



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 01:30 PM UTC

PDB ID : 7XV8 / pdb_00007xv8
Title : Crystal structure of the Human TR4 DNA-Binding Domain Homodimer Bound to DR1 Response Element
Authors : Liu, Y.; Chen, Z.
Deposited on : 2022-05-21
Resolution : 3.20 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
Xtriage (Phenix)	:	2.0
EDS	:	3.0
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

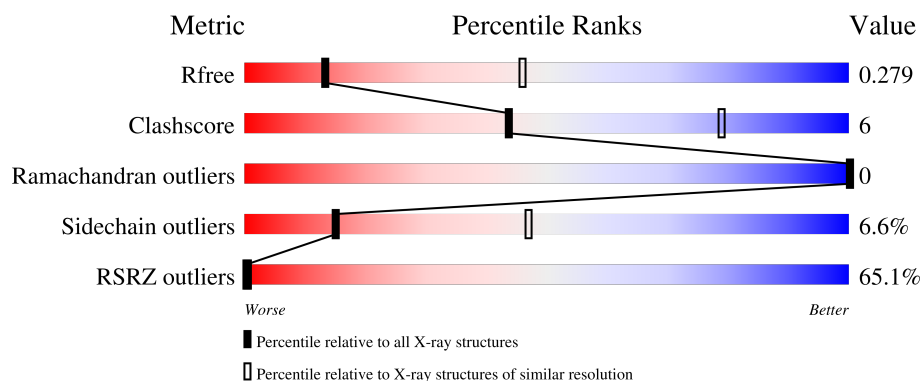
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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	1466 (3.20-3.20)
Clashscore	190562	1573 (3.20-3.20)
Ramachandran outliers	187476	1548 (3.20-3.20)
Sidechain outliers	187428	1547 (3.20-3.20)
RSRZ outliers	180081	1466 (3.20-3.20)

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	77	78% 90% 10%
1	B	77	51% 84% 14% .
2	C	18	78% 78% 22%
3	D	18	56% 39% 56% 6%

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
4	ZN	B	201	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 1809 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 Nuclear receptor subfamily 2 group C member 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	77	Total	C	N	O	S	0	0	1
			509	314	91	92	12			
1	B	76	Total	C	N	O	S	0	0	0
			511	315	92	92	12			

- Molecule 2 is a DNA chain called DNA (5'-D(*GP*GP*CP*AP*GP*AP*GP*GP*TP*CP*AP*AP*AP*GP*GP*TP*CP*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	18	Total	C	N	O	P	0	0	0
			372	177	77	101	17			

- Molecule 3 is a DNA chain called DNA (5'-D(*CP*TP*GP*AP*CP*CP*TP*TP*TP*GP*AP*CP*CP*TP*CP*TP*GP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	18	Total	C	N	O	P	0	0	0
			354	171	58	108	17			

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total	Zn	0	0
			2	2		
4	B	2	Total	Zn	0	0
			2	2		

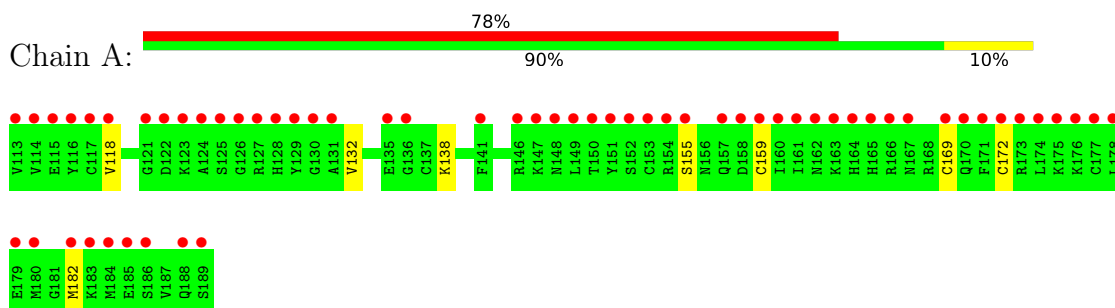
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	12	Total 12	O 12	0	0
5	B	23	Total 23	O 23	0	0
5	C	12	Total 12	O 12	0	0
5	D	12	Total 12	O 12	0	0

