Full wwPDB X-ray Structure Validation Report (i)

Aug 3, 2023 – 06:27 AM EDT

PDB ID	:	1HVB
Title	:	CRYSTAL STRUCTURE OF STREPTOMYCES R61 DD-PEPTIDASE COMPLEXED WITH A NOVEL CEPHALOSPORIN ANALOG OF CELL WALL PEPTIDOGLYCAN
Authors	:	McDonough, M.A.; Lee, W.; Silvaggi, N.R.; Mobashery, S.; Kelly, J.A.
Deposited on	:	2001-01-08
Resolution	:	1.17 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (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:

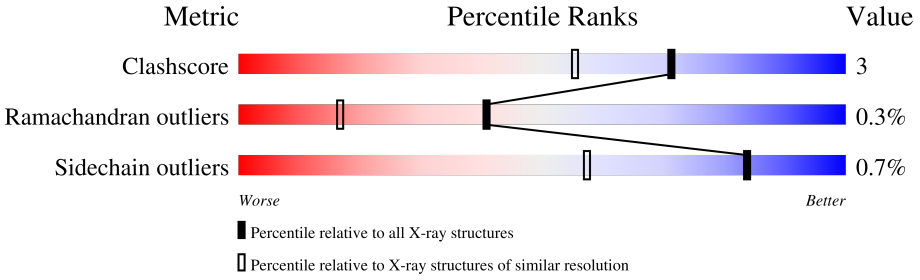
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.34

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 1.17 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1182 (1.20-1.16)
Ramachandran outliers	138981	1134 (1.20-1.16)
Sidechain outliers	138945	1134 (1.20-1.16)

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

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	349	89% 9% ••

2 Entry composition (i)

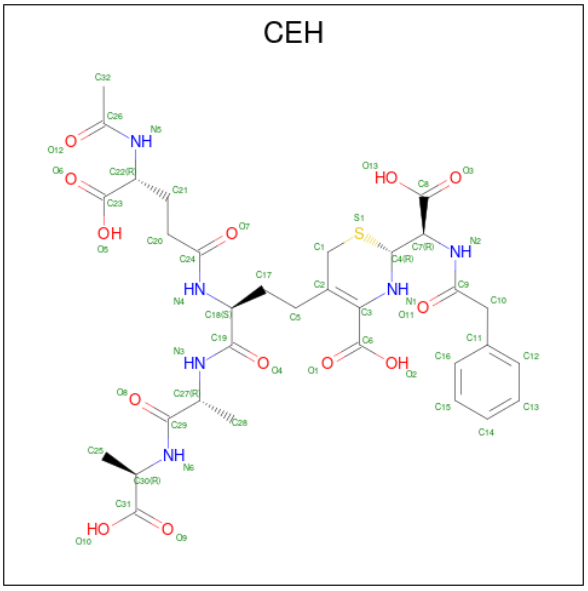
There are 3 unique types of molecules in this entry. The entry contains 3590 atoms, of which 272 are hydrogens and 0 are deuteriums.

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 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	346	2984	1705	272	455	540	12	0	27	0

- Molecule 2 is 5-{3-(S)-(4-(R)-ACETYLAMINO-4-CARBOXY-BUTYRYLAMINO)-3-[1-(R)-(1-(R)-CARBOXY-ETHYLCARBAMOYL)-ETHYLCARBAMOYL]-PROPYL}-2-(CARBOXY-PHENYLACETYLAMINO-METHYL)-3,6-DIHYDRO-2H-[1,3]THIAZINE-4-CARBOXYLIC ACID (three-letter code: CEH) (formula: $C_{32}H_{42}N_6O_{13}S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	51	32	6	12	1	0	1

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	555	555	555	0	7

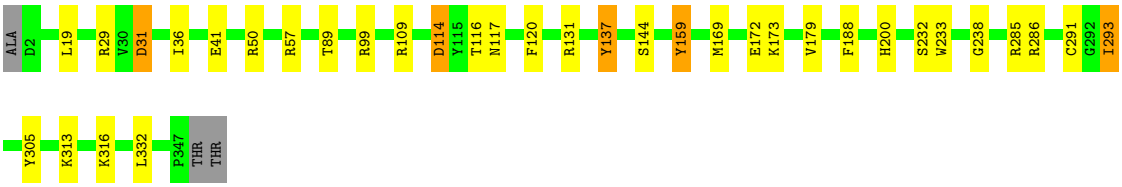
3 Residue-property plots (i)

