Full wwPDB X-ray Structure Validation Report ⓘ

Oct 4, 2023 – 02:01 PM EDT

PDB ID	:	6U2M
Title	:	Crystal structure of a HaloTag-based calcium indicator, HaloCaMP V2, bound to JF635
Authors	:	Deo, C.; Schreiter, E.R.
Deposited on	:	2019-08-20
Resolution	:	2.00 Å(reported)

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

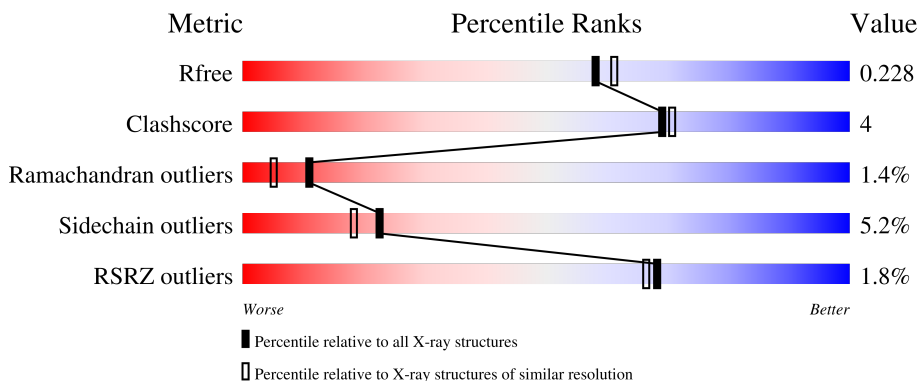|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.00 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		0.228
Clashscore		4
Ramachandran outliers		1.4%
Sidechain outliers		5.2%
RSRZ outliers		1.8%

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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	498	2% / 78% 12% • 7%
1	C	498	2% / 78% 11% • • 7%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7733 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 HaloCaMP V2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	464	Total	C	N	O	S	0	0	0
			3710	2371	624	696	19			
1	C	464	Total	C	N	O	S	0	0	0
			3710	2371	624	696	19			

- Molecule 2 is (1E,3S)-1-{10-[2-carboxy-5-({2-[2-(hexyloxy)ethoxy]ethyl}carbamoyl)phenyl]-7-(3-fluoroazetidin-1-yl)-5,5-dimethyldibenz o[b,e]silin-3(5H)-ylidene}-3-fluoroazetidin-1-ium (three-letter code: PUJ) (formula: $C_{39}H_{48}F_2N_3O_5Si$) (labeled as "Ligand of Interest" by depositor).

PUJ
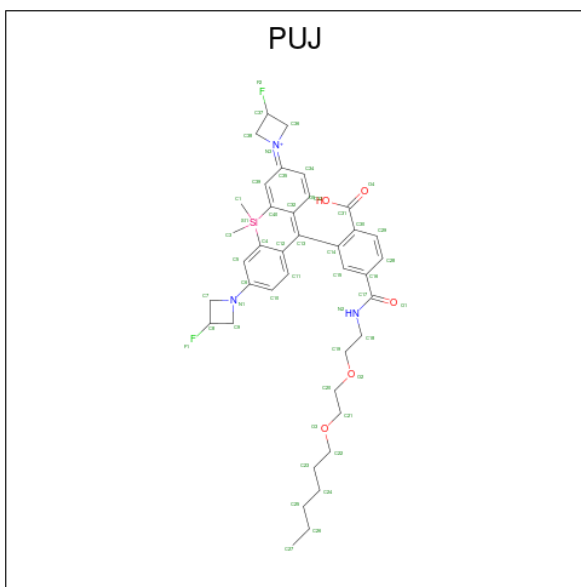
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	Si	0	0
			50	39	2	3	5	1		
2	C	1	Total	C	F	N	O	Si	0	0
			50	39	2	3	5	1		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Cl 1	0	0
3	C	1	Total 1	Cl 1	0	0

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	4	Total 4	Ca 4	0	0
4	C	4	Total 4	Ca 4	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	113	Total 113	O 113	0	0
5	C	90	Total 90	O 90	0	0

