



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2026 – 10:56 PM UTC

PDB ID : 6B88 / pdb_00006b88
Title : E. coli LepB in complex with GNE0775 ((4S,7S,10S)-10-((S)-4-amino-2-(2-(4-(tert-butyl)phenyl)-4-methylpyrimidine-5-carboxamido)-N-methylbutanamido)-16,26-bis(2-aminoethoxy)-N-(2-iminoethyl)-7-methyl-6,9-dioxo-5,8-diaza-1,2(1,3)-dibenzenacyclodecaphane-4-carboxamide)
Authors : Murray, J.M.; Rouge, L.
Deposited on : 2017-10-05
Resolution : 2.41 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](#) ①) were used in the production of this report:

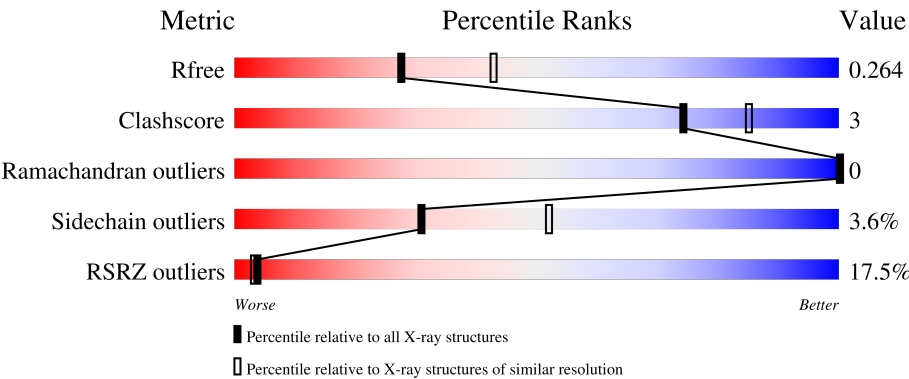
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal 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 i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.41 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))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	247	19% 89% 8% .
1	B	247	15% 87% 9% ..

2 Entry composition [i](#)

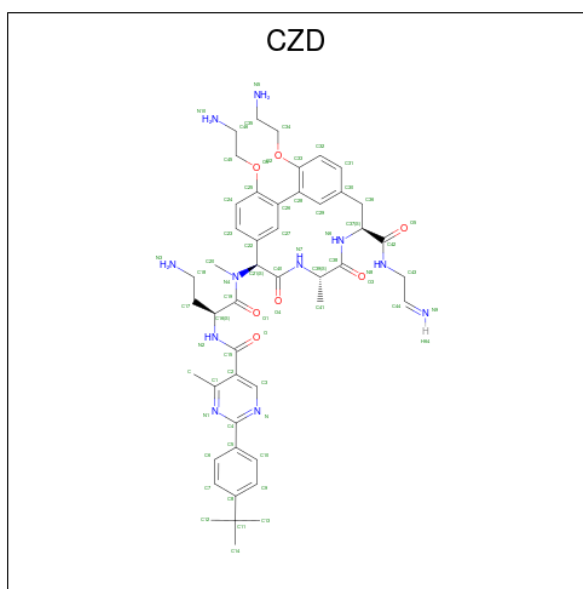
There are 4 unique types of molecules in this entry. The entry contains 3947 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Signal peptidase I.

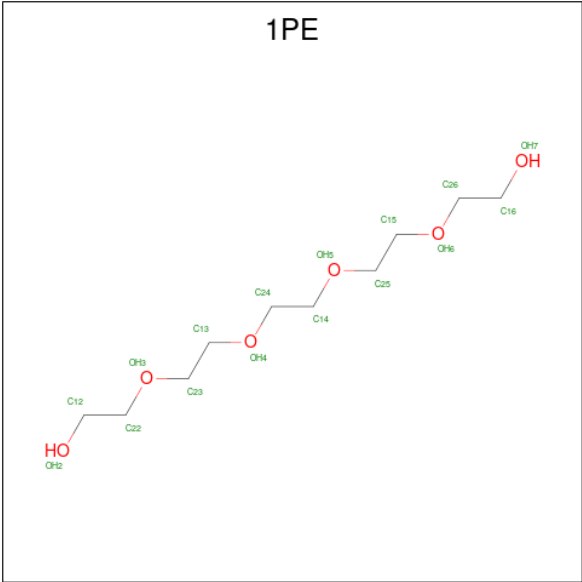
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	239	Total	C	N	O	S	0	0	0
			1834	1173	309	344	8			
1	B	240	Total	C	N	O	S	0	0	0
			1865	1188	317	352	8			

