



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:17 PM UTC

PDB ID : 6NU1 / pdb_00006nu1
Title : Crystal Structure of Human PKM2 in Complex with L-cysteine
Authors : Srivastava, D.; Nandi, S.; Dey, M.
Deposited on : 2019-01-30
Resolution : 2.25 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

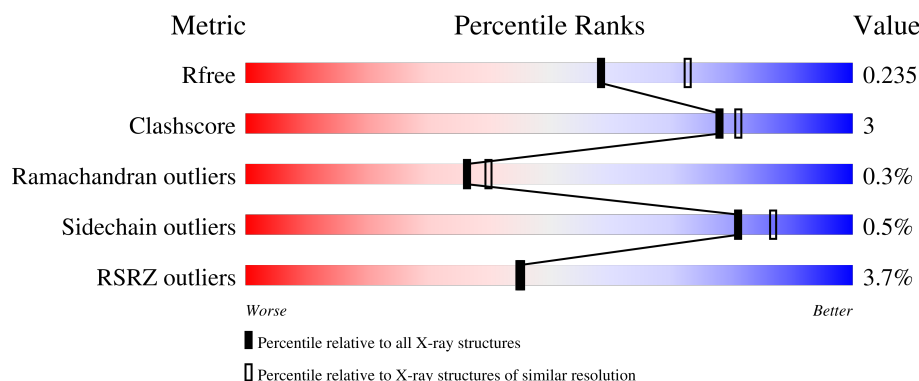
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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	551	5% 80% 6% 14%
1	B	551	4% 76% 6% 18%
1	C	551	3% 87% 7% 6%
1	D	551	2% 87% 6% 7%

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
5	OXL	A	604	-	X	-	-
5	OXL	B	604	-	X	-	-
5	OXL	C	604	-	X	-	-
5	OXL	D	604	-	X	-	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 15092 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 PKM.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	476	Total	C	N	O	S	0	1	0
			3452	2175	616	640	21			
1	B	452	Total	C	N	O	S	0	0	0
			3308	2083	590	614	21			
1	C	516	Total	C	N	O	S	0	0	0
			3737	2358	658	697	24			
1	D	515	Total	C	N	O	S	0	1	0
			3841	2421	682	714	24			

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP P14618
A	-18	GLY	-	expression tag	UNP P14618
A	-17	SER	-	expression tag	UNP P14618
A	-16	SER	-	expression tag	UNP P14618
A	-15	HIS	-	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	SER	-	expression tag	UNP P14618
A	-8	SER	-	expression tag	UNP P14618
A	-7	GLY	-	expression tag	UNP P14618
A	-6	LEU	-	expression tag	UNP P14618
A	-5	VAL	-	expression tag	UNP P14618
A	-4	PRO	-	expression tag	UNP P14618
A	-3	ARG	-	expression tag	UNP P14618
A	-2	GLY	-	expression tag	UNP P14618
A	-1	SER	-	expression tag	UNP P14618
A	0	HIS	-	expression tag	UNP P14618
B	-19	MET	-	initiating methionine	UNP P14618

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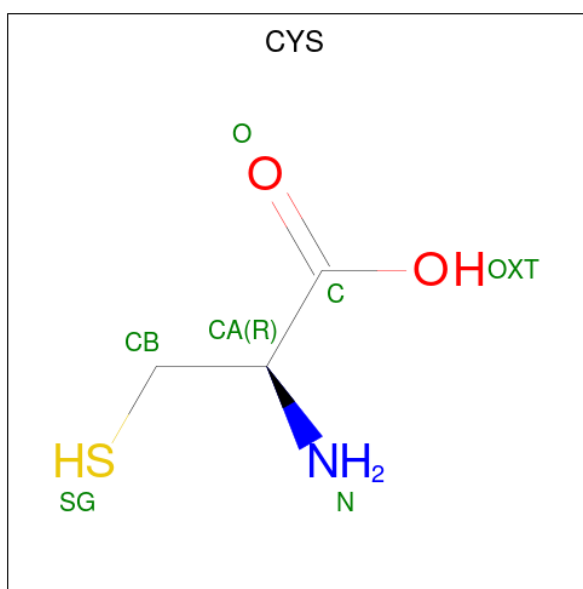
Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	GLY	-	expression tag	UNP P14618
B	-17	SER	-	expression tag	UNP P14618
B	-16	SER	-	expression tag	UNP P14618
B	-15	HIS	-	expression tag	UNP P14618
B	-14	HIS	-	expression tag	UNP P14618
B	-13	HIS	-	expression tag	UNP P14618
B	-12	HIS	-	expression tag	UNP P14618
B	-11	HIS	-	expression tag	UNP P14618
B	-10	HIS	-	expression tag	UNP P14618
B	-9	SER	-	expression tag	UNP P14618
B	-8	SER	-	expression tag	UNP P14618
B	-7	GLY	-	expression tag	UNP P14618
B	-6	LEU	-	expression tag	UNP P14618
B	-5	VAL	-	expression tag	UNP P14618
B	-4	PRO	-	expression tag	UNP P14618
B	-3	ARG	-	expression tag	UNP P14618
B	-2	GLY	-	expression tag	UNP P14618
B	-1	SER	-	expression tag	UNP P14618
B	0	HIS	-	expression tag	UNP P14618
C	-19	MET	-	initiating methionine	UNP P14618
C	-18	GLY	-	expression tag	UNP P14618
C	-17	SER	-	expression tag	UNP P14618
C	-16	SER	-	expression tag	UNP P14618
C	-15	HIS	-	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	SER	-	expression tag	UNP P14618
C	-8	SER	-	expression tag	UNP P14618
C	-7	GLY	-	expression tag	UNP P14618
C	-6	LEU	-	expression tag	UNP P14618
C	-5	VAL	-	expression tag	UNP P14618
C	-4	PRO	-	expression tag	UNP P14618
C	-3	ARG	-	expression tag	UNP P14618
C	-2	GLY	-	expression tag	UNP P14618
C	-1	SER	-	expression tag	UNP P14618
C	0	HIS	-	expression tag	UNP P14618
D	-19	MET	-	initiating methionine	UNP P14618
D	-18	GLY	-	expression tag	UNP P14618
D	-17	SER	-	expression tag	UNP P14618

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

- Molecule 2 is CYSTEINE (CCD ID: CYS) (formula: $C_3H_7NO_2S$).



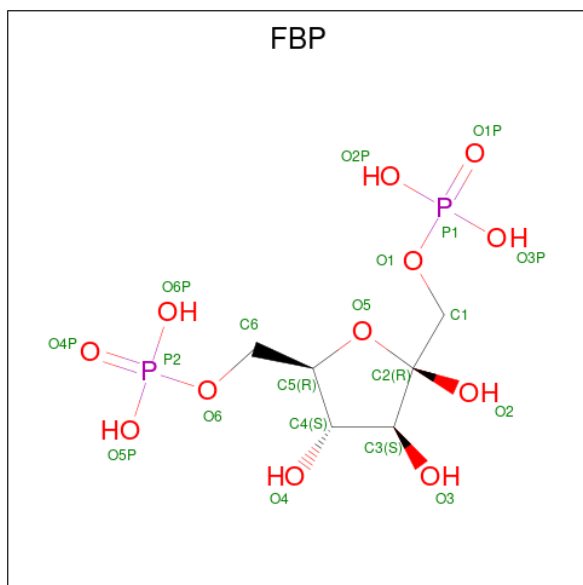
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	S	0	0
			7	3	1	2	1		
2	B	1	Total	C	N	O	S	0	0
			7	3	1	2	1		
2	C	1	Total	C	N	O	S	0	0
			7	3	1	2	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	D	1	Total	C	N	O	S	0	0
			7	3	1	2	1		

- Molecule 3 is 1,6-di-O-phosphono-beta-D-fructofuranose (CCD ID: FBP) (formula: $C_6H_{14}O_{12}P_2$).

