



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:39 AM UTC

PDB ID : 4EHZ / pdb_00004ehz
Title : The Jak1 kinase domain in complex with inhibitor
Authors : Lupardus, P.J.; Steffek, M.
Deposited on : 2012-04-04
Resolution : 2.17 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

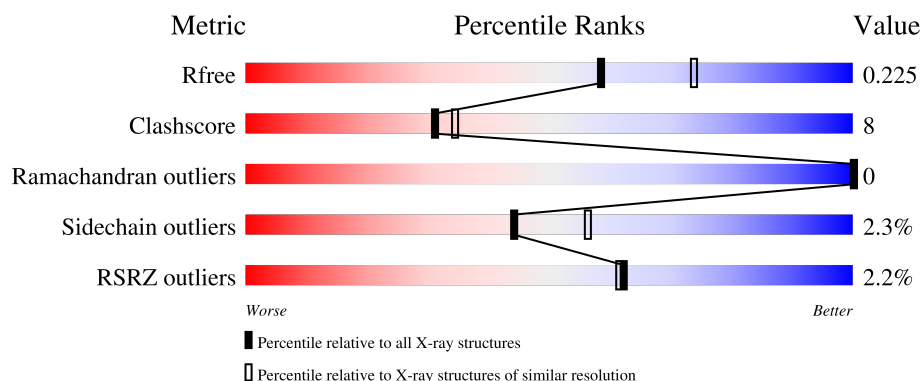
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.17 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	8975 (2.20-2.16)
Clashscore	190562	9786 (2.20-2.16)
Ramachandran outliers	187476	9664 (2.20-2.16)
Sidechain outliers	187428	9664 (2.20-2.16)
RSRZ outliers	180081	8979 (2.20-2.16)

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

Mol	Chain	Length	Quality of chain
1	A	302	
1	B	302	
1	C	302	
1	D	302	

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
3	EDO	C	1205	-	-	X	-
3	EDO	D	1203	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 9938 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.

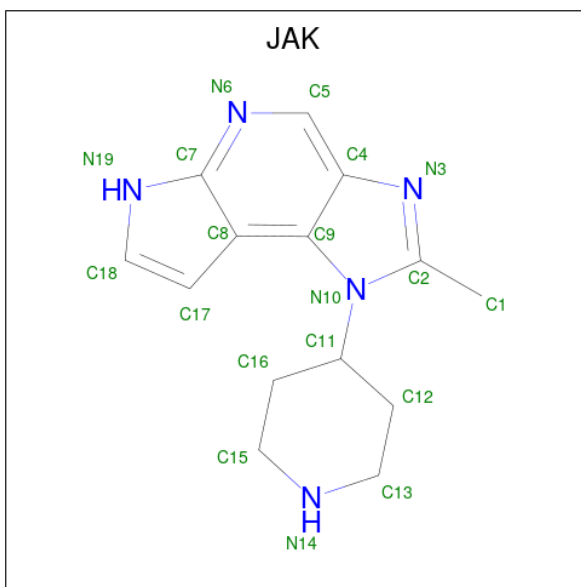
- Molecule 1 is a protein called Tyrosine-protein kinase JAK1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	292	Total	C	N	O	P	S	0	0	0
			2363	1504	402	440	2	15			
1	B	282	Total	C	N	O	P	S	0	1	0
			2304	1469	392	426	2	15			
1	C	280	Total	C	N	O	P	S	0	1	0
			2288	1459	390	422	2	15			
1	D	282	Total	C	N	O	P	S	0	0	0
			2298	1464	391	426	2	15			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	853	GLY	-	expression tag	UNP P23458
B	853	GLY	-	expression tag	UNP P23458
C	853	GLY	-	expression tag	UNP P23458
D	853	GLY	-	expression tag	UNP P23458

- Molecule 2 is 2-methyl-1-(piperidin-4-yl)-1,6-dihydroimidazo[4,5-d]pyrrolo[2,3-b]pyridine (CCD ID: JAK) (formula: C₁₄H₁₇N₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	N	0	0
			19	14	5		
2	B	1	Total	C	N	0	0
			19	14	5		
2	C	1	Total	C	N	0	0
			19	14	5		
2	D	1	Total	C	N	0	0
			19	14	5		

- 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 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	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	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

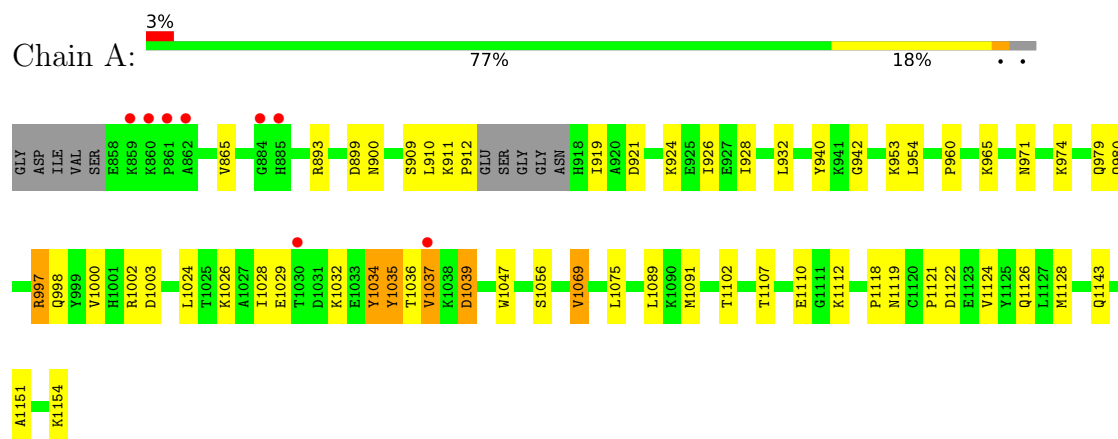
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	136	Total O 136 136	0	0
4	B	132	Total O 132 132	0	0
4	C	166	Total O 166 166	0	0
4	D	127	Total O 127 127	0	0

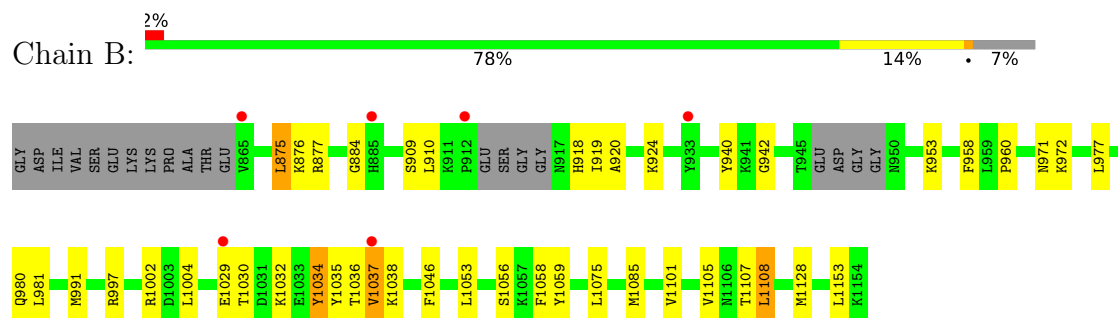
3 Residue-property plots [i](#)

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.

