



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 03:59 PM UTC

PDB ID : 3GQY / pdb_00003gqy
Title : Activator-Bound Structure of Human Pyruvate Kinase M2
Authors : Hong, B.; Dimov, S.; Tempel, W.; Auld, D.; Thomas, C.; Boxer, M.; Jianq, J.-K.; Skoumbourdis, A.; Min, S.; Southall, N.; Arrowsmith, C.H.; Edwards, A.M.; Bountra, C.; Weigelt, J.; Bochkarev, A.; Inglese, J.; Park, H.; Structural Genomics Consortium (SGC)
Deposited on : 2009-03-24
Resolution : 1.85 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](#) ①) 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

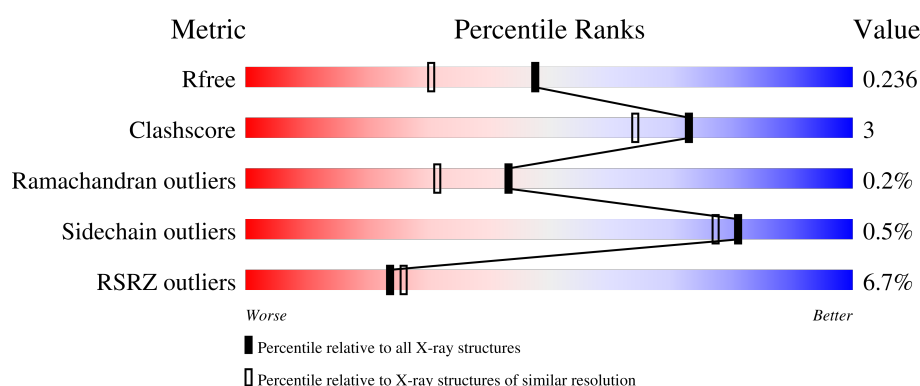
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3428 (1.86-1.86)
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)
RSRZ outliers	180081	3429 (1.86-1.86)

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	550	7% 85% 8% 7%
1	B	550	7% 85% 7% 8%
1	C	550	3% 88% 5% 6%
1	D	550	8% 85% 7% 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	UNX	A	532	-	-	-	X
4	UNX	B	532	-	-	-	X
4	UNX	B	533	-	-	-	X
4	UNX	B	534	-	-	-	X
4	UNX	C	532	-	-	-	X
4	UNX	C	533	-	-	-	X
4	UNX	D	532	-	-	-	X
4	UNX	D	533	-	-	-	X
4	UNX	D	534	-	-	-	X

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 15931 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 Pyruvate kinase isozymes M1/M2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	514	Total	C	N	O	S	0	0	0
			3819	2404	668	722	25			
1	B	504	Total	C	N	O	S	0	1	0
			3724	2344	658	698	24			
1	C	515	Total	C	N	O	S	0	0	0
			3805	2393	669	719	24			
1	D	505	Total	C	N	O	S	0	0	0
			3708	2333	656	695	24			

There are 76 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	MET	-	expression tag	UNP P14618
A	-17	GLY	-	expression tag	UNP P14618
A	-16	SER	-	expression tag	UNP P14618
A	-15	SER	-	expression tag	UNP P14618
A	-14	HIS	-	expression tag	UNP P14618
A	-13	HIS	-	expression tag	UNP P14618
A	-12	HIS	-	expression tag	UNP P14618
A	-11	HIS	-	expression tag	UNP P14618
A	-10	HIS	-	expression tag	UNP P14618
A	-9	HIS	-	expression tag	UNP P14618
A	-8	SER	-	expression tag	UNP P14618
A	-7	SER	-	expression tag	UNP P14618
A	-6	GLY	-	expression tag	UNP P14618
A	-5	LEU	-	expression tag	UNP P14618
A	-4	VAL	-	expression tag	UNP P14618
A	-3	PRO	-	expression tag	UNP P14618
A	-2	ARG	-	expression tag	UNP P14618
A	-1	GLY	-	expression tag	UNP P14618
A	0	SER	-	expression tag	UNP P14618
B	-18	MET	-	expression tag	UNP P14618
B	-17	GLY	-	expression tag	UNP P14618

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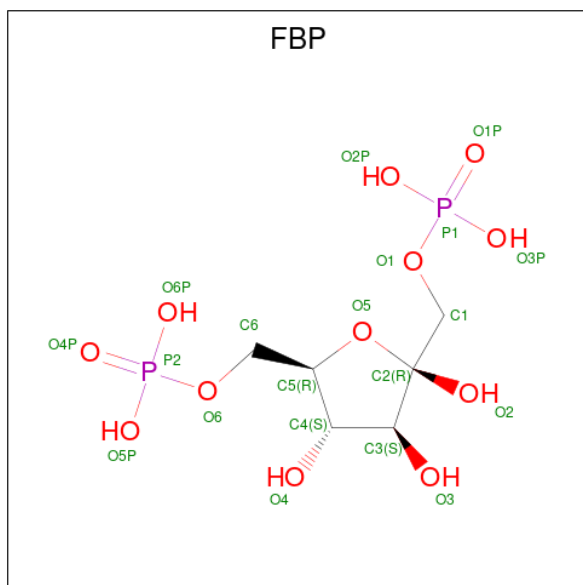
Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	SER	-	expression tag	UNP P14618
B	-15	SER	-	expression tag	UNP P14618
B	-14	HIS	-	expression tag	UNP P14618
B	-13	HIS	-	expression tag	UNP P14618
B	-12	HIS	-	expression tag	UNP P14618
B	-11	HIS	-	expression tag	UNP P14618
B	-10	HIS	-	expression tag	UNP P14618
B	-9	HIS	-	expression tag	UNP P14618
B	-8	SER	-	expression tag	UNP P14618
B	-7	SER	-	expression tag	UNP P14618
B	-6	GLY	-	expression tag	UNP P14618
B	-5	LEU	-	expression tag	UNP P14618
B	-4	VAL	-	expression tag	UNP P14618
B	-3	PRO	-	expression tag	UNP P14618
B	-2	ARG	-	expression tag	UNP P14618
B	-1	GLY	-	expression tag	UNP P14618
B	0	SER	-	expression tag	UNP P14618
C	-18	MET	-	expression tag	UNP P14618
C	-17	GLY	-	expression tag	UNP P14618
C	-16	SER	-	expression tag	UNP P14618
C	-15	SER	-	expression tag	UNP P14618
C	-14	HIS	-	expression tag	UNP P14618
C	-13	HIS	-	expression tag	UNP P14618
C	-12	HIS	-	expression tag	UNP P14618
C	-11	HIS	-	expression tag	UNP P14618
C	-10	HIS	-	expression tag	UNP P14618
C	-9	HIS	-	expression tag	UNP P14618
C	-8	SER	-	expression tag	UNP P14618
C	-7	SER	-	expression tag	UNP P14618
C	-6	GLY	-	expression tag	UNP P14618
C	-5	LEU	-	expression tag	UNP P14618
C	-4	VAL	-	expression tag	UNP P14618
C	-3	PRO	-	expression tag	UNP P14618
C	-2	ARG	-	expression tag	UNP P14618
C	-1	GLY	-	expression tag	UNP P14618
C	0	SER	-	expression tag	UNP P14618
D	-18	MET	-	expression tag	UNP P14618
D	-17	GLY	-	expression tag	UNP P14618
D	-16	SER	-	expression tag	UNP P14618
D	-15	SER	-	expression tag	UNP P14618
D	-14	HIS	-	expression tag	UNP P14618
D	-13	HIS	-	expression tag	UNP P14618

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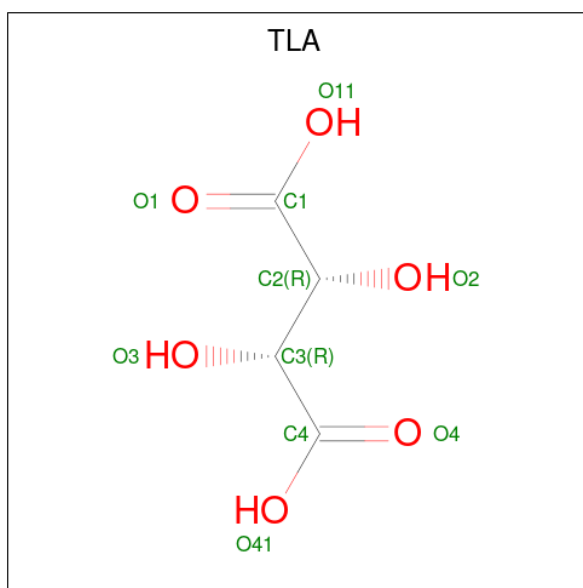
Chain	Residue	Modelled	Actual	Comment	Reference
D	-12	HIS	-	expression tag	UNP P14618
D	-11	HIS	-	expression tag	UNP P14618
D	-10	HIS	-	expression tag	UNP P14618
D	-9	HIS	-	expression tag	UNP P14618
D	-8	SER	-	expression tag	UNP P14618
D	-7	SER	-	expression tag	UNP P14618
D	-6	GLY	-	expression tag	UNP P14618
D	-5	LEU	-	expression tag	UNP P14618
D	-4	VAL	-	expression tag	UNP P14618
D	-3	PRO	-	expression tag	UNP P14618
D	-2	ARG	-	expression tag	UNP P14618
D	-1	GLY	-	expression tag	UNP P14618
D	0	SER	-	expression tag	UNP P14618

- 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		
2	C	1	Total	C	O	P	0	0
			6	1	4	1		
2	D	1	Total	C	O	P	0	0
			20	6	12	2		

- Molecule 3 is L(+)-TARTARIC ACID (CCD ID: TLA) (formula: $C_4H_6O_6$).