- Molecule 2 is (8S,11S,14S)-14-{[(2S)-4-amino-2-{[2-(4-tert-butylphenyl)-4-methylpyrimidine-5-carbonyl]amino}butanoyl](methylamino)-3,18-bis(2-aminoethoxy)-N-[(2Z)-2-iminoethyl]-11-methyl-10,13-dioxo-9,12-diazatricyclo[13.3.1.1^{2,6}]icosa-1(19),2(20),3,5,15,17-hexaene-8-carboxamide (CCD ID: CZD) (formula: C₄₇H₆₁N₁₁O₇).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			65	47	11	7		
2	B	1	Total	C	N	O	0	0
			65	47	11	7		

- Molecule 3 is PENTAETHYLENE GLYCOL (CCD ID: 1PE) (formula: C₁₀H₂₂O₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			16	10	6		

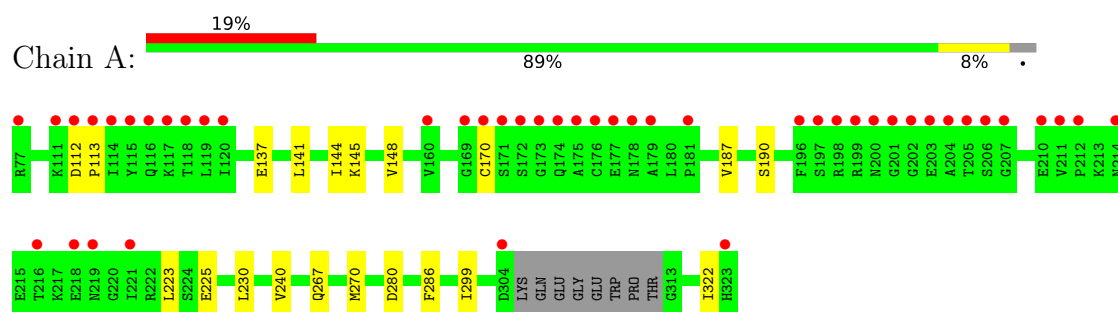
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	51	Total	O	0	2
			53	53		
4	B	48	Total	O	0	1
			49	49		

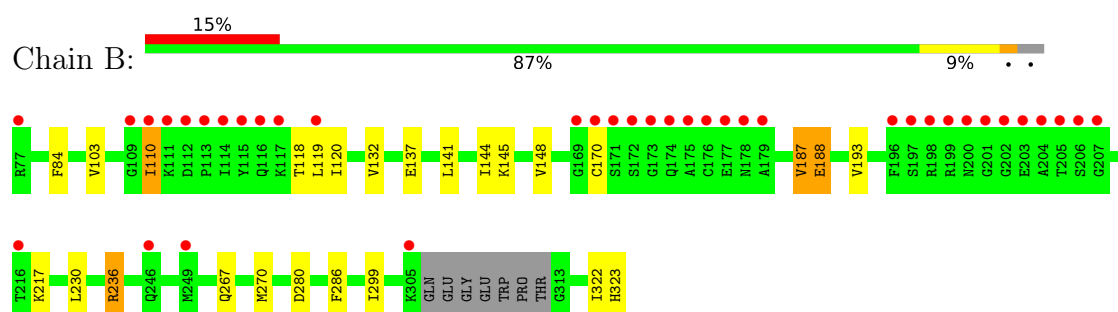
3 Residue-property plots [i](#)

