wwPDB X-ray Structure Validation Summary Report (i)

Jun 12, 2024 – 07:01 AM EDT

PDB ID	:	1EK2
Title	:	CRYSTAL STRUCTURE OF MURINE SOLUBLE EPOXIDE HYDROLASE COMPLEXED WITH CDU INHIBITOR
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Deposited on	:	2000-03-06
Resolution	:	3.00 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:

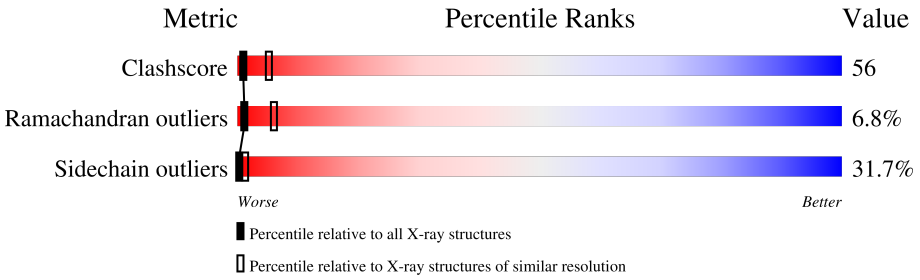
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	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-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)

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 chain
1	A	554	20% 47% 19% • 12%
1	B	554	23% 51% 23% ••

2 Entry composition (i)

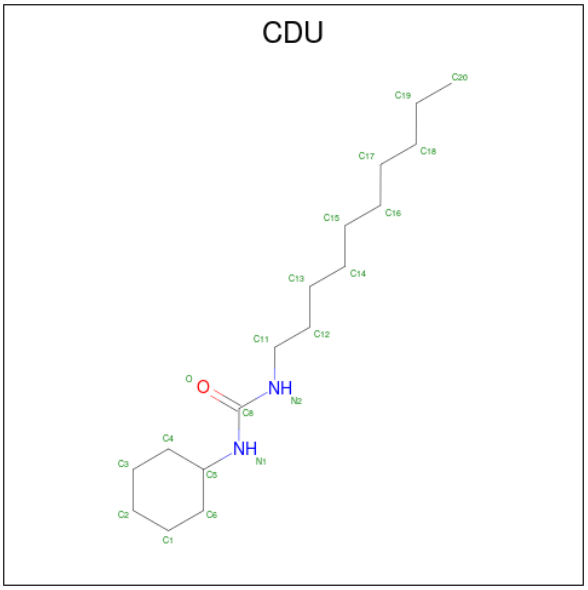
There are 3 unique types of molecules in this entry. The entry contains 8237 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 EPOXIDE HYDROLASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	487	Total	C	N	O	S	61	0	0
			3879	2501	648	701	29			
1	B	541	Total	C	N	O	S	71	0	0
			4299	2766	719	783	31			

- Molecule 2 is N-CYCLOHEXYL-N'-DECYLUREA (three-letter code: CDU) (formula: $C_{17}H_{34}N_2O$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			20	17	2	1		
2	B	1	Total	C	N	O	0	0
			20	17	2	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	10	Total O 10 10	0	0
3	B	9	Total O 9 9	0	0

