

# CERTIFICATE OF ANALYSIS

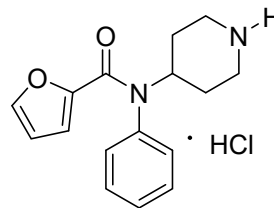


ISO/IEC 17025  
#AT-1773  
ISO Guide 34  
#AR-1774



## Furanyl norfentanyl (hydrochloride)

Item #: 19429  
Batch #: 0546010  
CAS Registry Number: N/A  
Expiry Date: 09JAN2025 (valid from date of certification)  
Description: neat solid  
Storage and Handling: Unopened at -20°C. Warm to room temperature prior to opening.  
Safety: Poison



**Intended Use:** For analytical testing purposes. Not intended for human or animal use.

**Instructions for Use:** Once opened this material should be minimally exposed to ambient conditions and returned to recommended storage conditions immediately after use. Ongoing stability testing supports a negligible decrease in purity over a series of thaw-refreeze cycles. It is recommended that laboratories perform periodic testing to verify the material remains fit for the intended use.

### Compound Information

|                     |                                                                     |
|---------------------|---------------------------------------------------------------------|
| Chemical Formula    | C <sub>16</sub> H <sub>18</sub> N <sub>2</sub> O <sub>2</sub> • HCl |
| Formula Weight      | 306.80 amu                                                          |
| UV λ <sub>max</sub> | 202 nm, 260 nm                                                      |

### Quality Information

| Qualifier                    | Method                       | Result         |
|------------------------------|------------------------------|----------------|
| Appearance                   | Visual inspection            | White solid    |
| Chromatographic Purity, HPLC | Cayman Method TST SD143      | 99.81% ± 0.18% |
| Identity, LCMS               | Cayman Method TST SD13, +ESI | 271.2 amu      |
| Identity, GCMS               | Cayman Method TST SD12       | Conforms       |
| FTIR                         | USP<851> (diamond ATR)       | Conforms       |
| % LOD                        | Cayman Method TST SD24       | 0.64% ± 0.49%  |
| % ROI                        | Cayman Method TST SD06       | <0.10% ± 0.21% |
| *Identity, NMR               | <sup>1</sup> H NMR           | Conforms       |

\*NMR and optical rotation data are provided as supplemental information but is not within scope of ISO accreditation. Property values are traceable to SI units through an unbroken chain of measurements.

### Measurement Uncertainty

All measurement uncertainties are expressed as expanded uncertainties in accordance with ISO 17025 and Guide 34 at the approximate 95% confidence interval using the appropriate coverage factor. Where applicable, optical rotation, chiral purity, and/or isotopic purity testing are performed to support the identification of the reference material, therefore the uncertainty is considered null.

Approval:  Title: Cayman Chemical ISO Quality Manager Certification Date: 09JAN2019

Cayman Chemical certifies that this standard meets the specifications stated in this certificate and warrants this product to meet the stated acceptance criteria through the expiration date when stored unopened as recommended.

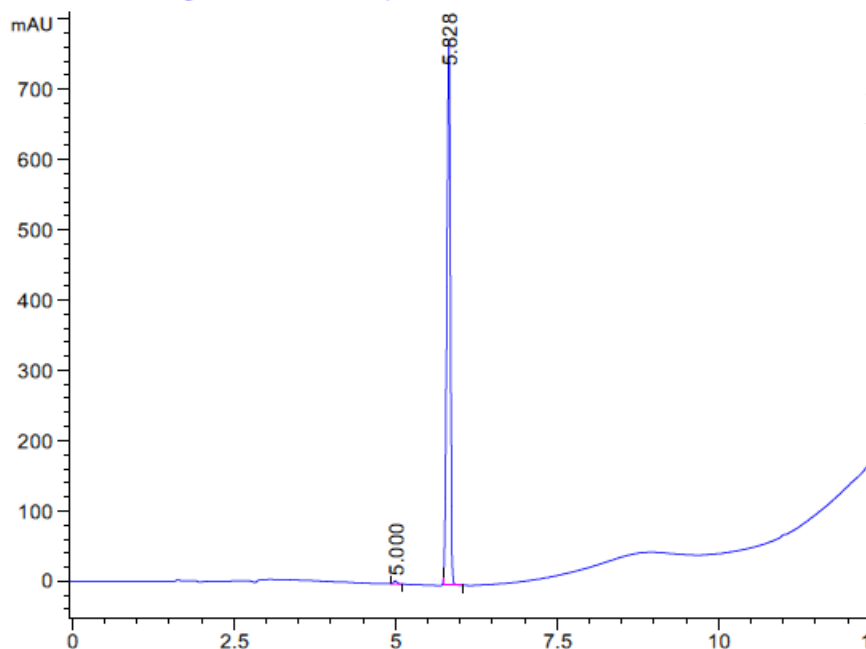
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## Supplemental Data

