



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 20, 2026 – 06:20 PM EDT

PDB ID : 9OPK / pdb_00009opk
Title : Crystal structure of IRAK4 with compound 1, an analog of KT-474 TBM
Authors : Fei, X.; Ramanathan, A.; Diagle, C.; Ford, M.; Campbell, V.; Zheng, X.; Li, H.; Sintchak, M.; Kamadurai, H.; Miller, R.; Kazmirski, S.; Huang, X.; Weiss, M.; Manolfi, N.; Zhu, X.
Deposited on : 2025-05-19
Resolution : 2.05 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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

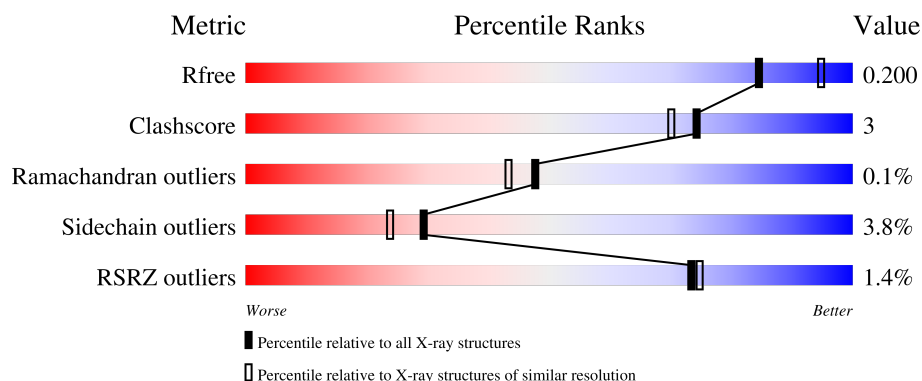
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.05 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	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	304	0.1% 88% 9% •
1	B	304	0.1% 89% 8% •
1	C	304	2% 87% 9% ••
1	D	304	2% 89% 7% ••

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 10006 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.

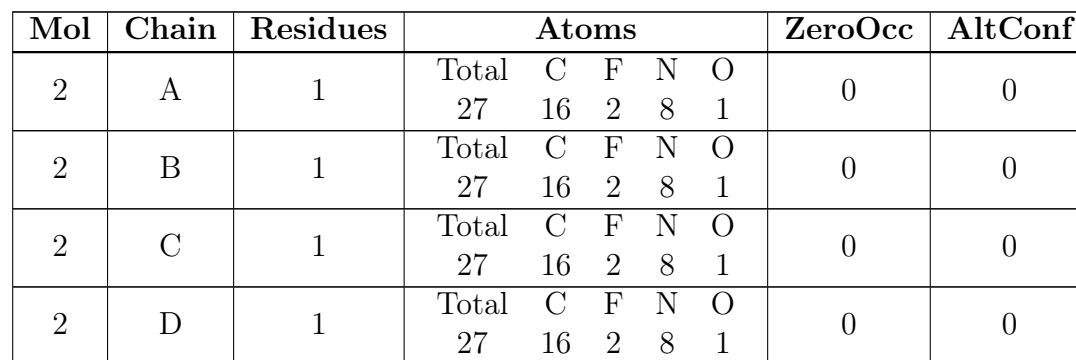
- Molecule 1 is a protein called Interleukin-1 receptor-associated kinase 4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	296	Total	C	N	O	P	S	0	2	0
			2345	1472	391	464	3	15			
1	B	295	Total	C	N	O	P	S	0	3	0
			2352	1474	394	467	3	14			
1	C	293	Total	C	N	O	P	S	0	1	0
			2319	1452	389	461	3	14			
1	D	295	Total	C	N	O	P	S	0	1	0
			2335	1464	391	463	3	14			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	157	SER	-	expression tag	UNP Q9NWZ3
A	158	ILE	-	expression tag	UNP Q9NWZ3
A	159	ALA	-	expression tag	UNP Q9NWZ3
B	157	SER	-	expression tag	UNP Q9NWZ3
B	158	ILE	-	expression tag	UNP Q9NWZ3
B	159	ALA	-	expression tag	UNP Q9NWZ3
C	157	SER	-	expression tag	UNP Q9NWZ3
C	158	ILE	-	expression tag	UNP Q9NWZ3
C	159	ALA	-	expression tag	UNP Q9NWZ3
D	157	SER	-	expression tag	UNP Q9NWZ3
D	158	ILE	-	expression tag	UNP Q9NWZ3
D	159	ALA	-	expression tag	UNP Q9NWZ3

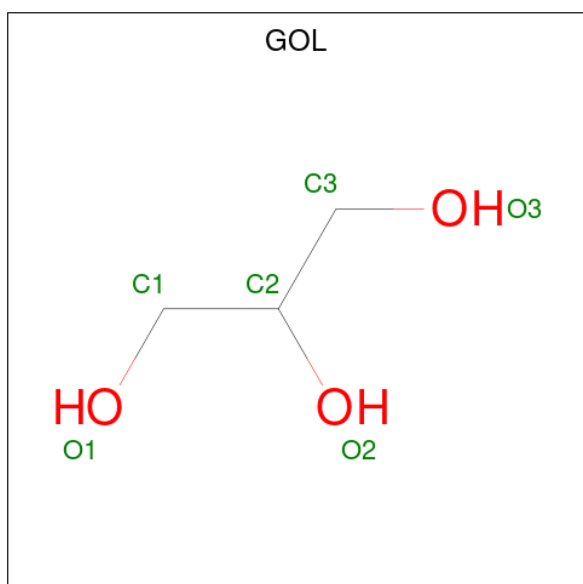
- Molecule 2 is (8R)-N-[3-(difluoromethyl)-1-methyl-1H-pyrazol-4-yl]-5-(piperazin-1-yl)pyrazolo[1,5-a]pyrimidine-3-carboxamide (CCD ID: A1CDD) (formula: C₁₆H₁₈F₂N₈O) (labeled as "Ligand of Interest" by depositor).



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- EDO
- Chemical structure of EDO (Ethane-1,2-diol) showing a zigzag conformation. The carbon atoms are labeled C1 and C2 in green. The hydroxyl groups are labeled HO and OH in red, with their respective oxygen atoms labeled O1 and O2 in green.