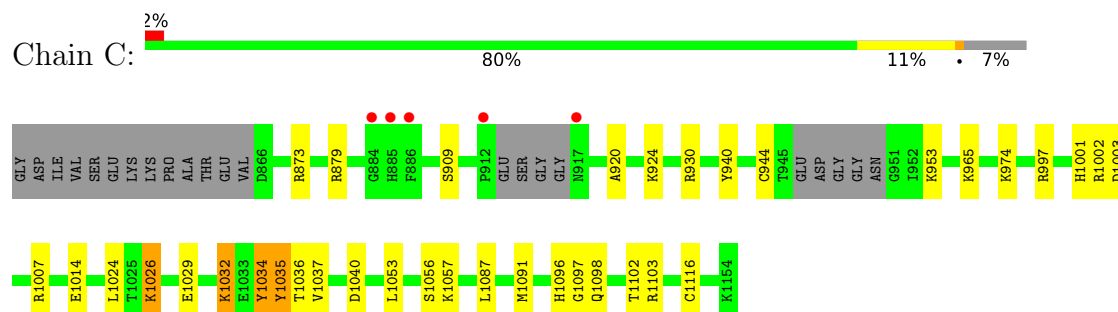
• Molecule 1: Tyrosine-protein kinase JAK1



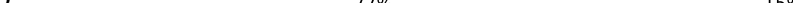
• Molecule 1: Tyrosine-protein kinase JAK1

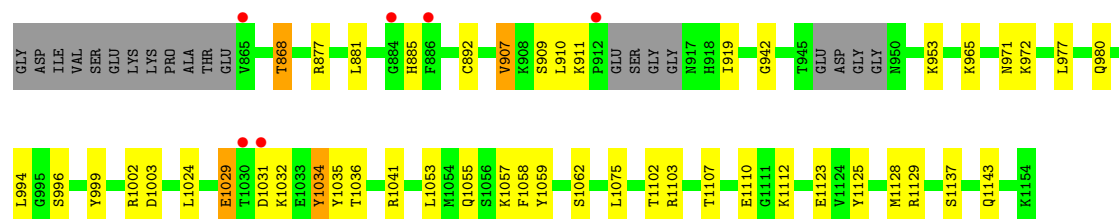


• Molecule 1: Tyrosine-protein kinase JAK1



• Molecule 1: Tyrosine-protein kinase JAK1

Chain D:  2% 77% 15% 7%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	42.71Å 172.18Å 88.03Å 90.00° 92.28° 90.00°	Depositor
Resolution (Å)	30.00 – 2.17 30.00 – 2.17	Depositor EDS
% Data completeness (in resolution range)	90.7 (30.00-2.17) 95.3 (30.00-2.17)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.43 (at 2.18Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7_648)	Depositor
R, R_{free}	0.171 , 0.229 0.172 , 0.225	Depositor DCC
R_{free} test set	3211 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	25.6	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 48.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.087 for h,-k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	9938	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 43.92 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.6448e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PTR, EDO, JAK

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	0.48	0/2380	0.83	0/3204
1	B	0.47	0/2322	0.79	0/3124
1	C	0.50	0/2306	0.80	3/3102 (0.1%)
1	D	0.48	0/2313	0.79	0/3113
All	All	0.48	0/9321	0.80	3/12543 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	1116	CYS	CA-C-N	5.35	123.57	119.66
1	C	1116	CYS	C-N-CA	5.35	123.57	119.66
1	C	997	ARG	N-CA-C	-5.11	106.89	112.72

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	2363	0	2354	46	0
1	B	2304	0	2305	31	0
1	C	2288	0	2286	41	0
1	D	2298	0	2292	43	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	19	0	17	0	0
2	B	19	0	17	0	0
2	C	19	0	17	0	0
2	D	19	0	17	0	0
3	A	20	0	30	3	0
3	B	4	0	6	0	0
3	C	16	0	24	10	0
3	D	8	0	12	6	0
4	A	136	0	0	1	0
4	B	132	0	0	1	0
4	C	166	0	0	2	0
4	D	127	0	0	3	0
All	All	9938	0	9377	154	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 8.