### HPLC-UV

DAD1 A, Sig=210,8 Ref=450,16 (C:\CAYMAN DATA\DATA\19429\19429-0546010 2)

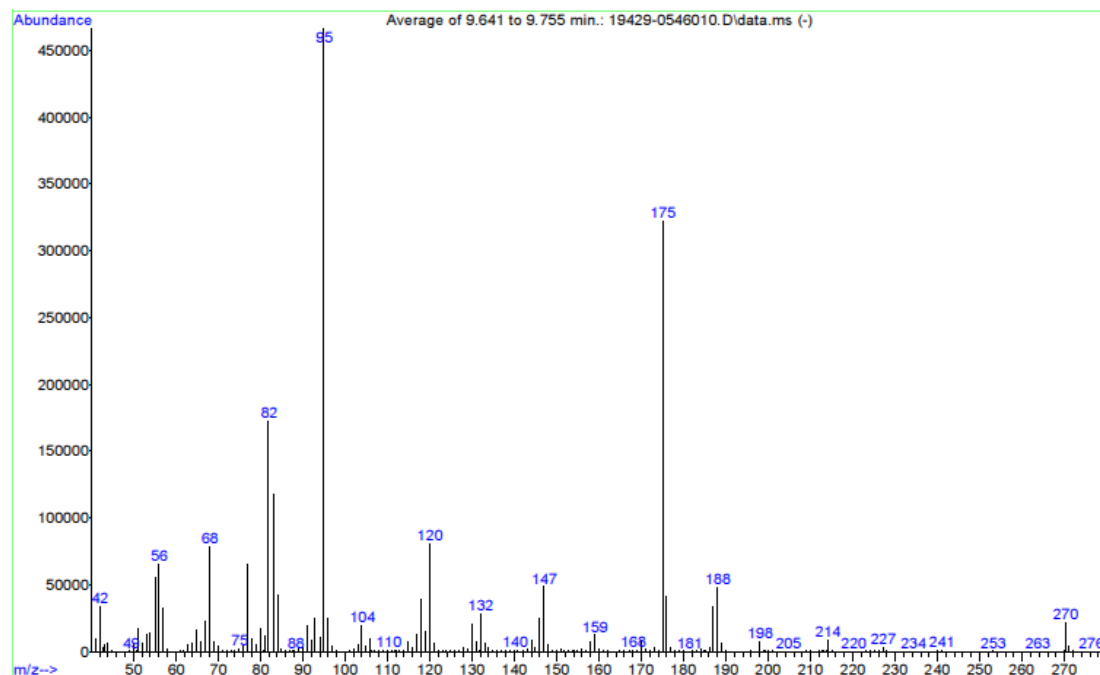


#### Conditions

4.6x150mm, 5um Gemini C18 column  
A: 0.025% TFA in H<sub>2</sub>O  
B: Methanol  
0-10 minutes 5-95% B, 10-13 minutes 95% B,  
13.1-20 minutes 5% B