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	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	C	1	Total C O 4 2 2	0	0
3	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
3	D	1	Total C O 4 2 2	0	0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

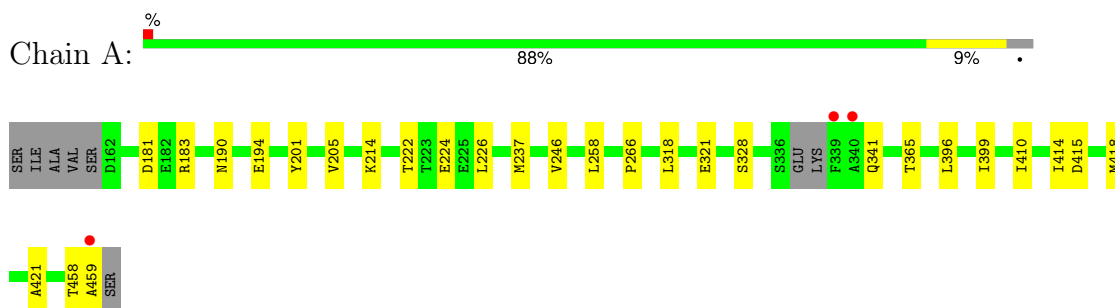
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	122	Total	O	0	1
			123	123		
5	B	129	Total	O	0	0
			129	129		
5	C	110	Total	O	0	0
			110	110		
5	D	120	Total	O	0	1
			121	121		

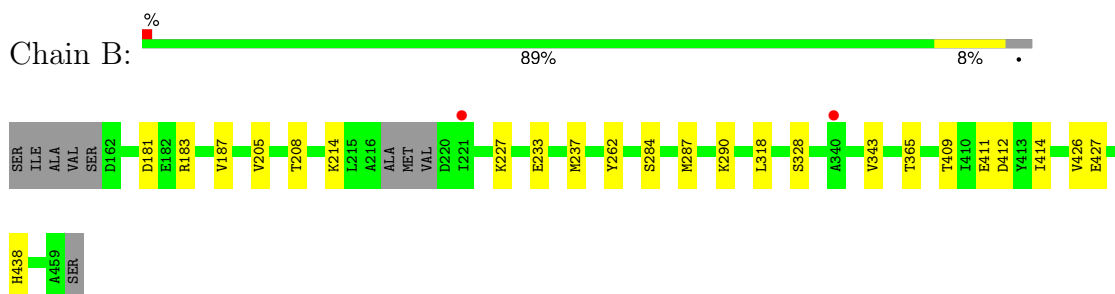
3 Residue-property plots [i](#)

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.

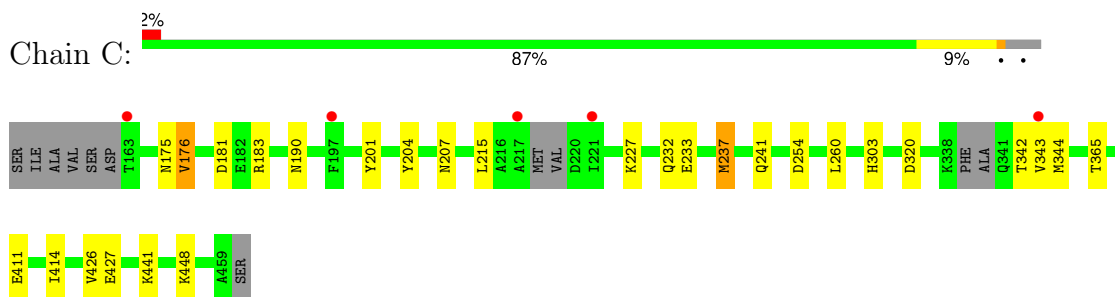
- Molecule 1: Interleukin-1 receptor-associated kinase 4



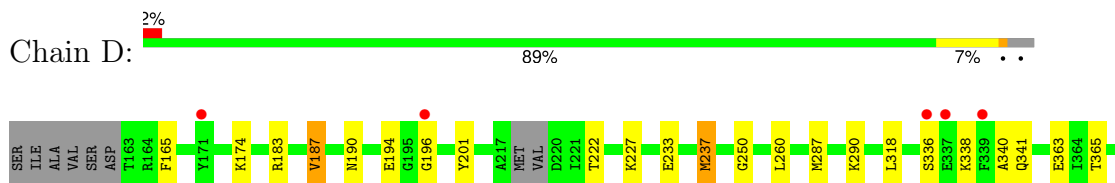
- Molecule 1: Interleukin-1 receptor-associated kinase 4



- Molecule 1: Interleukin-1 receptor-associated kinase 4



- Molecule 1: Interleukin-1 receptor-associated kinase 4





4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	87.60Å 121.70Å 140.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.28 – 2.05 41.28 – 2.05	Depositor EDS
% Data completeness (in resolution range)	99.5 (41.28-2.05) 99.4 (41.28-2.05)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.74 (at 2.05Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.158 , 0.206 0.166 , 0.200	Depositor DCC
R_{free} test set	4827 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	35.8	Xtriage
Anisotropy	0.465	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 47.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	10006	wwPDB-VP
Average B, all atoms (Å ²)	49.0	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 23.98 % 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 4.1894e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SEP, EDO, TPO, GOL, A1CDD

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	0.98	0/2356	1.37	0/3175
1	B	0.96	0/2366	1.35	0/3186
1	C	0.95	0/2325	1.36	2/3130 (0.1%)
1	D	0.95	0/2343	1.37	0/3156
All	All	0.96	0/9390	1.36	2/12647 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	175	ASN	CA-C-N	5.30	127.73	120.46
1	C	175	ASN	C-N-CA	5.30	127.73	120.46

