



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 4, 2026 – 05:43 PM EDT

PDB ID : 3ESD / pdb_00003esd
Title : cut-2b; NCN-Pt-Pincer-Cutinase Hybrid
Authors : Rutten, L.; Mannie, J.P.B.A.; Lutz, M.; Gros, P.
Deposited on : 2008-10-05
Resolution : 1.22 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 ⓘ](#)) 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 : 9.0.015 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

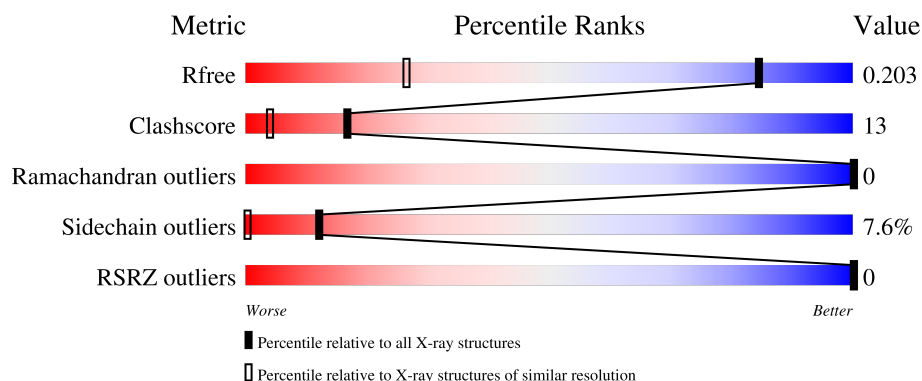
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.22 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	2002 (1.24-1.20)
Clashscore	190562	2061 (1.24-1.20)
Ramachandran outliers	187476	2009 (1.24-1.20)
Sidechain outliers	187428	2008 (1.24-1.20)
RSRZ outliers	180081	2000 (1.24-1.20)

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	214	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 1525 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.

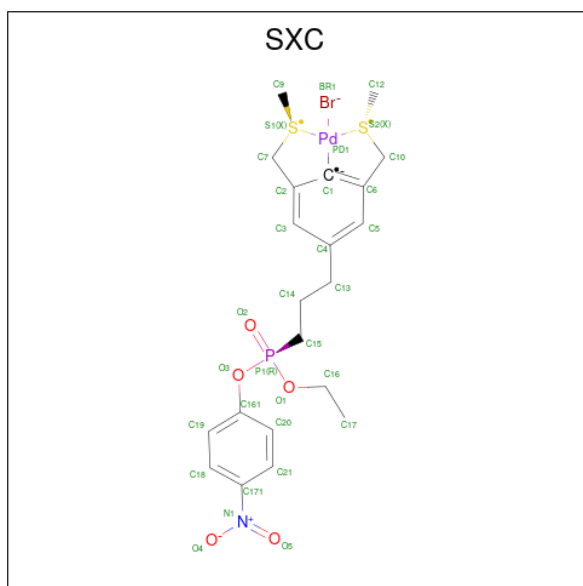
- Molecule 1 is a protein called Cutinase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	195	1430	890	258	277	5	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	32	ALA	ARG	SEE REMARK 999	UNP P00590
A	172	LYS	ASN	engineered mutation	UNP P00590

- Molecule 2 is bromo(4-{3-[(R)-ethoxy(4-nitrophenoxy)phosphoryl]propyl}-2,6-bis[(methylsulfanyl-kappaS)methyl]phenyl-kappaC 1)palladium(2+) (CCD ID: SXC) (formula: $C_{21}H_{27}BrNO_5PPdS_2$).



Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
			Total	Br	C	O	P	Pd	S		
2	A	1	22	1	15	2	1	1	2	0	0

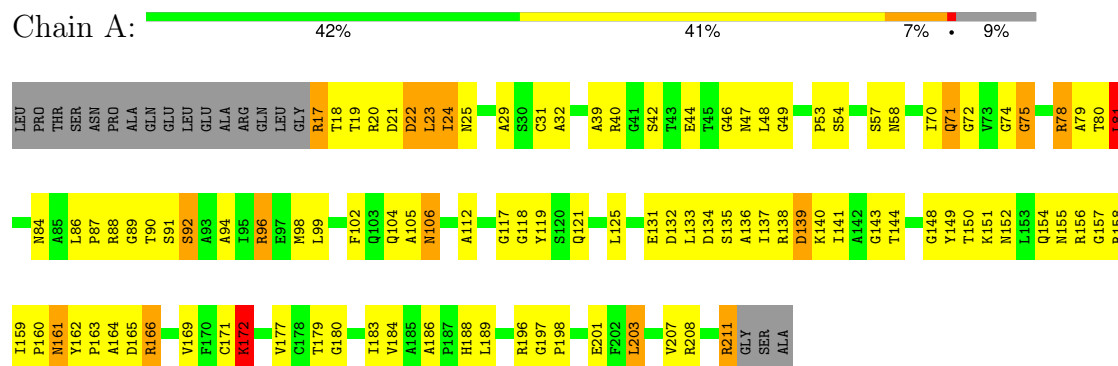
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	73	Total 73	O 73	0	0

3 Residue-property plots

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: Cutinase 1



4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	72.36Å 72.36Å 110.77Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	41.00 – 1.22 41.00 – 1.22	Depositor EDS
% Data completeness (in resolution range)	97.1 (41.00-1.22) 97.1 (41.00-1.22)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.16 (at 1.22Å)	Xtriage
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.199 , 0.222 0.182 , 0.203	Depositor DCC
R_{free} test set	3141 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	12.1	Xtriage
Anisotropy	0.415	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 29.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.37$, $\langle L^2 \rangle = 0.20$	Xtriage
Estimated twinning fraction	0.448 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	1525	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.70% 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: SXC

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	1.35	11/1453 (0.8%)	3.07	136/1971 (6.9%)

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	148	GLY	C-N	10.16	1.47	1.33
1	A	40	ARG	NE-CZ	-8.71	1.23	1.33
1	A	40	ARG	CZ-NH1	8.18	1.44	1.32
1	A	177	VAL	CA-C	7.58	1.64	1.52
1	A	125	LEU	C-N	-7.54	1.24	1.33
1	A	44	GLU	C-O	-7.29	1.14	1.23
1	A	44	GLU	CA-C	6.75	1.62	1.53
1	A	148	GLY	CA-C	-6.13	1.43	1.51
1	A	177	VAL	C-N	-5.87	1.25	1.33
1	A	72	GLY	C-N	5.08	1.38	1.33
1	A	148	GLY	C-O	-5.01	1.17	1.23

