Full wwPDB X-ray Structure Validation Report (i)

Sep 22, 2025 – 10:08 AM EDT

PDB ID	:	9PFP / pdb_00009pfp
Title	:	Structure of POU2F3 POU domains bound to coactivator OCA-T1 and DNA
Authors	:	Ipsaro, J.J.; Alpsoy, A.; Vakoc, C.R.; Joshua-Tor, L.
Deposited on	:	2025-07-06
Resolution	:	1.70 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:

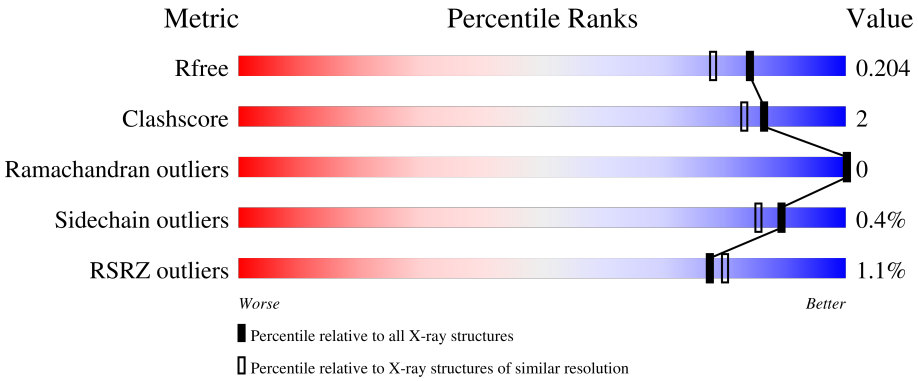
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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 1.70 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	5161 (1.70-1.70)
Clashscore	180529	5671 (1.70-1.70)
Ramachandran outliers	177936	5594 (1.70-1.70)
Sidechain outliers	177891	5594 (1.70-1.70)
RSRZ outliers	164620	5159 (1.70-1.70)

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% 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	160	2% 78% 6% 17%
1	E	160	% 79% 17%
2	B	41	51% 46%
2	F	41	54% 46%
3	C	15	100%

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Mol	Chain	Length	Quality of chain
3	G	15	100%
4	D	15	80% 20%
4	H	15	73% 27%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 7492 atoms, of which 3383 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 POU domain, class 2, transcription factor 3.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	133	Total	C	H	N	O	S	0	4	0
			2273	703	1156	201	205	8			
1	E	133	Total	C	H	N	O	S	0	2	0
			2255	698	1146	200	204	7			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	182	GLY	-	expression tag	UNP Q9UKI9
E	182	GLY	-	expression tag	UNP Q9UKI9

- Molecule 2 is a protein called POU domain class 2-associating factor 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	22	Total	C	H	N	O	0	0	0
			370	111	192	37	30			
2	F	22	Total	C	H	N	O	0	0	0
			370	111	192	37	30			

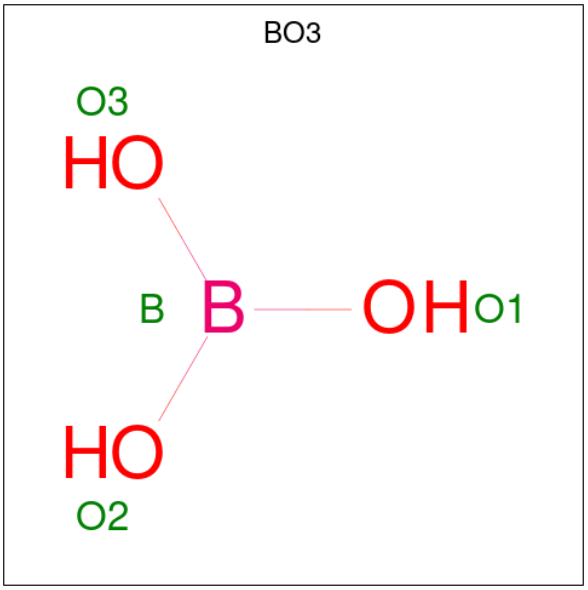
- Molecule 3 is a DNA chain called DNA containing POU domain recognition element octamer (sense strand).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
3	C	15	Total	C	H	N	O	P	0	0	0
			481	149	171	61	86	14			
3	G	15	Total	C	H	N	O	P	0	0	0
			481	149	171	61	86	14			

- Molecule 4 is a DNA chain called DNA containing POU domain recognition element octamer (antisense strand).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
4	D	15	Total	C	H	N	O	P	0	0	0
			472	146	173	49	90	14			
4	H	15	Total	C	H	N	O	P	0	0	0
			472	146	173	49	90	14			