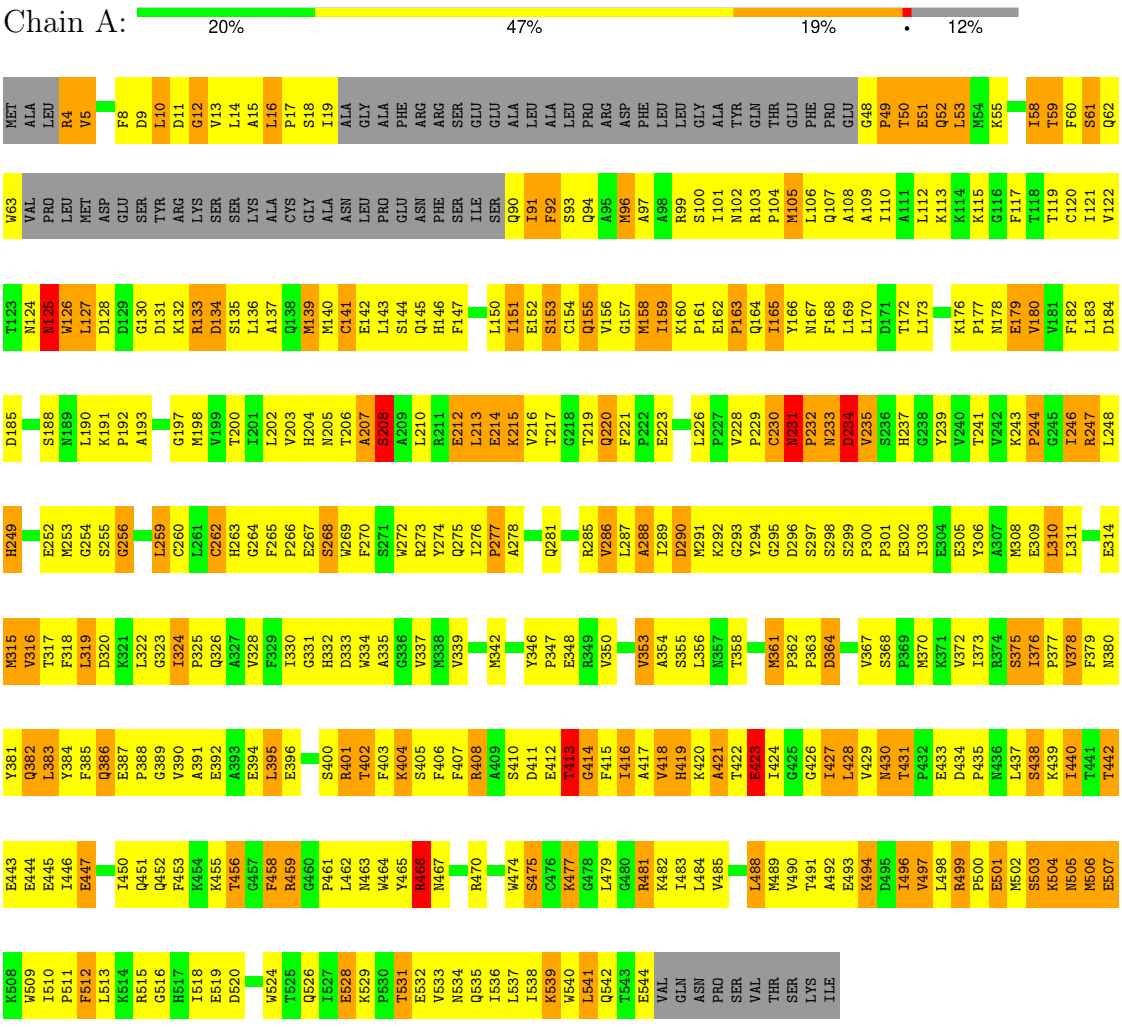
3 Residue-property plots (i)

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.

