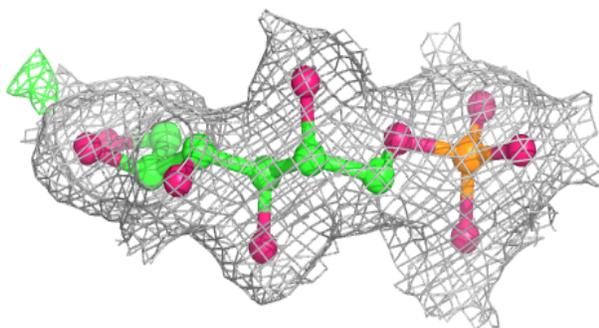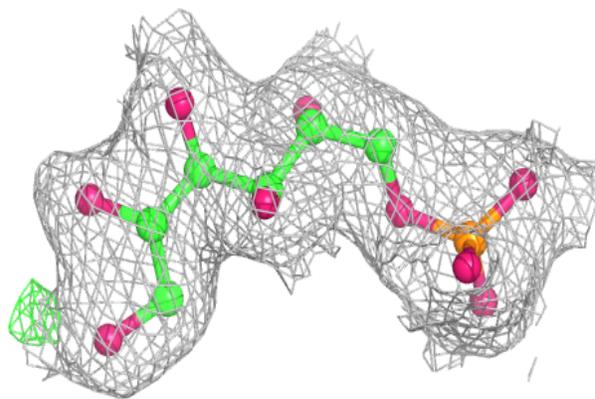
Electron density around S6P A 702:

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 ⓘ

There are no such residues in this entry.