



# wwPDB X-ray Structure Validation Summary Report

Nov 18, 2024 – 04:10 PM EST

PDB ID : 9DJT  
Title : Ternary complex structure of Cereblon-DDB1 bound to WIZ(ZF7) and the molecular glue WIZ-5  
Authors : Partridge, J.R.; Ma, X.; Ornelas, E.  
Deposited on : 2024-09-06  
Resolution : 2.95 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](mailto: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>.

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The following versions of software and data (see [references](#) ) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 1.21  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.003 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

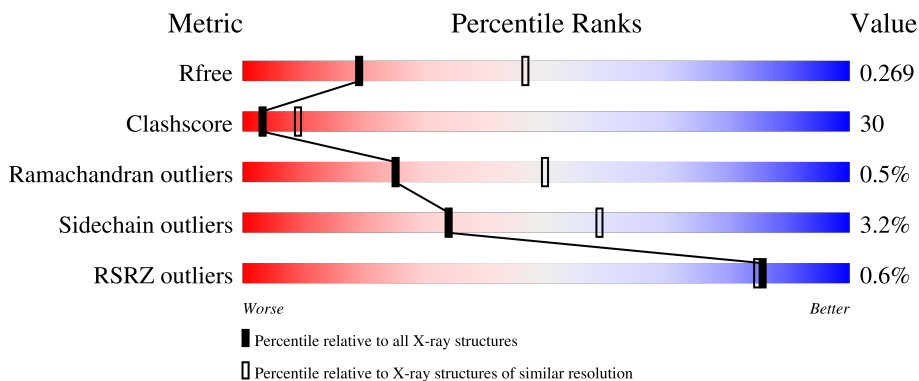
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.95 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))
$R_{free}$	164625	1044 (2.98-2.94)
Clashscore	180529	1097 (2.98-2.94)
Ramachandran outliers	177936	1049 (2.98-2.94)
Sidechain outliers	177891	1049 (2.98-2.94)
RSRZ outliers	164620	1044 (2.98-2.94)

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  $\geq 3$ , 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	373	 52% 37% 9%
1	D	373	 58% 34% 7%
2	B	836	 52% 42%
2	E	836	 53% 41% 5%
3	C	30	 60% 17% 10% 13%

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Mol	Chain	Length	Quality of chain
3	F	30	 57% 27% 7% 10%

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 17742 atoms, of which 54 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 Protein cereblon.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	338	2651	1700	446	482	23	0	0	0
1	D	347	2617	1682	436	477	22	0	0	0

- Molecule 2 is a protein called DNA damage-binding protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	801	6058	3852	1007	1165	34	0	0	0
2	E	795	5881	3747	966	1135	33	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	700	GLY	-	linker	UNP Q16531
B	701	ASN	-	linker	UNP Q16531
B	702	GLY	-	linker	UNP Q16531
B	703	ASN	-	linker	UNP Q16531
B	704	SER	-	linker	UNP Q16531
B	705	GLY	-	linker	UNP Q16531
E	700	GLY	-	linker	UNP Q16531
E	701	ASN	-	linker	UNP Q16531
E	702	GLY	-	linker	UNP Q16531
E	703	ASN	-	linker	UNP Q16531
E	704	SER	-	linker	UNP Q16531
E	705	GLY	-	linker	UNP Q16531

- Molecule 3 is a protein called Protein Wiz.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	26	Total	C	N	O	S	0	0	0
			176	107	31	35	3			
3	F	27	Total	C	N	O	S	0	0	0
			191	115	35	38	3			

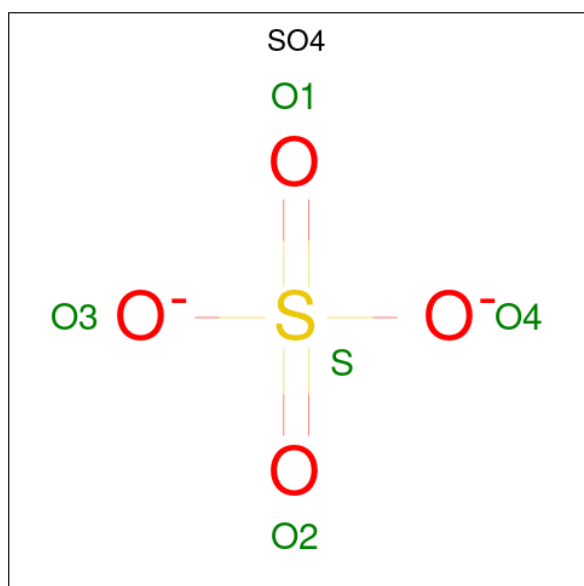
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	866	SER	-	expression tag	UNP O95785
F	866	SER	-	expression tag	UNP O95785

