WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Mar 18, 2024 – 04:19 pm GMT

PDB ID	:	8R0J
Title	:	Crystal structure of the retromer complex VPS29/VPS35 with the ligand bis-1,3-phenyl guanylhydrazone, 2a
Authors	:	Milani, M.; Fagnani, E.
Deposited on	:	2023-10-31
Resolution	:	2.40 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

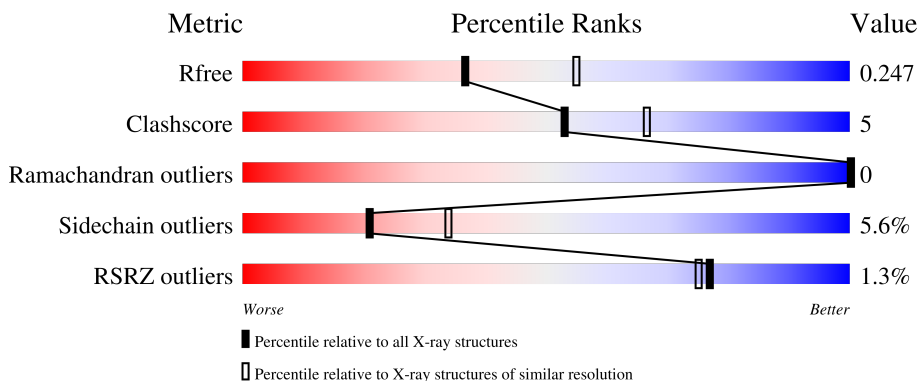|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1   Overall quality at a glance   ⓘ

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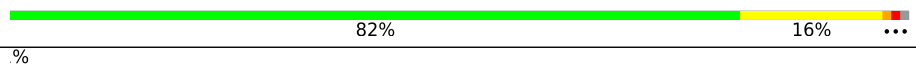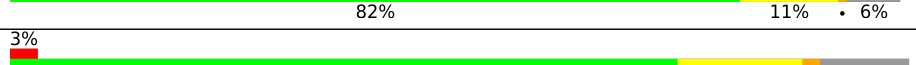*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 Å.

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

Metric	Percentile Ranks	Value
Rfree		0.247
Clashscore		5
Ramachandran outliers		0
Sidechain outliers		5.6%
RSRZ outliers		1.3%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	185	80% 18% ••
1	B	185	82% 16% •••
2	C	306	82% 11% • 6%
2	D	306	75% 14% • 10%

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	TRS	D	801	-	-	X	-

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7977 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 Vacuolar protein sorting-associated protein 29.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	183	Total	C	N	O	S	0	2	0
			1468	952	245	264	7			
1	B	183	Total	C	N	O	S	0	1	0
			1460	944	245	264	7			

There are 6 discrepancies between the modelled and reference sequences:

| Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	MET	-	initiating methionine	UNP Q9UBQ0
A	-1	GLU	-	expression tag	UNP Q9UBQ0
A	0	HIS	-	expression tag	UNP Q9UBQ0
B	-2	MET	-	initiating methionine	UNP Q9UBQ0
B	-1	GLU	-	expression tag	UNP Q9UBQ0
B	0	HIS	-	expression tag	UNP Q9UBQ0

- Molecule 2 is a protein called Vacuolar protein sorting-associated protein 35.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	287	Total	C	N	O	S	0	0	0
			2339	1488	410	431	10			
2	D	276	Total	C	N	O	S	0	0	0
			2261	1446	392	413	10			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	475	MET	-	initiating methionine	UNP Q96QK1
D	475	MET	-	initiating methionine	UNP Q96QK1

