

wwPDB X-ray Structure Validation Summary Report (i)

Jun 13, 2024 – 10:23 AM EDT

PDB ID	:	1MX9
Title	:	Crystal Structure of Human Liver Carboxylesterase in complexed with nalox-
		one methiodide, a heroin analogue
Authors	:	Bencharit, S.; Morton, C.L.; Xue, Y.; Potter, P.M.; Redinbo, M.R.
Deposited on	:	2002-10-01
Resolution	:	2.90 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i) 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 (1)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure: $X\text{-}RAY \, DIFFRACTION$

The reported resolution of this entry is 2.90 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.



Motria	Whole archive	Similar resolution
wietric	$(\# {\rm Entries})$	$(\# { m Entries}, { m resolution} { m range}({ m \AA}))$
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of	Quality of chain					
1	А	548	54%	41% · ·					
1	В	548	61%	33% • •					
1	С	548	59%	34% • •					
1	D	548	62%	33% • •					
1	Е	548	55%	38% ••					
1	F	548	57%	37% • •					
1	G	548	53%	41% •••					
1	Н	548	57%	38% ••					



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Mol	Chain	Length	Quality of chain					
1	Ι	548	49%	43%	••			
1	J	548	56%	38%	•••			
1	K	548	53%	42%	•••			
1	L	548	54%	40%	••			

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
2	NAG	J	479	-	-	Х	-
3	NLX	А	1	Х	-	Х	-
3	NLX	В	2	Х	-	Х	-
3	NLX	С	3	Х	-	Х	-
3	NLX	D	4	Х	-	Х	-
3	NLX	Е	5	Х	-	Х	-
3	NLX	F	6	Х	-	Х	-
3	NLX	G	1	Х	-	Х	-
3	NLX	Н	2	Х	-	Х	-
3	NLX	Ι	3	Х	-	Х	-
3	NLX	J	4	Х	-	Х	-
3	NLX	K	5	X	-	Х	-
3	NLX	L	6	Х	_	Х	_



2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 51134 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.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace	
1	Δ	520	Total	С	Ν	0	S	0	0	0
1	A	552	4130	2662	685	763	20	0	0	0
1	В	539	Total	С	Ν	0	S	0	0	0
1	D	002	4130	2662	685	763	20	0	0	0
1	C	531	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
		551	4124	2659	684	761	20	0	0	0
1	О	533	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
	D	000	4135	2665	686	764	20	0	0	0
1	E	531	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
		001	4124	2659	684	761	20	0	0	0
1	F	531	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
	L	551	4124	2659	684	761	20	0		0
1	G	532	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
	u	002	4130	2662	685	763	20	0	0	0
1	н	531	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
	11	001	4124	2659	684	761	20	0	0	0
1	т	531	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
	1	001	4124	2659	684	761	20	0	0	0
1	Т	532	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
1	0	002	4130	2662	685	763	20	0	0	0
1	K	531	Total	\mathbf{C}	Ν	Ο	\mathbf{S}	0	0	0
	17	001	4124	2659	684	761	20	U	0	0
1	L	531	Total	\mathbf{C}	Ν	Ο	S	0	0	0
1		001	4124	2659	684	761	20	0	U	U

• Molecule 1 is a protein called liver Carboxylesterase I.

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
А	?	-	GLN	deletion	UNP P23141
В	?	-	GLN	deletion	UNP P23141
С	?	-	GLN	deletion	UNP P23141
D	?	-	GLN	deletion	UNP P23141
Е	?	-	GLN	deletion	UNP P23141



Chain	Residue	Modelled	Actual	Comment	Reference
F	?	-	GLN	deletion	UNP P23141
G	?	-	GLN	deletion	UNP P23141
Н	?	-	GLN	deletion	UNP P23141
Ι	?	-	GLN	deletion	UNP P23141
J	?	-	GLN	deletion	UNP P23141
K	?	-	GLN	deletion	UNP P23141
L	?	-	GLN	deletion	UNP P23141

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• Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	А	1	Total C N O 14 8 1 5	0	0
2	А	1	Total C N O 14 8 1 5	0	0
2	В	1	Total C N O 14 8 1 5	0	0
2	С	1	Total C N O 14 8 1 5	0	0
2	D	1	Total C N O 14 8 1 5	0	0
2	Е	1	Total C N O 14 8 1 5	0	0
2	F	1	Total C N O 14 8 1 5	0	0