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

• Molecule 1: Signal peptidase I



• Molecule 1: Signal peptidase I



4 Data and refinement statistics

Property	Value	Source
Space group	I 4	Depositor
Cell constants a, b, c, α , β , γ	109.98Å 109.98Å 116.25Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	54.99 – 2.41 54.99 – 2.41	Depositor EDS
% Data completeness (in resolution range)	99.0 (54.99-2.41) 99.0 (54.99-2.41)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.63 (at 2.40Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.238 , 0.265 0.238 , 0.264	Depositor DCC
R_{free} test set	1349 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	31.3	Xtriage
Anisotropy	0.156	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 55.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.058 for -h,k,-l	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	3947	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.58% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CZD, 1PE

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	0.65	0/1881	0.85	0/2556
1	B	0.78	2/1912 (0.1%)	0.90	0/2594
All	All	0.72	2/3793 (0.1%)	0.88	0/5150

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	188	GLU	C-O	-5.96	1.18	1.24
1	B	187	VAL	C-O	-5.02	1.18	1.24

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	1834	0	1757	9	0
1	B	1865	0	1795	12	0
2	A	65	0	0	1	0
2	B	65	0	0	2	0
3	B	16	0	22	0	0
4	A	53	0	0	0	0
4	B	49	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	3947	0	3574	23	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 (23) 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:A:144:ILE:O	1:A:145:LYS:HD3	1.88	0.73
1:B:144:ILE:O	1:B:145:LYS:HD3	1.98	0.64
1:B:110:ILE:HG23	1:B:119:LEU:CD2	2.42	0.49
1:A:270:MET:O	1:A:280:ASP:HB2	2.13	0.48
2:B:402:CZD:C29	2:B:402:CZD:N6	2.76	0.48
1:A:145:LYS:HB2	1:A:270:MET:HB3	1.96	0.47
1:B:110:ILE:HG23	1:B:119:LEU:HD23	1.96	0.46
1:B:84:PHE:HA	2:B:402:CZD:O1	2.17	0.45
1:B:270:MET:O	1:B:280:ASP:HB2	2.17	0.44
1:B:145:LYS:HB2	1:B:270:MET:HB3	2.00	0.44
1:A:148:VAL:HG12	1:A:230:LEU:HD11	2.00	0.44
1:B:148:VAL:HG12	1:B:230:LEU:HD11	1.99	0.44
1:A:112:ASP:O	1:A:113:PRO:C	2.60	0.44
1:B:236:ARG:H	1:B:236:ARG:HG2	1.68	0.43
1:A:267:GLN:HB3	1:A:286:PHE:HB3	2.01	0.43
1:A:223:LEU:HD22	1:A:240:VAL:HG22	2.02	0.42
1:B:267:GLN:HB3	1:B:286:PHE:HB3	2.02	0.42
1:A:299:ILE:HG13	1:A:322:ILE:HG12	2.02	0.41
2:A:401:CZD:N6	2:A:401:CZD:C29	2.82	0.41
1:B:299:ILE:HG13	1:B:322:ILE:HG12	2.03	0.41
1:B:193:VAL:HG11	1:B:217:LYS:HB3	2.03	0.40
1:B:103:VAL:HG21	1:B:132:VAL:HG21	2.03	0.40
1:A:190:SER:HB3	1:A:225:GLU:HB2	2.03	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	A	235/247 (95%)	224 (95%)	11 (5%)	0	100	100
1	B	236/247 (96%)	227 (96%)	9 (4%)	0	100	100
All	All	471/494 (95%)	451 (96%)	20 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	A	192/212 (91%)	188 (98%)	4 (2%)	47	69
1	B	198/212 (93%)	188 (95%)	10 (5%)	21	37
All	All	390/424 (92%)	376 (96%)	14 (4%)	31	52

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	137	GLU
1	A	141	LEU
1	A	170	CYS
1	A	187	VAL
1	B	110	ILE
1	B	118	THR
1	B	120	ILE
1	B	137	GLU
1	B	141	LEU
1	B	170	CYS
1	B	187	VAL
1	B	188	GLU
1	B	236	ARG
1	B	323	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	214	ASN
1	A	244	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 ⓘ