3 Residue-property plots ⓘ

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

• Molecule 1: HaloCaMP V2
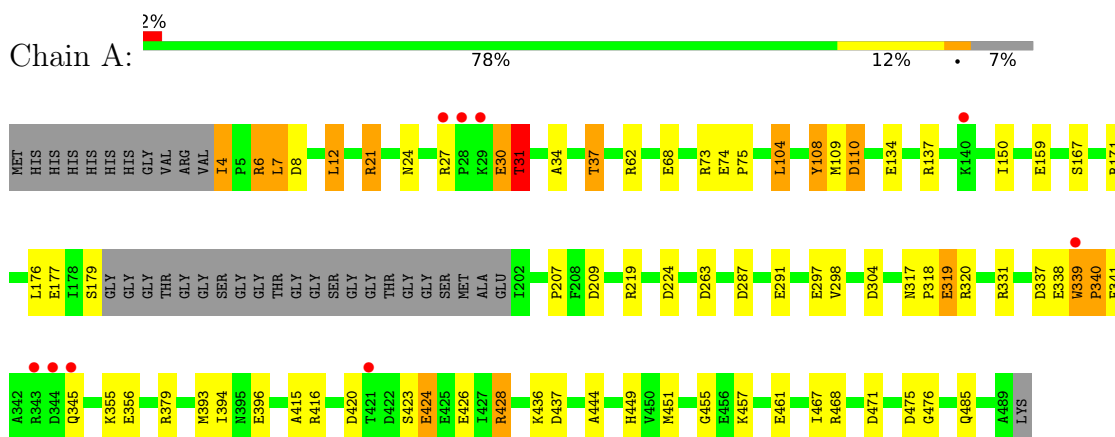
• Molecule 1: HaloCaMP V2
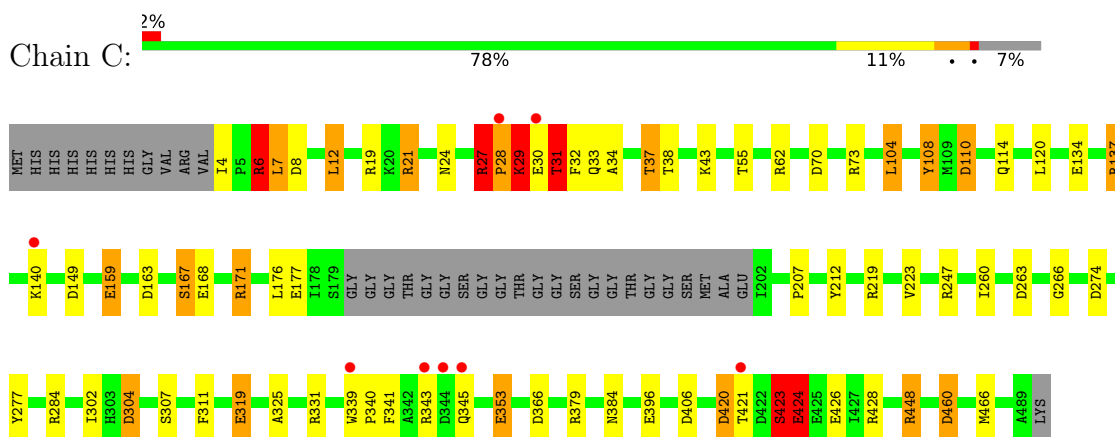
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 2 1	Depositor
Cell constants	92.56Å 60.66Å 122.60Å	Depositor
a, b, c, α, β, γ	90.00° 91.02° 90.00°	
Resolution (Å)	122.58 – 2.00	Depositor
	74.50 – 2.00	EDS
% Data completeness	98.2 (122.58-2.00)	Depositor
(in resolution range)	98.2 (74.50-2.00)	EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.10	Depositor
$< I/\sigma(I) >$ [1]	1.36 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.8.0189	Depositor
R, R_{free}	0.186 , 0.226	Depositor
	0.193 , 0.228	DCC
R_{free} test set	4438 reflections (4.89%)	wwPDB-VP
Wilson B-factor (Å^2)	40.5	Xtriage
Anisotropy	0.440	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 31.5	EDS
L-test for twinning[2]	$< \lvert L \rvert > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.239 for h,-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	7733	wwPDB-VP
Average B, all atoms (Å^2)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.27% 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 $< \lvert L \rvert >$, $< L^2 >$ 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: PUJ, CL, CA

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	1.31	18/3807 (0.5%)	1.32	31/5170 (0.6%)
1	C	1.29	15/3807 (0.4%)	1.30	34/5170 (0.7%)
All	All	1.30	33/7614 (0.4%)	1.31	65/10340 (0.6%)

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	C	0	3
All	All	0	4

All (33) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	339	TRP	CB-CG	9.81	1.68	1.50
1	C	319	GLU	CG-CD	7.55	1.63	1.51
1	A	319	GLU	CG-CD	7.48	1.63	1.51
1	A	110	ASP	CB-CG	-7.38	1.36	1.51
1	C	396	GLU	CD-OE2	-7.29	1.17	1.25
1	C	6	ARG	CD-NE	-7.04	1.34	1.46
1	A	6	ARG	CD-NE	-6.85	1.34	1.46
1	A	31	THR	CB-CG2	6.83	1.74	1.52
1	C	177	GLU	CG-CD	6.48	1.61	1.51
1	A	396	GLU	CG-CD	6.25	1.61	1.51
1	C	4	ILE	N-CA	6.25	1.58	1.46
1	A	396	GLU	CD-OE2	-6.19	1.18	1.25
1	A	291	GLU	CD-OE2	6.17	1.32	1.25
1	C	353	GLU	CD-OE1	6.14	1.32	1.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	291	GLU	CG-CD	5.97	1.60	1.51
1	A	356	GLU	CD-OE2	5.78	1.32	1.25
1	C	114	GLN	CG-CD	5.62	1.64	1.51
1	A	461	GLU	CD-OE1	5.60	1.31	1.25
1	C	110	ASP	CB-CG	-5.57	1.40	1.51
1	A	356	GLU	CG-CD	5.50	1.60	1.51
1	C	311	PHE	CG-CD1	5.44	1.47	1.38
1	A	110	ASP	CA-CB	-5.43	1.42	1.53
1	A	415	ALA	CA-CB	5.42	1.63	1.52
1	C	159	GLU	CD-OE1	5.30	1.31	1.25
1	C	304	ASP	N-CA	5.25	1.56	1.46
1	A	159	GLU	CD-OE1	5.25	1.31	1.25
1	C	460	ASP	CB-CG	5.22	1.62	1.51
1	C	108	TYR	CE1-CZ	5.15	1.45	1.38
1	A	4	ILE	C-O	-5.14	1.13	1.23
1	A	455	GLY	C-O	-5.13	1.15	1.23
1	C	167	SER	CB-OG	-5.10	1.35	1.42
1	C	31	THR	CB-CG2	5.09	1.69	1.52
1	A	108	TYR	CE1-CZ	5.07	1.45	1.38

