



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:02 AM UTC

PDB ID : 1PFK / pdb_00001pfk
Title : CRYSTAL STRUCTURE OF THE COMPLEX OF PHOSPHOFRUCTOKINASE FROM ESCHERICHIA COLI WITH ITS REACTION PRODUCTS
Authors : Shirakihara, Y.; Evans, P.R.
Deposited on : 1988-01-25
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

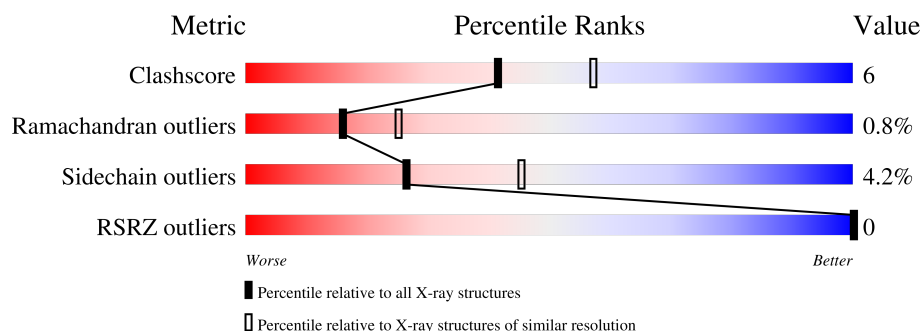
1 Overall quality at a glance

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))
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	320	 75% 20% . .
1	B	320	 76% 21% .

2 Entry composition [i](#)

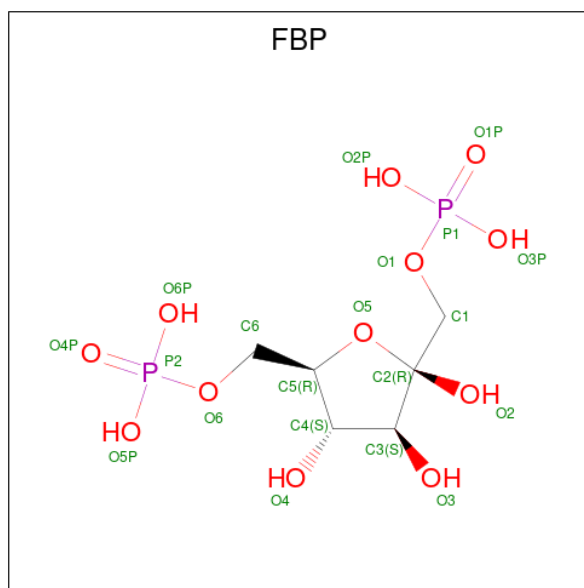
There are 5 unique types of molecules in this entry. The entry contains 5295 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PHOSPHOFRUCTOKINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	320	Total	C	N	O	S	0	0	0
			2433	1527	426	462	18			
1	B	320	Total	C	N	O	S	0	0	0
			2433	1527	426	462	18			

- Molecule 2 is 1,6-di-O-phosphono-beta-D-fructofuranose (CCD ID: FBP) (formula: $C_6H_{14}O_{12}P_2$).

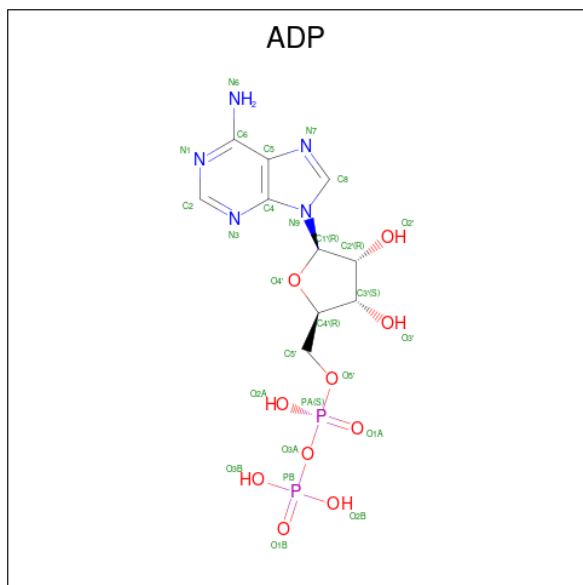


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	O	P	0	0
			20	6	12	2		
2	B	1	Total	C	O	P	0	0
			20	6	12	2		

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	2	Total Mg 2 2	0	0
3	B	2	Total Mg 2 2	0	0

- Molecule 4 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O P 27 10 5 10 2	0	0
4	A	1	Total C N O P 27 10 5 10 2	0	0
4	B	1	Total C N O P 27 10 5 10 2	0	0
4	B	1	Total C N O P 27 10 5 10 2	0	0

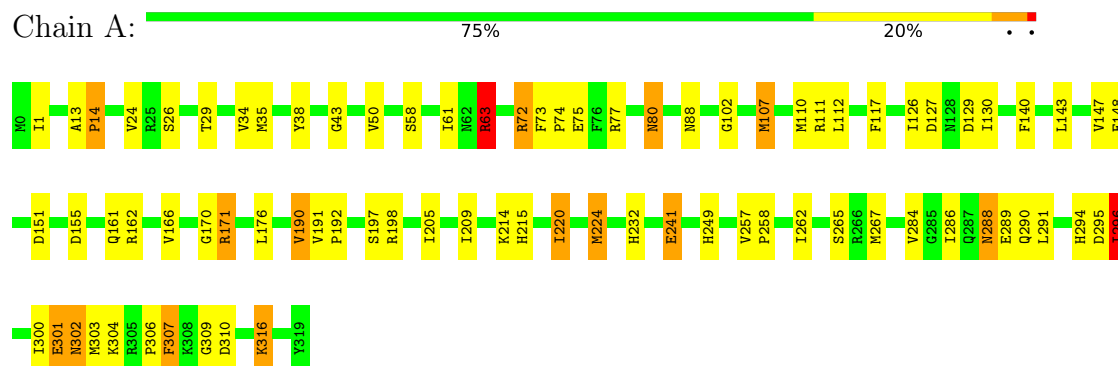
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	141	Total O 141 141	0	0
5	B	136	Total O 136 136	0	0