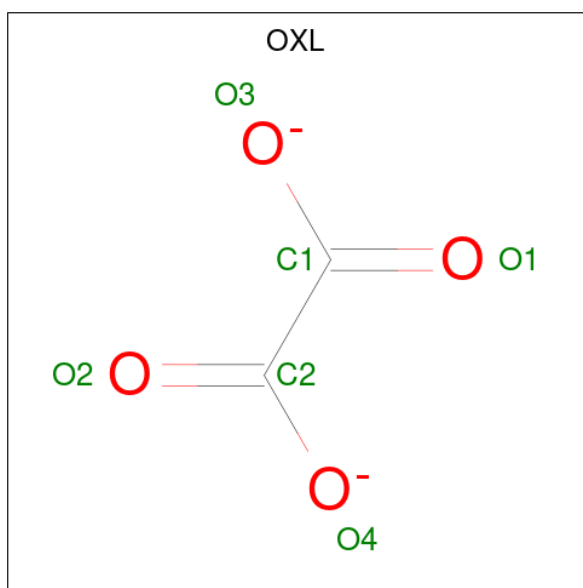


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	P	0	0
			20	6	12	2		
3	B	1	Total	C	O	P	0	0
			20	6	12	2		
3	C	1	Total	C	O	P	0	0
			20	6	12	2		
3	D	1	Total	C	O	P	0	0
			20	6	12	2		

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		
4	B	1	Total	Mg	0	0
			1	1		
4	C	1	Total	Mg	0	0
			1	1		
4	D	1	Total	Mg	0	0
			1	1		

- Molecule 5 is OXALATE ION (CCD ID: OXL) (formula: C_2O_4).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	2	4		
5	B	1	Total	C	O	0	0
			6	2	4		
5	C	1	Total	C	O	0	0
			6	2	4		
5	D	1	Total	C	O	0	0
			6	2	4		

- Molecule 6 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	1	Total	K	0	0
			1	1		
6	D	1	Total	K	0	0
			1	1		

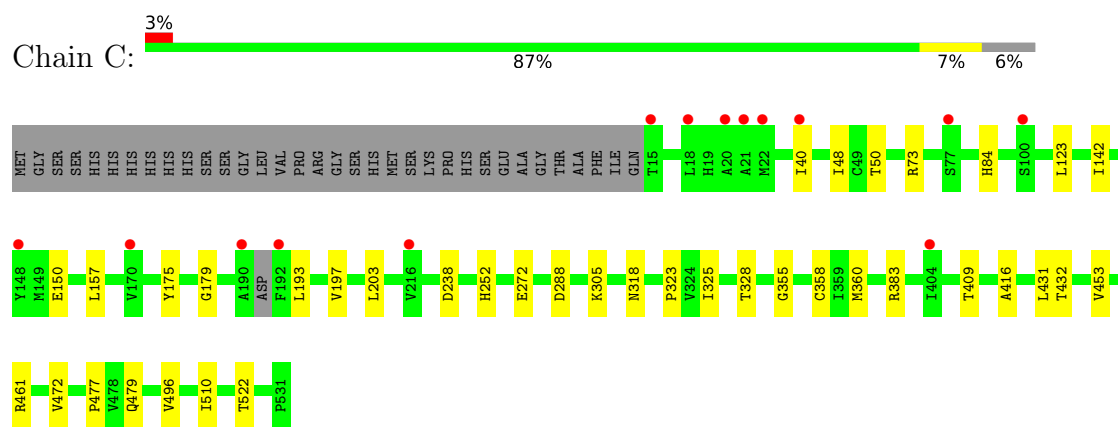
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	149	Total	O	0	0
			149	149		
7	B	146	Total	O	0	0
			146	146		
7	C	108	Total	O	0	0
			108	108		

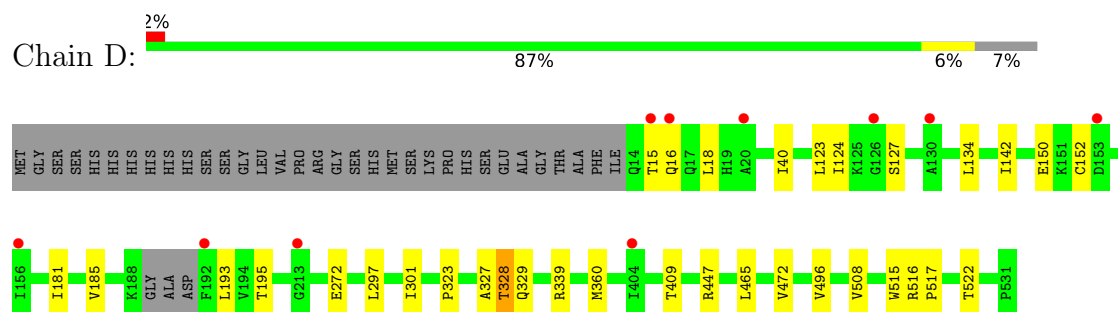
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	D	213	Total 213	O 213	0	0



- Molecule 1: Pyruvate kinase PKM



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	81.83Å 155.92Å 94.14Å 90.00° 103.51° 90.00°	Depositor
Resolution (Å)	24.70 – 2.25 24.70 – 2.25	Depositor EDS
% Data completeness (in resolution range)	97.8 (24.70-2.25) 97.7 (24.70-2.25)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.19 (at 2.26Å)	Xtriage
Refinement program	PHENIX (1.15.2_3472: ???)	Depositor
R, R_{free}	0.191 , 0.235 0.191 , 0.235	Depositor DCC
R_{free} test set	5287 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	33.9	Xtriage
Anisotropy	0.201	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 44.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	15092	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.74% 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: FBP, OXL, K, 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	0.16	0/3508	0.35	0/4755
1	B	0.16	0/3362	0.35	0/4559
1	C	0.14	0/3799	0.33	0/5164
1	D	0.17	0/3907	0.36	0/5296
All	All	0.16	0/14576	0.35	0/19774

There are no bond length outliers.