All (136) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	40	ARG	NE-CZ-NH2	28.05	144.44	119.20
1	A	177	VAL	O-C-N	26.21	156.38	122.05
1	A	112	ALA	O-C-N	23.79	149.91	123.03
1	A	157	GLY	O-C-N	20.74	147.65	122.34
1	A	47	ASN	OD1-CG-ND2	19.16	141.76	122.60
1	A	44	GLU	O-C-N	18.81	144.00	122.94
1	A	22	ASP	CA-CB-CG	16.45	129.05	112.60
1	A	32	ALA	O-C-N	16.30	141.19	122.94
1	A	125	LEU	O-C-N	15.54	139.87	122.15
1	A	125	LEU	CA-C-O	-15.47	104.02	120.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	148	GLY	CA-C-O	15.06	146.78	120.57
1	A	177	VAL	CA-C-O	-14.45	101.93	119.85
1	A	40	ARG	CD-NE-CZ	13.48	143.28	124.40
1	A	148	GLY	O-C-N	-13.06	105.72	122.70
1	A	49	GLY	O-C-N	-12.55	109.54	122.60
1	A	139	ASP	CA-C-O	12.50	134.20	120.20
1	A	172	LYS	O-C-N	12.45	137.03	122.96
1	A	112	ALA	CA-C-O	-12.35	106.59	121.66
1	A	79	ALA	O-C-N	12.27	137.31	122.58
1	A	138	ARG	O-C-N	-11.96	109.45	122.12
1	A	211	ARG	NE-CZ-NH1	11.70	133.20	121.50
1	A	138	ARG	CA-C-O	11.70	132.95	120.55
1	A	40	ARG	NH1-CZ-NH2	-11.65	104.15	119.30
1	A	157	GLY	CA-C-O	-11.60	104.50	119.58
1	A	159	ILE	O-C-N	11.53	130.46	121.46
1	A	47	ASN	CB-CG-ND2	-10.94	100.00	116.40
1	A	106	ASN	OD1-CG-ND2	10.61	133.21	122.60
1	A	79	ALA	CA-C-O	-10.49	109.38	121.65
1	A	40	ARG	NE-CZ-NH1	-10.13	111.37	121.50
1	A	20	ARG	NE-CZ-NH1	9.78	131.28	121.50
1	A	40	ARG	O-C-N	9.36	134.16	122.65
1	A	22	ASP	CB-CG-OD2	9.12	139.38	118.40
1	A	58	ASN	CA-C-O	-9.01	111.00	120.55
1	A	172	LYS	CA-C-O	-8.95	111.17	121.47
1	A	81	LEU	CA-C-N	8.82	129.91	120.03
1	A	81	LEU	C-N-CA	8.82	129.91	120.03
1	A	102	PHE	CA-CB-CG	8.81	122.61	113.80
1	A	102	PHE	CA-C-N	8.62	131.83	120.28
1	A	102	PHE	C-N-CA	8.62	131.83	120.28
1	A	32	ALA	CA-C-O	-8.61	111.56	121.72
1	A	138	ARG	CD-NE-CZ	8.57	136.40	124.40
1	A	20	ARG	O-C-N	-8.41	113.47	123.31
1	A	23	LEU	O-C-N	-8.40	112.01	122.17
1	A	151	LYS	CA-C-N	8.38	132.44	120.79
1	A	151	LYS	C-N-CA	8.38	132.44	120.79
1	A	162	TYR	CG-CD2-CE2	8.31	133.66	121.20
1	A	31	CYS	CA-C-O	8.20	129.15	120.95
1	A	29	ALA	CA-C-O	8.05	129.20	120.10
1	A	90	THR	CA-C-O	-7.87	112.86	121.28
1	A	139	ASP	O-C-N	-7.68	113.44	122.20
1	A	158	ARG	CA-C-O	7.67	130.44	121.46
1	A	135	SER	CA-C-O	7.64	128.76	120.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	89	GLY	O-C-N	7.59	131.46	122.50
1	A	179	THR	CA-C-N	6.99	135.49	121.93
1	A	179	THR	C-N-CA	6.99	135.49	121.93
1	A	197	GLY	CA-C-N	6.89	126.85	119.28
1	A	197	GLY	C-N-CA	6.89	126.85	119.28
1	A	154	GLN	CG-CD-OE1	6.86	134.52	120.80
1	A	149	TYR	CZ-CE2-CD2	6.80	131.84	119.60
1	A	164	ALA	O-C-N	-6.77	114.49	122.20
1	A	158	ARG	CD-NE-CZ	6.74	133.84	124.40
1	A	105	ALA	CA-C-N	6.72	129.18	120.44
1	A	105	ALA	C-N-CA	6.72	129.18	120.44
1	A	20	ARG	NE-CZ-NH2	-6.56	113.30	119.20
1	A	169	VAL	CA-C-O	6.54	127.56	120.57
1	A	154	GLN	CG-CD-NE2	-6.44	106.74	116.40