All (154) 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:879:ARG:HH22	3:C:1202:EDO:H12	1.40	0.86
1:C:965:LYS:HD2	1:C:1007[B]:ARG:HB3	1.57	0.85
1:C:965:LYS:HD2	1:C:1007[A]:ARG:HB3	1.61	0.81
1:D:972:LYS:N	3:D:1203:EDO:H12	1.96	0.81
1:C:1056:SER:HA	3:C:1205:EDO:H21	1.62	0.79
1:C:965:LYS:HZ2	1:C:1007[A]:ARG:H	1.28	0.79
1:D:1107:THR:HG23	1:D:1112:LYS:HD2	1.63	0.78
1:C:965:LYS:HZ2	1:C:1007[B]:ARG:H	1.29	0.78
1:D:868:THR:HG21	4:D:1417:HOH:O	1.84	0.78
1:B:1029:GLU:HG2	1:B:1032:LYS:HB2	1.67	0.76
1:D:972:LYS:HB2	3:D:1203:EDO:H11	1.70	0.72
1:D:877:ARG:HH22	1:D:953:LYS:HE3	1.57	0.70
1:A:1037:VAL:HG12	1:A:1056:SER:OG	1.92	0.70
1:C:1029:GLU:HB3	1:C:1032:LYS:HE2	1.72	0.69
1:C:1035:PTR:HE1	1:C:1037:VAL:HG22	1.75	0.68
1:D:1110:GLU:OE1	1:D:1112:LYS:HE2	1.95	0.67
1:A:1002:ARG:NH2	1:A:1037:VAL:HG21	2.10	0.67
1:B:1029:GLU:HG3	1:B:1032:LYS:HD3	1.77	0.67
1:D:885:HIS:O	1:D:911:LYS:HE3	1.96	0.65
1:A:924:LYS:HZ1	1:A:1026:LYS:NZ	1.95	0.64
1:D:909:SER:HB3	1:D:953:LYS:HG2	1.78	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:1075:LEU:HD12	1:D:1128:MET:HE1	1.80	0.63
1:C:965:LYS:NZ	1:C:1007[A]:ARG:H	1.95	0.63
1:A:924:LYS:NZ	1:A:1026:LYS:NZ	2.46	0.62
1:C:965:LYS:NZ	1:C:1007[B]:ARG:H	1.95	0.62
1:C:1040:ASP:CB	3:C:1205:EDO:H11	2.30	0.62
1:B:920:ALA:O	1:B:924:LYS:HE2	1.98	0.62
1:C:1040:ASP:HB3	3:C:1205:EDO:H11	1.81	0.62
1:D:1002:ARG:HA	1:D:1058:PHE:CZ	2.35	0.61
1:A:921:ASP:O	1:A:924:LYS:HG2	2.00	0.61
1:A:1047:TRP:CD1	1:A:1069:VAL:HG22	2.37	0.59
1:A:1107:THR:HG22	1:A:1112:LYS:HB2	1.85	0.58
1:B:1002:ARG:HA	1:B:1058:PHE:CZ	2.38	0.58
1:C:879:ARG:HH22	3:C:1202:EDO:C1	2.15	0.58
1:A:1039:ASP:OD1	1:A:1039:ASP:C	2.47	0.57
1:B:1038:LYS:N	1:B:1038:LYS:HD2	2.19	0.57
1:A:1002:ARG:HD3	1:A:1024:LEU:O	2.05	0.56
1:A:1032:LYS:N	1:A:1032:LYS:HD2	2.20	0.56
1:D:1031:ASP:O	1:D:1032:LYS:HG3	2.05	0.56
1:B:876:LYS:HE2	1:D:996:SER:HA	1.86	0.56
1:A:924:LYS:HZ1	1:A:1026:LYS:CE	2.18	0.56
1:A:928:ILE:O	1:A:932:LEU:HG	2.05	0.56
1:C:1056:SER:CA	3:C:1205:EDO:H21	2.32	0.56
1:C:1002:ARG:HH11	1:C:1026:LYS:HD3	1.70	0.56
1:C:920:ALA:O	1:C:924:LYS:HE2	2.06	0.55
1:A:1075:LEU:HD12	1:A:1128:MET:HE1	1.89	0.55
1:A:1029:GLU:HG2	1:A:1032:LYS:HD3	1.88	0.55
1:B:1034:PTR:HE2	1:B:1036:THR:OG1	2.07	0.55
1:A:1110:GLU:HB3	1:A:1112:LYS:NZ	2.22	0.55
1:D:885:HIS:CE1	1:D:1041:ARG:NH2	2.75	0.55
1:D:972:LYS:H	3:D:1203:EDO:H12	1.72	0.55
1:D:1034:PTR:HE2	1:D:1036:THR:OG1	2.07	0.54
1:D:977:LEU:HA	1:D:980:GLN:OE1	2.07	0.54
1:B:1075:LEU:HD12	1:B:1128:MET:HE1	1.90	0.54
1:A:1000:VAL:HG13	1:A:1028:ILE:HD11	1.89	0.54
1:A:926:ILE:HG12	1:A:954:LEU:HD13	1.91	0.53
1:D:1029:GLU:HB3	1:D:1032:LYS:HD2	1.91	0.53
1:C:944:CYS:HB3	1:C:953:LYS:HB2	1.90	0.52
1:B:884:GLY:HA3	4:B:1428:HOH:O	2.09	0.52
1:D:965:LYS:HE2	4:D:1411:HOH:O	2.09	0.52
1:D:910:LEU:HD11	1:D:919:ILE:HA	1.89	0.52
1:B:1029:GLU:H	1:B:1029:GLU:CD	2.16	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:980:GLN:HE22	3:A:1203:EDO:H12	1.75	0.52
1:C:1026:LYS:HG2	1:C:1035:PTR:CZ	2.40	0.52
1:D:972:LYS:HB2	3:D:1203:EDO:C1	2.40	0.52
1:A:979:GLN:HB2	3:A:1206:EDO:H11	1.91	0.52
1:A:1035:PTR:HE1	1:A:1037:VAL:HG23	1.91	0.51
1:C:1003:ASP:HB2	1:C:1024:LEU:HD12	1.92	0.51
1:C:1056:SER:HA	3:C:1205:EDO:C2	2.38	0.51
1:C:1053:LEU:O	1:D:1102:THR:HG21	2.11	0.50
1:A:924:LYS:NZ	1:A:1026:LYS:HZ2	2.09	0.50
1:C:1007[A]:ARG:HD3	4:C:1403:HOH:O	2.10	0.50
1:B:910:LEU:HD11	1:B:919:ILE:HA	1.94	0.50
1:C:965:LYS:HE2	4:C:1403:HOH:O	2.13	0.49
1:C:1102:THR:HG21	1:D:1053:LEU:O	2.13	0.49
1:B:924:LYS:N	1:B:924:LYS:HD3	2.27	0.49
1:B:1046:PHE:CE2	1:B:1085:MET:HG3	2.48	0.49
1:A:1151:ALA:HA	1:A:1154:LYS:HE2	1.93	0.49
1:D:1057:LYS:HD3	1:D:1059:TYR:OH	2.12	0.48
1:D:868:THR:HG23	1:D:942:GLY:HA2	1.95	0.48
1:D:1107:THR:HG22	1:D:1112:LYS:HB2	1.95	0.48
1:A:1039:ASP:OD1	1:A:1039:ASP:O	2.31	0.48
1:C:1002:ARG:NH1	1:C:1026:LYS:HD3	2.28	0.48
1:B:1034:PTR:HD1	1:B:1059:TYR:CE2	2.49	0.48
1:A:1110:GLU:HB3	1:A:1112:LYS:HZ3	1.78	0.48
1:C:1026:LYS:HG2	1:C:1035:PTR:CE1	2.43	0.48
1:A:1118:PRO:O	1:A:1119:ASN:HB2	2.14	0.48
1:D:885:HIS:C	1:D:911:LYS:HE3	2.38	0.48
1:C:1056:SER:CB	3:C:1205:EDO:H21	2.44	0.48
1:C:1097:GLY:N	1:D:1041:ARG:HG3	2.29	0.47
1:B:940:TYR:CZ	1:B:942:GLY:HA2	2.50	0.47
1:A:1122:ASP:O	1:A:1126:GLN:HG2	2.14	0.47
1:A:1037:VAL:HG11	4:A:1416:HOH:O	2.15	0.47
1:B:981:LEU:HB2	1:B:1153:LEU:HD21	1.96	0.47
1:C:909:SER:HB3	1:C:953:LYS:HG2	1.97	0.47
1:C:1034:PTR:CZ	1:C:1057:LYS:HE3	2.45	0.47
1:C:1040:ASP:HB2	3:C:1205:EDO:H11	1.97	0.46
1:D:1058:PHE:CE1	1:D:1062:SER:HB2	2.50	0.46
1:D:994:LEU:HG	1:D:999:TYR:HB2	1.96	0.46
1:C:1032:LYS:HB2	1:C:1032:LYS:HZ3	1.81	0.46
1:A:893:ARG:NE	1:A:900:ASN:ND2	2.63	0.46
1:B:920:ALA:O	1:B:924:LYS:HG2	2.15	0.46
1:A:909:SER:HB3	1:A:953:LYS:HG2	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1003:ASP:HB2	1:A:1024:LEU:HD12	1.96	0.46
1:A:940:TYR:CZ	1:A:942:GLY:HA2	2.50	0.46
1:B:1037:VAL:HG13	1:B:1056:SER:O	2.15	0.46
1:B:977:LEU:HA	1:B:980:GLN:OE1	2.17	0.45
1:A:1091:MET:HE2	1:A:1107:THR:HG21	1.99	0.45
1:C:1040:ASP:OD2	1:D:1103:ARG:NH1	2.49	0.45
1:D:965:LYS:HE3	4:D:1324:HOH:O	2.16	0.45
1:B:1101:VAL:O	1:B:1105:VAL:HG23	2.17	0.45
1:A:910:LEU:HD11	1:A:919:ILE:HA	1.99	0.45
1:C:1096:HIS:CD2	1:C:1103:ARG:HG3	2.53	0.44
1:D:972:LYS:N	3:D:1203:EDO:C1	2.75	0.44
1:A:1102:THR:HG21	1:B:1053:LEU:O	2.17	0.44
1:B:909:SER:HB3	1:B:953:LYS:HG2	2.00	0.44
1:B:1108:LEU:HD12	1:B:1108:LEU:HA	1.89	0.44
1:D:1055:GLN:CD	1:D:1057:LYS:HD2	2.43	0.43
1:D:1034:PTR:HE1	1:D:1034:PTR:O3P	2.17	0.43
1:D:1057:LYS:HE2	1:D:1057:LYS:HB3	1.85	0.43
1:A:1034:PTR:HE2	1:A:1036:THR:OG1	2.19	0.43
1:B:991:MET:HE2	1:B:1004:LEU:HD22	2.01	0.43
1:B:1029:GLU:CG	1:B:1032:LYS:HD3	2.45	0.43
1:C:930:ARG:HG2	1:C:940:TYR:CZ	2.53	0.43
1:D:885:HIS:HA	1:D:911:LYS:HZ2	1.83	0.43
1:B:1034:PTR:HD2	1:B:1034:PTR:C	2.48	0.43
1:A:971:ASN:OD1	1:A:974:LYS:HD3	2.19	0.43
1:A:1034:PTR:CD2	1:A:1034:PTR:C	2.97	0.42
1:A:960:PRO:O	3:A:1202:EDO:H11	2.20	0.42
1:D:892:CYS:SG	1:D:907:VAL:CG1	3.07	0.42
1:A:1107:THR:CG2	1:A:1112:LYS:HB2	2.48	0.42
1:B:877:ARG:NH2	1:D:1137:SER:O	2.52	0.42
1:C:1034:PTR:O3P	1:C:1034:PTR:HE1	2.20	0.42
1:A:1032:LYS:N	1:A:1032:LYS:CD	2.81	0.42
1:A:997:ARG:O	1:A:998:GLN:HB2	2.19	0.42
1:D:877:ARG:NH2	1:D:953:LYS:HE3	2.30	0.42
1:C:1001:HIS:O	1:C:1002:ARG:HB2	2.20	0.42
1:D:1125:TYR:CZ	1:D:1129:ARG:HD3	2.55	0.42
1:A:1121:PRO:HG2	1:A:1124:VAL:HG23	2.01	0.41
1:D:1003:ASP:HB2	1:D:1024:LEU:HD12	2.02	0.41
1:D:1059:TYR:CD1	1:D:1059:TYR:N	2.88	0.41
1:B:918:HIS:ND1	1:B:918:HIS:N	2.67	0.41
1:A:1075:LEU:HD12	1:A:1128:MET:CE	2.51	0.41
1:A:1089:LEU:HD23	1:A:1089:LEU:HA	1.83	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1098:GLN:HA	3:C:1203:EDO:H11	2.02	0.41
1:D:971:ASN:C	3:D:1203:EDO:H12	2.44	0.41
1:B:971:ASN:O	1:B:972:LYS:C	2.64	0.41
1:A:911:LYS:HA	1:A:912:PRO:HD3	1.89	0.40
1:B:875:LEU:HD12	1:B:875:LEU:HA	1.94	0.40
1:C:1087:LEU:O	1:C:1091:MET:HE3	2.22	0.40
1:A:899:ASP:O	1:A:900:ASN:HB3	2.20	0.40
1:C:974:LYS:HD3	1:C:1014:GLU:OE1	2.21	0.40
1:B:958:PHE:CZ	1:B:960:PRO:HA	2.56	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	286/302 (95%)	277 (97%)	9 (3%)	0	100	100
1	B	275/302 (91%)	270 (98%)	5 (2%)	0	100	100
1	C	273/302 (90%)	265 (97%)	8 (3%)	0	100	100
1	D	274/302 (91%)	270 (98%)	4 (2%)	0	100	100
All	All	1108/1208 (92%)	1082 (98%)	26 (2%)	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	258/267 (97%)	251 (97%)	7 (3%)	39	50
1	B	254/267 (95%)	248 (98%)	6 (2%)	43	55
1	C	251/267 (94%)	247 (98%)	4 (2%)	55	68
1	D	253/267 (95%)	247 (98%)	6 (2%)	43	55
All	All	1016/1068 (95%)	993 (98%)	23 (2%)	44	56

