



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2026 – 10:42 PM UTC

PDB ID : 1YVE / pdb_00001yve
Title : ACETOHYDROXY ACID ISOMEROREDUCTASE COMPLEXED WITH
NADPH, MAGNESIUM AND INHIBITOR IPOHA (N-HYDROXY-N-ISOP
ROPYLOXAMATE)
Authors : Biou, V.; Dumas, R.; Cohen-Addad, C.; Douce, R.; Job, D.; Pebay-Peyroula,
E.
Deposited on : 1996-10-11
Resolution : 1.65 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)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

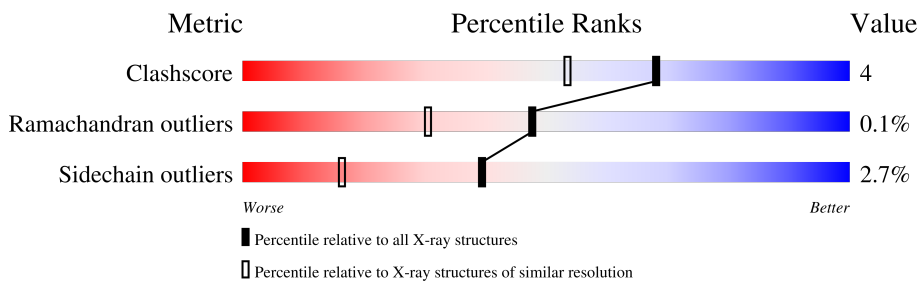
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.65 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))
Clashscore	190562	2662 (1.66-1.66)
Ramachandran outliers	187476	2621 (1.66-1.66)
Sidechain outliers	187428	2621 (1.66-1.66)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	I	524	
1	J	524	
1	K	524	
1	L	524	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 17729 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 ACETOHYDROXY ACID ISOMEROREDUCTASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	I	513	Total	C	N	O	S	0	0	0
			3934	2491	670	755	18			
1	J	510	Total	C	N	O	S	0	0	0
			3915	2480	667	750	18			
1	K	510	Total	C	N	O	S	0	0	0
			3915	2480	667	750	18			
1	L	513	Total	C	N	O	S	0	0	0
			3933	2491	670	754	18			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	79	ASP	ASN	conflict	UNP Q01292
J	79	ASP	ASN	conflict	UNP Q01292
K	79	ASP	ASN	conflict	UNP Q01292
L	79	ASP	ASN	conflict	UNP Q01292

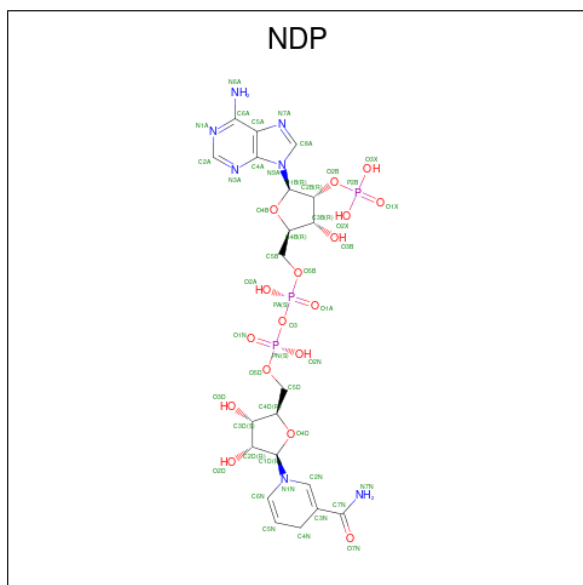
- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	I	2	Total	Mg	0	0
			2	2		
2	J	2	Total	Mg	0	0
			2	2		
2	K	2	Total	Mg	0	0
			2	2		
2	L	2	Total	Mg	0	0
			2	2		

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

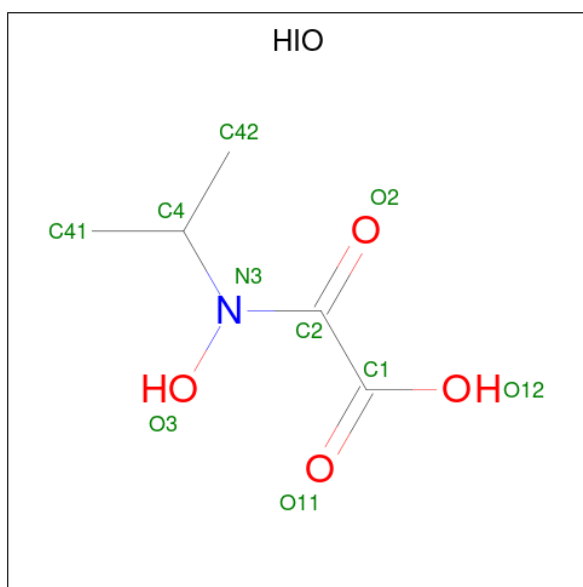
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	I	1	Total Cl 1 1	0	0
3	J	1	Total Cl 1 1	0	0
3	K	1	Total Cl 1 1	0	0

- Molecule 4 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	I	1	Total C N O P 48 21 7 17 3	0	0
4	K	1	Total C N O P 48 21 7 17 3	0	0
4	K	1	Total C N O P 48 21 7 17 3	0	0
4	L	1	Total C N O P 48 21 7 17 3	0	0

- Molecule 5 is N-HYDROXY-N-ISOPROPYLOXAMIC ACID (CCD ID: HIO) (formula: $C_5H_9NO_4$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	I	1	Total	C	N	O	0	0
			10	5	1	4		
5	J	1	Total	C	N	O	0	0
			10	5	1	4		
5	K	1	Total	C	N	O	0	0
			10	5	1	4		
5	L	1	Total	C	N	O	0	0
			10	5	1	4		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	I	567	Total	O	0	0
			567	567		
6	J	419	Total	O	0	0
			419	419		
6	K	416	Total	O	0	0
			416	416		
6	L	387	Total	O	0	0
			387	387		

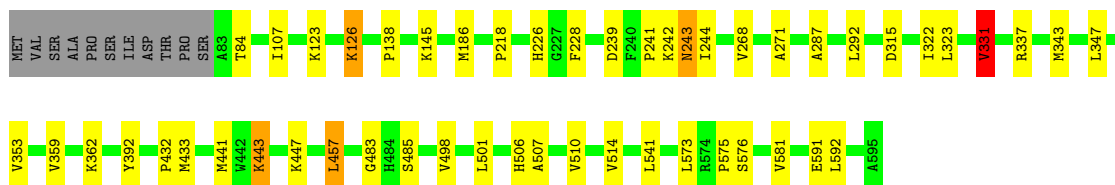
3 Residue-property plots

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. 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. 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.

Note EDS was not executed.