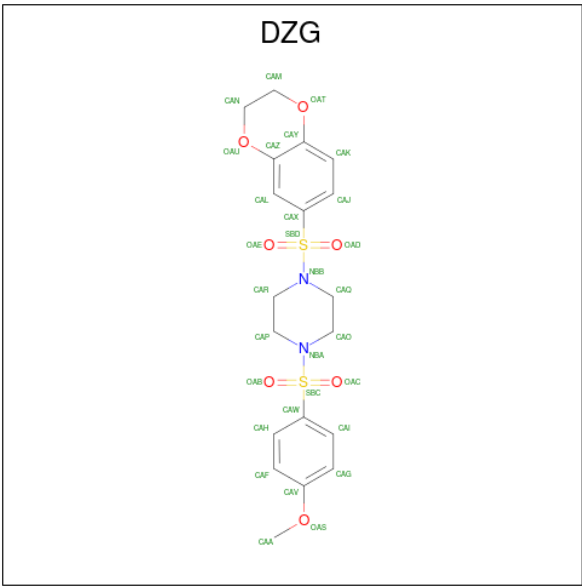
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			10	4	6		
3	B	1	Total	C	O	0	0
			10	4	6		
3	B	1	Total	C	O	0	0
			10	4	6		
3	C	1	Total	C	O	0	0
			10	4	6		
3	D	1	Total	C	O	0	0
			10	4	6		
3	D	1	Total	C	O	0	0
			10	4	6		

- Molecule 4 is UNKNOWN ATOM OR ION (CCD ID: UNX) (formula: X).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	X	0	0
			1	1		
4	B	3	Total	X	0	0
			3	3		
4	C	2	Total	X	0	0
			2	2		
4	D	3	Total	X	0	0
			3	3		

- Molecule 5 is 1-(2,3-dihydro-1,4-benzodioxin-6-ylsulfonyl)-4-[(4-methoxyphenyl)sulfonyl]pip

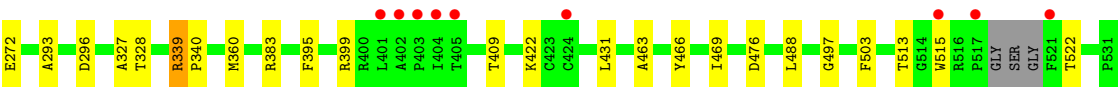
erazine (CCD ID: DZG) (formula: C₁₉H₂₂N₂O₇S₂).



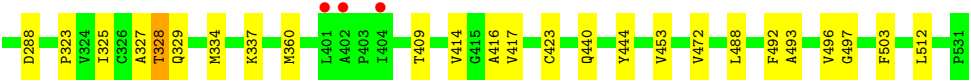
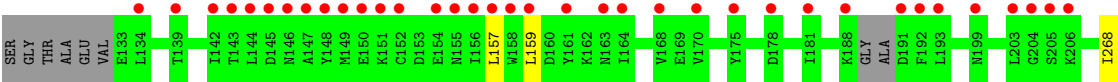
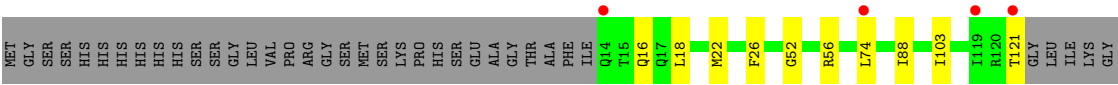
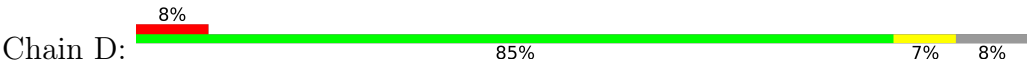
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	S	0	0
			30	19	2	7	2		
5	C	1	Total	C	N	O	S	0	0
			30	19	2	7	2		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	182	Total	O	0	0
			182	182		
6	B	164	Total	O	0	0
			164	164		
6	C	174	Total	O	0	0
			174	174		
6	D	160	Total	O	0	0
			160	160		



● Molecule 1: Pyruvate kinases M1/M2



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	81.15Å 152.95Å 93.16Å 90.00° 103.28° 90.00°	Depositor
Resolution (Å)	25.00 – 1.85 25.00 – 1.85	Depositor EDS
% Data completeness (in resolution range)	96.7 (25.00-1.85) 96.7 (25.00-1.85)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.88 (at 1.85Å)	Xtriage
Refinement program	REFMAC 5.5.0088	Depositor
R, R_{free}	0.213 , 0.238 0.213 , 0.236	Depositor DCC
R_{free} test set	2125 reflections (1.17%)	wwPDB-VP
Wilson B-factor (Å ²)	30.6	Xtriage
Anisotropy	0.033	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 39.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	15931	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.27% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: DZG, UNX, FBP, TLA

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	0.68	0/3882	0.71	0/5264
1	B	0.66	1/3786 (0.0%)	0.72	0/5134
1	C	0.65	0/3866	0.70	0/5246
1	D	0.65	0/3770	0.71	0/5117
All	All	0.66	1/15304 (0.0%)	0.71	0/20761

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	362	SER	CA-C	5.28	1.55	1.52

There are no bond angle outliers.

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	3819	0	3754	33	0
1	B	3724	0	3636	25	0
1	C	3805	0	3735	19	0
1	D	3708	0	3578	25	0
2	A	20	0	10	1	0
2	B	20	0	10	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	6	0	0	0	0
2	D	20	0	10	0	0
3	A	10	0	4	0	0
3	B	20	0	8	0	0
3	C	10	0	4	0	0
3	D	20	0	8	0	0
4	A	1	0	0	0	0
4	B	3	0	0	0	0
4	C	2	0	0	0	0
4	D	3	0	0	0	0
5	B	30	0	22	4	0
5	C	30	0	22	3	0
6	A	182	0	0	0	0
6	B	164	0	0	0	0
6	C	174	0	0	0	0
6	D	160	0	0	0	0
All	All	15931	0	14801	96	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 3.

