WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

May 23, 2020 – 09:59 am BST

PDB ID	:	5K01
Title	:	Crystal Structure of COMT in complex with 2,7-dimethyl-3-(1H-pyrazol-3-yl)imidazo[1,2-a]pyridine
Authors	:	Ehler, A.; Rodriguez-Sarmiento, R.M.; Rudolph, M.G.
Deposited on	:	2016-05-17
Resolution	:	1.38 Å(reported)

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

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 1.38 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.
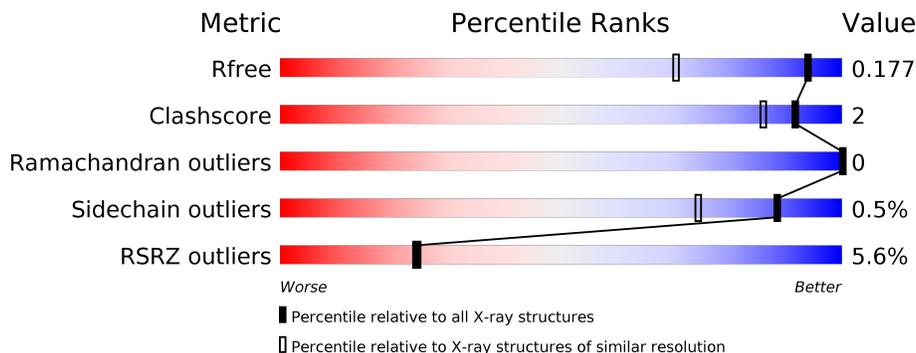
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2907 (1.40-1.36)
Clashscore	141614	3037 (1.40-1.36)
Ramachandran outliers	138981	2970 (1.40-1.36)
Sidechain outliers	138945	2969 (1.40-1.36)
RSRZ outliers	127900	2846 (1.40-1.36)

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 on 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	214	

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 3917 atoms, of which 1860 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 Catechol O-methyltransferase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	214	3660	1159	1849	294	345	13	0	25	0

There are 39 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	ARG	ARG	conflict	UNP P22734
A	12	TYR	TYR	conflict	UNP P22734
A	14	GLN	GLN	conflict	UNP P22734
A	16	ASN	ASN	conflict	UNP P22734
A	18	LYS	LYS	conflict	UNP P22734
A	21	ASP	ASP	conflict	UNP P22734
A	22	PRO	PRO	conflict	UNP P22734
A	34	THR	THR	conflict	UNP P22734
A	45	ALA	ALA	conflict	UNP P22734
A	48	GLN	GLN	conflict	UNP P22734
A	50	MET	MET	conflict	UNP P22734
A	55	ARG	ARG	conflict	UNP P22734
A	57	TYR	TYR	conflict	UNP P22734
A	58	SER	SER	conflict	UNP P22734
A	61	LEU	LEU	conflict	UNP P22734
A	62	VAL	VAL	conflict	UNP P22734
A	81	GLN	GLN	conflict	UNP P22734
A	87	LEU	LEU	conflict	UNP P22734
A	89	MET	MET	conflict	UNP P22734
A	101	GLN	GLN	conflict	UNP P22734
A	103	LEU	LEU	conflict	UNP P22734
A	104	ASN	ASN	conflict	UNP P22734
A	108	LEU	LEU	conflict	UNP P22734
A	109	GLN	GLN	conflict	UNP P22734
A	114	ILE	ILE	conflict	UNP P22734
A	115	LEU	LEU	conflict	UNP P22734
A	116	ASN	ASN	conflict	UNP P22734

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Chain	Residue	Modelled	Actual	Comment	Reference
A	122	LEU	LEU	conflict	UNP P22734
A	156	LYS	LYS	conflict	UNP P22734
A	173	VAL	VAL	conflict	UNP P22734
A	176	THR	THR	conflict	UNP P22734
A	182	TYR	TYR	conflict	UNP P22734
A	188	SER	SER	conflict	UNP P22734
A	195	SER	SER	conflict	UNP P22734
A	197	TYR	TYR	conflict	UNP P22734
A	201	MET	MET	conflict	UNP P22734
A	202	LYS	LYS	conflict	UNP P22734
A	213	GLN	GLN	conflict	UNP P22734
A	216	SER	SER	conflict	UNP P22734