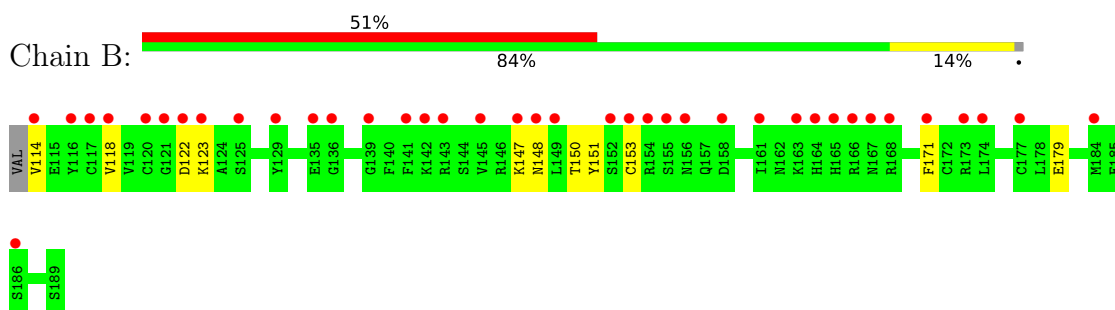
3 Residue-property plots [i](#)

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 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.

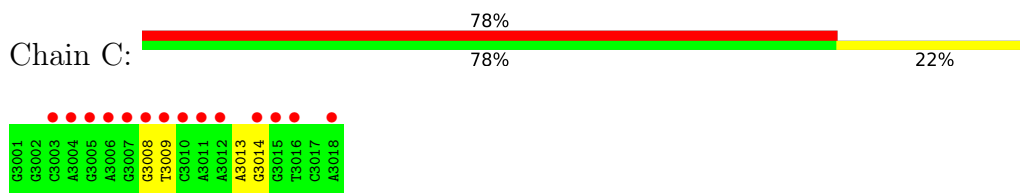
- Molecule 1: Nuclear receptor subfamily 2 group C member 2



- Molecule 1: Nuclear receptor subfamily 2 group C member 2



- Molecule 2: DNA (5'-D(*GP*GP*CP*AP*GP*AP*GP*GP*TP*CP*AP*AP*AP*GP*GP*TP*CP*A)-3')



- Molecule 3: DNA (5'-D(*CP*TP*GP*AP*CP*CP*TP*TP*TP*GP*AP*CP*CP*TP*CP*TP*GP*C)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	51.87Å 51.87Å 241.51Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.71 – 3.20 47.71 – 3.20	Depositor EDS
% Data completeness (in resolution range)	86.2 (47.71-3.20) 86.2 (47.71-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.27 (at 3.19Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.213 , 0.249 0.215 , 0.279	Depositor DCC
R_{free} test set	249 reflections (4.12%)	wwPDB-VP
Wilson B-factor (Å ²)	70.3	Xtriage
Anisotropy	0.544	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.44 , 391.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	1809	wwPDB-VP
Average B, all atoms (Å ²)	61.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.14% 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: ZN

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	1.20	0/515	1.68	2/689 (0.3%)
1	B	1.13	0/517	1.60	0/694
2	C	0.48	0/420	0.92	0/648
3	D	0.54	0/394	1.08	1/604 (0.2%)
All	All	0.94	0/1846	1.37	3/2635 (0.1%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	4015	DC	C4'-C3'-O3'	5.83	118.74	110.00
1	A	138	LYS	CA-C-N	5.66	126.37	120.03
1	A	138	LYS	C-N-CA	5.66	126.37	120.03

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	509	0	391	3	0
1	B	511	0	404	6	0
2	C	372	0	197	3	0
3	D	354	0	195	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	2	0	0	0	0
4	B	2	0	0	2	0
5	A	12	0	0	0	0
5	B	23	0	0	1	0
5	C	12	0	0	0	0
5	D	12	0	0	0	0
All	All	1809	0	1187	18	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 6.