- Molecule 5 is BORIC ACID (CCD ID: BO3) (formula: BH_3O_3).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	C	1	Total	B	H	O	0	0
			7	1	3	3		
5	C	1	Total	B	H	O	0	0
			7	1	3	3		
5	G	1	Total	B	H	O	0	0
			7	1	3	3		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	69	Total	O	0	0
			69	69		
6	B	11	Total	O	0	0
			11	11		
6	C	48	Total	O	0	0
			48	48		
6	D	36	Total	O	0	0
			36	36		
6	E	62	Total	O	0	0
			62	62		

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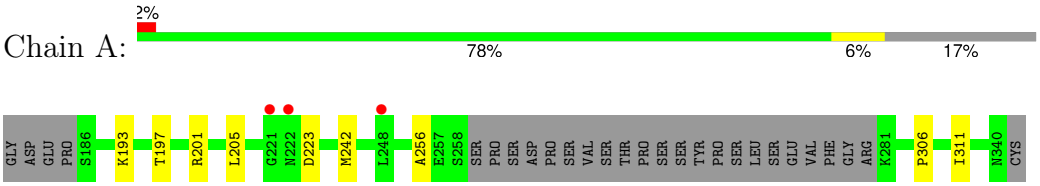
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	F	15	Total O 15 15	0	0
6	G	28	Total O 28 28	0	0
6	H	28	Total O 28 28	0	0

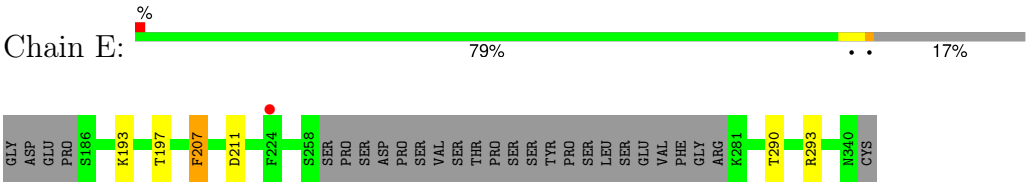
3 Residue-property plots (i)

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: POU domain, class 2, transcription factor 3



• Molecule 1: POU domain, class 2, transcription factor 3



• Molecule 2: POU domain class 2-associating factor 2

• Molecule 2: POU domain class 2-associating factor 2

• Molecule 3: DNA containing POU domain recognition element octamer (sense strand)

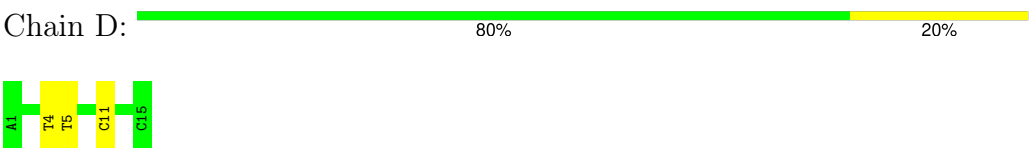
There are no outlier residues recorded for this chain.

• Molecule 3: DNA containing POU domain recognition element octamer (sense strand)

There are no outlier residues recorded for this chain.

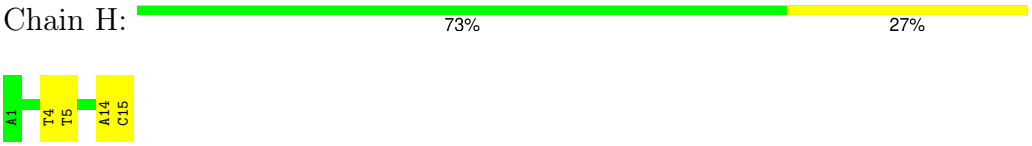
• Molecule 4: DNA containing POU domain recognition element octamer (antisense strand)

Chain D:



• Molecule 4: DNA containing POU domain recognition element octamer (antisense strand)

Chain H:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	49.78Å 94.26Å 56.80Å 90.00° 115.05° 90.00°	Depositor
Resolution (Å)	34.76 – 1.70 34.76 – 1.70	Depositor EDS
% Data completeness (in resolution range)	98.8 (34.76-1.70) 98.7 (34.76-1.70)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.37 (at 1.71Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.175 , 0.204 0.176 , 0.204	Depositor DCC
R_{free} test set	2552 reflections (3.31%)	wwPDB-VP
Wilson B-factor (Å^2)	35.1	Xtriage
Anisotropy	0.248	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.41 , 40.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.023 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	7492	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 6.48% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: BO3

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	0.25	0/1145	0.40	0/1522
1	E	0.25	0/1129	0.41	0/1501
2	B	0.20	0/179	0.32	0/237
2	F	0.21	0/179	0.29	0/237
3	C	0.38	0/349	0.64	0/538
3	G	0.38	0/349	0.61	0/538
4	D	0.56	0/333	0.76	0/511
4	H	0.43	0/333	0.68	0/511
All	All	0.33	0/3996	0.52	0/5595

There are no bond length outliers.