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

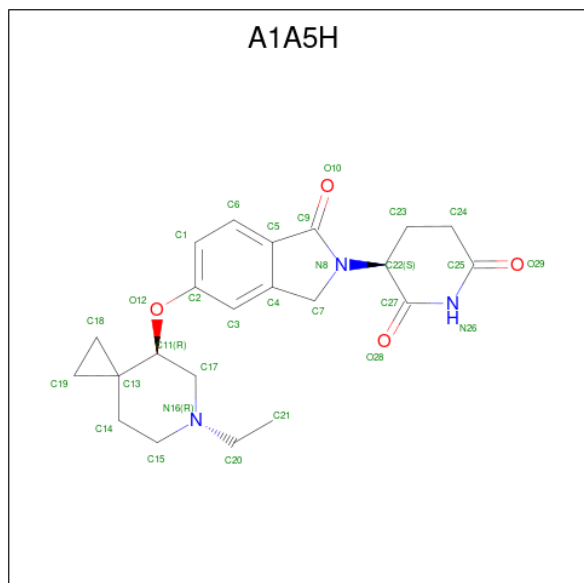
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		
4	C	1	Total	Zn	0	0
			1	1		
4	D	1	Total	Zn	0	0
			1	1		
4	F	1	Total	Zn	0	0
			1	1		

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total O S 5 4 1	0	0
5	D	1	Total O S 5 4 1	0	0

- Molecule 6 is (3S)-3-(5-{[(4R)-6-ethyl-6-azaspiro[2.5]octan-4-yl]oxy}-1-oxo-1,3-dihydro-2H-isoindol-2-yl)piperidine-2,6-dione (three-letter code: A1A5H) (formula: C<sub>22</sub>H<sub>27</sub>N<sub>3</sub>O<sub>4</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C H N O 56 22 27 3 4	27	0
6	D	1	Total C H N O 56 22 27 3 4	27	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	6	Total O 6 6	0	0
7	B	16	Total O 16 16	0	0
7	C	1	Total O 1 1	0	0
7	D	7	Total O 7 7	0	0
7	E	11	Total O 11 11	0	0

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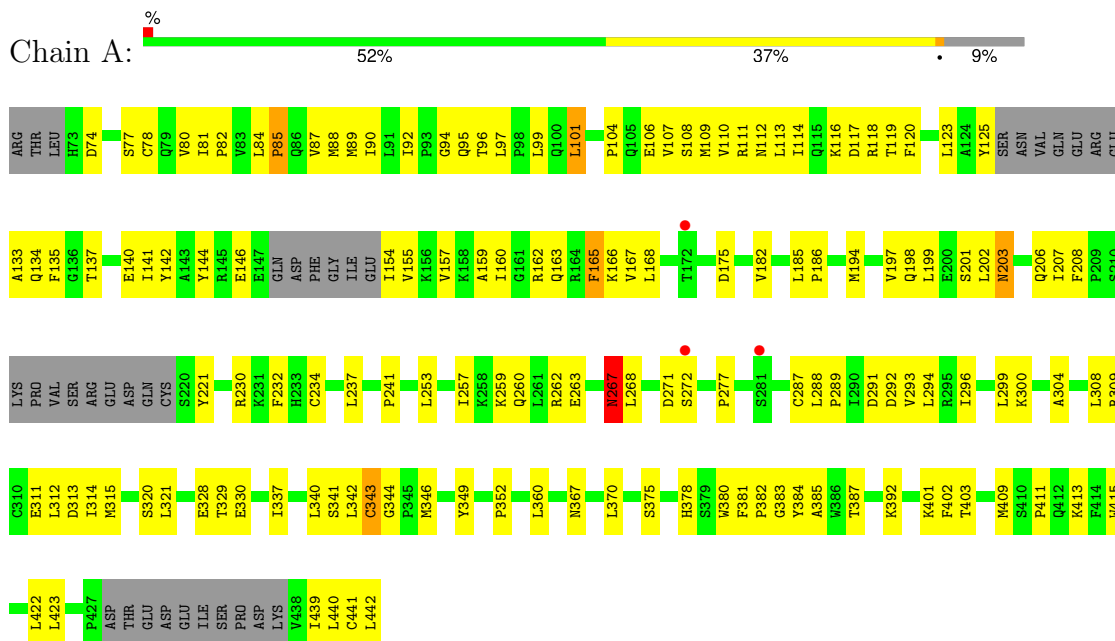
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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
7	F	1	Total	O	0	0
			1	1		

