Full wwPDB X-ray Structure Validation Report (i)

Feb 5, 2024 – 09:06 AM EST

PDB ID	:	1XTB
Title	:	Crystal Structure of Rabbit Phosphoglucose Isomerase Complexed with Sorbitol-6-Phosphate
Authors	:	Lee, J.H.; Jeffery, C.J.
Deposited on	:	2004-10-21
Resolution	:	2.00 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 (i) 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 (i)) were used in the production of this report:

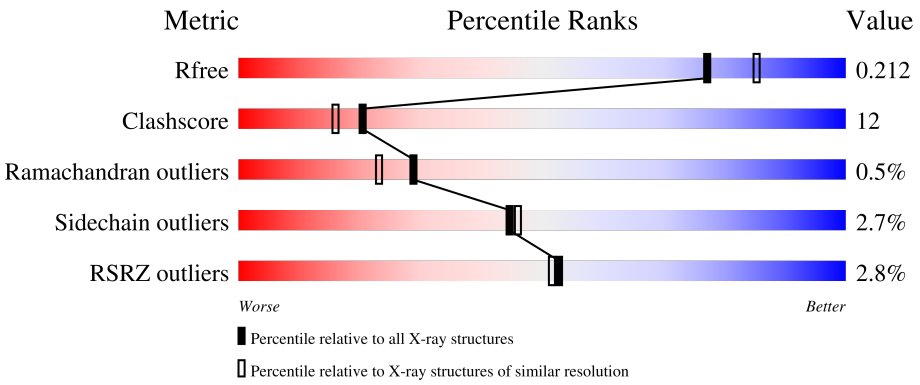
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	558	4% 76% 22% •
1	B	558	2% 77% 21% •

2 Entry composition (i)

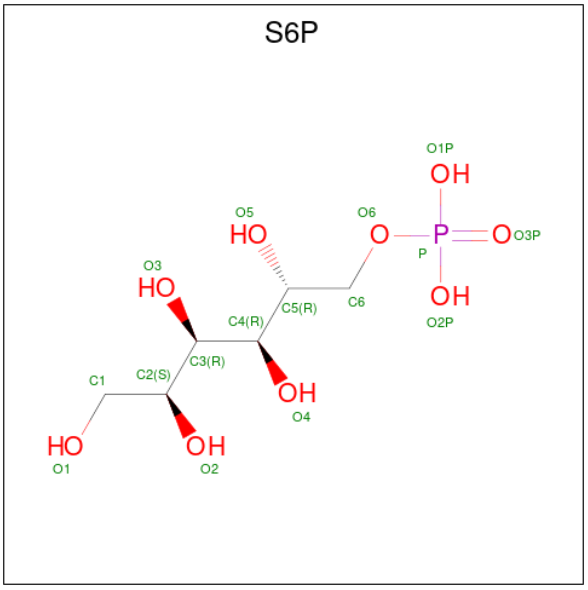
There are 3 unique types of molecules in this entry. The entry contains 9321 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 phosphoglucose isomerase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	556	4407	2814	767	807	19	0	0	0
1	B	556	4407	2814	767	807	19	0	0	0

- Molecule 2 is D-SORBITOL-6-PHOSPHATE (three-letter code: S6P) (formula: $C_6H_{15}O_9P$).



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

- Molecule 3 is water.

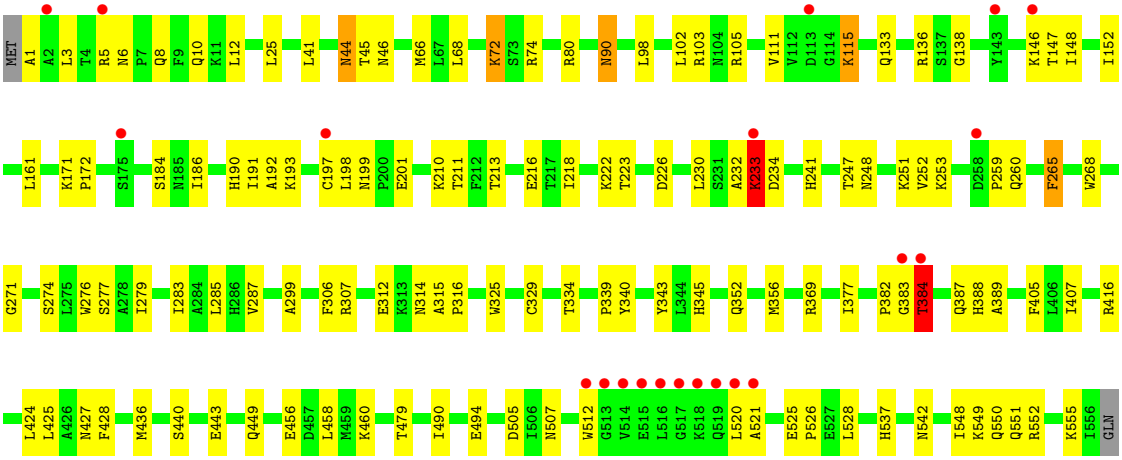
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	244	244	244	0	0
			Total	O		
3	B	231	231	231	0	0

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.