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Mol	Chain	Residues	A	ton	ns		ZeroOcc	AltConf	
9	С	1	Total	С	Ν	Ο	0	0	
	G	1	14	8	1	5	0	0	
0	Ц	1	Total	С	Ν	Ο	0	0	
	11	1	14	8	1	5	0	0	
9	Т	1	Total	С	Ν	Ο	0	0	
	1	1	14	8	1	5	0	0	
9	т	1	Total	С	Ν	Ο	0	0	
	J	I	14	8	1	5	0	0	
9	V	V	1	Total	С	Ν	Ο	0	0
	Т	1	14	8	1	5	0	0	
2	T	1	Total	С	Ν	0	0	0	
		1	14	8	1	5	0	0	

• Molecule 3 is (5A,17R)-4,5-EPOXY-3,14-DIHYDROXY-17-METHYL-6-OXO-17-(2-PROP ENYL)-MORPHINANIUM (three-letter code: NLX) (formula: $C_{20}H_{24}NO_4$).



Mol	Chain	Residues	A	Aton	ns		ZeroOcc	AltConf		
3	Λ	1	Total	С	Ν	Ο	0	0		
0	Л	I	25	20	1	4	0	0		
3	В	1	Total	С	Ν	Ο	0	0		
0	D	T	25	20	1	4	0	0		
3	С	С	C	C 1	Total	С	Ν	Ο	0	0
0	U	T	25	20	1	4	0	0		
3	л	1	Total	С	Ν	Ο	0	0		
0	D	T	25	20	1	4	0	0		
3	F	1	Total	С	N	O	0	0		
5		L	25	20	1	4	0			



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Mol	Chain	Residues	A	Aton	ns		ZeroOcc	AltConf	
2	Б	1	Total	С	Ν	0	0	0	
5	Г	L	25	20	1	4	0	0	
3	С	1	Total	С	Ν	Ο	0	0	
0	G	I	25	20	1	4	0	0	
3	н	1	Total	С	Ν	0	0	0	
0	11	I	25	20	1	4	0	0	
3	т	1	Total	С	Ν	Ο	0	0	
0	T	T	25	20	1	4	0	0	
3	T	1	Total	С	Ν	Ο	0	0	
0	0	T	25	20	1	4	0	0	
3	K	1	Total	С	Ν	Ο	0	0	
0	17	T	25	20	1	4	0	0	
3	L	1	Total	Ċ	N	0	0	0	
3		L L	25	20	1	4	0	0	

• Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	А	87	Total O 87 87	0	0
4	В	120	Total O 120 120	0	0
4	С	98	Total O 98 98	0	0
4	D	119	Total O 119 119	0	0
4	Е	112	Total O 112 112	0	0
4	F	91	Total O 91 91	0	0
4	G	69	Total O 69 69	0	0
4	Н	95	Total O 95 95	0	0
4	Ι	80	Total O 80 80	0	0
4	J	110	Total O 110 110	0	0
4	К	73	Total O 73 73	0	0
4	L	75	Total O 75 75	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. 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.





















PRO GLN THR GLU HIS ILE GLU CLU













 \bullet Molecule 1: liver Carboxylesterase I



 \bullet Molecule 1: liver Carboxylesterase I

Chain J:







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| 86022 | F0023
P6024 | V6025
V6026 | | V6029
H6030 | G6031 | K6032 | V6033
1.6034 | | F6037

 | | L6040

 | | <mark>A6048</mark> |
 | L6051
 | P6054 | | reoeo | R6064 |
 | P6067 | D6073

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 | V6077

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 | Y6083

 | P6085 | M6086 | C6087

 | D6090
 | P6091 | K6092
A6093
 | | L6096
 | 26098 | E6099 | R6104 | K6105 | E6106
W6107 | 16108
 | P6109 |
| S6113
E6114 | E0114
D6115 | 16121 | Y6122 | T6123
P6124 | A6125 | D6126 | L612/
T6128 | K6129 | K6130

 | | L6133

 | F0134
V6135 | M6136 | V6137
 | W6138
T6130
 | H6140 | G6141 | G6142 | G6143
1.6144 | M6145
 | | A6149

 | L6155

 | A6156

 | E6161

 | N6162

 | V6163 | 06169 | Y6170

 |
 | 16174 | W6175
G6176
 | F6177 | 00104
 | D0182
E6183 | H6184 | S6185
Be186 | G6187 | N6188 | 06194
 | |
| 16205 | 86207 | V6215 | T6216 | 16217
F6218 | G6219 | E6220 | 56221
A6222 | G6223 | G6224

 | E6225 | 977.9S

 | 1770 | <mark>S6233</mark> | P6234
 | L6235
 | 40230
K6237 | N6238 | | H6241
R6242 | A6243
 | 16244 | 56245
F6246