- Molecule 3 is Bis-1,3-phenyl guanylhydrazon (three-letter code: XFZ) (formula: $C_{10}H_{14}N_8$) (labeled as "Ligand of Interest" by depositor).
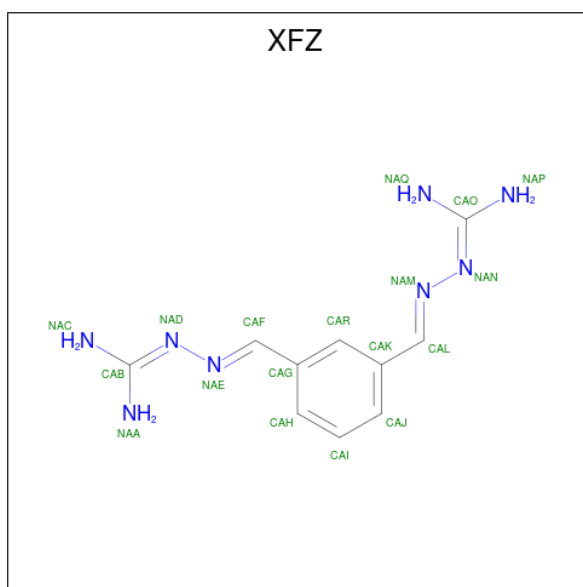
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	C	1	Total 18	C 10	N 8	0	0

- Molecule 4 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: $C_4H_{12}NO_3$).
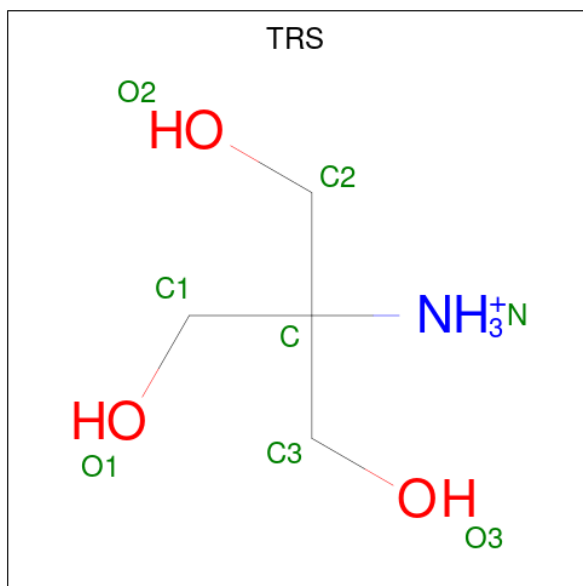
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	D	1	Total 7	C 4	N 1	O 2	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	95	Total 96	O 96	0	1
5	B	101	Total 101	O 101	0	0
5	C	116	Total 121	O 121	0	5
5	D	105	Total 106	O 106	0	1