1	A	78	ARG	CA-CB-CG	6.39	126.88	114.10
1	A	20	ARG	CA-C-O	6.39	127.41	120.32
1	A	141	ILE	CA-C-N	6.37	128.81	120.28
1	A	141	ILE	C-N-CA	6.37	128.81	120.28
1	A	138	ARG	NE-CZ-NH1	6.35	127.85	121.50
1	A	159	ILE	CA-C-O	-6.31	114.59	119.20
1	A	49	GLY	CA-C-O	6.31	131.91	122.00
1	A	40	ARG	CA-C-O	-6.27	114.73	121.94
1	A	152	ASN	N-CA-CB	6.25	119.32	109.82
1	A	137	ILE	CA-C-O	6.22	127.45	120.85
1	A	31	CYS	O-C-N	-6.22	116.14	123.11
1	A	74	GLY	O-C-N	-6.15	114.70	122.70
1	A	186	ALA	N-CA-CB	6.14	119.95	110.43
1	A	44	GLU	CA-C-O	-6.11	114.51	121.72
1	A	119	TYR	CA-C-O	6.10	126.95	120.36
1	A	58	ASN	O-C-N	6.05	128.53	122.12
1	A	154	GLN	O-C-N	5.94	128.41	122.12
1	A	24	ILE	CA-C-N	-5.86	112.88	122.54
1	A	24	ILE	C-N-CA	-5.86	112.88	122.54
1	A	92	SER	CA-C-O	5.83	126.73	120.55
1	A	117	GLY	O-C-N	-5.81	118.36	123.76
1	A	22	ASP	OD1-CG-OD2	-5.80	108.98	122.90
1	A	132	ASP	O-C-N	5.68	130.24	122.46
1	A	84	ASN	CA-CB-CG	5.68	118.28	112.60
1	A	98	MET	O-C-N	5.64	128.58	122.15
1	A	180	GLY	CA-C-N	-5.63	111.38	122.02
1	A	180	GLY	C-N-CA	-5.63	111.38	122.02
1	A	75	GLY	CA-C-N	5.61	130.09	120.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	75	GLY	C-N-CA	5.61	130.09	120.72
1	A	159	ILE	CA-C-N	5.61	126.86	119.84
1	A	159	ILE	C-N-CA	5.61	126.86	119.84
1	A	25	ASN	OD1-CG-ND2	5.60	128.20	122.60
1	A	18	THR	O-C-N	-5.58	115.19	122.39
1	A	138	ARG	NE-CZ-NH2	-5.58	114.18	119.20
1	A	155	ASN	O-C-N	-5.57	115.50	122.35
1	A	42	SER	O-C-N	5.57	129.72	122.87
1	A	102	PHE	CA-C-O	-5.56	114.66	120.55
1	A	121	GLN	CB-CG-CD	5.49	121.94	112.60
1	A	156	ARG	N-CA-C	5.47	119.12	111.90
1	A	143	GLY	CA-C-O	-5.44	116.16	121.06
1	A	164	ALA	CA-C-O	5.38	126.23	120.20
1	A	211	ARG	NH1-CZ-NH2	-5.37	112.31	119.30
1	A	91	SER	O-C-N	5.37	128.97	122.85
1	A	161	ASN	CA-C-N	5.35	131.95	122.48
1	A	161	ASN	C-N-CA	5.35	131.95	122.48
1	A	203	LEU	CA-C-N	5.34	128.00	120.42
1	A	203	LEU	C-N-CA	5.34	128.00	120.42
1	A	71	GLN	CA-C-N	-5.29	113.99	121.13
1	A	71	GLN	C-N-CA	-5.29	113.99	121.13
1	A	172	LYS	CA-C-N	-5.28	113.21	120.71
1	A	172	LYS	C-N-CA	-5.28	113.21	120.71
1	A	94	ALA	CA-C-O	5.26	126.00	120.42
1	A	44	GLU	CA-C-N	-5.25	112.70	120.94
1	A	44	GLU	C-N-CA	-5.25	112.70	120.94
1	A	211	ARG	NE-CZ-NH2	-5.24	114.49	119.20
1	A	47	ASN	CA-C-N	5.21	130.66	122.11
1	A	47	ASN	C-N-CA	5.21	130.66	122.11
1	A	88	ARG	CA-C-N	-5.20	113.72	122.25
1	A	88	ARG	C-N-CA	-5.20	113.72	122.25
1	A	112	ALA	CA-C-N	-5.18	114.10	121.50
1	A	112	ALA	C-N-CA	-5.18	114.10	121.50
1	A	149	TYR	CG-CD2-CE2	-5.16	113.47	121.20
1	A	144	THR	CA-C-N	-5.15	116.45	123.10
1	A	144	THR	C-N-CA	-5.15	116.45	123.10
1	A	149	TYR	CG-CD1-CE1	5.13	128.90	121.20
1	A	184	VAL	O-C-N	-5.08	115.30	122.76
1	A	161	ASN	OD1-CG-ND2	5.08	127.67	122.60
1	A	80	THR	O-C-N	-5.03	117.28	122.96
1	A	46	GLY	CA-C-N	-5.02	114.47	122.29
1	A	46	GLY	C-N-CA	-5.02	114.47	122.29