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 | L6251
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 | 10252
S6253

 | V6254

 | L6255 | K6257 | K6258

 | D6260
 | V6261 | K6262
P6263
 | L6264 | A6265
 | E0200 | I6268 | TG071 | - | T6278 | A6280
 | |
| | T6290 | E6291
E6292 | E6293 | T6297 | | K6302 | F 6303
1.6304 | | D6311

 | P6312 | K6313

 | 06316 | P6317 | L6318
 | L6319
 | V6322 | I 6323 | D6324 | G6325
M6326 | L6327
 | | F6333

 | <mark>06336</mark>

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 | ACCON

 | H6342

 | M6347 | V6348 | G6349

 | 16350
N6351
 | | F6355
G6356
 | W6357 | L6358
 | 10359
P6360 | M6361 | L6363 | Y6366 | P6367 | G6371
 | Q6372 |
| 46370 | 0/004 | L6382
W6383 | | Y6386
P6387 | | K6393 | E6394
1.6395 | 16396
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 | T6400 | E6401

 | D6409 | T6410 | V6411
 | K6412
ven13
 | K6414
K6414 | D6415 | L6416 | F641/
L6418 | D6419
 | L6420 | F6476

 | G6427

 | V6428

 | r0423

 | 16 <mark>4</mark> 32

 | V6433
A6434 | R6435 |

 | Dotad
 | T6444 | Y6445
M6446
 | Y6447 |
 | ro452
P6453 | | S6456 | M6459 | K6460 | T6463
 | V6464 |
| EC 171 | E04/1
L6472 | V6475 | | A6478
P6479 | F6480 | L6481 | G6484 | A6485 | S6486

 | E6487 | TEADO

 | L0492
S6493 | - | V6496
 | M6497
 | F6499 | W6500 | A6501 | A6504 |
 | P6509 | ues17

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 | Y6520

 | K6523

 | E6524

 | G6525
Y6526 | L6527 | Q6528

 | 10529
G6530
 | A6531 | N6532
T6533
 | Q6534 | A6535
 | A0530
06537 | K6538 | L6539
K6540 | D6541 | Tree 4 4 | A6545
 | F6546 |
| L6550 | K6553 | LYS
ALA | VAL | GLU | PRO | PRO | THR | GLU | HIS

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4 Data and refinement statistics (i)

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

Property	Value	Source	
Space group	P 1	Depositor	
Cell constants	91.17Å 120.71Å 177.02Å	Depositor	
a, b, c, α , β , γ	90.28° 89.32° 99.22°	Depositor	
Resolution (Å)	29.82 - 2.90	Depositor	
% Data completeness	95 7 (29 82-2 90)	Depositor	
(in resolution range)	30.1 (23.02 2.30)		
R_{merge}	(Not available)	Depositor	
R _{sym}	(Not available)	Depositor	
Refinement program	CNS 1.0	Depositor	
R, R_{free}	0.214 , 0.280	Depositor	
Estimated twinning fraction	No twinning to report.	Xtriage	
Total number of atoms	51134	wwPDB-VP	
Average B, all atoms $(Å^2)$	44.0	wwPDB-VP	



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: NAG, NLX

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).

Mal	Chain	Bond	lengths	Bo	ond angles
	Ullalli	RMSZ	# Z > 5	RMSZ	# Z > 5
1	А	0.38	0/4236	0.62	0/5754
1	В	0.41	0/4236	0.66	2/5754~(0.0%)
1	С	0.42	0/4230	0.65	2/5746~(0.0%)
1	D	0.41	0/4241	0.63	0/5761
1	Ε	0.40	0/4230	0.64	1/5746~(0.0%)
1	F	0.38	0/4230	0.62	0/5746
1	G	0.36	0/4236	0.60	0/5754
1	Н	0.39	0/4230	0.63	0/5746
1	Ι	0.36	0/4230	0.61	0/5746
1	J	0.39	0/4236	0.62	0/5754
1	K	0.36	0/4230	0.60	0/5746
1	L	0.37	0/4230	0.63	1/5746~(0.0%)
All	All	0.39	0/50795	0.63	$6/6\overline{8999}~(0.0\%)$