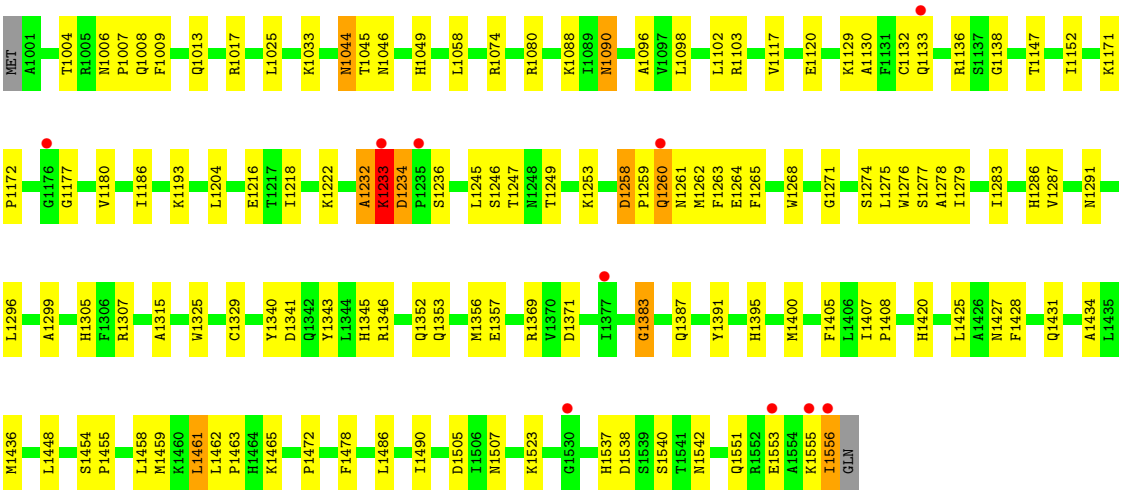
• Molecule 1: phosphoglucose isomerase

Chain A:



• Molecule 1: phosphoglucose isomerase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	82.77Å 115.19Å 271.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	12.00 – 2.00 48.60 – 2.02	Depositor EDS
% Data completeness (in resolution range)	(Not available) (12.00-2.00) 97.3 (48.60-2.02)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$< I/\sigma(I) >$ [1]	4.09 (at 2.01Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.199 , 0.219 0.192 , 0.212	Depositor DCC
R_{free} test set	8518 reflections (10.06%)	wwPDB-VP
Wilson B-factor (Å^2)	22.9	Xtriage
Anisotropy	0.184	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 55.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	9321	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.89% of the height of the origin peak. No significant pseudotranslation is detected.*

[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.36	0/4516	0.58	0/6116
1	B	0.41	0/4516	0.64	3/6116 (0.0%)
All	All	0.38	0/9032	0.61	3/12232 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	1262	MET	CG-SD-CE	6.17	110.08	100.20
1	B	1459	MET	CG-SD-CE	5.71	109.33	100.20
1	B	1383	GLY	O-C-N	-5.29	114.24	122.70

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	4407	0	4374	114	0
1	B	4407	0	4371	117	0
2	A	16	0	12	2	0
2	B	16	0	12	1	0
3	A	244	0	0	3	0
3	B	231	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	9321	0	8769	219	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 12.