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	865	VAL
1	A	965	LYS
1	A	997	ARG
1	A	1037	VAL
1	A	1039	ASP
1	A	1069	VAL
1	A	1143	GLN
1	B	875	LEU
1	B	997	ARG
1	B	1030	THR
1	B	1037	VAL
1	B	1107	THR
1	B	1108	LEU
1	C	873	ARG
1	C	1026	LYS
1	C	1032	LYS
1	C	1036	THR
1	D	868	THR
1	D	881	LEU
1	D	907	VAL
1	D	1029	GLU
1	D	1123	GLU
1	D	1143	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	900	ASN
1	A	950	ASN
1	A	979	GLN
1	A	1144	ASN

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Mol	Chain	Res	Type
1	B	904	GLN
1	B	1015	HIS
1	C	904	GLN
1	C	1096	HIS
1	D	869	HIS
1	D	885	HIS
1	D	900	ASN
1	D	904	GLN
1	D	1055	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

8 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
1	PTR	D	1034	1	15,16,17	1.90	1 (6%)	17,22,24	0.73	0
1	PTR	A	1035	1	15,16,17	1.85	1 (6%)	17,22,24	0.66	0
1	PTR	A	1034	1	15,16,17	1.95	1 (6%)	17,22,24	0.85	1 (5%)
1	PTR	D	1035	1	15,16,17	1.90	1 (6%)	17,22,24	0.65	0
1	PTR	C	1035	1	15,16,17	1.88	1 (6%)	17,22,24	0.67	0
1	PTR	C	1034	1	15,16,17	1.96	1 (6%)	17,22,24	0.87	1 (5%)
1	PTR	B	1034	1	15,16,17	1.98	1 (6%)	17,22,24	0.68	0
1	PTR	B	1035	1	15,16,17	1.83	1 (6%)	17,22,24	0.65	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
1	PTR	D	1034	1	-	0/10/11/13	0/1/1/1
1	PTR	A	1035	1	-	0/10/11/13	0/1/1/1
1	PTR	A	1034	1	-	0/10/11/13	0/1/1/1
1	PTR	D	1035	1	-	0/10/11/13	0/1/1/1
1	PTR	C	1035	1	-	0/10/11/13	0/1/1/1
1	PTR	C	1034	1	-	2/10/11/13	0/1/1/1
1	PTR	B	1034	1	-	0/10/11/13	0/1/1/1
1	PTR	B	1035	1	-	0/10/11/13	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1034	PTR	OH-CZ	-7.49	1.23	1.40
1	C	1034	PTR	OH-CZ	-7.25	1.24	1.40
1	A	1034	PTR	OH-CZ	-7.21	1.24	1.40
1	D	1035	PTR	OH-CZ	-7.09	1.24	1.40
1	D	1034	PTR	OH-CZ	-7.05	1.24	1.40
1	C	1035	PTR	OH-CZ	-6.94	1.25	1.40
1	A	1035	PTR	OH-CZ	-6.78	1.25	1.40
1	B	1035	PTR	OH-CZ	-6.66	1.25	1.40

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	1034	PTR	O3P-P-OH	2.65	113.16	105.32
1	A	1034	PTR	O3P-P-OH	2.29	112.09	105.32

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	C	1034	PTR	CZ-OH-P-O1P
1	C	1034	PTR	CZ-OH-P-O2P

There are no ring outliers.

6 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	1034	PTR	2	0
1	A	1035	PTR	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	1034	PTR	2	0
1	C	1035	PTR	3	0
1	C	1034	PTR	2	0
1	B	1034	PTR	3	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

16 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
3	EDO	C	1204	-	3,3,3	0.41	0	2,2,2	0.42	0
2	JAK	B	1201	-	21,22,22	0.94	1 (4%)	24,32,32	2.35	9 (37%)
3	EDO	A	1203	-	3,3,3	0.41	0	2,2,2	0.40	0
3	EDO	A	1204	-	3,3,3	0.42	0	2,2,2	0.60	0
3	EDO	C	1202	-	3,3,3	0.44	0	2,2,2	0.37	0
3	EDO	C	1203	-	3,3,3	0.53	0	2,2,2	0.32	0
3	EDO	D	1202	-	3,3,3	0.42	0	2,2,2	0.41	0
2	JAK	A	1201	-	21,22,22	1.06	2 (9%)	24,32,32	2.62	9 (37%)
3	EDO	B	1202	-	3,3,3	0.37	0	2,2,2	0.54	0
3	EDO	A	1205	-	3,3,3	0.44	0	2,2,2	0.54	0
3	EDO	A	1206	-	3,3,3	0.42	0	2,2,2	0.46	0
3	EDO	A	1202	-	3,3,3	0.43	0	2,2,2	0.42	0
3	EDO	D	1203	-	3,3,3	0.49	0	2,2,2	0.26	0
3	EDO	C	1205	-	3,3,3	0.43	0	2,2,2	0.26	0
2	JAK	D	1201	-	21,22,22	0.85	1 (4%)	24,32,32	2.49	8 (33%)
2	JAK	C	1201	-	21,22,22	0.88	1 (4%)	24,32,32	2.50	8 (33%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	C	1204	-	-	1/1/1/1	-
2	JAK	B	1201	-	-	0/4/12/12	0/4/4/4
3	EDO	A	1203	-	-	0/1/1/1	-
3	EDO	A	1204	-	-	1/1/1/1	-
3	EDO	C	1202	-	-	0/1/1/1	-
3	EDO	C	1203	-	-	1/1/1/1	-
3	EDO	D	1202	-	-	0/1/1/1	-
2	JAK	A	1201	-	-	0/4/12/12	0/4/4/4
3	EDO	B	1202	-	-	1/1/1/1	-
3	EDO	A	1205	-	-	1/1/1/1	-
3	EDO	A	1206	-	-	0/1/1/1	-
3	EDO	A	1202	-	-	0/1/1/1	-
3	EDO	D	1203	-	-	1/1/1/1	-
3	EDO	C	1205	-	-	0/1/1/1	-
2	JAK	D	1201	-	-	0/4/12/12	0/4/4/4
2	JAK	C	1201	-	-	0/4/12/12	0/4/4/4