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	Ε	0	1

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	С	3420	LEU	CA-CB-CG	5.80	128.63	115.30
1	С	3388	LEU	CB-CG-CD2	-5.50	101.66	111.00
1	В	2339	ARG	N-CA-C	5.37	125.50	111.00
1	В	2075	SER	N-CA-C	5.33	125.41	111.00



Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
1	L	6140	HIS	N-CA-C	5.01	124.53	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group		
1	Е	5118	TYR	Sidechain		

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	А	4130	0	4132	231	0
1	В	4130	0	4132	182	0
1	С	4124	0	4127	180	0
1	D	4135	0	4134	165	0
1	Е	4124	0	4127	200	0
1	F	4124	0	4127	192	0
1	G	4130	0	4132	237	0
1	Н	4124	0	4127	194	0
1	Ι	4124	0	4127	232	0
1	J	4130	0	4134	216	0
1	K	4124	0	4127	226	0
1	L	4124	0	4127	244	0
2	А	28	0	26	3	0
2	В	14	0	13	4	0
2	С	14	0	13	0	0
2	D	14	0	13	4	0
2	Е	14	0	13	2	0
2	F	14	0	13	0	0
2	G	14	0	13	4	0
2	Н	14	0	13	1	0
2	Ι	14	0	13	1	0
2	J	14	0	13	7	0
2	K	14	0	13	1	0
2	L	14	0	13	0	0
3	А	25	0	23	20	0



1	MX9	
T	MA9	

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	В	25	0	23	21	0
3	С	25	0	19	27	0
3	D	25	0	24	15	0
3	Е	25	0	24	18	0
3	F	25	0	21	23	0
3	G	25	0	23	12	0
3	Н	25	0	23	30	0
3	Ι	25	0	24	19	0
3	J	25	0	24	20	0
3	Κ	25	0	24	18	0
3	L	25	0	24	23	0
4	А	87	0	0	9	0
4	В	120	0	0	12	0
4	С	98	0	0	10	0
4	D	119	0	0	9	0
4	Е	112	0	0	16	0
4	F	91	0	0	8	0
4	G	69	0	0	10	0
4	Н	95	0	0	10	0
4	Ι	80	0	0	10	0
4	J	110	0	0	8	0
4	Κ	73	0	0	11	0
4	L	75	0	0	15	0
All	All	51134	0	49998	2453	0

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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 25.

The worst 5 of 2453 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)
3:C:3:NLX:N1	3:C:3:NLX:C9	1.69	1.56
3:C:3:NLX:C9	3:C:3:NLX:C14	1.78	1.55
1:D:4343:THR:HB	1:D:4442:ALA:HB2	1.17	1.13
1:H:2304:LEU:HB3	3:H:2:NLX:H201	1.28	1.11
1:C:3364:MET:CE	3:C:3:NLX:H181	1.83	1.08

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	Perc	entiles
1	А	530/548~(97%)	480 (91%)	41 (8%)	9~(2%)	9	31
1	В	530/548~(97%)	476 (90%)	48 (9%)	6 (1%)	14	42
1	С	529/548~(96%)	489 (92%)	33~(6%)	7 (1%)	12	37
1	D	531/548~(97%)	491 (92%)	36 (7%)	4 (1%)	19	51
1	Ε	529/548~(96%)	482 (91%)	40 (8%)	7 (1%)	12	37
1	F	529/548~(96%)	477 (90%)	44 (8%)	8 (2%)	10	34
1	G	530/548~(97%)	467 (88%)	55 (10%)	8 (2%)	10	34
1	Н	529/548~(96%)	470 (89%)	52 (10%)	7(1%)	12	37
1	Ι	529/548~(96%)	466 (88%)	56 (11%)	7(1%)	12	37
1	J	530/548~(97%)	484 (91%)	40 (8%)	6(1%)	14	42
1	Κ	529/548~(96%)	475 (90%)	48 (9%)	6 (1%)	14	42
1	L	529/548~(96%)	467 (88%)	53 (10%)	9(2%)	9	31
All	All	6354/6576~(97%)	5724 (90%)	546 (9%)	84 (1%)	12	37

5 of 84 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	А	1253	SER
1	В	2342	HIS
1	С	3253	SER
1	D	4185	SER
1	D	4253	SER

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent side chain 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.