All (65) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	6	ARG	NE-CZ-NH2	-24.56	108.02	120.30
1	A	6	ARG	NE-CZ-NH2	-23.52	108.54	120.30
1	A	6	ARG	NE-CZ-NH1	17.64	129.12	120.30
1	C	6	ARG	CD-NE-CZ	11.62	139.87	123.60
1	C	104	LEU	CB-CG-CD2	10.23	128.40	111.00
1	A	104	LEU	CA-CB-CG	10.00	138.31	115.30
1	C	104	LEU	CA-CB-CG	9.46	137.06	115.30
1	C	21	ARG	NE-CZ-NH1	-9.37	115.62	120.30
1	C	219	ARG	NE-CZ-NH1	9.03	124.81	120.30
1	A	73	ARG	NE-CZ-NH1	8.82	124.71	120.30
1	C	110	ASP	CB-CG-OD2	-8.72	110.45	118.30
1	C	73	ARG	NE-CZ-NH1	8.70	124.65	120.30
1	A	219	ARG	NE-CZ-NH1	8.48	124.54	120.30
1	A	109	MET	CG-SD-CE	-7.89	87.58	100.20
1	A	6	ARG	CD-NE-CZ	7.76	134.47	123.60
1	A	393	MET	CG-SD-CE	-7.61	88.03	100.20
1	A	110	ASP	CB-CG-OD2	-7.59	111.47	118.30
1	C	366	ASP	CB-CG-OD1	7.52	125.07	118.30
1	A	73	ARG	NE-CZ-NH2	-7.50	116.55	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	437	ASP	CB-CG-OD1	7.45	125.00	118.30
1	A	21	ARG	NE-CZ-NH1	-7.18	116.71	120.30
1	A	319	GLU	OE1-CD-OE2	-7.14	114.73	123.30
1	A	379	ARG	NE-CZ-NH2	-7.07	116.77	120.30
1	C	274	ASP	CB-CG-OD1	6.62	124.26	118.30
1	C	319	GLU	OE1-CD-OE2	-6.33	115.71	123.30
1	C	8	ASP	CB-CG-OD1	6.31	123.98	118.30
1	C	149	ASP	CB-CG-OD1	6.30	123.97	118.30
1	A	12	LEU	CA-CB-CG	6.28	129.75	115.30
1	C	12	LEU	CA-CB-CG	6.07	129.26	115.30
1	A	104	LEU	CB-CG-CD1	-6.07	100.69	111.00
1	C	177	GLU	OE1-CD-OE2	-6.04	116.05	123.30
1	C	448	ARG	CG-CD-NE	-6.01	99.17	111.80
1	A	209	ASP	CB-CG-OD2	-5.99	112.91	118.30
1	A	263	ASP	CB-CG-OD2	-5.90	112.99	118.30
1	C	423	SER	CB-CA-C	-5.84	99.00	110.10
1	C	379	ARG	NE-CZ-NH2	-5.70	117.45	120.30
1	C	274	ASP	CB-CG-OD2	-5.69	113.18	118.30
1	C	62	ARG	NE-CZ-NH1	5.67	123.13	120.30
1	A	475	ASP	CB-CG-OD1	5.62	123.36	118.30
1	A	7	LEU	CB-CG-CD2	5.61	120.54	111.00
1	C	6	ARG	NE-CZ-NH1	5.57	123.08	120.30
1	C	70	ASP	CB-CG-OD2	-5.55	113.31	118.30
1	A	171	ARG	NE-CZ-NH2	-5.54	117.53	120.30
1	C	284	ARG	NE-CZ-NH1	5.53	123.06	120.30
1	C	7	LEU	CB-CG-CD2	5.50	120.36	111.00
1	A	339	TRP	CA-CB-CG	5.49	124.12	113.70
1	C	263	ASP	CB-CG-OD1	5.48	123.23	118.30
1	C	19	ARG	CA-CB-CG	5.41	125.31	113.40
1	A	331	ARG	NE-CZ-NH1	5.40	123.00	120.30
1	C	70	ASP	CB-CG-OD1	5.37	123.13	118.30
1	C	137	ARG	NE-CZ-NH2	5.34	122.97	120.30
1	A	298	VAL	CB-CA-C	-5.29	101.35	111.40
1	C	263	ASP	CB-CG-OD2	-5.23	113.60	118.30
1	A	451	MET	CG-SD-CE	-5.21	91.87	100.20
1	C	406	ASP	CB-CG-OD1	5.21	122.99	118.30
1	C	73	ARG	NE-CZ-NH2	-5.19	117.71	120.30
1	A	104	LEU	CB-CG-CD2	5.18	119.80	111.00
1	A	287	ASP	CB-CG-OD1	5.13	122.92	118.30
1	C	247	ARG	NE-CZ-NH1	5.13	122.87	120.30
1	A	468	ARG	NE-CZ-NH1	5.12	122.86	120.30
1	C	331	ARG	NE-CZ-NH2	-5.12	117.74	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	219	ARG	NE-CZ-NH2	-5.11	117.75	120.30
1	A	6	ARG	CG-CD-NE	-5.05	101.18	111.80
1	A	224	ASP	CB-CG-OD2	-5.02	113.78	118.30
1	C	424	GLU	N-CA-CB	5.01	119.61	110.60