All (219) 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:1232:ALA:O	1:B:1233:LYS:HB2	1.41	1.07
1:B:1556:ILE:HG23	1:B:1556:ILE:O	1.58	0.99
1:A:456:GLU:CD	1:A:460:LYS:HD2	1.86	0.95
1:A:456:GLU:OE1	1:A:460:LYS:HD2	1.70	0.92
1:A:456:GLU:OE2	1:A:460:LYS:HD2	1.72	0.89
1:A:211:THR:O	1:A:251:LYS:HE3	1.73	0.88
1:A:537:HIS:H	1:A:542:ASN:HD21	1.20	0.88
1:A:383:GLY:O	1:A:384:THR:HG23	1.73	0.88
1:A:550:GLN:HE21	1:A:551:GLN:HE21	1.24	0.85
1:A:152:ILE:HD11	1:A:198:LEU:HD13	1.56	0.85
1:A:193:LYS:HD3	1:B:1343:TYR:OH	1.79	0.83
1:A:384:THR:CG2	1:A:424:LEU:CD1	2.59	0.80
1:B:1136:ARG:HH21	1:B:1177:GLY:CA	1.96	0.79
1:B:1232:ALA:O	1:B:1233:LYS:CB	2.26	0.78
1:B:1537:HIS:H	1:B:1542:ASN:HD21	1.31	0.77
1:B:1556:ILE:O	1:B:1556:ILE:CG2	2.27	0.77
1:A:384:THR:HG21	1:A:424:LEU:CD1	2.15	0.77
1:B:1006:ASN:HD21	1:B:1008:GLN:HB2	1.48	0.77
1:B:1129:LYS:O	1:B:1133:GLN:HG3	1.87	0.74
1:B:1305:HIS:HE1	1:B:1315:ALA:H	1.33	0.74
1:A:384:THR:CG2	1:A:424:LEU:HD12	2.17	0.73
1:B:1249:THR:HG22	1:B:1253:LYS:HE3	1.71	0.72
1:B:1130:ALA:HA	1:B:1133:GLN:HE21	1.54	0.72
1:B:1462:LEU:HB3	1:B:1463:PRO:HD3	1.72	0.71
1:A:383:GLY:C	1:A:384:THR:HG23	2.11	0.70
1:B:1408:PRO:HB3	1:B:1478:PHE:CE1	2.25	0.70
1:A:440:SER:OG	1:A:443:GLU:HG3	1.90	0.70
1:B:1461:LEU:HD22	1:B:1465:LYS:HE2	1.72	0.69
1:A:315:ALA:HB3	1:A:316:PRO:HD3	1.75	0.68
1:A:211:THR:O	1:A:251:LYS:CE	2.41	0.68
1:A:41:LEU:HD12	1:A:41:LEU:O	1.93	0.68
1:B:1260:GLN:O	1:B:1260:GLN:HG2	1.93	0.68
1:B:1258:ASP:OD1	1:B:1259:PRO:O	2.13	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:456:GLU:OE2	1:A:460:LYS:CD	2.43	0.66
1:B:1006:ASN:HD22	1:B:1009:PHE:H	1.41	0.66
1:B:1448:LEU:HD21	1:B:1465:LYS:HE3	1.78	0.65
1:B:1013:GLN:NE2	1:B:1017:ARG:HH22	1.94	0.65
1:A:90:ASN:ND2	1:A:507:ASN:HD21	1.95	0.64
1:A:314:ASN:OD1	1:A:316:PRO:HD2	1.97	0.64
1:B:1045:THR:O	1:B:1046:ASN:HB2	1.97	0.64
1:A:98:LEU:HB2	1:A:268:TRP:CE3	2.32	0.64
1:A:199:ASN:OD1	1:A:201:GLU:HG3	1.99	0.62
1:A:345:HIS:HA	1:A:382:PRO:HG3	1.80	0.62
1:A:232:ALA:O	1:A:233:LYS:C	2.37	0.62
1:B:1090:ASN:ND2	1:B:1507:ASN:HD21	1.97	0.61
1:A:152:ILE:CD1	1:A:198:LEU:HD13	2.30	0.61
1:A:369:ARG:HG2	1:A:369:ARG:HH11	1.66	0.61
1:B:1006:ASN:ND2	1:B:1008:GLN:HB2	2.16	0.61
1:A:45:THR:O	1:A:46:ASN:HB2	2.02	0.60
1:A:407:ILE:HD13	1:A:425:LEU:HD23	1.83	0.60
1:B:1259:PRO:O	1:B:1260:GLN:HB3	2.02	0.60
1:B:1058:LEU:HD12	1:B:1400:MET:HE1	1.83	0.60
3:A:3345:HOH:O	1:B:1222:LYS:HE3	2.00	0.60
1:B:1117:VAL:O	1:B:1120:GLU:HG2	2.01	0.60
1:B:1013:GLN:NE2	1:B:1017:ARG:NH2	2.50	0.60
1:B:1132:CYS:O	1:B:1136:ARG:HG3	2.01	0.60
1:B:1136:ARG:HH21	1:B:1177:GLY:HA3	1.67	0.59
1:A:213:THR:HG23	1:A:251:LYS:HE3	1.85	0.59
1:A:384:THR:HG22	1:A:424:LEU:HD12	1.84	0.59
1:B:1004:THR:HG21	1:B:1371:ASP:OD1	2.02	0.58
1:A:549:LYS:HG2	1:A:552:ARG:HH21	1.67	0.58
1:B:1387:GLN:HE22	1:B:1427:ASN:HB3	1.69	0.58
1:A:343:TYR:OH	1:B:1193:LYS:HE2	2.04	0.58
1:B:1556:ILE:O	1:B:1556:ILE:HD13	2.03	0.58
1:A:186:ILE:HB	1:A:216:GLU:HG3	1.85	0.57
1:B:1234:ASP:OD2	1:B:1236:SER:N	2.32	0.57
1:A:340:TYR:CD1	1:A:383:GLY:HA3	2.39	0.57
1:A:68:LEU:HD13	1:A:312:GLU:HG3	1.87	0.57
1:A:74:ARG:NH2	1:A:505:ASP:HB2	2.20	0.56
1:A:549:LYS:HG2	1:A:552:ARG:NH2	2.20	0.56
1:B:1400:MET:HE2	1:B:1472:PRO:HG3	1.86	0.56
1:A:387:GLN:HE22	1:A:427:ASN:HB3	1.70	0.56
1:B:1218:ILE:HG22	1:B:1222:LYS:HE2	1.87	0.56