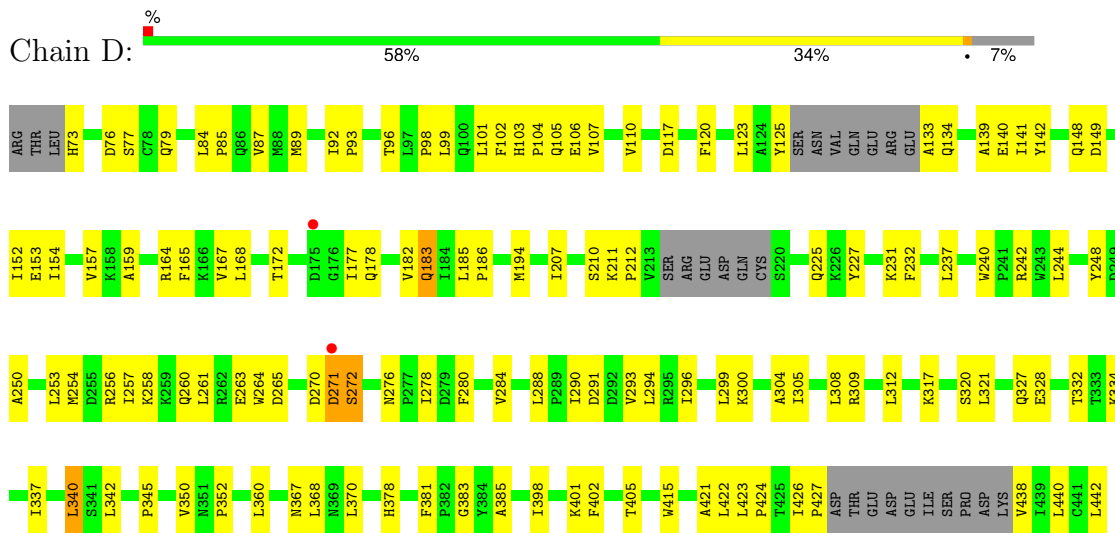
### 3 Residue-property plots

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: Protein cereblon



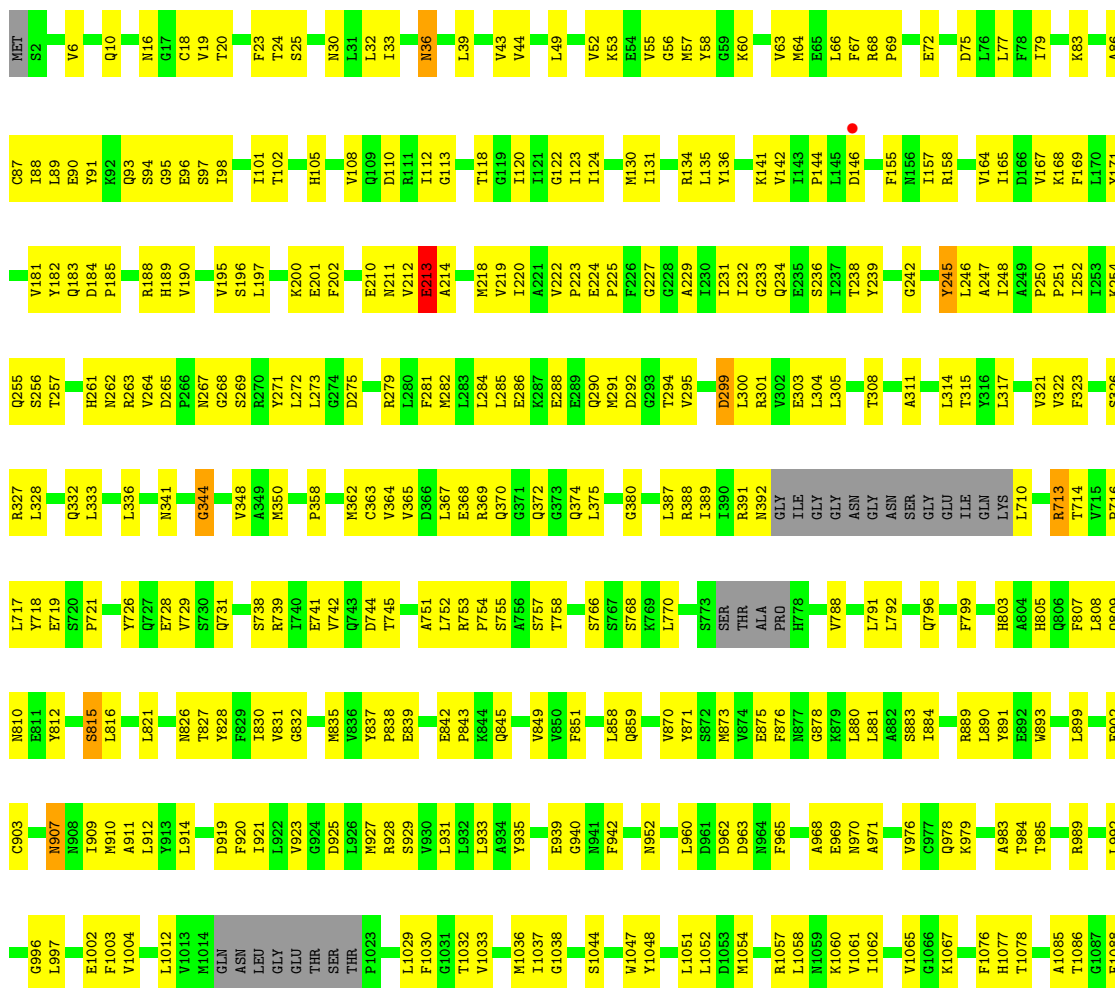