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: D-ALANYL-D-ALANINE CARBOXYPEPTIDASE

Chain A:



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 21	Depositor
Cell constants a, b, c, α, β, γ	50.78Å 66.66Å 100.93Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.17	Depositor
% Data completeness (in resolution range)	96.1 (10.00-1.17)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	SHELXL-97, CNS	Depositor
R, R_{free}	0.113 , 0.153	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3590	wwPDB-VP
Average B, all atoms (Å^2)	16.0	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: CEH

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	0.72	0/2867	1.20	22/3908 (0.6%)

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	50	ARG	NE-CZ-NH2	-11.42	114.59	120.30
1	A	50	ARG	NE-CZ-NH1	9.38	124.99	120.30
1	A	99	ARG	NE-CZ-NH1	9.29	124.94	120.30
1	A	99	ARG	NE-CZ-NH2	-8.38	116.11	120.30
1	A	31[A]	ASP	CB-CG-OD2	7.97	125.47	118.30
1	A	31[B]	ASP	CB-CG-OD2	7.97	125.47	118.30
1	A	159[A]	TYR	CB-CG-CD1	-7.21	116.68	121.00
1	A	159[B]	TYR	CB-CG-CD1	-7.21	116.68	121.00
1	A	285	ARG	NE-CZ-NH2	6.81	123.70	120.30
1	A	57	ARG	NE-CZ-NH2	-6.80	116.90	120.30
1	A	286	ARG	NE-CZ-NH1	6.76	123.68	120.30
1	A	29[A]	ARG	NE-CZ-NH2	6.68	123.64	120.30
1	A	29[B]	ARG	NE-CZ-NH2	6.68	123.64	120.30
1	A	305	TYR	CB-CG-CD2	6.13	124.68	121.00
1	A	188	PHE	CB-CG-CD2	-5.96	116.62	120.80
1	A	233	TRP	CH2-CZ2-CE2	5.52	122.92	117.40
1	A	131	ARG	NE-CZ-NH2	-5.52	117.54	120.30
1	A	109	ARG	CD-NE-CZ	5.33	131.06	123.60
1	A	114	ASP	CB-CG-OD2	5.32	123.08	118.30
1	A	137[A]	TYR	CB-CG-CD2	5.11	124.07	121.00
1	A	137[B]	TYR	CB-CG-CD2	5.11	124.07	121.00
1	A	188	PHE	CB-CG-CD1	5.05	124.33	120.80

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	2712	272	2640	16	0
2	A	51	0	35	4	0
3	A	555	0	0	7	0
All	All	3318	272	2675	19	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 (19) 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)
2:A:401[A]:CEH:H30	3:A:2433:HOH:O	1.87	0.73
1:A:200:HIS:HE1	1:A:232:SER:OG	1.84	0.60
1:A:173:LYS:HE3	3:A:2183:HOH:O	2.01	0.60
2:A:401[A]:CEH:H16	3:A:2412:HOH:O	2.01	0.60
1:A:172:GLU:OE2	1:A:179[B]:VAL:HG13	2.03	0.58
1:A:200:HIS:HD2	3:A:2278:HOH:O	1.87	0.57
1:A:31[A]:ASP:OD1	1:A:36[A]:ILE:HD12	2.06	0.56
1:A:332:LEU:HD21	3:A:2533:HOH:O	2.07	0.55
1:A:116[B]:THR:HG22	1:A:120:PHE:CE2	2.46	0.51
2:A:401[A]:CEH:O2	2:A:401[A]:CEH:H52	2.13	0.48
1:A:291:CYS:SG	1:A:293[B]:ILE:HD12	2.54	0.48
1:A:159[A]:TYR:CD2	2:A:401[A]:CEH:H12A	2.49	0.47
1:A:316:LYS:NZ	3:A:2388:HOH:O	2.50	0.45
1:A:313:LYS:NZ	3:A:2158:HOH:O	2.51	0.44
1:A:114:ASP:OD1	1:A:116[B]:THR:OG1	2.28	0.44
1:A:137[A]:TYR:HB3	1:A:169[A]:MET:CG	2.48	0.43
1:A:19:LEU:CD2	1:A:41[B]:GLU:HG2	2.49	0.43

