Full wwPDB X-ray Structure Validation Report (i)

Jun 13, 2024 – 12:21 AM EDT

PDB ID	:	1ENT
Title	:	X-RAY ANALYSES OF ASPARTIC PROTEINASES. THE THREE-DIMENSIONAL STRUCTURE AT 2.1 ANGSTROMS RESOLUTION OF ENDOTHIAPEPSIN
Authors	:	Blundell, T.L.; Dealwis, C.G.
Deposited on	:	1992-03-11
Resolution	:	1.90 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:

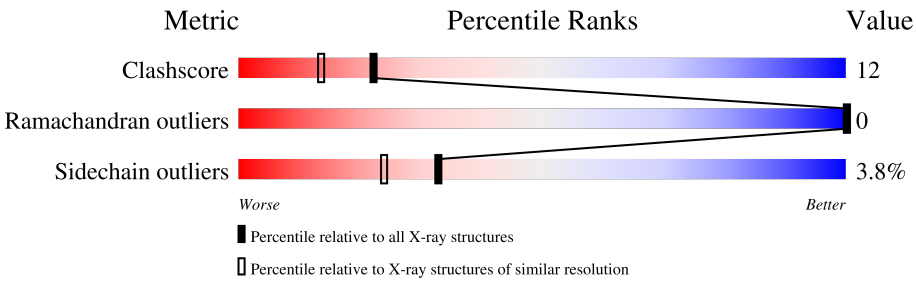
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA,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

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 1.90 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.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)

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 chain
1	E	330	88% 11% •

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	0EM	E	822	-	-	X	-

2 Entry composition (i)

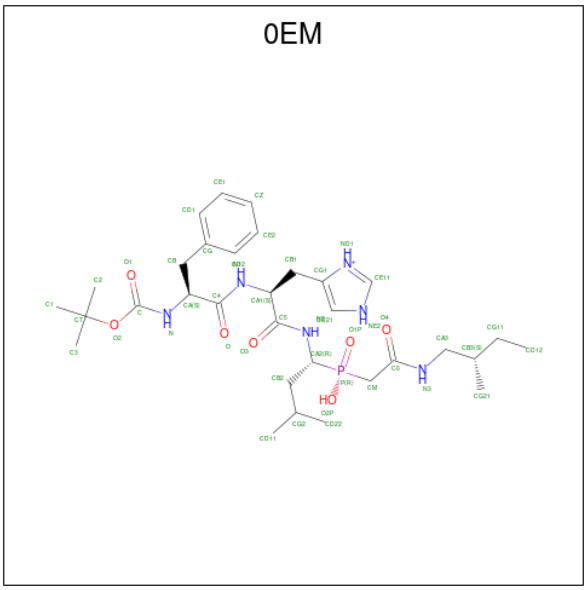
There are 4 unique types of molecules in this entry. The entry contains 2709 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 ENDOTHIAPEPSIN.

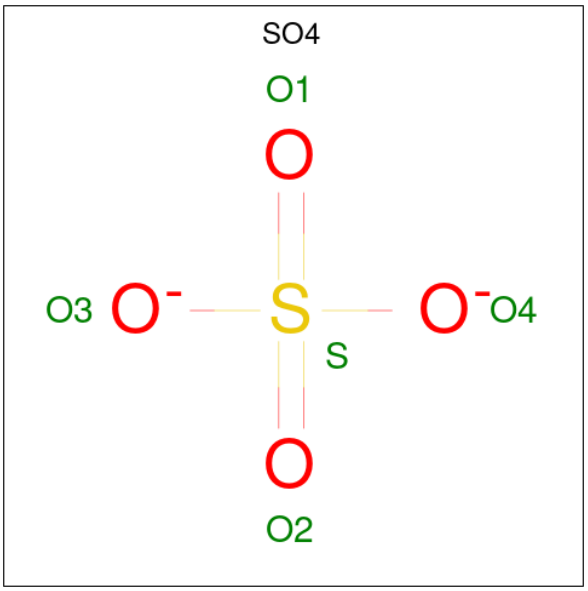
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	E	330	2389	1514	366	507	2	0	0	0