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	CZD	A	401	1	67,69,69	0.34	0	89,97,97	0.75	2 (2%)
2	CZD	B	402	-	67,69,69	0.31	0	89,97,97	0.81	4 (4%)
3	1PE	B	401	-	15,15,15	0.46	0	14,14,14	0.35	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	CZD	A	401	1	-	8/76/77/77	0/4/5/5
2	CZD	B	402	-	-	10/76/77/77	0/4/5/5
3	1PE	B	401	-	-	7/13/13/13	-

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	402	CZD	C3-C2-C15	2.81	125.17	118.23
2	A	401	CZD	C17-C16-C19	2.62	116.24	109.75
2	B	402	CZD	C28-C26-C25	2.52	126.81	121.91
2	B	402	CZD	C44-C43-N8	-2.50	103.48	112.07
2	B	402	CZD	C17-C16-C19	2.43	115.77	109.75
2	A	401	CZD	C26-C28-C33	2.08	125.96	121.91

There are no chirality outliers.

All (25) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	CZD	O2-C34-C35-N5
2	A	401	CZD	O6-C45-C46-N10
2	B	402	CZD	O2-C34-C35-N5
2	B	402	CZD	O6-C45-C46-N10
3	B	401	1PE	OH4-C13-C23-OH3
2	A	401	CZD	C29-C30-C36-C37
3	B	401	1PE	OH7-C16-C26-OH6
2	B	402	CZD	O4-C40-N7-C39
2	B	402	CZD	C29-C30-C36-C37
2	A	401	CZD	C31-C30-C36-C37
2	B	402	CZD	C31-C30-C36-C37
3	B	401	1PE	OH5-C14-C24-OH4
2	B	402	CZD	C21-C40-N7-C39
3	B	401	1PE	C12-C22-OH3-C23
3	B	401	1PE	C25-C15-OH6-C26
2	A	401	CZD	N6-C37-C42-O5
3	B	401	1PE	C14-C24-OH4-C13
2	A	401	CZD	N6-C37-C42-N8
2	B	402	CZD	O-C15-C2-C1
3	B	401	1PE	OH6-C15-C25-OH5
2	B	402	CZD	N6-C37-C42-O5
2	A	401	CZD	C36-C37-C42-O5

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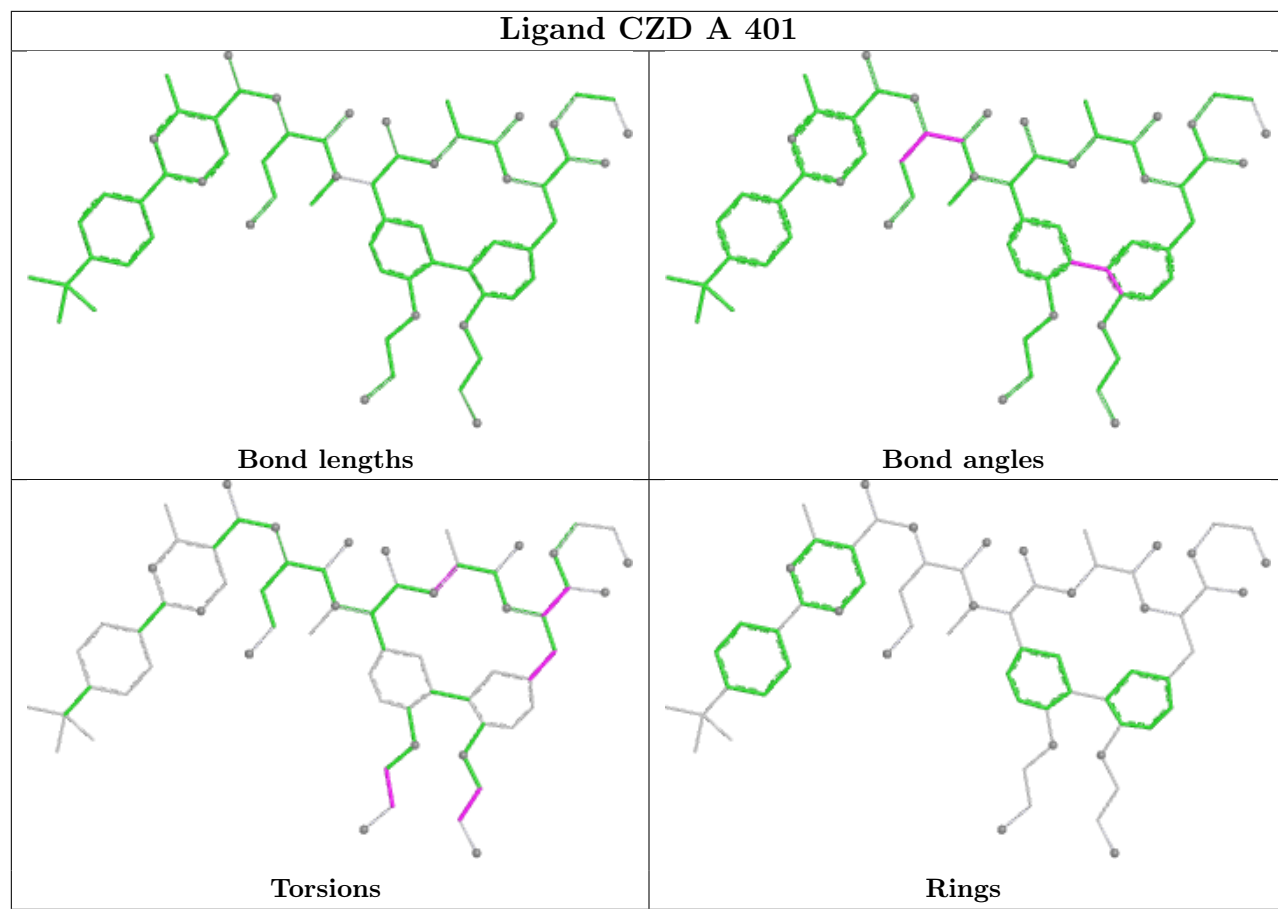
Mol	Chain	Res	Type	Atoms
2	B	402	CZD	N6-C37-C42-N8
2	B	402	CZD	N2-C15-C2-C1
2	A	401	CZD	C38-C39-N7-C40