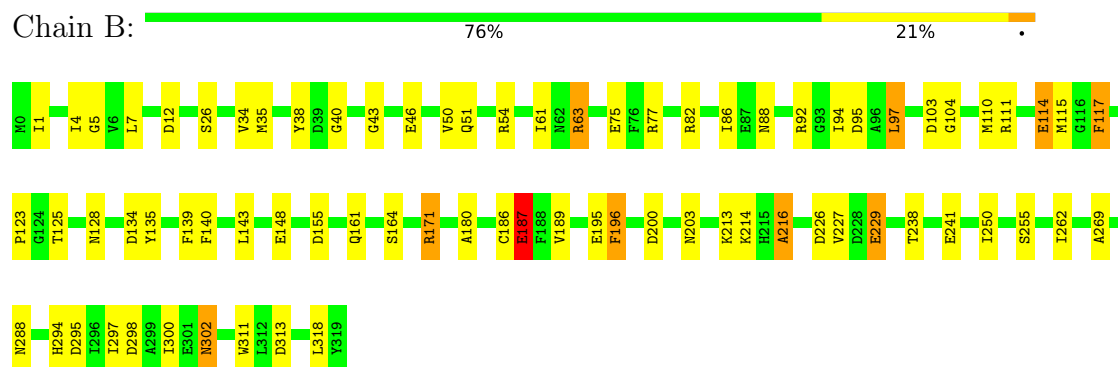
3 Residue-property plots

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: PHOSPHOFRUCTOKINASE



• Molecule 1: PHOSPHOFRUCTOKINASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	112.30Å 85.40Å 77.10Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	100.00 – 2.40 77.10 – 2.43	Depositor EDS
% Data completeness (in resolution range)	(Not available) (100.00-2.40) 94.2 (77.10-2.43)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.56 (at 2.44Å)	Xtriage
Refinement program	PROLSQ	Depositor
R, R_{free}	0.165 , (Not available) 0.162 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	28.9	Xtriage
Anisotropy	0.232	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 58.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5295	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.38% 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: FBP, ADP, MG

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	0.90	0/2470	1.77	36/3329 (1.1%)
1	B	0.92	0/2470	1.80	40/3329 (1.2%)
All	All	0.91	0/4940	1.78	76/6658 (1.1%)

There are no bond length outliers.

All (76) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	73	PHE	CA-CB-CG	9.34	123.14	113.80
1	A	80	ASN	CA-CB-CG	-9.04	103.56	112.60
1	B	148	GLU	CB-CG-CD	8.66	127.33	112.60
1	A	127	ASP	N-CA-C	8.34	120.37	111.28
1	A	63	ARG	CD-NE-CZ	8.21	135.90	124.40
1	A	72	ARG	CD-NE-CZ	8.11	135.75	124.40
1	B	300	ILE	N-CA-C	7.41	117.48	110.30
1	A	302	ASN	N-CA-C	6.92	120.61	112.72
1	A	301	GLU	N-CA-C	6.67	121.39	111.04
1	B	34	VAL	N-CA-C	6.60	117.81	108.17
1	A	296	ILE	N-CA-CB	6.50	117.73	110.51
1	B	295	ASP	N-CA-C	-6.47	100.26	109.96
1	B	311	TRP	CA-CB-CG	6.44	125.84	113.60
1	A	241	GLU	CA-CB-CG	6.38	126.85	114.10
1	A	215	HIS	CA-CB-CG	6.24	120.03	113.80
1	B	12	ASP	CA-CB-CG	6.23	118.83	112.60
1	A	14	PRO	CB-CA-C	6.10	119.64	111.71
1	B	51	GLN	CA-C-O	-6.00	113.84	120.69
1	B	171	ARG	CA-CB-CG	5.97	126.05	114.10
1	A	166	VAL	O-C-N	5.97	130.08	123.10
1	B	51	GLN	O-C-N	5.93	129.97	123.04
1	A	151	ASP	CA-CB-CG	5.87	118.47	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	95	ASP	CA-CB-CG	5.77	118.37	112.60
1	A	126	ILE	CA-C-N	5.71	127.94	120.28
1	A	126	ILE	C-N-CA	5.71	127.94	120.28
1	B	134	ASP	O-C-N	5.70	128.65	122.15
1	B	203	ASN	CA-CB-CG	-5.69	106.91	112.60
1	B	61	ILE	N-CA-C	5.66	117.07	110.62
1	B	216	ALA	CA-C-O	-5.66	113.32	120.28
1	A	155	ASP	CA-CB-CG	5.64	118.24	112.60
1	A	197	SER	N-CA-C	5.64	118.80	107.41
1	B	143	LEU	O-C-N	5.62	127.93	122.09
1	B	104	GLY	N-CA-C	-5.60	106.00	112.50
1	B	180	ALA	O-C-N	5.59	128.04	122.12
1	B	140	PHE	CA-C-O	-5.58	114.61	120.63
1	B	196	PHE	CA-CB-CG	5.57	119.37	113.80
1	B	117	PHE	CA-CB-CG	5.56	119.36	113.80
1	B	189	VAL	CB-CA-C	5.53	118.41	110.33
1	B	103	ASP	CA-CB-CG	5.53	118.13	112.60
1	B	123	PRO	CB-CA-C	-5.52	107.23	111.87
1	A	249	HIS	CA-CB-CG	-5.45	108.35	113.80
1	A	129	ASP	N-CA-C	5.44	119.61	112.92
1	B	238	THR	O-C-N	5.42	127.77	122.19
1	A	26	SER	O-C-N	5.38	127.61	122.07
1	B	302	ASN	N-CA-C	5.35	120.67	113.72
1	A	63	ARG	NE-CZ-NH1	5.32	126.82	121.50
1	A	190	VAL	CA-C-O	-5.31	114.87	120.39
1	A	224	MET	CA-CB-CG	-5.22	103.66	114.10
1	A	140	PHE	CA-CB-CG	-5.21	108.59	113.80
1	A	117	PHE	CA-CB-CG	-5.20	108.60	113.80
1	B	155	ASP	O-C-N	5.18	127.40	122.07
1	A	198	ARG	NE-CZ-NH2	-5.17	114.55	119.20
1	B	229	GLU	CB-CG-CD	5.16	121.37	112.60
1	B	186	CYS	O-C-N	5.16	128.67	122.79
1	B	187	GLU	CB-CG-CD	5.16	121.37	112.60
1	B	313	ASP	O-C-N	5.15	127.58	122.12
1	B	297	ILE	O-C-N	5.14	126.94	121.91
1	A	220	ILE	N-CA-C	5.12	116.08	108.46
1	B	46	GLU	CG-CD-OE1	5.09	130.11	118.40
1	B	255	SER	CA-C-O	5.09	124.89	119.80
1	B	241	GLU	CA-CB-CG	5.09	124.28	114.10
1	B	75	GLU	CB-CG-CD	5.08	121.24	112.60
1	A	88	ASN	CA-CB-CG	5.08	117.68	112.60
1	A	288	ASN	CB-CG-ND2	5.08	124.02	116.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	307	PHE	CA-CB-CG	5.08	118.88	113.80
1	A	309	GLY	CA-C-N	5.07	127.39	120.54
1	A	309	GLY	C-N-CA	5.07	127.39	120.54
1	B	250	ILE	N-CA-C	-5.05	104.77	111.09
1	B	4	ILE	CB-CA-C	-5.04	102.88	110.55
1	B	262	ILE	N-CA-C	5.04	115.81	110.72
1	B	241	GLU	N-CA-CB	5.04	117.40	109.69
1	A	232	HIS	CA-CB-CG	5.04	118.84	113.80
1	A	295	ASP	N-CA-C	-5.03	102.41	109.96
1	B	200	ASP	CA-CB-CG	5.03	117.63	112.60
1	A	117	PHE	O-C-N	5.02	125.97	121.35
1	A	61	ILE	CA-C-O	-5.00	115.19	120.64