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1201	JAK	C4-N3	-2.54	1.34	1.39
2	D	1201	JAK	C4-N3	-2.25	1.35	1.39
2	A	1201	JAK	C1-C2	2.20	1.52	1.49
2	C	1201	JAK	C4-N3	-2.18	1.35	1.39
2	B	1201	JAK	C4-N3	-2.11	1.35	1.39

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1201	JAK	C8-C7-N6	-8.13	120.04	126.40
2	B	1201	JAK	C8-C7-N6	-7.88	120.23	126.40
2	C	1201	JAK	C8-C7-N6	-7.76	120.33	126.40
2	D	1201	JAK	C8-C7-N6	-7.31	120.68	126.40
2	A	1201	JAK	C8-C9-C4	-4.16	116.54	121.19
2	A	1201	JAK	C4-N3-C2	3.90	110.30	105.57
2	C	1201	JAK	C8-C9-C4	-3.87	116.86	121.19
2	D	1201	JAK	C7-N19-C18	3.84	110.33	108.11
2	D	1201	JAK	C9-C4-N3	-3.72	107.06	110.29
2	D	1201	JAK	C4-N3-C2	3.69	110.05	105.57

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1201	JAK	C7-N19-C18	3.68	110.24	108.11
2	D	1201	JAK	C8-C9-C4	-3.66	117.09	121.19
2	A	1201	JAK	C5-N6-C7	3.57	123.19	116.19
2	A	1201	JAK	C9-C4-N3	-3.42	107.32	110.29
2	B	1201	JAK	C8-C9-C4	-3.42	117.36	121.19
2	B	1201	JAK	C5-N6-C7	3.42	122.89	116.19
2	C	1201	JAK	C9-C4-N3	-3.40	107.33	110.29
2	A	1201	JAK	C7-C8-C17	-3.33	104.75	106.40
2	C	1201	JAK	N19-C7-N6	3.33	132.08	126.69
2	C	1201	JAK	C4-N3-C2	3.32	109.60	105.57
2	D	1201	JAK	N19-C7-N6	3.32	132.06	126.69
2	A	1201	JAK	N19-C7-N6	3.19	131.85	126.69
2	D	1201	JAK	C5-N6-C7	3.10	122.26	116.19
2	C	1201	JAK	C5-N6-C7	3.09	122.24	116.19
2	B	1201	JAK	N19-C7-N6	3.01	131.56	126.69
2	B	1201	JAK	C4-N3-C2	2.62	108.75	105.57
2	B	1201	JAK	C7-C8-C17	-2.52	105.15	106.40
2	B	1201	JAK	C9-C4-N3	-2.38	108.22	110.29
2	B	1201	JAK	C7-N19-C18	2.33	109.46	108.11
2	A	1201	JAK	C9-C8-C17	2.30	136.00	132.05
2	C	1201	JAK	C7-C8-C17	-2.22	105.30	106.40
2	B	1201	JAK	C9-C8-C17	2.12	135.69	132.05
2	A	1201	JAK	C7-N19-C18	2.06	109.30	108.11
2	D	1201	JAK	C15-C16-C11	-2.06	107.02	110.77

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1204	EDO	O1-C1-C2-O2
3	B	1202	EDO	O1-C1-C2-O2
3	D	1203	EDO	O1-C1-C2-O2
3	A	1205	EDO	O1-C1-C2-O2
3	C	1203	EDO	O1-C1-C2-O2
3	C	1204	EDO	O1-C1-C2-O2

There are no ring outliers.

7 monomers are involved in 19 short contacts:

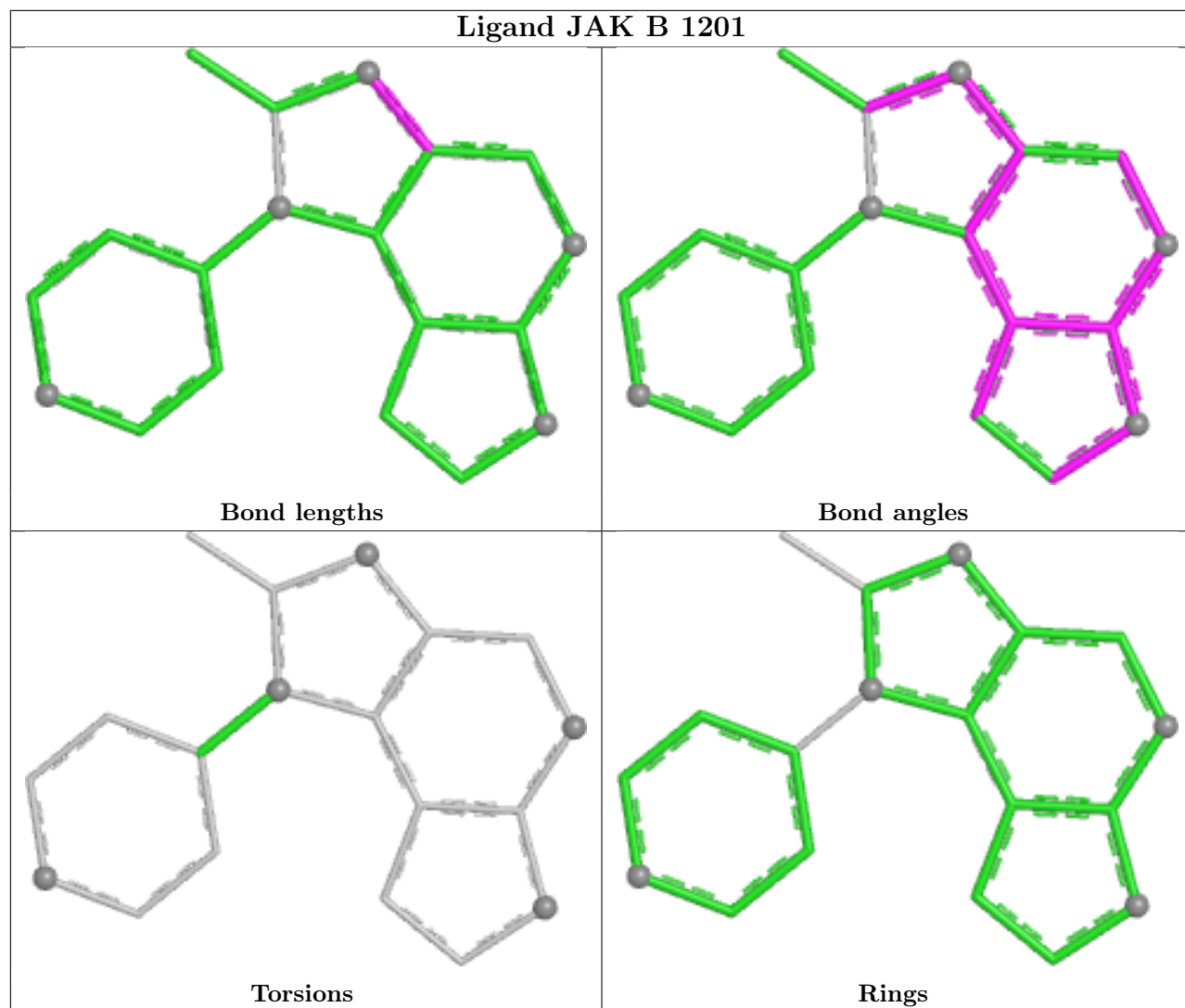
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1203	EDO	1	0

