Full wwPDB X-ray Structure Validation Report ⓘ

Oct 10, 2022 – 12:08 PM EDT

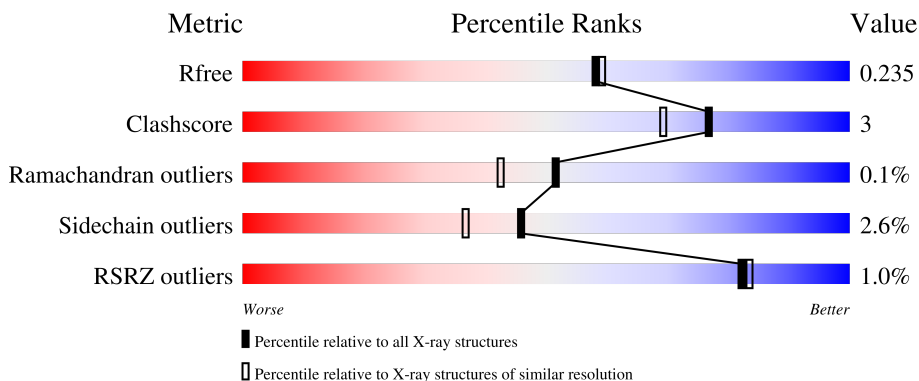|		
PDB ID	:	5SHR
Title	:	Crystal Structure of human phosphodiesterase 10 in complex with N-[(5,8-dimethyl-[1,2,4]triazolo[1,5-a]pyrazin-2-yl)methyl]-N,2-dimethyl-5-phenyl-1,2,4-triazol-3-amine
Authors	:	Joseph, C.; Benz, J.; Flohr, A.; Rudolph, M.G.
Deposited on	:	2022-02-01
Resolution	:	1.98 Å(reported)

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 1.98 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		0.235
Clashscore		3
Ramachandran outliers		0.1%
Sidechain outliers		2.6%
RSRZ outliers		1.0%

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	11647 (2.00-1.96)
Clashscore	141614	1014 (1.98-1.98)
Ramachandran outliers	138981	1006 (1.98-1.98)
Sidechain outliers	138945	1006 (1.98-1.98)
RSRZ outliers	127900	11410 (2.00-1.96)

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	343	81% — 10% · 9%
2	B	343	.% — 83% — 9% 8%
2	C	343	.% — 82% — 9% 9%
2	D	343	.% — 84% — 7% 9%

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 10790 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 cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	312	Total 2549	C 1629	N 434	O 461	S 25	0	1	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	447	GLY	-	expression tag	UNP Q9Y233
A	448	SER	-	expression tag	UNP Q9Y233

- Molecule 2 is a protein called cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	315	Total 2554	C 1632	N 434	O 464	S 24	0	1	0
2	C	312	Total 2548	C 1629	N 431	O 464	S 24	0	2	0
2	D	312	Total 2528	C 1617	N 431	O 456	S 24	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	447	GLY	-	expression tag	UNP Q9Y233
B	448	SER	-	expression tag	UNP Q9Y233
C	447	GLY	-	expression tag	UNP Q9Y233
C	448	SER	-	expression tag	UNP Q9Y233
D	447	GLY	-	expression tag	UNP Q9Y233
D	448	SER	-	expression tag	UNP Q9Y233

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Zn 1	0	0
3	B	1	Total 1	Zn 1	0	0
3	C	1	Total 1	Zn 1	0	0
3	D	1	Total 1	Zn 1	0	0