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2433	0	2430	39	0
1	B	2433	0	2430	27	0
2	A	20	0	10	0	0
2	B	20	0	10	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	54	0	24	0	0
4	B	54	0	24	2	0
5	A	141	0	0	3	0
5	B	136	0	0	5	0
All	All	5295	0	4928	64	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 6.

All (64) 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:82:ARG:HE	1:B:115:MET:HE1	1.31	0.95
1:A:24:VAL:HG22	1:A:34:VAL:HG11	1.63	0.81
1:A:316:LYS:NZ	5:A:427:HOH:O	2.12	0.81
1:A:107:MET:HE3	1:A:300:ILE:HD13	1.71	0.71
1:A:161:GLN:HA	1:A:214:LYS:O	1.90	0.71
1:A:162:ARG:HG2	1:A:241:GLU:HG3	1.77	0.66
1:A:102:GLY:HA2	1:A:130:ILE:HD11	1.80	0.63
1:B:213:LYS:HE2	4:B:326:ADP:O1A	2.01	0.60
1:B:161:GLN:HA	1:B:214:LYS:O	2.02	0.59
1:B:88:ASN:O	1:B:92:ARG:HG2	2.03	0.59
1:B:187:GLU:HG2	1:B:216:ALA:HA	1.83	0.58
1:A:303:MET:O	1:A:304:LYS:HG3	2.05	0.56
1:B:128:ASN:OD1	1:B:135:TYR:HA	2.05	0.55
1:A:191:VAL:HB	1:A:192:PRO:HD2	1.88	0.54
1:B:63:ARG:HH11	1:B:63:ARG:HG2	1.73	0.52
1:A:306:PRO:HG2	5:A:464:HOH:O	2.12	0.50
1:B:38:TYR:O	1:B:43:GLY:HA3	2.11	0.50
1:B:82:ARG:O	1:B:86:ILE:HG13	2.12	0.50
1:A:75:GLU:OE2	1:A:75:GLU:N	2.45	0.50
1:A:205:ILE:O	1:A:209:ILE:HG13	2.12	0.50
1:A:63:ARG:HH11	1:A:63:ARG:HG2	1.76	0.49
1:A:110:MET:HB2	1:A:296:ILE:HG21	1.93	0.49
1:B:54:ARG:HD2	5:B:454:HOH:O	2.12	0.49
1:A:38:TYR:O	1:A:43:GLY:HA3	2.13	0.48
1:B:35:MET:HG3	1:B:94:ILE:HD11	1.95	0.48
1:B:110:MET:O	1:B:114:GLU:HG2	2.14	0.48
1:B:196:PHE:HA	5:B:408:HOH:O	2.14	0.47
1:A:267:MET:HE2	1:A:284:VAL:HG12	1.96	0.47
1:A:190:VAL:HB	1:A:220:ILE:HG13	1.97	0.47
1:A:13:ALA:HA	1:A:14:PRO:HD3	1.74	0.46
1:B:226:ASP:OD1	1:B:229:GLU:HG3	2.16	0.45
1:A:294:HIS:CG	1:A:303:MET:HE1	2.51	0.45
1:A:258:PRO:O	1:A:262:ILE:HG13	2.16	0.45
1:A:289:GLU:HB2	1:B:288:ASN:HD22	1.82	0.45
1:B:298:ASP:O	1:B:302:ASN:HB2	2.16	0.45
1:A:75:GLU:C	1:A:77:ARG:N	2.75	0.44
1:A:110:MET:HE2	1:A:110:MET:HB3	1.86	0.44
1:B:82:ARG:NH2	1:B:111:ARG:HD2	2.33	0.44
1:A:265:SER:HB3	1:B:318:LEU:CD1	2.48	0.43
1:A:72:ARG:C	1:A:74:PRO:HD3	2.43	0.43
1:A:303:MET:C	1:A:304:LYS:HG3	2.44	0.43
1:A:58:SER:HB3	4:B:326:ADP:H2'	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:72:ARG:O	1:A:74:PRO:HD3	2.18	0.43
1:A:75:GLU:C	1:A:77:ARG:H	2.26	0.43
1:A:224:MET:HE2	1:A:224:MET:HB3	1.92	0.43
1:B:63:ARG:HG2	1:B:63:ARG:NH1	2.34	0.43
1:B:86:ILE:HG23	1:B:117:PHE:CE1	2.53	0.43
1:A:257:VAL:HB	1:A:258:PRO:HD2	2.00	0.43
1:A:170:GLY:O	1:A:171:ARG:HB3	2.19	0.42
1:A:38:TYR:HE2	1:A:50:VAL:HG13	1.84	0.42
1:A:176:LEU:HD12	1:A:176:LEU:HA	1.82	0.42
1:B:7:LEU:HD13	1:B:40:GLY:HA2	2.02	0.42
1:B:26:SER:OG	1:B:269:ALA:HA	2.19	0.42
1:A:35:MET:HE3	1:A:35:MET:HB3	1.93	0.41
1:A:288:ASN:O	1:A:289:GLU:HB2	2.20	0.41
1:B:5:GLY:O	1:B:97:LEU:HA	2.19	0.41
1:B:77:ARG:NH1	5:B:449:HOH:O	2.54	0.41
1:B:128:ASN:HB2	1:B:139:PHE:CD2	2.56	0.41
1:A:110:MET:HE1	1:A:111:ARG:NH1	2.36	0.41
1:A:143:LEU:O	1:A:147:VAL:HG23	2.19	0.41
1:A:148:GLU:HB2	5:A:393:HOH:O	2.21	0.41
1:A:291:LEU:HD23	1:A:291:LEU:HA	1.95	0.41
1:B:114:GLU:HG3	5:B:450:HOH:O	2.21	0.40
1:B:227:VAL:HG22	5:B:379: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	318/320 (99%)	306 (96%)	10 (3%)	2 (1%)	21	32
1	B	318/320 (99%)	310 (98%)	5 (2%)	3 (1%)	14	22
All	All	636/640 (99%)	616 (97%)	15 (2%)	5 (1%)	16	25