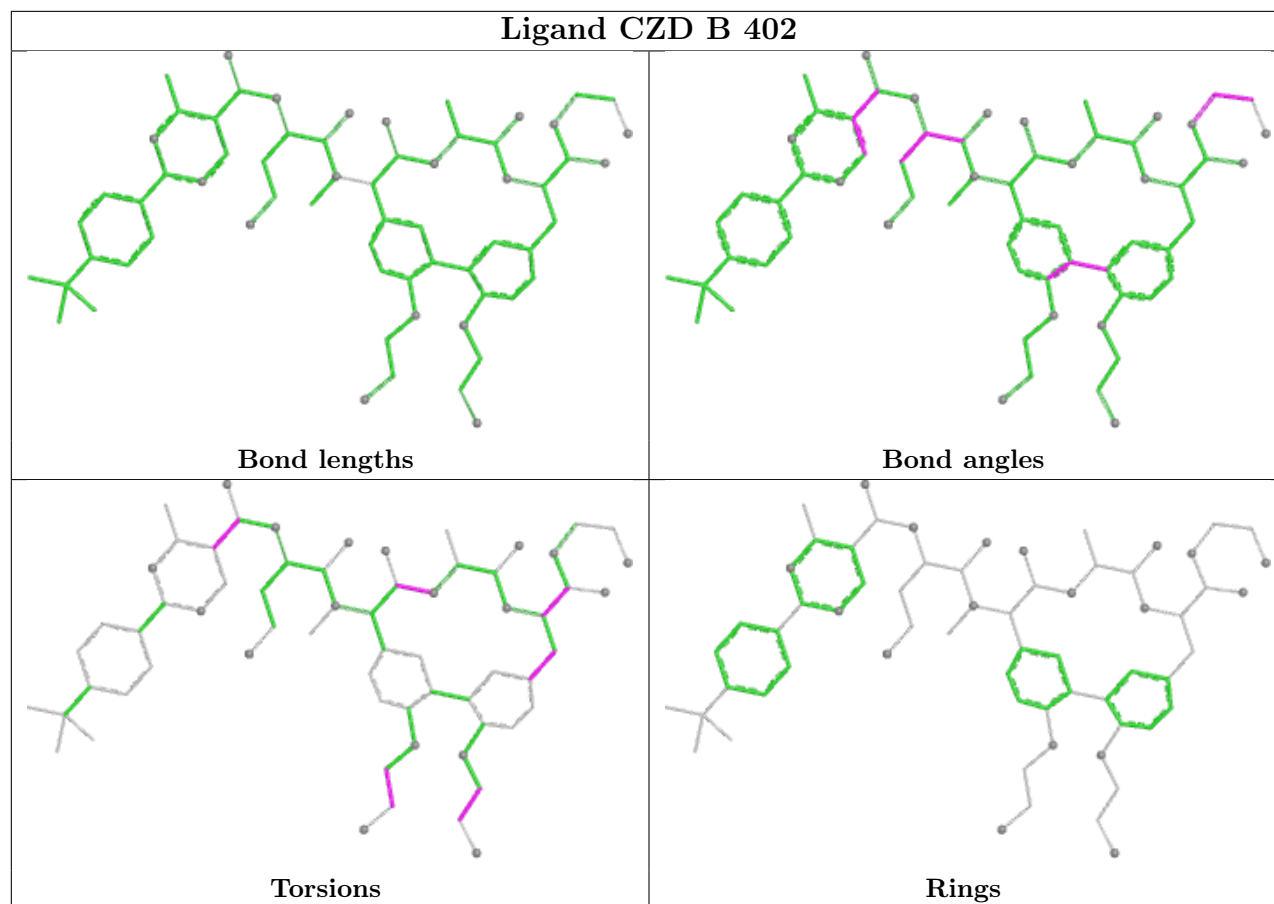
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	CZD	1	0
2	B	402	CZD	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