- Molecule 1: Protein cereblon



- Molecule 2: DNA damage-binding protein 1

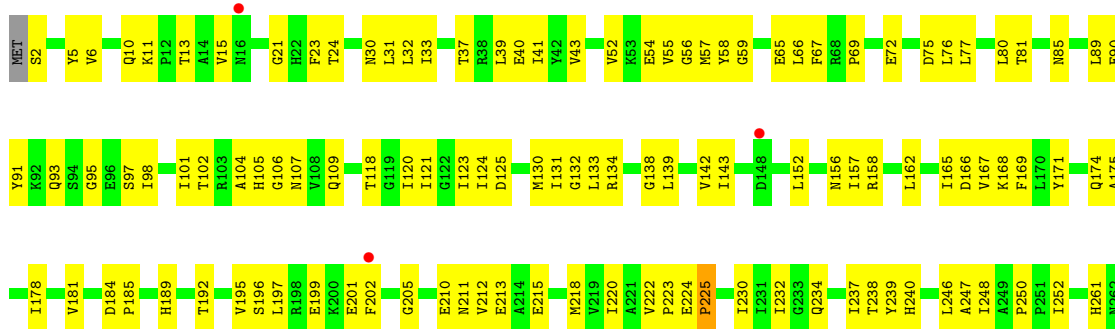


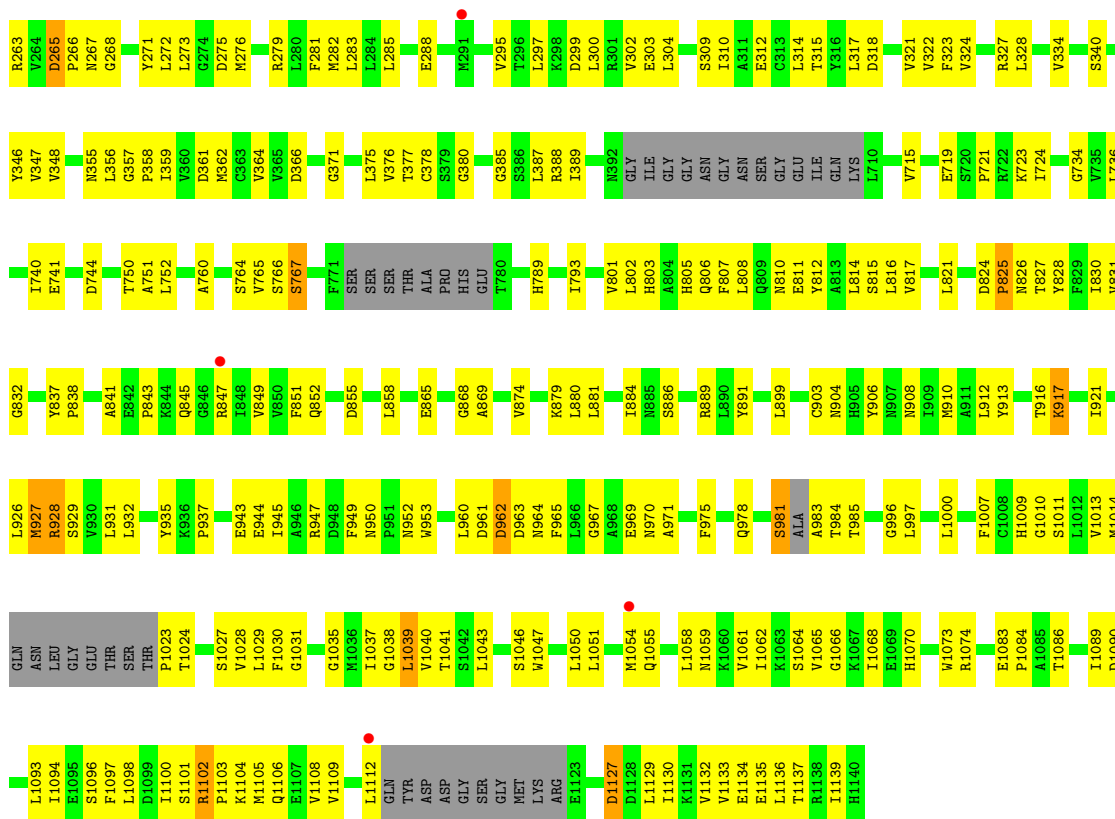
Chain B: 