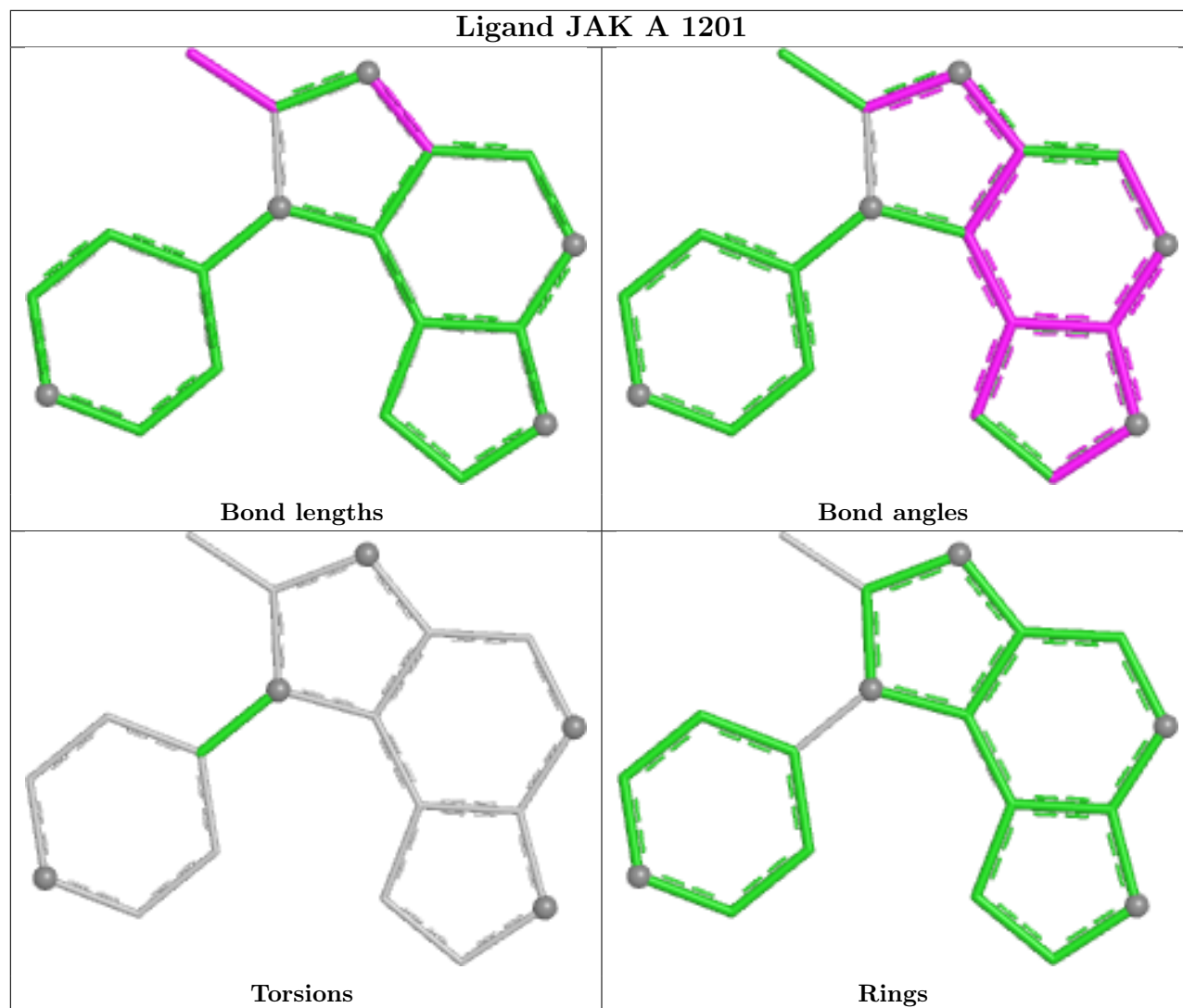
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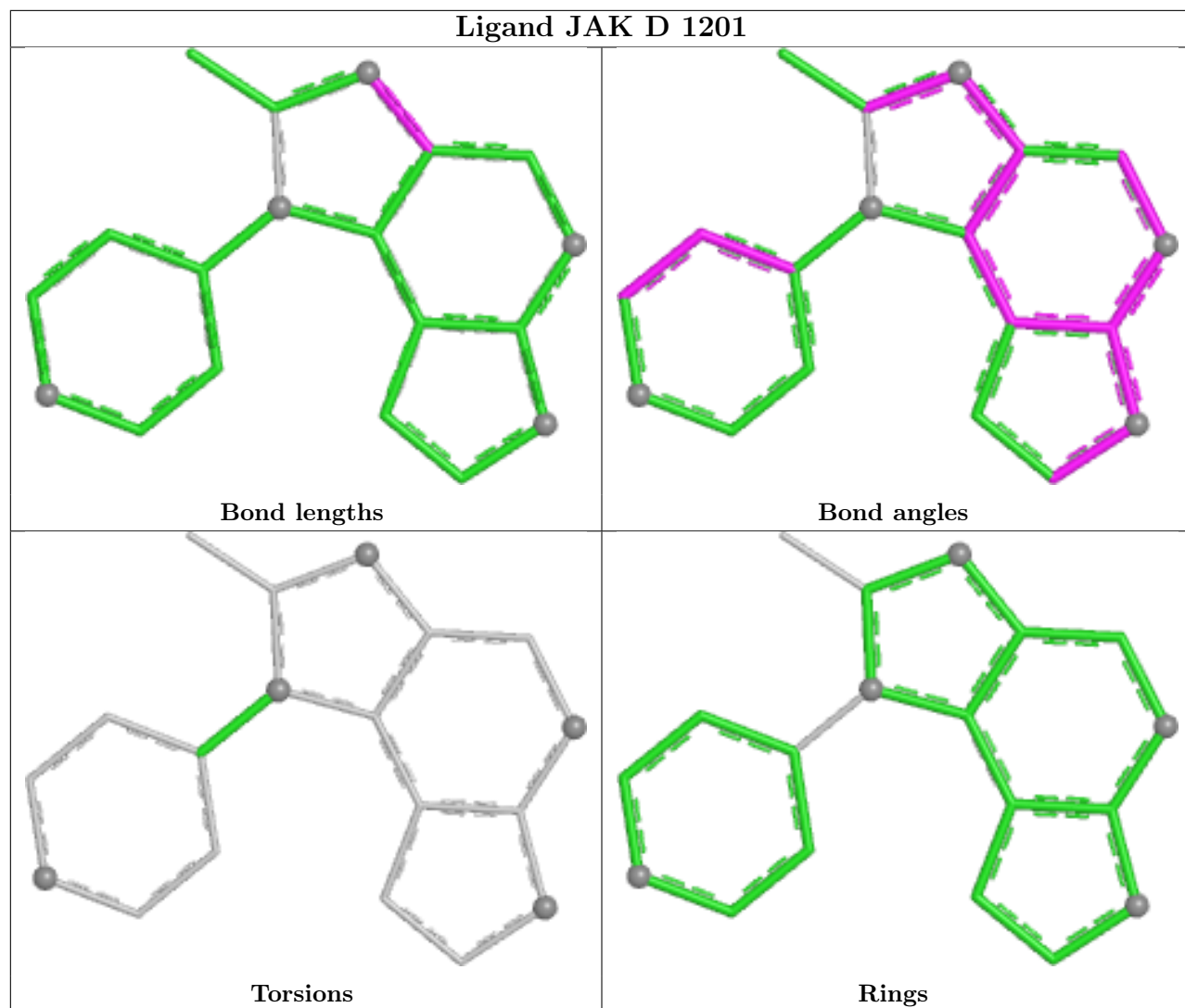
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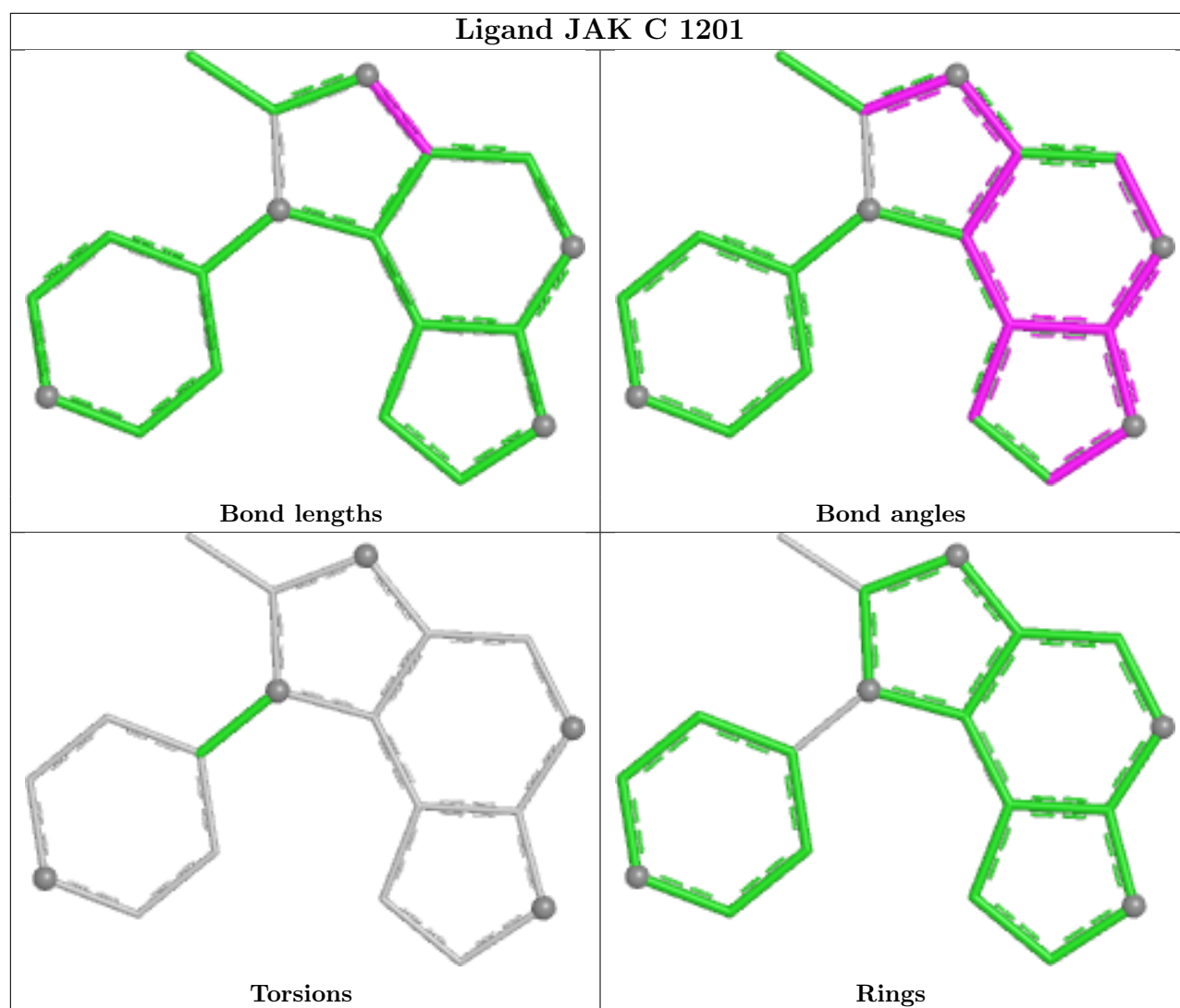
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	1202	EDO	2	0
3	C	1203	EDO	1	0
3	A	1206	EDO	1	0
3	A	1202	EDO	1	0
3	D	1203	EDO	6	0
3	C	1205	EDO	7	0