- Molecule 2 is 2,7-dimethyl-3-(1H-pyrazol-5-yl)imidazo[1,2-a]pyridine (three-letter code: 6OW) (formula: $C_{12}H_{12}N_4$).
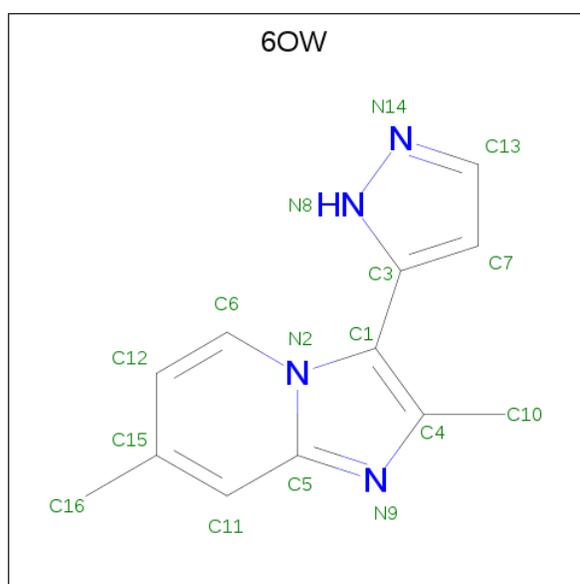
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	N		
2	A	1	27	12	11	4	0	0

- Molecule 3 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	K		
3	A	1	1	1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	229	Total 229	O 229	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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: Catechol O-methyltransferase

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	33.79Å　　59.79Å　　108.09Å 90.00°　　90.00°　　90.00°	Depositor
Resolution (Å)	32.25　–　1.38 32.25　–　1.38	Depositor EDS
% Data completeness (in resolution range)	95.5 (32.25-1.38) 91.3 (32.25-1.38)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.31 (at 1.38Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.134　,　0.176 0.136　,　0.177	Depositor DCC
R_{free} test set	2206 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	15.7	Xtriage
Anisotropy	0.040	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 49.4	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	3917	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.48% 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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: K, 6OW

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	0.43	0/1914	0.60	0/2592

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 (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	1811	1849	1821	6	0
2	A	16	11	0	0	0
3	A	1	0	0	0	0
4	A	229	0	0	2	1
All	All	2057	1860	1821	6	1

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 (6) 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:199[A]:GLU:O	4:A:401:HOH:O	1.87	0.92
1:A:165:VAL:HG22	1:A:211[A]:ILE:HD12	1.90	0.54
1:A:3:ASP:OD2	1:A:11:ARG:NH2	2.44	0.50
1:A:64[A]:GLU:OE1	1:A:72[A]:SER:OG	2.21	0.49
1:A:144:LYS:NZ	4:A:402:HOH:O	2.19	0.47
1:A:148:LEU:HB3	1:A:149:PRO:HD3	2.01	0.42

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:407:HOH:O	4:A:566:HOH:O[3_555]	2.19	0.01

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	237/214 (111%)	230 (97%)	7 (3%)	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	206/184 (112%)	205 (100%)	1 (0%)	88	74

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

Mol	Chain	Res	Type
1	A	156	LYS

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

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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	#$|Z| > 2$
2	6OW	A	301	-	14,18,18	1.85	5 (35%)	11,26,26	1.68	1 (9%)

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.

Full wwPDB X-ray Structure Validation Report

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	6OW	A	301	-	-	0/0/4/4	0/3/3/3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	6OW	C5-N9	3.09	1.36	1.33
2	A	301	6OW	N14-N8	-2.94	1.31	1.37
2	A	301	6OW	C7-C13	2.57	1.41	1.38
2	A	301	6OW	C6-N2	-2.14	1.36	1.38
2	A	301	6OW	C11-C15	2.04	1.41	1.37

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	301	6OW	C15-C11-C5	-4.28	117.82	121.15

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 (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(Å²)	Q<0.9
1	A	214/214 (100%)	-0.17	12 (5%)	24	24	10, 18, 47, 63	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	35	GLN	5.0
1	A	34	THR	4.4
1	A	216	SER	3.7
1	A	40	MET	3.0
1	A	37	GLU	2.8
1	A	5	LYS	2.8
1	A	82[A]	PRO	2.7
1	A	38	TRP	2.4
1	A	32	TYR	2.4
1	A	36	LYS	2.3
1	A	42	VAL	2.2
1	A	3	ASP	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 carbohydrates 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
2	6OW	A	301	16/16	0.98	0.05	11,14,21,21	0
3	K	A	302	1/1	1.00	0.05	21,21,21,21	0

6.5 Other polymers (i)

There are no such residues in this entry.