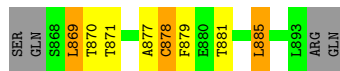
• Molecule 2: DNA damage-binding protein 1

Chain E: 

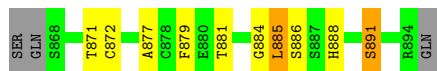




● Molecule 3: Protein Wiz



● Molecule 3: Protein Wiz



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	109.71Å 145.60Å 192.10Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.96 – 2.95 29.96 – 2.95	Depositor EDS
% Data completeness (in resolution range)	99.0 (29.96-2.95) 98.9 (29.96-2.95)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.23	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.10 (at 2.96Å)	Xtrriage
Refinement program	PHENIX 1.21_5207	Depositor
R, $R_{free}$	0.205 , 0.260 0.227 , 0.269	Depositor DCC
$R_{free}$ test set	3213 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	97.5	Xtrriage
Anisotropy	0.319	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 70.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	17742	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	103.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.74% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, SO4, A1A5H

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	0.49	0/2713	0.70	1/3693 (0.0%)
1	D	0.49	0/2679	0.65	1/3662 (0.0%)
2	B	0.47	0/6169	0.70	2/8392 (0.0%)
2	E	0.45	0/5989	0.70	0/8171
3	C	0.50	0/178	0.83	1/240 (0.4%)
3	F	0.51	0/193	0.76	0/259
All	All	0.47	0/17921	0.70	5/24417 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	186	PRO	CB-CA-C	-5.70	97.76	112.00
2	B	36	ASN	N-CA-C	-5.61	95.86	111.00
2	B	213	GLU	CB-CA-C	-5.33	99.74	110.40
1	D	328	GLU	N-CA-CB	5.31	120.16	110.60
3	C	869	LEU	CB-CA-C	5.22	120.11	110.20

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	2651	0	2587	160	0
1	D	2617	0	2488	118	0
2	B	6058	0	5814	379	0
2	E	5881	0	5540	390	0
3	C	176	0	159	9	0
3	F	191	0	176	7	0
4	A	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	F	1	0	0	0	0
5	A	5	0	0	0	0
5	D	5	0	0	1	0
6	A	29	27	0	0	0
6	D	29	27	0	0	0
7	A	6	0	0	0	0
7	B	16	0	0	0	0
7	C	1	0	0	1	0
7	D	7	0	0	1	0
7	E	11	0	0	0	0
7	F	1	0	0	0	0
All	All	17688	54	16764	1028	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 30.

The worst 5 of 1028 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:130:MET:CE	2:E:142:VAL:HG13	1.46	1.44
1:A:207:ILE:HG23	2:B:188:ARG:NH2	1.61	1.16
1:A:401:LYS:HE2	1:A:413:LYS:HD3	1.17	1.16
1:A:194:MET:O	1:A:198:GLN:HG3	1.44	1.14
2:B:1098:LEU:HD11	2:B:1133:VAL:HG11	1.25	1.13

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	328/373 (88%)	302 (92%)	23 (7%)	3 (1%)	14	35
1	D	339/373 (91%)	304 (90%)	32 (9%)	3 (1%)	14	35
2	B	791/836 (95%)	727 (92%)	61 (8%)	3 (0%)	30	54
2	E	783/836 (94%)	724 (92%)	57 (7%)	2 (0%)	37	60
3	C	24/30 (80%)	22 (92%)	2 (8%)	0	100	100
3	F	25/30 (83%)	25 (100%)	0	0	100	100
All	All	2290/2478 (92%)	2104 (92%)	175 (8%)	11 (0%)	25	50

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	343	CYS
2	B	95	GLY
1	D	272	SER
1	A	85	PRO
1	A	267	ASN

### 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	288/340 (85%)	276 (96%)	12 (4%)	25	50
1	D	272/340 (80%)	266 (98%)	6 (2%)	47	69
2	B	643/727 (88%)	627 (98%)	16 (2%)	42	66

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
2	E	609/727 (84%)	588 (97%)	21 (3%)	32 57
3	C	19/26 (73%)	17 (90%)	2 (10%)	5 16
3	F	21/26 (81%)	18 (86%)	3 (14%)	2 7
All	All	1852/2186 (85%)	1792 (97%)	60 (3%)	34 59

5 of 60 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	878	CYS
2	E	1102	ARG
1	D	340	LEU
2	E	1064	SER
3	F	891	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
2	E	211	ASN
2	E	1055	GLN
1	D	163	GLN
1	D	178	GLN
1	D	233	HIS