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.
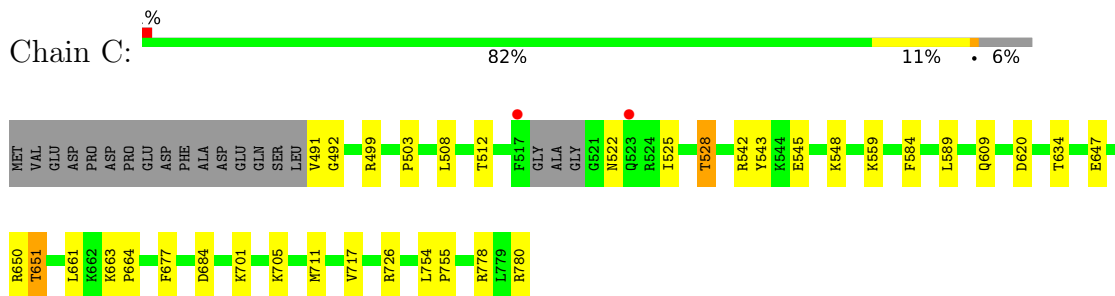
• Molecule 1: Vacuolar protein sorting-associated protein 29
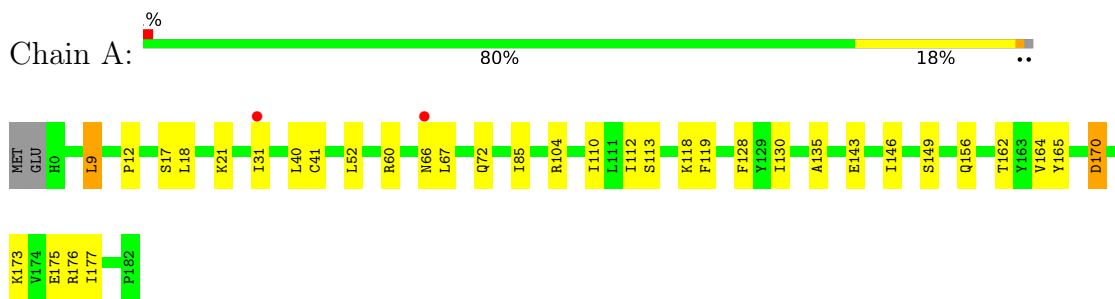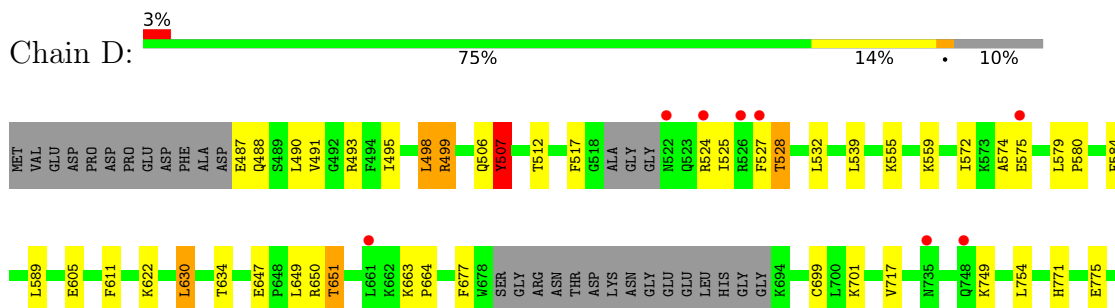
Chain A:

• Molecule 1: Vacuolar protein sorting-associated protein 29

Chain B:

• Molecule 2: Vacuolar protein sorting-associated protein 35

Chain C:

• Molecule 2: Vacuolar protein sorting-associated protein 35

Chain D:
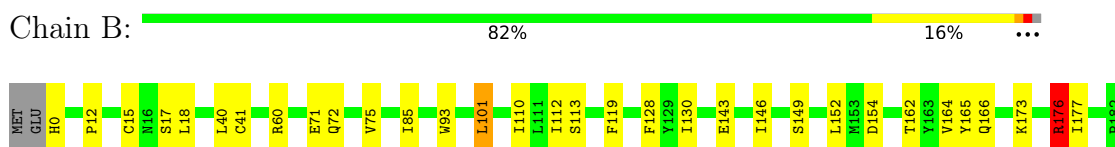
L779
R780

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	48.15Å 130.34Å 146.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.75 – 2.40	Depositor
	48.75 – 2.40	EDS
% Data completeness	99.9 (48.75-2.40)	Depositor
(in resolution range)	100.0 (48.75-2.40)	EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.40 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0419	Depositor
R, R_{free}	0.185 , 0.250	Depositor
	0.189 , 0.247	DCC
R_{free} test set	1857 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	39.0	Xtriage
Anisotropy	0.404	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 62.2	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	7977	wwPDB-VP
Average B, all atoms (Å^2)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.03% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: TRS, XFZ

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	0.35	0/1510	0.76	0/2047
1	B	0.35	0/1498	0.76	0/2031
2	C	0.36	0/2384	0.73	0/3207
2	D	0.35	0/2304	0.74	2/3101 (0.1%)
All	All	0.35	0/7696	0.75	2/10386 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	1
2	C	0	1
All	All	0	3

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	507	TYR	N-CA-CB	-8.36	95.56	110.60
2	D	507	TYR	CB-CA-C	5.58	121.57	110.40