All (18) 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:B:153:CYS:HG	4:B:201:ZN:ZN	0.80	0.87
1:B:150:THR:O	5:B:301:HOH:O	2.05	0.73
1:B:153:CYS:SG	4:B:201:ZN:ZN	1.83	0.67
1:A:169:CYS:HB3	1:A:172:CYS:HB2	1.81	0.62
3:D:4017:DG:H2''	3:D:4018:DC:OP2	2.00	0.61
2:C:3008:DG:OP2	2:C:3008:DG:H8	1.88	0.56
1:A:118:VAL:HG22	1:A:132:VAL:O	2.07	0.55
1:B:122:ASP:OD1	1:B:123:LYS:N	2.41	0.53
2:C:3008:DG:H2'	2:C:3009:DT:H72	1.91	0.53
3:D:4015:DC:H2''	3:D:4016:DT:O5'	2.08	0.53
3:D:4001:DC:H2''	3:D:4002:DT:O5'	2.13	0.48
3:D:4012:DC:H2''	3:D:4013:DC:H6	1.78	0.48
1:B:147:LYS:O	1:B:148:ASN:C	2.59	0.45
3:D:4006:DC:H2''	3:D:4007:DT:O5'	2.17	0.45
1:A:159:CYS:HB2	1:A:172:CYS:SG	2.56	0.45
3:D:4011:DA:C5	3:D:4012:DC:C4	3.04	0.44
1:B:151:TYR:HB2	1:B:171:PHE:HA	2.01	0.43
2:C:3013:DA:H2'	2:C:3014:DG:C8	2.55	0.42

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	75/77 (97%)	69 (92%)	6 (8%)	0	100	100
1	B	74/77 (96%)	68 (92%)	6 (8%)	0	100	100
All	All	149/154 (97%)	137 (92%)	12 (8%)	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	38/69 (55%)	36 (95%)	2 (5%)	20	53
1	B	38/69 (55%)	35 (92%)	3 (8%)	11	40
All	All	76/138 (55%)	71 (93%)	5 (7%)	15	47

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	155	SER
1	A	182	MET
1	B	114	VAL
1	B	118	VAL
1	B	179	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 [i](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	77/77 (100%)	4.03	60 (77%) 0 0	49, 62, 87, 105	1 (1%)
1	B	76/77 (98%)	3.28	39 (51%) 0 1	42, 61, 79, 94	1 (1%)
2	C	18/18 (100%)	2.78	14 (77%) 0 0	48, 60, 66, 71	0
3	D	18/18 (100%)	2.38	10 (55%) 0 0	41, 56, 77, 94	0
All	All	189/190 (99%)	3.45	123 (65%) 0 0	41, 61, 80, 105	2 (1%)

All (123) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	156	ASN	21.4
1	B	154	ARG	19.7
1	B	155	SER	14.1
1	A	180	MET	12.1
1	B	166	ARG	10.7
1	B	122	ASP	10.2
1	A	152	SER	9.6
1	A	123	LYS	9.5
1	A	161	ILE	8.2
1	A	135	GLU	8.2
1	A	150	THR	7.9
1	A	160	ILE	7.8
1	A	179	GLU	7.8
1	A	164	HIS	7.8
1	A	114	VAL	7.5
1	B	153	CYS	7.4
1	A	122	ASP	7.3
1	B	186	SER	7.2
1	B	171	PHE	7.2
1	A	183	LYS	7.1
1	A	116	TYR	6.9