- Molecule 2 is N-(tert-butoxycarbonyl)-L-phenylalanyl-N-{(1S)-1-[(R)-hydroxy(2-{[(2S)-2-methylbutyl]amino}-2-oxoethyl)phosphoryl]-3-methylbutyl}-3-(1H-imidazol-3-ium-4-yl)-L-alaninamide (three-letter code: 0EM) (formula: $C_{32}H_{52}N_6O_7P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	E	1	46	32	6	7	1	0	0

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	E	1	Total O S 5 4 1	0	0
3	E	1	Total O S 5 4 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	E	264	Total O 264 264	0	0

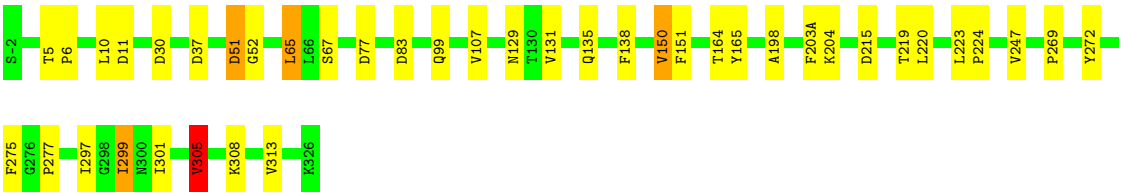
3 Residue-property plots (i)

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: ENDOTHIAPEPSIN

Chain E:



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 21 1	Depositor
Cell constants a, b, c, α, β, γ	43.00Å 75.70Å 42.90Å 90.00° 97.10° 90.00°	Depositor
Resolution (Å)	(Not available) – 1.90	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-1.90)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	RESTRAIN	Depositor
R, R_{free}	0.170 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2709	wwPDB-VP
Average B, all atoms ($Å^2$)	0.0	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: SO4, 0EM

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	E	0.98	0/2445	1.26	10/3345 (0.3%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	150	VAL	CA-CB-CG2	10.32	126.38	110.90
1	E	305	VAL	CA-CB-CG2	9.48	125.12	110.90
1	E	107	VAL	CA-CB-CG2	5.95	119.82	110.90
1	E	247	VAL	CA-CB-CG2	5.52	119.18	110.90
1	E	215	ASP	N-CA-CB	-5.51	100.68	110.60
1	E	65	LEU	CB-CG-CD2	5.46	120.29	111.00
1	E	30	ASP	CB-CG-OD1	5.42	123.18	118.30
1	E	151	PHE	N-CA-CB	5.37	120.27	110.60
1	E	313	VAL	CA-CB-CG2	5.36	118.94	110.90
1	E	215	ASP	CB-CG-OD1	5.03	122.83	118.30

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	E	2389	0	2280	22	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	46	0	51	36	0
3	E	10	0	0	0	0
4	E	264	0	0	2	2
All	All	2709	0	2331	56	2

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 12.

All (56) 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:E:822:0EM:CD22	2:E:822:0EM:HD22	0.97	1.15
2:E:822:0EM:HD3	2:E:822:0EM:CD12	0.97	1.14
2:E:822:0EM:CD12	2:E:822:0EM:HD15	0.97	1.13
2:E:822:0EM:CD22	2:E:822:0EM:HD23	0.97	1.12
2:E:822:0EM:CD22	2:E:822:0EM:HD24	0.97	1.10
2:E:822:0EM:CD12	2:E:822:0EM:HD25	0.97	1.10
2:E:822:0EM:HD13	2:E:822:0EM:CD11	0.97	1.10
2:E:822:0EM:CD11	2:E:822:0EM:HD12	0.97	1.10
2:E:822:0EM:HD21	2:E:822:0EM:CD21	0.97	1.08
2:E:822:0EM:HE11	2:E:822:0EM:CE11	0.97	1.07
2:E:822:0EM:CD11	2:E:822:0EM:HD14	0.97	1.05
2:E:822:0EM:HD12	2:E:822:0EM:CG2	2.05	0.87
2:E:822:0EM:HD13	2:E:822:0EM:CG2	2.05	0.86
2:E:822:0EM:HD25	2:E:822:0EM:CG11	2.05	0.86
2:E:822:0EM:HD3	2:E:822:0EM:CG11	2.05	0.86
2:E:822:0EM:HD14	2:E:822:0EM:CG2	2.05	0.85
2:E:822:0EM:HD13	2:E:822:0EM:HD12	1.58	0.85
2:E:822:0EM:HD12	2:E:822:0EM:HD14	1.58	0.85
2:E:822:0EM:HD15	2:E:822:0EM:HD25	1.58	0.85
2:E:822:0EM:HD3	2:E:822:0EM:HD25	1.58	0.85
2:E:822:0EM:HD3	2:E:822:0EM:HD15	1.58	0.85
2:E:822:0EM:HD15	2:E:822:0EM:CG11	2.05	0.85
2:E:822:0EM:HD22	2:E:822:0EM:HD23	1.58	0.84
2:E:822:0EM:HD23	2:E:822:0EM:HD24	1.58	0.84
2:E:822:0EM:HD22	2:E:822:0EM:HD24	1.58	0.83
2:E:822:0EM:HD13	2:E:822:0EM:HD14	1.58	0.83
2:E:822:0EM:HD23	2:E:822:0EM:CG2	2.09	0.82
2:E:822:0EM:HD22	2:E:822:0EM:CG2	2.09	0.82
1:E:297:ILE:HG12	2:E:822:0EM:HE11	1.59	0.81
2:E:822:0EM:HD24	2:E:822:0EM:CG2	2.09	0.80