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	104	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	B	176	ARG	Sidechain
2	C	780	ARG	Sidechain

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	1468	0	1480	16	0
1	B	1460	0	1471	17	0
2	C	2339	0	2337	19	0
2	D	2261	0	2270	31	0
3	C	18	0	0	0	0
4	D	7	0	9	7	0
5	A	96	0	0	0	0
5	B	101	0	0	4	0
5	C	121	0	0	1	0
5	D	106	0	0	2	0
All	All	7977	0	7567	81	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 (81) 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)
2:C:491:VAL:HG12	2:C:492:GLY:H	1.21	1.02
1:B:15[A]:CYS:SG	5:B:252:HOH:O	2.41	0.78
2:C:491:VAL:HG12	2:C:492:GLY:N	1.99	0.78
2:D:630:LEU:HG	4:D:801:TRS:C1	2.15	0.76
2:C:491:VAL:CG1	2:C:492:GLY:H	2.00	0.74
1:B:15[B]:CYS:SG	5:B:252:HOH:O	2.46	0.73
2:D:634:THR:OG1	4:D:801:TRS:H22	1.88	0.73
2:D:487:GLU:OE2	2:D:524:ARG:NH1	2.23	0.71
2:C:584:PHE:CZ	2:C:609:GLN:HG2	2.32	0.65
2:D:498:LEU:HD22	2:D:506:GLN:HG2	1.80	0.63
1:B:60:ARG:HD2	5:B:227:HOH:O	2.00	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:525:ILE:HA	2:C:528:THR:HG22	1.86	0.58
2:D:647:GLU:O	2:D:651:THR:HG23	2.06	0.56
2:D:630:LEU:CD1	4:D:801:TRS:C1	2.83	0.55
2:D:574:ALA:O	2:D:575:GLU:HB2	2.07	0.55
1:A:143:GLU:HB3	1:A:146:ILE:HD11	1.89	0.54
2:D:701:LYS:NZ	5:D:904:HOH:O	2.39	0.54
1:A:60:ARG:HD3	1:A:67:LEU:HD23	1.91	0.53
1:A:31:ILE:HD11	1:A:52:LEU:HB3	1.90	0.53
2:C:647:GLU:O	2:C:651:THR:HG23	2.08	0.53
2:D:717:VAL:HG11	2:D:754:LEU:HD13	1.90	0.53
2:D:507:TYR:HB2	2:D:539:LEU:HD21	1.91	0.53
2:C:589:LEU:HG	2:C:634:THR:HG23	1.92	0.52
1:B:143:GLU:HB2	1:B:146:ILE:HD11	1.89	0.52
2:D:499:ARG:HD3	5:D:969:HOH:O	2.09	0.52
1:B:0:HIS:NE2	1:B:154:ASP:OD1	2.43	0.52
2:C:717:VAL:HG11	2:C:754:LEU:HD13	1.91	0.51
1:A:40:LEU:N	1:A:41:CYS:HA	2.27	0.50
1:A:9:LEU:HD22	1:A:135:ALA:HB3	1.93	0.49
2:D:630:LEU:HD12	4:D:801:TRS:C1	2.43	0.48
2:C:559:LYS:HE3	5:C:917:HOH:O	2.13	0.48
2:C:508:LEU:O	2:C:512:THR:HG23	2.13	0.48
1:B:176:ARG:NH2	5:B:204:HOH:O	2.43	0.48
1:A:85:ILE:O	1:A:113:SER:HA	2.14	0.47
1:A:173:LYS:HE2	1:A:173:LYS:HA	1.96	0.47
2:C:711:MET:HB2	2:D:605:GLU:HG2	1.95	0.47
2:D:495:ILE:HD11	2:D:532:LEU:HD23	1.96	0.47
2:D:525:ILE:HA	2:D:528:THR:HG22	1.97	0.46
1:B:40:LEU:N	1:B:41:CYS:HA	2.30	0.46
1:A:164:VAL:HG12	1:A:175:GLU:HB2	1.95	0.46
1:B:60:ARG:NH2	1:B:71:GLU:OE1	2.48	0.46