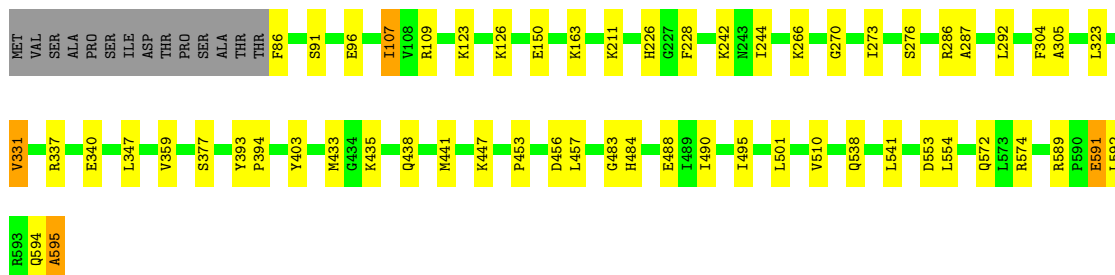
• Molecule 1: ACETOHYDROXY ACID ISOMEROREDUCTASE

Chain I:  88% 9% ..



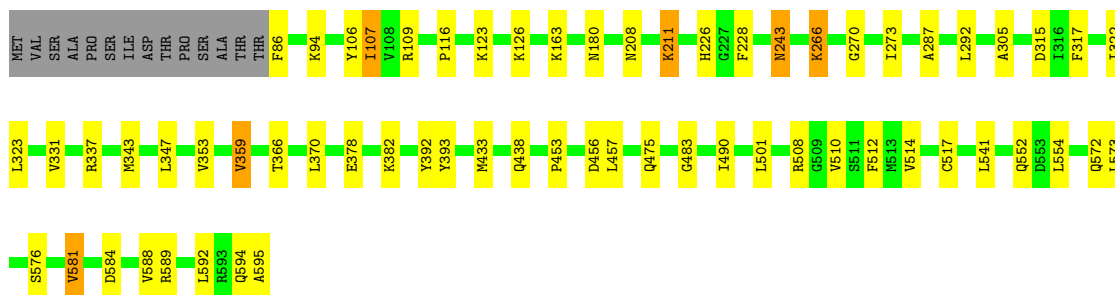
• Molecule 1: ACETOHYDROXY ACID ISOMEROREDUCTASE

Chain J:  86% 10% ..



• Molecule 1: ACETOHYDROXY ACID ISOMEROREDUCTASE

Chain K:  85% 11% ..



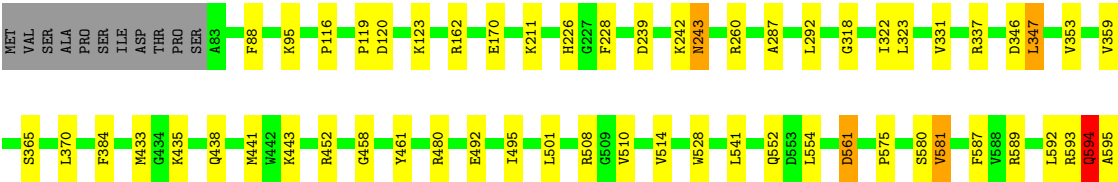
• Molecule 1: ACETOHYDROXY ACID ISOMEROREDUCTASE

Chain L:

87%

10%

..



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	111.43Å 61.94Å 162.54Å 90.00° 95.08° 90.00°	Depositor
Resolution (Å)	10.00 – 1.65	Depositor
% Data completeness (in resolution range)	(Not available) (10.00-1.65)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.197 , 0.239	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	17729	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, HIO, NDP, CL

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	I	0.68	0/4013	0.99	17/5426 (0.3%)
1	J	0.66	0/3994	0.98	15/5399 (0.3%)
1	K	0.64	0/3994	0.99	15/5399 (0.3%)
1	L	0.57	0/4012	0.96	19/5426 (0.4%)
All	All	0.64	0/16013	0.98	66/21650 (0.3%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	I	0	3

There are no bond length outliers.

All (66) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	J	270	GLY	N-CA-C	8.65	121.98	112.29
1	I	510	VAL	N-CA-C	8.46	119.25	110.62
1	L	501	LEU	N-CA-C	8.13	121.32	111.40
1	J	501	LEU	N-CA-C	7.38	120.76	111.24
1	I	501	LEU	N-CA-C	7.23	120.57	111.24
1	I	287	ALA	N-CA-C	7.23	119.78	111.11
1	L	323	LEU	N-CA-C	7.20	119.13	111.28
1	K	270	GLY	N-CA-C	7.13	121.06	111.72
1	K	514	VAL	N-CA-C	6.94	117.08	110.42
1	J	483	GLY	N-CA-C	6.80	125.39	115.32
1	J	510	VAL	N-CA-C	6.48	117.23	110.62
1	K	323	LEU	N-CA-C	6.42	117.94	111.07

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	I	514	VAL	N-CA-C	6.41	117.09	110.36
1	I	581	VAL	CB-CA-C	-6.38	99.68	110.71
1	K	359	VAL	N-CA-C	6.36	117.87	110.62
1	J	538	GLN	N-CA-C	6.35	118.29	111.36
1	J	287	ALA	N-CA-C	6.31	118.69	111.11
1	I	483	GLY	N-CA-C	6.30	125.69	115.67
1	J	359	VAL	N-CA-C	6.29	117.03	110.62
1	I	443	LYS	N-CA-C	-6.22	104.58	111.36
1	L	514	VAL	N-CA-C	6.22	116.89	110.36
1	K	483	GLY	N-CA-C	6.20	125.30	114.76
1	I	322	ILE	N-CA-C	6.19	117.67	110.62
1	K	322	ILE	N-CA-C	6.18	117.67	110.62
1	K	287	ALA	N-CA-C	6.07	118.67	111.33
1	J	495	ILE	N-CA-C	6.05	116.71	110.36
1	K	510	VAL	N-CA-C	6.02	116.76	110.62
1	L	510	VAL	N-CA-C	6.01	116.75	110.62
1	J	323	LEU	N-CA-C	5.98	117.80	111.28
1	J	266	LYS	N-CA-C	5.96	118.54	111.33
1	J	377	SER	N-CA-C	-5.90	103.15	110.41
1	L	461	TYR	CA-C-N	5.88	125.36	119.24
1	L	461	TYR	C-N-CA	5.88	125.36	119.24
1	I	331	VAL	CB-CA-C	5.80	119.97	112.14
1	L	243	ASN	N-CA-C	5.74	119.05	112.57
1	J	126	LYS	N-CA-C	-5.68	106.89	113.88
1	I	323	LEU	N-CA-C	5.65	117.44	111.28
1	I	353	VAL	N-CA-C	5.63	115.83	110.42
1	K	581	VAL	CB-CA-C	-5.62	101.84	110.50
1	I	506	HIS	N-CA-C	-5.61	105.25	111.36
1	K	266	LYS	N-CA-C	5.61	118.93	111.75
1	L	359	VAL	N-CA-C	5.58	116.22	110.36
1	L	561	ASP	CA-C-N	5.57	125.24	119.56
1	L	561	ASP	C-N-CA	5.57	125.24	119.56
1	K	392	TYR	N-CA-C	5.54	117.01	110.97
1	I	507	ALA	N-CA-C	5.51	116.97	111.07
1	L	384	PHE	N-CA-C	-5.51	105.18	111.07
1	L	581	VAL	CB-CA-C	-5.49	102.31	110.33
1	I	498	VAL	N-CA-C	5.38	118.65	111.44
1	I	359	VAL	N-CA-C	5.35	116.72	110.62
1	K	315	ASP	N-CA-C	5.33	116.89	111.14
1	K	501	LEU	N-CA-C	5.30	119.67	112.04
1	L	552	GLN	N-CA-C	5.28	117.04	111.28
1	J	574	ARG	N-CA-C	5.27	116.57	109.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	L	495	ILE	N-CA-C	5.27	115.48	110.42
1	L	322	ILE	N-CA-C	5.26	116.62	110.62
1	J	595	ALA	N-CA-C	-5.22	96.38	111.00
1	I	392	TYR	N-CA-C	5.17	116.60	110.97
1	L	353	VAL	N-CA-C	5.17	115.38	110.42
1	K	353	VAL	N-CA-C	5.14	115.36	110.42
1	K	490	ILE	N-CA-C	5.13	115.85	110.62
1	L	287	ALA	N-CA-C	5.11	119.80	111.37
1	I	315	ASP	N-CA-C	5.09	116.64	111.14
1	L	528	TRP	N-CA-C	5.07	119.74	113.50
1	L	365	SER	N-CA-C	5.03	116.76	111.28
1	J	490	ILE	N-CA-C	5.01	115.73	110.62