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	3452	0	3311	23	0
1	B	3308	0	3198	17	0
1	C	3737	0	3599	20	0
1	D	3841	0	3817	21	0
2	A	7	0	4	1	0
2	B	7	0	4	0	0
2	C	7	0	4	0	0
2	D	7	0	4	0	0
3	A	20	0	10	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	20	0	10	1	0
3	C	20	0	10	1	0
3	D	20	0	10	1	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	6	0	0	1	0
5	B	6	0	0	0	0
5	C	6	0	0	0	0
5	D	6	0	0	0	0
6	B	1	0	0	0	0
6	D	1	0	0	0	0
7	A	149	0	0	1	0
7	B	146	0	0	0	0
7	C	108	0	0	2	0
7	D	213	0	0	1	0
All	All	15092	0	13981	80	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 (80) 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:D:15:THR:HG22	1:D:16:GLN:HG3	1.70	0.74
1:A:482:TRP:HH2	3:A:602:FBP:H12	1.54	0.71
1:A:433:LYS:NZ	7:A:701:HOH:O	2.26	0.69
1:D:339:ARG:NH2	7:D:703:HOH:O	2.28	0.65
1:A:175:TYR:HB3	1:A:179:GLY:HA2	1.81	0.62
1:B:514:GLY:N	3:B:602:FBP:O3	2.37	0.58
1:C:175:TYR:HB3	1:C:179:GLY:HA2	1.86	0.56
1:A:482:TRP:CH2	3:A:602:FBP:H12	2.37	0.56
1:A:464:HIS:HD1	2:A:601:CYS:N	2.04	0.55
1:D:123:LEU:HB2	1:D:150:GLU:HA	1.90	0.53
1:C:48:ILE:HB	1:C:360:MET:HG3	1.91	0.53
1:A:270:LYS:HE2	1:A:272:GLU:OE2	2.09	0.52
1:A:497:GLY:HA3	1:A:503:PHE:CZ	2.44	0.52
1:C:142:ILE:HB	1:C:193:LEU:HB2	1.90	0.52
1:B:477:PRO:O	1:B:479:GLN:NE2	2.41	0.52
1:B:395:PHE:CZ	1:B:399:ARG:HD3	2.45	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:416:ALA:HB2	1:A:512:LEU:HD21	1.93	0.51
1:B:331:LEU:HD23	1:B:344:GLU:HB3	1.93	0.51
1:B:64:MET:HE3	1:B:375:VAL:HG21	1.92	0.50
1:B:48:ILE:HG12	1:B:71:VAL:HB	1.93	0.50
1:B:472:VAL:HG11	1:B:496:VAL:HG11	1.92	0.50
1:C:305:LYS:NZ	7:C:709:HOH:O	2.42	0.49
1:D:339:ARG:NH2	1:D:339:ARG:HB3	2.27	0.49
1:A:117:PRO:HD2	1:A:244:PHE:HB2	1.93	0.49
1:A:432:THR:HA	3:A:602:FBP:H61	1.95	0.49
1:D:185:VAL:HA	1:D:195:THR:HG22	1.95	0.48
1:B:15:THR:HG22	1:B:38:PRO:HD2	1.95	0.48
1:B:246:ARG:HG2	1:B:273:ASN:HD21	1.79	0.48
1:B:497:GLY:HA3	1:B:503:PHE:CZ	2.49	0.48
1:B:323:PRO:HB3	1:B:465:LEU:O	2.14	0.47
1:C:409:THR:HG23	1:C:522:THR:HB	1.96	0.47
1:D:472:VAL:HG11	1:D:496:VAL:HG11	1.96	0.47
1:C:477:PRO:O	1:C:479:GLN:NE2	2.43	0.47
1:D:327:ALA:HB1	1:D:360:MET:HE2	1.97	0.47
1:A:175:TYR:CE1	1:A:212:PRO:HG2	2.49	0.47
1:C:252:HIS:CE1	1:D:127:SER:HB2	2.49	0.47
1:D:517:PRO:HA	3:D:602:FBP:H12	1.97	0.46
1:C:50:THR:OG1	1:C:73:ARG:NH1	2.43	0.46
1:A:433:LYS:HE3	1:A:455:ARG:HB2	1.97	0.46
1:C:431:LEU:HD22	1:C:453:VAL:HB	1.97	0.46
1:D:16:GLN:HG2	1:D:40:ILE:HG23	1.98	0.46
1:D:16:GLN:HB2	1:D:18:LEU:HG	1.98	0.46
1:A:433:LYS:HD3	1:A:433:LYS:HA	1.66	0.45
1:A:519:SER:HB2	3:A:602:FBP:O4P	2.16	0.45
1:D:339:ARG:HB3	1:D:339:ARG:HH21	1.81	0.45
1:A:477:PRO:O	1:A:479:GLN:NE2	2.44	0.45
1:C:157:LEU:HD12	1:C:203:LEU:HD21	1.98	0.44
1:A:472:VAL:HG11	1:A:496:VAL:HG21	2.00	0.44
1:A:293:ALA:HB1	5:A:604:OXL:C2	2.47	0.44
1:C:318:ASN:HD21	1:C:355:GLY:HA3	1.82	0.44
1:B:118:GLU:OE2	1:B:120:ARG:NH1	2.50	0.44
1:C:325:ILE:HG12	1:C:358:CYS:HB2	1.99	0.43
1:C:288:ASP:O	1:C:323:PRO:HD2	2.18	0.43
1:B:371:PRO:O	1:B:375:VAL:HG23	2.18	0.43
1:C:472:VAL:HG11	1:C:496:VAL:HG11	2.00	0.43
1:D:16:GLN:HB3	1:D:447[A]:ARG:NH1	2.34	0.43
1:C:432:THR:HA	3:C:602:FBP:H61	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:266:LYS:HA	1:A:266:LYS:HD3	1.87	0.42
1:C:416:ALA:HB1	1:C:510:ILE:HG21	2.01	0.42
1:D:409:THR:HG23	1:D:522:THR:HB	2.00	0.42
1:C:40:ILE:O	1:C:383:ARG:HD2	2.19	0.42
1:B:297:LEU:O	1:B:301:ILE:HG12	2.19	0.42
1:A:222:SER:O	1:A:226:ILE:HG13	2.19	0.42
1:D:124:ILE:HD13	1:D:152:CYS:HB2	2.02	0.42
1:D:142:ILE:HB	1:D:193:LEU:HB3	2.02	0.42
1:C:123:LEU:HB2	1:C:150:GLU:HA	2.01	0.42
1:B:239:MET:SD	1:B:465:LEU:HD21	2.60	0.42
1:D:328:THR:HG22	1:D:329:GLN:HG3	2.02	0.42
1:A:482:TRP:CE3	1:A:517:PRO:HG3	2.56	0.41
1:C:238:ASP:CG	1:C:461:ARG:HE	2.27	0.41
1:D:515:TRP:CD2	1:D:516:ARG:HG2	2.55	0.41
1:D:323:PRO:HB3	1:D:465:LEU:O	2.20	0.41
1:C:84:HIS:ND1	7:C:704:HOH:O	2.37	0.41
1:D:297:LEU:O	1:D:301:ILE:HG12	2.20	0.41
1:B:55:SER:HA	1:B:60:THR:HG21	2.02	0.41
1:B:70:ASN:HB3	1:B:464:HIS:CG	2.56	0.41
1:A:272:GLU:O	1:A:300:GLU:HG3	2.21	0.40
1:A:327:ALA:HB1	1:A:360:MET:HE2	2.03	0.40
1:D:134:LEU:HD12	1:D:181:ILE:HD13	2.04	0.40
1:A:472:VAL:HG12	1:A:492:PHE:CE2	2.56	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	463/551 (84%)	450 (97%)	11 (2%)	2 (0%)	30 31
1	B	442/551 (80%)	426 (96%)	14 (3%)	2 (0%)	24 24

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	512/551 (93%)	498 (97%)	13 (2%)	1 (0%)	43	50
1	D	512/551 (93%)	503 (98%)	8 (2%)	1 (0%)	43	50
All	All	1929/2204 (88%)	1877 (97%)	46 (2%)	6 (0%)	36	40

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	163	ASN
1	B	328	THR
1	C	328	THR
1	D	328	THR
1	A	328	THR
1	B	173	LYS