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2345	0	2312	18	0
1	B	2352	0	2316	16	0
1	C	2319	0	2283	15	0
1	D	2335	0	2298	12	0
2	A	27	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	27	0	0	0	0
2	C	27	0	0	0	0
2	D	27	0	0	0	0
3	A	8	0	12	0	0
3	B	12	0	18	3	0
3	C	20	0	30	4	0
3	D	12	0	18	0	0
4	B	6	0	8	0	0
4	D	6	0	8	0	0
5	A	123	0	0	0	0
5	B	129	0	0	2	0
5	C	110	0	0	0	0
5	D	121	0	0	0	0
All	All	10006	0	9303	58	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 (58) 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:B:284:SER:H	1:B:287:MET:HE3	1.39	0.88
1:A:318[B]:LEU:HD21	2:A:501:A1CDD:C14	2.09	0.81
1:C:176:VAL:HG13	1:C:204:TYR:H	1.51	0.73
1:C:320:ASP:OD2	3:C:503:EDO:H21	1.91	0.69
1:B:284:SER:OG	1:B:287:MET:HG3	1.96	0.66
1:C:237:MET:HE2	1:C:237:MET:HA	1.78	0.65
1:A:246:VAL:HG11	1:A:318[B]:LEU:HD22	1.85	0.58
1:A:341:GLN:HA	1:D:338:LYS:HE2	1.84	0.58
1:A:341:GLN:HE22	1:D:341:GLN:HB2	1.70	0.56
1:B:284:SER:N	1:B:287:MET:HE3	2.16	0.56
1:C:320:ASP:OD2	3:C:503:EDO:C2	2.53	0.56
1:D:287:MET:HA	1:D:287:MET:HE2	1.88	0.56
1:A:237:MET:HE3	1:A:246:VAL:HG23	1.88	0.56
1:C:181:ASP:OD2	1:C:183:ARG:NH1	2.40	0.55
1:B:414[B]:ILE:HD11	1:B:426:VAL:HG21	1.88	0.55
1:A:266:PRO:HG2	1:A:321:GLU:HG3	1.89	0.54
1:A:222:THR:HG22	1:A:224:GLU:H	1.72	0.53
1:C:176:VAL:HG22	1:C:204:TYR:O	2.08	0.53
1:B:233[A]:GLU:OE2	1:B:262:TYR:OH	2.28	0.52
1:D:233:GLU:HG2	1:D:260:LEU:HD13	1.92	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:237:MET:CE	1:A:246:VAL:HG23	2.42	0.50
1:A:318[A]:LEU:HD12	1:A:328:SER:HB3	1.94	0.49
1:D:165:PHE:HB3	1:D:250:GLY:HA2	1.94	0.49
1:B:318:LEU:HD12	1:B:328:SER:HB3	1.94	0.48
1:C:232:GLN:HE22	3:C:502:EDO:H21	1.78	0.48
1:D:237:MET:HA	1:D:237:MET:HE2	1.96	0.47
1:C:181:ASP:OD1	1:C:183:ARG:HD3	2.14	0.47
1:A:181:ASP:OD2	1:A:183:ARG:NH1	2.48	0.46
1:C:233:GLU:HG2	1:C:260:LEU:HD13	1.96	0.46
1:A:396:LEU:O	1:A:399:ILE:HG12	2.14	0.46
1:B:181:ASP:OD2	1:B:183:ARG:NH1	2.48	0.46
1:A:414[B]:ILE:HD11	1:A:421:ALA:HB1	1.98	0.46
1:B:438:HIS:CE1	5:B:683:HOH:O	2.69	0.46
1:C:342:TPO:O3P	1:C:441:LYS:NZ	2.42	0.45
1:C:414[B]:ILE:HD11	1:C:426:VAL:HG21	1.99	0.45
1:C:303:HIS:HA	3:C:505:EDO:H21	1.99	0.44
1:D:183:ARG:HB3	1:D:187:VAL:CG2	2.46	0.44
1:B:287:MET:HA	3:B:503:EDO:H11	1.98	0.44
1:C:176:VAL:HG13	1:C:204:TYR:N	2.26	0.44
1:D:363:GLU:OE1	1:D:441:LYS:HE2	2.18	0.44
1:B:290:LYS:HD3	3:B:503:EDO:H22	2.00	0.43
1:C:190:ASN:O	1:C:201:TYR:HA	2.18	0.43
1:A:341:GLN:OE1	1:D:340:ALA:HB3	2.18	0.43
1:B:414[B]:ILE:HD12	1:B:426:VAL:HG11	2.01	0.43
1:B:287:MET:HG2	3:B:503:EDO:H11	2.00	0.43
1:B:287:MET:HE1	5:B:700:HOH:O	2.19	0.42
1:B:409:THR:HG23	1:B:412:ASP:H	1.83	0.42
1:A:458:THR:O	1:A:459:ALA:C	2.62	0.42
1:A:318[B]:LEU:CD2	2:A:501:A1CDD:C14	2.91	0.42
1:A:181:ASP:OD1	1:A:183:ARG:HD3	2.19	0.42
1:A:190:ASN:O	1:A:201:TYR:HA	2.20	0.41
1:B:414[B]:ILE:CD1	1:B:426:VAL:HG21	2.50	0.41
1:A:415:ASP:HB3	1:A:418:MET:HE2	2.02	0.41
1:D:287:MET:HE2	1:D:287:MET:CA	2.50	0.41
1:D:190:ASN:O	1:D:201:TYR:HA	2.21	0.41
1:D:318:LEU:N	1:D:318:LEU:HD22	2.36	0.40
1:C:237:MET:HA	1:C:237:MET:CE	2.48	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	291/304 (96%)	282 (97%)	9 (3%)	0	100	100
1	B	291/304 (96%)	286 (98%)	5 (2%)	0	100	100
1	C	285/304 (94%)	281 (99%)	4 (1%)	0	100	100
1	D	289/304 (95%)	282 (98%)	6 (2%)	1 (0%)	36	30
All	All	1156/1216 (95%)	1131 (98%)	24 (2%)	1 (0%)	48	43

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	196	GLY

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	256/261 (98%)	249 (97%)	7 (3%)	39	36
1	B	257/261 (98%)	248 (96%)	9 (4%)	32	27
1	C	253/261 (97%)	240 (95%)	13 (5%)	21	14
1	D	254/261 (97%)	245 (96%)	9 (4%)	32	27
All	All	1020/1044 (98%)	982 (96%)	38 (4%)	29	25

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	194	GLU
1	A	205	VAL
1	A	214	LYS
1	A	226	LEU
1	A	258	LEU
1	A	365	THR
1	A	410	ILE
1	B	187	VAL
1	B	205	VAL
1	B	208	THR
1	B	214	LYS
1	B	227	LYS
1	B	343	VAL
1	B	365	THR
1	B	411	GLU
1	B	427	GLU
1	C	176	VAL
1	C	207	ASN
1	C	215	LEU
1	C	227	LYS
1	C	237	MET
1	C	241	GLN
1	C	254	ASP
1	C	343	VAL
1	C	344	MET
1	C	365	THR
1	C	411	GLU
1	C	427	GLU
1	C	448	LYS
1	D	174	LYS
1	D	187	VAL
1	D	194	GLU
1	D	222	THR
1	D	227	LYS
1	D	237	MET
1	D	290	LYS
1	D	336	SER
1	D	365	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	394	GLN

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Mol	Chain	Res	Type
1	B	190	ASN
1	B	455	GLN
1	C	451	GLN
1	D	438	HIS
1	D	455	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

12 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	SEP	C	346	1	8,9,10	0.60	0	7,12,14	0.62	0
1	TPO	B	342	1	8,10,11	0.76	0	10,14,16	0.86	0
1	TPO	A	345	1	8,10,11	0.78	0	10,14,16	0.83	0
1	TPO	C	342	1	8,10,11	0.66	0	10,14,16	0.93	0
1	TPO	D	342	1	8,10,11	0.67	0	10,14,16	0.87	0
1	SEP	A	346	1	8,9,10	0.61	0	7,12,14	0.63	0
1	SEP	D	346	1	8,9,10	0.60	0	7,12,14	0.85	0
1	TPO	B	345	1	8,10,11	0.81	0	10,14,16	0.80	0
1	TPO	D	345	1	8,10,11	0.78	0	10,14,16	0.80	0
1	SEP	B	346	1	8,9,10	0.60	0	7,12,14	0.68	0
1	TPO	A	342	1	8,10,11	0.63	0	10,14,16	0.99	0
1	TPO	C	345	1	8,10,11	0.88	0	10,14,16	0.80	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	SEP	C	346	1	-	2/6/8/10	-
1	TPO	B	342	1	-	1/9/11/13	-
1	TPO	A	345	1	-	3/9/11/13	-
1	TPO	C	342	1	-	2/9/11/13	-
1	TPO	D	342	1	-	1/9/11/13	-
1	SEP	A	346	1	-	0/6/8/10	-
1	SEP	D	346	1	-	0/6/8/10	-
1	TPO	B	345	1	-	3/9/11/13	-
1	TPO	D	345	1	-	3/9/11/13	-
1	SEP	B	346	1	-	0/6/8/10	-
1	TPO	A	342	1	-	0/9/11/13	-
1	TPO	C	345	1	-	2/9/11/13	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	345	TPO	N-CA-CB-OG1
1	B	342	TPO	O-C-CA-CB
1	B	345	TPO	N-CA-CB-OG1
1	C	342	TPO	O-C-CA-CB
1	C	345	TPO	N-CA-CB-OG1
1	C	346	SEP	CB-OG-P-O1P
1	D	342	TPO	O-C-CA-CB
1	D	345	TPO	N-CA-CB-OG1
1	D	345	TPO	O-C-CA-CB
1	C	346	SEP	CB-OG-P-O3P
1	A	345	TPO	CB-OG1-P-O1P
1	B	345	TPO	CB-OG1-P-O1P
1	A	345	TPO	O-C-CA-CB
1	B	345	TPO	O-C-CA-CB
1	C	342	TPO	C-CA-CB-CG2
1	C	345	TPO	O-C-CA-CB
1	D	345	TPO	CB-OG1-P-O1P