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 than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	290/302 (96%)	-0.29	8 (2%) 55 54	12, 27, 61, 102	0
1	B	280/302 (92%)	-0.34	6 (2%) 63 63	12, 28, 57, 89	1 (0%)
1	C	278/302 (92%)	-0.42	5 (1%) 67 67	11, 24, 52, 90	1 (0%)
1	D	280/302 (92%)	-0.27	6 (2%) 63 63	11, 27, 59, 88	0
All	All	1128/1208 (93%)	-0.33	25 (2%) 62 61	11, 27, 58, 102	2 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	912	PRO	4.7
1	A	862	ALA	3.7
1	B	885	HIS	3.4
1	A	861	PRO	3.4
1	C	885	HIS	3.2
1	C	884	GLY	3.1
1	B	1037	VAL	3.1
1	A	884	GLY	3.1
1	C	912	PRO	2.9
1	A	1030	THR	2.8
1	B	912	PRO	2.8
1	D	1030	THR	2.8
1	D	865	VAL	2.7
1	C	917	ASN	2.7
1	D	1031	ASP	2.5
1	C	886	PHE	2.4
1	A	859	LYS	2.4
1	B	933	TYR	2.3
1	D	886	PHE	2.2
1	B	1029	GLU	2.2
1	D	884	GLY	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	865	VAL	2.1
1	A	885	HIS	2.1
1	A	860	LYS	2.1
1	A	1037	VAL	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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($\text{\AA}^2$)	Q<0.9
1	PTR	A	1035	16/17	0.88	0.12	29,54,69,79	0
1	PTR	B	1034	16/17	0.88	0.09	31,54,73,77	0
1	PTR	B	1035	16/17	0.89	0.10	26,41,60,66	0
1	PTR	A	1034	16/17	0.90	0.09	25,47,65,75	0
1	PTR	C	1034	16/17	0.90	0.09	26,43,66,67	0
1	PTR	D	1034	16/17	0.90	0.08	21,49,82,84	0
1	PTR	C	1035	16/17	0.92	0.09	25,35,65,68	0
1	PTR	D	1035	16/17	0.92	0.08	24,37,55,57	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	EDO	B	1202	4/4	0.77	0.19	49,50,51,57	0
3	EDO	C	1203	4/4	0.80	0.12	44,50,54,54	0
3	EDO	A	1204	4/4	0.84	0.13	41,46,48,49	0
3	EDO	A	1205	4/4	0.86	0.15	43,45,52,56	0
3	EDO	D	1203	4/4	0.86	0.24	34,37,42,54	0
3	EDO	C	1204	4/4	0.88	0.12	38,39,44,49	0

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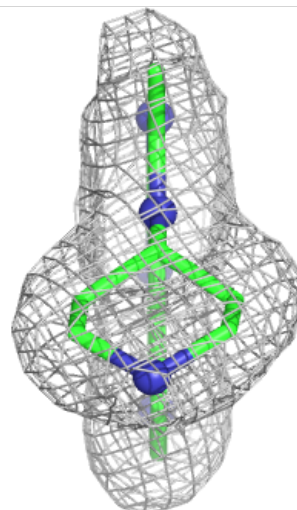
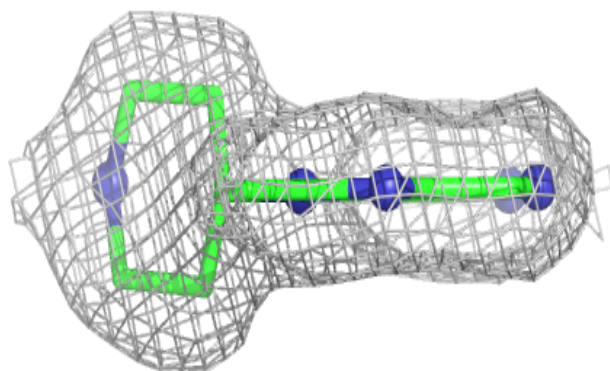
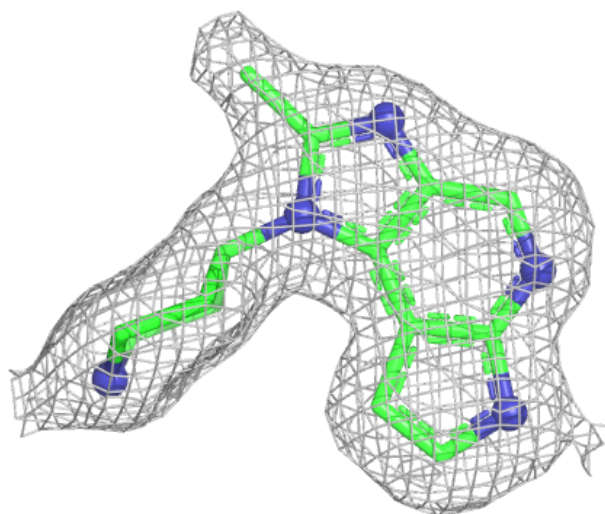
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	EDO	C	1202	4/4	0.88	0.20	36,49,51,53	0
3	EDO	C	1205	4/4	0.91	0.12	50,54,60,62	0
3	EDO	A	1206	4/4	0.91	0.12	43,48,52,55	0
3	EDO	A	1203	4/4	0.92	0.10	40,46,46,47	0
3	EDO	A	1202	4/4	0.94	0.09	22,22,35,44	0
3	EDO	D	1202	4/4	0.95	0.12	20,30,40,48	0
2	JAK	A	1201	19/19	0.97	0.05	7,12,22,23	0
2	JAK	B	1201	19/19	0.97	0.04	9,14,21,23	0
2	JAK	C	1201	19/19	0.97	0.05	8,13,18,19	0
2	JAK	D	1201	19/19	0.98	0.04	9,12,16,18	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.