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	171	ARG
1	A	1	ILE
1	B	1	ILE
1	B	171	ARG
1	B	125	THR

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	253/255 (99%)	240 (95%)	13 (5%)	21	37
1	B	253/255 (99%)	245 (97%)	8 (3%)	34	56
All	All	506/510 (99%)	485 (96%)	21 (4%)	26	45

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	29	THR
1	A	63	ARG
1	A	80	ASN
1	A	107	MET
1	A	112	LEU
1	A	286	ILE
1	A	290	GLN
1	A	296	ILE
1	A	301	GLU
1	A	302	ASN
1	A	307	PHE
1	A	310	ASP
1	A	316	LYS
1	B	50	VAL
1	B	63	ARG
1	B	97	LEU
1	B	114	GLU
1	B	164	SER

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Mol	Chain	Res	Type
1	B	187	GLU
1	B	195	GLU
1	B	294	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	160	HIS
1	A	288	ASN
1	A	302	ASN
1	B	288	ASN

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 10 ligands modelled in this entry, 4 are monoatomic - leaving 6 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	FBP	A	323	3	18,20,20	1.00	0	21,32,32	0.71	0
4	ADP	A	326	3	28,29,29	0.86	0	43,45,45	0.59	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	ADP	B	326	3	28,29,29	0.91	1 (3%)	43,45,45	0.75	2 (4%)
4	ADP	B	324	3	28,29,29	0.91	1 (3%)	43,45,45	0.81	0
2	FBP	B	323	-	18,20,20	1.04	1 (5%)	21,32,32	1.22	3 (14%)
4	ADP	A	324	3	28,29,29	0.84	0	43,45,45	0.73	0

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	FBP	A	323	3	-	1/13/32/32	0/1/1/1
4	ADP	A	326	3	-	0/16/32/32	0/3/3/3
4	ADP	B	326	3	-	0/16/32/32	0/3/3/3
4	ADP	B	324	3	-	0/16/32/32	0/3/3/3
2	FBP	B	323	-	-	5/13/32/32	0/1/1/1
4	ADP	A	324	3	-	1/16/32/32	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	324	ADP	C2-N3	-2.17	1.30	1.33
4	B	326	ADP	C2-N1	2.14	1.37	1.33
2	B	323	FBP	P2-O5P	-2.14	1.46	1.54

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	323	FBP	O1-P1-O1P	2.71	113.77	106.44
2	B	323	FBP	O6P-P2-O6	2.69	113.69	106.67
2	B	323	FBP	O5P-P2-O6	2.24	112.51	106.67
4	B	326	ADP	O2A-PA-O3A	2.15	113.08	107.27
4	B	326	ADP	O2'-C2'-C3'	2.10	118.54	111.82

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	323	FBP	C1-O1-P1-O1P
2	B	323	FBP	C1-O1-P1-O2P

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Mol	Chain	Res	Type	Atoms
2	B	323	FBP	C1-O1-P1-O3P
2	B	323	FBP	O1-C1-C2-O2
2	B	323	FBP	O1-C1-C2-O5
4	A	324	ADP	PB-O3A-PA-O5'
2	A	323	FBP	C4-C5-C6-O6

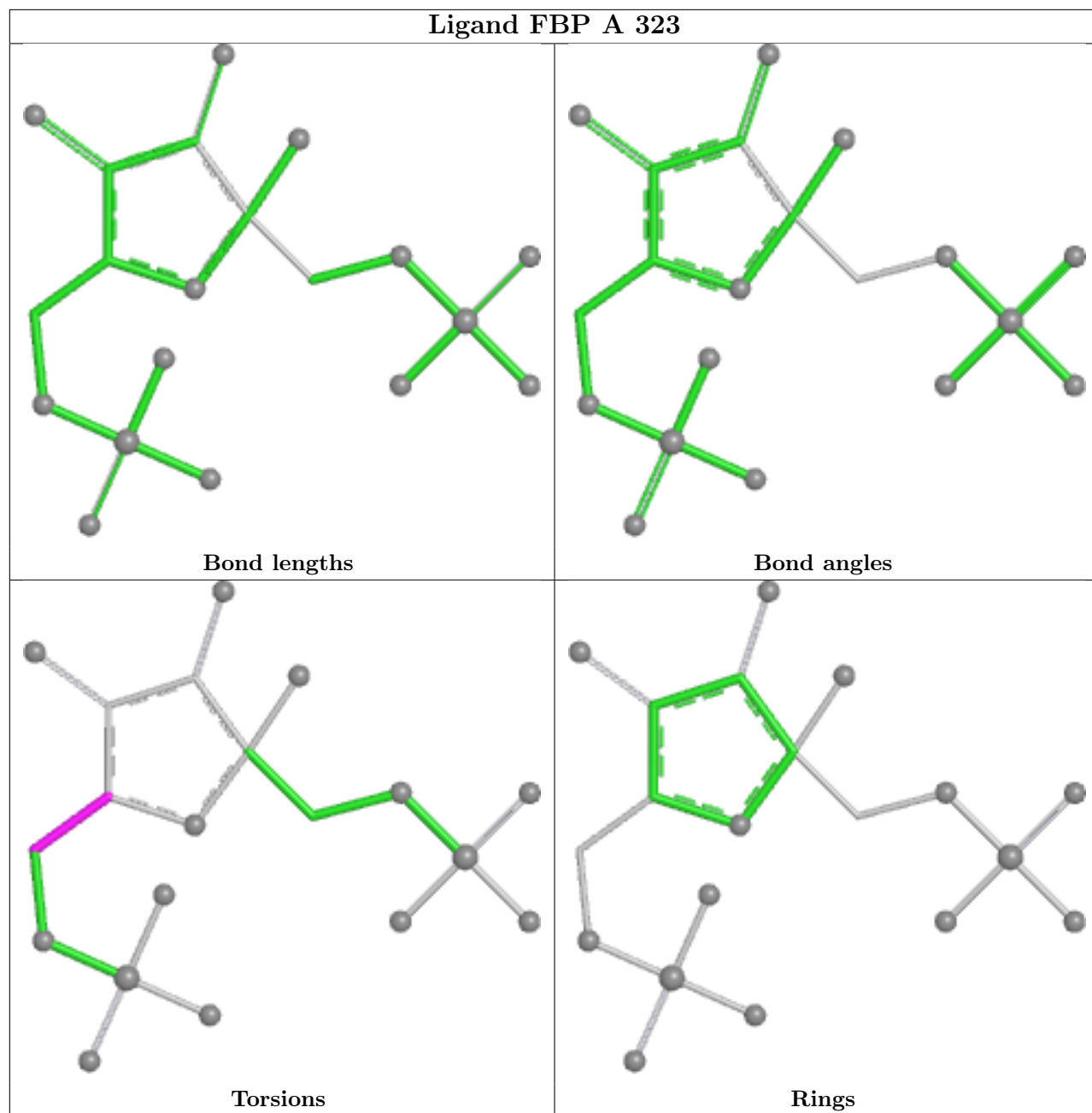
There are no ring outliers.

