W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Oct 1, 2023 – 01:14 AM EDT

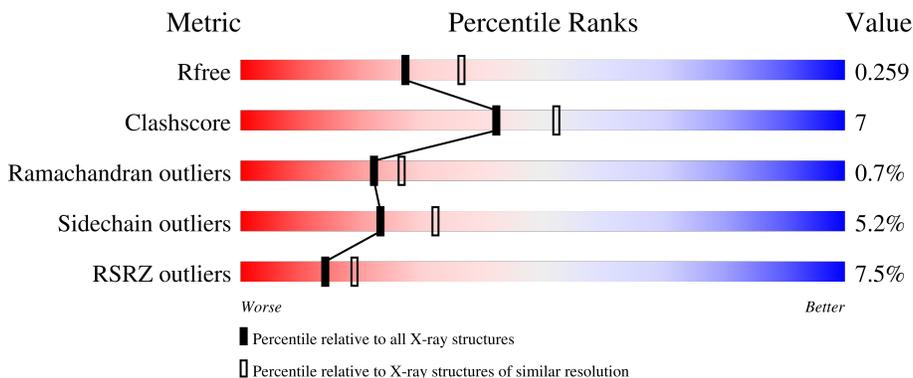|		
PDB ID	:	3OTT
Title	:	Crystal Structure of the extracellular domain of the putative one component system BT4673 from B. thetaiotaomicron
Authors	:	Zhang, Z.; Liu, Q.; Hendrickson, W.A.
Deposited on	:	2010-09-13
Resolution	:	2.30 Å(reported)

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 2.30 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	Percentile Ranks	Value
Rfree		0.259
Clashscore		7
Ramachandran outliers		0.7%
Sidechain outliers		5.2%
RSRZ outliers		7.5%

Worse — *Better*

▮ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	758	11% / 79% 16% · ·
1	B	758	4% / 82% 14% · ·

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 12329 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 Two-component system sensor histidine kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	737	Total 6002	C 3810	N 1030	O 1145	S 17	0	0	0
1	B	739	Total 6011	C 3815	N 1028	O 1151	S 17	0	2	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	28	MET	-	expression tag	UNP Q89YQ8
A	29	GLU	-	expression tag	UNP Q89YQ8
A	778	LEU	-	expression tag	UNP Q89YQ8
A	779	GLU	-	expression tag	UNP Q89YQ8
A	780	HIS	-	expression tag	UNP Q89YQ8
A	781	HIS	-	expression tag	UNP Q89YQ8
A	782	HIS	-	expression tag	UNP Q89YQ8
A	783	HIS	-	expression tag	UNP Q89YQ8
A	784	HIS	-	expression tag	UNP Q89YQ8
A	785	HIS	-	expression tag	UNP Q89YQ8
B	28	MET	-	expression tag	UNP Q89YQ8
B	29	GLU	-	expression tag	UNP Q89YQ8
B	778	LEU	-	expression tag	UNP Q89YQ8
B	779	GLU	-	expression tag	UNP Q89YQ8
B	780	HIS	-	expression tag	UNP Q89YQ8
B	781	HIS	-	expression tag	UNP Q89YQ8
B	782	HIS	-	expression tag	UNP Q89YQ8
B	783	HIS	-	expression tag	UNP Q89YQ8
B	784	HIS	-	expression tag	UNP Q89YQ8
B	785	HIS	-	expression tag	UNP Q89YQ8

- Molecule 2 is HEXATANTALUM DODECABROMIDE (three-letter code: TBR) (formula: $Br_{12}Ta_6$).
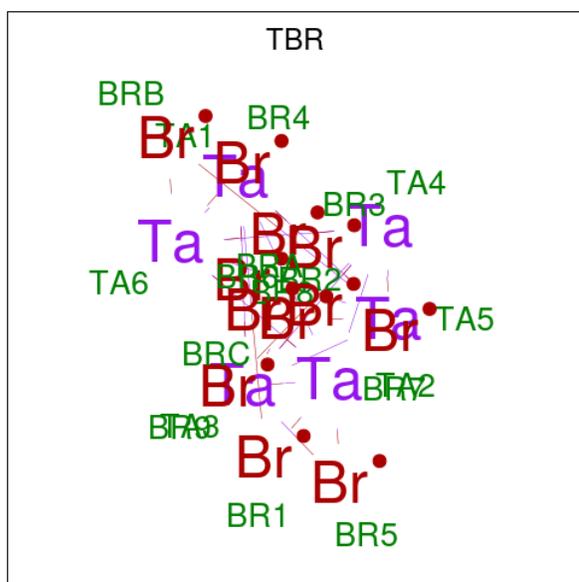
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 18	Br 12	Ta 6	0	0
2	B	1	Total 18	Br 12	Ta 6	0	0

• Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	138	Total 138	O 138	0	0
3	B	142	Total 142	O 142	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: g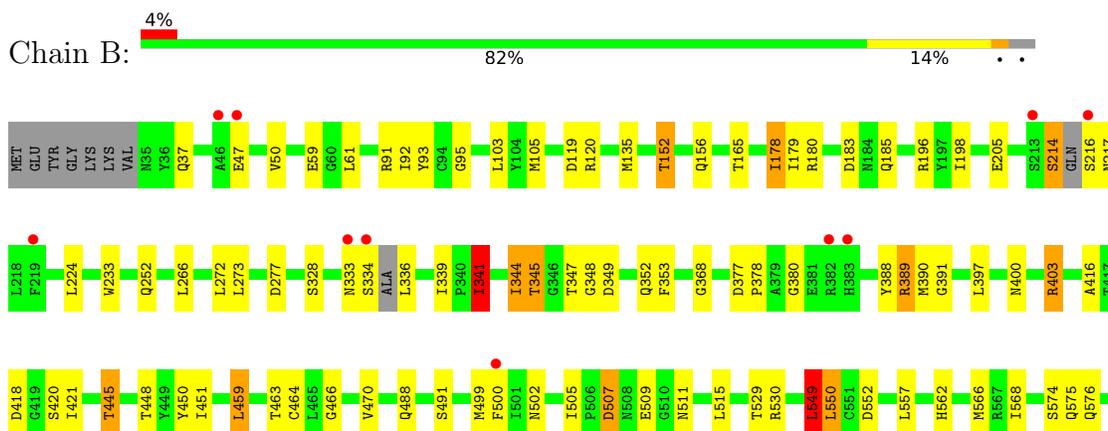reen = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Two-component system sensor histidine kinase

Chain A:

• Molecule 1: Two-component system sensor histidine kinase

Chain B:

G581 S582 F583 S584 N585 N586 E587 M591 T592 I598 L606 Q619 N620 MET T622 S628 D636 N652 L653 GLU A655 Q658 P659 L664 L665 Y669 I670 V675 S676 P677 R680 D681 T689 N690 S691 S702 L732 K733 S734 L751 R758 D759 G760

Q761 P762 S763 N764 R765 P766 W777 LEU GLU HIS HIS HIS HIS HIS HIS
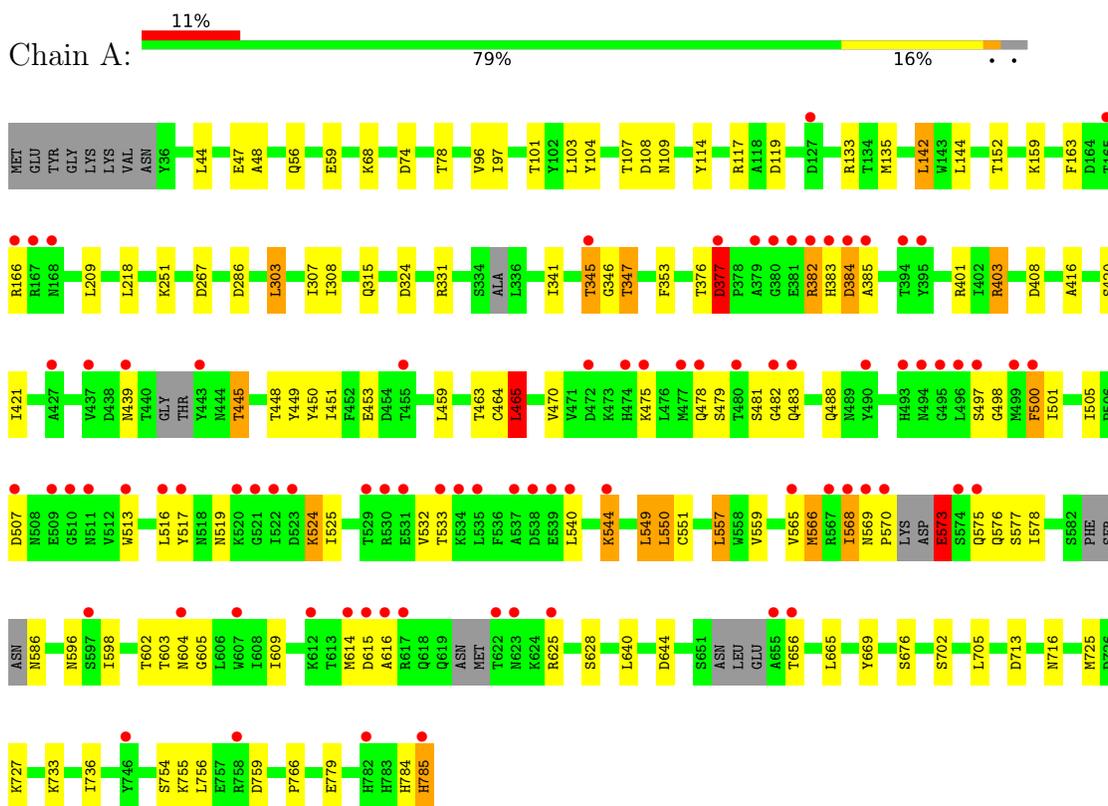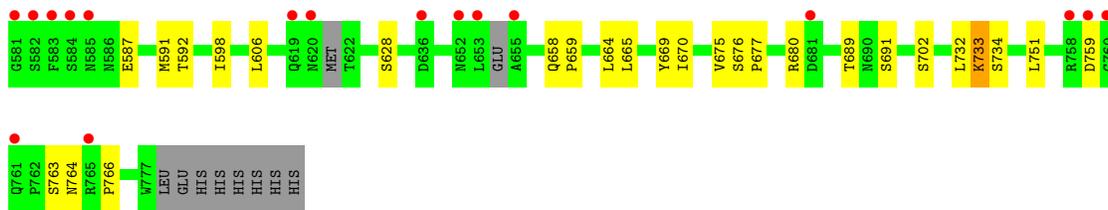
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	88.17Å 88.17Å 432.96Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.27 – 2.30 39.27 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.1 (39.27-2.30) 99.1 (39.27-2.30)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.93 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.195 , 0.253 0.204 , 0.259	Depositor DCC
R_{free} test set	3840 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	30.7	Xtriage
Anisotropy	0.275	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 38.5	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	12329	wwPDB-VP
Average B, all atoms (Å^2)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.38% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: TBR