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	I	138	PRO	Mainchain
1	I	241	PRO	Mainchain
1	I	573	LEU	Mainchain

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	I	3934	0	3896	22	0
1	J	3915	0	3877	29	0
1	K	3915	0	3877	34	0
1	L	3933	0	3896	27	0
2	I	2	0	0	0	0
2	J	2	0	0	0	0
2	K	2	0	0	0	0
2	L	2	0	0	0	0
3	I	1	0	0	0	0
3	J	1	0	0	0	0
3	K	1	0	0	0	0
4	I	48	0	26	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	K	96	0	52	2	0
4	L	48	0	26	0	0
5	I	10	0	7	0	0
5	J	10	0	7	0	0
5	K	10	0	7	2	0
5	L	10	0	7	0	0
6	I	567	0	0	18	0
6	J	419	0	0	10	0
6	K	416	0	0	16	0
6	L	387	0	0	11	0
All	All	17729	0	15678	115	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (115) 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:K:211:LYS:HE3	1:K:211:LYS:H	1.38	0.88
6:K:791:HOH:O	1:L:438:GLN:HG3	1.80	0.81
1:J:457:LEU:HB3	6:J:744:HOH:O	1.82	0.80
1:J:403:TYR:OH	1:J:484:HIS:HE1	1.73	0.71
6:K:985:HOH:O	1:L:162:ARG:HB2	1.91	0.70
1:I:575:PRO:HG2	6:I:945:HOH:O	1.93	0.68
1:L:593:ARG:O	1:L:594:GLN:HB2	1.94	0.67
1:K:438:GLN:HG3	6:L:834:HOH:O	1.95	0.67
1:K:123:LYS:HD3	6:K:662:HOH:O	1.96	0.65
1:K:337:ARG:HD2	1:K:541:LEU:HD13	1.77	0.65
1:J:331:VAL:HG13	1:J:441:MET:HE1	1.80	0.64
1:K:94:LYS:HE2	6:K:668:HOH:O	1.97	0.64
1:I:457:LEU:HA	6:I:1161:HOH:O	1.97	0.63
1:I:362:LYS:HG3	6:I:986:HOH:O	1.96	0.63
1:J:123:LYS:HG3	1:J:286:ARG:HG2	1.81	0.62
1:I:271:ALA:HB1	6:I:946:HOH:O	2.00	0.62
1:K:211:LYS:HE3	1:K:211:LYS:N	2.11	0.61
1:I:443:LYS:HE3	6:I:1039:HOH:O	2.00	0.61
1:J:273:ILE:HD13	6:J:755:HOH:O	2.00	0.60
1:I:432:PRO:HB3	6:I:906:HOH:O	2.01	0.59
6:K:791:HOH:O	1:L:435:LYS:HD2	2.01	0.59
1:I:84:THR:O	1:I:485:SER:HB3	2.02	0.59
4:I:600:NDP:H8A	6:I:763:HOH:O	2.03	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:L:370:LEU:HB2	6:L:693:HOH:O	2.04	0.57
1:K:86:PHE:CD2	1:K:305:ALA:HB1	2.39	0.57
1:L:575:PRO:HB3	6:L:974:HOH:O	2.04	0.56
1:J:591:GLU:H	1:J:591:GLU:CD	2.13	0.56
1:J:484:HIS:HD2	1:J:488:GLU:OE1	1.90	0.55
1:L:226:HIS:CD2	1:L:228:PHE:HB2	2.42	0.55
1:J:572:GLN:HA	6:J:767:HOH:O	2.06	0.54
1:I:331:VAL:HG13	1:I:441:MET:HE1	1.88	0.54
1:L:116:PRO:O	1:L:119:PRO:HD2	2.08	0.53
1:K:584:ASP:HA	1:K:594:GLN:HB3	1.89	0.53
6:I:1054:HOH:O	1:J:438:GLN:HG3	2.06	0.53
1:K:378:GLU:O	1:K:382:LYS:HG3	2.09	0.52
4:K:605:NDP:P2B	1:L:162:ARG:HH21	2.33	0.52
1:L:452:ARG:CZ	6:L:942:HOH:O	2.57	0.52
1:J:337:ARG:HD2	1:J:541:LEU:HD13	1.92	0.51
1:J:594:GLN:HG2	1:J:595:ALA:H	1.75	0.51
1:L:260:ARG:HD3	1:L:587:PHE:CE2	2.45	0.51
1:J:453:PRO:HG2	1:J:456:ASP:HB2	1.93	0.51
1:K:576:SER:HA	6:K:946:HOH:O	2.10	0.51
1:I:362:LYS:HD3	6:I:982:HOH:O	2.11	0.50
1:K:359:VAL:HB	1:K:457:LEU:HD13	1.92	0.50
1:K:226:HIS:CD2	1:K:228:PHE:HB2	2.46	0.50
1:L:589:ARG:HA	6:L:664:HOH:O	2.12	0.50
1:L:443:LYS:HE3	6:L:832:HOH:O	2.12	0.50
1:K:393:TYR:HB3	6:K:926:HOH:O	2.11	0.50
4:K:605:NDP:H8A	6:L:658:HOH:O	2.11	0.50
1:K:366:THR:HB	6:K:965:HOH:O	2.12	0.49
1:K:508:ARG:NH1	1:K:594:GLN:HB2	2.28	0.49
1:K:109:ARG:CZ	1:K:573:LEU:HD23	2.43	0.49
1:J:433:MET:HG2	6:J:637:HOH:O	2.13	0.48
1:J:96:GLU:OE1	1:J:109:ARG:HD2	2.13	0.48
1:J:226:HIS:CD2	1:J:228:PHE:HB2	2.47	0.48
1:K:594:GLN:HG2	1:K:595:ALA:N	2.28	0.48
6:I:1054:HOH:O	1:J:435:LYS:HD2	2.13	0.48
5:K:603:HIO:O11	5:K:603:HIO:H4	2.14	0.47
1:K:208:ASN:HA	1:K:211:LYS:NZ	2.28	0.47
1:L:337:ARG:HD2	1:L:541:LEU:HD13	1.96	0.47
1:L:480:ARG:NH2	1:L:561:ASP:OD1	2.44	0.47
1:I:447:LYS:HG2	6:I:1128:HOH:O	2.15	0.47
1:L:331:VAL:HG13	1:L:441:MET:HE1	1.96	0.47
1:I:447:LYS:HE3	6:I:1129:HOH:O	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:K:243:ASN:H	1:K:243:ASN:HD22	1.63	0.46
1:I:126:LYS:HA	1:I:126:LYS:HD2	1.63	0.46
1:I:226:HIS:CD2	1:I:228:PHE:HB2	2.51	0.46
1:K:343:MET:HG2	1:K:347:LEU:HB3	1.97	0.46
1:L:88:PHE:O	1:L:95:LYS:HE2	2.16	0.46
1:J:86:PHE:CD2	1:J:305:ALA:HB1	2.51	0.45
1:L:443:LYS:HD3	1:L:443:LYS:HA	1.84	0.45
1:J:123:LYS:HG3	1:J:286:ARG:CG	2.46	0.45
1:J:457:LEU:HA	6:J:743:HOH:O	2.16	0.45
1:J:457:LEU:HD12	6:J:964:HOH:O	2.17	0.45
1:K:106:TYR:O	1:K:107:ILE:HD12	2.17	0.45
1:K:208:ASN:HA	1:K:211:LYS:HZ2	1.82	0.45
1:K:347:LEU:HD21	6:K:1008:HOH:O	2.16	0.44
1:J:107:ILE:HD11	1:J:304:PHE:HB3	1.99	0.44
1:K:589:ARG:HD2	6:K:877:HOH:O	2.17	0.44
1:L:580:SER:HA	6:L:886:HOH:O	2.16	0.44
1:K:273:ILE:HD13	6:K:958:HOH:O	2.16	0.44
1:L:508:ARG:HD2	1:L:595:ALA:CB	2.48	0.44
1:K:433:MET:HG2	6:K:764:HOH:O	2.18	0.43
1:J:242:LYS:HA	1:J:242:LYS:HD3	1.84	0.43
1:K:266:LYS:HE2	6:K:678:HOH:O	2.18	0.43
1:J:447:LYS:HD2	6:J:944:HOH:O	2.19	0.43
1:J:572:GLN:HB2	6:J:1007:HOH:O	2.17	0.43
1:I:145:LYS:HD3	6:I:741:HOH:O	2.19	0.43
1:K:453:PRO:HG2	1:K:456:ASP:HB2	2.00	0.43
1:I:337:ARG:HD2	1:I:541:LEU:HD13	2.01	0.42
1:J:337:ARG:HA	6:J:657:HOH:O	2.18	0.42
1:I:343:MET:HG2	1:I:347:LEU:HB3	2.02	0.42
1:L:120:ASP:O	1:L:123:LYS:HD3	2.20	0.42
1:J:276:SER:HB3	1:J:304:PHE:CZ	2.54	0.42
1:J:393:TYR:HB3	6:J:711:HOH:O	2.20	0.42
1:I:591:GLU:HG2	1:I:592:LEU:HD13	2.03	0.41
6:K:776:HOH:O	1:L:433:MET:HG2	2.21	0.41
1:I:243:ASN:HD22	1:I:243:ASN:H	1.68	0.41
1:K:317:PHE:CZ	1:K:475:GLN:HG3	2.55	0.41
1:K:572:GLN:HB2	6:K:941:HOH:O	2.20	0.41
1:L:170:GLU:HB3	6:L:891:HOH:O	2.18	0.41
1:K:370:LEU:HD23	1:K:370:LEU:HA	1.89	0.41
1:I:123:LYS:HE3	6:I:844:HOH:O	2.20	0.41
1:J:589:ARG:HB2	1:J:592:LEU:HD13	2.02	0.41
1:L:242:LYS:HD3	6:L:605:HOH:O	2.19	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:I:433:MET:HG2	6:I:683:HOH:O	2.20	0.41
6:I:1100:HOH:O	1:J:340:GLU:HG2	2.20	0.41
1:L:458:GLY:HA2	6:L:944:HOH:O	2.21	0.41
1:I:575:PRO:HG3	6:I:946:HOH:O	2.20	0.41
1:K:517:CYS:SG	5:K:603:HIO:H421	2.61	0.41
1:I:218:PRO:HD2	6:I:884:HOH:O	2.21	0.40
1:L:318:GLY:HA3	1:L:492:GLU:OE2	2.21	0.40
1:K:552:GLN:HG2	6:K:979:HOH:O	2.21	0.40
1:L:347:LEU:HD12	1:L:347:LEU:HA	1.93	0.40
1:K:512:PHE:CZ	1:K:588:VAL:HG11	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	I	511/524 (98%)	498 (98%)	12 (2%)	1 (0%)	43	27
1	J	508/524 (97%)	496 (98%)	11 (2%)	1 (0%)	43	27
1	K	508/524 (97%)	496 (98%)	12 (2%)	0	100	100
1	L	511/524 (98%)	493 (96%)	17 (3%)	1 (0%)	43	27
All	All	2038/2096 (97%)	1983 (97%)	52 (3%)	3 (0%)	48	30