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Mol	Chain	Res	Type	RSRZ
1	B	167	ASN	6.5
1	B	163	LYS	6.4
1	A	189	SER	6.2
1	A	171	PHE	6.2
1	A	184	MET	6.2
1	B	139	GLY	5.7
1	A	185	GLU	5.5
1	A	126	GLY	5.5
1	B	165	HIS	5.4
2	C	3004	DA	5.4
1	A	125	SER	5.1
1	A	147	LYS	5.0
1	A	155	SER	5.0
1	B	142	LYS	4.9
2	C	3008	DG	4.9
1	A	174	LEU	4.9
1	A	124	ALA	4.9
1	B	158	ASP	4.8
1	A	172	CYS	4.8
1	A	130	GLY	4.7
3	D	4018	DC	4.7
1	A	117	CYS	4.6
2	C	3011	DA	4.5
1	A	177	CYS	4.5
1	A	163	LYS	4.5
1	B	117	CYS	4.4
1	A	128	HIS	4.3
1	B	123	LYS	4.2
1	B	161	ILE	4.1
1	A	149	LEU	4.1
1	A	157	GLN	4.1
1	B	173	ARG	4.0
1	B	141	PHE	3.9
3	D	4011	DA	3.9
1	B	168	ARG	3.9
1	A	182	MET	3.8
1	A	167	ASN	3.8
1	A	159	CYS	3.8
1	A	162	ASN	3.7
3	D	4016	DT	3.7
3	D	4015	DC	3.7
2	C	3009	DT	3.7

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Mol	Chain	Res	Type	RSRZ
1	B	152	SER	3.6
2	C	3012	DA	3.6
1	A	178	LEU	3.6
1	A	129	TYR	3.5
1	B	164	HIS	3.5
1	A	141	PHE	3.4
1	B	114	VAL	3.4
1	A	176	LYS	3.3
1	A	118	VAL	3.3
1	B	120	CYS	3.2
1	B	135	GLU	3.2
1	A	170	GLN	3.2
2	C	3003	DC	3.1
1	A	136	GLY	3.1
3	D	4012	DC	3.1
1	A	188	GLN	3.0
1	B	136	GLY	3.0
1	A	165	HIS	3.0
2	C	3010	DC	2.9
1	A	148	ASN	2.9
1	A	115	GLU	2.9
1	A	146	ARG	2.9
1	A	151	TYR	2.9
1	B	149	LEU	2.8
3	D	4002	DT	2.7
1	A	154	ARG	2.7
1	B	129	TYR	2.7
1	A	153	CYS	2.6
3	D	4009	DT	2.5
3	D	4017	DG	2.5
2	C	3018	DA	2.5
3	D	4008	DT	2.5
2	C	3007	DG	2.4
2	C	3005	DG	2.4
3	D	4010	DG	2.4
1	A	127	ARG	2.4
1	A	186	SER	2.4
1	B	121	GLY	2.3
1	A	158	ASP	2.3
1	A	131	ALA	2.3
1	A	166	ARG	2.3
1	B	116	TYR	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	175	LYS	2.3
2	C	3014	DG	2.3
2	C	3006	DA	2.2
1	B	148	ASN	2.2
1	A	173	ARG	2.2
1	B	174	LEU	2.2
1	B	143	ARG	2.2
2	C	3015	DG	2.1
1	B	145	VAL	2.1
1	A	121	GLY	2.1
1	B	125	SER	2.1
1	B	118	VAL	2.1
1	B	147	LYS	2.1
1	A	113	VAL	2.0
1	A	169	CYS	2.0
1	B	177	CYS	2.0
1	B	184	MET	2.0
2	C	3016	DT	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](#)