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	342	TPO	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

19 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	B	505	-	3,3,3	0.05	0	2,2,2	0.04	0
2	A1CDD	A	501	-	29,30,30	0.88	0	33,43,43	2.71	9 (27%)
3	EDO	C	506	-	3,3,3	0.07	0	2,2,2	0.15	0
3	EDO	D	504	-	3,3,3	0.18	0	2,2,2	0.07	0
3	EDO	C	503	-	3,3,3	0.11	0	2,2,2	0.35	0
2	A1CDD	B	501	-	29,30,30	1.01	2 (6%)	33,43,43	2.98	12 (36%)
4	GOL	D	502	-	5,5,5	0.08	0	5,5,5	0.23	0
3	EDO	A	502	-	3,3,3	0.07	0	2,2,2	0.13	0
2	A1CDD	C	501	-	29,30,30	0.91	0	33,43,43	2.82	11 (33%)
3	EDO	C	505	-	3,3,3	0.05	0	2,2,2	0.32	0
3	EDO	C	504	-	3,3,3	0.11	0	2,2,2	0.05	0
4	GOL	B	502	-	5,5,5	0.09	0	5,5,5	0.24	0
2	A1CDD	D	501	-	29,30,30	0.95	0	33,43,43	2.84	12 (36%)
3	EDO	A	503	-	3,3,3	0.06	0	2,2,2	0.20	0
3	EDO	D	505	-	3,3,3	0.08	0	2,2,2	0.10	0
3	EDO	C	502	-	3,3,3	0.03	0	2,2,2	0.03	0
3	EDO	B	504	-	3,3,3	0.07	0	2,2,2	0.07	0
3	EDO	B	503	-	3,3,3	0.13	0	2,2,2	0.33	0
3	EDO	D	503	-	3,3,3	0.07	0	2,2,2	0.28	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
3	EDO	B	505	-	-	0/1/1/1	-
2	A1CDD	A	501	-	-	0/16/24/24	0/4/4/4
3	EDO	C	506	-	-	1/1/1/1	-
3	EDO	D	504	-	-	1/1/1/1	-
3	EDO	C	503	-	-	1/1/1/1	-
2	A1CDD	B	501	-	-	0/16/24/24	0/4/4/4
4	GOL	D	502	-	-	2/4/4/4	-
3	EDO	A	502	-	-	0/1/1/1	-
2	A1CDD	C	501	-	-	0/16/24/24	0/4/4/4
3	EDO	C	505	-	-	1/1/1/1	-
3	EDO	C	504	-	-	1/1/1/1	-
4	GOL	B	502	-	-	2/4/4/4	-
2	A1CDD	D	501	-	-	0/16/24/24	0/4/4/4
3	EDO	A	503	-	-	1/1/1/1	-
3	EDO	D	505	-	-	0/1/1/1	-
3	EDO	C	502	-	-	1/1/1/1	-
3	EDO	B	504	-	-	1/1/1/1	-
3	EDO	B	503	-	-	1/1/1/1	-
3	EDO	D	503	-	-	0/1/1/1	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	A1CDD	C9-N7	2.93	1.37	1.34
2	B	501	A1CDD	N7-N5	2.14	1.39	1.36

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	A1CDD	C4-N5-N7	11.62	109.44	104.32
2	D	501	A1CDD	C4-N5-N7	10.71	109.04	104.32
2	C	501	A1CDD	C4-N5-N7	10.65	109.01	104.32
2	A	501	A1CDD	C4-N5-N7	10.22	108.82	104.32
2	C	501	A1CDD	C15-N18-N17	5.76	109.45	103.81
2	A	501	A1CDD	C15-N18-N17	5.74	109.43	103.81
2	B	501	A1CDD	C15-N18-N17	5.74	109.42	103.81
2	D	501	A1CDD	C15-N18-N17	5.69	109.38	103.81
2	B	501	A1CDD	C9-N7-N5	-5.45	107.31	112.71
2	D	501	A1CDD	C9-N7-N5	-4.88	107.87	112.71
2	C	501	A1CDD	C9-N7-N5	-4.80	107.95	112.71

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	501	A1CDD	C10-N7-N5	4.75	124.40	119.57
2	B	501	A1CDD	C10-N7-N5	4.74	124.39	119.57
2	A	501	A1CDD	C10-N7-N5	4.30	123.94	119.57
2	A	501	A1CDD	C9-N7-N5	-4.20	108.55	112.71
2	C	501	A1CDD	C10-N7-N5	3.95	123.59	119.57
2	A	501	A1CDD	C13-C14-N16	3.69	133.56	123.54
2	B	501	A1CDD	C13-C14-N16	3.61	133.36	123.54
2	C	501	A1CDD	C13-C14-N16	3.56	133.21	123.54
2	D	501	A1CDD	C13-C14-N16	3.37	132.70	123.54
2	C	501	A1CDD	C15-C13-C14	3.12	106.90	104.57
2	D	501	A1CDD	C20-N17-N18	2.93	131.36	127.01
2	C	501	A1CDD	C20-N17-N18	2.89	131.31	127.01
2	A	501	A1CDD	C15-C13-C14	2.88	106.72	104.57
2	A	501	A1CDD	C13-C15-N18	-2.86	108.89	112.45
2	C	501	A1CDD	C13-C15-N18	-2.84	108.92	112.45
2	B	501	A1CDD	C13-C15-N18	-2.83	108.94	112.45
2	B	501	A1CDD	C15-C13-C14	2.66	106.56	104.57
2	C	501	A1CDD	C26-C24-N21	-2.61	104.48	109.61
2	B	501	A1CDD	C20-N17-N18	2.54	130.78	127.01
2	A	501	A1CDD	C26-C24-N21	-2.49	104.71	109.61
2	D	501	A1CDD	C13-C15-N18	-2.46	109.39	112.45
2	B	501	A1CDD	C2-C4-N5	2.36	123.03	119.32
2	D	501	A1CDD	C15-C13-C14	2.28	106.27	104.57
2	D	501	A1CDD	C13-C11-N8	2.27	119.78	114.94
2	A	501	A1CDD	C20-N17-N18	2.20	130.28	127.01
2	B	501	A1CDD	C25-C23-N21	-2.16	105.35	109.61
2	D	501	A1CDD	C24-N21-C19	2.16	125.52	119.30
2	C	501	A1CDD	C25-N27-C26	2.07	116.25	110.40
2	D	501	A1CDD	O12-C11-C13	-2.07	117.44	121.04
2	D	501	A1CDD	C2-C4-N5	2.06	122.55	119.32
2	B	501	A1CDD	C24-N21-C19	2.05	125.22	119.30
2	B	501	A1CDD	O12-C11-C13	-2.04	117.48	121.04
2	C	501	A1CDD	C24-N21-C19	2.04	125.18	119.30