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	1117	1156	1138	6	0
1	E	1109	1146	1140	4	0
2	B	178	192	192	1	0
2	F	178	192	192	0	0
3	C	310	171	171	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	G	310	171	171	0	0
4	D	299	173	173	2	0
4	H	299	173	173	2	0
5	C	8	6	6	0	0
5	G	4	3	3	0	0
6	A	69	0	0	0	0
6	B	11	0	0	0	0
6	C	48	0	0	0	0
6	D	36	0	0	1	0
6	E	62	0	0	0	0
6	F	15	0	0	0	0
6	G	28	0	0	0	0
6	H	28	0	0	0	0
All	All	4109	3383	3359	14	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 2.

All (14) 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:193:LYS:O	1:A:197:THR:HG23	1.99	0.63
1:E:290:THR:HG23	1:E:293:ARG:NH2	2.16	0.61
4:D:11:DC:OP1	6:D:101:HOH:O	2.16	0.61
1:A:306:PRO:HG2	1:A:311:ILE:HD11	1.90	0.54
4:H:4:DT:H2'	4:H:5:DT:C6	2.45	0.52
1:E:290:THR:HG23	1:E:293:ARG:HH22	1.78	0.47
1:A:242[B]:MET:HG3	2:B:22:VAL:HG21	1.98	0.46
1:E:207:PHE:CE1	1:E:211:ASP:HB3	2.53	0.44
1:A:201:ARG:NH1	1:A:205:LEU:HD21	2.33	0.43
1:A:223:ASP:OD1	1:A:223:ASP:N	2.52	0.42
4:H:14:DA:H2"	4:H:15:DC:H5"	2.00	0.42
1:E:193:LYS:O	1:E:197:THR:HG23	2.20	0.42
4:D:4:DT:H2'	4:D:5:DT:C6	2.55	0.41
1:A:201:ARG:NH2	1:A:256:ALA:O	2.54	0.40

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	133/160 (83%)	132 (99%)	1 (1%)	0	100	100
1	E	131/160 (82%)	128 (98%)	3 (2%)	0	100	100
2	B	20/41 (49%)	19 (95%)	1 (5%)	0	100	100
2	F	20/41 (49%)	20 (100%)	0	0	100	100
All	All	304/402 (76%)	299 (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	A	127/148 (86%)	127 (100%)	0	100	100
1	E	125/148 (84%)	124 (99%)	1 (1%)	79	71
2	B	19/36 (53%)	19 (100%)	0	100	100
2	F	19/36 (53%)	19 (100%)	0	100	100
All	All	290/368 (79%)	289 (100%)	1 (0%)	89	88

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	207	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	222	ASN
1	E	236	ASN
2	F	14	GLN

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)

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	$\#\|Z\| > 2$
5	BO3	C	102	-	3,3,3	0.18	0	3,3,3	0.89	0
5	BO3	G	101	-	3,3,3	0.26	0	3,3,3	0.92	0
5	BO3	C	101	-	3,3,3	0.26	0	3,3,3	1.22	0

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, 95^{th} 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	133/160 (83%)	0.01	3 (2%) 61 64	21, 45, 70, 102	2 (1%)
1	E	133/160 (83%)	0.02	1 (0%) 82 85	24, 48, 73, 88	1 (0%)
2	B	22/41 (53%)	0.43	0 100 100	36, 56, 83, 99	0
2	F	22/41 (53%)	0.53	0 100 100	35, 63, 99, 104	0
3	C	15/15 (100%)	-0.64	0 100 100	32, 35, 55, 57	0
3	G	15/15 (100%)	-0.55	0 100 100	30, 38, 63, 64	0
4	D	15/15 (100%)	-0.52	0 100 100	33, 38, 48, 50	0
4	H	15/15 (100%)	-0.58	0 100 100	30, 36, 53, 65	0
All	All	370/462 (80%)	-0.02	4 (1%) 77 80	21, 46, 75, 104	3 (0%)

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	222	ASN	2.7
1	A	248	LEU	2.3
1	E	224	PHE	2.3
1	A	221	GLY	2.2

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

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, 95^{th} 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
5	BO3	C	101	4/4	0.86	0.17	35,41,52,63	0
5	BO3	G	101	4/4	0.90	0.13	32,37,45,45	0
5	BO3	C	102	4/4	0.94	0.12	36,38,44,46	0

6.5 Other polymers (i)

There are no such residues in this entry.