Mol	Chain	Analysed	Rotameric	Outliers	Perce	entiles
1	А	448/463~(97%)	435~(97%)	13 (3%)	42	76
1	В	448/463~(97%)	431 (96%)	17 (4%)	33	67
1	С	447/463~(96%)	420 (94%)	27~(6%)	19	49
1	D	448/463~(97%)	423 (94%)	25~(6%)	21	52
1	Ε	447/463~(96%)	422 (94%)	25~(6%)	21	52
1	F	447/463~(96%)	426 (95%)	21 (5%)	26	59
1	G	448/463~(97%)	419 (94%)	29~(6%)	17	45
1	Н	447/463~(96%)	427~(96%)	20 (4%)	27	61
1	Ι	447/463~(96%)	418 (94%)	29~(6%)	17	45
1	J	448/463~(97%)	426 (95%)	22~(5%)	25	57
1	Κ	447/463~(96%)	421 (94%)	26~(6%)	20	50
1	L	447/463~(96%)	433 (97%)	14 (3%)	40	74
All	All	5369/5556~(97%)	5101 (95%)	268 (5%)	24	57

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

 $5~{\rm of}~268$ residues with a non-rotameric side chain are listed below:

Mol	Chain	Res	Type
1	Κ	5128	THR
1	Κ	5299	LEU
1	L	6264	LEU
1	Е	5319	LEU
1	Е	5266	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 177 such sidechains are listed below:

Mol	Chain	Res	Type
1	Н	2267	GLN
1	J	4238	ASN
1	Н	2372	GLN
1	Ι	3336	GLN
1	J	4375	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.



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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

25 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	Bos	Link	Bond lengths		Bond angles			
WIOI	Type	Ullalli	nes		Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z >2
3	NLX	L	6	-	26,29,29	<mark>3.35</mark>	15 (57%)	45,49,49	2.19	15 (33%)
3	NLX	F	6	-	26,29,29	3.41	17 (65%)	45,49,49	5.27	22 (48%)
2	NAG	G	179	-	14,14,15	0.55	0	17,19,21	0.58	0
3	NLX	В	2	-	26,29,29	2.96	15 (57%)	45,49,49	2.04	14 (31%)
2	NAG	L	679	-	$14,\!14,\!15$	0.60	0	17,19,21	0.65	0
2	NAG	F	679	-	$14,\!14,\!15$	0.51	0	17,19,21	0.76	1 (5%)
2	NAG	А	180	-	14,14,15	0.60	0	17,19,21	0.66	0
2	NAG	Н	279	-	$14,\!14,\!15$	0.48	0	17,19,21	0.66	0
2	NAG	Е	579	-	$14,\!14,\!15$	0.51	0	17,19,21	0.76	1 (5%)
2	NAG	Ι	379	-	14,14,15	0.47	0	17,19,21	0.78	1 (5%)
2	NAG	K	579	-	14,14,15	0.52	0	17,19,21	0.75	1 (5%)
3	NLX	Н	2	-	26,29,29	<mark>3.28</mark>	15 (57%)	45,49,49	2.46	15 (33%)
2	NAG	В	279	-	14,14,15	0.49	0	17,19,21	0.59	0
3	NLX	С	3	-	26,29,29	4.40	18 (69%)	45,49,49	5.14	19 (42%)
3	NLX	J	4	-	26,29,29	<mark>3.41</mark>	14 (53%)	45,49,49	2.06	12 (26%)
2	NAG	С	379	-	14,14,15	0.48	0	17,19,21	0.73	0
3	NLX	G	1	-	26,29,29	<mark>3.39</mark>	15 (57%)	45,49,49	2.22	14 (31%)
3	NLX	Ι	3	-	26,29,29	3.16	17 (65%)	45,49,49	2.36	15 (33%)
3	NLX	D	4	-	26,29,29	<mark>3.29</mark>	17 (65%)	45,49,49	2.30	15 (33%)