1ml/min  
30°C column temp  
UV monitored at 210 nm

### GC-MS



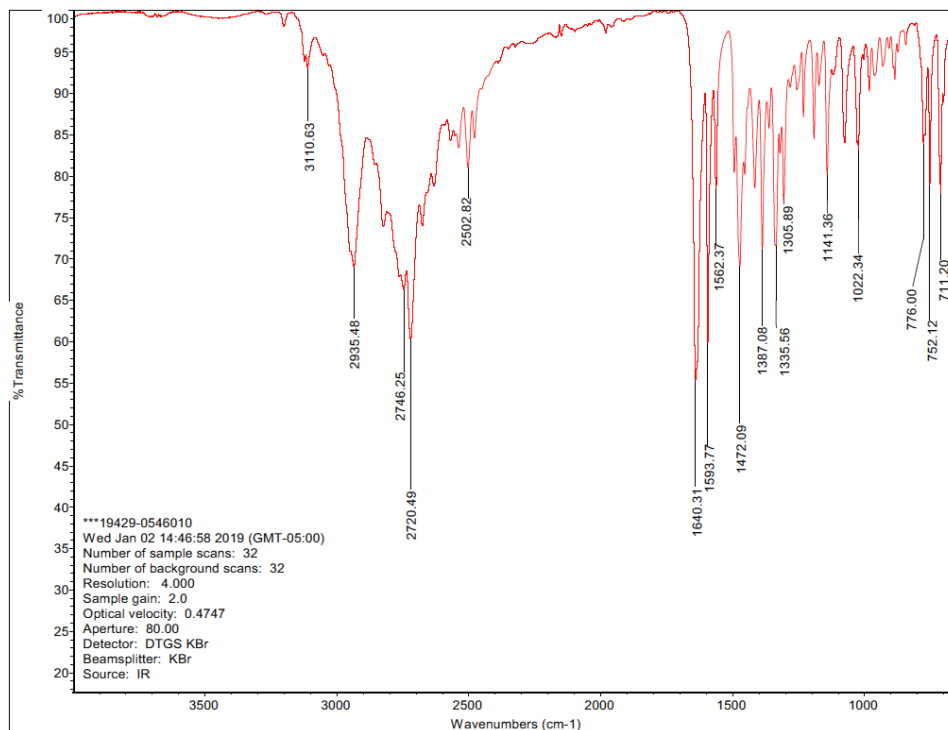
#### Conditions

Agilent 6890 GC/  
5973 MSD  
30m x 0.32mm, 0.5um  
Rtx-5MS column  
He carrier gas;  
Flow: 2mL/min  
Inlet temp: 300°C  
15:1 split  
Oven Program:  
50°C for 1 minute,  
ramp to 300°C at  
30°C / minute, hold at  
300°C to 15 minutes  
Transfer line temp:  
300°C  
70ev EI MS  
40-600 m/z  
Apex spectrum -  
background  
(1 minute window in  
front of peak)  
Tune File: stune

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## FTIR



### Conditions

Thermo Nicolet iS10 FTIR /  
Diamond SmartATR (single bounce)  
32 scans / 32 background scans  
Range: 650-4000 $\text{cm}^{-1}$   
Resolution: 4.000  
ATR and background corrected

## ESI-MS



### Conditions

Agilent 1260 HPLC /  
G6125MSD  
FIA-MS (no column)  
Mobile phase: 50:50:0.1  
MeOH/H<sub>2</sub>O/Acetic Acid  
Flow: 0.5mL/min  
+ESI 100-1000m/z range  
Nebulizer: 60psi  
Desolvation Gas: 13L/min  
Desolvation Temp: 350°C  
Electrospray Voltage: 4kV  
MS collected across peak  
width at half height

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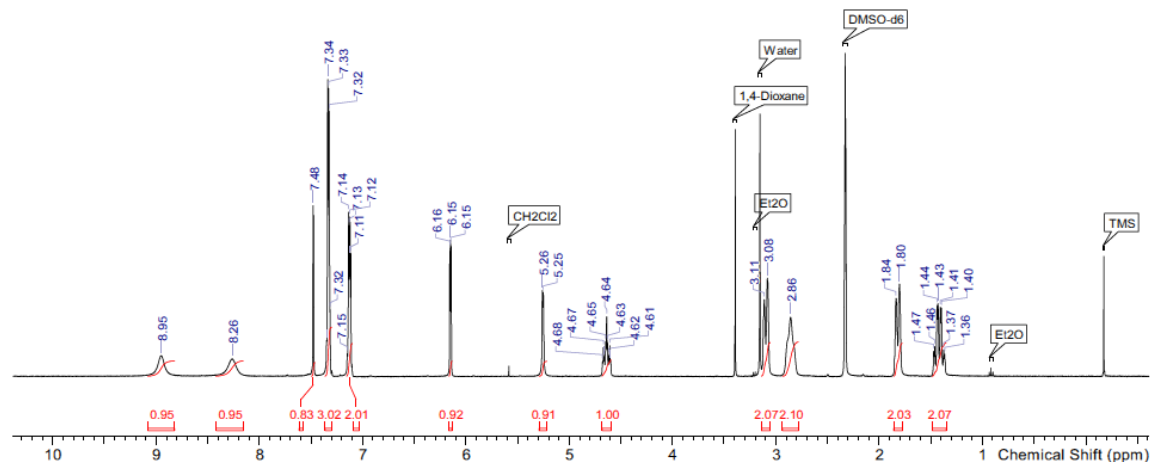
**NMR \*not within scope of ISO 17025/Guide 34 accreditation**