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	1430	0	1422	37	0
2	A	22	0	17	2	0
3	A	73	0	0	1	0
All	All	1525	0	1439	37	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 13.

All (37) 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:163:PRO:HG2	1:A:166:ARG:HD2	1.51	0.91
1:A:198:PRO:HA	1:A:201:GLU:HG2	1.68	0.76
1:A:17:ARG:HG3	1:A:19:THR:H	1.54	0.71
1:A:150:THR:HB	3:A:246:HOH:O	1.94	0.68
1:A:24:ILE:HA	1:A:104:GLN:HE22	1.59	0.67
1:A:17:ARG:HE	1:A:19:THR:N	1.94	0.66
1:A:23:LEU:HD11	1:A:104:GLN:HG2	1.78	0.64
1:A:48:LEU:HB3	1:A:53:PRO:HD3	1.80	0.64
1:A:203:LEU:O	1:A:207:VAL:HG23	2.01	0.59
1:A:24:ILE:HG22	1:A:71:GLN:HE22	1.69	0.58
1:A:81:LEU:O	2:A:215:SXC:H17	2.05	0.56
1:A:24:ILE:HA	1:A:104:GLN:NE2	2.23	0.54
1:A:17:ARG:HE	1:A:19:THR:H	1.55	0.54
1:A:134:ASP:OD1	1:A:136:ALA:HB3	2.09	0.53
1:A:188:HIS:NE2	2:A:215:SXC:H216	2.23	0.53
1:A:160:PRO:O	1:A:161:ASN:HB2	2.11	0.51
1:A:198:PRO:HA	1:A:201:GLU:CG	2.41	0.47
1:A:54:SER:HB3	1:A:196:ARG:HG2	1.97	0.45
1:A:39:ALA:O	1:A:118:GLY:HA2	2.17	0.45
1:A:208:ARG:O	1:A:211:ARG:O	2.34	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:17:ARG:NH2	1:A:19:THR:OG1	2.49	0.45
1:A:99:LEU:HD23	1:A:99:LEU:HA	1.84	0.45
1:A:163:PRO:CG	1:A:166:ARG:HD2	2.34	0.45
1:A:75:GLY:O	1:A:78:ARG:NH1	2.49	0.45
1:A:139:ASP:O	1:A:166:ARG:NH2	2.50	0.45
1:A:163:PRO:HB2	1:A:165:ASP:OD1	2.17	0.45
1:A:96:ARG:HH11	1:A:96:ARG:HG3	1.82	0.44
1:A:17:ARG:CG	1:A:19:THR:H	2.29	0.44
1:A:131:GLU:O	1:A:131:GLU:HG2	2.17	0.43
1:A:96:ARG:HG3	1:A:96:ARG:NH1	2.35	0.42
1:A:48:LEU:CB	1:A:53:PRO:HD3	2.48	0.42
1:A:86:LEU:HB3	1:A:87:PRO:HD2	2.02	0.42
1:A:198:PRO:CA	1:A:201:GLU:HG2	2.45	0.42
1:A:172:LYS:HZ3	1:A:172:LYS:HG3	1.79	0.41
1:A:21:ASP:HB3	1:A:24:ILE:CG2	2.50	0.41
1:A:22:ASP:CG	1:A:70:ILE:H	2.27	0.40
1:A:106:ASN:OD1	1:A:140:LYS:HE3	2.21	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	193/214 (90%)	190 (98%)	3 (2%)	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	145/159 (91%)	134 (92%)	11 (8%)	12 0