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 5 is N-{[(4R)-5,8-dimethyl[1,2,4]triazolo[1,5-a]pyrazin-2-yl]methyl}-N,1-dimethyl-3-phenyl-1H-1,2,4-triazol-5-amine (three-letter code: JIP) (formula: $C_{18}H_{20}N_8$) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 26	C 18	N 8	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total C N 26 18 8			0	0
5	C	1	Total C N 26 18 8			0	0
5	D	1	Total C N 26 18 8			0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	128	Total O 128 128		0	0
6	B	152	Total O 152 152		0	0
6	C	131	Total O 131 131		0	0
6	D	88	Total O 88 88		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: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A
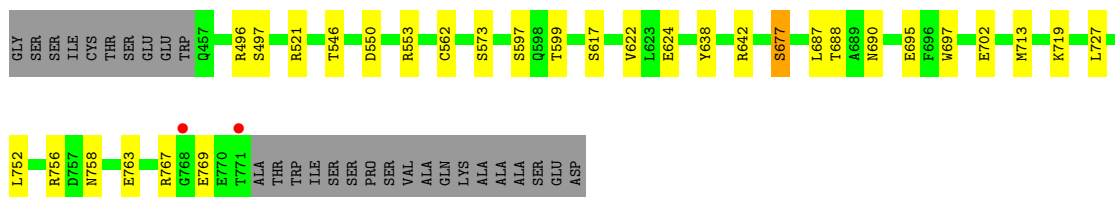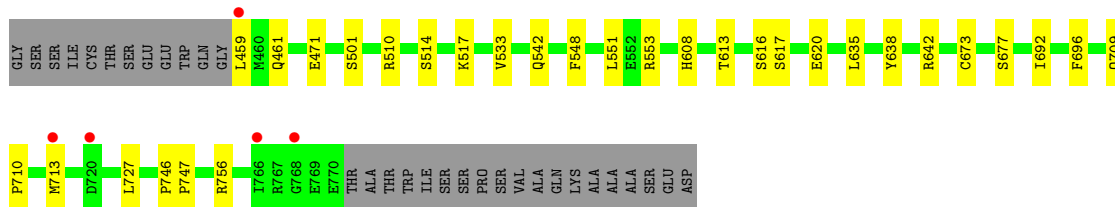
Chain A:

• Molecule 2: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain B:

• Molecule 2: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain C:

• Molecule 2: cAMP and cAMP-inhibited cGMP 3',5'-cyclic phosphodiesterase 10A

Chain D:

R756 G768 GLU GLU THR ALA THR TRP ILE SER SER PRO SER VAL ALA GLN LYS ALA ALA ALA SER GLU ASP

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α, β, γ	135.12Å 135.12Å 234.84Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.46 – 1.98 43.46 – 1.98	Depositor EDS
% Data completeness (in resolution range)	87.9 (43.46-1.98) 87.9 (43.46-1.98)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.24 (at 1.98Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.182 , 0.230 0.190 , 0.235	Depositor DCC
R_{free} test set	5102 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	29.5	Xtriage
Anisotropy	0.226	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 42.5	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.025 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	10790	wwPDB-VP
Average B, all atoms (Å^2)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.68% 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: JIP, CME, MG, ZN

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	0.86	0/2592	0.96	1/3505 (0.0%)
2	B	0.85	4/2608 (0.2%)	0.95	2/3529 (0.1%)
2	C	0.81	0/2605	0.93	1/3526 (0.0%)
2	D	0.83	1/2579 (0.0%)	0.94	1/3490 (0.0%)
All	All	0.84	5/10384 (0.0%)	0.94	5/14050 (0.0%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	695	GLU	CD-OE2	-6.87	1.18	1.25
2	B	597	SER	CA-CB	-5.75	1.44	1.52
2	D	592	GLU	CD-OE1	-5.43	1.19	1.25
2	B	702	GLU	CD-OE2	-5.32	1.19	1.25
2	B	624	GLU	CD-OE2	-5.30	1.19	1.25

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	467	ARG	NE-CZ-NH1	5.59	123.09	120.30
2	C	510	ARG	NE-CZ-NH1	5.52	123.06	120.30
2	B	642	ARG	NE-CZ-NH2	-5.25	117.67	120.30
2	B	496	ARG	NE-CZ-NH2	5.14	122.87	120.30
1	A	609	ASN	N-CA-CB	5.04	119.68	110.60

