Full wwPDB X-ray Structure Validation Report ⓘ

Apr 20, 2026 – 06:16 PM EDT

PDB ID	:	9ZKG / pdb_00009zkg
Title	:	VRK1 in complex with the inhibitor MP-60
Authors	:	Aroucha, J.P.; Crowley-Dolen, E.K.; Mitchison, T.J.; Massirer, K.B.; Borges, R.J.
Deposited on	:	2025-12-06
Resolution	:	2.06 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:

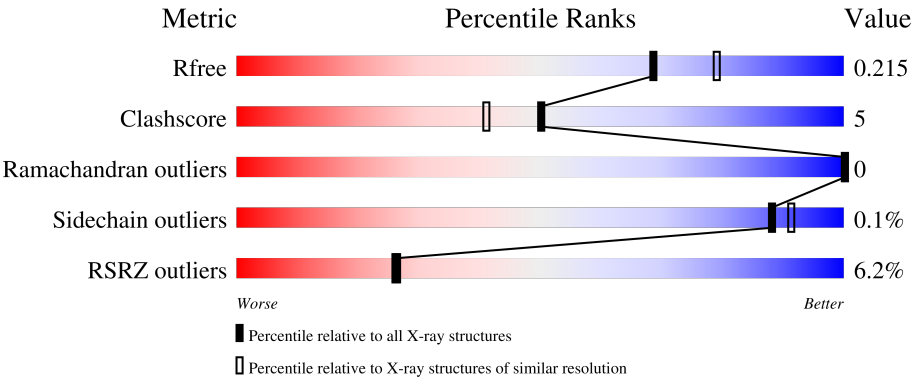
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 (i)

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

The reported resolution of this entry is 2.06 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	3774 (2.08-2.04)
Clashscore	190562	3883 (2.08-2.04)
Ramachandran outliers	187476	3860 (2.08-2.04)
Sidechain outliers	187428	3860 (2.08-2.04)
RSRZ outliers	180081	3775 (2.08-2.04)

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

Mol	Chain	Length	Quality of chain
1	A	364	4% 81% 8% 11%
1	B	364	2% 78% 9% 13%
1	C	364	10% 77% 10% 13%
1	D	364	5% 77% 9% 13%

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
2	GOL	A	401	-	-	X	-
5	PEG	B	401	-	-	X	-
5	PEG	D	403	-	-	X	-

2 Entry composition (i)

There are 10 unique types of molecules in this entry. The entry contains 10764 atoms, of which 26 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 Serine/threonine-protein kinase VRK1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	323	Total	C	N	O	S	0	2	0
			2542	1620	434	474	14			
1	B	316	Total	C	N	O	S	0	1	0
			2495	1594	425	463	13			
1	C	315	Total	C	N	O	S	0	4	0
			2474	1577	427	459	11			
1	D	315	Total	C	N	O	S	0	4	0
			2509	1605	429	461	14			

There are 52 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP Q99986
A	2	MET	-	expression tag	UNP Q99986
A	34	ALA	LYS	engineered mutation	UNP Q99986
A	35	ALA	LYS	engineered mutation	UNP Q99986
A	36	ALA	GLU	engineered mutation	UNP Q99986
A	212	ALA	GLU	engineered mutation	UNP Q99986
A	214	ALA	LYS	engineered mutation	UNP Q99986
A	215	ALA	GLU	engineered mutation	UNP Q99986
A	292	ALA	GLU	engineered mutation	UNP Q99986
A	293	ALA	LYS	engineered mutation	UNP Q99986
A	295	ALA	LYS	engineered mutation	UNP Q99986
A	359	ALA	LYS	engineered mutation	UNP Q99986
A	360	ALA	LYS	engineered mutation	UNP Q99986
B	1	SER	-	expression tag	UNP Q99986
B	2	MET	-	expression tag	UNP Q99986
B	34	ALA	LYS	engineered mutation	UNP Q99986
B	35	ALA	LYS	engineered mutation	UNP Q99986
B	36	ALA	GLU	engineered mutation	UNP Q99986
B	212	ALA	GLU	engineered mutation	UNP Q99986
B	214	ALA	LYS	engineered mutation	UNP Q99986
B	215	ALA	GLU	engineered mutation	UNP Q99986

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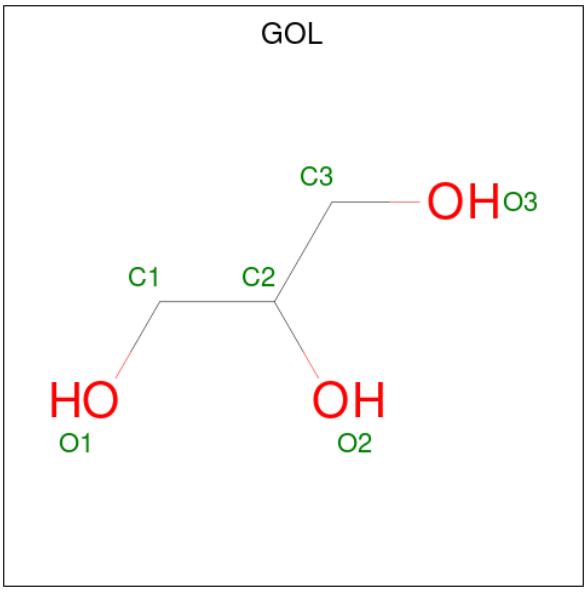
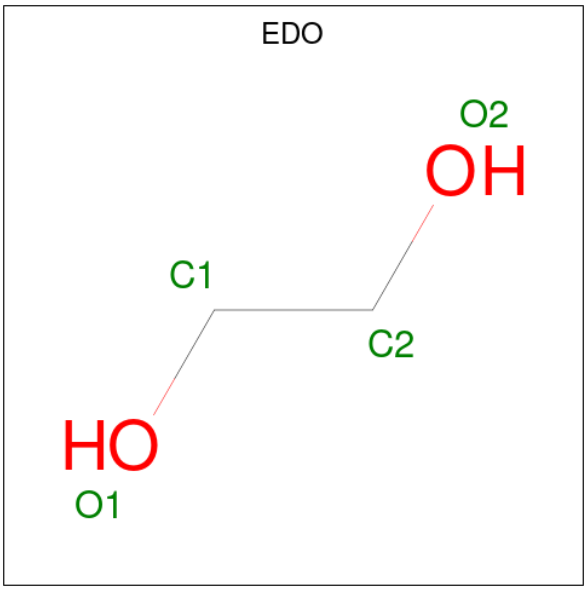
Chain	Residue	Modelled	Actual	Comment	Reference
B	292	ALA	GLU	engineered mutation	UNP Q99986
B	293	ALA	LYS	engineered mutation	UNP Q99986
B	295	ALA	LYS	engineered mutation	UNP Q99986
B	359	ALA	LYS	engineered mutation	UNP Q99986
B	360	ALA	LYS	engineered mutation	UNP Q99986
C	1	SER	-	expression tag	UNP Q99986
C	2	MET	-	expression tag	UNP Q99986
C	34	ALA	LYS	engineered mutation	UNP Q99986
C	35	ALA	LYS	engineered mutation	UNP Q99986
C	36	ALA	GLU	engineered mutation	UNP Q99986
C	212	ALA	GLU	engineered mutation	UNP Q99986
C	214	ALA	LYS	engineered mutation	UNP Q99986
C	215	ALA	GLU	engineered mutation	UNP Q99986
C	292	ALA	GLU	engineered mutation	UNP Q99986
C	293	ALA	LYS	engineered mutation	UNP Q99986
C	295	ALA	LYS	engineered mutation	UNP Q99986
C	359	ALA	LYS	engineered mutation	UNP Q99986
C	360	ALA	LYS	engineered mutation	UNP Q99986
D	1	SER	-	expression tag	UNP Q99986
D	2	MET	-	expression tag	UNP Q99986
D	34	ALA	LYS	engineered mutation	UNP Q99986
D	35	ALA	LYS	engineered mutation	UNP Q99986
D	36	ALA	GLU	engineered mutation	UNP Q99986
D	212	ALA	GLU	engineered mutation	UNP Q99986
D	214	ALA	LYS	engineered mutation	UNP Q99986
D	215	ALA	GLU	engineered mutation	UNP Q99986
D	292	ALA	GLU	engineered mutation	UNP Q99986
D	293	ALA	LYS	engineered mutation	UNP Q99986
D	295	ALA	LYS	engineered mutation	UNP Q99986
D	359	ALA	LYS	engineered mutation	UNP Q99986
D	360	ALA	LYS	engineered mutation	UNP Q99986