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	239/247 (96%)	0.87	46 (19%) 3 2	15, 41, 114, 137	0
1	B	240/247 (97%)	0.77	38 (15%) 5 4	17, 44, 113, 131	0
All	All	479/494 (96%)	0.82	84 (17%) 4 3	15, 43, 113, 137	0

All (84) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	204	ALA	5.7
1	A	200	ASN	5.5
1	B	114	ILE	5.5
1	A	201	GLY	5.5
1	B	113	PRO	5.4
1	A	173	GLY	5.2
1	A	204	ALA	5.2
1	B	175	ALA	5.2
1	B	202	GLY	5.1
1	A	205	THR	5.0
1	B	116	GLN	4.9
1	A	179	ALA	4.9
1	B	117	LYS	4.8
1	A	175	ALA	4.6
1	B	112	ASP	4.6
1	A	112	ASP	4.6
1	A	114	ILE	4.4
1	A	177	GLU	4.4
1	A	216	THR	4.3
1	A	202	GLY	4.3
1	A	203	GLU	4.2
1	B	176	CYS	4.1
1	A	113	PRO	4.0
1	B	115	TYR	4.0

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Mol	Chain	Res	Type	RSRZ
1	A	116	GLN	4.0
1	A	197	SER	4.0
1	B	197	SER	4.0
1	A	199	ARG	3.8
1	A	198	ARG	3.7
1	A	207	GLY	3.7
1	B	174	GLN	3.7
1	B	172	SER	3.6
1	B	203	GLU	3.6
1	B	110	ILE	3.6
1	B	198	ARG	3.6
1	B	305	LYS	3.5
1	A	118	THR	3.5
1	A	172	SER	3.5
1	B	179	ALA	3.5
1	A	170	CYS	3.5
1	A	206	SER	3.5
1	B	200	ASN	3.4
1	A	174	GLN	3.4
1	B	171	SER	3.4
1	A	115	TYR	3.3
1	A	196	PHE	3.3
1	B	199	ARG	3.2
1	B	205	THR	3.1
1	A	176	CYS	3.1
1	B	173	GLY	3.1
1	B	207	GLY	3.1
1	A	169	GLY	3.0
1	A	214	ASN	3.0
1	A	119	LEU	2.9
1	B	170	CYS	2.9
1	B	216	THR	2.8
1	B	246	GLN	2.7
1	B	119	LEU	2.6
1	A	218	GLU	2.6
1	A	171	SER	2.5
1	B	111	LYS	2.5
1	A	219	ASN	2.5
1	A	212	PRO	2.5
1	A	304	ASP	2.5
1	A	77	ARG	2.5
1	A	211	VAL	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	120	ILE	2.4
1	A	117	LYS	2.4
1	A	210	GLU	2.4
1	A	160	VAL	2.3
1	A	178	ASN	2.3
1	B	109	GLY	2.3
1	B	77	ARG	2.3
1	B	196	PHE	2.2
1	A	323	HIS	2.2
1	A	181	PRO	2.2
1	A	221	ILE	2.2
1	B	178	ASN	2.1
1	B	201	GLY	2.1
1	B	177	GLU	2.1
1	B	206	SER	2.1
1	B	249	MET	2.1
1	A	111	LYS	2.1
1	B	169	GLY	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