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	502	GOL	O1-C1-C2-C3
4	D	502	GOL	C1-C2-C3-O3
4	D	502	GOL	O2-C2-C3-O3
3	C	503	EDO	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
3	C	505	EDO	O1-C1-C2-O2
3	B	503	EDO	O1-C1-C2-O2
3	C	504	EDO	O1-C1-C2-O2
3	D	504	EDO	O1-C1-C2-O2
4	B	502	GOL	O1-C1-C2-O2
3	C	506	EDO	O1-C1-C2-O2
3	A	503	EDO	O1-C1-C2-O2
3	C	502	EDO	O1-C1-C2-O2
3	B	504	EDO	O1-C1-C2-O2

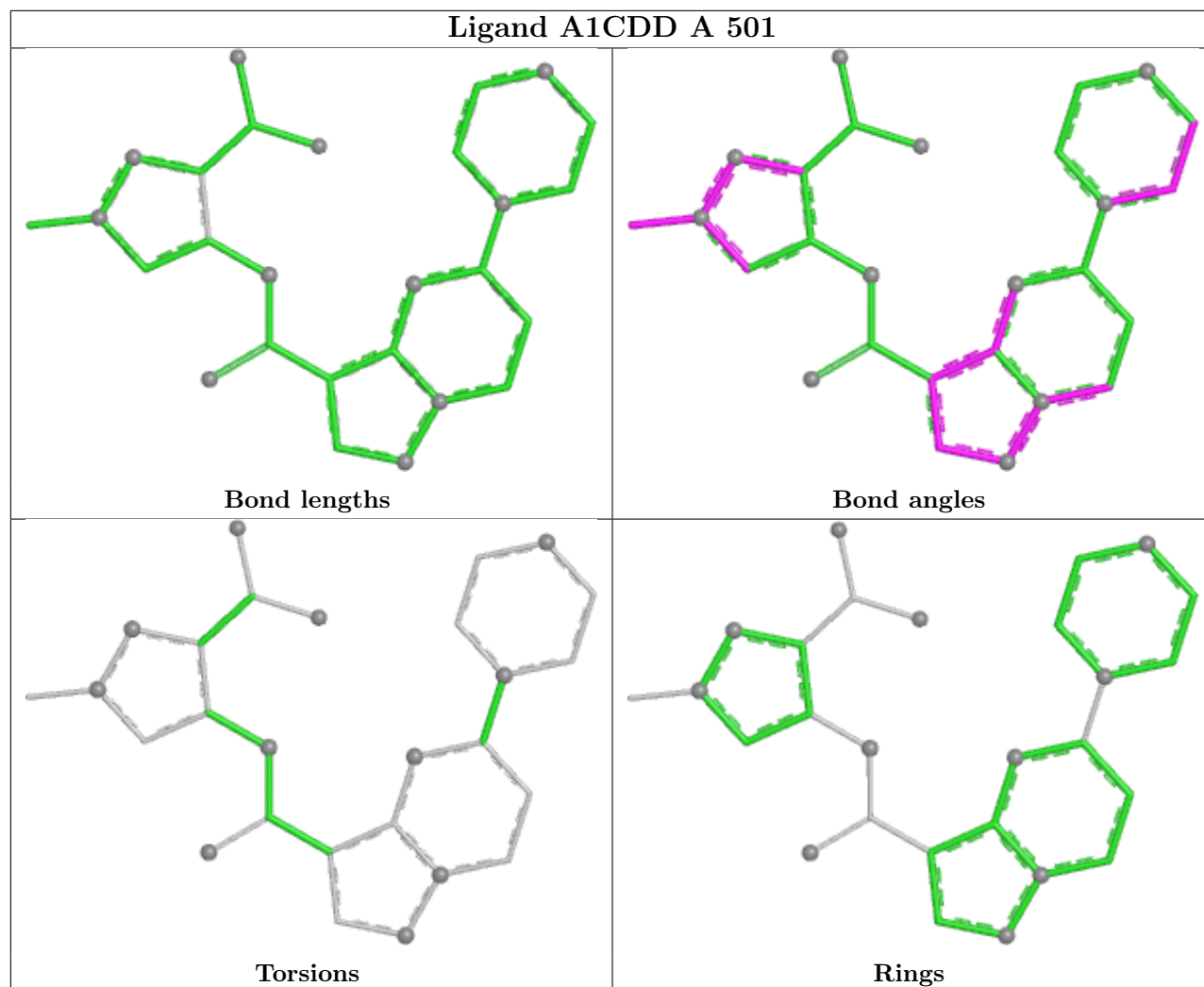
There are no ring outliers.

5 monomers are involved in 9 short contacts:

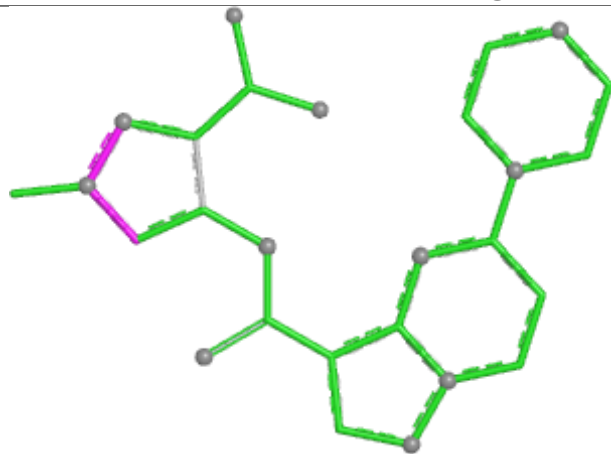
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	A1CDD	2	0
3	C	503	EDO	2	0
3	C	505	EDO	1	0
3	C	502	EDO	1	0
3	B	503	EDO	3	0

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 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.