1:B:1234:ASP:OD2	1:B:1236:SER:CB	2.54	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:223:THR:OG1	1:B:1420:HIS:HE1	1.89	0.55
1:B:1407:ILE:HD13	1:B:1425:LEU:HD23	1.88	0.55
1:B:1369:ARG:HG2	1:B:1369:ARG:HH11	1.71	0.55
1:A:325:TRP:O	1:A:329:CYS:HB2	2.07	0.54
1:B:1136:ARG:HH21	1:B:1177:GLY:N	2.04	0.54
1:A:193:LYS:HD3	1:B:1343:TYR:HH	1.70	0.54
1:A:247:THR:HG22	1:A:265:PHE:O	2.06	0.54
1:A:146:LYS:HD3	1:A:201:GLU:OE1	2.07	0.54
1:A:226:ASP:O	1:A:230:LEU:HD13	2.08	0.53
1:A:12:LEU:HD23	1:A:66:MET:HB3	1.91	0.53
1:B:1074:ARG:NH2	1:B:1505:ASP:HB2	2.24	0.53
1:B:1098:LEU:HB2	1:B:1268:TRP:CE3	2.44	0.53
1:A:12:LEU:HD11	1:A:325:TRP:CE3	2.44	0.53
1:A:384:THR:HG21	1:A:424:LEU:HD13	1.91	0.53
1:A:136:ARG:HD3	1:A:285:LEU:O	2.09	0.52
1:B:1555:LYS:HG2	3:B:3398:HOH:O	2.09	0.52
1:A:184:SER:H	1:A:190:HIS:CE1	2.28	0.52
1:A:274:SER:O	1:A:279:ILE:HB	2.10	0.52
1:B:1249:THR:O	1:B:1253:LYS:HG3	2.10	0.52
1:B:1025:LEU:HB3	1:B:1436:MET:HG2	1.92	0.51
1:B:1044:ASN:ND2	1:B:1046:ASN:H	2.08	0.51
1:A:389:ALA:HB1	1:B:1353:GLN:HB2	1.91	0.51
1:A:191:ILE:HG23	1:A:192:ALA:N	2.26	0.51
1:B:1258:ASP:O	1:B:1261:ASN:HB2	2.10	0.50
1:B:1276:TRP:HE3	1:B:1296:LEU:HD23	1.75	0.50
1:B:1152:ILE:N	1:B:1152:ILE:HD12	2.27	0.50
1:A:340:TYR:CG	1:A:383:GLY:HA3	2.45	0.50
1:B:1341:ASP:OD2	1:B:1343:TYR:HB2	2.12	0.50
1:A:521:ALA:O	1:A:525:GLU:HG3	2.11	0.50
1:A:68:LEU:CD1	1:A:312:GLU:HG3	2.42	0.50
1:B:1246:SER:O	1:B:1264:GLU:HA	2.12	0.50
1:B:1523:LYS:HD3	3:B:3234:HOH:O	2.10	0.50
1:A:512:TRP:CZ2	1:B:1461:LEU:HD21	2.47	0.49
1:A:384:THR:HG21	1:A:424:LEU:HD12	1.89	0.49
1:B:1305:HIS:CE1	1:B:1315:ALA:H	2.22	0.49
1:A:41:LEU:HD12	1:A:41:LEU:C	2.31	0.49
1:B:1058:LEU:HD12	1:B:1400:MET:CE	2.42	0.49
1:B:1274:SER:O	1:B:1279:ILE:HB	2.13	0.49
1:A:90:ASN:C	1:A:90:ASN:HD22	2.15	0.49
1:A:384:THR:HG21	1:B:1186:ILE:HG22	1.94	0.49
1:B:1259:PRO:C	1:B:1261:ASN:H	2.16	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:271:GLY:HA3	2:A:2002:S6P:H12	1.95	0.48
1:B:1537:HIS:HB2	1:B:1542:ASN:ND2	2.29	0.48
1:A:12:LEU:HD23	1:A:66:MET:CB	2.43	0.48
1:A:389:ALA:O	1:B:1357:GLU:HB2	2.13	0.48
1:A:44:ASN:ND2	1:A:46:ASN:H	2.12	0.48
1:A:405:PHE:HB3	1:A:428:PHE:CE1	2.49	0.48
1:A:218:ILE:CG2	1:A:222:LYS:HE3	2.43	0.48
1:A:334:THR:HG22	1:A:377:ILE:HB	1.95	0.48
1:B:1136:ARG:NH2	1:B:1177:GLY:N	2.62	0.48
1:A:384:THR:O	1:A:388:HIS:HD2	1.97	0.48
1:A:253:LYS:HD3	1:A:259:PRO:HD3	1.95	0.47
1:A:479:THR:OG1	1:B:1551:GLN:NE2	2.47	0.47
1:B:1340:TYR:CE1	1:B:1383:GLY:HA3	2.49	0.47
1:B:1458:LEU:C	1:B:1458:LEU:HD23	2.34	0.47
1:B:1395:HIS:HE1	1:B:1431:GLN:OE1	1.97	0.47
1:A:458:LEU:C	1:A:458:LEU:HD23	2.35	0.47
1:A:456:GLU:HB2	3:A:3393:HOH:O	2.15	0.47
1:B:1253:LYS:HE2	1:B:1259:PRO:HG3	1.96	0.47
1:B:1259:PRO:O	1:B:1260:GLN:OE1	2.32	0.47
1:B:1345:HIS:CE1	1:B:1346:ARG:HG2	2.50	0.47
1:B:1454:SER:HB2	1:B:1455:PRO:HD2	1.96	0.47
1:A:537:HIS:N	1:A:542:ASN:HD21	2.00	0.47
1:B:1138:GLY:O	1:B:1147:THR:HG22	2.15	0.46
1:A:25:LEU:HB3	1:A:436:MET:HG2	1.96	0.46
1:B:1538:ASP:OD1	1:B:1540:SER:HB3	2.14	0.46
1:A:105:ARG:HG2	1:A:105:ARG:HH11	1.79	0.46
1:B:1246:SER:OG	1:B:1247:THR:N	2.49	0.46
1:A:369:ARG:HG2	1:A:369:ARG:NH1	2.31	0.46
1:B:1090:ASN:HD22	1:B:1507:ASN:HD21	1.63	0.46
1:B:1408:PRO:HB3	1:B:1478:PHE:HE1	1.78	0.46
1:A:383:GLY:C	1:A:384:THR:CG2	2.81	0.46
1:B:1556:ILE:HD13	1:B:1556:ILE:C	2.36	0.46
1:A:201:GLU:O	1:A:241:HIS:HE1	1.98	0.46
1:B:1186:ILE:HB	1:B:1216:GLU:HG3	1.97	0.46