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	207	PRO	Peptide
1	C	207	PRO	Peptide
1	C	27	ARG	Peptide
1	C	6	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	3710	0	3606	27	0
1	C	3710	0	3606	28	0
2	A	50	0	0	1	0
2	C	50	0	0	3	0
3	A	1	0	0	0	0
3	C	1	0	0	0	0
4	A	4	0	0	0	0
4	C	4	0	0	0	0
5	A	113	0	0	2	0
5	C	90	0	0	0	0
All	All	7733	0	7212	54	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 4.

All (54) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:31:THR:CB	1:A:31:THR:CG2	1.74	1.62
1:A:304:ASP:OD1	2:A:600:PUJ:C27	1.96	1.12
1:C:304:ASP:OD1	2:C:600:PUJ:C27	2.09	0.99
1:C:134:GLU:OE1	1:C:137:ARG:NH2	2.23	0.72
1:A:423:SER:O	1:A:424:GLU:HB3	1.92	0.70
1:A:134:GLU:OE1	1:A:137:ARG:NH2	2.25	0.70
1:C:33:GLN:O	1:C:37:THR:HG22	1.92	0.69
1:A:423:SER:O	1:A:424:GLU:CB	2.43	0.66
1:C:423:SER:HB3	1:C:426:GLU:H	1.59	0.66
1:A:436:LYS:HE3	5:A:801:HOH:O	1.97	0.65
1:C:27:ARG:O	1:C:28:PRO:C	2.35	0.64
1:A:423:SER:HB2	1:A:426:GLU:H	1.65	0.62
1:C:34:ALA:HA	1:C:37:THR:HG23	1.83	0.61
1:A:31:THR:CG2	1:A:31:THR:HB	2.14	0.61
1:C:24:ASN:HD21	1:C:421:THR:HB	1.66	0.59
1:A:340:PRO:HG2	1:A:341:PHE:CE2	2.39	0.58
1:C:27:ARG:O	1:C:29:LYS:N	2.37	0.57
1:A:457:LYS:HG2	1:C:212:TYR:CZ	2.39	0.56
1:C:302:ILE:HD12	1:C:307:SER:HA	1.88	0.55
1:C:423:SER:O	1:C:424:GLU:HB3	2.07	0.55
1:A:30:GLU:OE1	1:A:31:THR:N	2.39	0.54
1:C:24:ASN:ND2	1:C:421:THR:HB	2.22	0.53
1:C:159:GLU:HA	1:C:159:GLU:OE1	2.09	0.52
1:A:31:THR:CG2	1:A:31:THR:CA	2.82	0.51
1:C:423:SER:CB	1:C:426:GLU:H	2.24	0.50
1:A:34:ALA:HA	1:A:37:THR:HG23	1.92	0.50
1:A:428:ARG:CZ	1:A:428:ARG:HB2	2.43	0.49
1:C:423:SER:O	1:C:424:GLU:CB	2.61	0.49
1:C:340:PRO:HG2	1:C:341:PHE:CE2	2.49	0.48
1:A:340:PRO:HG2	1:A:341:PHE:CD2	2.50	0.46
1:C:31:THR:HG23	1:C:32:PHE:H	1.80	0.46
1:A:337:ASP:O	1:A:338:GLU:HG3	2.16	0.46
1:A:74:GLU:HB3	1:A:75:PRO:HD3	1.98	0.45
1:C:448:ARG:NH2	1:C:460:ASP:OD1	2.47	0.45
1:A:471:ASP:OD2	1:A:476:GLY:N	2.50	0.44
1:C:420:ASP:O	1:C:426:GLU:OE1	2.36	0.44
1:A:317:ASN:N	1:A:318:PRO:HD3	2.33	0.44
1:C:55:THR:HG23	2:C:600:PUJ:C18	2.48	0.43
1:C:120:LEU:O	1:C:325:ALA:HA	2.18	0.43
1:A:62:ARG:HH22	1:A:68:GLU:CD	2.22	0.43
1:A:337:ASP:O	1:A:337:ASP:OD1	2.37	0.43
1:C:168:GLU:OE2	1:C:171:ARG:NH1	2.52	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:416:ARG:HA	1:A:416:ARG:HD2	1.83	0.43
1:C:21:ARG:HA	1:C:466:MET:HG3	2.01	0.43
1:C:223:VAL:O	1:C:260:ILE:HA	2.19	0.43
1:A:449:HIS:HB3	5:A:801:HOH:O	2.19	0.42
1:A:6:ARG:HD3	1:A:8:ASP:OD1	2.19	0.42
1:C:24:ASN:ND2	1:C:421:THR:CG2	2.83	0.42
1:A:297:GLU:HA	1:A:320:ARG:O	2.19	0.41
1:C:163:ASP:O	1:C:167:SER:HB2	2.20	0.41
1:A:24:ASN:HB3	1:A:27:ARG:HE	1.84	0.41
1:C:304:ASP:OD1	2:C:600:PUJ:C26	2.66	0.41
1:C:266:GLY:HA3	1:C:277:TYR:CE1	2.56	0.41
1:A:444:ALA:HA	1:A:467:ILE:HD11	2.01	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	460/498 (92%)	436 (95%)	19 (4%)	5 (1%)	14	8
1	C	460/498 (92%)	435 (95%)	17 (4%)	8 (2%)	9	4
All	All	920/996 (92%)	871 (95%)	36 (4%)	13 (1%)	11	5