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:297:ILE:HG22	1:E:299:ILE:HG22	1.61	0.80
2:E:822:0EM:HD21	2:E:822:0EM:CG1	2.12	0.79
2:E:822:0EM:HE11	2:E:822:0EM:ND1	2.11	0.66
2:E:822:0EM:HD21	2:E:822:0EM:NE2	2.11	0.65
2:E:822:0EM:HE11	2:E:822:0EM:NE2	2.12	0.64
1:E:297:ILE:CG2	1:E:299:ILE:HG22	2.27	0.62
1:E:5:THR:HG23	4:E:852:HOH:O	1.99	0.61
1:E:220:LEU:HA	1:E:305:VAL:HG13	1.83	0.61
1:E:129:ASN:ND2	1:E:135:GLN:H	2.00	0.60
1:E:305:VAL:HA	1:E:308:LYS:HE2	1.89	0.54
1:E:223:LEU:HB3	1:E:224:PRO:HD2	1.90	0.54
1:E:219:THR:HG21	1:E:275:PHE:CZ	2.43	0.54
1:E:77:ASP:HB3	2:E:822:0EM:HB21	1.91	0.52
1:E:99:GLN:NE2	1:E:138:PHE:HA	2.26	0.51
1:E:10:LEU:O	1:E:11:ASP:HB2	2.12	0.49
1:E:269:PRO:HG2	1:E:272:TYR:CE1	2.48	0.49
1:E:223:LEU:HB3	1:E:224:PRO:CD	2.44	0.48
1:E:129:ASN:ND2	1:E:131:VAL:H	2.12	0.47
1:E:83:ASP:HB2	4:E:862:HOH:O	2.16	0.46
1:E:219:THR:CG2	1:E:275:PHE:CZ	2.99	0.45
1:E:129:ASN:HD21	1:E:131:VAL:HB	1.82	0.44
1:E:198:ALA:HB2	1:E:203(A):PHE:HA	2.01	0.43
1:E:164:THR:HG22	1:E:165:TYR:N	2.34	0.42
2:E:822:0EM:H22	2:E:822:0EM:O1	2.20	0.42
1:E:297:ILE:HD13	1:E:301:ILE:HD12	2.03	0.40
1:E:51:ASP:HB3	1:E:52:GLY:H	1.33	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:1046:HOH:O	4:E:1061:HOH:O[2_656]	0.21	1.99
4:E:909:HOH:O	4:E:1037:HOH:O[1_655]	1.92	0.28

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	E	328/330 (99%)	323 (98%)	5 (2%)	0	100 100

There are no Ramachandran outliers to report.