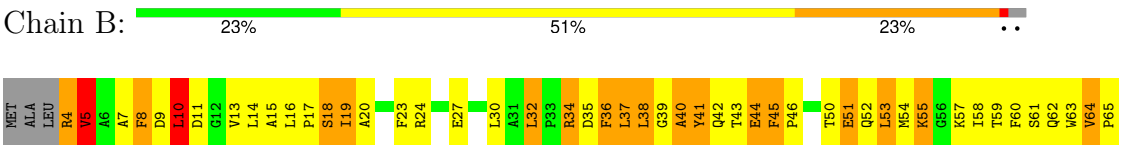
- Molecule 1: EPOXIDE HYDROLASE

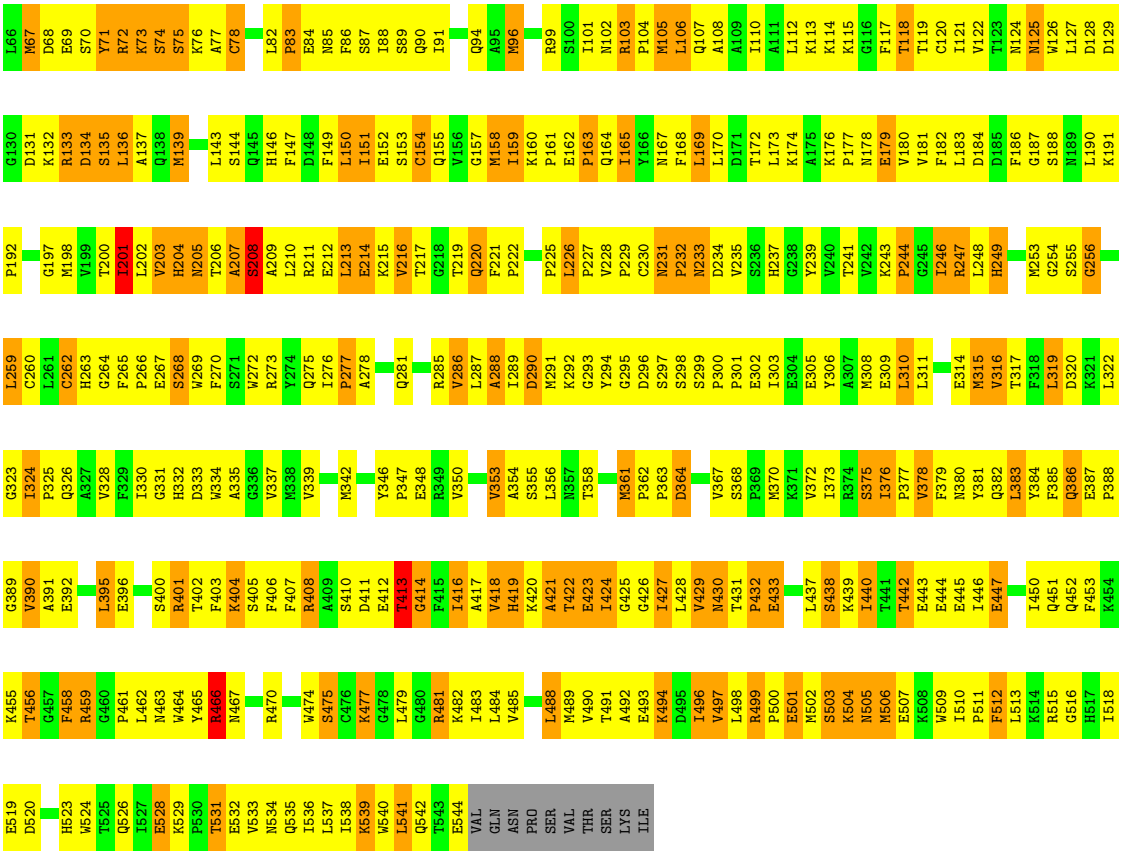
Chain A:



- Molecule 1: EPOXIDE HYDROLASE

Chain B:




L66 M67 D68 E69 S70 Y71 R72 K73 S74 S75 K76 A77 C78 L82 P83 E84 N85 F86 S87 I88 S89 Q90 I91 Q94 A95 M96 R99 S100 I101 N102 R103 P104 M105 L106 Q107 A108 A109 I110 A111 L112 K113 K114 K115 G116 F117 T118 T119 C120 I121 V122 T123 N124 N125 W126 L127 D128 D129
G130 D131 K132 R133 D134 S135 L136 A137 Q138 M139 L143 S144 Q145 H146 F147 D148 F149 L150 I151 E152 S153 C154 Q155 V156 G157 M158 I159 K160 P161 E162 P163 Q164 I165 Y166 N167 F168 L169 L170 D171 T172 L173 K174 A175 K176 P177 N178 E179 V180 V181 F182 L183 D184 D185 F186 G187 S188 N189 L190 K191
P192 G197 M198 V199 T200 I201 L202 V203 H204 N205 T206 A207 S208 A209 L210 R211 E212 L213 E214 K215 V216 T217 G218 T219 Q220 F221 P222 P225 L226 P227 V228 P229 C230 N231 P232 N233 D234 V235 S236 H237 G238 Y239 V240 T241 V242 K243 P244 G245 I246 R247 L248 H249 M253 G254 S255 G256
L259 C260 L261 C262 H263 G264 F265 P266 E267 S268 W269 F270 S271 W272 R273 Y274 Q275 I276 P277 A278 Q281 R285 V286 L287 A288 I289 D290 M291 K292 G293 Y294 G295 D296 S297 S298 S299 P300 P301 E302 I303 E304 E305 Y306 A307 M308 E309 L310 L311 E314 M315 V316 T317 F318 L319 D320 K321 L322
G323 I324 P325 Q326 A327 V328 F329 I330 G331 H332 D333 W334 A335 G336 V337 M338 V339 M342 Y346 P347 E348 H349 V350 V353 A354 S355 L356 N357 T358 M361 P362 P363 D364 V367 S368 P369 M370 K371 V372 I373 R374 S375 I376 P377 V378 F379 N380 Y381 Q382 L383 Y384 F385 Q386 E387 P388
G389 V390 A391 E392 L395 E396 S400 R401 T402 F403 K404 S405 F406 F407 R408 A409 S410 D411 E412 T413 G414 F415 I416 A417 V418 H419 K420 A421 T422 E423 I424 G425 G426 I427 L428 V429 N430 T431 P432 E433 L437 S438 K439 I440 T441 T442 E443 E444 E445 I446 E447 I450 Q451 Q452 F453 K454
K455 T456 G457 F458 R459 G460 P461 L462 N463 W464 Y465 R466 N467 R470 W474 S475 C476 K477 G478 L479 G480 R481 K482 I483 L484 V485 L488 M489 V490 T491 A492 E493 K494 D495 I496 V497 L498 R499 P500 E501 M502 S503 K504 N505 M506 E507 K508 W509 I510 P511 F512 L513 K514 R515 G516 H517 I518
E519 D520 H523 W524 T525 Q526 I527 E528 K529 P530 T531 E532 V533 N534 Q535 I536 L537 I538 K539 W540 L541 Q542 T543 E544 VAL GLN ASN PRO SER VAL THR SER LYS ILE