- Molecule 2 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).

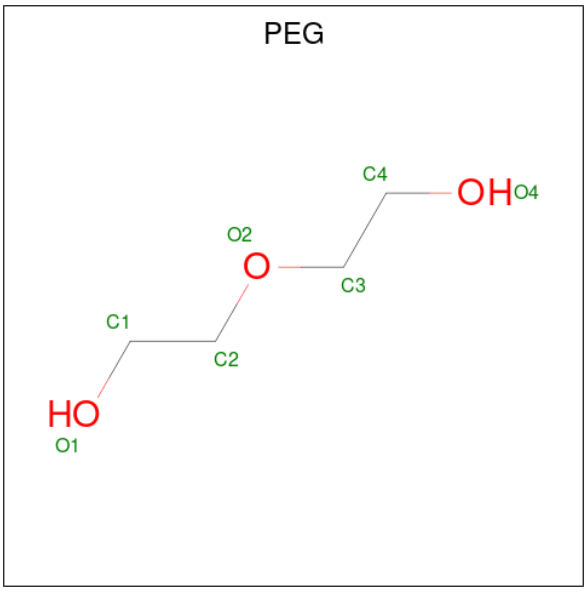


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 8 4 4	0	1
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0
3	D	1	Total C O 4 2 2	0	0

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

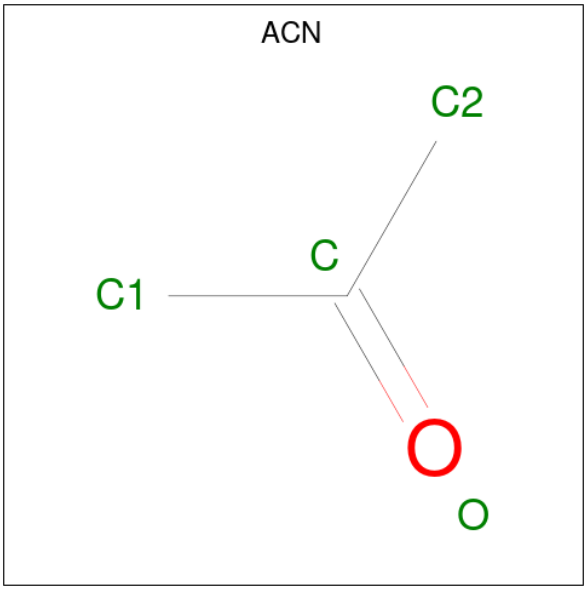
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Cl 1 1	0	0
4	C	2	Total Cl 2 2	0	0
4	D	4	Total Cl 4 4	0	0

- Molecule 5 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



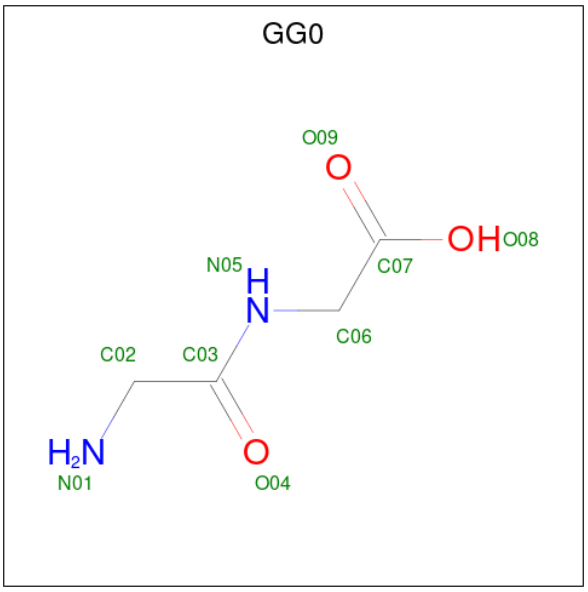
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C O 7 4 3	0	0
5	D	1	Total C O 7 4 3	0	0

- Molecule 6 is ACETONE (CCD ID: ACN) (formula: C_3H_6O).



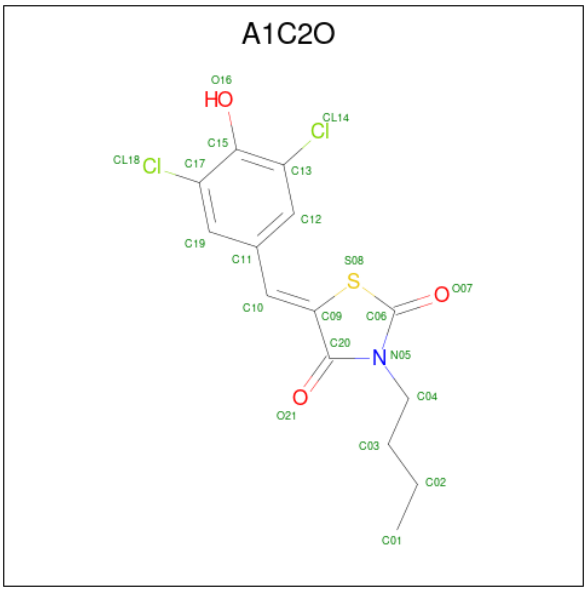
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total C O 4 3 1	0	0

- Molecule 7 is 2-(2-azanylethanoylamino)ethanoic acid (CCD ID: GG0) (formula: $C_4H_8N_2O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	1	Total	C	N	O	0	0
			9	4	2	3		
7	B	1	Total	C	N	O	0	0
			9	4	2	3		