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	331/453 (73%)	329 (99%)	2 (1%)	78	84
1	B	320/453 (71%)	319 (100%)	1 (0%)	86	90
1	C	359/453 (79%)	357 (99%)	2 (1%)	78	84
1	D	393/453 (87%)	391 (100%)	2 (0%)	81	87
All	All	1403/1812 (77%)	1396 (100%)	7 (0%)	81	87

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

Mol	Chain	Res	Type
1	A	414	VAL
1	A	508	VAL
1	B	258	LEU
1	C	197	VAL
1	C	272	GLU
1	D	272	GLU

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Mol	Chain	Res	Type
1	D	508	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	252	HIS
1	A	273	ASN
1	A	393	GLN
1	A	458	GLN
1	A	491	ASN
1	C	318	ASN
1	C	391	HIS
1	C	393	GLN
1	D	252	HIS
1	D	440	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 18 ligands modelled in this entry, 6 are monoatomic - 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
5	OXL	D	604	4	5,5,5	1.42	0	6,6,6	2.45	3 (50%)
2	CYS	D	601	-	5,6,6	1.09	1 (20%)	3,7,7	1.55	1 (33%)
5	OXL	A	604	4	5,5,5	1.41	0	6,6,6	2.29	2 (33%)
5	OXL	B	604	4	5,5,5	1.44	0	6,6,6	2.16	2 (33%)
5	OXL	C	604	4	5,5,5	1.47	0	6,6,6	2.23	2 (33%)
2	CYS	A	601	-	5,6,6	1.05	1 (20%)	3,7,7	1.47	1 (33%)
2	CYS	B	601	-	5,6,6	1.06	1 (20%)	3,7,7	1.71	1 (33%)
3	FBP	C	602	-	18,20,20	0.91	1 (5%)	21,32,32	0.69	0
3	FBP	A	602	-	18,20,20	0.96	1 (5%)	21,32,32	0.61	0
3	FBP	B	602	-	18,20,20	0.91	1 (5%)	21,32,32	0.85	0
3	FBP	D	602	-	18,20,20	0.93	1 (5%)	21,32,32	0.77	0
2	CYS	C	601	-	5,6,6	1.09	1 (20%)	3,7,7	1.41	1 (33%)

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
5	OXL	D	604	4	-	4/4/4/4	-
2	CYS	D	601	-	-	0/6/6/6	-
5	OXL	A	604	4	-	4/4/4/4	-
5	OXL	B	604	4	-	4/4/4/4	-
5	OXL	C	604	4	-	4/4/4/4	-
2	CYS	A	601	-	-	0/6/6/6	-
2	CYS	B	601	-	-	0/6/6/6	-
3	FBP	C	602	-	-	2/13/32/32	0/1/1/1
3	FBP	A	602	-	-	2/13/32/32	0/1/1/1
3	FBP	B	602	-	-	3/13/32/32	0/1/1/1
3	FBP	D	602	-	-	5/13/32/32	0/1/1/1
2	CYS	C	601	-	-	0/6/6/6	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	602	FBP	O2-C2	2.93	1.45	1.40
3	A	602	FBP	O2-C2	2.84	1.45	1.40
3	C	602	FBP	O2-C2	2.81	1.45	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	602	FBP	O2-C2	2.61	1.45	1.40
2	C	601	CYS	OXT-C	-2.26	1.23	1.30
2	A	601	CYS	OXT-C	-2.14	1.23	1.30
2	B	601	CYS	OXT-C	-2.09	1.24	1.30
2	D	601	CYS	OXT-C	-2.08	1.24	1.30

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	604	OXL	O3-C1-C2	3.85	120.30	112.83
5	C	604	OXL	O3-C1-C2	3.76	120.12	112.83
5	A	604	OXL	O3-C1-C2	3.71	120.03	112.83
5	D	604	OXL	O4-C2-C1	3.61	119.84	112.83
5	B	604	OXL	O4-C2-C1	3.41	119.45	112.83
5	A	604	OXL	O4-C2-C1	3.37	119.37	112.83
5	C	604	OXL	O4-C2-C1	3.37	119.37	112.83
5	B	604	OXL	O3-C1-C2	3.32	119.27	112.83
2	B	601	CYS	OXT-C-O	-2.85	117.62	124.08
2	D	601	CYS	OXT-C-O	-2.58	118.24	124.08
2	A	601	CYS	OXT-C-O	-2.50	118.42	124.08
2	C	601	CYS	OXT-C-O	-2.44	118.54	124.08
5	D	604	OXL	O3-C1-O1	-2.12	118.85	123.90

There are no chirality outliers.

All (28) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	602	FBP	C4-C5-C6-O6
3	B	602	FBP	O1-C1-C2-C3
3	B	602	FBP	O1-C1-C2-O5
3	D	602	FBP	O1-C1-C2-O2
3	D	602	FBP	O1-C1-C2-C3
3	D	602	FBP	O1-C1-C2-O5
3	C	602	FBP	C4-C5-C6-O6
3	D	602	FBP	C4-C5-C6-O6
3	A	602	FBP	O5-C5-C6-O6
3	C	602	FBP	O5-C5-C6-O6
3	D	602	FBP	O5-C5-C6-O6
5	C	604	OXL	O3-C1-C2-O4
5	D	604	OXL	O3-C1-C2-O4
5	A	604	OXL	O3-C1-C2-O4
5	B	604	OXL	O3-C1-C2-O4