4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	151.90Å 143.00Å 60.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-3.00)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.211 , 0.290	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	8237	wwPDB-VP
Average B, all atoms (Å^2)	39.0	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: CDU

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	0.43	0/3981	0.64	0/5397
1	B	0.42	0/4413	0.61	0/5984
All	All	0.42	0/8394	0.62	0/11381

There are no bond length outliers.

There are no bond angle outliers.

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	3879	0	3863	431	0
1	B	4299	0	4270	485	0
2	A	20	0	34	5	0
2	B	20	0	34	1	0
3	A	10	0	0	0	0
3	B	9	0	0	1	0
All	All	8237	0	8201	893	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 56.

The worst 5 of 893 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:16:LEU:HG	1:B:17:PRO:HA	1.29	1.10
1:A:484:LEU:HD13	1:B:61:SER:HB2	1.37	1.06
1:A:348:GLU:HA	1:B:133:ARG:HG3	1.37	1.01
1:A:122:VAL:HG22	1:A:151:ILE:HG13	1.44	1.00
1:B:122:VAL:HG22	1:B:151:ILE:HG13	1.46	0.95

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	481/554 (87%)	350 (73%)	98 (20%)	33 (7%)	1	6
1	B	539/554 (97%)	393 (73%)	110 (20%)	36 (7%)	1	6
All	All	1020/1108 (92%)	743 (73%)	208 (20%)	69 (7%)	1	6

5 of 69 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	18	SER
1	A	61	SER
1	A	207	ALA
1	A	231	ASN
1	A	232	PRO

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	424/480 (88%)	293 (69%)	131 (31%)	0 1
1	B	468/480 (98%)	316 (68%)	152 (32%)	0 1
All	All	892/960 (93%)	609 (68%)	283 (32%)	0 1

5 of 283 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	386	GLN
1	B	416	ILE
1	B	477	LYS
1	A	438	SER
1	A	428	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	517	HIS
1	B	386	GLN
1	B	107	GLN
1	B	463	ASN
1	B	281	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)

2 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	$\#\|Z\| > 2$
2	CDU	B	1200	-	20,20,20	1.88	8 (40%)	22,22,22	2.01	4 (18%)
2	CDU	A	1100	-	20,20,20	1.88	8 (40%)	22,22,22	2.00	4 (18%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	CDU	B	1200	-	-	4/15/23/23	0/1/1/1
2	CDU	A	1100	-	-	2/15/23/23	0/1/1/1

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1200	CDU	C6-C5	3.29	1.59	1.52
2	A	1100	CDU	C5-N1	3.27	1.53	1.46
2	A	1100	CDU	C6-C5	3.25	1.59	1.52
2	B	1200	CDU	C5-N1	3.23	1.53	1.46
2	A	1100	CDU	C4-C5	2.93	1.58	1.52

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	1200	CDU	N2-C8-N1	5.42	129.38	115.82
2	A	1100	CDU	N2-C8-N1	5.39	129.31	115.82
2	A	1100	CDU	O-C8-N2	-4.44	114.84	122.47
2	B	1200	CDU	O-C8-N2	-4.44	114.84	122.47
2	B	1200	CDU	C5-N1-C8	4.18	131.92	122.92

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1100	CDU	C4-C5-N1-C8
2	B	1200	CDU	C4-C5-N1-C8
2	B	1200	CDU	C15-C16-C17-C18
2	B	1200	CDU	C11-C12-C13-C14
2	B	1200	CDU	C13-C14-C15-C16