### 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 oligosaccharides in this entry.

## 5.6 Ligand geometry

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

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
5	SO4	D	502	-	4,4,4	0.88	0	6,6,6	0.23	0
5	SO4	A	502	-	4,4,4	0.94	0	6,6,6	0.31	0
6	A1A5H	D	503	-	33,33,33	0.35	0	44,50,50	0.66	1 (2%)
6	A1A5H	A	503	-	33,33,33	0.44	0	44,50,50	0.55	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
6	A1A5H	D	503	-	-	3/10/55/55	0/5/5/5
6	A1A5H	A	503	-	-	4/10/55/55	0/5/5/5

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
6	D	503	A1A5H	C11-C17-N16	2.09	114.70	110.91

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	503	A1A5H	C21-C20-N16-C17
6	A	503	A1A5H	C21-C20-N16-C15
6	A	503	A1A5H	C3-C2-O12-C11
6	A	503	A1A5H	C1-C2-O12-C11
6	D	503	A1A5H	C1-C2-O12-C11

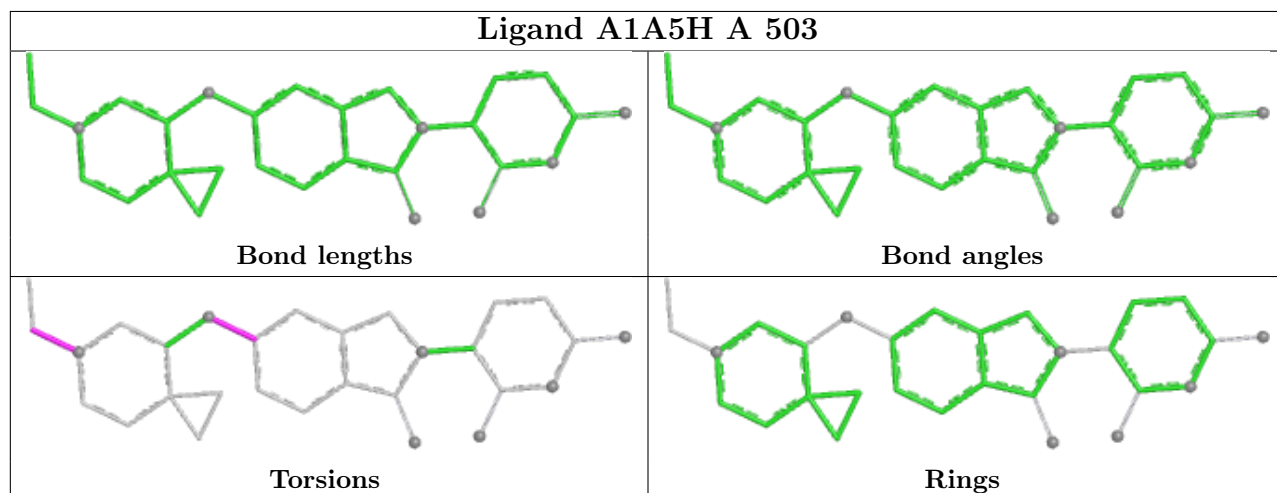
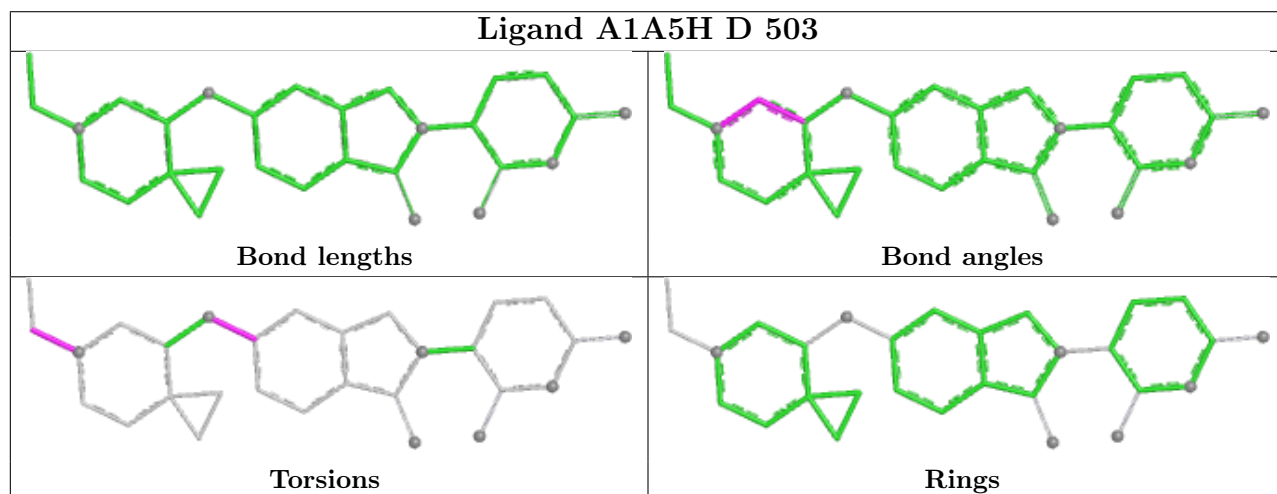