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	2549	0	2525	21	0
2	B	2554	0	2520	13	0
2	C	2548	0	2518	15	0
2	D	2528	0	2501	11	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	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	26	0	0	0	0
5	B	26	0	0	1	0
5	C	26	0	0	1	0
5	D	26	0	0	1	0
6	A	128	0	0	0	0
6	B	152	0	0	2	0
6	C	131	0	0	3	0
6	D	88	0	0	0	0
All	All	10790	0	10064	60	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 (60) 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:B:713:MET:SD	5:B:803:JIP:C26	2.69	0.79
2:C:613:THR:HB	6:C:1010:HOH:O	1.87	0.74
1:A:461:GLN:HA	1:A:461:GLN:OE1	1.88	0.73
2:B:497:SER:O	2:B:553:ARG:HD2	1.90	0.70
2:D:497:SER:O	2:D:553:ARG:HD2	1.96	0.66
2:C:713:MET:SD	5:C:803:JIP:C26	2.87	0.63
2:B:719:LYS:NZ	6:B:902:HOH:O	2.35	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:735:ILE:HB	1:A:736:PRO:HD3	1.86	0.56
2:B:677:SER:HB2	2:B:688:THR:HG21	1.89	0.54
1:A:722:VAL:HB	1:A:723:PRO:HD3	1.90	0.54
2:D:711:ILE:HG13	2:D:713:MET:HG3	1.90	0.53
2:D:713:MET:SD	5:D:803:JIP:C26	2.97	0.53
2:B:697:TRP:CZ2	2:B:719:LYS:HG2	2.44	0.52
1:A:662:ARG:HG2	1:A:662:ARG:NH1	2.25	0.52
2:B:687:LEU:O	2:B:690:ASN:HB2	2.10	0.52
2:D:609:ASN:HD22	2:D:612:SER:HB3	1.75	0.51
1:A:549:THR:O	1:A:553:ARG:HG3	2.11	0.51
2:B:697:TRP:CH2	2:B:719:LYS:HE3	2.45	0.51
2:D:497:SER:O	2:D:553:ARG:CD	2.60	0.50
2:B:767:ARG:NH2	2:B:769:GLU:OE2	2.38	0.48
2:B:752:LEU:HD21	2:B:756:ARG:NH2	2.29	0.48
2:C:514:SER:OG	2:C:608:HIS:NE2	2.46	0.47
1:A:498:CYS:SG	1:A:554:LYS:HG3	2.54	0.47
2:C:542:GLN:NE2	2:C:542:GLN:HA	2.29	0.47
1:A:469:CME:C	1:A:469:CME:SD	3.02	0.47
2:B:550:ASP:N	2:B:550:ASP:OD1	2.49	0.46
1:A:662:ARG:CG	1:A:662:ARG:HH11	2.27	0.46
1:A:735:ILE:N	1:A:736:PRO:HD2	2.31	0.46
2:C:548:PHE:O	2:C:553:ARG:NH2	2.49	0.46
2:C:620:GLU:HG3	6:C:927:HOH:O	2.15	0.46
2:C:709:GLN:HE21	2:C:710:PRO:HD2	1.81	0.45
1:A:523:PRO:HD2	1:A:695:GLU:HG2	1.98	0.45
1:A:542:GLN:NE2	1:A:542:GLN:HA	2.31	0.45
2:D:752:LEU:HD21	2:D:756:ARG:NH2	2.33	0.44
1:A:662:ARG:NH1	1:A:662:ARG:CG	2.80	0.43
1:A:700:GLY:HA3	1:A:714:MET:O	2.18	0.43
2:C:533:VAL:HG13	2:C:673:CYS:HB3	2.00	0.43
2:C:746:PRO:N	2:C:747:PRO:CD	2.82	0.43
2:C:692:ILE:HG22	2:C:696:PHE:CE2	2.55	0.42
2:D:457:GLN:HA	2:D:460:MET:CE	2.49	0.42
1:A:682:TRP:N	1:A:683:PRO:CD	2.82	0.42
2:B:758:ASN:OD1	6:B:901:HOH:O	2.20	0.42
2:B:727:LEU:HD11	2:B:763:GLU:HG3	2.02	0.42
2:D:675:LEU:O	2:D:678:VAL:HG22	2.20	0.42
2:C:551:LEU:HD23	2:C:551:LEU:HA	1.89	0.42
1:A:749:GLU:N	1:A:750:PRO:CD	2.83	0.41
2:B:562:CYS:HB3	2:B:599:THR:OG1	2.19	0.41
1:A:551:LEU:HD23	1:A:551:LEU:HA	1.84	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:735:ILE:HB	1:A:736:PRO:CD	2.50	0.41
1:A:510:ARG:HG2	1:A:608:HIS:CE1	2.56	0.41
2:D:457:GLN:HA	2:D:460:MET:HE2	2.03	0.41
2:C:459:LEU:HD12	2:C:459:LEU:HA	1.88	0.41
2:C:635:LEU:HD12	2:C:635:LEU:HA	1.92	0.41
2:D:493:MET:SD	2:D:535:HIS:HA	2.61	0.41
1:A:477:PHE:HB3	1:A:535:HIS:CE1	2.57	0.40
1:A:603:LEU:HD23	1:A:603:LEU:HA	1.88	0.40
2:C:756:ARG:HD2	6:C:952:HOH:O	2.21	0.40
2:D:735:ILE:O	2:D:736:PRO:C	2.58	0.40
1:A:497:SER:OG	1:A:557:LEU:HD11	2.21	0.40
2:C:638:TYR:OH	2:C:642:ARG:HD3	2.22	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	309/343 (90%)	298 (96%)	11 (4%)	0	100	100
2	B	313/343 (91%)	306 (98%)	7 (2%)	0	100	100
2	C	311/343 (91%)	307 (99%)	4 (1%)	0	100	100
2	D	309/343 (90%)	298 (96%)	10 (3%)	1 (0%)	41	29
All	All	1242/1372 (90%)	1209 (97%)	32 (3%)	1 (0%)	51	42