2:C:650:ARG:CD	2:C:677:PHE:CE1	2.98	0.46
1:B:110:ILE:HA	1:B:128:PHE:O	2.16	0.46
2:C:663:LYS:N	2:C:664:PRO:CD	2.79	0.46
2:D:517:PHE:HB3	2:D:528:THR:HG23	1.99	0.45
1:B:85:ILE:O	1:B:113:SER:HA	2.16	0.45
2:C:542:ARG:HA	2:C:545:GLU:HG2	1.99	0.45
2:D:634:THR:OG1	4:D:801:TRS:C2	2.61	0.45
1:B:166:GLN:OE1	1:B:173:LYS:HE2	2.16	0.45
2:C:650:ARG:HD3	2:C:677:PHE:CD1	2.52	0.44
2:D:663:LYS:N	2:D:664:PRO:CD	2.80	0.44
1:B:119:PHE:CD1	1:B:164:VAL:HG21	2.53	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:118:LYS:HD2	1:A:143:GLU:OE1	2.17	0.44
2:D:579:LEU:HB3	2:D:580:PRO:HD3	2.00	0.44
2:D:488:GLN:HG2	2:D:527:PHE:HB3	1.99	0.43
1:A:164:VAL:CG1	1:A:175:GLU:HB2	2.48	0.43
1:A:21:LYS:HE3	1:A:170:ASP:OD1	2.18	0.43
1:A:110:ILE:HA	1:A:128:PHE:O	2.19	0.43
2:D:495:ILE:O	2:D:499:ARG:HD2	2.17	0.43
1:A:149:SER:HA	1:A:165:TYR:O	2.19	0.43
2:D:775:GLU:O	2:D:779:LEU:HG	2.17	0.43
2:D:779:LEU:O	2:D:780:ARG:C	2.56	0.43
2:C:661:LEU:HD11	2:D:649:LEU:HD23	2.01	0.43
2:D:630:LEU:CG	4:D:801:TRS:C1	2.90	0.43
2:D:491:VAL:O	2:D:495:ILE:HG12	2.19	0.43
1:B:101:LEU:C	1:B:101:LEU:HD12	2.39	0.42
1:B:119:PHE:CG	1:B:164:VAL:HG21	2.55	0.42
2:C:701:LYS:HE3	2:C:705:LYS:HE3	2.00	0.42
2:D:517:PHE:HB3	2:D:528:THR:CG2	2.50	0.42
1:A:112:ILE:HA	1:A:130:ILE:O	2.19	0.42
2:D:525:ILE:HD11	2:D:574:ALA:HB2	2.01	0.42
1:B:149:SER:HA	1:B:165:TYR:O	2.20	0.41
1:B:112:ILE:HA	1:B:130:ILE:O	2.21	0.41
2:C:754:LEU:N	2:C:755:PRO:CD	2.84	0.41
2:D:572:ILE:HD11	2:D:584:PHE:HE2	1.85	0.41
1:A:119[B]:PHE:CG	1:A:164:VAL:HG21	2.56	0.41
2:D:589:LEU:HG	2:D:634:THR:HG23	2.03	0.41
1:B:93:TRP:HH2	4:D:801:TRS:H21	1.85	0.40
1:A:119[B]:PHE:CD1	1:A:164:VAL:HG21	2.55	0.40
2:C:503:PRO:HB2	2:C:543:TYR:CE1	2.57	0.40
2:D:650:ARG:HD3	2:D:677:PHE:CD2	2.57	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	183/185 (99%)	176 (96%)	7 (4%)	0	100	100
1	B	182/185 (98%)	177 (97%)	5 (3%)	0	100	100
2	C	283/306 (92%)	276 (98%)	7 (2%)	0	100	100
2	D	270/306 (88%)	264 (98%)	6 (2%)	0	100	100
All	All	918/982 (94%)	893 (97%)	25 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	163/163 (100%)	152 (93%)	11 (7%)	16	26
1	B	162/163 (99%)	152 (94%)	10 (6%)	18	29
2	C	252/267 (94%)	243 (96%)	9 (4%)	35	54
2	D	245/267 (92%)	229 (94%)	16 (6%)	17	27
All	All	822/860 (96%)	776 (94%)	46 (6%)	21	34