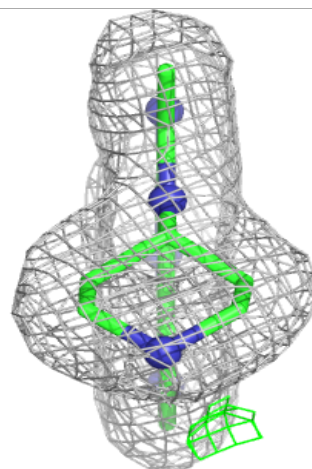
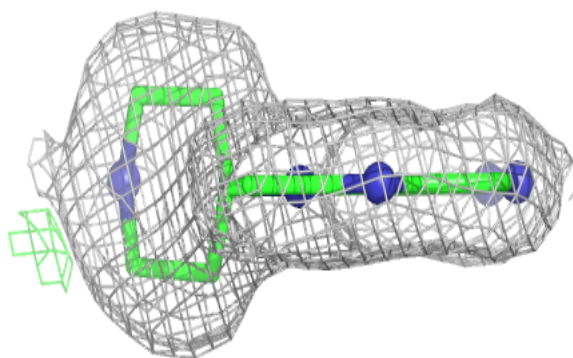
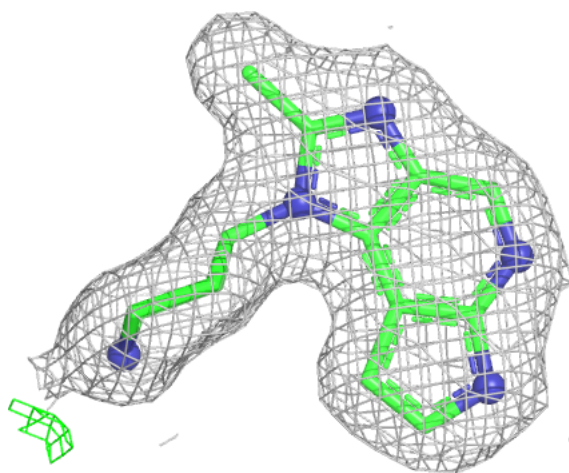
Electron density around JAK A 1201:

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



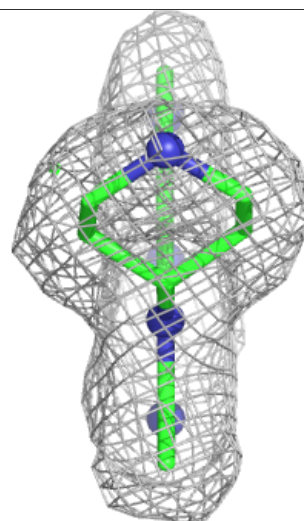
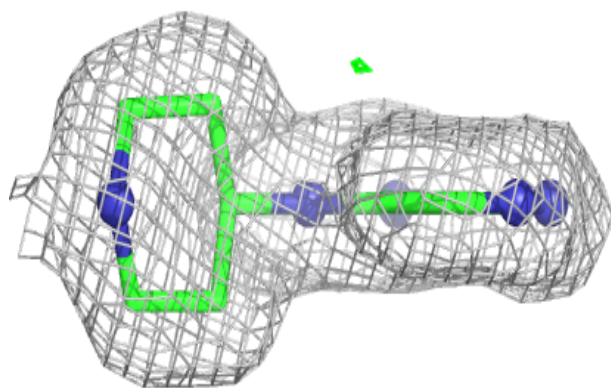
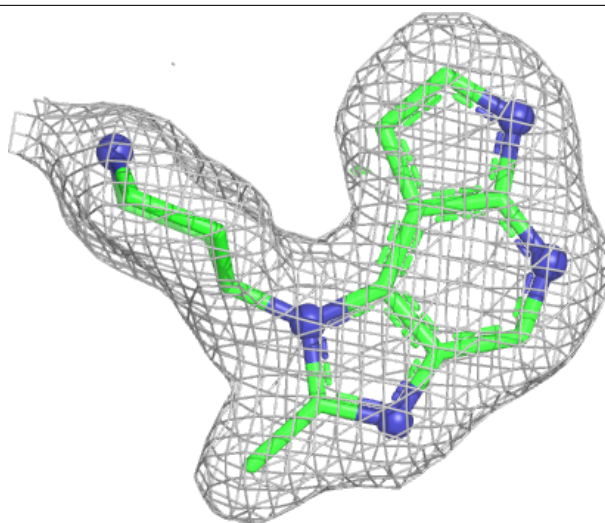
Electron density around JAK B 1201:

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



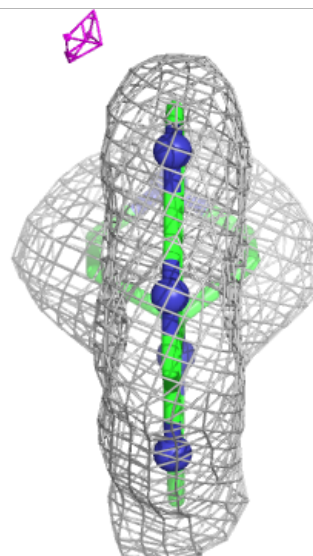
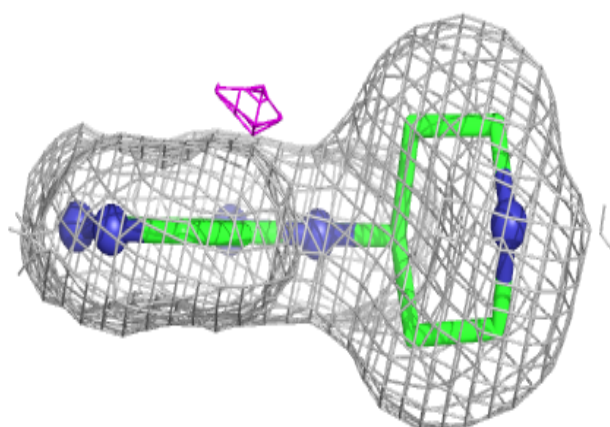
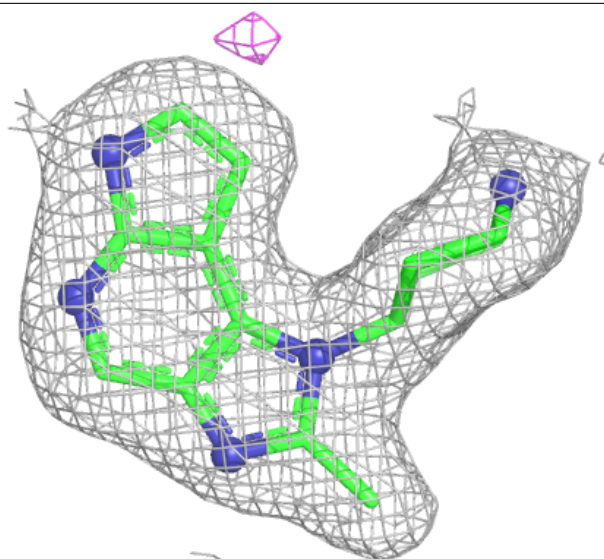
Electron density around JAK C 1201:

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



Electron density around JAK D 1201:

$2mF_o-DF_c$ (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.