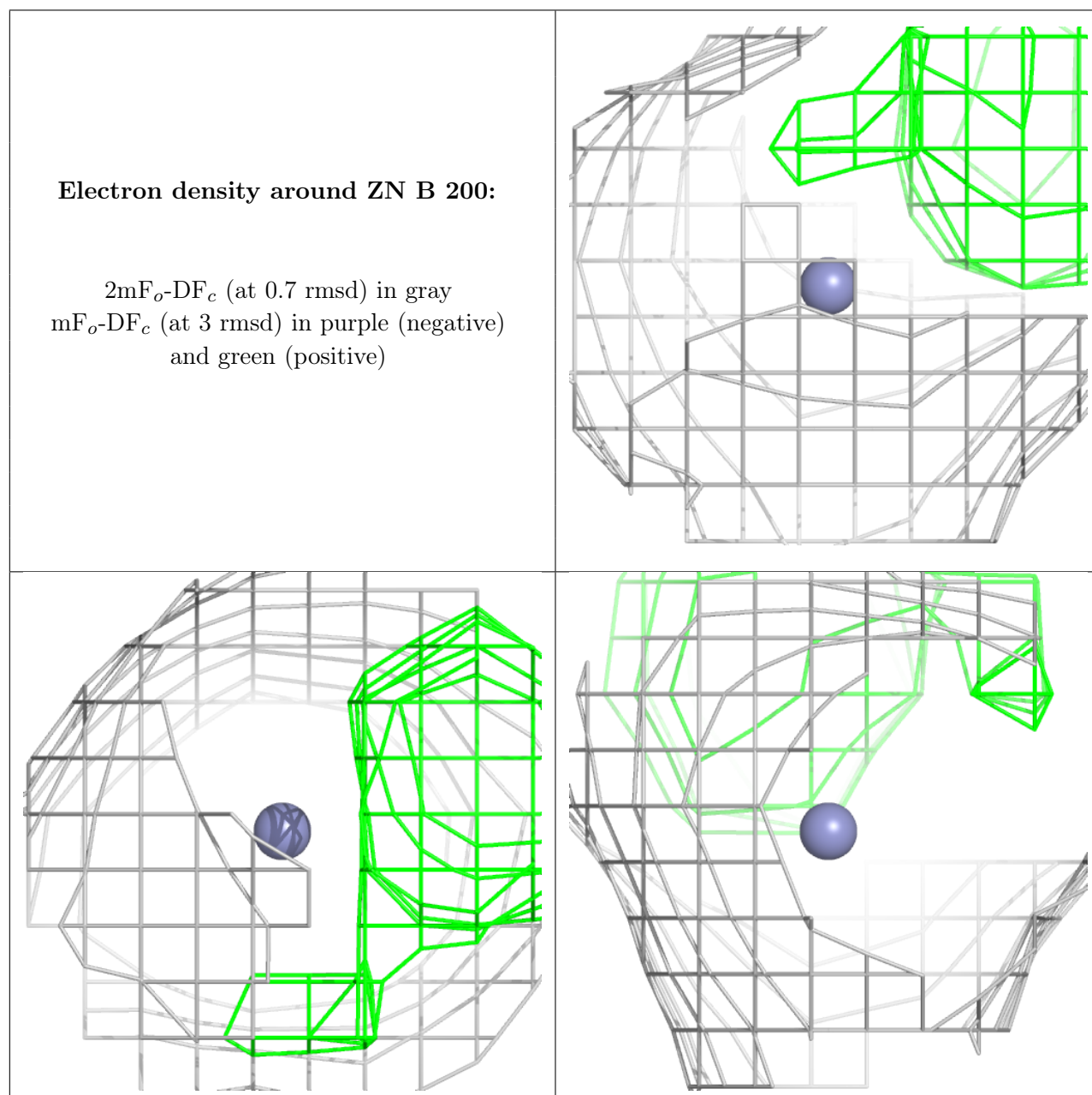
There are no oligosaccharides in this entry.

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.