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	0.85	2/6153 (0.0%)	0.85	9/8355 (0.1%)
1	B	0.99	0/6165	0.93	15/8372 (0.2%)
All	All	0.92	2/12318 (0.0%)	0.89	24/16727 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	1
All	All	0	2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	614	MET	C-N	5.98	1.47	1.34
1	A	573	GLU	C-N	5.61	1.47	1.34

The worst 5 of 24 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	403	ARG	NE-CZ-NH2	-13.49	113.55	120.30
1	B	403	ARG	NE-CZ-NH1	10.01	125.30	120.30
1	A	403	ARG	NE-CZ-NH2	-9.55	115.53	120.30
1	A	117	ARG	NE-CZ-NH2	-9.45	115.57	120.30
1	A	403	ARG	NE-CZ-NH1	8.98	124.79	120.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	573	GLU	Mainchain
1	B	344	ILE	Peptide

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	6002	0	5719	94	0
1	B	6011	0	5748	70	0
2	A	18	0	0	2	0
2	B	18	0	0	1	0
3	A	138	0	0	1	0
3	B	142	0	0	4	0
All	All	12329	0	11467	162	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 7.

The worst 5 of 162 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:616:ALA:HB2	3:A:799:HOH:O	1.47	1.14
1:A:107:THR:HG22	1:A:109:ASN:H	1.09	1.11
1:A:345:THR:HG23	1:A:385:ALA:HB3	1.15	1.08
1:A:166:ARG:HG3	1:A:166:ARG:HH11	1.15	1.05
1:A:345:THR:CG2	1:A:385:ALA:HB3	1.86	1.03

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	723/758 (95%)	677 (94%)	38 (5%)	8 (1%)	14	15
1	B	731/758 (96%)	698 (96%)	31 (4%)	2 (0%)	41	50
All	All	1454/1516 (96%)	1375 (95%)	69 (5%)	10 (1%)	22	26

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	384	ASP
1	A	482	GLY
1	A	656	THR
1	A	347	THR
1	A	439	ASN

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	658/676 (97%)	623 (95%)	35 (5%)	22	31
1	B	660/676 (98%)	626 (95%)	34 (5%)	23	32
All	All	1318/1352 (98%)	1249 (95%)	69 (5%)	23	32

5 of 69 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	550	LEU
1	B	574	SER
1	B	680	ARG
1	A	576	GLN
1	A	573	GLU

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	242	GLN
1	B	185	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 monosaccharides in this entry.

5.6   Ligand geometry ⓘ

2 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	TBR	A	1	-	0,36,36	-	-	-		
2	TBR	B	2	-	0,36,36	-	-	-		

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.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1	TBR	2	0
2	B	2	TBR	1	0

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 ⓘ

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	737/758 (97%)	0.55	83 (11%)	5	7	12, 33, 91, 120	6 (0%)
1	B	739/758 (97%)	0.26	27 (3%)	41	48	10, 24, 47, 83	0
All	All	1476/1516 (97%)	0.40	110 (7%)	14	19	10, 27, 80, 120	6 (0%)

The worst 5 of 110 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	585	ASN	6.2
1	B	333	ASN	6.2
1	B	584	SER	6.0
1	A	427	ALA	5.6
1	A	497	SER	5.5

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 monosaccharides in this entry.

6.4 Ligands ⓘ

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	TBR	A	1	18/18	0.84	0.24	44,51,54,56	18
2	TBR	B	2	18/18	0.89	0.18	30,40,44,45	0

6.5 Other polymers ⓘ

There are no such residues in this entry.