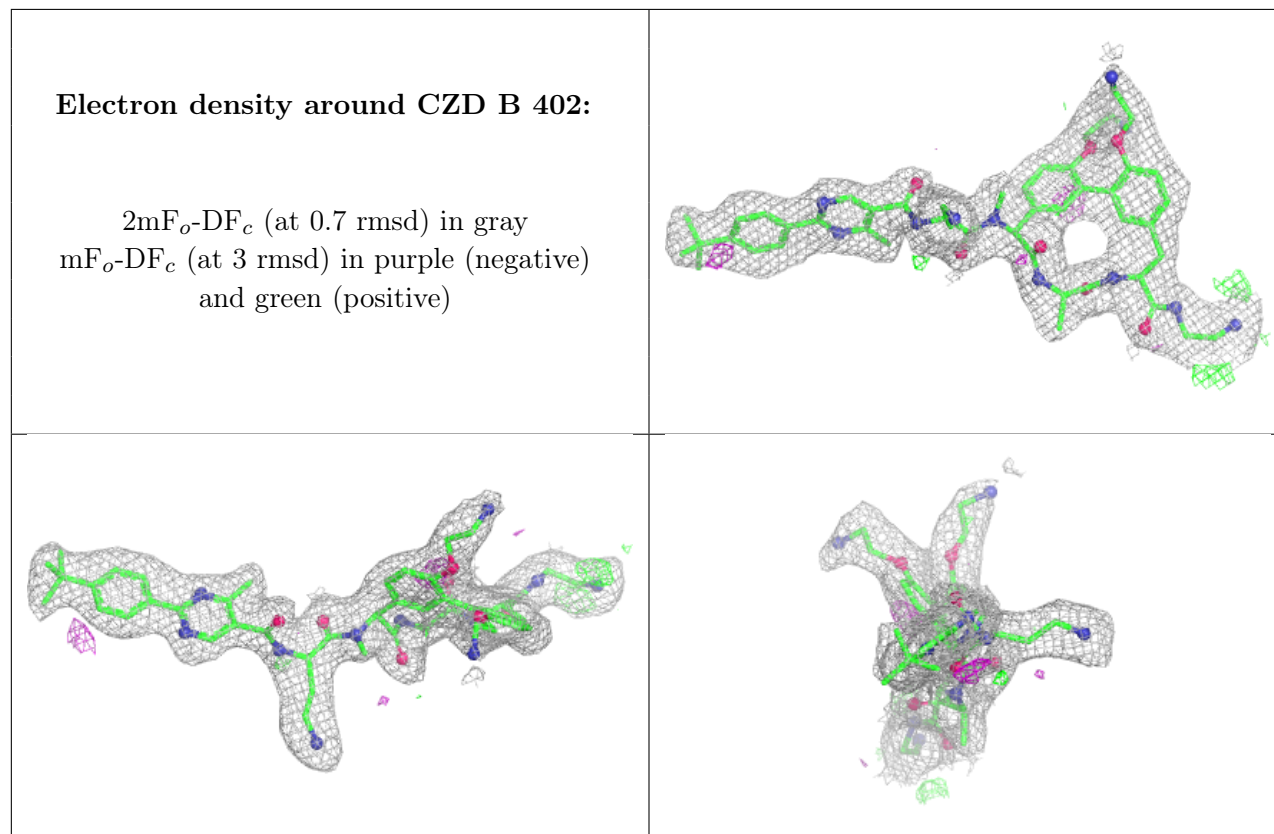
6.4 Ligands [i](#)