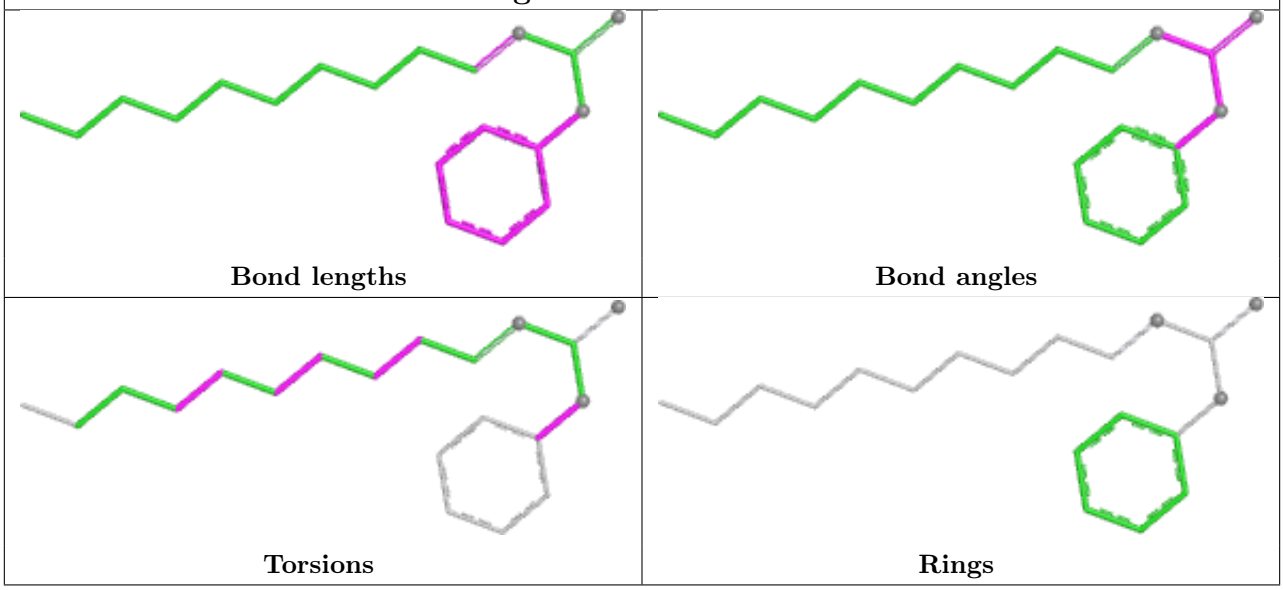
There are no ring outliers.

2 monomers are involved in 6 short contacts:

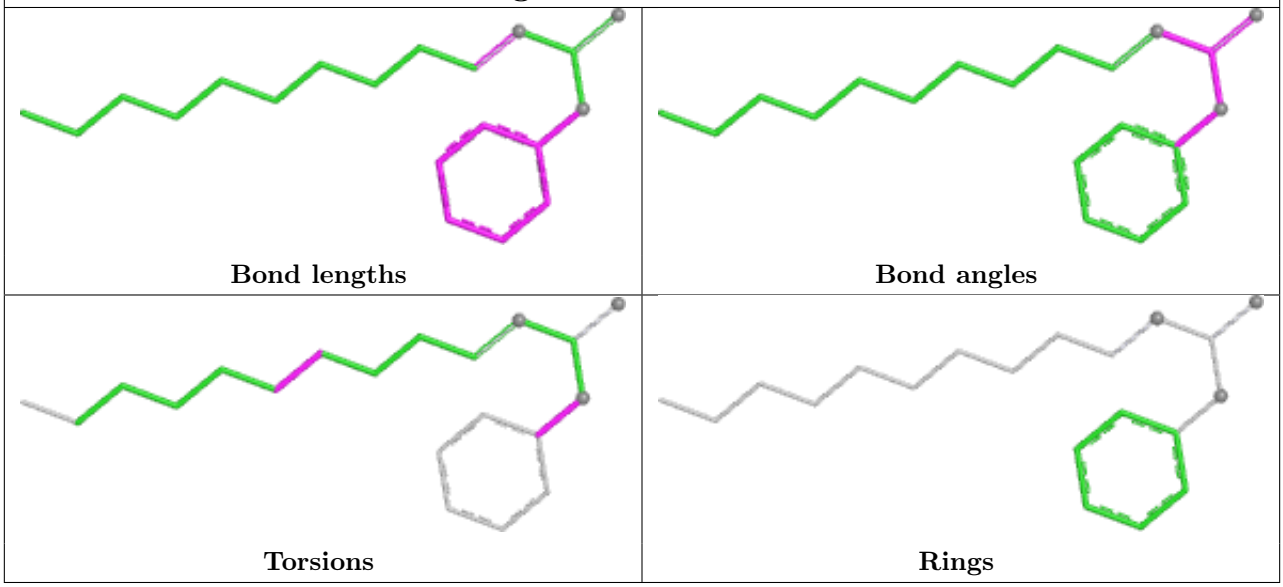
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1200	CDU	1	0
2	A	1100	CDU	5	0

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

Ligand CDU B 1200



Ligand CDU A 1100



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.