- Molecule 8 is (5Z)-3-butyl-5-[(3,5-dichloro-4-hydroxyphenyl)methylidene]-1,3-thiazolidine-2,4-dione (CCD ID: A1C2O) (formula: $C_{14}H_{13}Cl_2NO_3S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
8	C	1	Total	C	Cl	H	N	O	S	0	0
			34	14	2	13	1	3	1		

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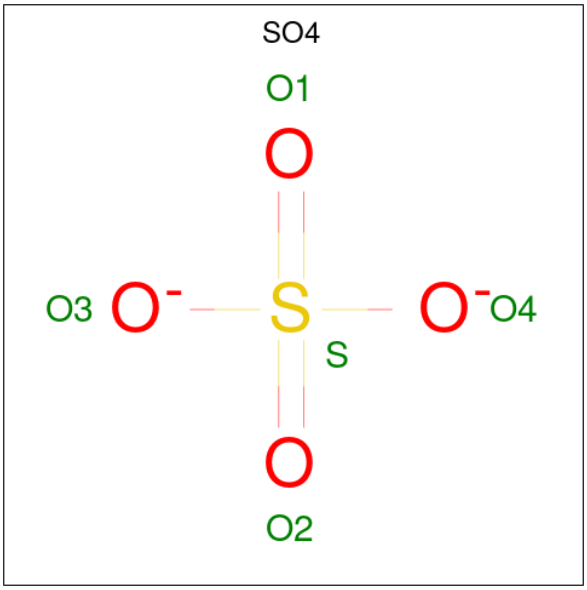
Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
8	D	1	Total	C	Cl	H	N	O	S	0	0
			34	14	2	13	1	3	1		

- Molecule 9 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	C	1	Total	O	S	0	0
			5	4	1		
9	C	1	Total	O	S	0	0
			5	4	1		
9	C	1	Total	O	S	0	0
			5	4	1		
9	D	1	Total	O	S	0	0
			5	4	1		
9	D	1	Total	O	S	0	0
			5	4	1		
9	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	140	Total	O	0	0
			140	140		
10	B	153	Total	O	0	0
			153	153		

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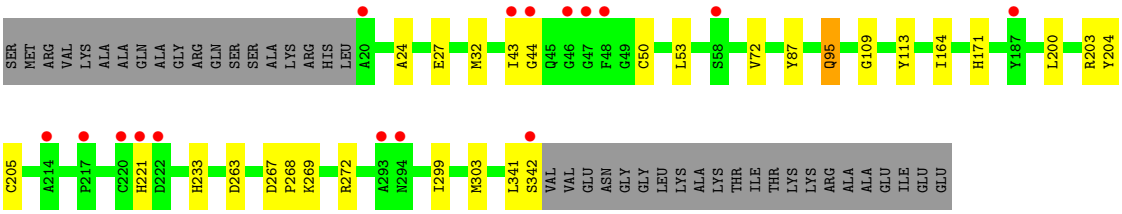
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	C	112	Total O 112 112	0	0
10	D	134	Total O 134 134	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

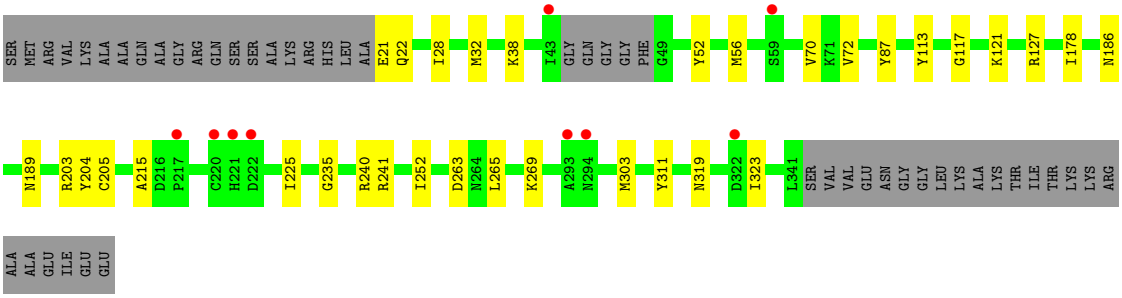
• Molecule 1: Serine/threonine-protein kinase VRK1

Chain A:



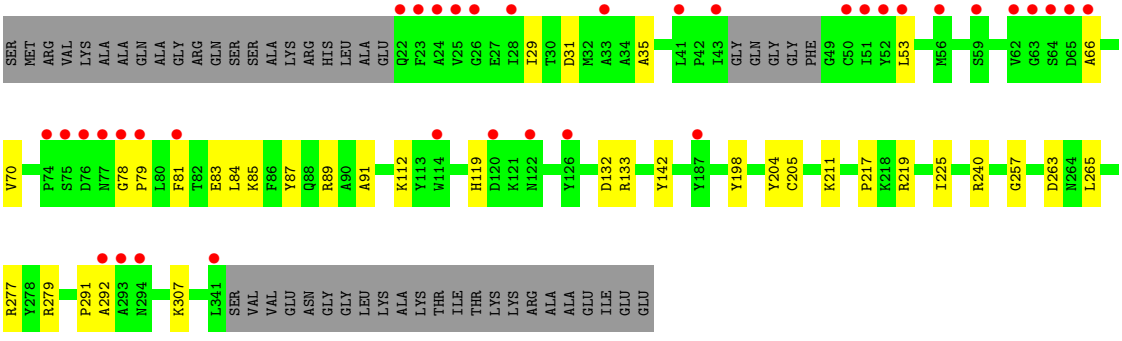
• Molecule 1: Serine/threonine-protein kinase VRK1

Chain B:



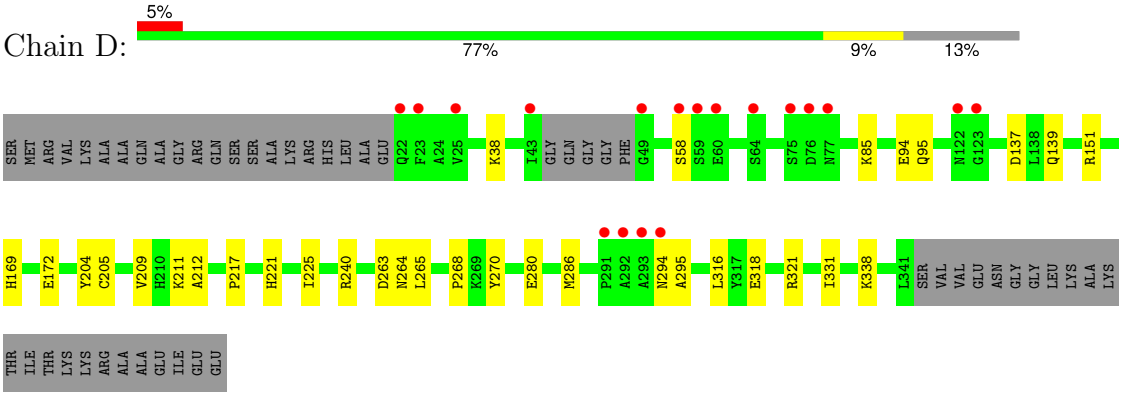
• Molecule 1: Serine/threonine-protein kinase VRK1

Chain C:



• Molecule 1: Serine/threonine-protein kinase VRK1

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	91.46Å 95.93Å 191.83Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.97 – 2.06 47.97 – 2.06	Depositor EDS
% Data completeness (in resolution range)	100.0 (47.97-2.06) 100.0 (47.97-2.06)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.30 (at 2.07Å)	Xtriage
Refinement program	PHENIX 1.21.2_5419	Depositor
R, R_{free}	0.181 , 0.216 0.181 , 0.215	Depositor DCC
R_{free} test set	5245 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	33.1	Xtriage
Anisotropy	0.413	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 50.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.025 for k,h,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	10764	wwPDB-VP
Average B, all atoms (Å^2)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.89% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GG0, CL, ACN, PEG, GOL, EDO, A1C2O, SO4

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	0.19	0/2608	0.37	0/3533
1	B	0.18	0/2555	0.36	0/3458
1	C	0.17	0/2541	0.32	0/3443
1	D	0.19	0/2580	0.34	0/3492
All	All	0.18	0/10284	0.35	0/13926

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

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	2542	0	2467	26	0
1	B	2495	0	2442	25	0
1	C	2474	0	2379	31	0
1	D	2509	0	2457	27	0
2	A	6	0	8	5	0
2	C	12	0	16	2	0
2	D	6	0	8	1	0
3	A	12	0	18	1	0
3	B	8	0	12	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	12	0	18	4	0
3	D	8	0	12	0	0
4	A	1	0	0	0	0
4	C	2	0	0	0	0
4	D	4	0	0	0	0
5	B	7	0	10	5	0
5	D	7	0	10	4	0
6	B	4	0	6	1	0
7	B	18	0	0	0	0
8	C	21	13	0	1	0
8	D	21	13	0	1	0
9	C	15	0	0	1	0
9	D	15	0	0	0	0
10	A	140	0	0	1	0
10	B	153	0	0	4	0
10	C	112	0	0	3	0
10	D	134	0	0	4	0
All	All	10738	26	9863	107	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 5.

All (107) 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:C:219:ARG:HH21	3:C:403:EDO:H22	1.34	0.90
1:D:286:MET:HE3	1:D:295:ALA:HB1	1.53	0.89
1:C:211:LYS:HB2	3:C:402:EDO:H21	1.60	0.81
1:C:53:LEU:HD22	1:C:133:ARG:HD2	1.64	0.79
1:D:209:VAL:HG12	5:D:403:PEG:H21	1.66	0.77
1:C:66:ALA:O	1:C:133:ARG:HD3	1.84	0.76
1:D:172:GLU:HA	1:D:205[B]:CYS:SG	2.30	0.71
1:B:203:ARG:NH1	6:B:402:ACN:O	2.25	0.70
1:B:21:GLU:O	1:B:121:LYS:HE2	1.98	0.64
1:D:212:ALA:H	5:D:403:PEG:H41	1.61	0.64
1:C:31:ASP:OD2	1:C:35:ALA:HB3	1.98	0.64
1:B:252:ILE:HD12	1:B:303[A]:MET:HE1	1.80	0.63
1:A:171:HIS:NE2	2:A:401:GOL:H32	2.14	0.62
1:B:311:TYR:HB2	5:B:401:PEG:H41	1.82	0.61
1:D:211:LYS:HD2	5:D:403:PEG:H41	1.83	0.61
1:A:95:GLN:NE2	2:A:401:GOL:H12	2.16	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:109:GLY:HA3	1:A:164:ILE:HD11	1.84	0.60
1:A:32:MET:HE2	1:D:316:LEU:HD12	1.83	0.59
1:C:112:LYS:HB3	1:C:132:ASP:OD2	2.03	0.59
1:D:263:ASP:HB2	10:D:524:HOH:O	2.05	0.57
8:D:404:A1C2O:CL18	2:D:405:GOL:H31	2.41	0.57
1:D:294:ASN:HA	10:D:503:HOH:O	2.05	0.57
1:A:95:GLN:HE21	2:A:401:GOL:H32	1.69	0.57
1:A:43:ILE:HG23	1:A:44:GLY:H	1.71	0.56
1:A:203:ARG:HH11	3:A:402[B]:EDO:H21	1.71	0.56
1:B:252:ILE:CD1	1:B:303[A]:MET:HE1	2.36	0.56
1:A:204:TYR:CE2	1:A:205:CYS:HB2	2.41	0.56
1:A:32:MET:CE	1:D:316:LEU:HD12	2.37	0.55
1:B:241:ARG:HH22	5:B:401:PEG:H21	1.72	0.55
1:C:29:ILE:HG22	1:C:119:HIS:CG	2.42	0.55
1:A:43:ILE:HG23	1:A:44:GLY:N	2.23	0.54
1:C:277:ARG:NH2	10:C:503:HOH:O	2.39	0.54
1:C:211:LYS:HB2	3:C:402:EDO:C2	2.33	0.53
1:A:200:LEU:HD13	1:A:221:HIS:CG	2.43	0.53
1:D:338:LYS:HE3	10:D:511:HOH:O	2.07	0.53
1:C:291:PRO:O	1:C:292:ALA:HB3	2.09	0.53
1:D:286:MET:CE	1:D:295:ALA:HB1	2.33	0.53
1:B:204:TYR:CE2	1:B:205:CYS:HB2	2.44	0.52
1:B:87:TYR:HB3	1:B:113:TYR:HB2	1.91	0.52
1:B:22:GLN:HG3	1:B:72:VAL:HG11	1.92	0.52
1:B:269:LYS:HE3	10:B:538:HOH:O	2.09	0.52
1:C:217:PRO:HD3	1:D:217:PRO:HG3	1.92	0.51
1:A:263:ASP:HB2	10:A:518:HOH:O	2.10	0.51
1:C:211:LYS:HD3	3:C:402:EDO:H21	1.93	0.51
1:C:83:GLU:HG3	1:C:198:TYR:HB2	1.93	0.50
1:C:84:LEU:HD23	1:C:84:LEU:O	2.11	0.50
1:D:38:LYS:NZ	1:D:58:SER:O	2.41	0.50
1:A:95:GLN:HE21	2:A:401:GOL:C3	2.25	0.50
1:C:142:TYR:OH	1:C:257:GLY:HA2	2.12	0.50
1:C:89:ARG:NH1	9:C:408:SO4:O3	2.42	0.49
1:A:50:CYS:HB2	1:A:72:VAL:O	2.13	0.49
1:A:341:LEU:O	1:A:342:SER:HB3	2.12	0.49
1:D:280:GLU:HG3	10:D:612:HOH:O	2.13	0.48
1:A:95:GLN:HE21	2:A:401:GOL:H12	1.78	0.48
1:D:172:GLU:HG2	1:D:205[B]:CYS:SG	2.54	0.48
1:C:133:ARG:HG2	1:C:133:ARG:HH21	1.79	0.47
1:D:264:ASN:HB3	1:D:270:TYR:CD2	2.48	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:267:ASP:OD1	1:A:269:LYS:HG2	2.15	0.47
1:C:70:VAL:HG13	1:C:70:VAL:O	2.14	0.47
1:C:263:ASP:HB2	10:C:572:HOH:O	2.13	0.47
1:B:32:MET:HG3	1:B:117:GLY:HA2	1.96	0.47
1:B:240:ARG:HH22	3:B:404:EDO:H12	1.79	0.47
1:A:233:HIS:HB3	1:A:272:ARG:HD3	1.96	0.46
1:C:87:TYR:HA	1:C:91:ALA:HB3	1.96	0.46
5:B:401:PEG:H21	5:B:401:PEG:H42	1.44	0.46
1:C:240:ARG:HH22	2:C:404:GOL:H2	1.79	0.46
1:B:186:ASN:HB3	1:B:189:ASN:O	2.15	0.46
1:D:204:TYR:CE2	1:D:205[A]:CYS:HB2	2.50	0.46
1:C:240:ARG:HH22	2:C:404:GOL:C2	2.29	0.46
1:C:84:LEU:HD23	1:C:84:LEU:C	2.41	0.45
1:D:94[B]:GLU:H	1:D:94[B]:GLU:CD	2.24	0.45
1:B:127:ARG:HG3	10:B:622:HOH:O	2.15	0.45
1:C:112:LYS:HA	10:C:509:HOH:O	2.17	0.45
1:A:24:ALA:O	1:A:27:GLU:HB2	2.17	0.45
1:D:137:ASP:OD1	1:D:139:GLN:HB3	2.17	0.45
1:A:87:TYR:HB3	1:A:113:TYR:HB2	1.99	0.44
1:A:43:ILE:HD13	1:A:53:LEU:HD21	1.98	0.44
1:C:81:PHE:CZ	1:C:85:LYS:HE3	2.52	0.44
1:D:151:ARG:HD3	1:D:331:ILE:HG21	2.00	0.44
1:C:204:TYR:CE2	1:C:205:CYS:HB2	2.53	0.43
1:B:311:TYR:CB	5:B:401:PEG:H41	2.46	0.43
1:B:28:ILE:HD11	1:B:38:LYS:HE2	2.01	0.43
1:A:299:ILE:O	1:A:303[B]:MET:HG2	2.18	0.43
1:C:133:ARG:HG3	8:C:405:A1C2O:O21	2.19	0.43
1:C:279[B]:ARG:NH2	1:C:307:LYS:HA	2.34	0.43
1:A:268:PRO:HB2	1:B:56:MET:SD	2.59	0.42
1:D:221:HIS:CE1	1:D:268:PRO:HB2	2.53	0.42
1:C:225:ILE:HG23	1:C:265:LEU:HD22	2.02	0.42
1:B:178:ILE:H	1:B:178:ILE:HD12	1.85	0.42
1:D:94[A]:GLU:HG3	1:D:95:GLN:N	2.34	0.42
1:D:169:HIS:CG	1:D:240:ARG:HG2	2.54	0.42
1:C:78:GLY:N	1:C:79:PRO:CD	2.81	0.42
1:B:215:ALA:HB2	1:B:235:GLY:O	2.20	0.42
1:C:133:ARG:HG2	1:C:133:ARG:NH2	2.34	0.42
1:B:311:TYR:H	5:B:401:PEG:C4	2.33	0.41
1:A:299:ILE:O	1:A:303[A]:MET:HG3	2.20	0.41
1:A:341:LEU:O	1:A:342:SER:CB	2.68	0.41
1:B:263:ASP:HB2	10:B:513:HOH:O	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:319:ASN:O	1:B:323:ILE:HG13	2.20	0.41
1:D:85:LYS:HB2	1:D:85:LYS:HE3	1.82	0.41
1:B:225:ILE:HD13	1:B:265:LEU:O	2.20	0.41
1:B:269:LYS:HG2	10:B:548:HOH:O	2.21	0.41
1:A:303[A]:MET:HE2	1:A:303[A]:MET:HB3	1.75	0.41
1:B:52:TYR:HB2	1:B:70:VAL:CG1	2.51	0.40
1:D:209:VAL:HG12	5:D:403:PEG:C2	2.42	0.40
1:D:225:ILE:HG23	1:D:265:LEU:HD22	2.03	0.40
1:D:318:GLU:OE1	1:D:321:ARG:NH1	2.54	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	323/364 (89%)	313 (97%)	10 (3%)	0	100	100
1	B	313/364 (86%)	305 (97%)	8 (3%)	0	100	100
1	C	315/364 (86%)	301 (96%)	14 (4%)	0	100	100
1	D	315/364 (86%)	304 (96%)	11 (4%)	0	100	100
All	All	1266/1456 (87%)	1223 (97%)	43 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	263/304 (86%)	262 (100%)	1 (0%)	84 87
1	B	260/304 (86%)	260 (100%)	0	100 100
1	C	251/304 (83%)	251 (100%)	0	100 100
1	D	261/304 (86%)	261 (100%)	0	100 100
All	All	1035/1216 (85%)	1034 (100%)	1 (0%)	88 91