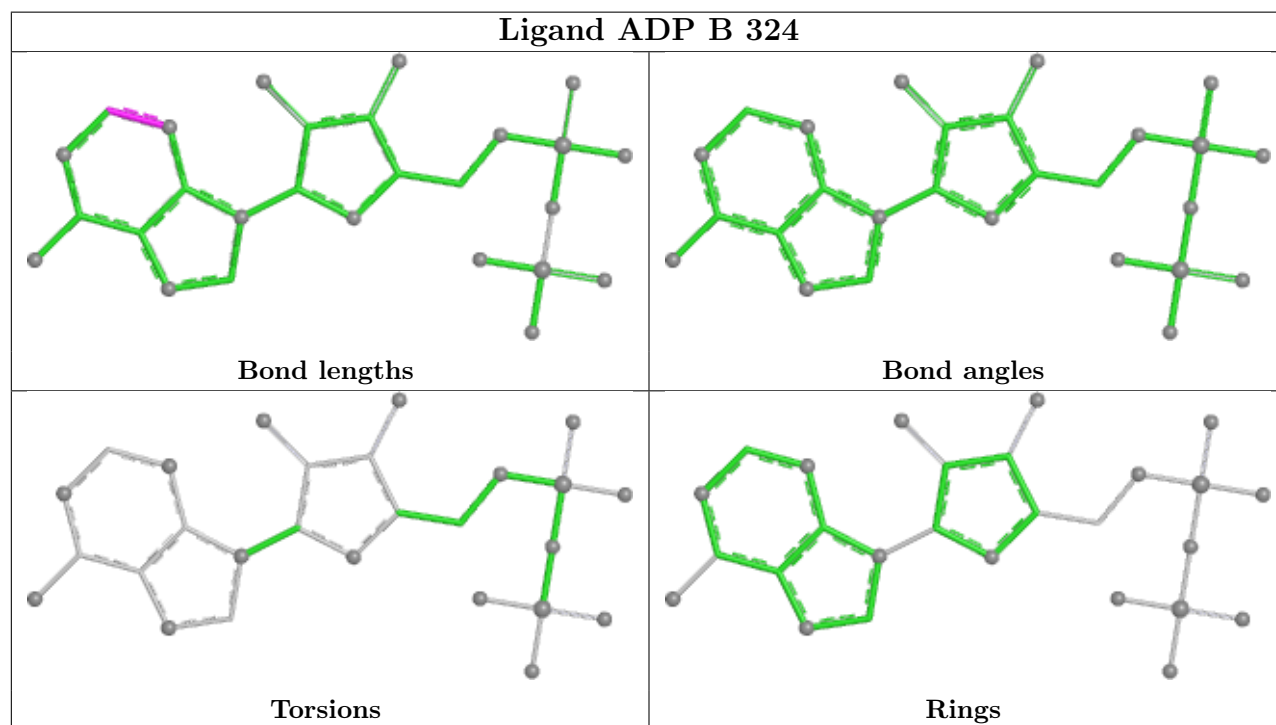
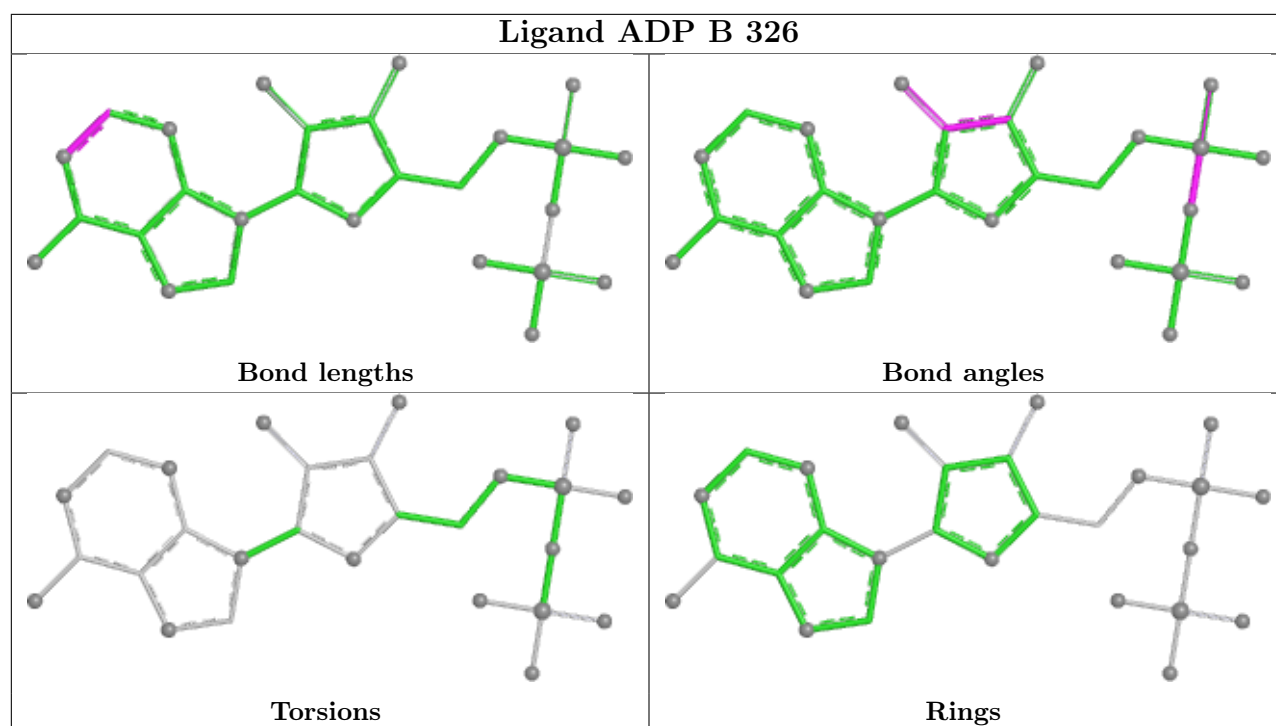
1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	326	ADP	2	0