All (13) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	424	GLU
1	C	27	ARG
1	C	30	GLU
1	C	31	THR
1	C	424	GLU
1	C	28	PRO

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Mol	Chain	Res	Type
1	A	340	PRO
1	A	31	THR
1	A	345	GLN
1	C	29	LYS
1	C	38	THR
1	A	339	TRP
1	C	339	TRP

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	400/419 (96%)	379 (95%)	21 (5%)	22	18
1	C	400/419 (96%)	379 (95%)	21 (5%)	22	18
All	All	800/838 (96%)	758 (95%)	42 (5%)	22	18

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	ILE
1	A	7	LEU
1	A	12	LEU
1	A	21	ARG
1	A	30	GLU
1	A	31	THR
1	A	37	THR
1	A	104	LEU
1	A	108	TYR
1	A	110	ASP
1	A	150	ILE
1	A	167	SER
1	A	176	LEU
1	A	177	GLU
1	A	179	SER
1	A	319	GLU

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Mol	Chain	Res	Type
1	A	355	LYS
1	A	394	ILE
1	A	420	ASP
1	A	428	ARG
1	A	485	GLN
1	C	6	ARG
1	C	7	LEU
1	C	12	LEU
1	C	29	LYS
1	C	31	THR
1	C	37	THR
1	C	43	LYS
1	C	104	LEU
1	C	108	TYR
1	C	110	ASP
1	C	140	LYS
1	C	171	ARG
1	C	176	LEU
1	C	319	GLU
1	C	343	ARG
1	C	345	GLN
1	C	353	GLU
1	C	384	ASN
1	C	420	ASP
1	C	423	SER
1	C	428	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	477	GLN
1	C	383	GLN
1	C	477	GLN

5.3.3 RNA ⓘ

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 12 ligands modelled in this entry, 10 are monoatomic - leaving 2 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
2	PUJ	A	600	-	48,55,55	1.19	5 (10%)	60,79,79	2.17	13 (21%)
2	PUJ	C	600	-	48,55,55	1.17	4 (8%)	60,79,79	2.27	13 (21%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PUJ	A	600	-	-	12/31/82/82	0/5/6/6
2	PUJ	C	600	-	-	13/31/82/82	0/5/6/6

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	600	PUJ	C35-N3	3.61	1.43	1.35
2	A	600	PUJ	C39-C40	3.39	1.41	1.35
2	C	600	PUJ	C35-N3	3.30	1.42	1.35
2	C	600	PUJ	SI1-C40	-3.16	1.82	1.87
2	C	600	PUJ	C39-C40	3.09	1.40	1.35
2	C	600	PUJ	SI1-C4	-2.96	1.81	1.87

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	600	PUJ	SI1-C40	-2.91	1.82	1.87
2	A	600	PUJ	SI1-C4	-2.69	1.82	1.87
2	A	600	PUJ	O5-C31	-2.03	1.24	1.30

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	600	PUJ	C8-C9-N1	-8.06	82.54	87.96
2	A	600	PUJ	C8-C9-N1	-7.33	83.03	87.96
2	C	600	PUJ	C8-C7-N1	-7.02	83.24	87.96
2	C	600	PUJ	C37-C36-N3	-6.86	83.34	87.96
2	C	600	PUJ	C37-C38-N3	-6.73	83.43	87.96
2	A	600	PUJ	C8-C7-N1	-6.66	83.48	87.96
2	A	600	PUJ	C37-C38-N3	-6.50	83.58	87.96
2	A	600	PUJ	C37-C36-N3	-6.13	83.83	87.96
2	C	600	PUJ	C14-C13-C12	-4.99	114.13	119.94
2	A	600	PUJ	C14-C13-C12	-4.45	114.75	119.94
2	A	600	PUJ	C12-C13-C32	4.30	128.59	119.99
2	C	600	PUJ	C12-C13-C32	3.99	127.97	119.99
2	A	600	PUJ	C14-C13-C32	-3.63	116.57	120.45
2	A	600	PUJ	C33-C32-C40	3.21	118.73	115.66
2	C	600	PUJ	C15-C14-C13	-2.91	114.05	119.21
2	C	600	PUJ	C33-C32-C40	2.71	118.25	115.66
2	A	600	PUJ	C33-C32-C13	-2.62	118.33	123.96
2	C	600	PUJ	C14-C13-C32	-2.58	117.69	120.45
2	A	600	PUJ	C11-C12-C13	-2.38	118.51	123.28
2	C	600	PUJ	C33-C32-C13	-2.29	119.05	123.96
2	C	600	PUJ	C11-C12-C13	-2.28	118.72	123.28
2	A	600	PUJ	C10-C6-N1	-2.21	118.34	121.38
2	A	600	PUJ	C15-C14-C13	-2.12	115.45	119.21
2	C	600	PUJ	C6-C5-C4	-2.11	120.63	122.68
2	A	600	PUJ	C6-C5-C4	-2.02	120.72	122.68
2	C	600	PUJ	O4-C31-C30	-2.00	117.08	121.94