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	371/349 (106%)	364 (98%)	6 (2%)	1 (0%)	41 17

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	238	GLY

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	310/286 (108%)	307 (99%)	3 (1%)	76 46

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	117	ASN
1	A	293[A]	ILE
1	A	293[B]	ILE

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	21	GLN
1	A	33	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	38	GLN
1	A	185	ASN
1	A	200	HIS
1	A	258	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)

1 ligand is 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	CEH	A	401[A]	1	47,52,53	3.58	13 (27%)	61,70,72	3.52	24 (39%)

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	CEH	A	401[A]	1	-	10/54/73/75	0/1/2/2

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401[A]	CEH	C2-C3	14.40	1.68	1.34
2	A	401[A]	CEH	C10-C9	-12.17	1.25	1.51
2	A	401[A]	CEH	C10-C11	7.83	1.64	1.51
2	A	401[A]	CEH	O11-C9	7.21	1.37	1.23
2	A	401[A]	CEH	C7-N2	-6.01	1.38	1.46
2	A	401[A]	CEH	C1-C2	-4.18	1.34	1.50
2	A	401[A]	CEH	C9-N2	3.55	1.41	1.34
2	A	401[A]	CEH	C24-N4	3.48	1.41	1.34
2	A	401[A]	CEH	C19-N3	2.86	1.40	1.34
2	A	401[A]	CEH	C29-N6	2.50	1.39	1.34
2	A	401[A]	CEH	O8-C29	-2.36	1.18	1.23
2	A	401[A]	CEH	O10-C31	-2.25	1.23	1.30
2	A	401[A]	CEH	C3-C6	2.13	1.51	1.48

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	401[A]	CEH	O7-C24-C20	14.09	147.77	122.02
2	A	401[A]	CEH	O7-C24-N4	-9.72	106.55	122.95
2	A	401[A]	CEH	O11-C9-N2	-9.18	107.45	122.95
2	A	401[A]	CEH	C10-C9-N2	6.58	126.47	115.88
2	A	401[A]	CEH	C7-N2-C9	6.25	129.82	123.13
2	A	401[A]	CEH	C20-C24-N4	-5.86	105.67	115.83
2	A	401[A]	CEH	O2-C6-C3	5.27	125.44	116.76
2	A	401[A]	CEH	C25-C30-C31	-4.78	99.40	110.20
2	A	401[A]	CEH	C10-C11-C12	-4.73	114.12	120.89
2	A	401[A]	CEH	O12-C26-C32	-4.58	113.56	122.06
2	A	401[A]	CEH	C17-C18-C19	-4.12	100.57	110.20
2	A	401[A]	CEH	C22-N5-C26	3.77	132.67	121.48
2	A	401[A]	CEH	C5-C17-C18	3.54	119.78	113.16
2	A	401[A]	CEH	O2-C6-O1	-3.21	116.27	123.61
2	A	401[A]	CEH	C16-C11-C12	3.07	123.00	118.17
2	A	401[A]	CEH	C20-C21-C22	-2.96	107.62	113.16
2	A	401[A]	CEH	C2-C3-C6	-2.92	115.57	125.96
2	A	401[A]	CEH	C19-C18-N4	2.82	118.84	111.16
2	A	401[A]	CEH	C28-C27-N3	-2.82	105.09	110.38
2	A	401[A]	CEH	C27-C29-N6	-2.37	111.24	116.75
2	A	401[A]	CEH	C21-C22-C23	-2.29	104.82	110.35
2	A	401[A]	CEH	O4-C19-N3	-2.13	118.98	122.93
2	A	401[A]	CEH	O8-C29-N6	2.10	126.82	122.93
2	A	401[A]	CEH	O6-C23-C22	-2.02	115.63	122.26