|                 |                                                                                                                 |                        |        |
|-----------------|-----------------------------------------------------------------------------------------------------------------|------------------------|--------|
| Date            | Dec 18 2018                                                                                                     |                        |        |
| File Name       | \\sulfur\private\inmrdata\ 2018\CC-1671-188_20181218_1\CC-1671-188_20181218_01\CC-1671-188_20181218_001.fid.fid |                        |        |
| Frequency (MHz) | 399.9680                                                                                                        | Nucleus                | 1H     |
| Solvent         | DMSO-d6                                                                                                         | Temperature (degree C) | 26.000 |
|                 |                                                                                                                 | Number of Transients   | 32     |

<sup>1</sup>H NMR (DMSO-d<sub>6</sub>, 400 MHz) δ 8.95 (br s, 1H), 8.26 (br s, 1H), 7.48 (d, 1H, J=0.8 Hz), 7.3-7.4 (m, 3H), 7.1-7.2 (m, 2H), 6.15 (dd, 1H, J=1.6, 3.5 Hz), 5.25 (d, 1H, J=3.1 Hz), 4.64 (tt, 1H, J=3.6, 12.1 Hz), 3.10 (br d, 2H, J=12.9 Hz), 2.86 (br s, 2H), 1.82 (br d, 2H, J=13.3 Hz), 1.42 (dq, 2H, J=3.9, 12.9 Hz)

Conditions

Varian Inova 400MHz NMR  
64 scans



## Homogeneity

A minimum sample size of 1.5 µg was used to determine homogeneity of the bulk solid. The recommended minimum quantity for use is 1.5 µg. Quantities below this have not been evaluated.

## Short Term Stability Summary

No decrease in purity was observed at ambient conditions or 60°C after two weeks. This data supports shipping of this product at ambient temperature.

## Long Term Stability

Long term stability data predicts 6 years stability at the -20°C storage temperature.

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## Revision History

| Revision # | Date      | Reason for Revision |
|------------|-----------|---------------------|
| 01         | 09JAN2019 | Initial version     |

## Disclaimers

### Material Safety Data

This material should be considered hazardous until information to the contrary becomes available. Do not ingest, swallow, or inhale. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. This information contains some but not all of the information required for the safe and proper use of this material. Before use, review the complete Material Safety Data Sheet, which has been sent via email to your institution.

### Warranty and Limitation of Remedy

Cayman Chemical Company makes no warranty or guarantee of any kind, whether written or oral, expressed or implied, including without limitation, any warranty of fitness for a particular purpose, suitability and merchantability, which extends beyond the description of the chemicals hereof. Cayman warrants only to the original customer that the material will meet our specifications at the time of delivery.

Cayman will carry out its delivery obligations with due care and skill. Thus, in no event will Cayman have any obligation or liability, whether in tort (including negligence) or in contract, for any direct, indirect, incidental or consequential damages, even if Cayman is informed about their possible existence.

This limitation of liability does not apply in the case of intentional acts or negligence of Cayman, its directors or its employees.

Buyer's exclusive remedy and Cayman's sole liability hereunder shall be limited to a refund of the purchase price, or at Cayman's option, the replacement, at no cost to Buyer, of all material that does not meet our specification.

Said refund or replacement is conditioned on Buyer giving written notice to Cayman within thirty (30) days after arrival of the material at its destination. Failure of Buyer to give said notice within thirty (30) days shall constitute a waiver of Buyer of all claims hereunder with respect to said material.

For further details, please refer to our Warranty and Limitations of Remedy located on our website and in our catalog.

This Certificate shall not be reproduced except in full, without written approval from the Cayman Chemical ISO Quality Manager

ISO CRT SD01 v 2.0



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