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	J	163	LYS
1	L	594	GLN
1	I	268	VAL

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	I	423/433 (98%)	412 (97%)	11 (3%)	40	17
1	J	421/433 (97%)	409 (97%)	12 (3%)	37	14
1	K	421/433 (97%)	409 (97%)	12 (3%)	37	14
1	L	423/433 (98%)	413 (98%)	10 (2%)	43	20
All	All	1688/1732 (98%)	1643 (97%)	45 (3%)	39	16

All (45) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	I	107	ILE
1	I	126	LYS
1	I	186	MET
1	I	239	ASP
1	I	242	LYS
1	I	243	ASN
1	I	244	ILE
1	I	292	LEU
1	I	331	VAL
1	I	457	LEU
1	I	576	SER
1	J	91	SER
1	J	107	ILE
1	J	150	GLU
1	J	211	LYS
1	J	244	ILE
1	J	292	LEU
1	J	331	VAL
1	J	347	LEU
1	J	394	PRO
1	J	553	ASP
1	J	554	LEU
1	J	591	GLU
1	K	107	ILE

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Mol	Chain	Res	Type
1	K	116	PRO
1	K	126	LYS
1	K	163	LYS
1	K	180	ASN
1	K	211	LYS
1	K	243	ASN
1	K	292	LEU
1	K	331	VAL
1	K	554	LEU
1	K	581	VAL
1	K	592	LEU
1	L	211	LYS
1	L	239	ASP
1	L	243	ASN
1	L	292	LEU
1	L	346	ASP
1	L	347	LEU
1	L	554	LEU
1	L	581	VAL
1	L	592	LEU
1	L	594	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	I	238	GLN
1	I	243	ASN
1	I	551	ASN
1	J	127	GLN
1	J	310	GLN
1	J	484	HIS
1	J	572	GLN
1	K	103	HIS
1	K	219	ASN
1	K	238	GLN
1	K	243	ASN
1	K	274	ASN
1	K	310	GLN
1	K	385	GLN
1	L	243	ASN
1	L	280	HIS
1	L	552	GLN