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	E	263/263 (100%)	253 (96%)	10 (4%)	33 24

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	6	PRO
1	E	37	ASP
1	E	51	ASP
1	E	65	LEU
1	E	67	SER
1	E	150	VAL
1	E	204	LYS
1	E	277	PRO
1	E	299	ILE
1	E	305	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	19	GLN
1	E	99	GLN
1	E	129	ASN
1	E	134(A)	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	E	135	GLN
1	E	141	ASN
1	E	166	ASN
1	E	187	GLN
1	E	300	ASN

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)

3 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	0EM	E	822	-	40,47,47	0.95	2 (5%)	48,65,65	0.87	2 (4%)
3	SO4	E	823	-	4,4,4	0.18	0	6,6,6	0.11	0
3	SO4	E	824	-	4,4,4	0.16	0	6,6,6	0.12	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
2	0EM	E	822	-	-	6/51/55/55	0/2/2/2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	822	0EM	O2-C	3.81	1.42	1.34
2	E	822	0EM	O2-CT	-2.63	1.43	1.48

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	E	822	0EM	O2-C-N	2.67	114.50	110.02
2	E	822	0EM	O2-C-O1	-2.16	121.67	125.62

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	E	822	0EM	O3-C5-CA1-N1
2	E	822	0EM	N2-C5-CA1-N1
2	E	822	0EM	CA3-CB3-CG11-CD12
2	E	822	0EM	CG21-CB3-CG11-CD12
2	E	822	0EM	CA1-CB1-CG1-CD21
2	E	822	0EM	O3-C5-CA1-CB1

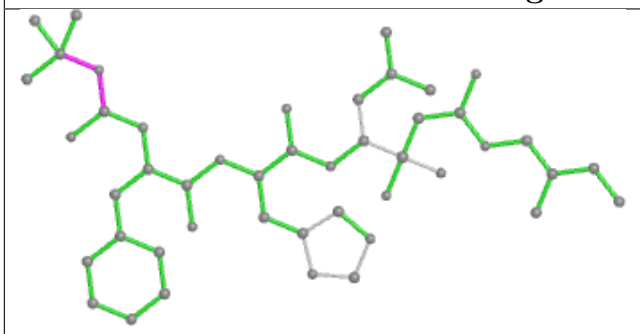
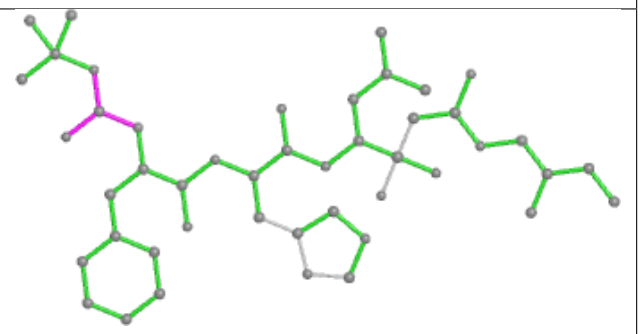
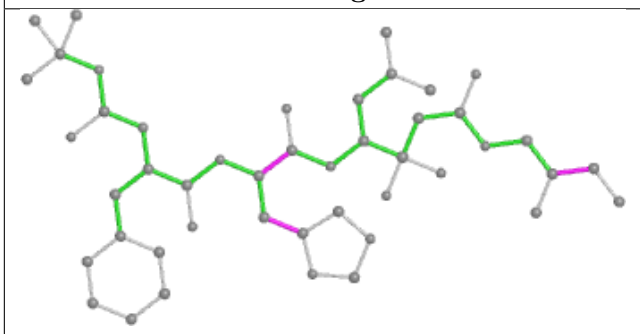
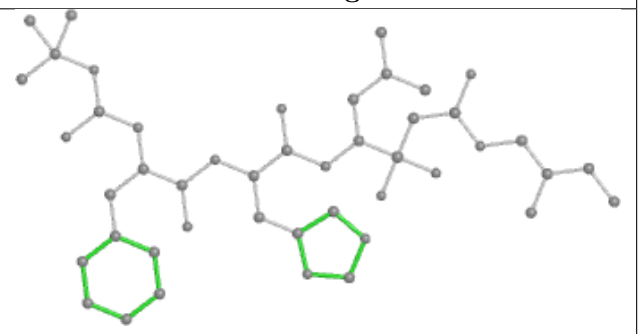
There are no ring outliers.

1 monomer is involved in 36 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	822	0EM	36	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 0EM E 822	
 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)

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.