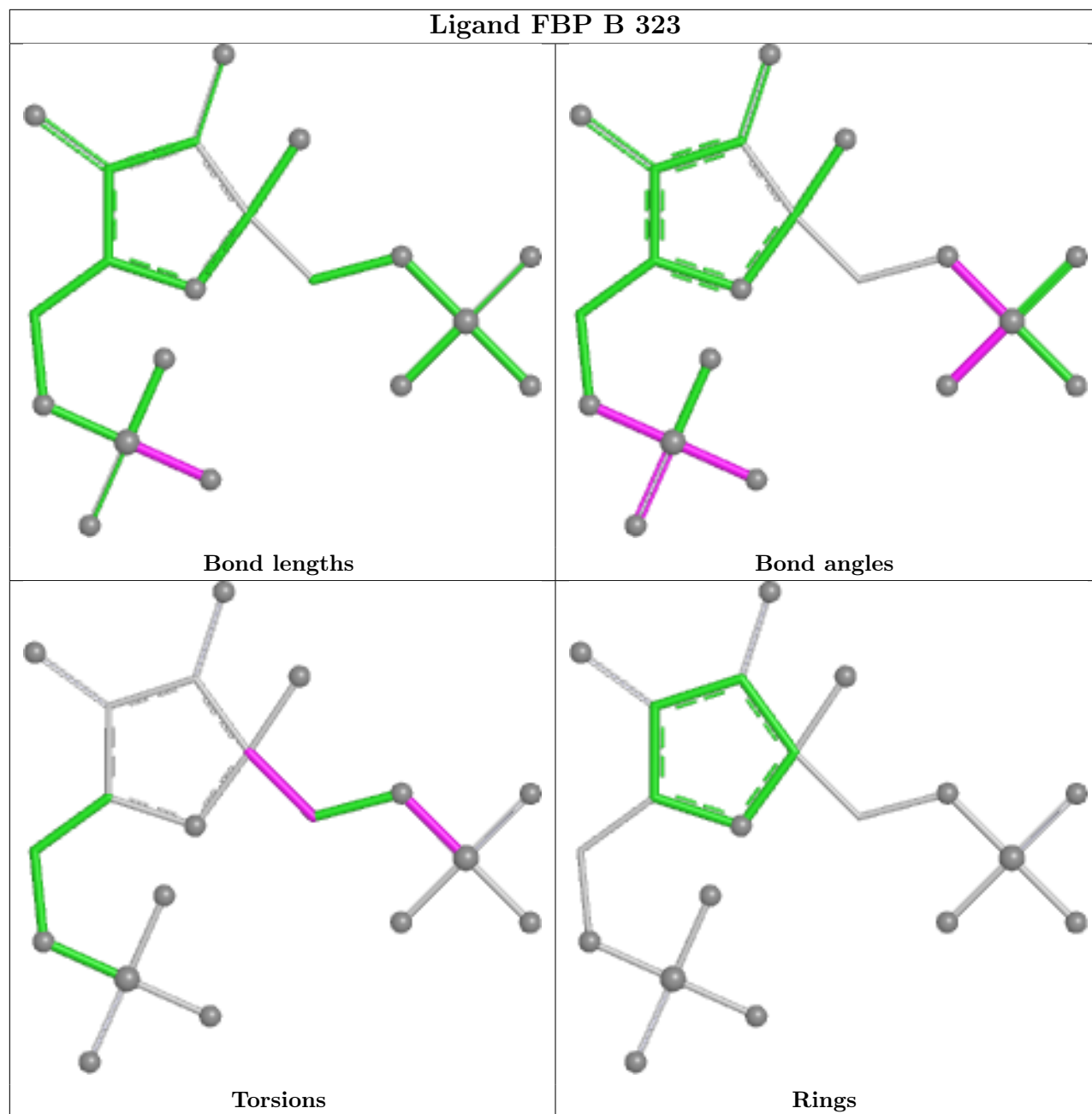
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