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LEU
1	A	12	PRO
1	A	17	SER
1	A	18	LEU
1	A	66	ASN
1	A	72	GLN
1	A	156	GLN
1	A	162	THR
1	A	170	ASP
1	A	176	ARG
1	A	177	ILE
1	B	12	PRO
1	B	17	SER

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Mol	Chain	Res	Type
1	B	18	LEU
1	B	72	GLN
1	B	75	VAL
1	B	101	LEU
1	B	152	LEU
1	B	162	THR
1	B	176	ARG
1	B	177	ILE
2	C	499	ARG
2	C	522	ASN
2	C	528	THR
2	C	548	LYS
2	C	620	ASP
2	C	651	THR
2	C	684	ASP
2	C	726	ARG
2	C	778	ARG
2	D	490	LEU
2	D	493	ARG
2	D	498	LEU
2	D	499	ARG
2	D	507	TYR
2	D	512	THR
2	D	528	THR
2	D	555	LYS
2	D	559	LYS
2	D	611	PHE
2	D	622	LYS
2	D	630	LEU
2	D	651	THR
2	D	699	CYS
2	D	749	LYS
2	D	771	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	C	522	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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

2 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
4	TRS	D	801	-	6,6,7	0.34	0	5,8,9	0.50	0
3	XFZ	C	801	-	18,18,18	5.53	7 (38%)	22,22,22	3.56	6 (27%)

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
4	TRS	D	801	-	-	5/6/6/9	-
3	XFZ	C	801	-	-	5/12/12/12	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	801	XFZ	NAM-NAN	-21.68	1.10	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	801	XFZ	NAE-NAD	5.29	1.47	1.40
3	C	801	XFZ	CAG-CAF	-4.01	1.38	1.47
3	C	801	XFZ	CAK-CAL	-3.51	1.39	1.47
3	C	801	XFZ	CAF-NAE	2.81	1.34	1.27
3	C	801	XFZ	CAL-NAM	2.77	1.34	1.27
3	C	801	XFZ	CAB-NAD	2.09	1.38	1.33

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	801	XFZ	CAB-NAD-NAE	12.39	128.59	110.89
3	C	801	XFZ	CAF-NAE-NAD	7.61	125.69	113.03
3	C	801	XFZ	CAL-NAM-NAN	5.56	122.27	113.03
3	C	801	XFZ	CAR-CAG-CAF	-2.95	114.84	120.43
3	C	801	XFZ	CAK-CAL-NAM	-2.60	116.61	121.19
3	C	801	XFZ	CAO-NAN-NAM	2.04	113.80	110.89

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	801	XFZ	CAB-NAD-NAE-CAF
4	D	801	TRS	N-C-C2-O2
3	C	801	XFZ	CAR-CAK-CAL-NAM
3	C	801	XFZ	CAJ-CAK-CAL-NAM
3	C	801	XFZ	NAE-CAF-CAG-CAH
3	C	801	XFZ	NAE-CAF-CAG-CAR
4	D	801	TRS	C3-C-C2-O2
4	D	801	TRS	N-C-C3-O3
4	D	801	TRS	C1-C-C2-O2
4	D	801	TRS	C1-C-C3-O3

There are no ring outliers.