All (96) 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:159:LEU:HD21	1:A:209:VAL:HG21	1.46	0.94
1:A:496:VAL:O	1:A:500:ARG:HG2	1.91	0.70
1:A:159:LEU:CD2	1:A:209:VAL:HG21	2.21	0.69
1:B:409[A]:THR:HG22	1:B:440:GLN:OE1	1.95	0.66
1:A:16:GLN:HG2	1:A:40:ILE:HG23	1.78	0.65
1:A:526:ARG:HD3	1:C:515:TRP:CD2	2.36	0.61
1:D:409:THR:CG2	1:D:440:GLN:OE1	2.49	0.61
1:B:453:VAL:HG21	1:B:493:ALA:HB2	1.84	0.59
1:B:409[A]:THR:CG2	1:B:440:GLN:OE1	2.52	0.58
1:D:416:ALA:HB2	1:D:512:LEU:HD21	1.86	0.57
1:A:416:ALA:HB2	1:A:512:LEU:HD21	1.86	0.57
1:B:404:ILE:HD13	1:D:22:MET:HE1	1.87	0.57
1:C:466:TYR:HB2	1:C:469:ILE:HD12	1.87	0.56
1:C:395:PHE:CZ	1:C:399:ARG:HD2	2.42	0.55
1:D:488:LEU:C	1:D:488:LEU:HD23	2.31	0.54
1:C:27:LEU:HD13	5:C:540:DZG:HAM	1.90	0.54
1:A:472:VAL:HG11	1:A:496:VAL:HG11	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:476:ASP:OD2	1:C:488:LEU:HD21	2.08	0.53
1:B:463:ALA:HB1	1:B:469:ILE:HG21	1.90	0.53
1:A:27:LEU:HD13	5:B:540:DZG:HAM	1.90	0.53
1:D:409:THR:HG21	1:D:440:GLN:OE1	2.09	0.53
1:C:327:ALA:HB1	1:C:360:MET:HE2	1.90	0.53
1:C:488:LEU:C	1:C:488:LEU:HD23	2.35	0.52
1:A:526:ARG:HD3	1:C:515:TRP:CE3	2.45	0.52
1:B:453:VAL:CG2	1:B:493:ALA:HB2	2.39	0.52
1:D:472:VAL:HG11	1:D:496:VAL:HG11	1.91	0.52
1:B:508:VAL:HG21	1:B:527:VAL:CG1	2.40	0.52
1:B:508:VAL:CG2	1:B:527:VAL:CG1	2.89	0.50
1:B:508:VAL:CG2	1:B:527:VAL:HG13	2.42	0.49
1:B:416:ALA:HB2	1:B:512:LEU:HD21	1.95	0.49
1:A:134:LEU:HD11	1:A:203:LEU:HD22	1.94	0.48
1:B:185:VAL:HA	1:B:195:THR:HG22	1.95	0.48
1:A:430:VAL:HG22	1:A:512:LEU:HD12	1.95	0.48
1:B:121:THR:HB	1:B:157:LEU:HD11	1.96	0.47
1:B:409[A]:THR:HG23	1:B:522:THR:HB	1.96	0.47
1:C:27:LEU:HD13	5:C:540:DZG:CAM	2.44	0.47
1:B:221:VAL:HG12	1:B:226:ILE:HG13	1.97	0.47
1:C:339:ARG:HB2	1:C:340:PRO:HD2	1.97	0.47
1:A:412:THR:HG22	1:A:512:LEU:HD22	1.96	0.47
1:A:27:LEU:HD13	5:B:540:DZG:CAM	2.46	0.46
1:B:488:LEU:HD23	1:B:488:LEU:C	2.40	0.46
1:A:161:TYR:CE1	1:A:164:ILE:HA	2.50	0.46
1:C:175:TYR:HB3	1:C:179:GLY:HA2	1.97	0.46
1:D:103:ILE:HD13	1:D:492:PHE:CE1	2.50	0.46
1:A:510:ILE:CD1	1:A:527:VAL:HG22	2.46	0.46
1:A:497:GLY:HA3	1:A:503:PHE:CZ	2.51	0.46
1:A:494:MET:HE1	1:A:509:VAL:CG2	2.46	0.46
1:A:488:LEU:C	1:A:488:LEU:HD23	2.41	0.46
1:A:494:MET:HE1	1:A:509:VAL:HG21	1.99	0.45
1:D:497:GLY:HA3	1:D:503:PHE:CZ	2.51	0.45
1:A:328:THR:HG22	1:A:329:GLN:HG3	1.99	0.45
1:A:272:GLU:HG2	1:A:293:ALA:HB3	1.99	0.45
1:A:514:GLY:HA3	2:A:541:FBP:O3	2.17	0.45
1:B:497:GLY:HA3	1:B:503:PHE:CZ	2.52	0.45
1:C:463:ALA:HB1	1:C:469:ILE:HG21	1.99	0.45
1:A:142:ILE:HD12	1:A:142:ILE:N	2.32	0.44
1:D:453:VAL:CG2	1:D:493:ALA:HB2	2.47	0.44
1:B:16:GLN:NE2	1:B:40:ILE:HD13	2.32	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:48:ILE:HG12	1:C:71:VAL:HB	2.00	0.44
1:D:52:GLY:O	1:D:56:ARG:HB2	2.18	0.44
1:D:74:LEU:HD11	1:D:88:ILE:HG13	2.00	0.44
1:D:121:THR:HA	1:D:159:LEU:HD23	1.98	0.44
1:B:112:LEU:HD23	1:B:112:LEU:C	2.42	0.44
1:C:497:GLY:HA3	1:C:503:PHE:CZ	2.52	0.44
1:D:16:GLN:HG3	1:D:18:LEU:HG	2.00	0.44
1:D:334:MET:HA	1:D:337:LYS:O	2.18	0.44
1:D:453:VAL:HG21	1:D:493:ALA:HB2	2.00	0.44
1:D:288:ASP:O	1:D:323:PRO:HD2	2.19	0.43
1:B:334:MET:HA	1:B:337:LYS:O	2.19	0.43
5:C:540:DZG:HAP	1:D:26:PHE:CE1	2.53	0.43
1:C:409:THR:HG22	1:C:522:THR:O	2.19	0.43
1:D:409:THR:HG22	1:D:440:GLN:OE1	2.19	0.43
1:D:328:THR:HG22	1:D:329:GLN:HG3	2.00	0.43
1:A:463:ALA:HB1	1:A:469:ILE:HG21	2.01	0.43
1:A:331:LEU:HD23	1:A:344:GLU:HB3	2.00	0.42
1:A:26:PHE:CE1	5:B:540:DZG:HARA	2.54	0.42
1:A:292:VAL:HG12	1:A:294:ARG:HG2	2.02	0.42
1:D:327:ALA:HB1	1:D:360:MET:HE2	2.01	0.42
1:A:466:TYR:HB2	1:A:469:ILE:HD12	2.02	0.42
1:B:38:PRO:HA	1:B:39:PRO:HD3	1.97	0.42
1:B:255:ARG:CZ	1:B:267:ILE:HD12	2.50	0.42
1:B:418:GLU:HG3	1:D:414:VAL:HG13	2.00	0.42
1:A:38:PRO:HA	1:A:39:PRO:HD3	1.94	0.42
1:B:30:MET:SD	5:B:540:DZG:HAAB	2.60	0.42
1:C:40:ILE:O	1:C:383:ARG:HD2	2.20	0.42
1:D:417:VAL:HG21	1:D:444:TYR:HB2	2.02	0.41
1:A:507:ASP:O	1:A:530:VAL:HG23	2.20	0.41
1:A:52:GLY:O	1:A:56:ARG:HB2	2.21	0.41
1:B:327:ALA:HB1	1:B:360:MET:HE2	2.02	0.41
1:A:453:VAL:HG21	1:A:493:ALA:HB2	2.03	0.41
1:C:272:GLU:HB3	1:C:293:ALA:HB3	2.02	0.41
1:D:121:THR:HB	1:D:157:LEU:HD11	2.02	0.41
1:A:402:ALA:HB1	1:C:422:LYS:NZ	2.36	0.40
1:B:405:THR:O	1:D:423:CYS:HA	2.21	0.40
1:D:268:ILE:HG21	1:D:325:ILE:HD12	2.03	0.40
1:C:431:LEU:HG	1:C:513:THR:HG22	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	510/550 (93%)	502 (98%)	7 (1%)	1 (0%)	43	31
1	B	497/550 (90%)	490 (99%)	6 (1%)	1 (0%)	43	31
1	C	511/550 (93%)	503 (98%)	7 (1%)	1 (0%)	43	31
1	D	499/550 (91%)	492 (99%)	6 (1%)	1 (0%)	43	31
All	All	2017/2200 (92%)	1987 (98%)	26 (1%)	4 (0%)	43	31

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	328	THR
1	A	328	THR
1	C	328	THR
1	D	328	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	388/452 (86%)	386 (100%)	2 (0%)	81	77
1	B	372/452 (82%)	370 (100%)	2 (0%)	81	77
1	C	384/452 (85%)	381 (99%)	3 (1%)	73	67
1	D	365/452 (81%)	365 (100%)	0	100	100
All	All	1509/1808 (84%)	1502 (100%)	7 (0%)	81	77