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Mol	Chain	Res	Type
1	L	572	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 19 ligands modelled in this entry, 11 are monoatomic - leaving 8 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	HIO	J	603	2	8,9,9	2.15	2 (25%)	5,12,12	2.26	3 (60%)
5	HIO	I	603	2	8,9,9	1.03	0	5,12,12	1.82	2 (40%)
5	HIO	K	603	2	8,9,9	2.50	1 (12%)	5,12,12	4.16	3 (60%)
4	NDP	K	600	2	51,52,52	1.62	10 (19%)	71,80,80	1.70	15 (21%)
4	NDP	I	600	-	51,52,52	1.76	9 (17%)	71,80,80	1.55	10 (14%)
4	NDP	K	605	-	51,52,52	1.76	10 (19%)	71,80,80	1.68	9 (12%)
4	NDP	L	600	-	51,52,52	1.77	9 (17%)	71,80,80	1.58	11 (15%)
5	HIO	L	603	2	8,9,9	2.45	3 (37%)	5,12,12	3.93	3 (60%)

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	HIO	J	603	2	-	4/9/12/12	-
5	HIO	I	603	2	-	2/9/12/12	-
5	HIO	K	603	2	-	3/9/12/12	-
4	NDP	K	600	2	-	9/34/77/77	0/5/5/5
4	NDP	I	600	-	-	9/34/77/77	0/5/5/5
4	NDP	K	605	-	-	9/34/77/77	0/5/5/5
4	NDP	L	600	-	-	10/34/77/77	0/5/5/5
5	HIO	L	603	2	-	3/9/12/12	-

All (44) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	K	603	HIO	C2-N3	6.77	1.41	1.34
4	K	605	NDP	P2B-O2B	-6.04	1.48	1.59
4	I	600	NDP	P2B-O2B	-5.84	1.49	1.59
4	L	600	NDP	P2B-O2B	-5.62	1.49	1.59
5	L	603	HIO	C2-N3	5.57	1.40	1.34
5	J	603	HIO	C2-N3	5.47	1.40	1.34
4	I	600	NDP	C4N-C3N	-4.53	1.41	1.50
4	K	605	NDP	C4N-C3N	-4.49	1.41	1.50
4	K	600	NDP	C4N-C3N	-4.34	1.41	1.50
4	K	600	NDP	P2B-O2B	-4.30	1.52	1.59
4	L	600	NDP	C4N-C3N	-4.17	1.42	1.50
4	K	605	NDP	C5A-N7A	-4.00	1.31	1.39
4	I	600	NDP	P2B-O1X	-3.97	1.38	1.50
4	L	600	NDP	P2B-O1X	-3.93	1.38	1.50
4	L	600	NDP	P2B-O2X	-3.84	1.40	1.54
4	K	600	NDP	C5A-N7A	-3.70	1.32	1.39
4	L	600	NDP	C5A-N7A	-3.66	1.32	1.39
4	K	605	NDP	P2B-O3X	-3.61	1.41	1.54
4	L	600	NDP	P2B-O3X	-3.58	1.41	1.54
4	I	600	NDP	P2B-O3X	-3.55	1.41	1.54
4	I	600	NDP	C4N-C5N	-3.51	1.39	1.49
4	K	600	NDP	P2B-O3X	-3.48	1.41	1.54
4	K	605	NDP	C7N-C3N	3.36	1.55	1.48
4	K	600	NDP	P2B-O1X	-3.35	1.40	1.50
4	I	600	NDP	C5A-N7A	-3.25	1.33	1.39
4	I	600	NDP	P2B-O2X	-3.20	1.42	1.54
4	K	605	NDP	P2B-O2X	-3.17	1.43	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	L	600	NDP	C4N-C5N	-3.05	1.41	1.49
4	K	600	NDP	C4N-C5N	-3.03	1.41	1.49
4	K	605	NDP	C4N-C5N	-2.94	1.41	1.49
4	K	605	NDP	P2B-O1X	-2.90	1.41	1.50
5	L	603	HIO	O12-C1	2.77	1.38	1.30
4	K	600	NDP	C7N-C3N	2.74	1.54	1.48
4	K	600	NDP	P2B-O2X	-2.66	1.44	1.54
5	L	603	HIO	O2-C2	2.57	1.28	1.23
4	K	600	NDP	C6N-C5N	2.48	1.40	1.33
4	K	600	NDP	C6N-N1N	2.39	1.43	1.37
4	I	600	NDP	PA-O3	-2.39	1.56	1.59
4	K	605	NDP	C8A-N9A	-2.17	1.33	1.37
4	L	600	NDP	C7N-C3N	2.16	1.53	1.48
5	J	603	HIO	O12-C1	2.12	1.36	1.30
4	I	600	NDP	C6N-C5N	2.09	1.39	1.33
4	L	600	NDP	PN-O3	2.04	1.61	1.59
4	K	605	NDP	C4A-N9A	-2.02	1.33	1.37