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	ARG
1	A	57	SER
1	A	81	LEU
1	A	92	SER
1	A	96	ARG
1	A	133	LEU
1	A	166	ARG
1	A	171	CYS
1	A	172	LYS
1	A	183	ILE
1	A	189	LEU

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	71	GLN
1	A	152	ASN

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 ⓘ

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	SXC	A	215	1	18,24,35	1.25	3 (16%)	8,36,53	3.92	2 (25%)

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	SXC	A	215	1	-	0/5/51/62	0/3/3/4

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	215	SXC	C3-C4	-2.47	1.36	1.44
2	A	215	SXC	C3-C2	2.43	1.40	1.34
2	A	215	SXC	C5-C4	2.41	1.40	1.36

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	215	SXC	C6-C5-C4	-10.46	113.61	123.16
2	A	215	SXC	C7-C2-C3	-2.78	122.56	127.52

There are no chirality outliers.

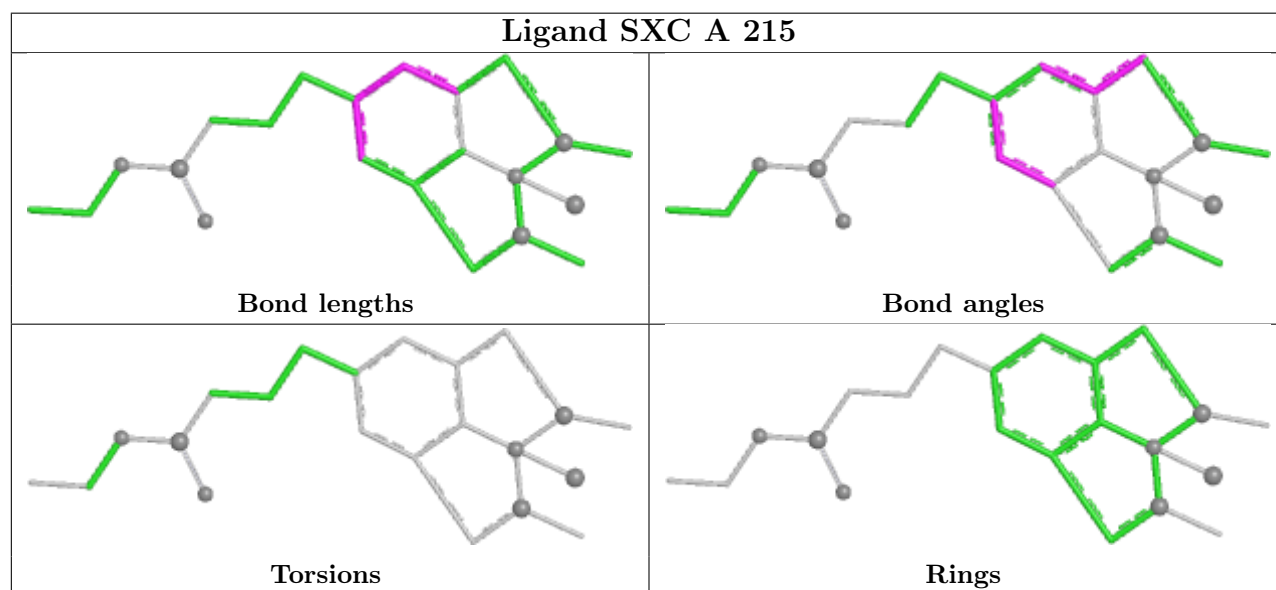
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	215	SXC	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	195/214 (91%)	-0.88	0 100 100	9, 21, 33, 51	0

There are no RSRZ outliers to report.