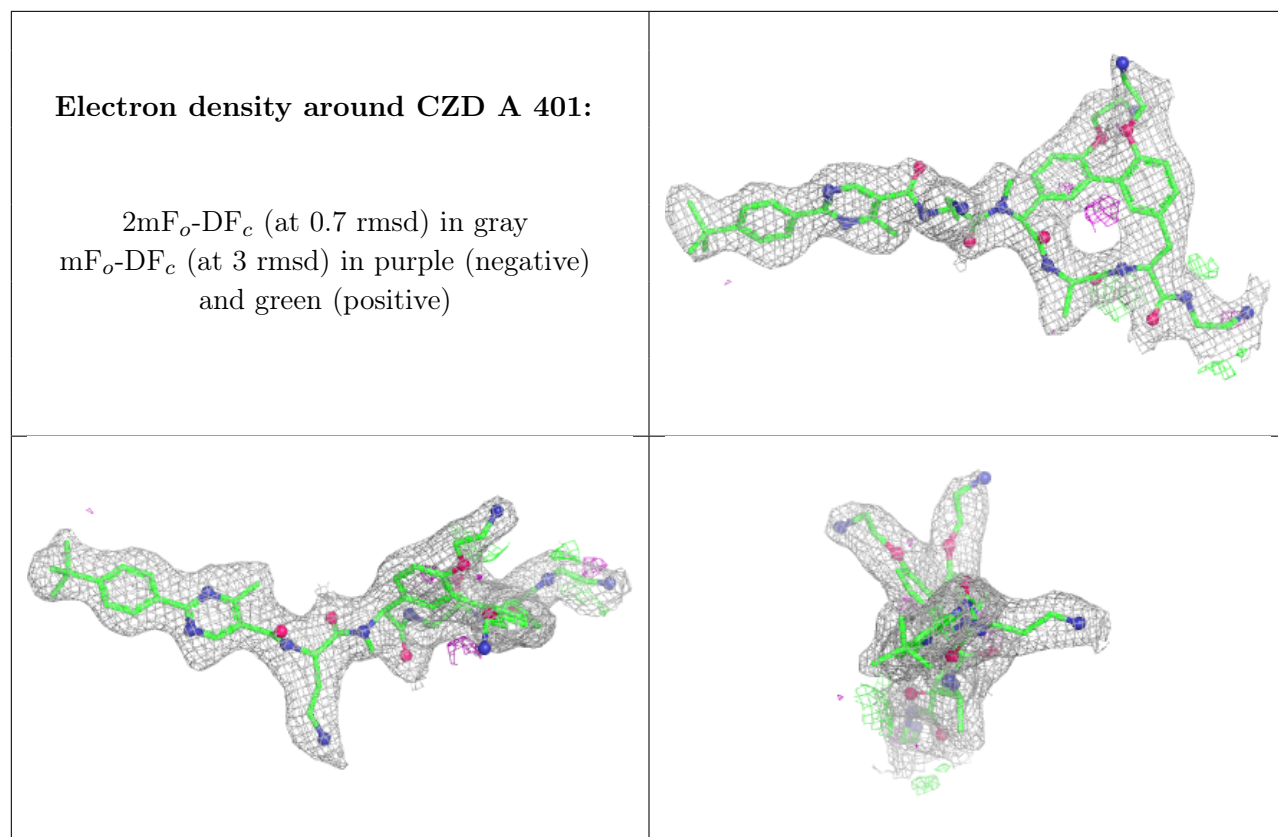
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	1PE	B	401	16/16	0.87	0.15	36,42,58,64	0
2	CZD	B	402	65/65	0.91	0.10	21,32,45,50	0
2	CZD	A	401	65/65	0.91	0.10	20,31,44,52	0

The following is a graphical depiction of the model fit to experimental electron density of all

instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.





6.5 Other polymers [i](#)

There are no such residues in this entry.