All (56) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	L	603	HIO	C41-C4-N3	6.90	117.36	109.96
5	K	603	HIO	C41-C4-N3	6.74	117.19	109.96
4	K	605	NDP	N3A-C2A-N1A	-5.71	119.94	128.58
5	K	603	HIO	C42-C4-N3	5.38	115.73	109.96
4	K	605	NDP	C5A-C4A-N3A	-5.38	119.31	126.72
4	K	600	NDP	N3A-C2A-N1A	-5.30	120.55	128.58
4	L	600	NDP	C5A-C4A-N3A	-5.20	119.55	126.72
4	I	600	NDP	C5A-C4A-N3A	-5.19	119.56	126.72
4	K	600	NDP	C5A-C4A-N3A	-5.19	119.58	126.72
4	I	600	NDP	N3A-C2A-N1A	-5.02	120.98	128.58
4	L	600	NDP	N3A-C2A-N1A	-4.81	121.31	128.58
5	L	603	HIO	C42-C4-N3	-4.37	105.28	109.96
4	K	600	NDP	N3A-C4A-N9A	4.04	134.04	127.17
4	K	600	NDP	N9A-C8A-N7A	-3.93	108.35	113.94
4	K	605	NDP	C2A-N3A-C4A	3.93	121.43	111.83
4	K	600	NDP	C2A-N3A-C4A	3.70	120.86	111.83
4	L	600	NDP	N3A-C4A-N9A	3.63	133.34	127.17
4	I	600	NDP	N3A-C4A-N9A	3.54	133.19	127.17
4	K	605	NDP	C5A-N7A-C8A	3.53	108.99	103.45
4	K	605	NDP	C4A-C5A-N7A	-3.47	106.62	110.58
4	K	600	NDP	C5A-N7A-C8A	3.46	108.88	103.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	600	NDP	C2A-N3A-C4A	3.44	120.23	111.83
4	K	605	NDP	N9A-C8A-N7A	-3.43	109.08	113.94
5	J	603	HIO	C41-C4-N3	3.38	113.59	109.96
4	K	605	NDP	C2A-N1A-C6A	3.26	124.08	118.73
4	K	605	NDP	N3A-C4A-N9A	3.25	132.70	127.17
4	L	600	NDP	C2A-N3A-C4A	3.24	119.75	111.83
4	L	600	NDP	C2A-N1A-C6A	3.21	124.01	118.73
4	L	600	NDP	C5A-N7A-C8A	3.21	108.50	103.45
4	L	600	NDP	C4A-C5A-N7A	-3.15	106.99	110.58
4	I	600	NDP	C5A-N7A-C8A	3.14	108.38	103.45
4	I	600	NDP	N9A-C8A-N7A	-3.13	109.49	113.94
4	L	600	NDP	N9A-C8A-N7A	-2.98	109.71	113.94
4	K	600	NDP	C3N-C2N-N1N	-2.97	118.84	123.20
5	L	603	HIO	O12-C1-O11	-2.94	116.90	123.90
5	K	603	HIO	O12-C1-O11	-2.84	117.13	123.90
4	I	600	NDP	C4A-C5A-N7A	-2.75	107.44	110.58
4	L	600	NDP	N6A-C6A-N1A	2.68	124.36	118.38
4	K	600	NDP	C4A-N9A-C8A	2.67	108.54	105.74
5	I	603	HIO	C42-C4-N3	-2.64	107.13	109.96
4	I	600	NDP	O4B-C1B-N9A	2.63	113.15	108.09
4	K	600	NDP	C3B-C2B-C1B	-2.61	97.80	102.81
5	I	603	HIO	C41-C4-N3	2.59	112.74	109.96
4	I	600	NDP	C3N-C2N-N1N	-2.58	119.42	123.20
4	L	600	NDP	C6A-C5A-C4A	2.57	120.69	117.18
4	K	600	NDP	O3D-C3D-C4D	-2.56	103.73	111.08
4	I	600	NDP	C2A-N1A-C6A	2.53	122.89	118.73
5	J	603	HIO	O12-C1-O11	-2.48	117.99	123.90
4	K	600	NDP	O3-PA-O1A	-2.41	103.44	110.70
5	J	603	HIO	O2-C2-C1	-2.38	115.20	118.46
4	K	605	NDP	C3N-C2N-N1N	-2.37	119.72	123.20
4	K	600	NDP	C4A-C5A-N7A	-2.32	107.94	110.58
4	K	600	NDP	O2N-PN-O3	2.27	113.40	107.27
4	K	600	NDP	C5B-C4B-C3B	-2.09	107.70	115.21
4	L	600	NDP	C3N-C2N-N1N	-2.08	120.15	123.20
4	K	600	NDP	C2A-N1A-C6A	2.08	122.14	118.73

There are no chirality outliers.

All (49) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	I	600	NDP	C5B-O5B-PA-O2A
4	K	600	NDP	C5B-O5B-PA-O2A

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Mol	Chain	Res	Type	Atoms
4	K	605	NDP	C5B-O5B-PA-O2A
4	L	600	NDP	C5B-O5B-PA-O2A
4	L	600	NDP	C5B-O5B-PA-O3
5	I	603	HIO	O2-C2-N3-O3
5	I	603	HIO	C41-C4-N3-O3
5	J	603	HIO	O11-C1-C2-N3
5	J	603	HIO	O12-C1-C2-O2
5	J	603	HIO	O2-C2-N3-O3
5	J	603	HIO	C41-C4-N3-O3
5	K	603	HIO	O2-C2-N3-O3
5	K	603	HIO	C41-C4-N3-O3
5	L	603	HIO	O2-C2-N3-O3
5	L	603	HIO	C41-C4-N3-O3
4	I	600	NDP	C1B-C2B-O2B-P2B
4	K	600	NDP	C1B-C2B-O2B-P2B
4	K	605	NDP	C1B-C2B-O2B-P2B
4	L	600	NDP	C1B-C2B-O2B-P2B
4	I	600	NDP	C3B-C2B-O2B-P2B
4	K	600	NDP	C3B-C2B-O2B-P2B
4	K	605	NDP	C3B-C2B-O2B-P2B
4	L	600	NDP	C3B-C2B-O2B-P2B
4	I	600	NDP	PA-O3-PN-O1N
4	K	600	NDP	PA-O3-PN-O1N
4	K	605	NDP	PA-O3-PN-O2N
4	L	600	NDP	PA-O3-PN-O2N
4	K	600	NDP	C5B-O5B-PA-O3
4	K	605	NDP	C5B-O5B-PA-O3
4	L	600	NDP	C5B-O5B-PA-O1A
5	K	603	HIO	C42-C4-N3-O3
5	L	603	HIO	C42-C4-N3-O3
4	I	600	NDP	PA-O3-PN-O2N
4	K	600	NDP	C2B-O2B-P2B-O3X
4	K	605	NDP	C2B-O2B-P2B-O3X
4	I	600	NDP	C2D-C1D-N1N-C6N
4	I	600	NDP	O4D-C1D-N1N-C6N
4	K	600	NDP	O4D-C1D-N1N-C6N
4	K	605	NDP	O4D-C1D-N1N-C6N
4	L	600	NDP	O4D-C1D-N1N-C6N
4	K	600	NDP	C2D-C1D-N1N-C6N
4	K	605	NDP	C2D-C1D-N1N-C6N
4	L	600	NDP	C2D-C1D-N1N-C6N
4	K	600	NDP	PA-O3-PN-O2N