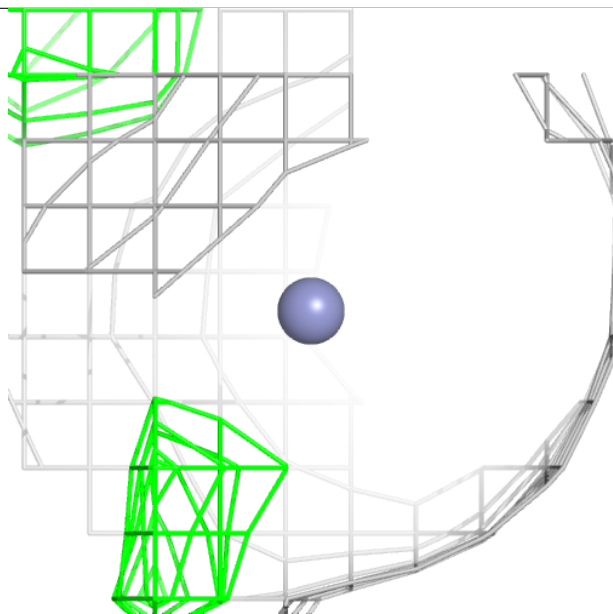
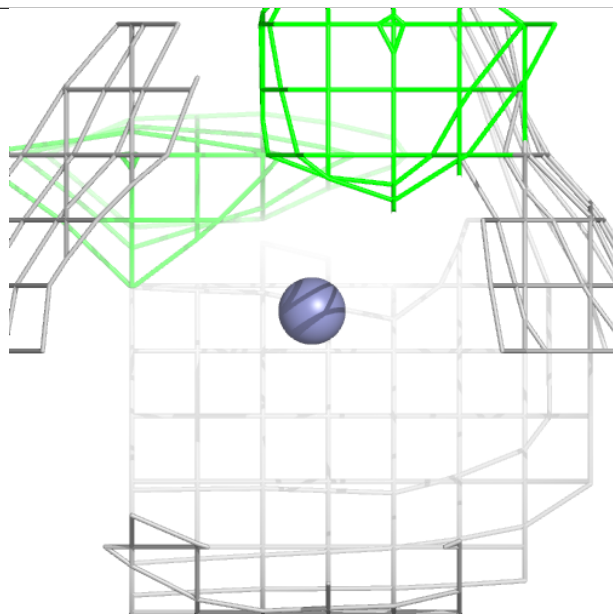
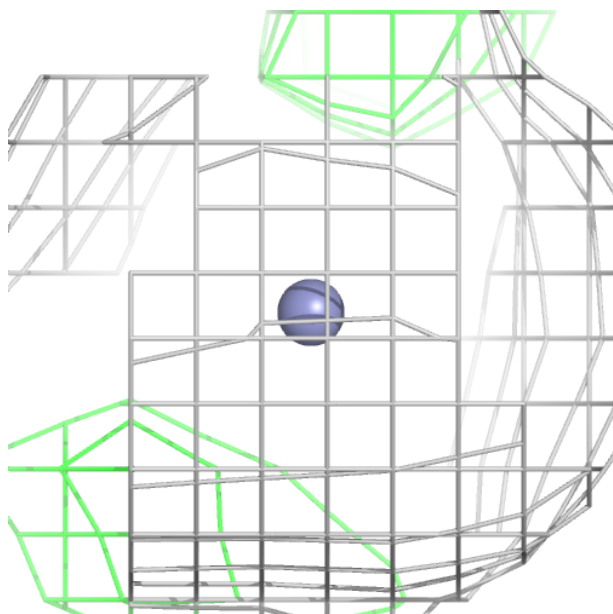
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	ZN	B	200	1/1	0.97	0.11	63,63,63,63	0
4	ZN	A	201	1/1	0.98	0.16	75,75,75,75	0
4	ZN	A	200	1/1	0.98	0.13	61,61,61,61	0
4	ZN	B	201	1/1	0.99	0.08	77,77,77,77	0

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.