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401[A]	CEH	N1-C3-C6-O2
2	A	401[A]	CEH	C23-C22-N5-C26
2	A	401[A]	CEH	O12-C26-N5-C22
2	A	401[A]	CEH	C32-C26-N5-C22
2	A	401[A]	CEH	C9-C10-C11-C12
2	A	401[A]	CEH	N5-C22-C23-O5
2	A	401[A]	CEH	C9-C10-C11-C16
2	A	401[A]	CEH	N5-C22-C23-O6
2	A	401[A]	CEH	C2-C3-C6-O1
2	A	401[A]	CEH	N1-C3-C6-O1

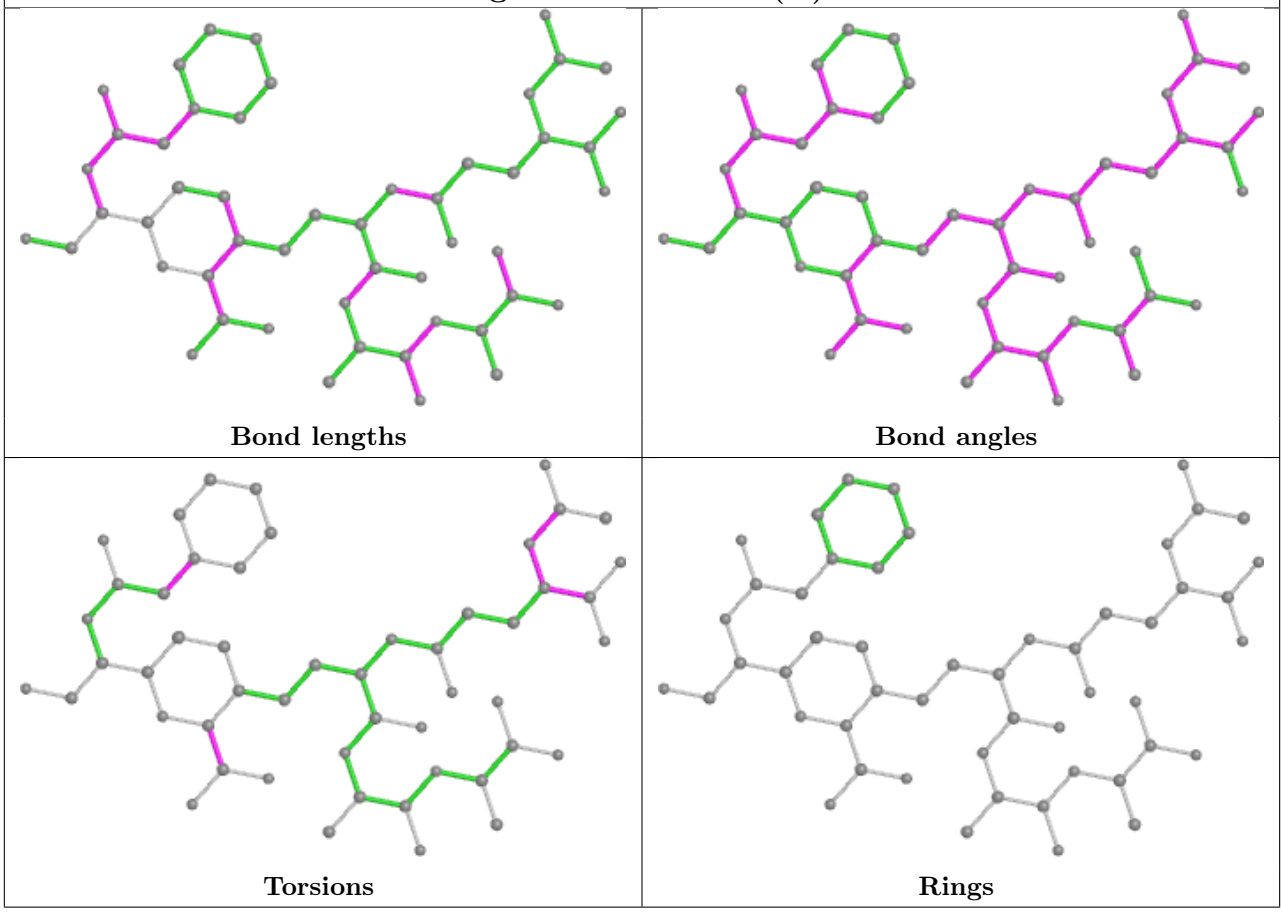
There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401[A]	CEH	4	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 CEH A 401 (A)



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.