1 monomer is involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	801	TRS	7	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 XFZ C 801

Bond lengths   Bond angles

Torsions   Rings
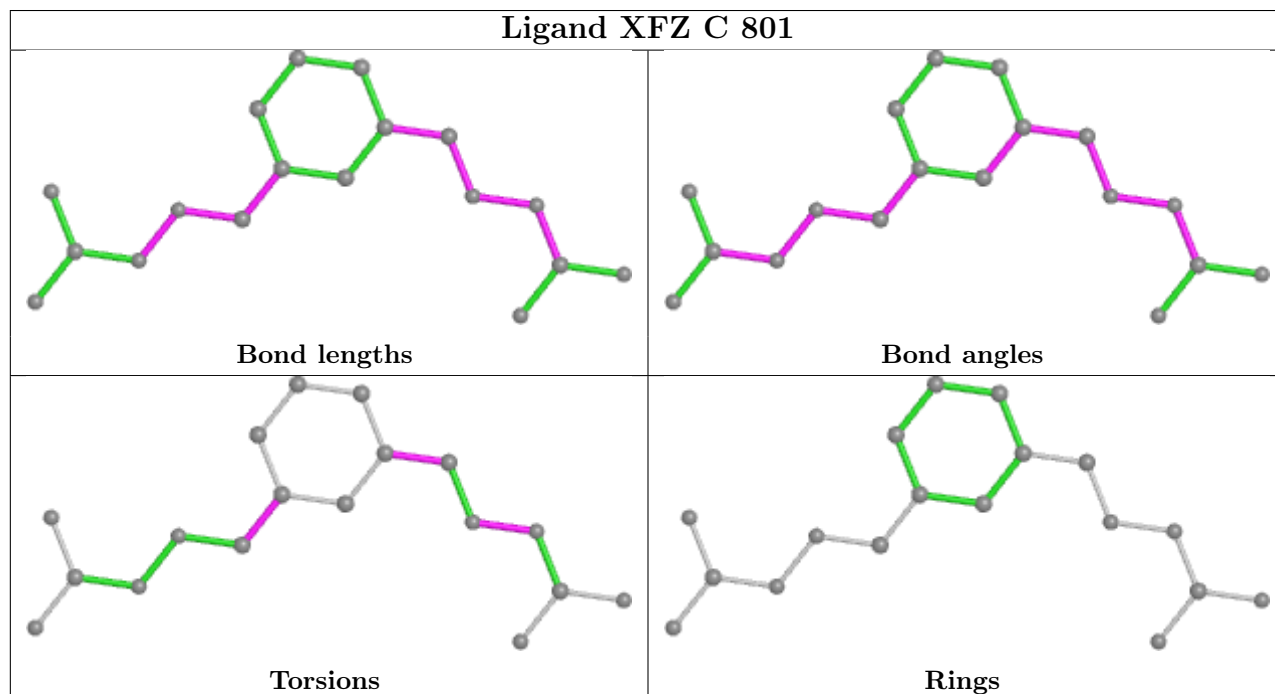
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	183/185 (98%)	-0.26	2 (1%)	80	79	24, 43, 80, 101	0
1	B	183/185 (98%)	-0.40	0	100	100	23, 41, 68, 91	0
2	C	287/306 (93%)	-0.32	2 (0%)	87	86	23, 43, 72, 98	0
2	D	276/306 (90%)	-0.04	8 (2%)	51	50	24, 48, 85, 128	0
All	All	929/982 (94%)	-0.24	12 (1%)	77	75	23, 43, 79, 128	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	735	ASN	4.2
2	D	575	GLU	3.6
2	D	522	ASN	3.5
1	A	66	ASN	3.2
2	D	527	PHE	2.7
2	D	526	ARG	2.7
2	C	517	PHE	2.6
2	D	661	LEU	2.4
2	D	524	ARG	2.1
1	A	31	ILE	2.0
2	C	523	GLN	2.0
2	D	748	GLN	2.0