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	95	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	97	GLN
1	A	281	ASN
1	B	97	GLN
1	D	145	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 34 ligands modelled in this entry, 7 are monoatomic - leaving 27 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	PEG	D	403	-	6,6,6	0.23	0	5,5,5	0.27	0
3	EDO	C	402	-	3,3,3	0.25	0	2,2,2	0.36	0
7	GG0	B	405	-	7,8,8	1.21	1 (14%)	6,9,9	1.17	0
2	GOL	C	401	-	5,5,5	0.40	0	5,5,5	0.29	0
2	GOL	C	404	-	5,5,5	0.30	0	5,5,5	0.35	0
3	EDO	D	401	-	3,3,3	0.22	0	2,2,2	0.43	0
9	SO4	C	407	-	4,4,4	0.68	0	6,6,6	0.08	0
3	EDO	C	403	-	3,3,3	0.23	0	2,2,2	0.34	0
9	SO4	C	409	-	4,4,4	0.72	0	6,6,6	0.12	0
3	EDO	D	402	-	3,3,3	0.26	0	2,2,2	0.34	0
8	A1C2O	C	405	-	22,22,22	6.73	15 (68%)	31,31,31	6.74	4 (12%)
3	EDO	B	406	-	3,3,3	0.24	0	2,2,2	0.35	0
9	SO4	D	408	-	4,4,4	0.66	0	6,6,6	0.13	0
9	SO4	D	406	-	4,4,4	0.71	0	6,6,6	0.14	0
9	SO4	C	408	-	4,4,4	0.69	0	6,6,6	0.11	0
3	EDO	C	406	-	3,3,3	0.17	0	2,2,2	0.45	0
3	EDO	A	402[B]	-	3,3,3	0.24	0	2,2,2	0.35	0
2	GOL	A	401	-	5,5,5	0.37	0	5,5,5	0.42	0
7	GG0	B	403	-	7,8,8	1.07	1 (14%)	6,9,9	0.92	0
2	GOL	D	405	-	5,5,5	0.30	0	5,5,5	0.35	0
5	PEG	B	401	-	6,6,6	0.25	0	5,5,5	0.31	0
6	ACN	B	402	-	3,3,3	0.44	0	3,3,3	0.23	0
3	EDO	A	403	-	3,3,3	0.27	0	2,2,2	0.18	0
8	A1C2O	D	404	-	22,22,22	6.50	16 (72%)	31,31,31	6.38	6 (19%)
9	SO4	D	407	-	4,4,4	0.70	0	6,6,6	0.10	0
3	EDO	B	404	-	3,3,3	0.24	0	2,2,2	0.39	0
3	EDO	A	402[A]	-	3,3,3	0.24	0	2,2,2	0.35	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
5	PEG	D	403	-	-	3/4/4/4	-
3	EDO	C	402	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	GG0	B	405	-	-	2/7/7/7	-
2	GOL	C	401	-	-	0/4/4/4	-
2	GOL	C	404	-	-	2/4/4/4	-
3	EDO	D	401	-	-	0/1/1/1	-
3	EDO	C	403	-	-	0/1/1/1	-
3	EDO	D	402	-	-	0/1/1/1	-
8	A1C2O	C	405	-	-	4/8/24/24	0/2/2/2
3	EDO	B	406	-	-	0/1/1/1	-
3	EDO	C	406	-	-	1/1/1/1	-
3	EDO	A	402[B]	-	-	0/1/1/1	-
2	GOL	A	401	-	-	2/4/4/4	-
7	GG0	B	403	-	-	2/7/7/7	-
2	GOL	D	405	-	-	0/4/4/4	-
5	PEG	B	401	-	-	3/4/4/4	-
3	EDO	A	403	-	-	0/1/1/1	-
8	A1C2O	D	404	-	-	2/8/24/24	0/2/2/2
3	EDO	B	404	-	-	1/1/1/1	-
3	EDO	A	402[A]	-	-	0/1/1/1	-