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	615	SER

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	281/304 (92%)	273 (97%)	8 (3%)	43	32
2	B	282/305 (92%)	275 (98%)	7 (2%)	47	39
2	C	283/305 (93%)	275 (97%)	8 (3%)	43	32
2	D	279/305 (92%)	273 (98%)	6 (2%)	52	46
All	All	1125/1219 (92%)	1096 (97%)	29 (3%)	46	37

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	461	GLN
1	A	471	GLU
1	A	504	GLU
1	A	521	ARG
1	A	553	ARG
1	A	576	GLN
1	A	638	TYR
1	A	681	LEU
2	B	521	ARG
2	B	546	THR
2	B	573	SER
2	B	617	SER
2	B	622	VAL
2	B	638	TYR
2	B	677	SER
2	C	461	GLN
2	C	471	GLU
2	C	501	SER
2	C	517	LYS
2	C	616	SER
2	C	617	SER
2	C	677	SER
2	C	727	LEU
2	D	500	THR

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Mol	Chain	Res	Type
2	D	557	LEU
2	D	576	GLN
2	D	581	PRO
2	D	638	TYR
2	D	713	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	542	GLN
1	A	576	GLN
1	A	604	GLN
1	A	709	GLN
1	A	743	GLN
1	A	761	GLN
2	B	484	ASN
2	B	545	HIS
2	B	604	GLN
2	B	650	GLN
2	C	461	GLN
2	C	542	GLN
2	C	604	GLN
2	C	709	GLN
2	C	743	GLN
2	D	476	HIS
2	D	484	ASN
2	D	604	GLN
2	D	609	ASN
2	D	743	GLN
2	D	761	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

5 non-standard protein/DNA/RNA residues 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	#$|Z| > 2$
2	CME	C	509	2	8,9,10	0.45	0	5,9,11	0.49	0
2	CME	D	509	2	8,9,10	0.65	0	5,9,11	0.45	0
1	CME	A	469	1	8,9,10	0.63	0	5,9,11	0.94	0
2	CME	B	509	2	8,9,10	0.53	0	5,9,11	0.49	0
1	CME	A	509	1	8,9,10	0.50	0	5,9,11	1.00	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
2	CME	C	509	2	-	1/5/8/10	-
2	CME	D	509	2	-	1/5/8/10	-
1	CME	A	469	1	-	2/5/8/10	-
2	CME	B	509	2	-	1/5/8/10	-
1	CME	A	509	1	-	1/5/8/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	469	CME	SD-CE-CZ-OH
2	C	509	CME	SD-CE-CZ-OH
1	A	509	CME	SD-CE-CZ-OH
2	D	509	CME	CZ-CE-SD-SG
1	A	469	CME	CE-SD-SG-CB
2	B	509	CME	SD-CE-CZ-OH

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	469	CME	1	0

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 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	JIP	B	803	-	21,29,29	3.19	11 (52%)	22,42,42	2.54	10 (45%)
5	JIP	D	803	-	21,29,29	3.54	9 (42%)	22,42,42	2.57	9 (40%)
5	JIP	A	803	-	21,29,29	3.91	8 (38%)	22,42,42	2.16	7 (31%)
5	JIP	C	803	-	21,29,29	3.82	14 (66%)	22,42,42	2.52	10 (45%)