1:B:1271:GLY:HA3	2:B:2001:S6P:H12	1.98	0.45
1:B:1405:PHE:HB3	1:B:1428:PHE:CE1	2.52	0.45
1:A:548:ILE:HD13	1:B:1425:LEU:HD22	1.99	0.45
1:A:283:ILE:O	1:A:287:VAL:HG22	2.17	0.45
1:B:1395:HIS:HD2	3:B:3023:HOH:O	1.99	0.45
1:B:1283:ILE:O	1:B:1287:VAL:HG22	2.17	0.45
1:B:1448:LEU:HD21	1:B:1465:LYS:CE	2.45	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1408:PRO:HA	1:B:1478:PHE:O	2.17	0.44
1:A:248:ASN:O	1:A:252:VAL:HG23	2.17	0.44
3:A:3174:HOH:O	1:B:1049:HIS:HD2	2.00	0.44
1:B:1088:LYS:HA	1:B:1096:ALA:HA	1.99	0.44
1:B:1249:THR:CG2	1:B:1253:LYS:HE3	2.46	0.44
1:A:12:LEU:CD1	1:A:329:CYS:SG	3.05	0.44
1:A:456:GLU:O	1:A:460:LYS:HG3	2.17	0.44
1:B:1234:ASP:OD2	1:B:1236:SER:HB3	2.17	0.44
1:A:111:VAL:HA	1:A:115:LYS:O	2.17	0.44
1:A:146:LYS:NZ	1:A:146:LYS:HB3	2.32	0.44
1:B:1325:TRP:O	1:B:1329:CYS:HB2	2.18	0.43
1:A:12:LEU:HD12	1:A:329:CYS:SG	2.58	0.43
1:A:218:ILE:HG22	1:A:222:LYS:HE3	1.99	0.43
1:B:1400:MET:CE	1:B:1472:PRO:HG3	2.49	0.43
1:A:80:ARG:HD2	1:A:307:ARG:HA	2.00	0.43
1:A:147:THR:HG22	1:A:148:ILE:N	2.32	0.43
1:A:550:GLN:NE2	1:A:551:GLN:HE21	2.04	0.43
1:A:528:LEU:O	1:A:552:ARG:NH2	2.51	0.43
1:A:152:ILE:HD11	1:A:198:LEU:CD1	2.37	0.43
1:A:440:SER:HG	1:A:443:GLU:HG3	1.84	0.43
1:B:1263:PHE:CD1	1:B:1263:PHE:N	2.87	0.43
1:A:102:LEU:HD13	1:A:277:SER:HB3	2.01	0.42
1:A:276:TRP:CZ3	1:A:299:ALA:HB2	2.54	0.42
1:A:520:LEU:HD12	1:B:1434:ALA:HB2	2.00	0.42
1:B:1259:PRO:O	1:B:1260:GLN:CB	2.66	0.42
1:B:1276:TRP:CH2	1:B:1299:ALA:HB2	2.54	0.42
1:A:171:LYS:N	1:A:172:PRO:CD	2.82	0.42
1:B:1080:ARG:HD2	1:B:1307:ARG:HA	2.00	0.42
1:B:1171:LYS:N	1:B:1172:PRO:CD	2.81	0.42
1:A:6:ASN:OD1	1:A:8:GLN:HB2	2.20	0.42
1:A:80:ARG:HG3	1:A:306:PHE:CE2	2.55	0.42
1:A:339:PRO:O	1:A:382:PRO:HA	2.19	0.42
1:A:490:ILE:O	1:A:494:GLU:HG3	2.20	0.42
1:B:1180:VAL:HG21	1:B:1286:HIS:HB2	2.01	0.42
1:B:1006:ASN:HD22	1:B:1009:PHE:N	2.14	0.42
1:B:1486:LEU:O	1:B:1490:ILE:HG13	2.20	0.42
1:A:343:TYR:OH	1:B:1193:LYS:CE	2.68	0.41
1:B:1537:HIS:N	1:B:1542:ASN:HD21	2.09	0.41
1:B:1556:ILE:O	1:B:1556:ILE:CD1	2.66	0.41
1:A:6:ASN:O	1:A:10:GLN:HG3	2.21	0.41
1:A:90:ASN:HD22	1:A:507:ASN:HD21	1.66	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:210:LYS:N	2:A:2002:S6P:O3P	2.42	0.41
1:A:146:LYS:CD	1:A:201:GLU:OE1	2.67	0.41
1:B:1102:LEU:HD13	1:B:1277:SER:HB3	2.01	0.41
1:B:1204:LEU:C	1:B:1204:LEU:HD13	2.40	0.41
1:A:1:ALA:O	1:A:5:ARG:HG3	2.20	0.41
1:A:233:LYS:HE3	1:A:233:LYS:HB3	1.73	0.41
1:A:352:GLN:O	1:A:356:MET:HB2	2.20	0.41
1:A:449:GLN:HA	1:A:449:GLN:NE2	2.35	0.41
1:A:213:THR:HG23	1:A:251:LYS:CE	2.49	0.41
1:A:525:GLU:N	1:A:526:PRO:HD2	2.36	0.41
1:B:1387:GLN:HA	1:B:1391:TYR:CG	2.56	0.41
1:A:72:LYS:HB3	1:A:72:LYS:HE3	1.86	0.41
1:B:1033:LYS:HB3	1:B:1033:LYS:HE3	1.87	0.41
1:B:1275:LEU:C	1:B:1275:LEU:HD12	2.40	0.41
1:B:1007:PRO:HG2	1:B:1008:GLN:OE1	2.21	0.40
1:B:1171:LYS:HD3	1:B:1286:HIS:HE1	1.84	0.40
1:B:1352:GLN:O	1:B:1356:MET:HB2	2.22	0.40
1:B:1245:LEU:HD13	1:B:1278:ALA:O	2.22	0.40
1:B:1369:ARG:HG2	1:B:1369:ARG:NH1	2.34	0.40
1:A:138:GLY:HA2	1:A:147:THR:HG23	2.04	0.40
1:B:1291:ASN:HD22	1:B:1291:ASN:HA	1.70	0.40
1:B:1356:MET:HA	3:B:3027:HOH:O	2.21	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	554/558 (99%)	533 (96%)	18 (3%)	3 (0%)	29	23
1	B	554/558 (99%)	532 (96%)	20 (4%)	2 (0%)	34	30
All	All	1108/1116 (99%)	1065 (96%)	38 (3%)	5 (0%)	29	23