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](#)

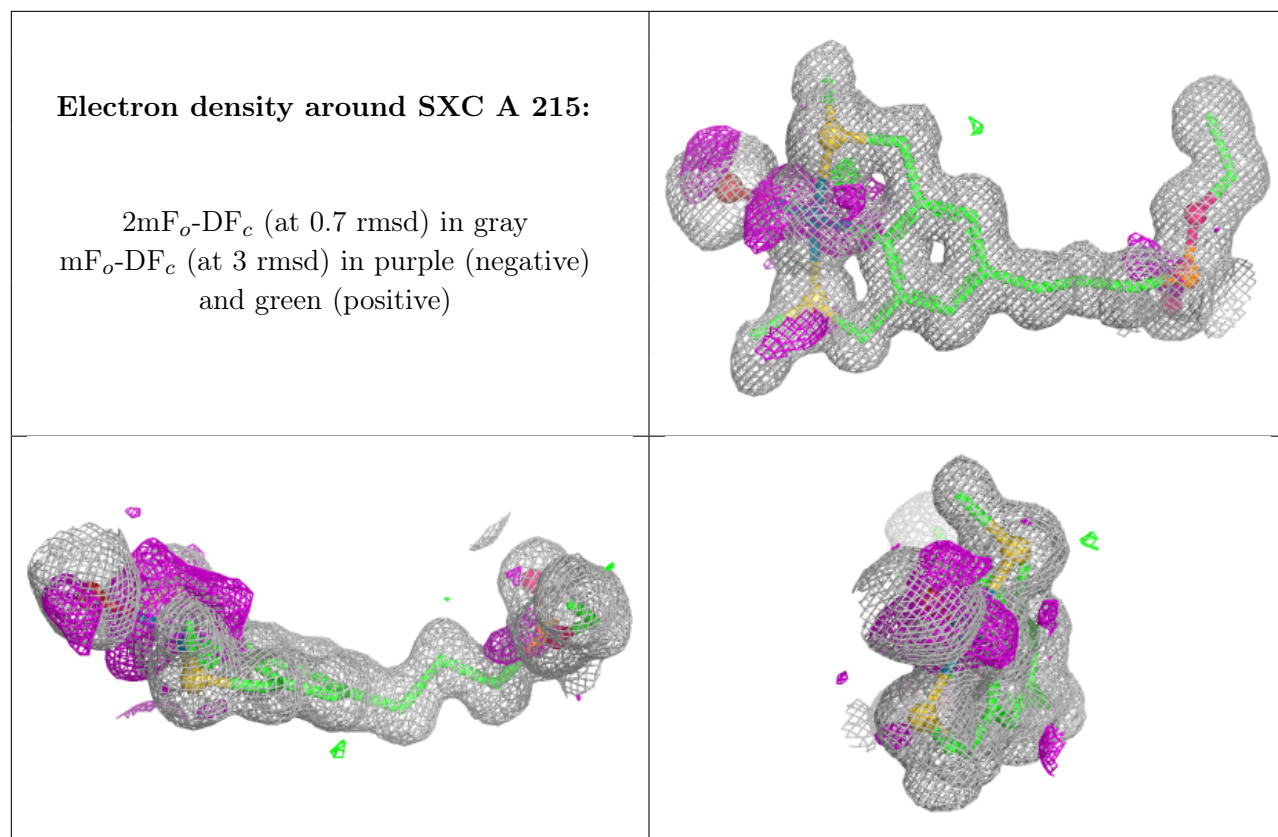
There are no oligosaccharides in this entry.

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
2	SXC	A	215	22/32	1.00	0.03	8,15,22,62	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.