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	272	GLU
1	A	296	ASP
1	B	431	LEU
1	B	508	VAL
1	C	74	LEU
1	C	296	ASP
1	C	339	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	44	ASN
1	A	252	HIS
1	A	523	ASN
1	C	44	ASN
1	C	458	GLN
1	D	44	ASN
1	D	78	HIS
1	D	458	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 9 are unknown - leaving 12 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	D	541	-	18,20,20	0.90	1 (5%)	21,32,32	0.74	0
3	TLA	B	543	-	9,9,9	1.08	0	12,12,12	1.01	1 (8%)
2	FBP	B	541	-	18,20,20	0.90	1 (5%)	21,32,32	0.72	0
2	FBP	C	541	-	5,5,20	1.05	0	7,7,32	0.56	0
3	TLA	C	542	-	9,9,9	1.18	0	12,12,12	0.94	0
3	TLA	B	542	-	9,9,9	1.24	0	12,12,12	1.08	1 (8%)
2	FBP	A	541	-	18,20,20	1.00	1 (5%)	21,32,32	0.63	0
3	TLA	D	542	-	9,9,9	1.28	0	12,12,12	0.99	1 (8%)
3	TLA	D	543	-	9,9,9	1.23	0	12,12,12	0.92	0
5	DZG	C	540	-	33,33,33	2.67	6 (18%)	49,49,49	2.19	8 (16%)
3	TLA	A	542	-	9,9,9	1.05	0	12,12,12	0.96	1 (8%)
5	DZG	B	540	-	33,33,33	2.88	6 (18%)	49,49,49	2.22	9 (18%)

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	D	541	-	-	2/13/32/32	0/1/1/1
3	TLA	B	543	-	-	0/12/12/12	-
2	FBP	B	541	-	-	2/13/32/32	0/1/1/1
2	FBP	C	541	-	-	0/1/3/32	-
3	TLA	C	542	-	-	0/12/12/12	-
3	TLA	B	542	-	-	0/12/12/12	-
2	FBP	A	541	-	-	2/13/32/32	0/1/1/1
3	TLA	D	542	-	-	0/12/12/12	-
3	TLA	D	543	-	-	0/12/12/12	-
5	DZG	C	540	-	-	1/26/43/43	0/4/4/4
3	TLA	A	542	-	-	6/12/12/12	-
5	DZG	B	540	-	-	0/26/43/43	0/4/4/4

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	540	DZG	SBC-NBA	7.49	1.74	1.63
5	C	540	DZG	OAE-SBD	6.88	1.50	1.43
5	B	540	DZG	OAE-SBD	6.83	1.50	1.43
5	B	540	DZG	OAB-SBC	6.48	1.50	1.43
5	B	540	DZG	OAC-SBC	6.33	1.50	1.43
5	C	540	DZG	OAC-SBC	6.28	1.50	1.43
5	B	540	DZG	OAD-SBD	5.90	1.49	1.43
5	B	540	DZG	SBD-NBB	5.89	1.71	1.63
5	C	540	DZG	SBC-NBA	5.83	1.71	1.63
5	C	540	DZG	SBD-NBB	5.77	1.71	1.63
5	C	540	DZG	OAB-SBC	5.69	1.49	1.43
5	C	540	DZG	OAD-SBD	5.20	1.49	1.43
2	A	541	FBP	O2-C2	3.41	1.46	1.40
2	D	541	FBP	O2-C2	2.90	1.45	1.40
2	B	541	FBP	O2-C2	2.89	1.45	1.40

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	540	DZG	OAE-SBD-OAD	-7.04	108.60	119.59
5	C	540	DZG	CAX-SBD-NBB	6.81	115.49	107.28
5	B	540	DZG	OAE-SBD-OAD	-6.78	109.00	119.59
5	B	540	DZG	OAC-SBC-OAB	-6.75	109.06	119.59
5	C	540	DZG	OAC-SBC-OAB	-6.72	109.10	119.59
5	B	540	DZG	CAW-SBC-NBA	6.64	115.29	107.28
5	B	540	DZG	CAX-SBD-NBB	6.53	115.16	107.28
5	C	540	DZG	CAW-SBC-NBA	5.91	114.41	107.28
5	B	540	DZG	OAD-SBD-NBB	3.36	109.85	106.69
5	C	540	DZG	OAC-SBC-NBA	2.86	109.38	106.69
5	B	540	DZG	CAR-CAP-NBA	2.83	111.97	108.97
5	C	540	DZG	OAD-SBD-NBB	2.45	109.00	106.69
5	B	540	DZG	OAE-SBD-NBB	2.37	108.92	106.69
5	B	540	DZG	OAE-SBD-CAX	-2.36	105.17	108.10
5	C	540	DZG	CAO-NBA-SBC	-2.27	112.83	117.06
3	B	542	TLA	O41-C4-C3	2.25	119.55	113.31
3	D	542	TLA	O41-C4-C3	2.17	119.33	113.31
3	A	542	TLA	O41-C4-C3	2.11	119.18	113.31
5	C	540	DZG	OAE-SBD-CAX	-2.07	105.53	108.10
3	B	543	TLA	O41-C4-C3	2.03	118.97	113.31
5	B	540	DZG	OAB-SBC-NBA	2.02	108.58	106.69

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	541	FBP	C4-C5-C6-O6
2	B	541	FBP	C4-C5-C6-O6
2	D	541	FBP	C4-C5-C6-O6
2	A	541	FBP	O5-C5-C6-O6
2	B	541	FBP	O5-C5-C6-O6
3	A	542	TLA	O2-C2-C3-C4
2	D	541	FBP	O5-C5-C6-O6
3	A	542	TLA	O1-C1-C2-C3
3	A	542	TLA	C1-C2-C3-O3
3	A	542	TLA	C1-C2-C3-C4
5	C	540	DZG	CAP-NBA-SBC-OAC
3	A	542	TLA	O11-C1-C2-C3
3	A	542	TLA	O2-C2-C3-O3

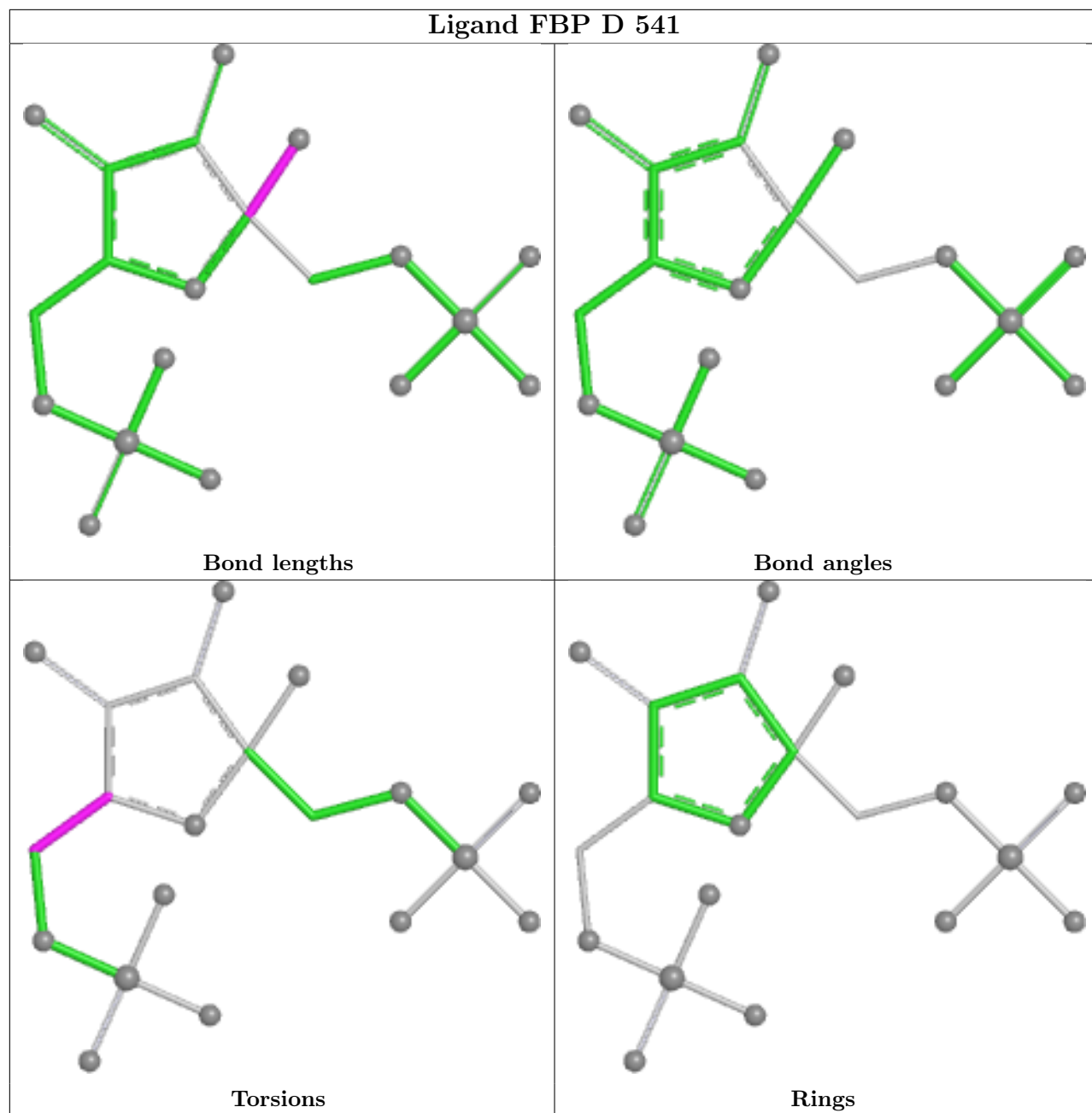
There are no ring outliers.