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	JIP	B	803	-	-	2/8/12/12	0/4/4/4
5	JIP	D	803	-	-	2/8/12/12	0/4/4/4
5	JIP	A	803	-	-	2/8/12/12	0/4/4/4
5	JIP	C	803	-	-	3/8/12/12	0/4/4/4

All (42) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	803	JIP	C5-N8	10.28	1.49	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	803	JIP	C3-N4	8.15	1.46	1.35
5	D	803	JIP	C23-C17	-7.70	1.44	1.50
5	A	803	JIP	C18-N22	7.67	1.40	1.33
5	A	803	JIP	C3-N4	7.66	1.45	1.35
5	D	803	JIP	C5-N8	6.79	1.44	1.35
5	D	803	JIP	C3-N4	6.68	1.44	1.35
5	C	803	JIP	C5-N8	6.68	1.44	1.35
5	C	803	JIP	C18-N22	6.47	1.39	1.33
5	B	803	JIP	C17-N14	6.37	1.37	1.32
5	A	803	JIP	C17-N14	-6.21	1.27	1.32
5	B	803	JIP	C5-N8	6.11	1.43	1.35
5	B	803	JIP	C3-N4	5.66	1.43	1.35
5	D	803	JIP	C26-N8	5.63	1.55	1.46
5	C	803	JIP	C13-C7	5.60	1.51	1.39
5	D	803	JIP	C18-N22	5.56	1.38	1.33
5	C	803	JIP	C3-N2	4.94	1.45	1.34
5	C	803	JIP	C25-N8	4.39	1.55	1.46
5	B	803	JIP	C25-C21	-4.21	1.46	1.50
5	B	803	JIP	C3-N2	3.94	1.43	1.34
5	A	803	JIP	C23-C17	3.77	1.53	1.50
5	B	803	JIP	C6-N1	3.75	1.54	1.47
5	C	803	JIP	C12-C11	3.58	1.47	1.38
5	C	803	JIP	C23-C17	3.49	1.53	1.50
5	B	803	JIP	C18-N22	-3.46	1.30	1.33
5	A	803	JIP	C3-N2	3.45	1.42	1.34
5	B	803	JIP	C13-C7	3.39	1.46	1.39
5	C	803	JIP	C25-C21	-3.17	1.47	1.50
5	B	803	JIP	C26-N8	3.06	1.51	1.46
5	D	803	JIP	C3-N2	3.06	1.41	1.34
5	C	803	JIP	C17-N14	2.83	1.34	1.32
5	C	803	JIP	C6-N1	2.80	1.52	1.47
5	D	803	JIP	C24-C16	-2.77	1.46	1.50
5	C	803	JIP	C9-C7	2.68	1.45	1.39
5	D	803	JIP	C11-C10	2.66	1.45	1.38
5	C	803	JIP	C10-C9	2.60	1.44	1.38
5	C	803	JIP	C26-N8	2.59	1.50	1.46
5	A	803	JIP	C13-C7	2.45	1.44	1.39
5	B	803	JIP	C15-N14	2.32	1.39	1.34
5	D	803	JIP	C17-N14	2.20	1.34	1.32
5	A	803	JIP	C26-N8	2.20	1.49	1.46
5	B	803	JIP	C12-C11	2.08	1.43	1.38