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	600	PUJ	C11-C12-C13-C14
2	A	600	PUJ	C11-C12-C13-C32
2	C	600	PUJ	C11-C12-C13-C14
2	C	600	PUJ	C11-C12-C13-C32

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Mol	Chain	Res	Type	Atoms
2	C	600	PUJ	O3-C22-C23-C24
2	C	600	PUJ	O2-C20-C21-O3
2	C	600	PUJ	C16-C17-N2-C18
2	C	600	PUJ	C23-C24-C25-C26
2	A	600	PUJ	C22-C23-C24-C25
2	A	600	PUJ	C24-C25-C26-C27
2	C	600	PUJ	C29-C30-C31-O5
2	C	600	PUJ	C29-C30-C31-O4
2	C	600	PUJ	C18-C19-O2-C20
2	A	600	PUJ	C29-C30-C31-O4
2	A	600	PUJ	C23-C22-O3-C21
2	C	600	PUJ	C14-C30-C31-O5
2	A	600	PUJ	C29-C30-C31-O5
2	C	600	PUJ	C14-C30-C31-O4
2	C	600	PUJ	C23-C22-O3-C21
2	A	600	PUJ	C18-C19-O2-C20
2	A	600	PUJ	N2-C18-C19-O2
2	C	600	PUJ	O1-C17-N2-C18
2	A	600	PUJ	C14-C30-C31-O4
2	A	600	PUJ	C14-C30-C31-O5
2	A	600	PUJ	C20-C21-O3-C22

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	600	PUJ	1	0
2	C	600	PUJ	3	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 PUJ A 600