3 monomers are involved in 8 short contacts:

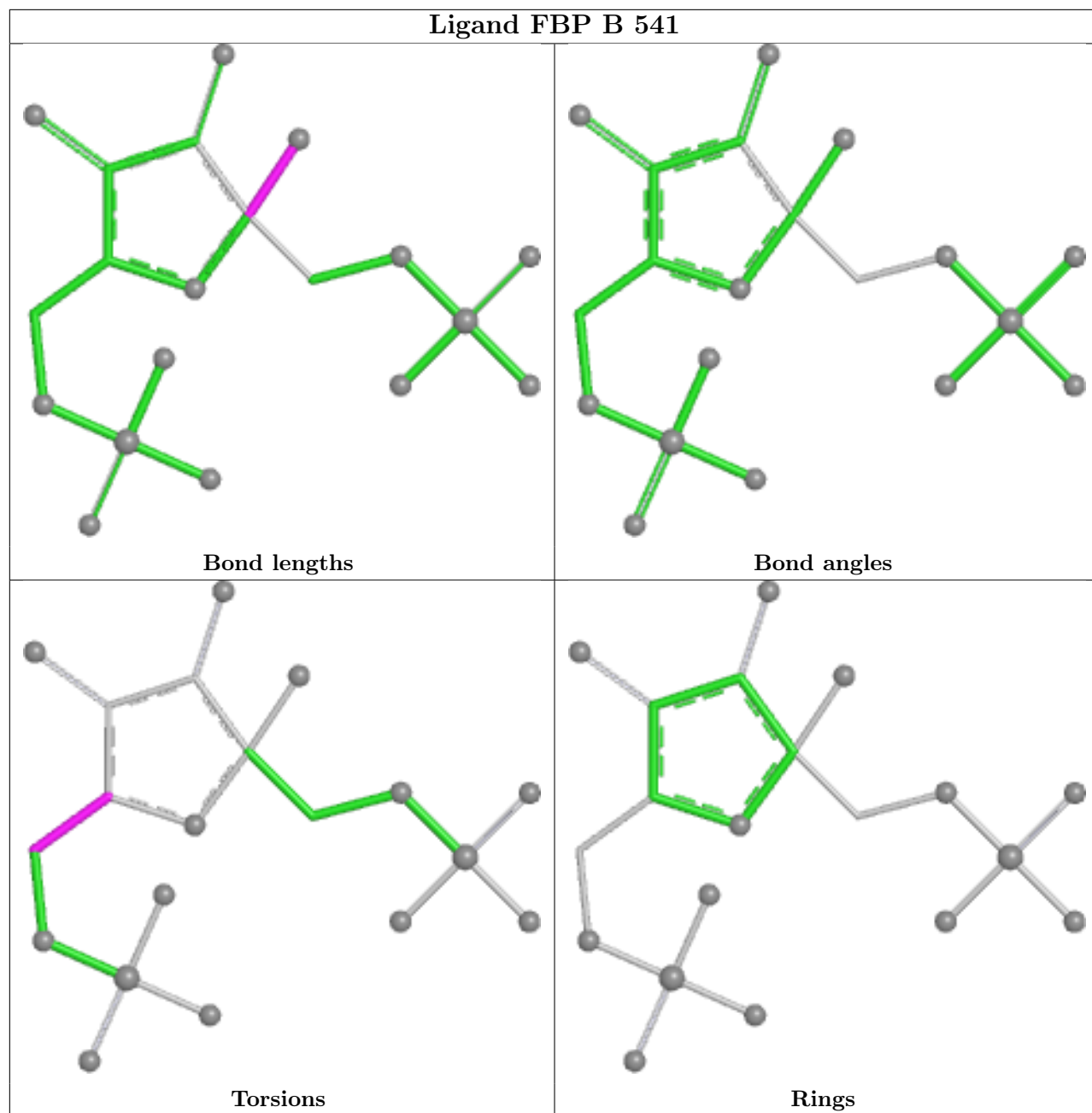
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	541	FBP	1	0
5	C	540	DZG	3	0
5	B	540	DZG	4	0

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.