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	D	803	JIP	C23-C17-C18	-7.27	109.60	121.74
5	B	803	JIP	C23-C17-C18	-5.36	112.79	121.74
5	A	803	JIP	C24-C16-N19	5.14	123.68	118.12
5	C	803	JIP	C23-C17-C18	-4.74	113.83	121.74
5	B	803	JIP	C23-C17-N14	4.61	126.64	117.67
5	C	803	JIP	C7-C3-N4	-4.59	117.98	123.71
5	A	803	JIP	C25-N8-C5	-4.57	113.82	119.72
5	B	803	JIP	C25-C21-N22	-4.42	116.76	123.09
5	C	803	JIP	C25-C21-N22	-3.89	117.52	123.09
5	B	803	JIP	C7-C3-N4	-3.85	118.90	123.71
5	D	803	JIP	C23-C17-N14	3.68	124.82	117.67
5	B	803	JIP	C26-N8-C5	-3.60	117.77	121.27
5	D	803	JIP	C7-C3-N4	-3.54	119.30	123.71
5	D	803	JIP	C10-C9-C7	-3.52	116.13	120.56
5	D	803	JIP	C25-N8-C5	-3.35	115.39	119.72
5	A	803	JIP	C25-C21-N22	-3.28	118.39	123.09
5	D	803	JIP	C9-C7-C13	3.28	124.12	117.59
5	A	803	JIP	C25-C21-N20	3.27	127.69	123.11
5	C	803	JIP	N2-C3-N4	3.24	116.49	114.50
5	B	803	JIP	C25-C21-N20	3.19	127.57	123.11
5	C	803	JIP	C23-C17-N14	3.17	123.84	117.67
5	C	803	JIP	C25-C21-N20	3.06	127.39	123.11
5	C	803	JIP	C26-N8-C25	2.88	122.49	114.84
5	C	803	JIP	C10-C9-C7	-2.80	117.05	120.56
5	C	803	JIP	C26-N8-C5	-2.78	118.56	121.27
5	D	803	JIP	C25-C21-N22	-2.69	119.24	123.09
5	A	803	JIP	C23-C17-C18	-2.66	117.30	121.74
5	D	803	JIP	C15-N14-C17	-2.62	114.31	119.17
5	A	803	JIP	N2-C3-N4	-2.51	112.96	114.50
5	C	803	JIP	C9-C7-C13	2.44	122.45	117.59
5	A	803	JIP	C7-C3-N4	-2.37	120.75	123.71
5	B	803	JIP	C10-C9-C7	-2.26	117.73	120.56
5	D	803	JIP	C13-C7-C3	-2.22	117.02	120.79
5	B	803	JIP	C9-C7-C13	2.21	122.00	117.59
5	B	803	JIP	C24-C16-N19	2.14	120.43	118.12
5	B	803	JIP	N2-C3-N4	2.03	115.75	114.50

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	803	JIP	N20-C21-C25-N8
5	A	803	JIP	N22-C21-C25-N8

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Mol	Chain	Res	Type	Atoms
5	B	803	JIP	N20-C21-C25-N8
5	B	803	JIP	N22-C21-C25-N8
5	C	803	JIP	N20-C21-C25-N8
5	C	803	JIP	N22-C21-C25-N8
5	D	803	JIP	N20-C21-C25-N8
5	D	803	JIP	N22-C21-C25-N8
5	C	803	JIP	C21-C25-N8-C26

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	803	JIP	1	0
5	D	803	JIP	1	0
5	C	803	JIP	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 JIP B 803

Bond lengths

Bond angles

Torsions

Rings

Ligand JIP D 803

Bond lengths

Bond angles

Torsions

Rings

Ligand JIP A 803

Bond lengths

Bond angles

Torsions

Rings

Ligand JIP C 803

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	310/343 (90%)	0.04	1 (0%)	94	94	24, 36, 61, 97	0
2	B	314/343 (91%)	0.05	2 (0%)	89	90	24, 34, 61, 88	0
2	C	311/343 (90%)	-0.16	5 (1%)	72	73	25, 36, 58, 90	0
2	D	311/343 (90%)	0.03	5 (1%)	72	73	29, 42, 65, 81	0
All	All	1246/1372 (90%)	-0.01	13 (1%)	82	83	24, 38, 62, 97	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	459	LEU	5.0
2	C	768	GLY	3.3
2	D	457	GLN	3.0
2	B	771	THR	2.9
2	D	657	ASN	2.7
2	C	459	LEU	2.5
2	D	613	THR	2.5
2	C	766	ILE	2.2
2	B	768	GLY	2.2
2	C	713	MET	2.1
2	D	713	MET	2.1
2	C	720[A]	ASP	2.1
2	D	720	ASP	2.0