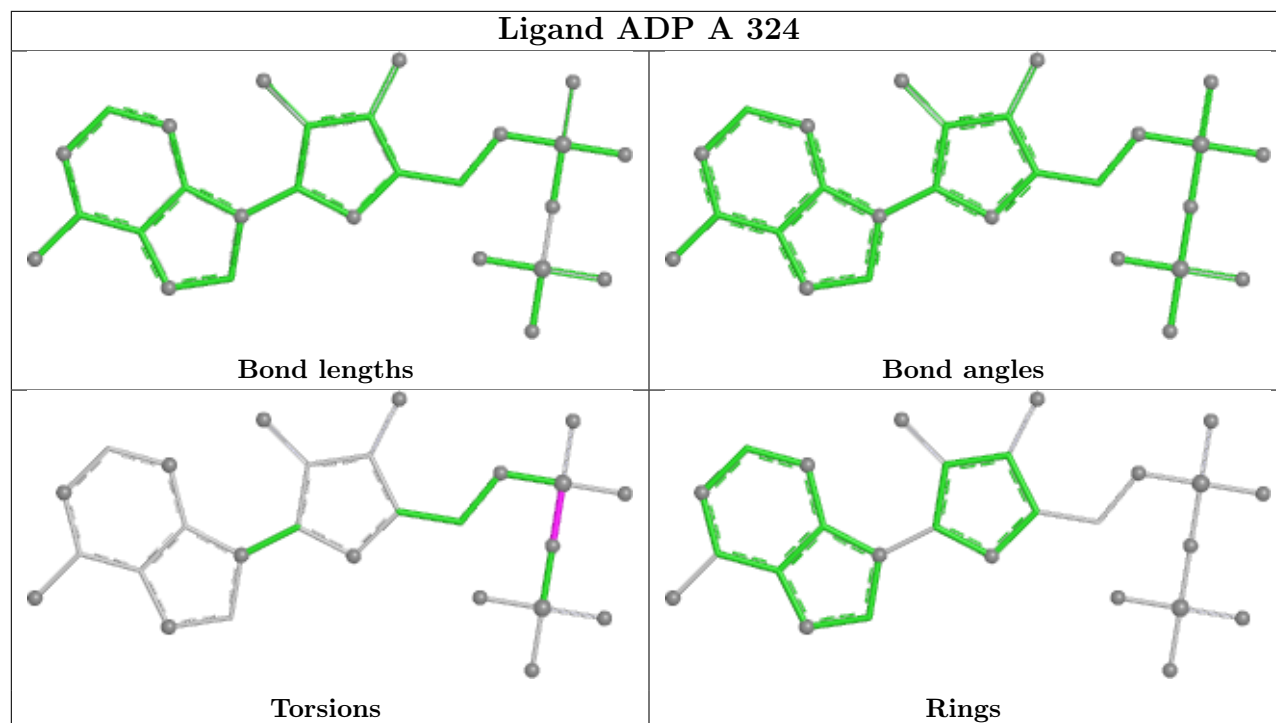
Ligand FBP A 323





Ligand FBP B 323





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	320/320 (100%)	-0.33	0 100 100	13, 34, 70, 99	0
1	B	320/320 (100%)	-0.32	0 100 100	12, 36, 64, 90	0
All	All	640/640 (100%)	-0.33	0 100 100	12, 35, 66, 99	0

There are no RSRZ outliers to report.

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 oligosaccharides 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
3	MG	B	325	1/1	0.81	0.10	64,64,64,64	0
4	ADP	B	324	27/27	0.92	0.09	49,51,58,58	0
4	ADP	A	324	27/27	0.95	0.07	41,46,48,49	0
3	MG	B	327	1/1	0.96	0.05	14,14,14,14	0
2	FBP	B	323	20/20	0.97	0.07	28,37,51,51	4
4	ADP	A	326	27/27	0.97	0.06	31,48,51,53	0
3	MG	A	325	1/1	0.97	0.06	61,61,61,61	0

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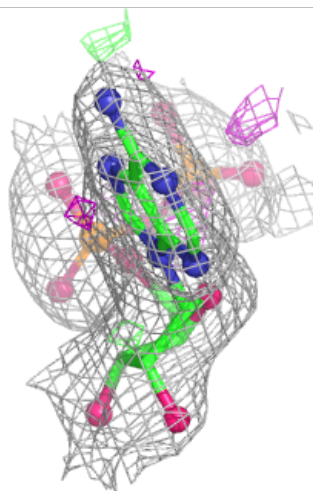
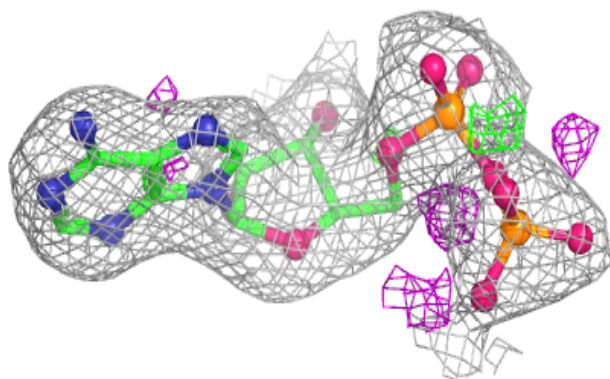
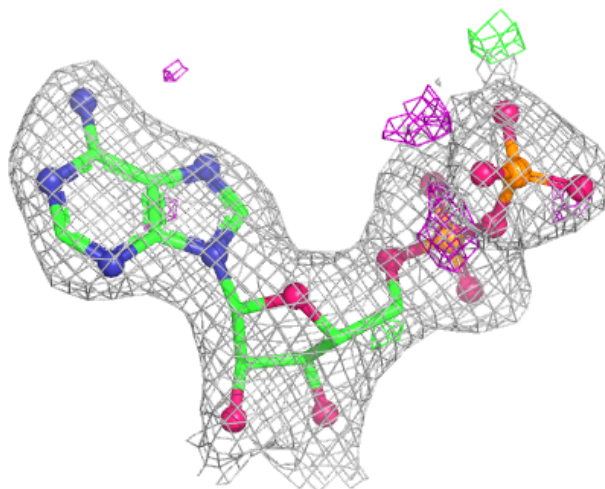
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	ADP	B	326	27/27	0.97	0.06	28,35,47,47	0
2	FBP	A	323	20/20	0.98	0.06	27,31,45,45	4
3	MG	A	327	1/1	0.98	0.04	27,27,27,27	0

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.

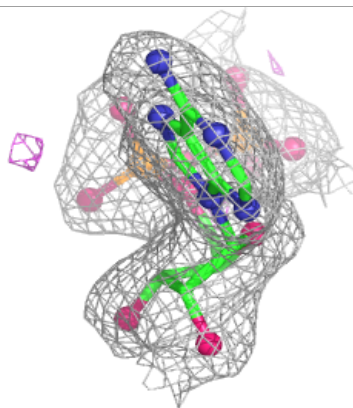
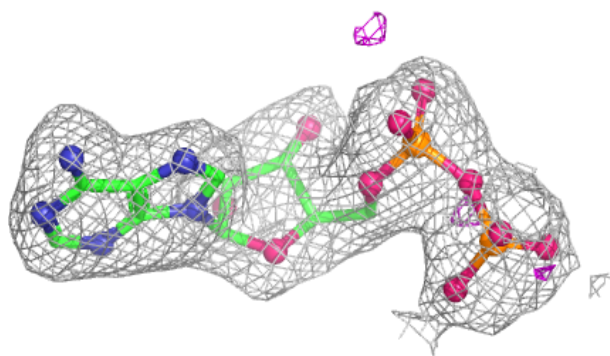
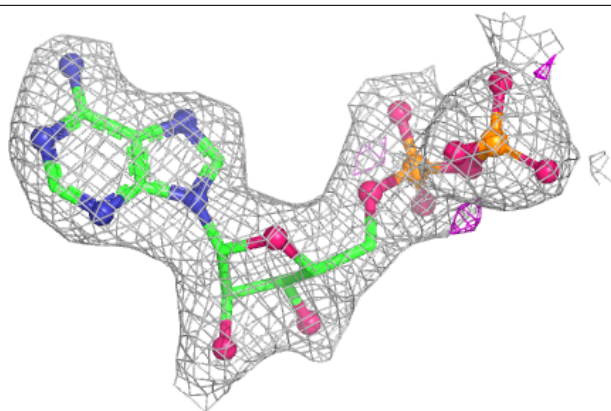
Electron density around ADP B 324:

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

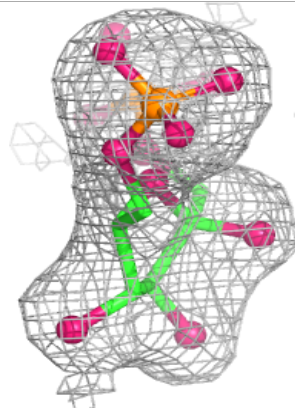
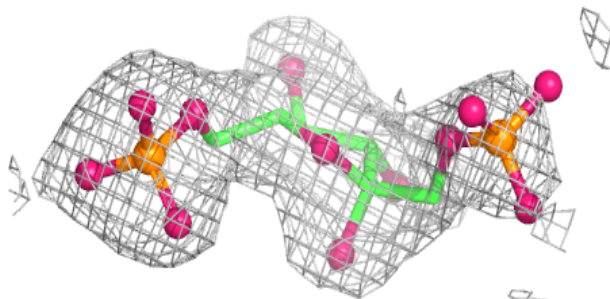
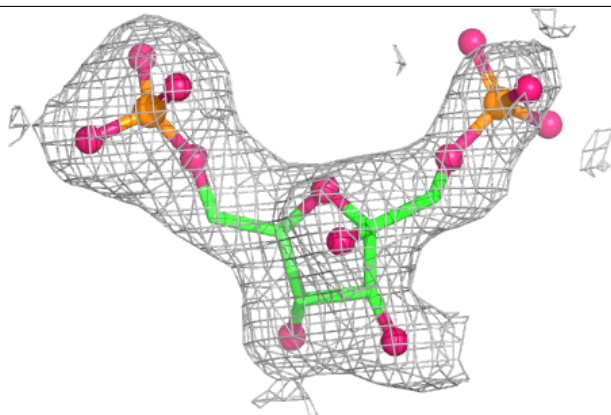


Electron density around ADP A 324:

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

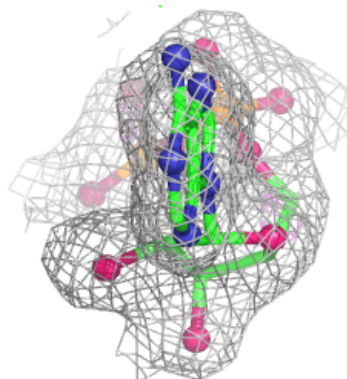
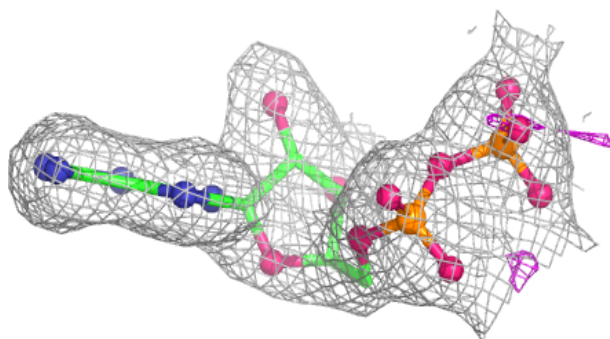
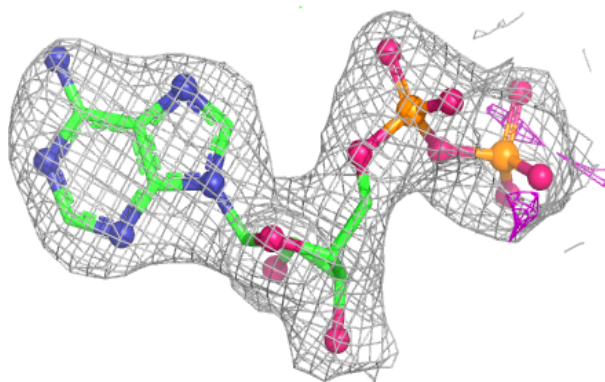
**Electron density around FBP B 323:**

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

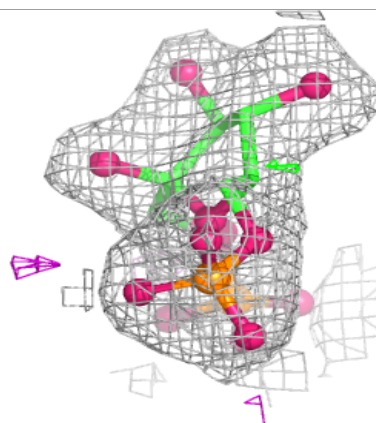
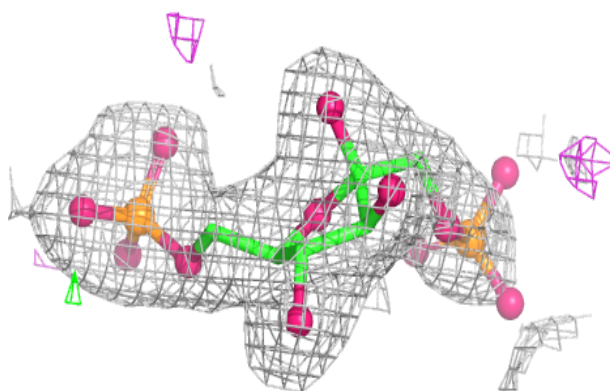
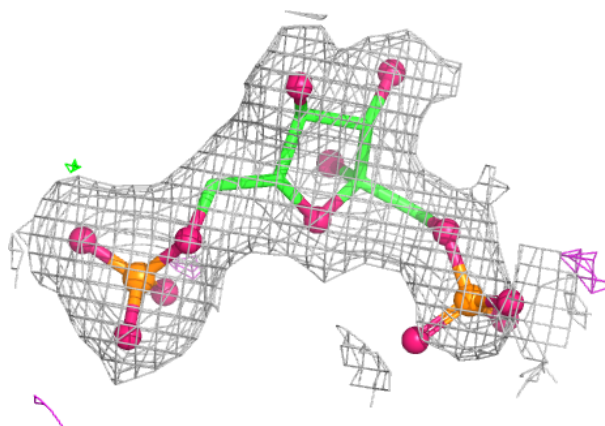


Electron density around ADP B 326:

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

**Electron density around FBP A 323:**

$2mF_o-DF_c$ (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.