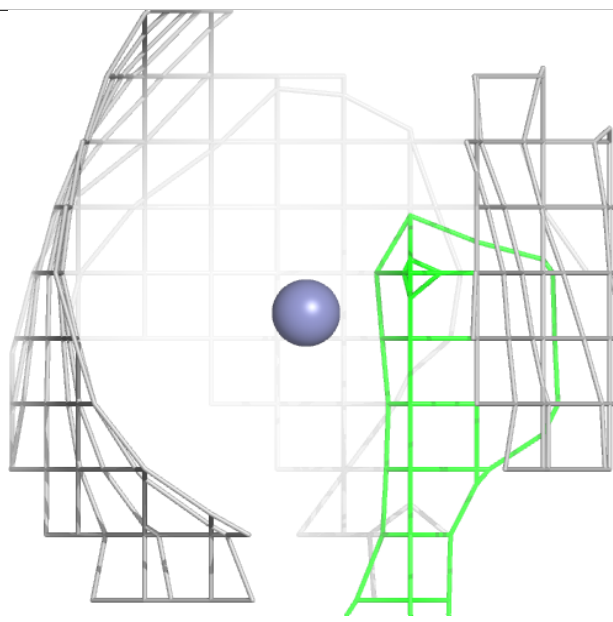
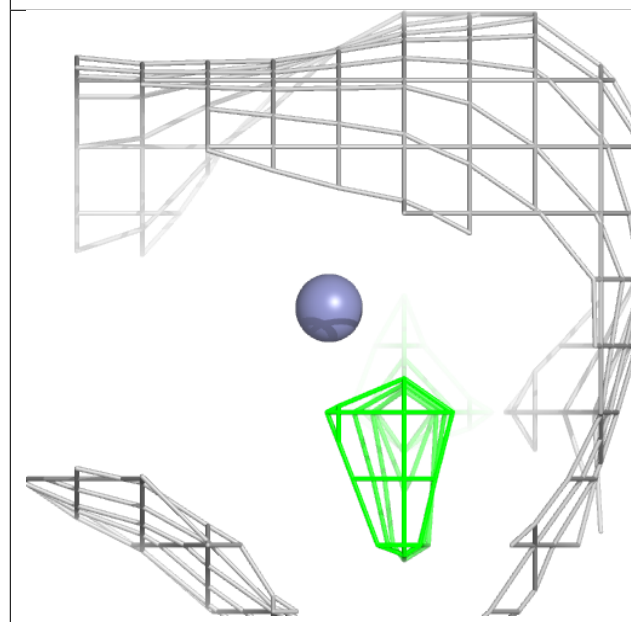
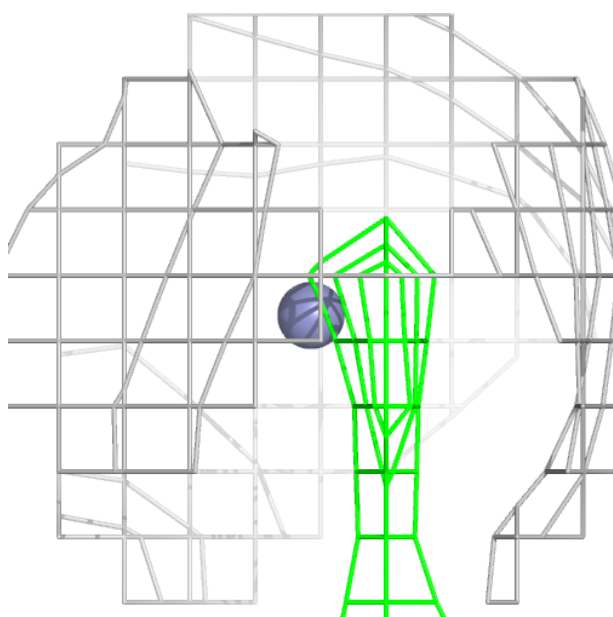
Electron density around ZN A 201:

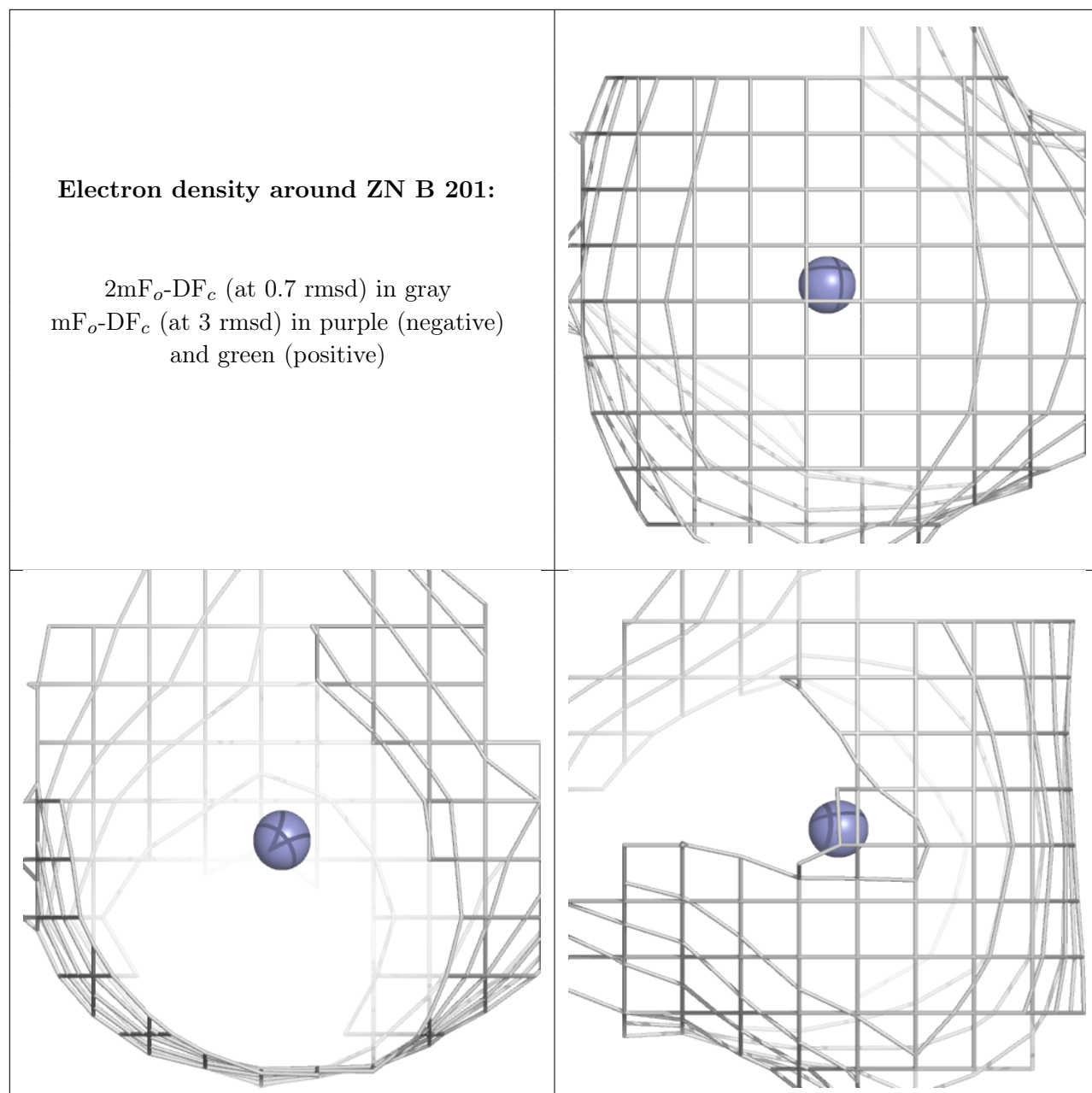
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around ZN A 200:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers ⓘ

There are no such residues in this entry.