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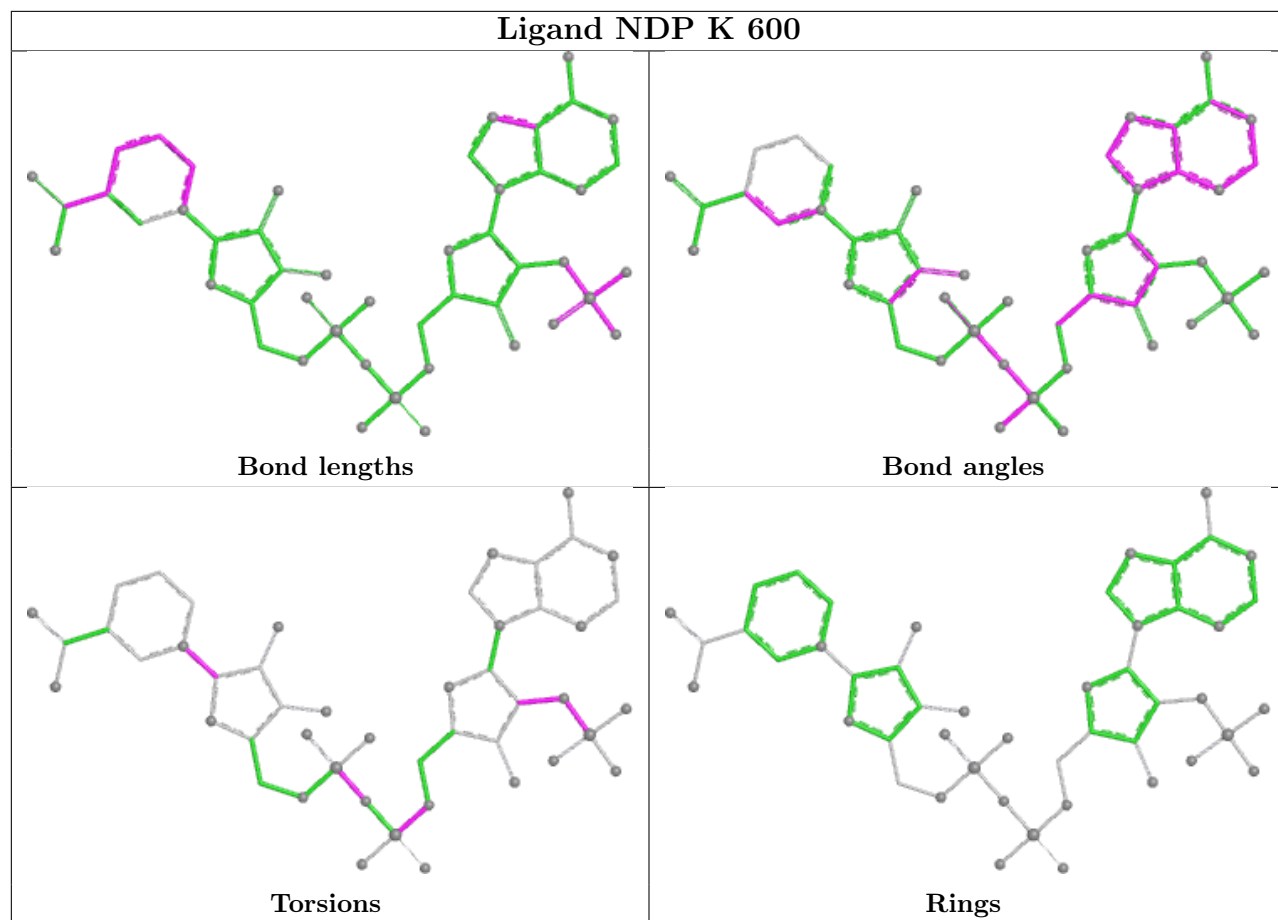
Mol	Chain	Res	Type	Atoms
4	K	605	NDP	PA-O3-PN-O1N
4	L	600	NDP	PA-O3-PN-O1N
4	I	600	NDP	C2B-O2B-P2B-O3X
4	L	600	NDP	C2B-O2B-P2B-O3X
4	I	600	NDP	C2D-C1D-N1N-C2N

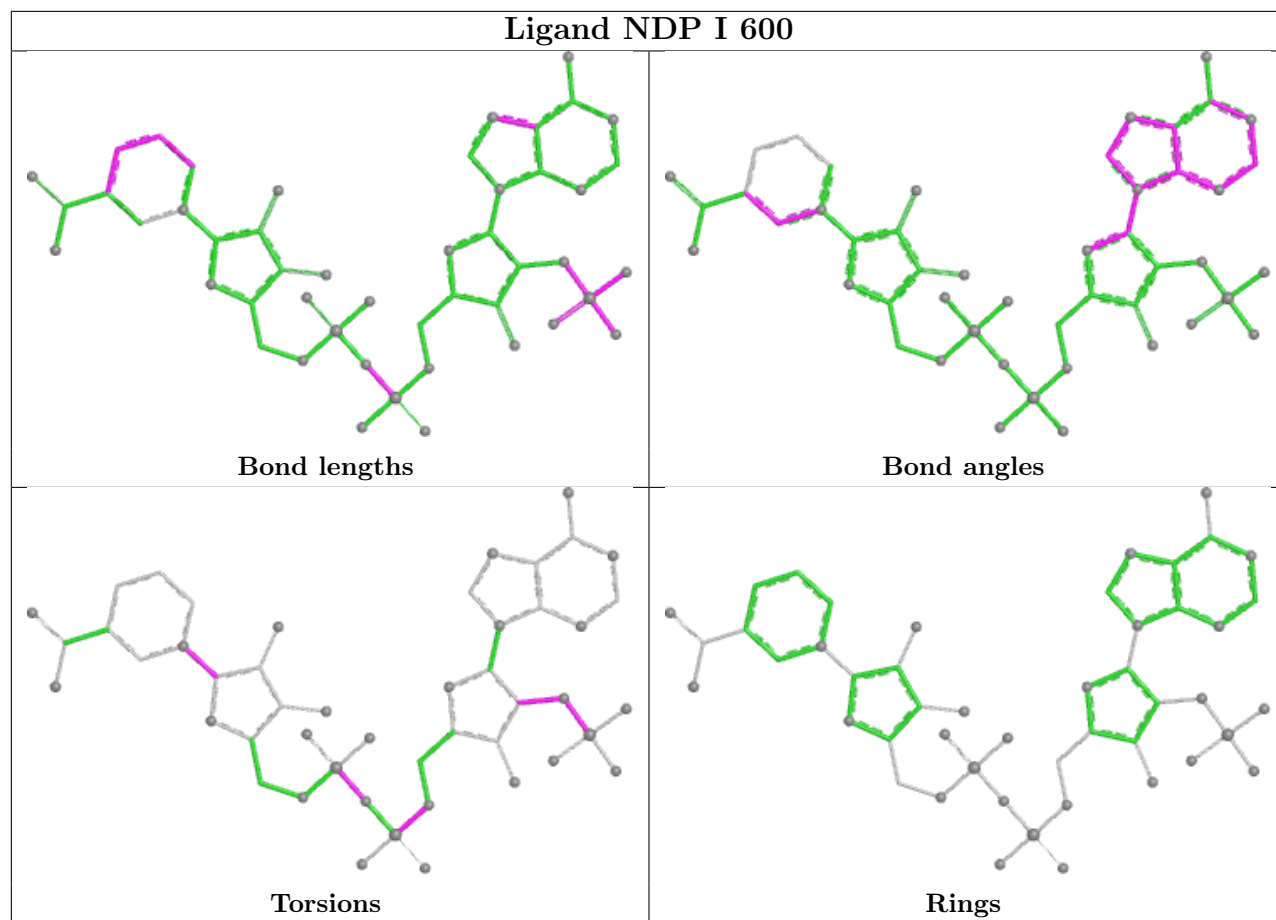
There are no ring outliers.