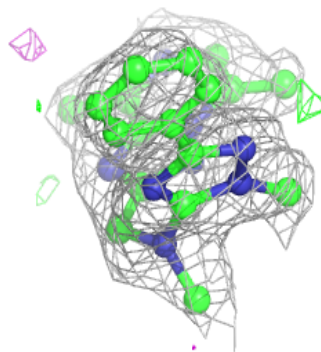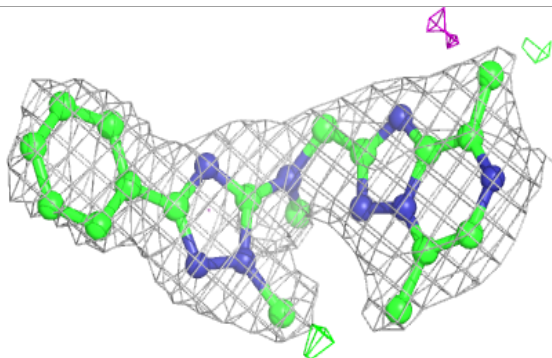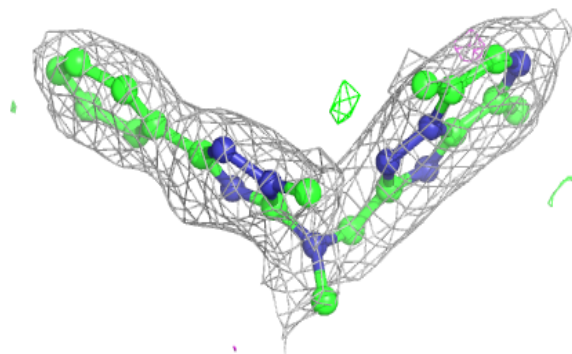## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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	CME	D	509	10/11	0.90	0.15	40,53,100,101	0
1	CME	A	469	10/11	0.91	0.13	34,40,69,80	0
2	CME	C	509	10/11	0.92	0.11	35,46,73,76	0
1	CME	A	509	10/11	0.94	0.11	39,52,92,94	0
2	CME	B	509	10/11	0.94	0.11	30,47,77,81	0

6.3 Carbohydrates (i)

There are no monosaccharides 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.

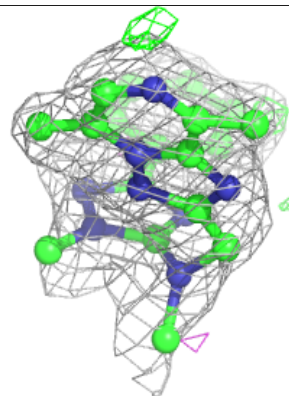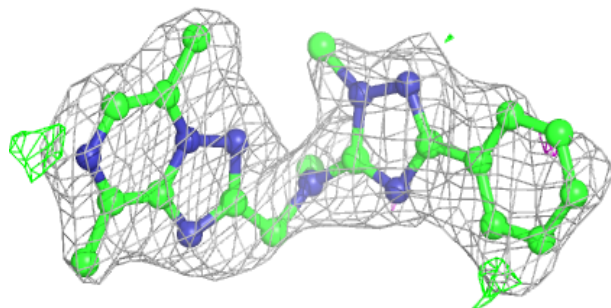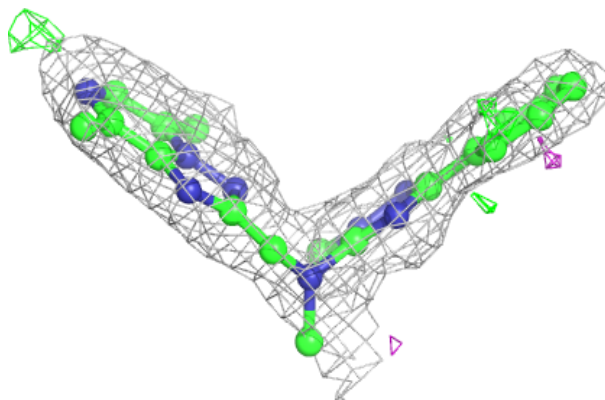| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	JIP	B	803	26/26	0.92	0.13	38,48,60,62	0
5	JIP	C	803	26/26	0.92	0.17	34,53,63,69	0
4	MG	D	802	1/1	0.93	0.04	35,35,35,35	0
5	JIP	D	803	26/26	0.93	0.16	39,55,69,79	0
5	JIP	A	803	26/26	0.94	0.12	33,50,58,62	0
4	MG	B	802	1/1	0.97	0.11	25,25,25,25	0
4	MG	C	802	1/1	0.98	0.08	27,27,27,27	0
4	MG	A	802	1/1	0.98	0.05	28,28,28,28	0
3	ZN	D	801	1/1	0.99	0.09	35,35,35,35	0
3	ZN	A	801	1/1	1.00	0.10	30,30,30,30	0
3	ZN	B	801	1/1	1.00	0.10	30,30,30,30	0
3	ZN	C	801	1/1	1.00	0.09	32,32,32,32	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.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