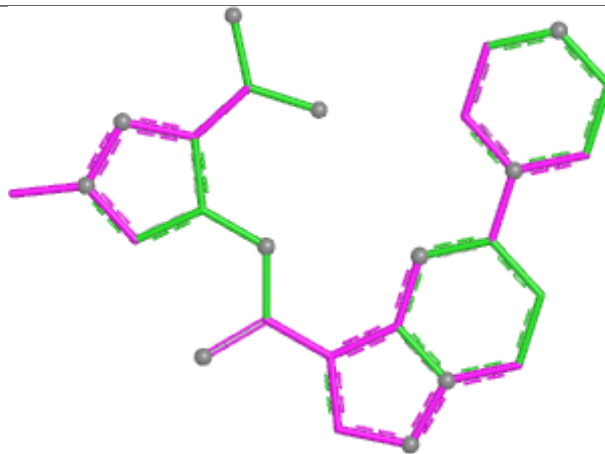
Ligand A1CDD A 501



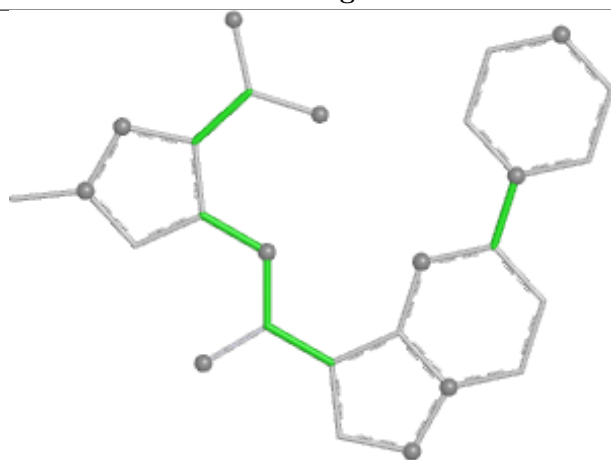
Ligand A1CDD B 501



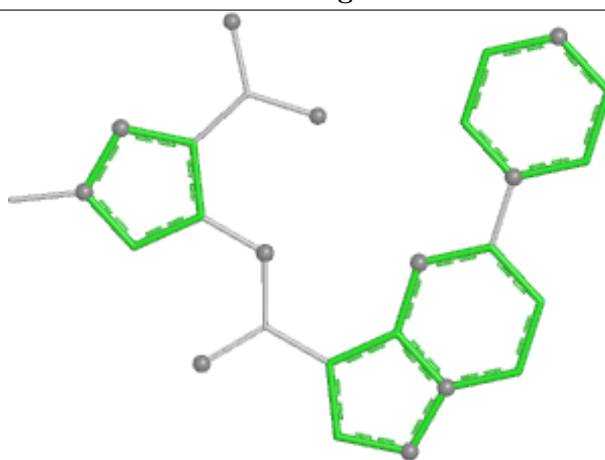
Bond lengths



Bond angles

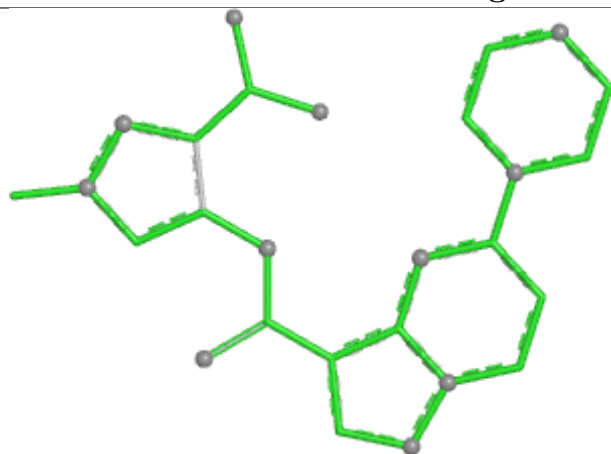


Torsions

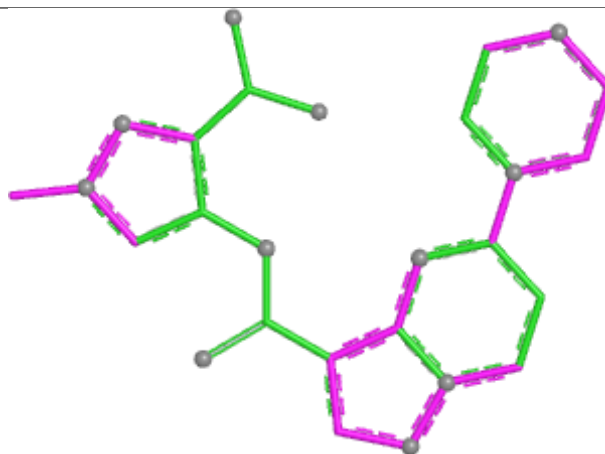


Rings

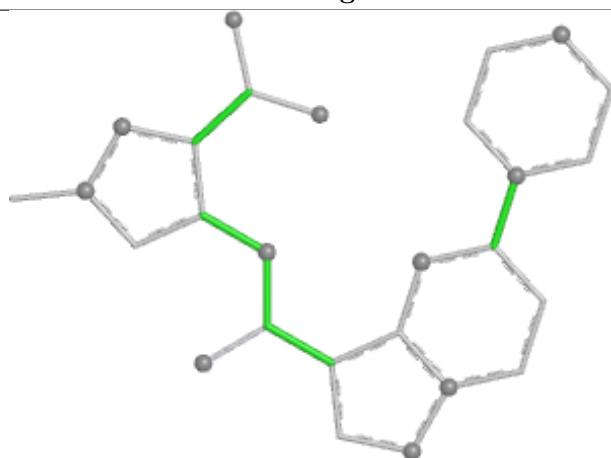
Ligand A1CDD C 501



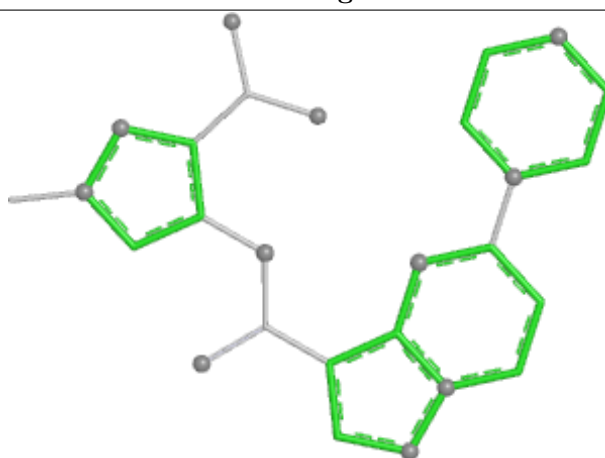
Bond lengths



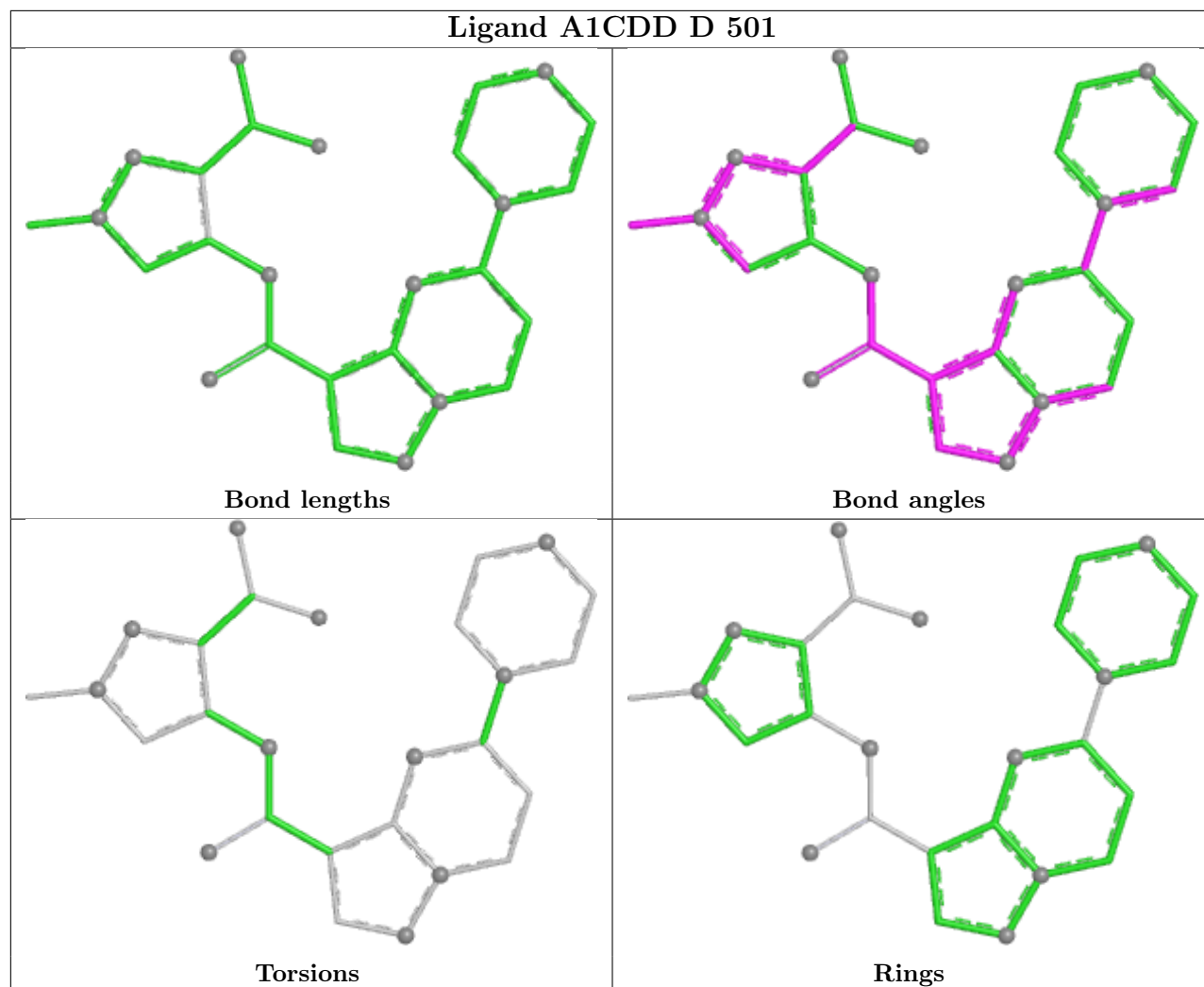
Bond angles



Torsions



Rings



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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	293/304 (96%)	-0.14	3 (1%) 79 81	20, 46, 77, 112	2 (0%)
1	B	292/304 (96%)	-0.17	2 (0%) 84 85	25, 44, 73, 106	3 (1%)
1	C	290/304 (95%)	-0.11	5 (1%) 69 70	23, 46, 86, 110	1 (0%)
1	D	292/304 (96%)	-0.09	6 (2%) 63 65	26, 44, 82, 110	1 (0%)
All	All	1167/1216 (95%)	-0.12	16 (1%) 73 75	20, 45, 82, 112	7 (0%)

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	339	PHE	3.7
1	D	459	ALA	3.4
1	A	340	ALA	3.1
1	C	343	VAL	2.6
1	D	171	TYR	2.5
1	C	217	ALA	2.4
1	A	339	PHE	2.4
1	D	337	GLU	2.4
1	D	336	SER	2.4
1	C	197	PHE	2.3
1	C	221	ILE	2.2
1	D	196	GLY	2.2
1	B	221	ILE	2.1
1	A	459	ALA	2.1
1	B	340	ALA	2.1