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	234	ASP
1	B	1233	LYS
1	A	233	LYS
1	A	384	THR
1	B	1232	ALA

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	477/479 (100%)	462 (97%)	15 (3%)	40	40
1	B	477/479 (100%)	466 (98%)	11 (2%)	50	53
All	All	954/958 (100%)	928 (97%)	26 (3%)	44	46

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	LEU
1	A	44	ASN
1	A	72	LYS
1	A	90	ASN
1	A	103	ARG
1	A	115	LYS
1	A	133	GLN
1	A	161	LEU
1	A	197	CYS
1	A	233	LYS
1	A	260	GLN
1	A	265	PHE
1	A	384	THR
1	A	416	ARG
1	A	555	LYS
1	B	1044	ASN
1	B	1090	ASN
1	B	1103	ARG

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Mol	Chain	Res	Type
1	B	1233	LYS
1	B	1234	ASP
1	B	1258	ASP
1	B	1260	GLN
1	B	1265	PHE
1	B	1461	LEU
1	B	1553	GLU
1	B	1556	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (41) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	37	ASN
1	A	44	ASN
1	A	46	ASN
1	A	90	ASN
1	A	153	ASN
1	A	215	GLN
1	A	260	GLN
1	A	294	GLN
1	A	304	GLN
1	A	353	GLN
1	A	387	GLN
1	A	449	GLN
1	A	542	ASN
1	A	550	GLN
1	B	1006	ASN
1	B	1013	GLN
1	B	1014	GLN
1	B	1016	HIS
1	B	1044	ASN
1	B	1046	ASN
1	B	1049	HIS
1	B	1090	ASN
1	B	1107	ASN
1	B	1133	GLN
1	B	1153	ASN
1	B	1215	GLN
1	B	1286	HIS
1	B	1291	ASN
1	B	1294	GLN
1	B	1305	HIS

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Mol	Chain	Res	Type
1	B	1353	GLN
1	B	1359	ASN
1	B	1385	ASN
1	B	1387	GLN
1	B	1395	HIS
1	B	1410	GLN
1	B	1420	HIS
1	B	1449	GLN
1	B	1542	ASN
1	B	1550	GLN
1	B	1551	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)

2 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	S6P	B	2001	-	15,15,15	1.54	2 (13%)	21,21,21	1.34	2 (9%)
2	S6P	A	2002	-	15,15,15	1.53	3 (20%)	21,21,21	1.29	2 (9%)

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	S6P	B	2001	-	-	0/20/20/20	-
2	S6P	A	2002	-	-	1/20/20/20	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	2002	S6P	C6-C5	4.31	1.57	1.51
2	B	2001	S6P	C6-C5	4.20	1.57	1.51
2	B	2001	S6P	O1-C1	-2.25	1.32	1.42
2	A	2002	S6P	O1-C1	-2.23	1.33	1.42
2	A	2002	S6P	P-O6	2.01	1.66	1.60

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	2001	S6P	O5-C5-C6	-4.28	100.30	109.92
2	A	2002	S6P	O5-C5-C6	-4.11	100.69	109.92
2	B	2001	S6P	P-O6-C6	-2.41	111.66	118.30
2	A	2002	S6P	P-O6-C6	-2.07	112.58	118.30

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	2002	S6P	C1-C2-C3-C4

There are no ring outliers.

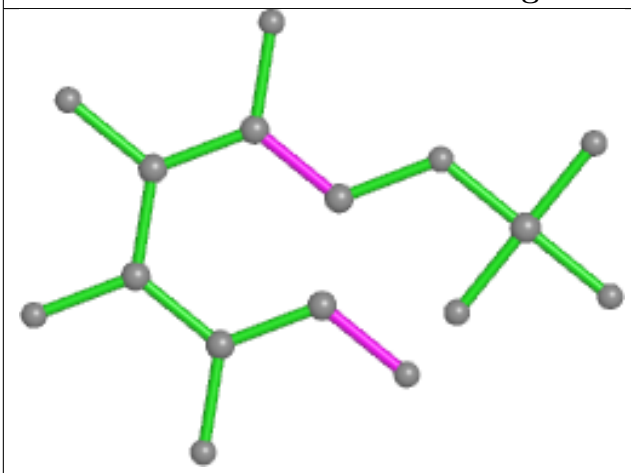
2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	2001	S6P	1	0
2	A	2002	S6P	2	0

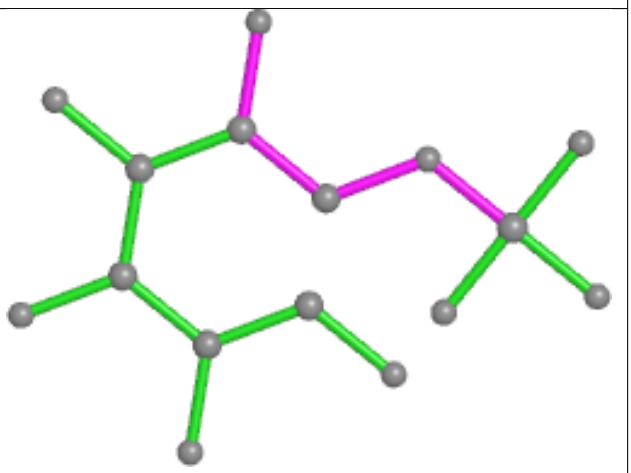
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