There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	502	SO4	1	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

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	338/373 (90%)	-0.35	3 (0%) 81 79	74, 96, 150, 182	0
1	D	347/373 (93%)	-0.31	2 (0%) 85 85	76, 96, 154, 199	0
2	B	801/836 (95%)	-0.40	1 (0%) 92 93	69, 98, 144, 189	0
2	E	795/836 (95%)	-0.35	7 (0%) 81 79	73, 102, 148, 194	0
3	C	26/30 (86%)	-0.20	0 100 100	90, 102, 113, 117	0
3	F	27/30 (90%)	-0.23	0 100 100	89, 101, 124, 134	0
All	All	2334/2478 (94%)	-0.36	13 (0%) 85 85	69, 99, 149, 199	0

The worst 5 of 13 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	847	ARG	3.5
1	D	175	ASP	2.6
1	A	272	SER	2.5
2	E	291	MET	2.4
2	B	146	ASP	2.3

### 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](#)

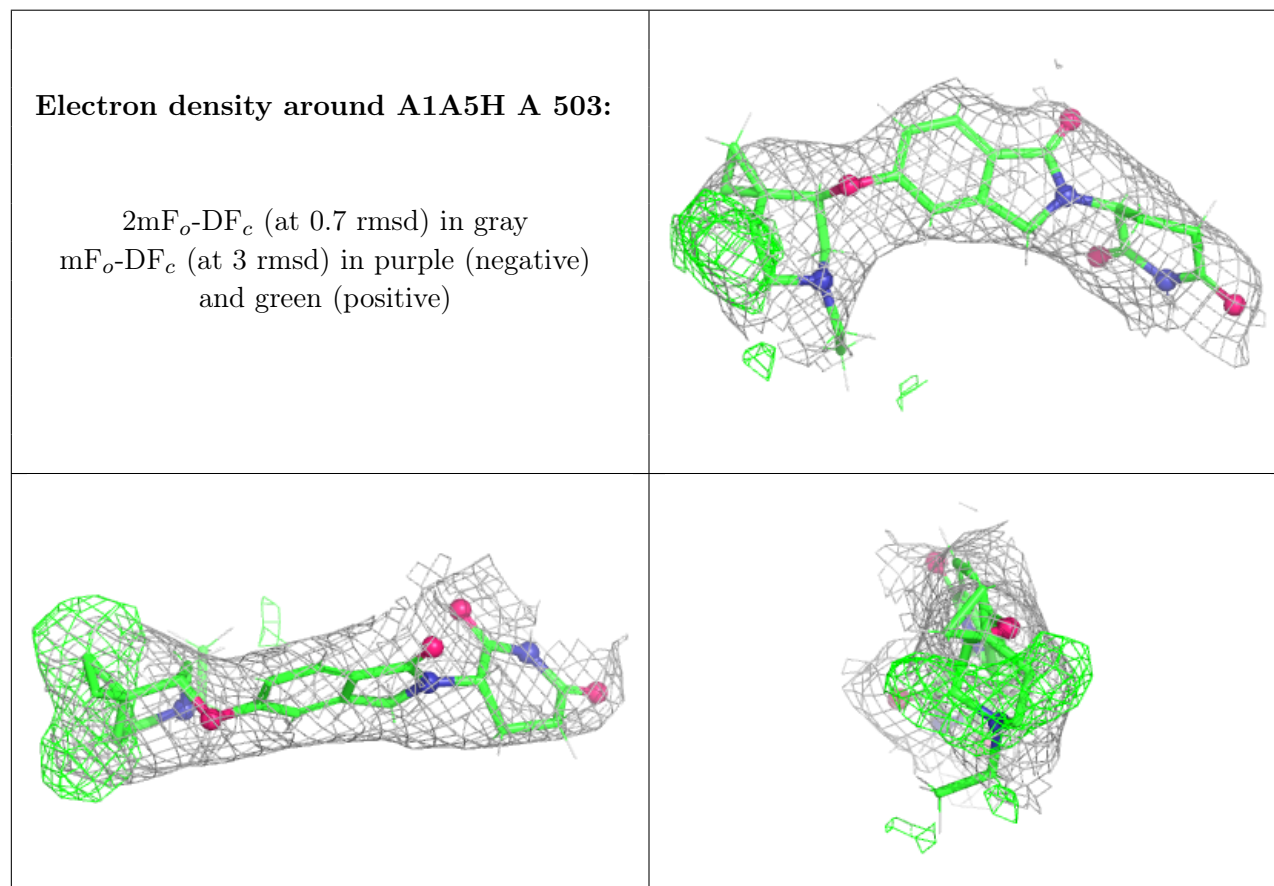
There are no monosaccharides in this entry.