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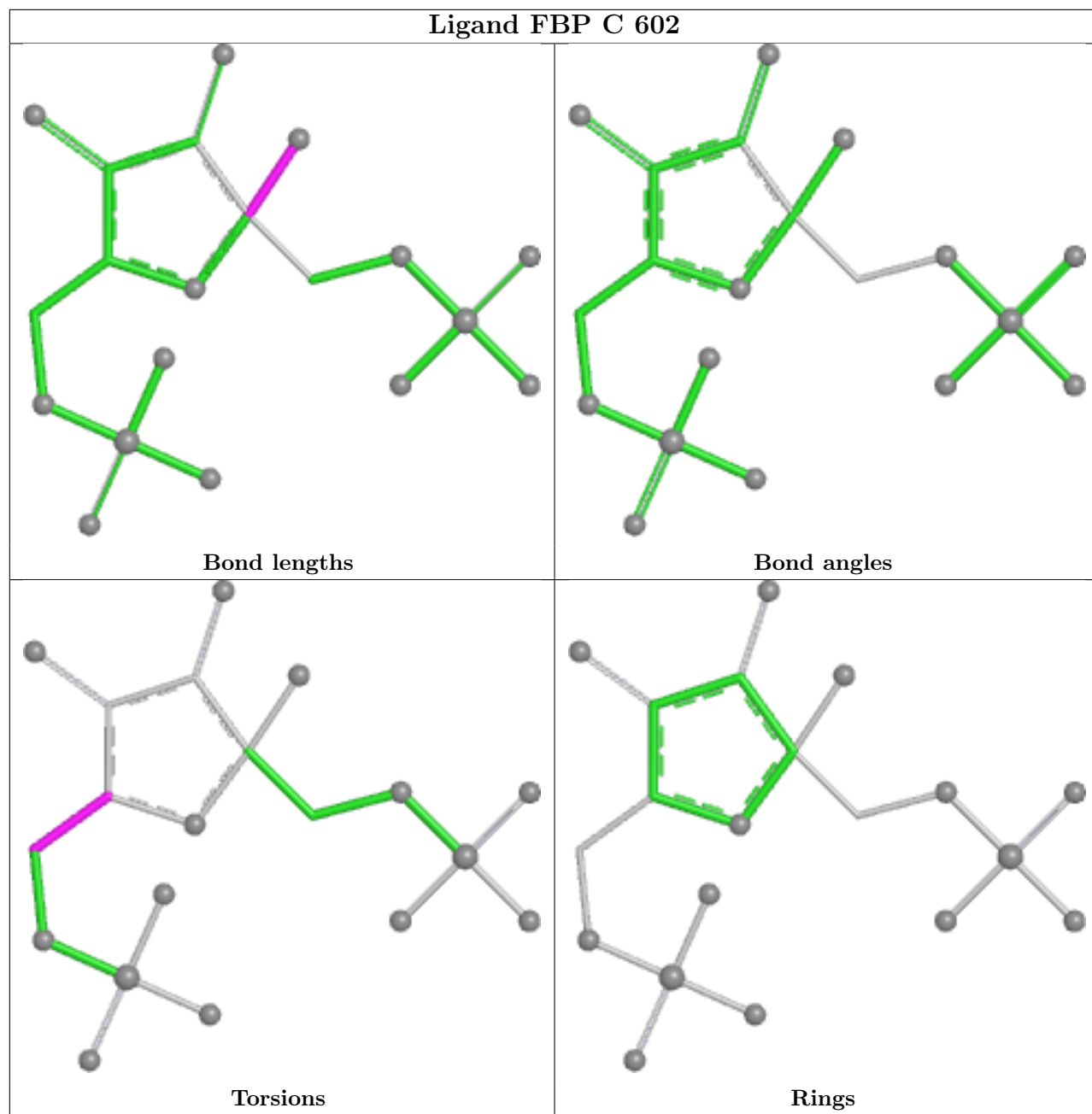
Mol	Chain	Res	Type	Atoms
3	B	602	FBP	O1-C1-C2-O2
5	B	604	OXL	O1-C1-C2-O2
5	C	604	OXL	O1-C1-C2-O2
5	A	604	OXL	O1-C1-C2-O2
5	D	604	OXL	O1-C1-C2-O2
5	D	604	OXL	O3-C1-C2-O2
5	B	604	OXL	O3-C1-C2-O2
5	C	604	OXL	O1-C1-C2-O4
5	C	604	OXL	O3-C1-C2-O2
5	A	604	OXL	O1-C1-C2-O4
5	A	604	OXL	O3-C1-C2-O2
5	B	604	OXL	O1-C1-C2-O4
5	D	604	OXL	O1-C1-C2-O4

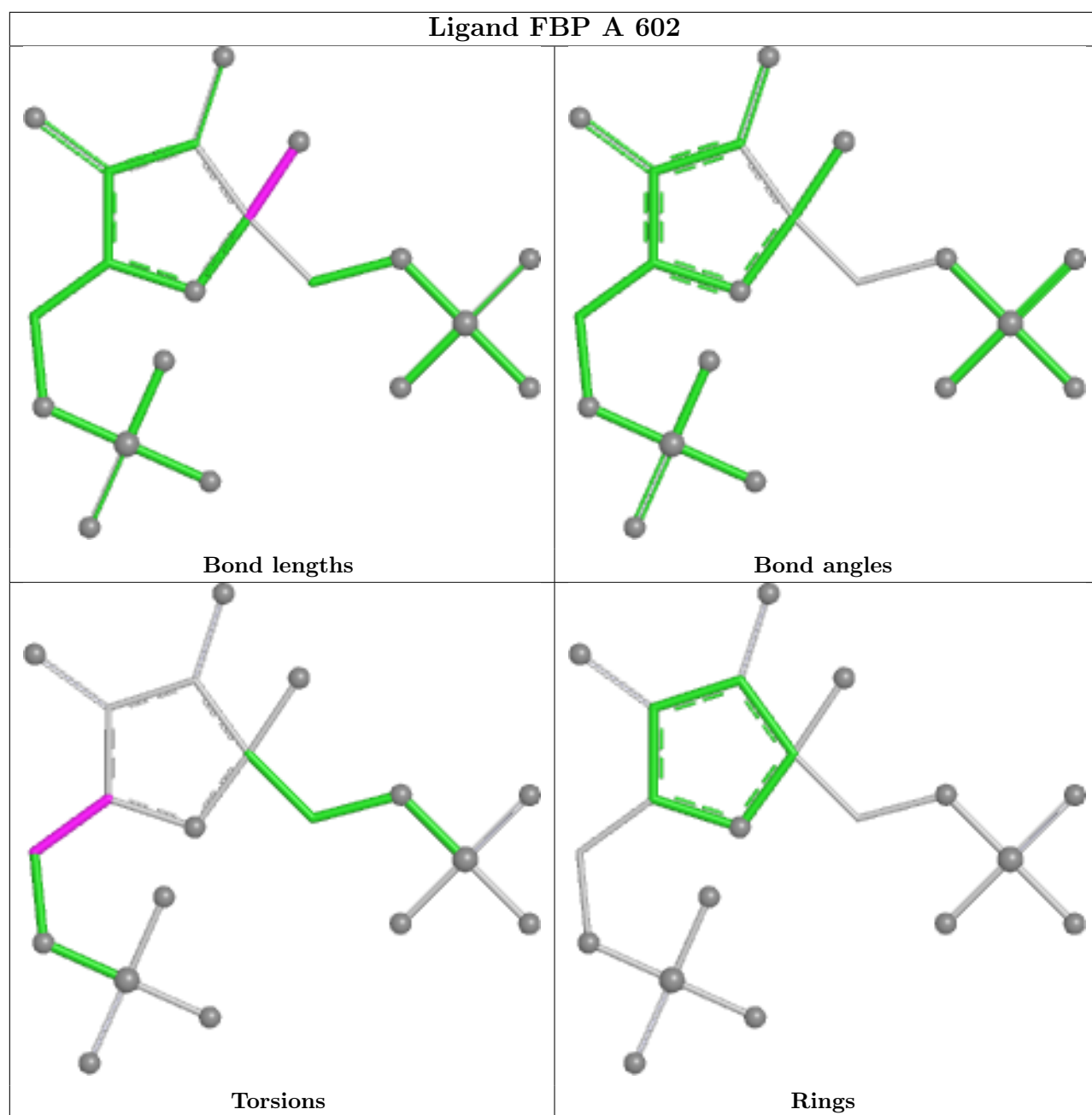
There are no ring outliers.