All (33) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	C	405	A1C2O	C10-C09	17.50	1.53	1.34
8	D	404	A1C2O	C10-C09	16.91	1.52	1.34
8	C	405	A1C2O	C20-N05	11.72	1.66	1.40
8	D	404	A1C2O	C20-N05	11.41	1.66	1.40
8	C	405	A1C2O	C06-N05	10.81	1.54	1.38
8	D	404	A1C2O	C06-N05	10.58	1.54	1.38
8	C	405	A1C2O	C15-C13	9.12	1.53	1.39
8	D	404	A1C2O	C19-C17	9.07	1.53	1.38
8	C	405	A1C2O	C06-S08	-8.81	1.67	1.77
8	C	405	A1C2O	C19-C17	8.49	1.52	1.38
8	D	404	A1C2O	C15-C13	8.11	1.51	1.39
8	D	404	A1C2O	C06-S08	-8.02	1.68	1.77
8	C	405	A1C2O	C12-C11	7.80	1.53	1.39
8	D	404	A1C2O	C12-C11	7.35	1.52	1.39
8	C	405	A1C2O	C15-C17	-5.29	1.31	1.39
8	C	405	A1C2O	C20-C09	4.87	1.57	1.48
8	D	404	A1C2O	C15-C17	-4.81	1.32	1.39
8	D	404	A1C2O	C19-C11	-4.71	1.31	1.39
8	C	405	A1C2O	C09-S08	-4.69	1.63	1.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	D	404	A1C2O	C12-C13	-4.67	1.31	1.38
8	D	404	A1C2O	C09-S08	-4.65	1.63	1.73
8	C	405	A1C2O	C19-C11	-4.54	1.32	1.39
8	D	404	A1C2O	C20-C09	4.29	1.56	1.48
8	C	405	A1C2O	C12-C13	-3.95	1.32	1.38
8	C	405	A1C2O	C11-C10	3.43	1.53	1.46
8	D	404	A1C2O	C11-C10	3.03	1.52	1.46
8	C	405	A1C2O	C13-CL14	2.30	1.79	1.73
8	C	405	A1C2O	C17-CL18	2.24	1.78	1.73
8	D	404	A1C2O	O07-C06	-2.20	1.18	1.21
7	B	405	GG0	C06-C07	2.16	1.56	1.50
7	B	403	GG0	O08-C07	-2.08	1.23	1.30
8	D	404	A1C2O	C17-CL18	2.05	1.78	1.73
8	D	404	A1C2O	O21-C20	-2.01	1.19	1.23

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
8	C	405	A1C2O	C09-S08-C06	34.60	106.08	91.80
8	D	404	A1C2O	C09-S08-C06	31.88	104.96	91.80
8	D	404	A1C2O	C20-N05-C06	-11.44	107.39	116.61
8	C	405	A1C2O	C20-N05-C06	-10.80	107.90	116.61
8	C	405	A1C2O	C11-C10-C09	-6.47	122.22	130.92
8	D	404	A1C2O	C04-N05-C06	5.79	127.36	120.96
8	D	404	A1C2O	C11-C10-C09	-5.52	123.49	130.92
8	C	405	A1C2O	C04-N05-C06	4.83	126.30	120.96
8	D	404	A1C2O	C10-C09-S08	3.30	133.50	129.25
8	D	404	A1C2O	C10-C09-C20	-2.65	117.45	120.37

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	GOL	O1-C1-C2-C3
7	B	403	GG0	N05-C06-C07-O09
8	C	405	A1C2O	C20-C09-C10-C11
8	C	405	A1C2O	S08-C09-C10-C11
8	C	405	A1C2O	C03-C04-N05-C06
8	D	404	A1C2O	C03-C04-N05-C06
5	B	401	PEG	C4-C3-O2-C2
8	C	405	A1C2O	C03-C04-N05-C20
7	B	405	GG0	O04-C03-N05-C06

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Mol	Chain	Res	Type	Atoms
7	B	403	GG0	N05-C06-C07-O08
8	D	404	A1C2O	C03-C04-N05-C20
7	B	405	GG0	C02-C03-N05-C06
5	D	403	PEG	O2-C3-C4-O4
2	C	404	GOL	O1-C1-C2-C3
2	A	401	GOL	O1-C1-C2-O2
2	C	404	GOL	O1-C1-C2-O2
5	B	401	PEG	O2-C3-C4-O4
5	D	403	PEG	O1-C1-C2-O2
3	B	404	EDO	O1-C1-C2-O2
5	D	403	PEG	C1-C2-O2-C3
5	B	401	PEG	O1-C1-C2-O2
3	C	406	EDO	O1-C1-C2-O2

There are no ring outliers.