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

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

6.3 Carbohydrates ⓘ

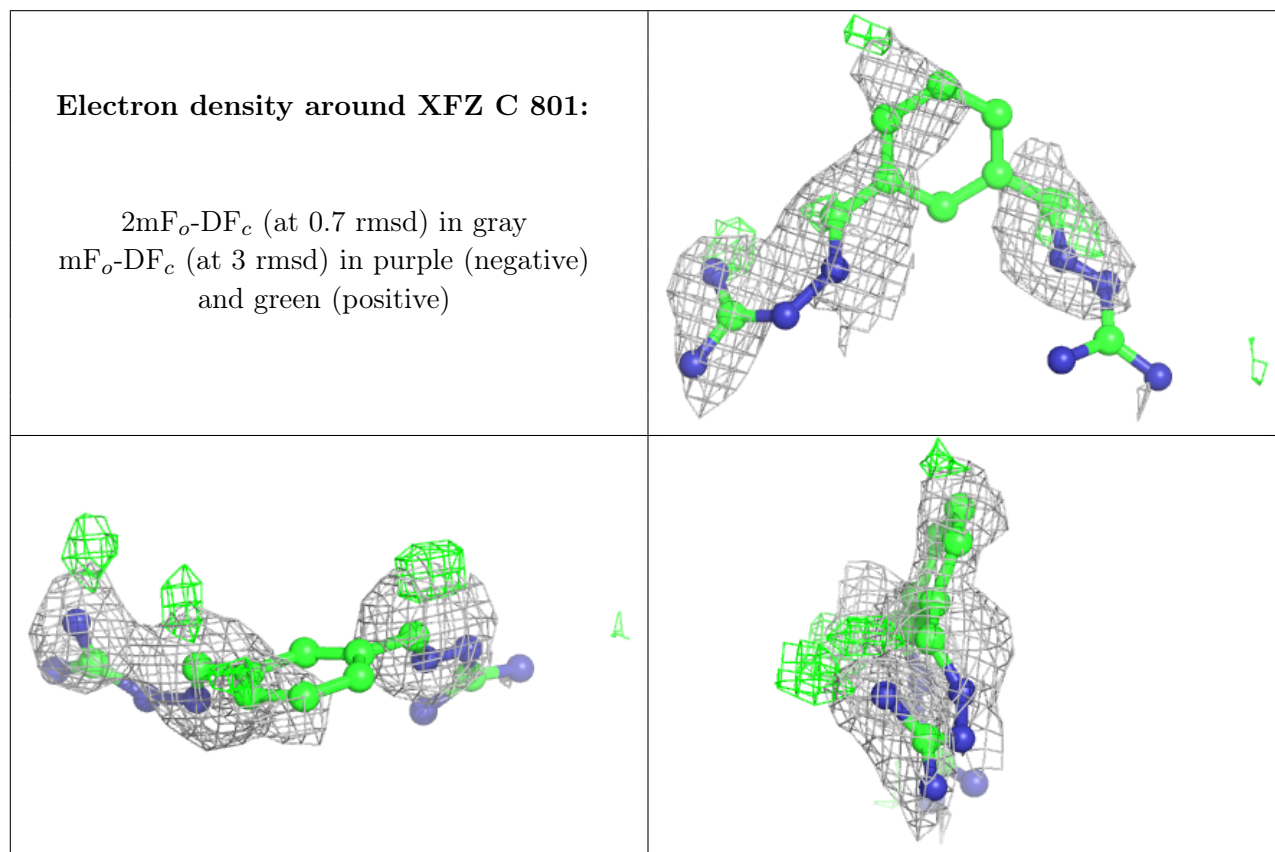There are no monosaccharides in this entry.

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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($\mathring{A}^2$)	Q<0.9
3	XFZ	C	801	18/18	0.65	0.31	60,96,120,127	0
4	TRS	D	801	7/8	0.87	0.26	34,36,39,47	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 XFZ C 801:

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

6.5 Other polymers ⓘ

There are no such residues in this entry.