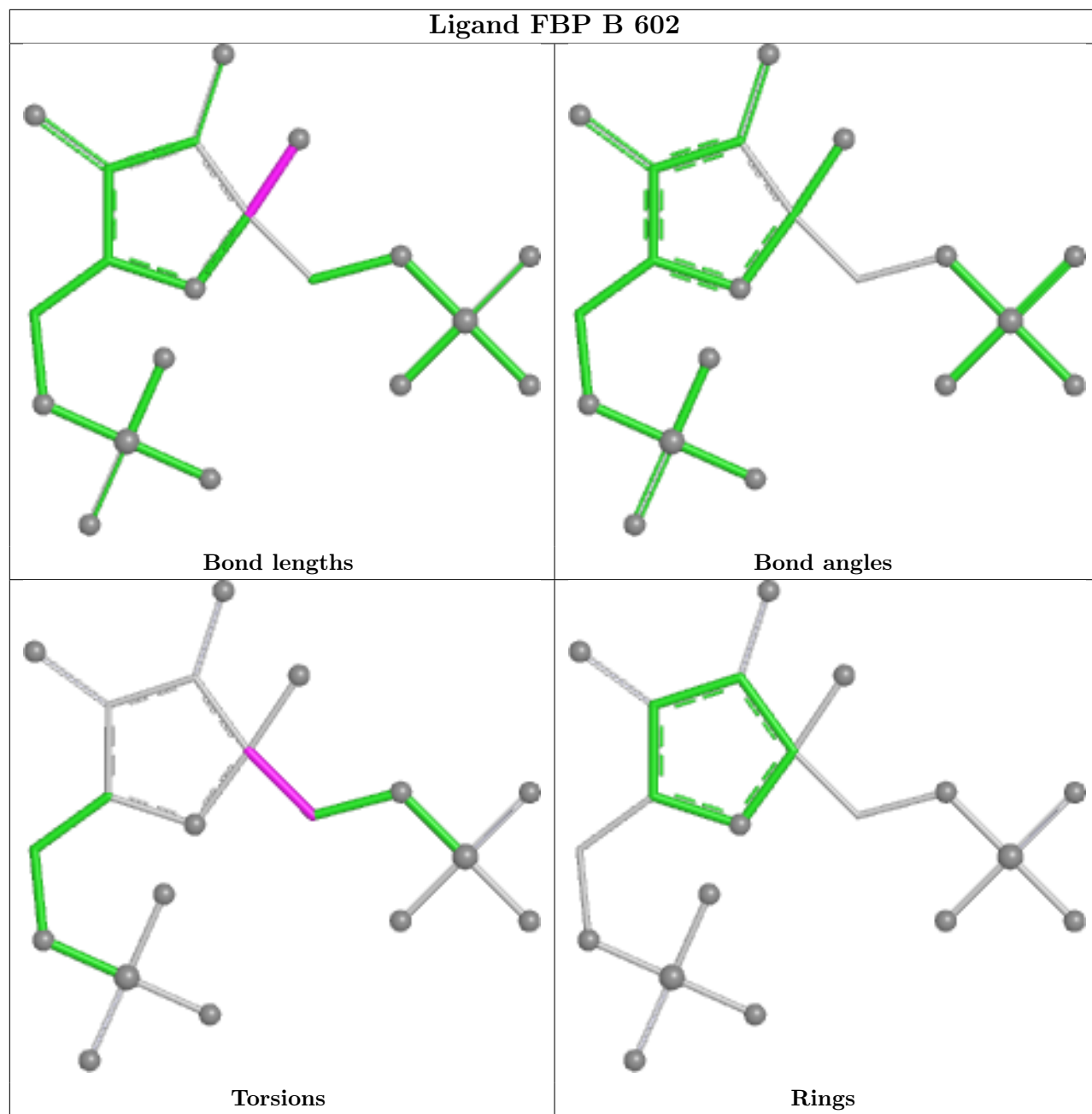
6 monomers are involved in 9 short contacts:

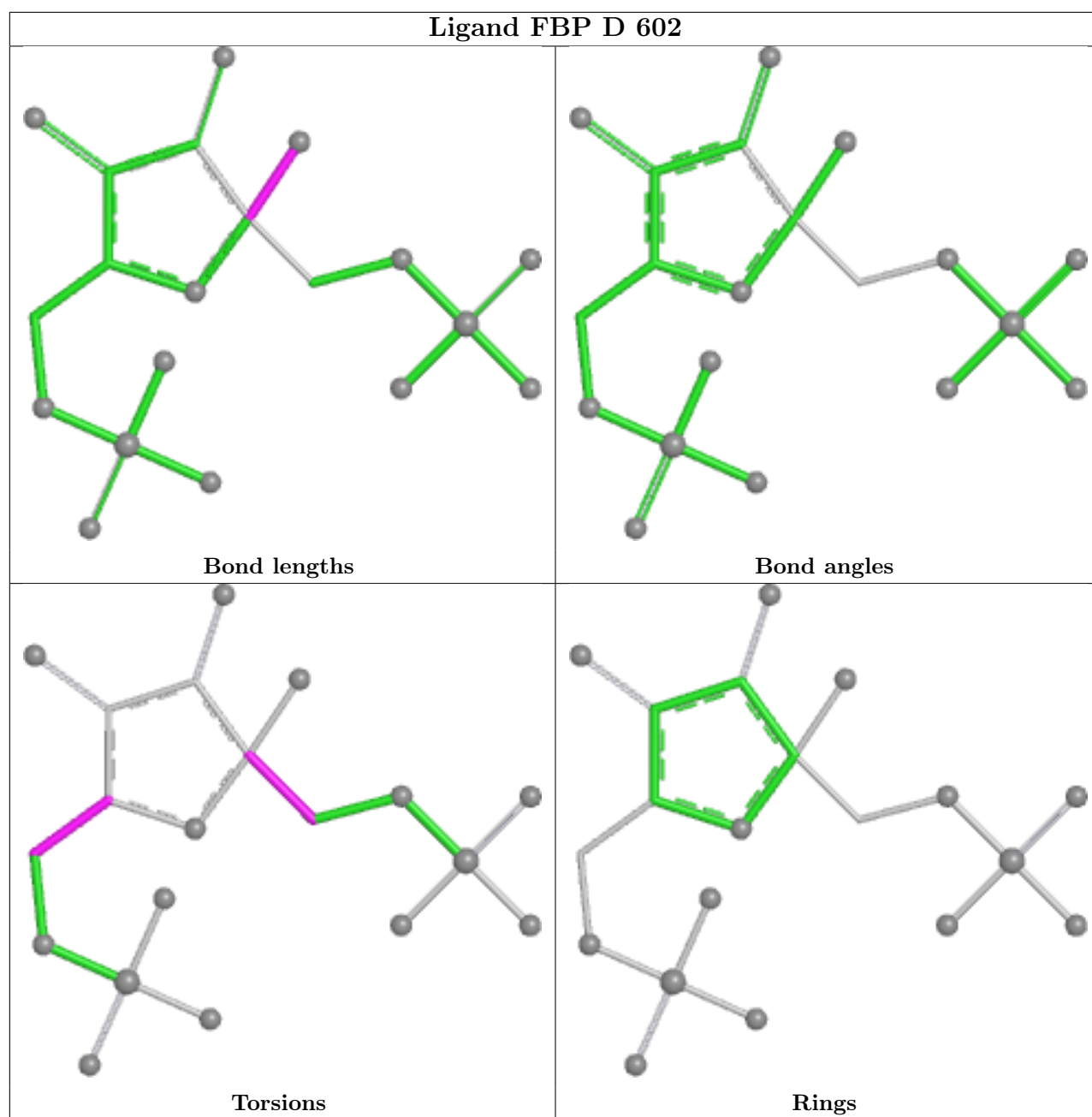
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	604	OXL	1	0
2	A	601	CYS	1	0
3	C	602	FBP	1	0
3	A	602	FBP	4	0
3	B	602	FBP	1	0
3	D	602	FBP	1	0

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









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	476/551 (86%)	0.32	28 (5%)	28 26	19, 37, 78, 90	1 (0%)
1	B	452/551 (82%)	0.12	20 (4%)	39 38	23, 37, 68, 97	0
1	C	516/551 (93%)	0.33	14 (2%)	56 57	27, 43, 65, 82	0
1	D	515/551 (93%)	0.05	10 (1%)	66 67	18, 32, 60, 75	1 (0%)
All	All	1959/2204 (88%)	0.21	72 (3%)	45 45	18, 38, 66, 97	2 (0%)