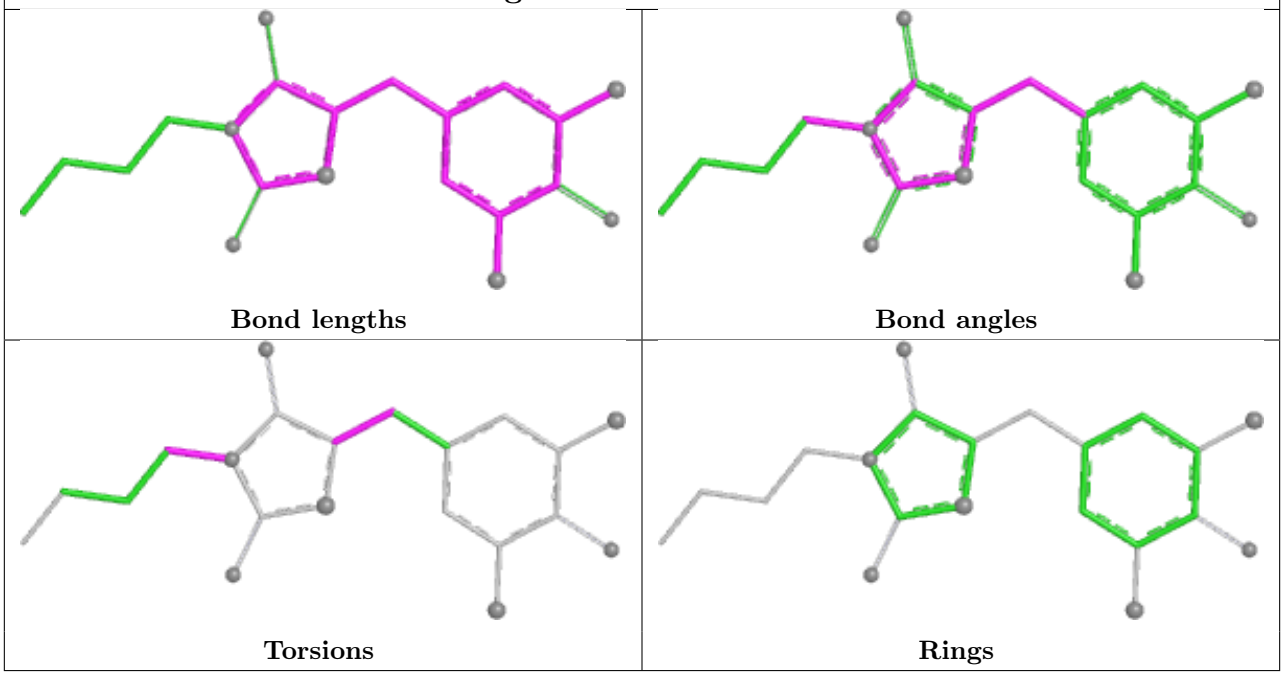
13 monomers are involved in 26 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	403	PEG	4	0
3	C	402	EDO	3	0
2	C	404	GOL	2	0
3	C	403	EDO	1	0
8	C	405	A1C2O	1	0
9	C	408	SO4	1	0
3	A	402[B]	EDO	1	0
2	A	401	GOL	5	0
2	D	405	GOL	1	0
5	B	401	PEG	5	0
6	B	402	ACN	1	0
8	D	404	A1C2O	1	0
3	B	404	EDO	1	0

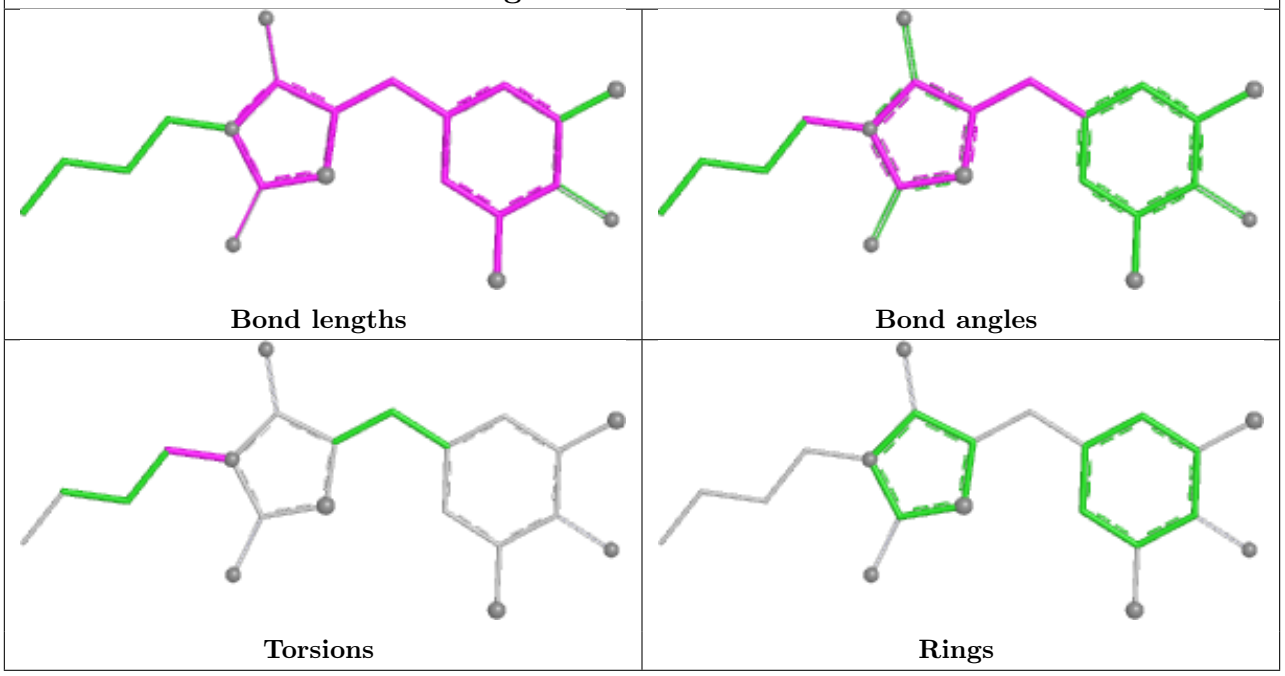
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier.

The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand A1C2O C 405



Ligand A1C2O D 404



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, 95^{th} 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	323/364 (88%)	-0.07	16 (4%)	34	34	21, 36, 63, 107	2 (0%)
1	B	316/364 (86%)	-0.11	9 (2%)	55	56	21, 37, 67, 105	1 (0%)
1	C	315/364 (86%)	0.32	36 (11%)	10	10	17, 41, 101, 119	4 (1%)
1	D	315/364 (86%)	0.00	18 (5%)	29	29	21, 37, 78, 94	4 (1%)
All	All	1269/1456 (87%)	0.03	79 (6%)	26	26	17, 37, 81, 119	11 (0%)