Electron density around JIP B 803:

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

Electron density around JIP C 803:

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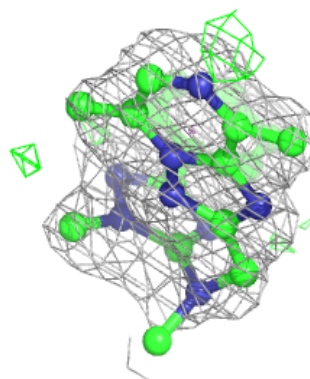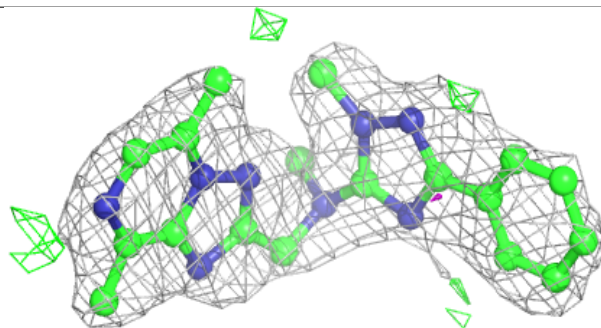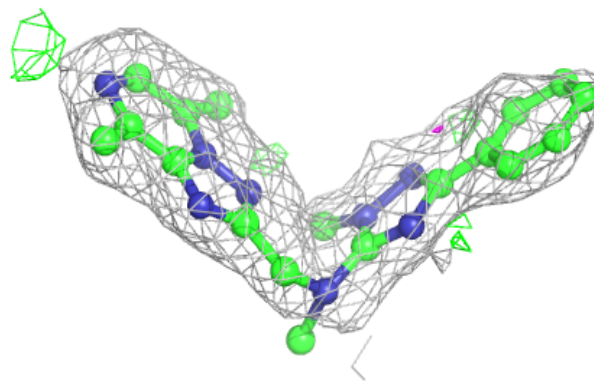$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around JIP D 803:

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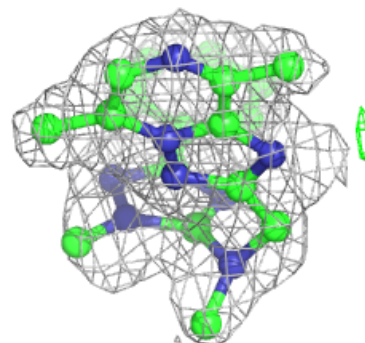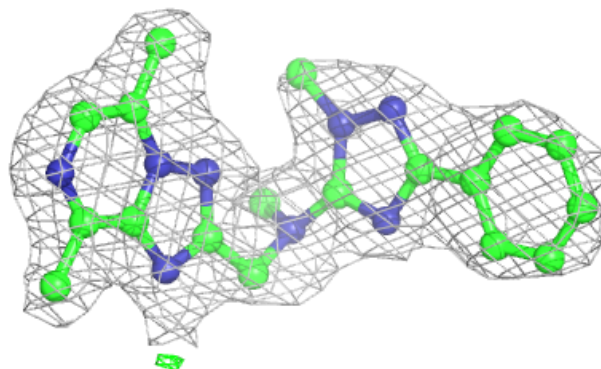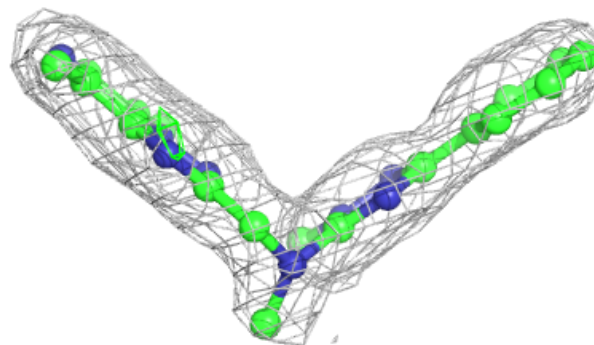mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around JIP A 803:

$2mF_o$-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 ⓘ

There are no such residues in this entry.