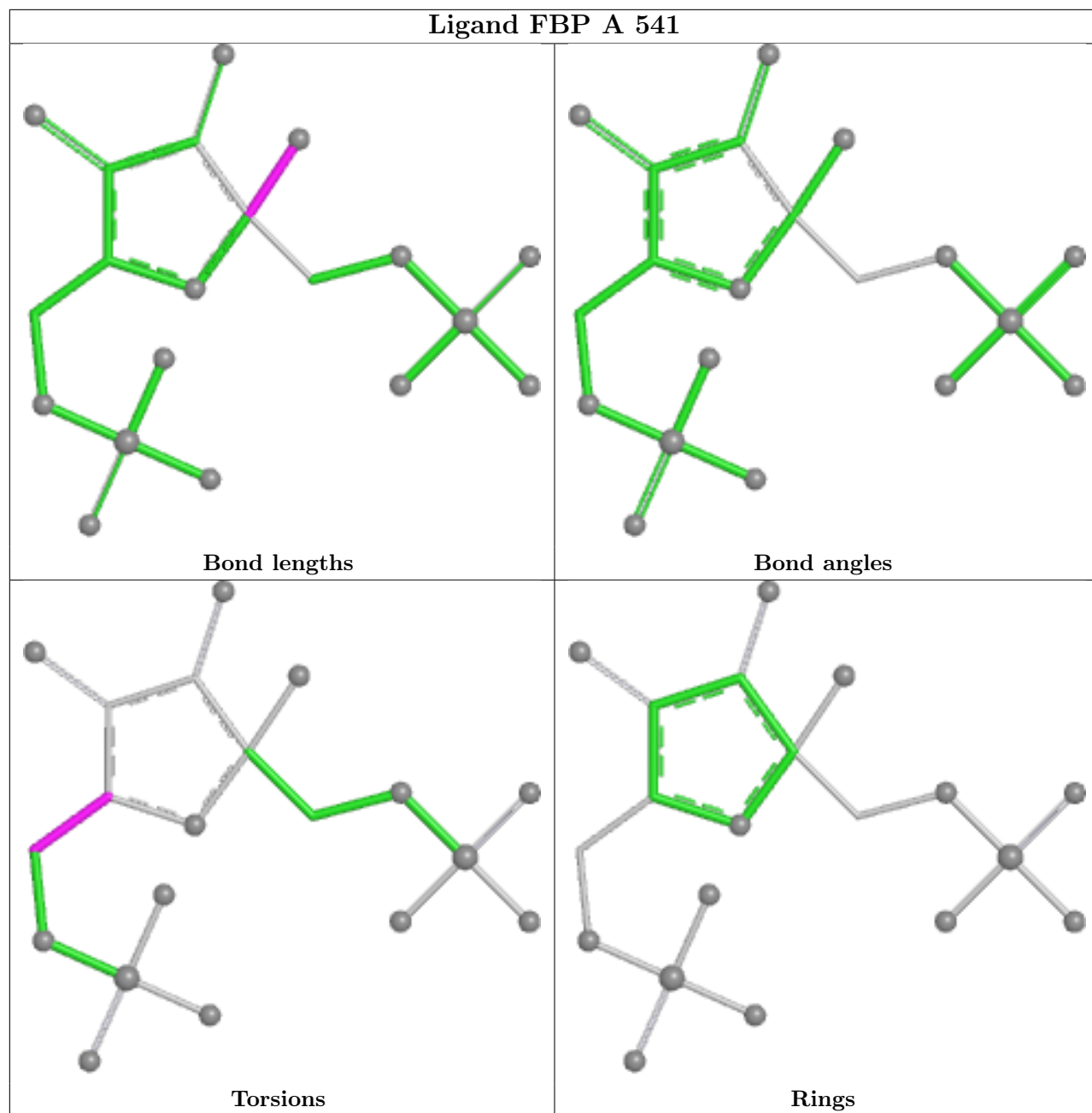
Ligand FBP D 541

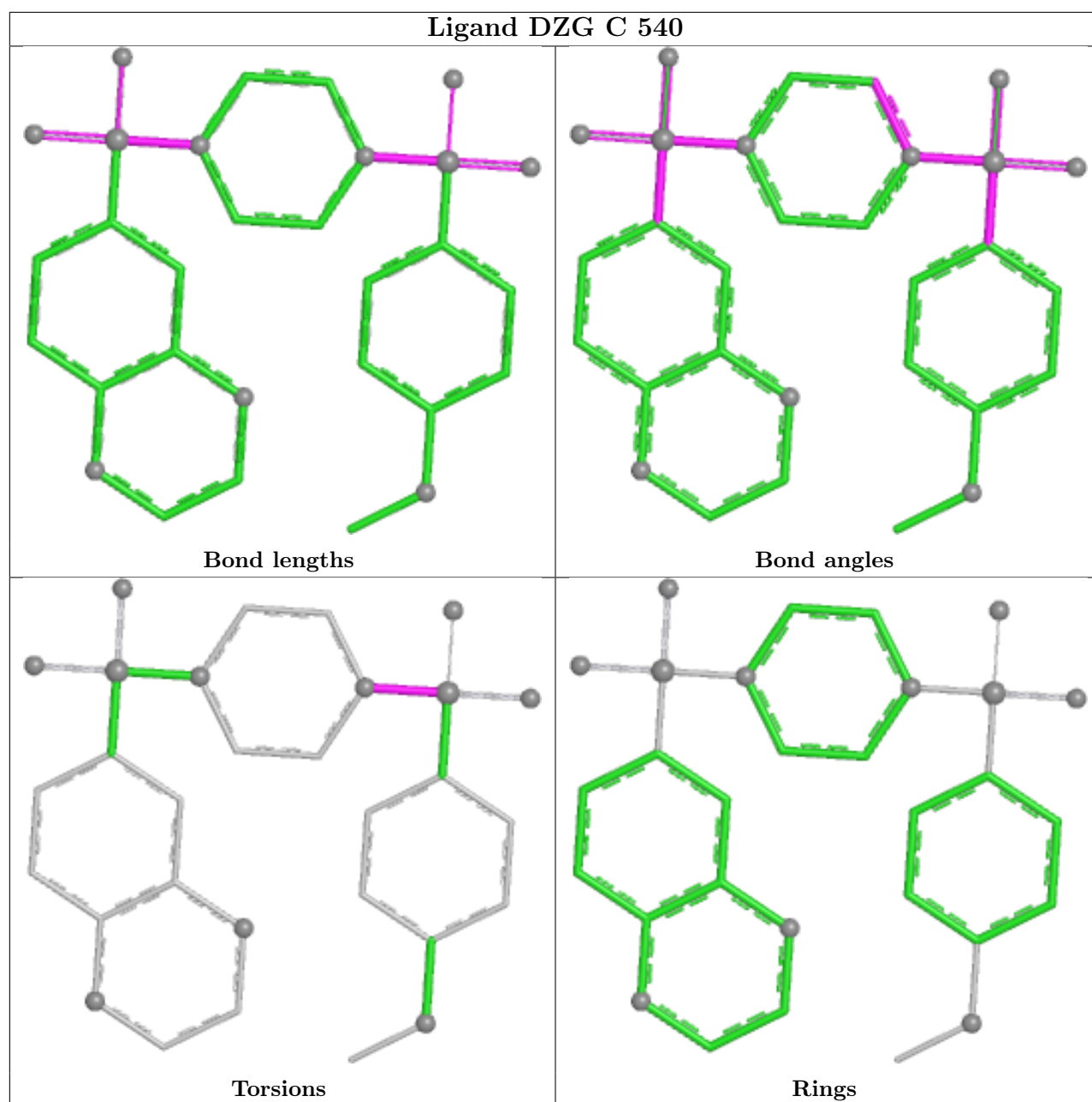


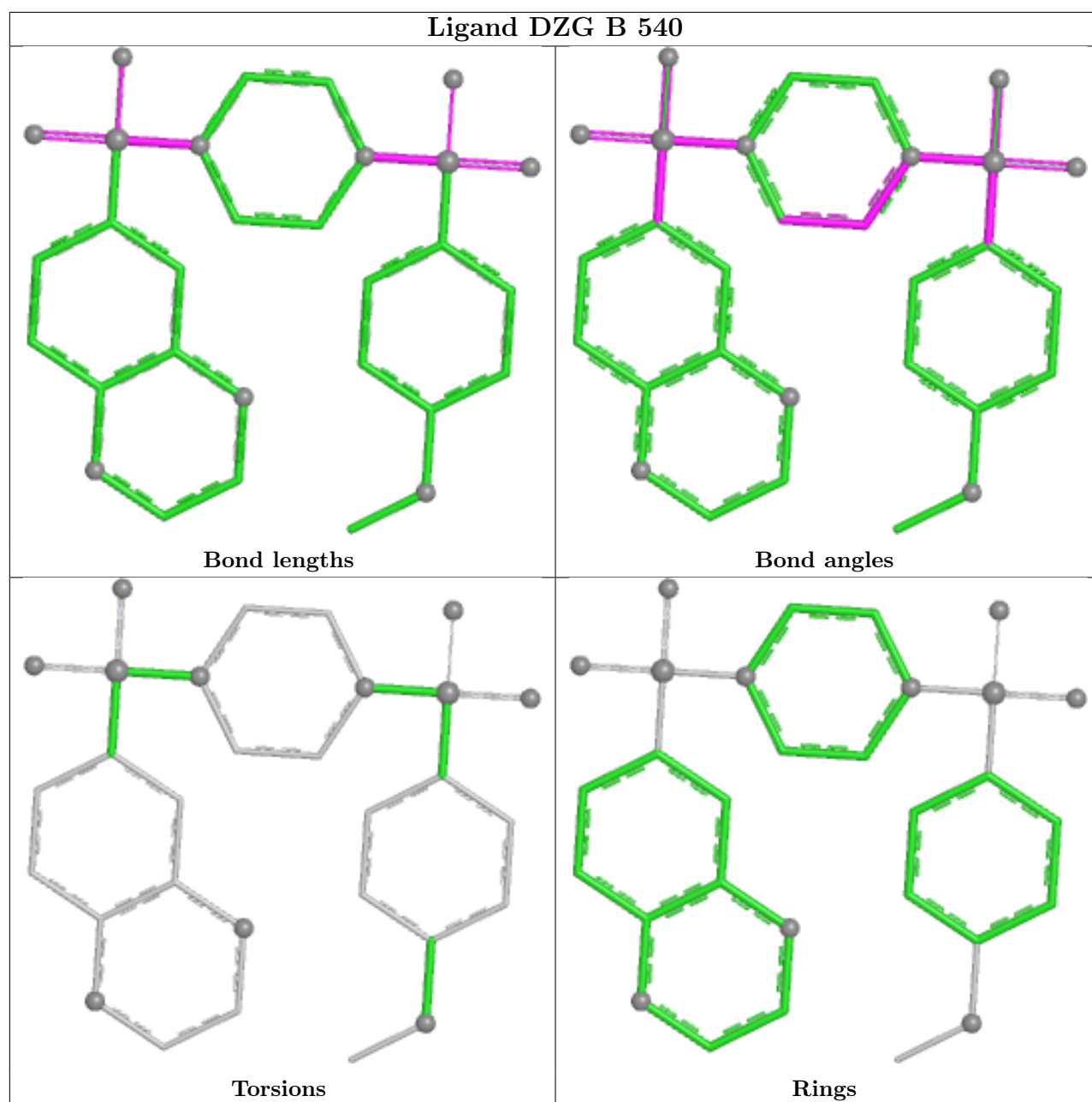
Ligand FBP B 541



Ligand FBP A 541







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å ²)	Q<0.9
1	A	514/550 (93%)	0.32	38 (7%)	20	22	19, 30, 57, 64	0
1	B	504/550 (91%)	0.30	40 (7%)	18	19	19, 30, 64, 80	1 (0%)
1	C	515/550 (93%)	0.16	16 (3%)	51	55	20, 30, 46, 61	0
1	D	505/550 (91%)	0.30	43 (8%)	16	17	20, 30, 56, 70	0
All	All	2038/2200 (92%)	0.27	137 (6%)	24	26	19, 30, 57, 80	1 (0%)