1	C	163	THR	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(Å ²)	Q<0.9
1	SEP	D	346	10/11	0.84	0.09	54,66,102,103	0
1	SEP	A	346	10/11	0.85	0.09	64,72,103,104	0
1	TPO	C	342	11/12	0.86	0.10	66,78,86,92	0
1	SEP	C	346	10/11	0.88	0.10	54,74,101,104	0
1	TPO	B	342	11/12	0.91	0.09	53,57,64,67	0
1	SEP	B	346	10/11	0.93	0.07	49,61,85,91	0
1	TPO	D	342	11/12	0.93	0.09	61,68,76,77	0
1	TPO	A	342	11/12	0.93	0.07	71,80,86,91	0
1	TPO	B	345	11/12	0.94	0.07	47,51,58,64	0
1	TPO	A	345	11/12	0.95	0.05	55,61,64,71	0
1	TPO	D	345	11/12	0.97	0.05	49,53,56,56	0
1	TPO	C	345	11/12	0.97	0.08	48,53,58,61	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(Å ²)	Q<0.9
3	EDO	C	505	4/4	0.77	0.24	59,63,65,68	0
3	EDO	C	504	4/4	0.80	0.19	75,75,76,78	0
3	EDO	B	504	4/4	0.83	0.15	53,62,63,67	0
3	EDO	B	503	4/4	0.86	0.23	47,53,54,60	0
3	EDO	C	502	4/4	0.86	0.12	70,70,73,76	0
3	EDO	B	505	4/4	0.88	0.16	63,65,67,72	0
3	EDO	D	504	4/4	0.88	0.15	47,56,62,76	0
4	GOL	D	502	6/6	0.88	0.11	44,62,63,72	0
3	EDO	D	505	4/4	0.90	0.17	64,68,72,79	0
3	EDO	C	503	4/4	0.91	0.11	53,58,58,64	0
3	EDO	A	502	4/4	0.91	0.14	66,70,71,79	0
3	EDO	A	503	4/4	0.92	0.11	71,74,76,82	0
4	GOL	B	502	6/6	0.93	0.08	58,61,62,64	0
3	EDO	C	506	4/4	0.93	0.10	54,60,67,73	0