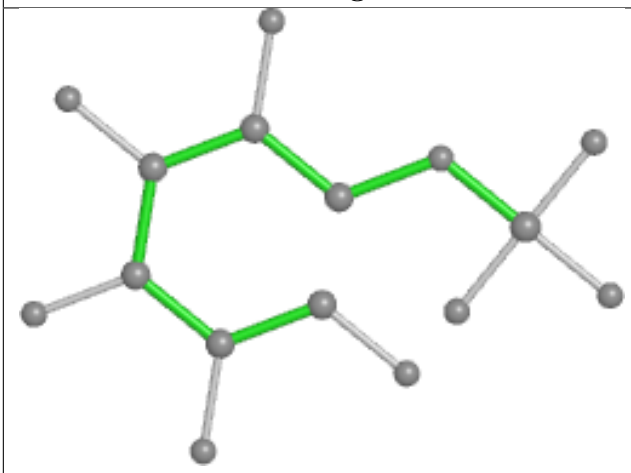
Ligand S6P B 2001



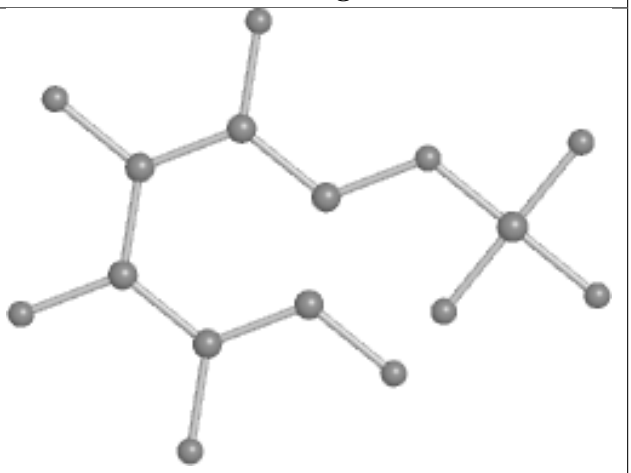
Bond lengths



Bond angles

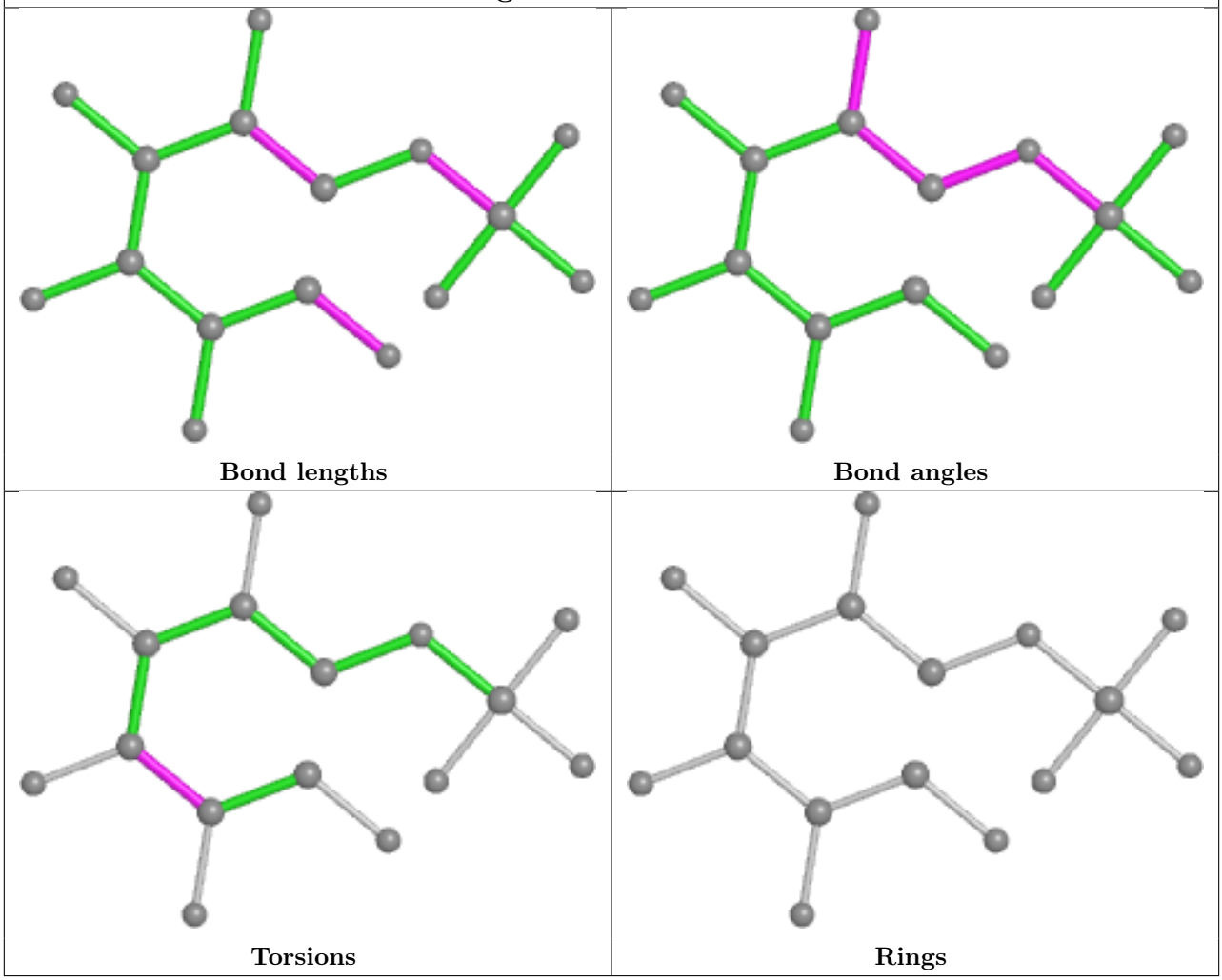


Torsions



Rings

Ligand S6P A 2002



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, 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	556/558 (99%)	0.00	21 (3%)	40	39	4, 23, 46, 59	10 (1%)
1	B	556/558 (99%)	-0.21	10 (1%)	68	66	14, 22, 41, 55	0
All	All	1112/1116 (99%)	-0.10	31 (2%)	53	51	4, 23, 44, 59	10 (0%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	514	VAL	7.4
1	A	384	THR	6.9
1	A	512	TRP	5.5
1	A	516	LEU	5.3
1	A	517	GLY	4.7
1	A	520	LEU	4.4
1	A	513	GLY	3.9
1	B	1260	GLN	3.9
1	B	1556	ILE	3.7
1	B	1553	GLU	3.6
1	A	521	ALA	3.1
1	A	258	ASP	3.1
1	A	113	ASP	3.1
1	A	233	LYS	2.9
1	A	146	LYS	2.8
1	B	1233	LYS	2.8
1	A	519	GLN	2.7
1	A	383	GLY	2.6
1	A	5	ARG	2.4