All (137) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	404	ILE	7.8
1	A	404	ILE	5.0
1	B	138	ALA	5.0
1	A	403	PRO	4.9
1	C	515	TRP	4.7
1	B	142	ILE	4.6
1	D	139	THR	4.3
1	C	517	PRO	4.3
1	D	144	LEU	4.2
1	D	14	GLN	4.1
1	B	132	VAL	4.1
1	B	194	VAL	4.0
1	B	156	ILE	4.0
1	A	168	VAL	3.9
1	D	156	ILE	3.9
1	A	134	LEU	3.9
1	B	159	LEU	3.9
1	A	192	PHE	3.9
1	A	159	LEU	3.8
1	C	403	PRO	3.8
1	A	402	ALA	3.8

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Mol	Chain	Res	Type	RSRZ
1	A	185	VAL	3.8
1	A	405	THR	3.7
1	C	402	ALA	3.6
1	A	171	GLY	3.5
1	B	143	THR	3.5
1	D	191	ASP	3.5
1	B	14	GLN	3.4
1	D	149	MET	3.4
1	B	148	TYR	3.4
1	A	137	GLY	3.4
1	D	159	LEU	3.4
1	B	133	GLU	3.3
1	D	145	ASP	3.3
1	D	404	ILE	3.3
1	D	192	PHE	3.3
1	B	157	LEU	3.3
1	A	170	VAL	3.2
1	D	143	THR	3.2
1	A	190	ALA	3.2
1	D	142	ILE	3.2
1	B	41	THR	3.2
1	D	152	CYS	3.2
1	D	134	LEU	3.1
1	D	158	TRP	3.1
1	B	193	LEU	3.1
1	D	147	ALA	3.0
1	B	183	LEU	3.0
1	B	124	ILE	3.0
1	A	202	SER	3.0
1	B	18	LEU	2.9
1	B	185	VAL	2.9
1	A	217	ASP	2.9
1	D	148	TYR	2.8
1	A	156	ILE	2.8
1	B	402	ALA	2.8
1	D	163	ASN	2.8
1	B	170	VAL	2.8
1	B	152	CYS	2.7
1	B	192	PHE	2.7
1	A	164	ILE	2.7
1	A	197	VAL	2.7
1	B	167	VAL	2.7

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Mol	Chain	Res	Type	RSRZ
1	D	121	THR	2.7
1	B	178	ASP	2.6
1	C	14	GLN	2.6
1	A	193	LEU	2.6
1	D	203	LEU	2.6
1	C	213	GLY	2.6
1	A	191	ASP	2.6
1	D	157	LEU	2.6
1	B	168	VAL	2.6
1	D	206	LYS	2.6
1	A	470	PHE	2.6
1	A	133	GLU	2.5
1	D	188	LYS	2.5
1	D	175	TYR	2.5
1	D	204	GLY	2.5
1	B	146	ASN	2.5
1	B	139	THR	2.5
1	D	401	LEU	2.5
1	B	197	VAL	2.5
1	C	168	VAL	2.5
1	C	401	LEU	2.4
1	D	193	LEU	2.4
1	B	478	VAL	2.4
1	B	40	ILE	2.4
1	D	154	GLU	2.4
1	B	153	ASP	2.3
1	A	401	LEU	2.3
1	A	40	ILE	2.3
1	B	155	ASN	2.3
1	C	163	ASN	2.3
1	D	168	VAL	2.3
1	B	191	ASP	2.3
1	D	146	ASN	2.3
1	C	139	THR	2.3
1	C	147	ALA	2.3
1	A	200	GLY	2.3
1	D	199	ASN	2.3
1	A	136	LYS	2.2
1	A	196	GLU	2.2
1	D	402	ALA	2.2
1	C	521	PHE	2.2
1	A	216	VAL	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	213	GLY	2.2
1	B	501	GLY	2.2
1	D	119	ILE	2.2
1	D	151	LYS	2.2
1	A	182	SER	2.2
1	A	162	LYS	2.2
1	D	150	GLU	2.1
1	D	161	TYR	2.1
1	B	164	ILE	2.1
1	A	172	SER	2.1
1	B	203	LEU	2.1
1	D	74	LEU	2.1
1	B	199	ASN	2.1
1	A	132	VAL	2.1
1	A	167	VAL	2.1
1	D	170	VAL	2.1
1	B	154	GLU	2.1
1	A	144	LEU	2.1
1	A	178	ASP	2.1
1	D	164	ILE	2.1
1	D	178	ASP	2.1
1	B	202	SER	2.1
1	D	205	SER	2.1
1	A	22	MET	2.1
1	C	170	VAL	2.1
1	B	140	LEU	2.1
1	C	424	CYS	2.1
1	A	215	ALA	2.1
1	D	181	ILE	2.0
1	C	405	THR	2.0
1	D	155	ASN	2.0
1	B	125	LYS	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 oligosaccharides in this entry.

6.4 Ligands ⓘ

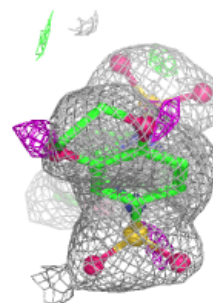
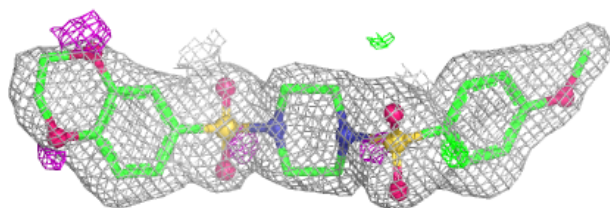
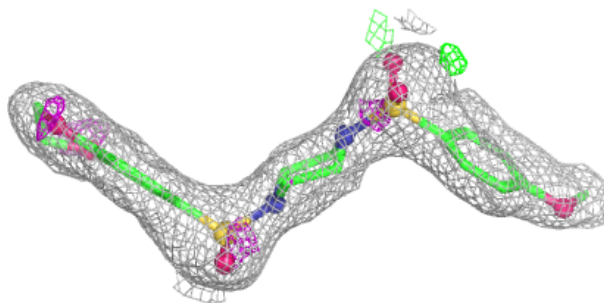
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	UNX	D	533	1/1	-0.52	1.57	2,2,2,2	1
4	UNX	C	532	1/1	-0.24	1.48	2,2,2,2	1
4	UNX	D	534	1/1	-0.00	1.44	2,2,2,2	1
4	UNX	B	532	1/1	0.12	1.34	2,2,2,2	1
4	UNX	B	534	1/1	0.31	1.39	2,2,2,2	1
4	UNX	D	532	1/1	0.51	1.53	2,2,2,2	1
4	UNX	B	533	1/1	0.57	1.22	2,2,2,2	1
4	UNX	A	532	1/1	0.58	1.43	2,2,2,2	1
4	UNX	C	533	1/1	0.60	1.22	2,2,2,2	1
3	TLA	D	543	10/10	0.78	0.11	47,49,49,49	0
3	TLA	C	542	10/10	0.85	0.11	32,38,40,40	0
3	TLA	B	543	10/10	0.88	0.08	42,43,44,44	0
3	TLA	B	542	10/10	0.88	0.09	34,37,37,37	0
5	DZG	C	540	30/30	0.89	0.12	40,44,47,47	0
3	TLA	D	542	10/10	0.90	0.08	39,39,40,40	0
3	TLA	A	542	10/10	0.90	0.08	31,35,36,36	0
2	FBP	C	541	6/20	0.90	0.11	44,45,46,47	0
5	DZG	B	540	30/30	0.92	0.11	39,41,42,44	0
2	FBP	A	541	20/20	0.94	0.09	30,35,39,39	0
2	FBP	B	541	20/20	0.97	0.06	21,27,31,32	0
2	FBP	D	541	20/20	0.98	0.05	21,22,24,25	0