Bond lengths

Bond angles

Torsions

Rings

Ligand PUJ C 600

Bond lengths

Bond angles

Torsions

Rings
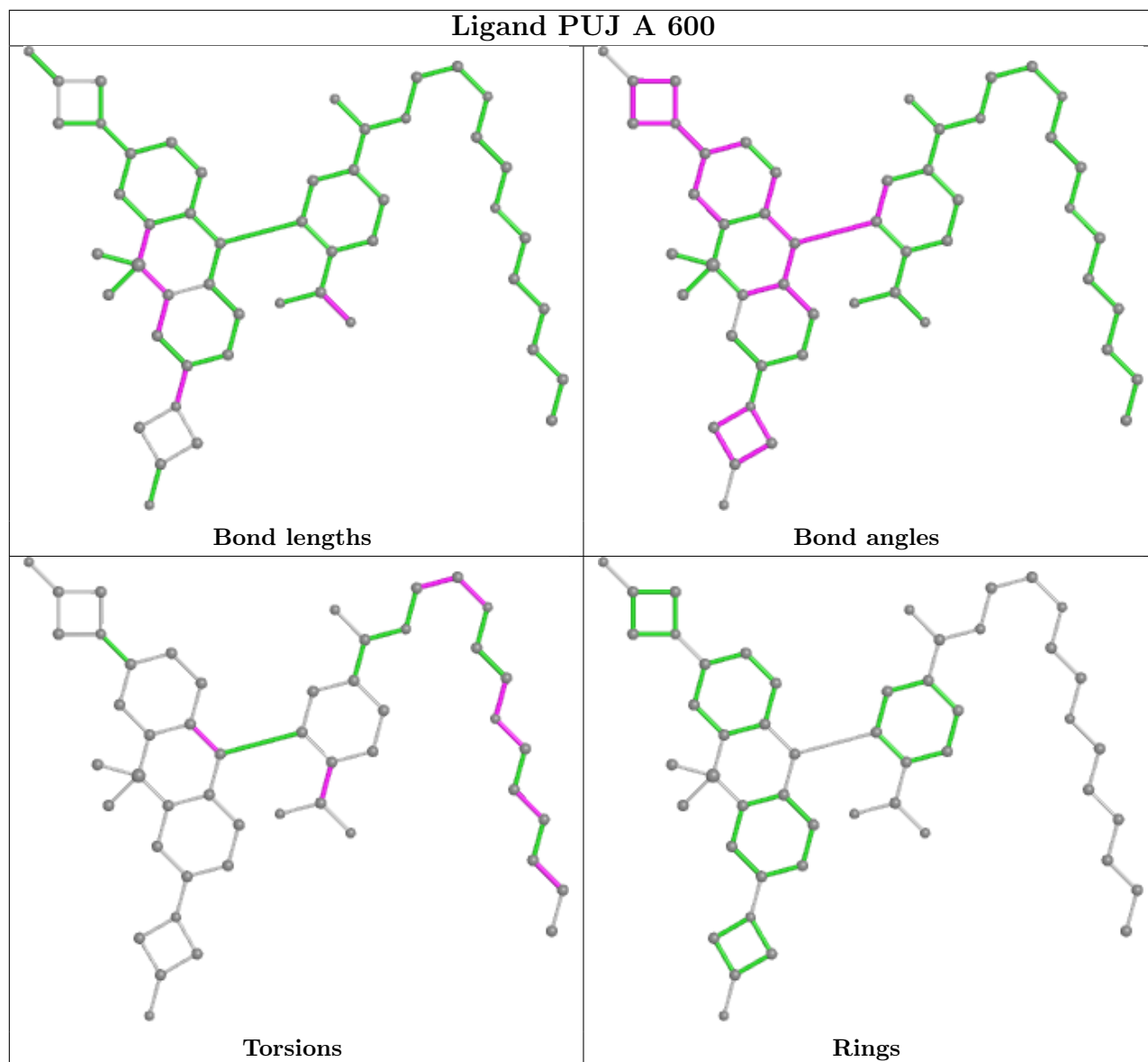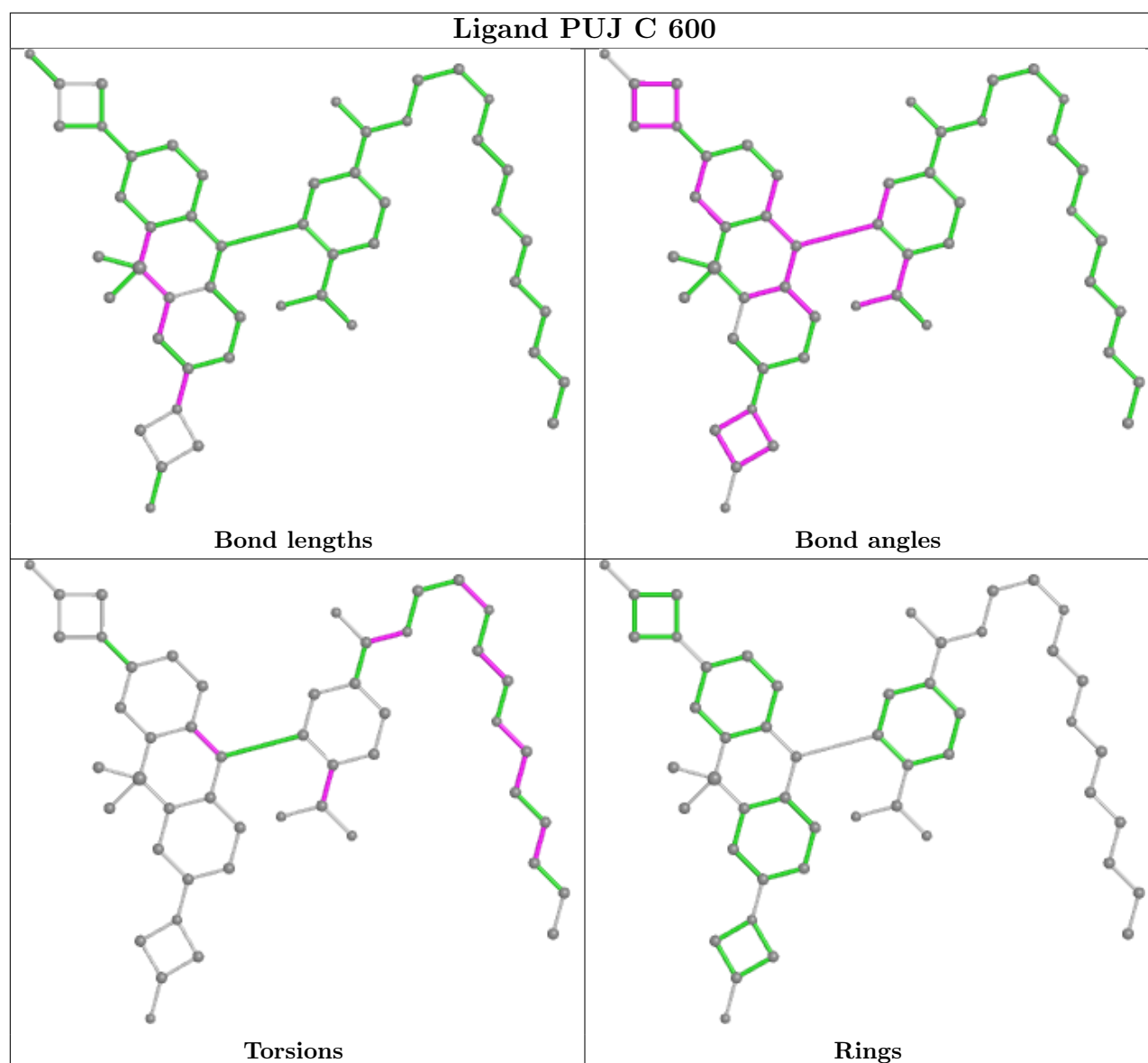
5.7 Other polymers ⓘ

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(Å^2)	Q<0.9
1	A	464/498 (93%)	-0.12	9 (1%)	66 65	32, 49, 80, 144	0
1	C	464/498 (93%)	-0.12	8 (1%)	70 68	33, 50, 79, 142	0
All	All	928/996 (93%)	-0.12	17 (1%)	68 66	32, 50, 80, 144	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	339	TRP	13.9
1	C	339	TRP	9.8
1	A	421	THR	7.4
1	A	344	ASP	5.0
1	C	344	ASP	4.2
1	A	343	ARG	4.1
1	C	140	LYS	3.8
1	C	421	THR	3.7
1	A	140	LYS	3.1
1	C	343	ARG	2.9
1	C	30	GLU	2.7
1	A	28	PRO	2.6
1	C	345	GLN	2.4
1	C	28	PRO	2.3
1	A	29	LYS	2.2
1	A	345	GLN	2.2
1	A	27	ARG	2.1

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.