Mal	Type Chain Bes		Tink	Bond lengths			Bond angles						
IVIOI	туре	Unam	nes	ries	nes	nes		Counts	RMSZ	# Z >2	Counts	RMSZ	# Z >2
3	NLX	Е	5	-	26,29,29	3.07	17 (65%)	45,49,49	2.05	14 (31%)			
2	NAG	А	179	-	14,14,15	0.63	0	17,19,21	0.65	0			
3	NLX	А	1	-	26,29,29	<mark>3.68</mark>	16 (61%)	45,49,49	2.20	16 (35%)			
3	NLX	K	5	-	26,29,29	<mark>3.15</mark>	15 (57%)	45,49,49	2.09	15 (33%)			
2	NAG	D	479	-	14,14,15	0.45	0	17,19,21	0.61	0			
2	NAG	J	479	-	14,14,15	0.55	0	17,19,21	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
3	NLX	L	6	-	1/1/6/7	0/4/62/62	0/6/5/5
3	NLX	F	6	-	1/1/6/7	2/4/62/62	0/6/5/5
2	NAG	G	179	-	-	5/6/23/26	0/1/1/1
3	NLX	В	2	-	1/1/6/7	0/4/62/62	0/6/5/5
2	NAG	L	679	-	-	2/6/23/26	0/1/1/1
2	NAG	F	679	-	-	3/6/23/26	0/1/1/1
2	NAG	А	180	-	-	3/6/23/26	0/1/1/1
2	NAG	Н	279	-	-	4/6/23/26	0/1/1/1
2	NAG	Е	579	-	-	0/6/23/26	0/1/1/1
2	NAG	Ι	379	-	-	4/6/23/26	0/1/1/1
3	NLX	Н	2	-	1/1/6/7	0/4/62/62	0/6/5/5
2	NAG	K	579	-	-	4/6/23/26	0/1/1/1
3	NLX	С	3	-	1/1/6/7	1/4/62/62	0/6/5/5
2	NAG	В	279	-	-	2/6/23/26	0/1/1/1
3	NLX	J	4	-	1/1/6/7	0/4/62/62	0/6/5/5
2	NAG	С	379	-	-	2/6/23/26	0/1/1/1
3	NLX	G	1	-	1/1/6/7	1/4/62/62	0/6/5/5
3	NLX	Ι	3	-	1/1/6/7	0/4/62/62	0/6/5/5
3	NLX	D	4	-	1/1/6/7	0/4/62/62	0/6/5/5
2	NAG	А	179	-	-	4/6/23/26	0/1/1/1
3	NLX	Е	5	-	1/1/6/7	0/4/62/62	0/6/5/5
3	NLX	А	1	-	1/1/6/7	0/4/62/62	0/6/5/5
3	NLX	K	5	-	1/1/6/7	$0/4/62/6\overline{2}$	0/6/5/5
2	NAG	D	479	-	-	2/6/23/26	0/1/1/1
2	NAG	J	479	-	-	3/6/23/26	0/1/1/1



Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	С	3	NLX	C14-C9	14.77	1.78	1.55
3	D	4	NLX	C14-C9	10.24	1.71	1.55
3	Н	2	NLX	C14-C9	9.99	1.71	1.55
3	J	4	NLX	C14-C9	9.64	1.70	1.55
3	А	1	NLX	C14-C9	9.52	1.70	1.55

The worst 5 of 191 bond length outliers are listed below:

The worst 5 of 190 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^{o})$	$Ideal(^{o})$
3	С	3	NLX	C20-N1-C17	-23.54	63.74	108.50
3	F	6	NLX	C20-N1-C17	-22.28	66.14	108.50
3	С	3	NLX	C20-N1-C16	-17.31	68.71	108.64
3	F	6	NLX	C20-N1-C16	-15.98	71.79	108.64
3	С	3	NLX	C16-N1-C17	10.17	131.74	109.05

5 of 12 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	А	1	NLX	N1
3	В	2	NLX	N1
3	С	3	NLX	N1
3	D	4	NLX	N1
3	Е	5	NLX	N1

5 of 42 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	А	179	NAG	C8-C7-N2-C2
2	А	179	NAG	O7-C7-N2-C2
2	А	180	NAG	C8-C7-N2-C2
2	А	180	NAG	O7-C7-N2-C2
2	В	279	NAG	C8-C7-N2-C2

There are no ring outliers.

22 monomers are involved in 273 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	L	6	NLX	23	0
3	F	6	NLX	23	0
2	G	179	NAG	4	0
3	В	2	NLX	21	0



Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	А	180	NAG	1	0
2	Н	279	NAG	1	0
2	Е	579	NAG	2	0
2	Ι	379	NAG	1	0
2	K	579	NAG	1	0
3	Н	2	NLX	30	0
2	В	279	NAG	4	0
3	С	3	NLX	27	0
3	J	4	NLX	20	0
3	G	1	NLX	12	0
3	Ι	3	NLX	19	0
3	D	4	NLX	15	0
3	Е	5	NLX	18	0
2	А	179	NAG	3	0
3	A	1	NLX	20	0
3	Κ	5	NLX	18	0
2	D	479	NAG	4	0
2	J	479	NAG	7	0

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The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





















































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)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.