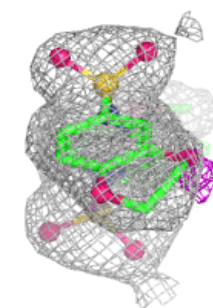
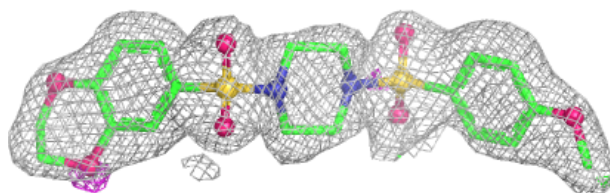
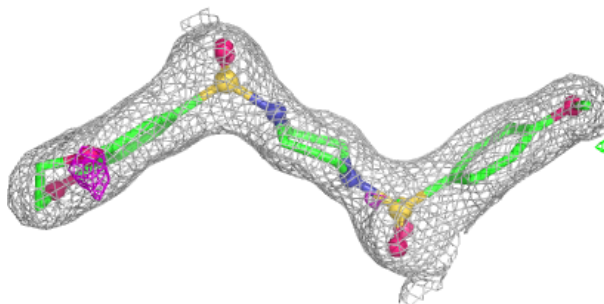
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around DZG C 540:

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

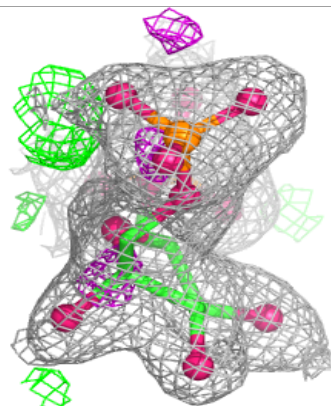
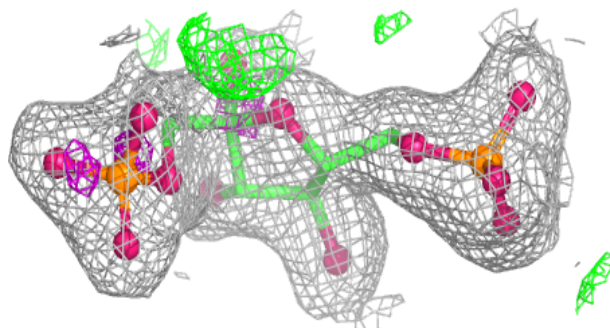
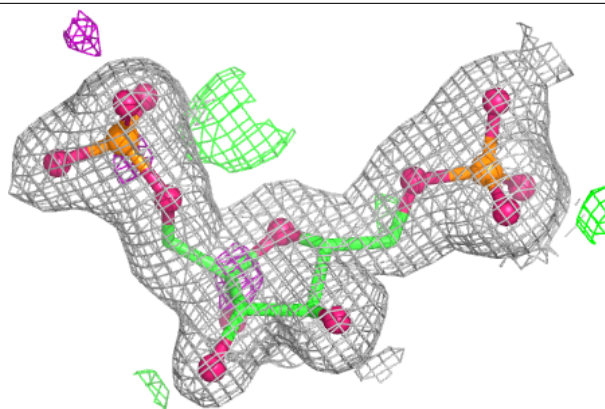
**Electron density around DZG B 540:**

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

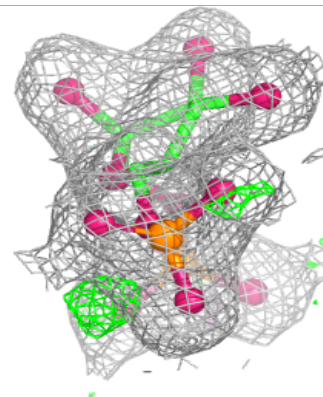
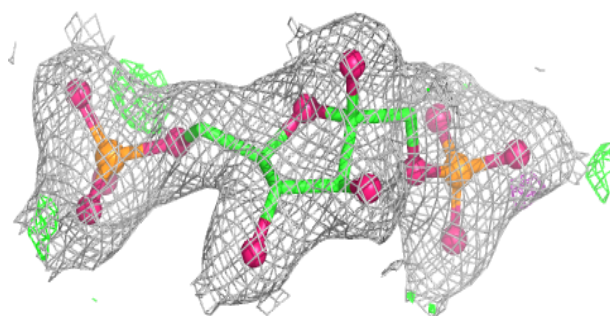
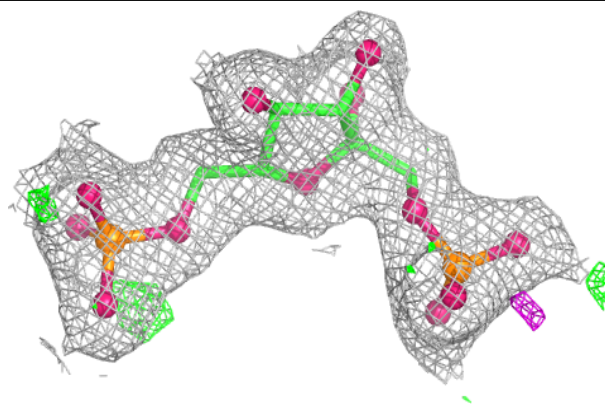


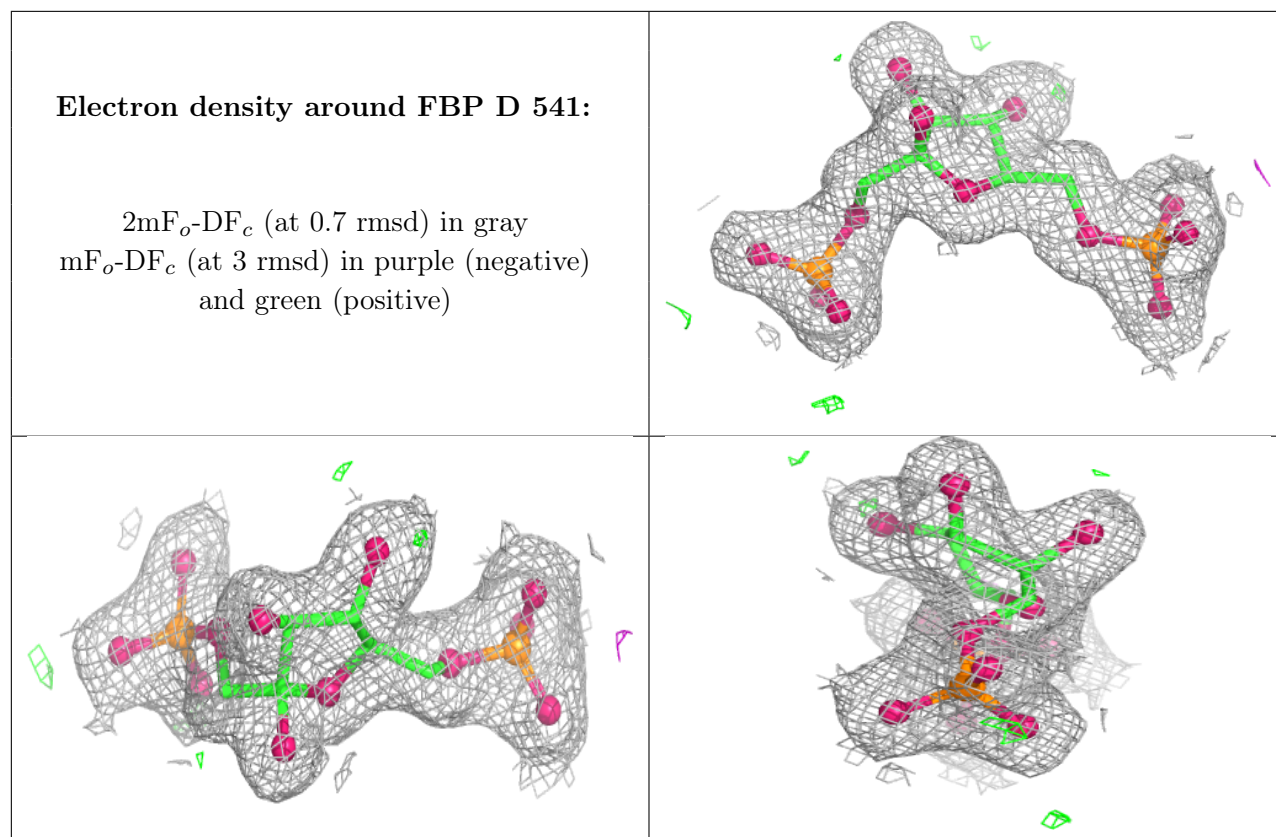
Electron density around FBP A 541:

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

**Electron density around FBP B 541:**

$2mF_o-DF_c$ (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.