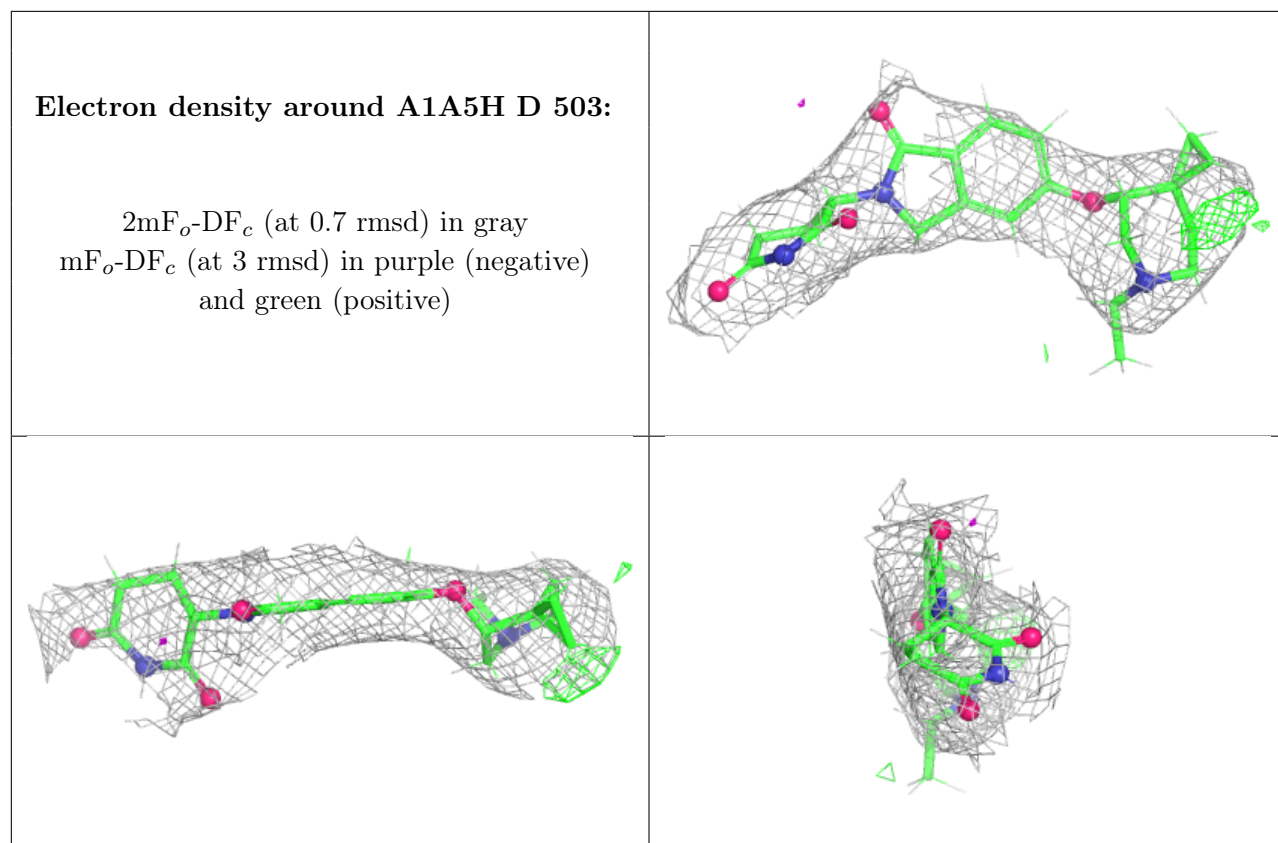
## 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
6	A1A5H	A	503	29/29	0.86	0.13	90,111,140,143	27
5	SO4	D	502	5/5	0.88	0.14	119,119,127,128	0
6	A1A5H	D	503	29/29	0.88	0.11	89,112,133,141	27
5	SO4	A	502	5/5	0.94	0.09	99,104,109,112	0
4	ZN	D	501	1/1	0.99	0.08	102,102,102,102	0
4	ZN	A	501	1/1	1.00	0.04	92,92,92,92	0
4	ZN	F	900	1/1	1.00	0.04	101,101,101,101	0
4	ZN	C	900	1/1	1.00	0.03	97,97,97,97	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.