1	B	1555	LYS	2.4
1	A	518	LYS	2.3
1	A	515	GLU	2.3
1	A	197	CYS	2.2
1	B	1176	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	175	SER	2.2
1	B	1530	GLY	2.1
1	B	1235	PRO	2.1
1	A	143	TYR	2.1
1	B	1377	ILE	2.0
1	B	1133	GLN	2.0
1	A	2	ALA	2.0

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

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

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

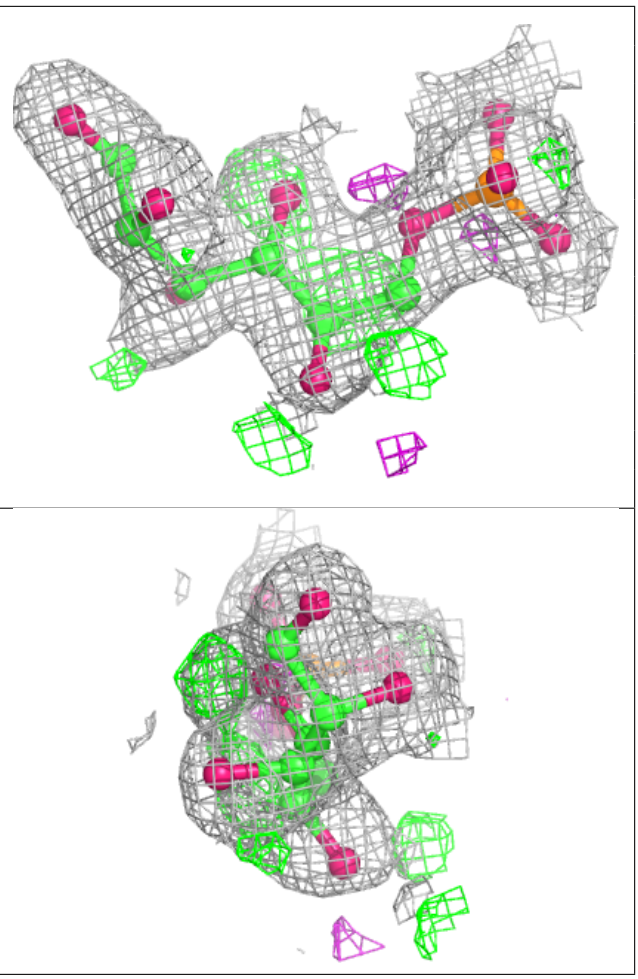
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	S6P	A	2002	16/16	0.93	0.14	26,29,32,32	0
2	S6P	B	2001	16/16	0.93	0.16	21,24,27,28	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.

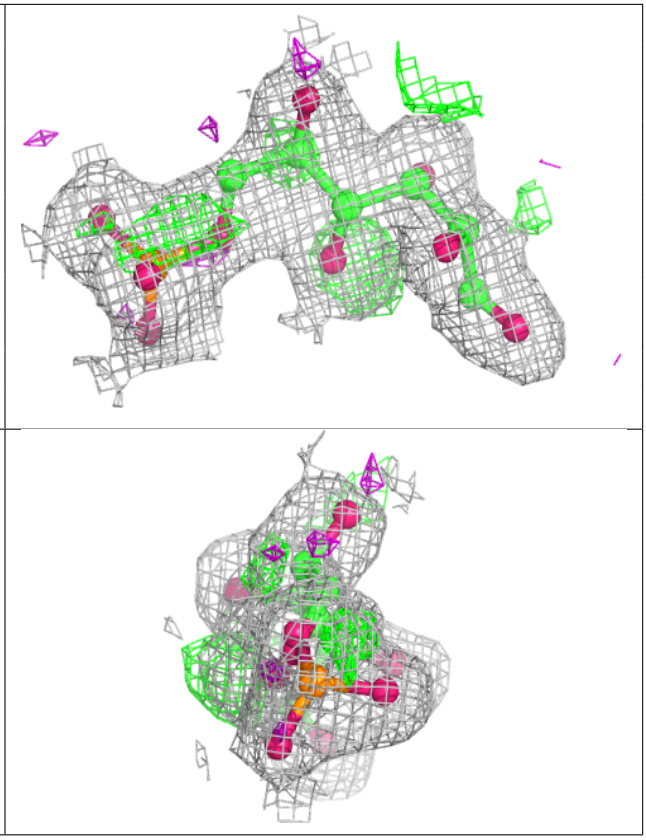
Electron density around S6P A 2002:

$2mF_o$-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 2001:

$2mF_o$-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.