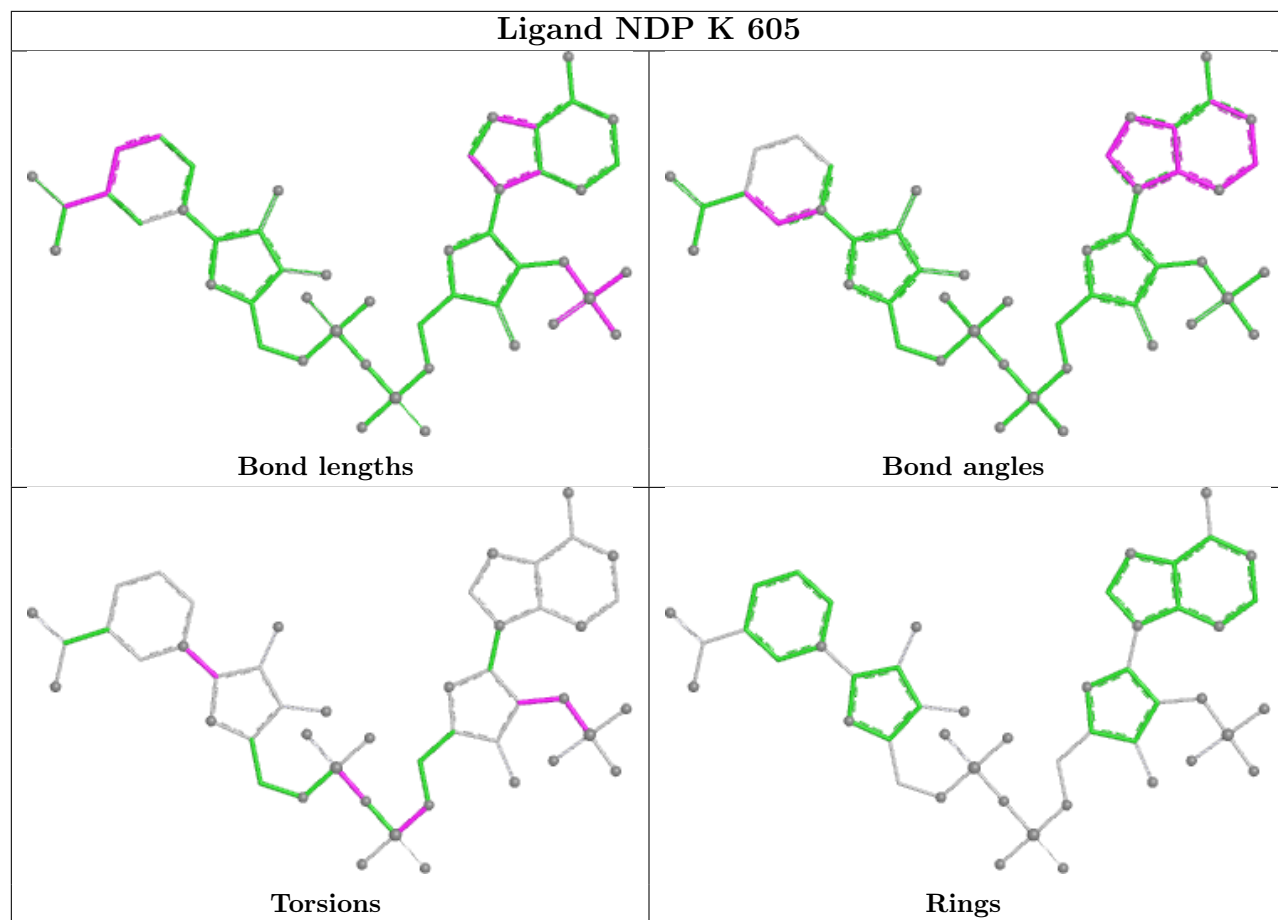
3 monomers are involved in 5 short contacts:

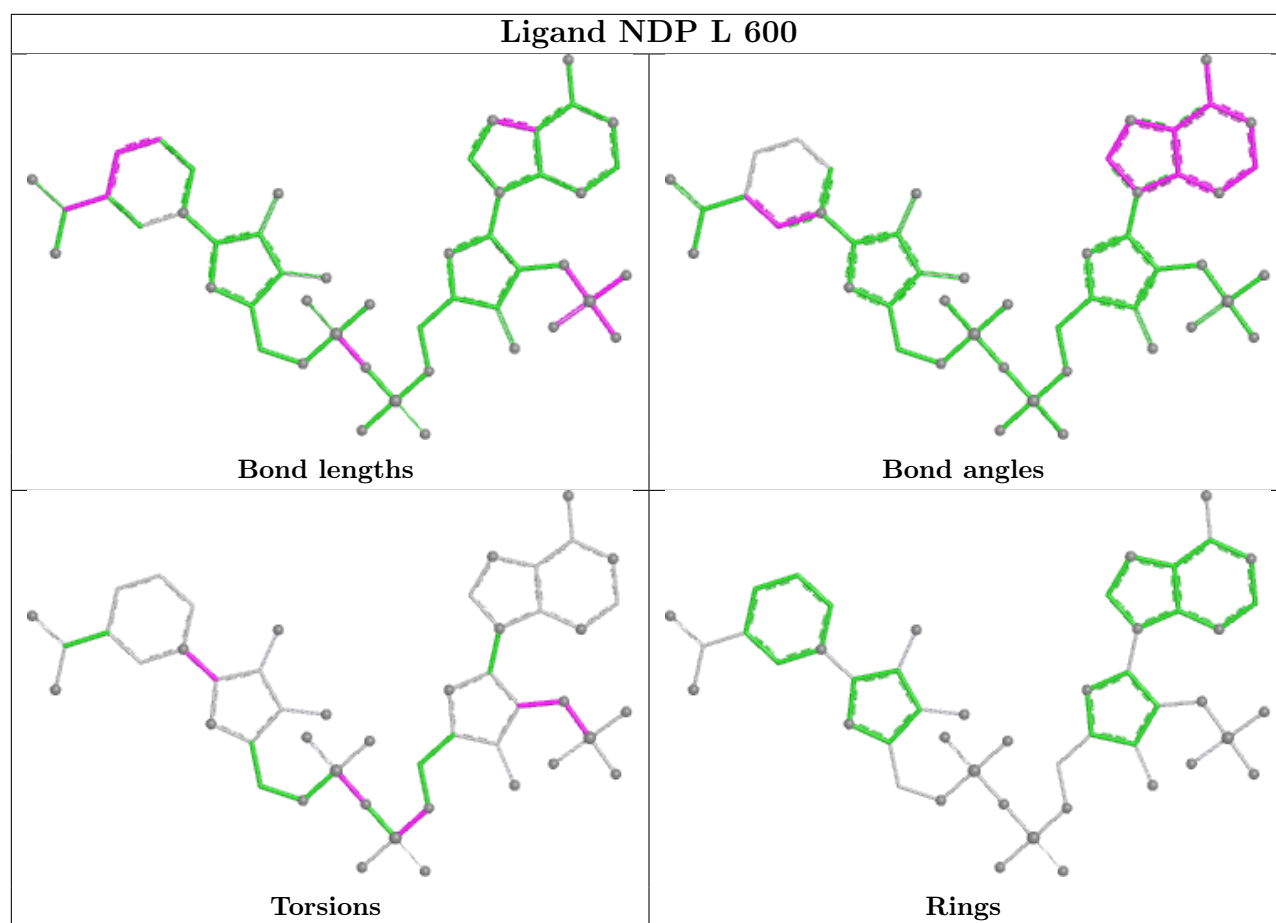
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	K	603	HIO	2	0
4	I	600	NDP	1	0
4	K	605	NDP	2	0

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.