All (72) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	164	ILE	4.1
1	A	153	ASP	3.9
1	B	180	LEU	3.9
1	C	192	PHE	3.9
1	A	40	ILE	3.9
1	B	171	GLY	3.8
1	A	152	CYS	3.7
1	A	217	ASP	3.7
1	C	40	ILE	3.5
1	A	144	LEU	3.3
1	A	163	ASN	3.3
1	B	163	ASN	3.3
1	A	202	SER	3.2
1	B	161	TYR	3.2
1	B	182	SER	3.2
1	C	190	ALA	3.2
1	D	126	GLY	3.1
1	B	121	THR	3.1
1	D	192	PHE	3.1
1	D	130	ALA	3.0
1	A	41	THR	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	164	ILE	3.0
1	A	214	ALA	2.9
1	B	519	SER	2.9
1	D	20	ALA	2.9
1	A	172	SER	2.9
1	A	200	GLY	2.9
1	B	213	GLY	2.9
1	C	21	ALA	2.9
1	D	15	THR	2.8
1	A	132	VAL	2.8
1	D	153	ASP	2.8
1	A	14	GLN	2.8
1	D	16	GLN	2.8
1	A	18	LEU	2.7
1	A	157	LEU	2.7
1	B	217	ASP	2.7
1	C	15	THR	2.6
1	C	216	VAL	2.6
1	D	213	GLY	2.5
1	B	181	ILE	2.5
1	D	156	ILE	2.5
1	B	215	ALA	2.5
1	B	354	ASP	2.5
1	B	172	SER	2.5
1	A	156	ILE	2.4
1	A	215	ALA	2.4
1	D	404	ILE	2.4
1	A	213	GLY	2.3
1	C	100	SER	2.3
1	A	161	TYR	2.3
1	A	143	THR	2.3
1	B	119	ILE	2.3
1	B	216	VAL	2.3
1	B	212	PRO	2.2
1	C	22	MET	2.2
1	A	531	PRO	2.2
1	B	14	GLN	2.2
1	C	404	ILE	2.2
1	A	206	LYS	2.2
1	A	15	THR	2.2
1	A	78	HIS	2.2
1	B	214	ALA	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	162	LYS	2.1
1	C	148	TYR	2.1
1	C	20	ALA	2.1
1	C	170	VAL	2.1
1	A	220	ALA	2.0
1	A	178	ASP	2.0
1	C	77	SER	2.0
1	B	211	LEU	2.0
1	C	18	LEU	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 [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
6	K	B	605	1/1	0.74	0.16	86,86,86,86	0
3	FBP	B	602	20/20	0.82	0.13	37,67,81,82	0
5	OXL	C	604	6/6	0.88	0.19	39,43,45,47	0
5	OXL	A	604	6/6	0.92	0.10	32,36,44,48	0
5	OXL	B	604	6/6	0.92	0.10	36,41,48,53	0
2	CYS	C	601	7/7	0.93	0.10	39,41,47,47	0
3	FBP	C	602	20/20	0.93	0.08	41,47,69,70	20
3	FBP	A	602	20/20	0.93	0.10	30,42,55,60	0
5	OXL	D	604	6/6	0.94	0.11	28,30,37,39	0
3	FBP	D	602	20/20	0.94	0.09	29,43,58,63	0
2	CYS	A	601	7/7	0.96	0.08	29,33,36,38	0
2	CYS	B	601	7/7	0.96	0.08	25,25,29,30	7
4	MG	A	603	1/1	0.97	0.03	36,36,36,36	0
6	K	D	605	1/1	0.97	0.12	51,51,51,51	0

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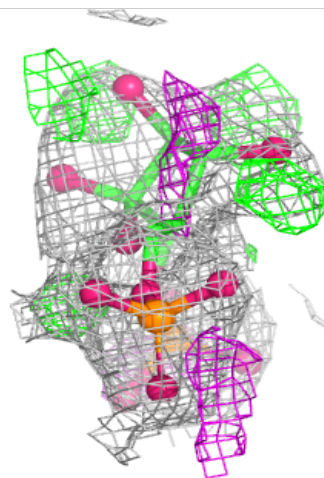
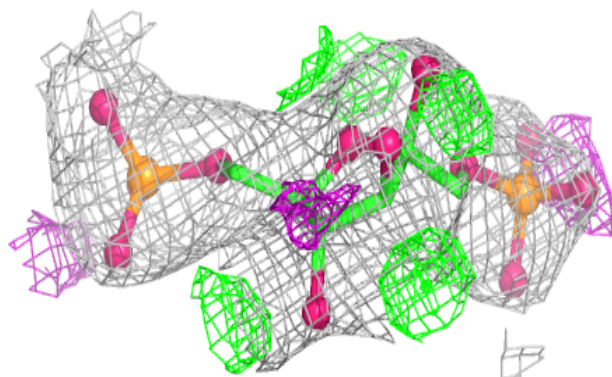
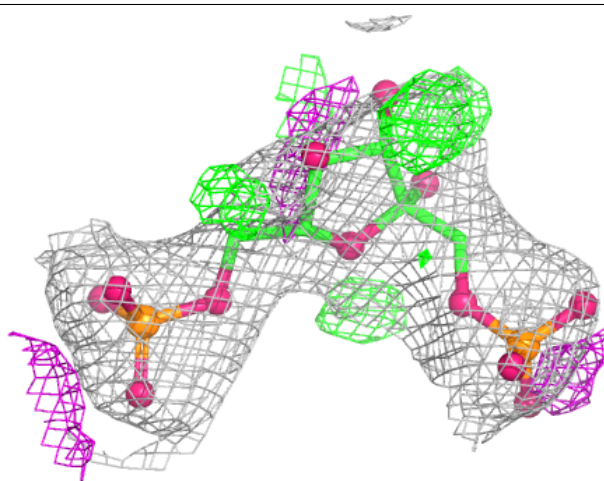
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	CYS	D	601	7/7	0.98	0.07	27,29,31,33	0
4	MG	B	603	1/1	0.98	0.03	41,41,41,41	0
4	MG	D	603	1/1	0.98	0.02	31,31,31,31	0
4	MG	C	603	1/1	0.99	0.03	41,41,41,41	0

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.