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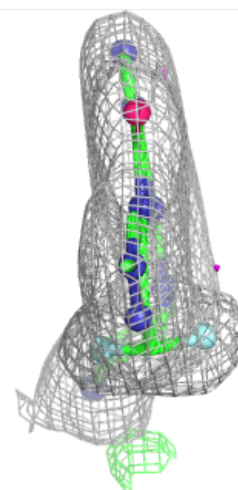
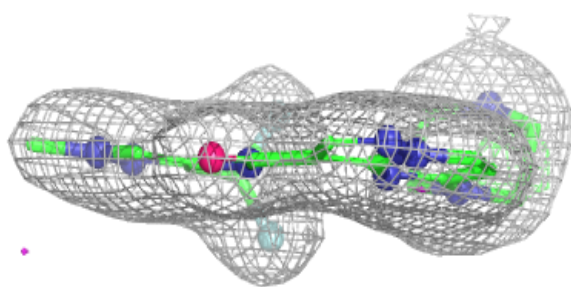
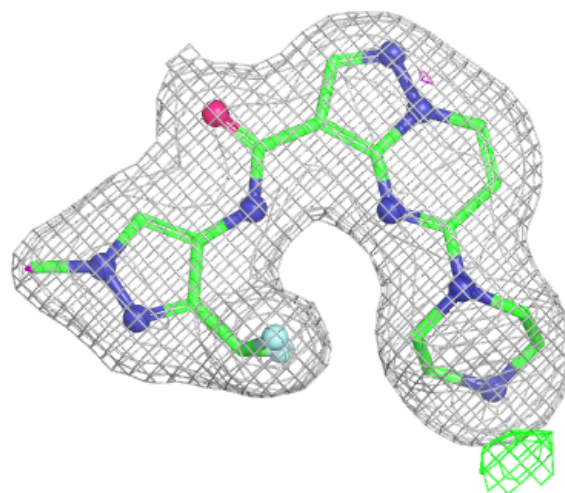
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	EDO	D	503	4/4	0.95	0.11	69,74,74,75	0
2	A1CDD	C	501	27/27	0.97	0.06	30,34,38,39	0
2	A1CDD	B	501	27/27	0.97	0.06	28,34,38,40	0
2	A1CDD	D	501	27/27	0.98	0.04	29,33,37,38	0
2	A1CDD	A	501	27/27	0.98	0.05	29,33,40,41	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.

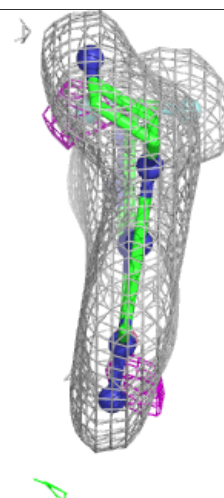
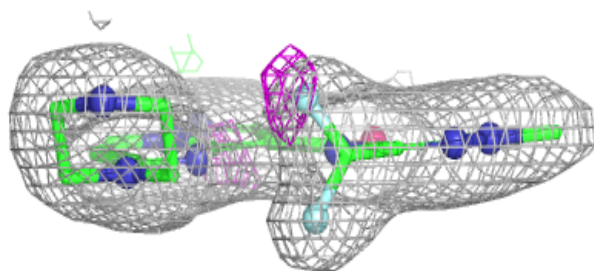
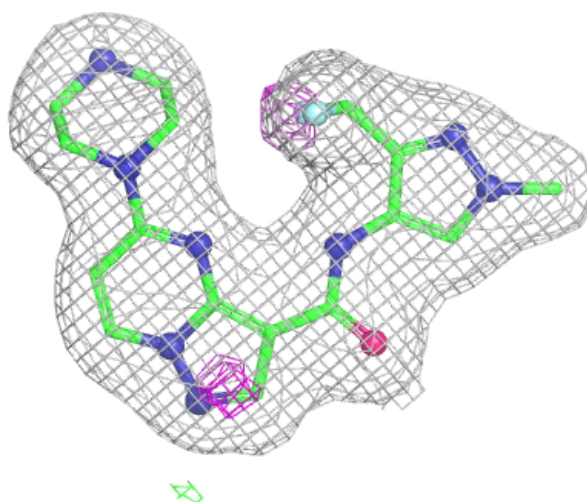
Electron density around A1CDD C 501:

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



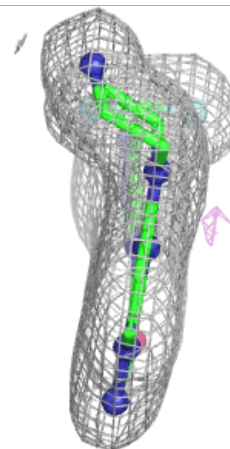
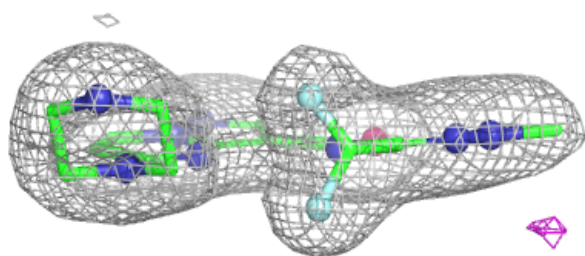
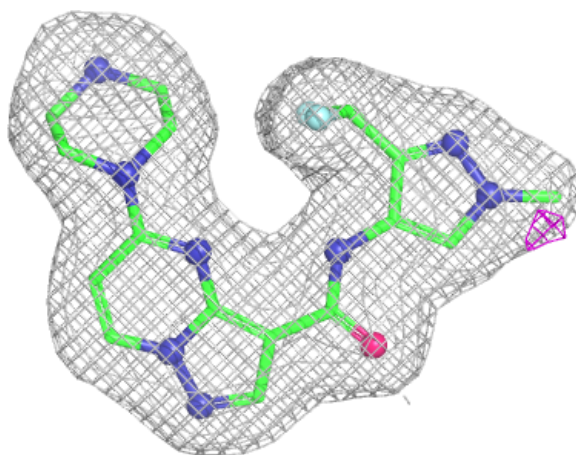
Electron density around A1CDD B 501:

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



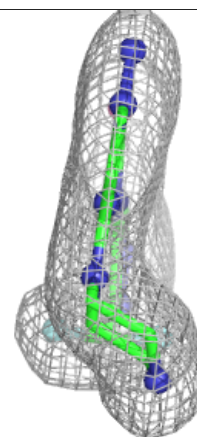
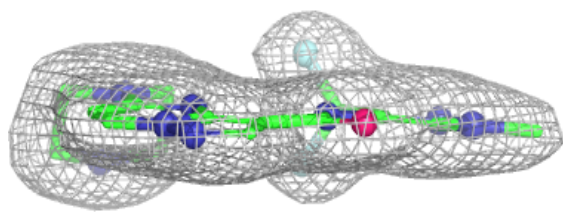
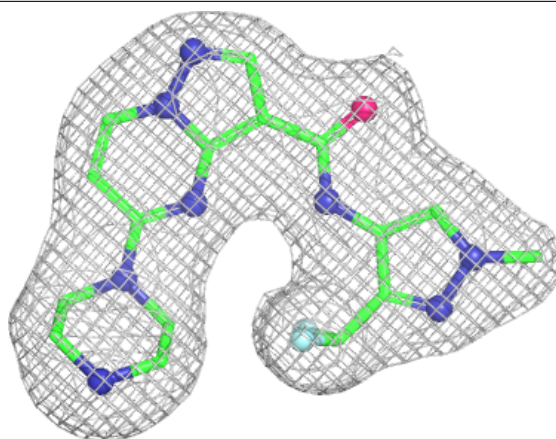
Electron density around A1CDD D 501:

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



Electron density around A1CDD A 501:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.