All (79) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	293	ALA	4.8
1	C	43	ILE	4.5
1	C	50	CYS	4.3
1	C	23	PHE	4.3
1	D	23	PHE	4.3
1	C	28	ILE	4.2
1	C	22	GLN	4.1
1	A	293	ALA	4.1
1	A	20	ALA	3.8
1	C	25	VAL	3.8
1	B	59	SER	3.7
1	A	221	HIS	3.6
1	A	44	GLY	3.5
1	C	294	ASN	3.4
1	B	221	HIS	3.3
1	D	293	ALA	3.2
1	C	59	SER	3.2
1	C	62	VAL	3.1
1	D	43	ILE	3.0
1	C	292	ALA	3.0
1	A	342	SER	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	220	CYS	2.9
1	D	77	ASN	2.9
1	A	187	TYR	2.8
1	C	126	TYR	2.8
1	C	26	GLY	2.8
1	C	77	ASN	2.8
1	A	46	GLY	2.8
1	C	122	ASN	2.7
1	D	294	ASN	2.7
1	D	75	SER	2.7
1	D	49	GLY	2.7
1	D	123	GLY	2.7
1	D	59	SER	2.7
1	C	114	TRP	2.7
1	B	222	ASP	2.7
1	C	78	GLY	2.6
1	D	292	ALA	2.6
1	D	60	GLU	2.5
1	C	66	ALA	2.5
1	A	294	ASN	2.5
1	C	81	PHE	2.5
1	C	75	SER	2.5
1	C	33	ALA	2.5
1	A	43	ILE	2.4
1	D	22	GLN	2.4
1	C	52	TYR	2.3
1	D	76	ASP	2.3
1	A	217	PRO	2.3
1	D	291	PRO	2.3
1	C	187	TYR	2.3
1	C	63	GLY	2.3
1	C	51	ILE	2.3
1	C	74	PRO	2.3
1	A	58	SER	2.3
1	A	220	CYS	2.3
1	A	222	ASP	2.3
1	C	120	ASP	2.3
1	A	48	PHE	2.2
1	B	294	ASN	2.2
1	C	24	ALA	2.2
1	C	56	MET	2.2
1	C	64	SER	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	25	VAL	2.2
1	D	58	SER	2.2
1	B	217	PRO	2.2
1	C	76	ASP	2.2
1	A	214	ALA	2.2
1	C	53	LEU	2.1
1	D	122	ASN	2.1
1	C	65	ASP	2.1
1	D	64	SER	2.1
1	C	41	LEU	2.0
1	B	322	ASP	2.0
1	B	43	ILE	2.0
1	B	293	ALA	2.0
1	C	341	LEU	2.0
1	C	79	PRO	2.0
1	A	47	GLY	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, 95^{th} 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	ACN	B	402	4/4	0.68	0.25	46,49,51,51	0
5	PEG	B	401	7/7	0.77	0.19	32,44,50,54	7
3	EDO	D	401	4/4	0.77	0.19	42,44,46,46	0
3	EDO	C	403	4/4	0.79	0.16	52,53,60,64	0
3	EDO	C	406	4/4	0.80	0.16	38,43,45,46	0
7	GG0	B	405	9/9	0.81	0.17	38,53,58,58	9
3	EDO	B	404	4/4	0.82	0.17	44,50,52,57	0

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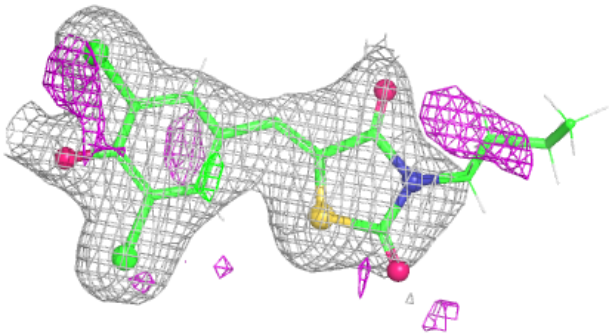
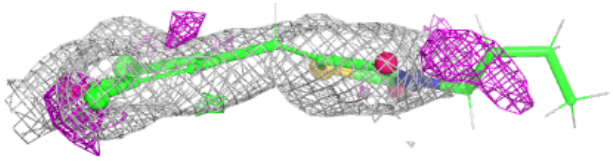
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	EDO	A	402[B]	4/4	0.84	0.18	36,39,42,44	4
3	EDO	A	402[A]	4/4	0.84	0.18	32,42,43,44	4
3	EDO	B	406	4/4	0.84	0.14	43,45,48,52	0
9	SO4	C	408	5/5	0.84	0.11	66,71,72,83	5
2	GOL	D	405	6/6	0.85	0.15	47,53,54,54	6
2	GOL	A	401	6/6	0.85	0.15	37,41,56,57	6
7	GG0	B	403	9/9	0.86	0.16	40,51,54,54	9
2	GOL	C	404	6/6	0.87	0.14	33,42,47,52	6
9	SO4	D	408	5/5	0.87	0.11	56,56,76,77	5
5	PEG	D	403	7/7	0.89	0.15	24,34,42,43	7
3	EDO	A	403	4/4	0.89	0.14	33,41,42,48	0
4	CL	C	410	1/1	0.90	0.20	69,69,69,69	0
2	GOL	C	401	6/6	0.90	0.12	35,37,46,46	0
8	A1C2O	C	405	21/21	0.91	0.13	42,68,100,100	0
4	CL	D	409	1/1	0.91	0.15	59,59,59,59	0
4	CL	C	411	1/1	0.91	0.14	75,75,75,75	0
9	SO4	C	409	5/5	0.92	0.09	32,35,49,51	5
9	SO4	D	407	5/5	0.92	0.08	54,56,59,59	5
4	CL	A	404	1/1	0.92	0.19	68,68,68,68	0
3	EDO	C	402	4/4	0.93	0.12	35,36,42,45	4
3	EDO	D	402	4/4	0.93	0.10	31,34,41,54	4
4	CL	D	410	1/1	0.94	0.14	60,60,60,60	0
9	SO4	C	407	5/5	0.94	0.08	51,54,62,75	5
8	A1C2O	D	404	21/21	0.96	0.09	31,55,88,88	0
4	CL	D	412	1/1	0.96	0.10	66,66,66,66	0
4	CL	D	411	1/1	0.97	0.12	49,49,49,49	0
9	SO4	D	406	5/5	0.97	0.06	40,40,44,46	5

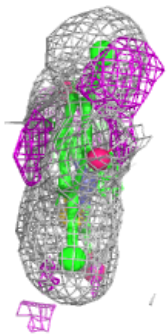
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around A1C2O C 405:

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

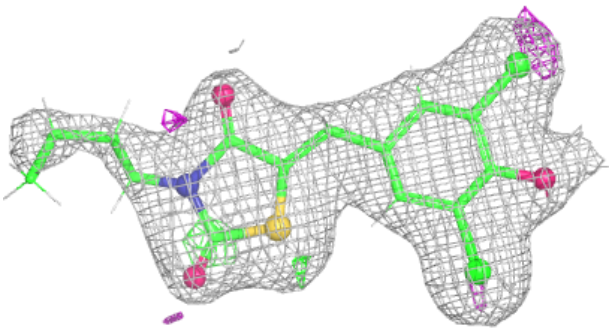


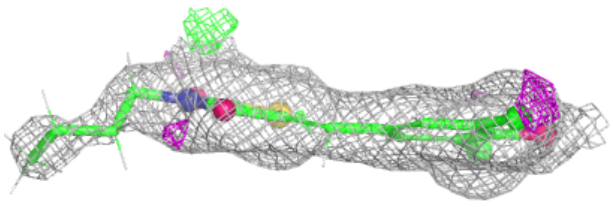


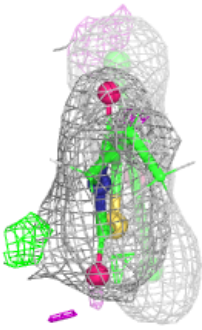


Electron density around A1C2O D 404:

$2mF_o$-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.