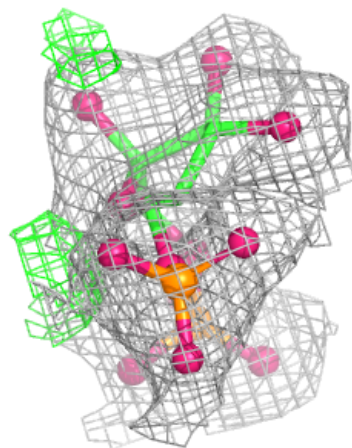
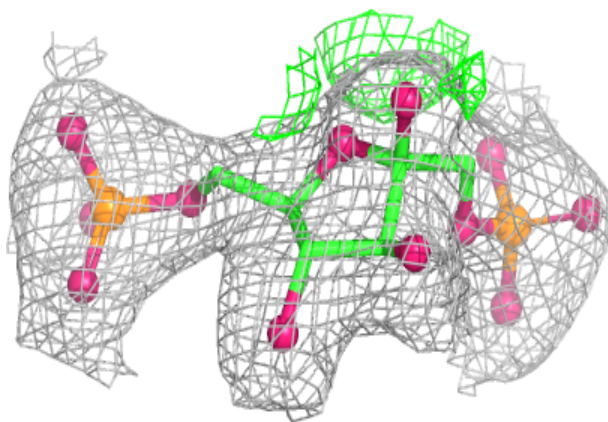
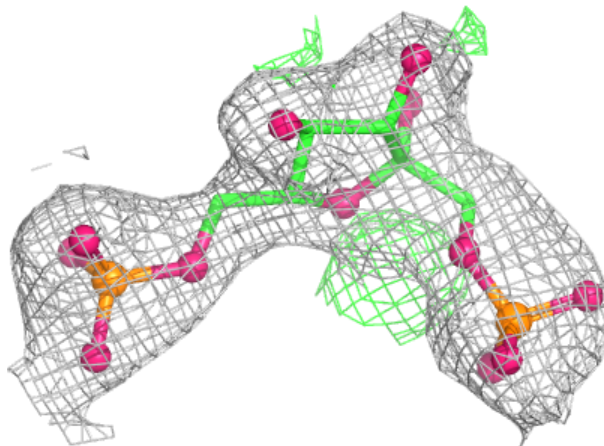
Electron density around FBP B 602:

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



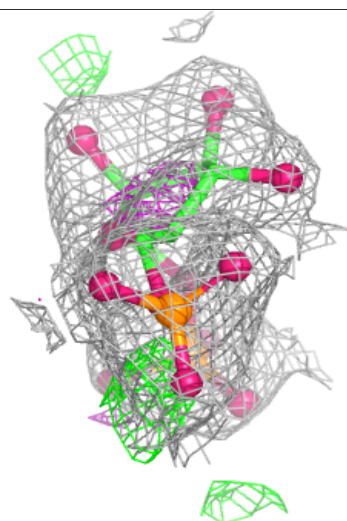
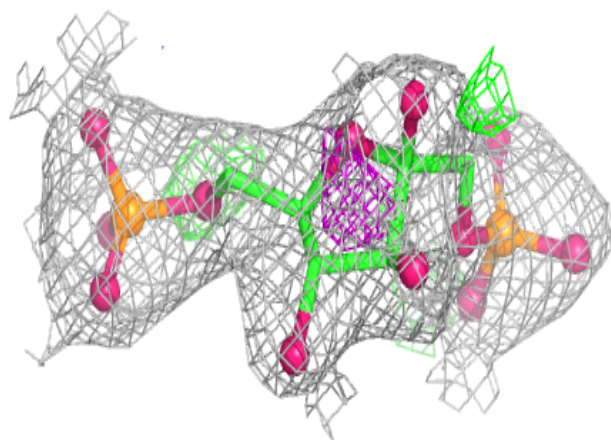
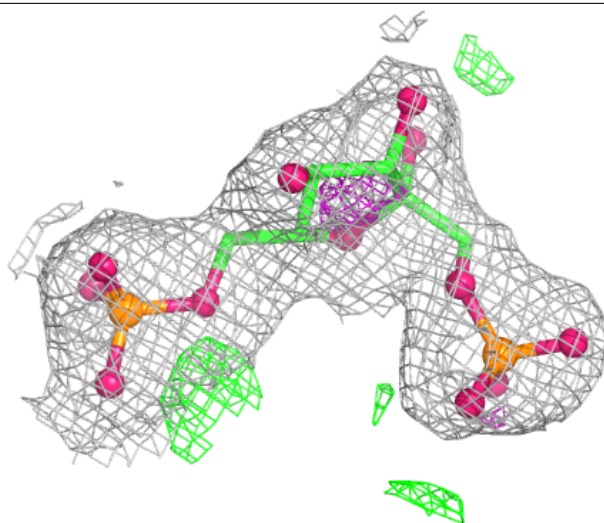
Electron density around FBP C 602:

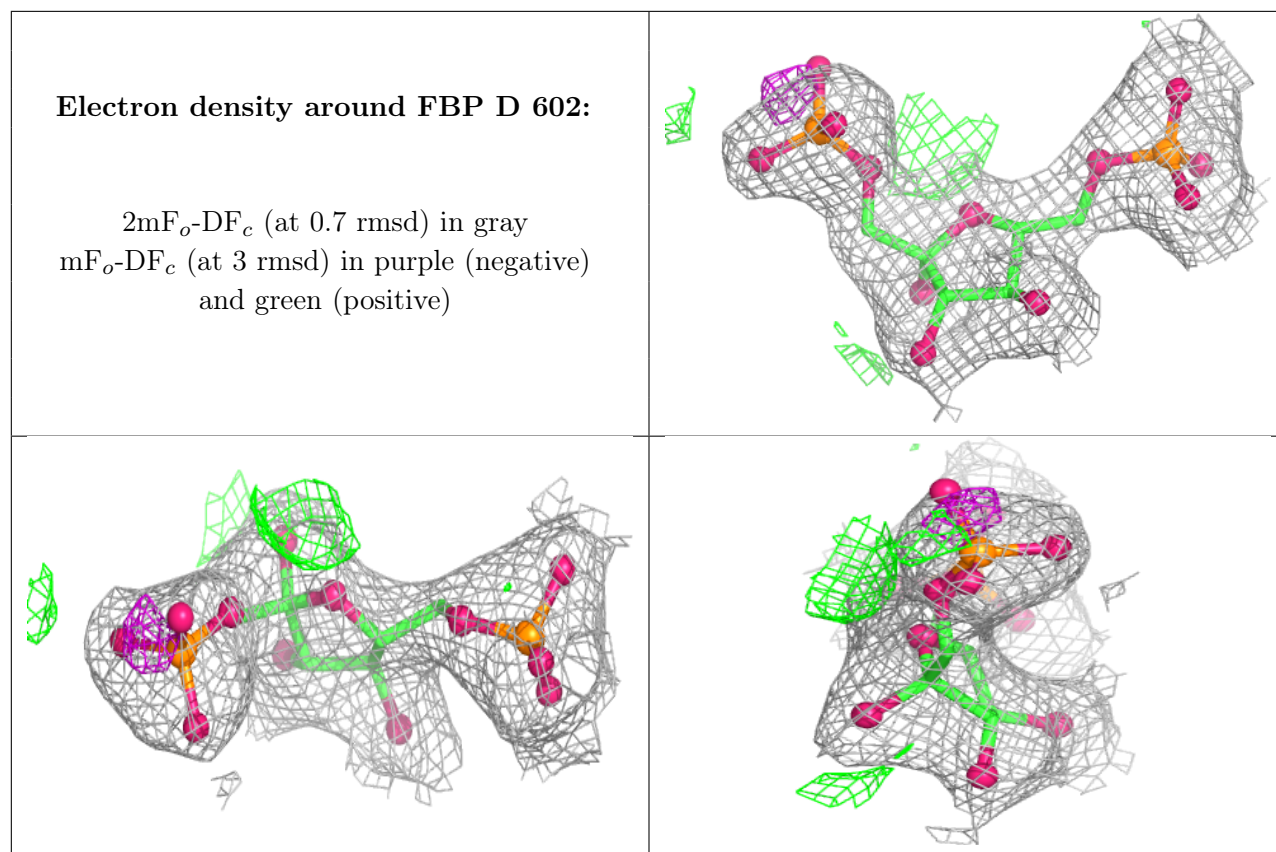
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around FBP A 602:

$2mF_o-DF_c$ (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.