6.4 Ligands ⓘ

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

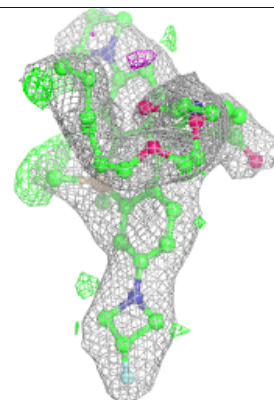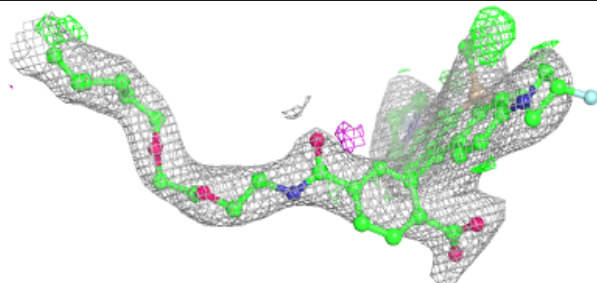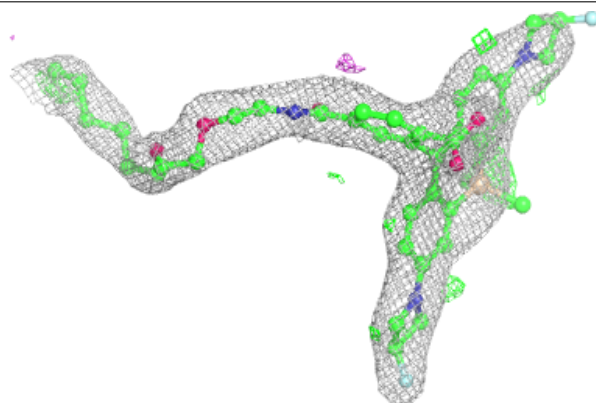| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	PUJ	C	600	50/50	0.87	0.26	66,92,110,116	0
2	PUJ	A	600	50/50	0.90	0.18	57,79,105,113	0
4	CA	A	604	1/1	0.98	0.10	60,60,60,60	0
4	CA	C	603	1/1	0.98	0.05	59,59,59,59	0
4	CA	A	603	1/1	0.99	0.08	45,45,45,45	0
3	CL	C	601	1/1	0.99	0.11	38,38,38,38	0
4	CA	A	605	1/1	0.99	0.08	49,49,49,49	0
4	CA	C	602	1/1	0.99	0.11	51,51,51,51	0
4	CA	A	602	1/1	0.99	0.07	59,59,59,59	0
4	CA	C	604	1/1	0.99	0.07	50,50,50,50	0
4	CA	C	605	1/1	0.99	0.11	55,55,55,55	0
3	CL	A	601	1/1	1.00	0.11	38,38,38,38	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 PUJ C 600:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
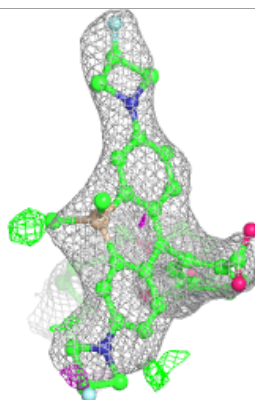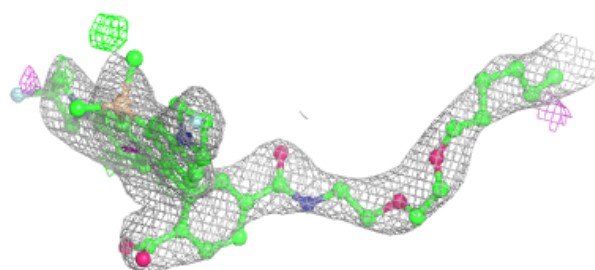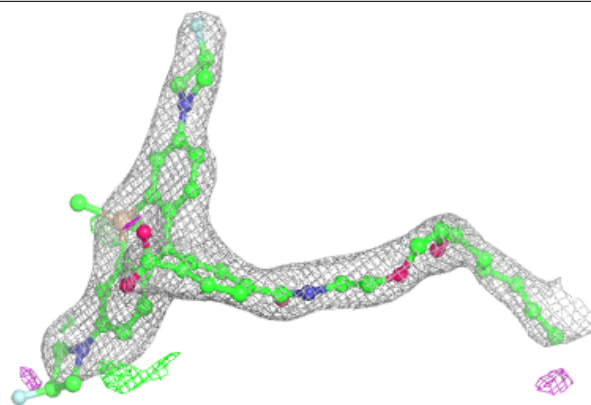
Electron density around PUJ A 600:

$2mF_o\text{-}DF_c$ (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.