

CERTIFICATE OF ANALYSIS

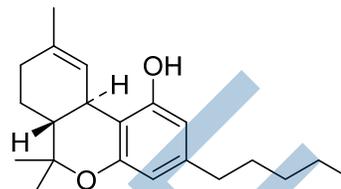


Δ9-THC CRM

6aR,7,8,10aR-tetrahydro-6,6,9-trimethyl-3-pentyl-6H-dibenzo[b,d]pyran-1-ol

Item #: ISO60157
Batch #: 0515871
CAS Registry Number: 1972-08-03

Expiry: 13OCT2020 (valid from date of certification)
Provided as: 1mg/mL (nominal) solution in methanol
Volume per ampule: not less than 1mL
*Ampules are overfilled. It is advised that labs use measured volumes.
Storage and Handling: Store unopened at -20°C. Warm to RT prior to opening.
Safety: Flammable, Poison



Compound Information

Chemical Formula	C ₂₁ H ₃₀ O ₂
Formula Weight	314.50 amu

Certified Concentration

Certified Concentration	1.000 mg/mL ± 0.007 mg/mL
Concentration is calculated based on product mass, solution mass, corrected purity and density at 20°C and is traceable to SI units through an unbroken chain of measurements.	
Uncertainty of concentration is expressed as and expanded uncertainty in accordance with ISO 17025 and Guide 34 at the approximate 95% confidence interval using a coverage factor of k=2 and incorporates uncertainties from the corrected purity, solution preparation, homogeneity, long and short term stability.	
Concentration was verified by comparison to an independently prepared calibration standard.	

Neat Material Quality Information (Item: ISO00157 Batch: 0499581)

Qualifier	Method	Limit	Result	Meets Specification
Chromatographic Purity, HPLC	Cayman Method TST SD151	≥95.00%	97.12% ± 0.18%	Y
Identity, LCMS	Cayman Method TST SD13, +ESI	315.2 ± 0.5 amu	315.4 amu	Y
Identity, GCMS	Cayman Method TST SD12	Conforms	Conforms	Y
FTIR	USP<851> (diamond ATR)	Conforms	Conforms	Y
% LOD	Cayman Method TST SD24	≤5.00%	0.45% ± 0.52%	Y
% ROI	Cayman Method TST SD06	≤3.00%	<0.10% ± 0.23%	Y
*Identity, NMR	¹ H NMR	Conforms	Conforms	Y
**Corrected Purity			96.59% ± 0.59%	

*NMR is provided as supplemental info but is not within scope of ISO accreditation

**Corrected purity is determined as follows: Corrected Purity = [(100 - % LOD - % ROI)*Chromatographic Purity/100]

Measurement Uncertainty

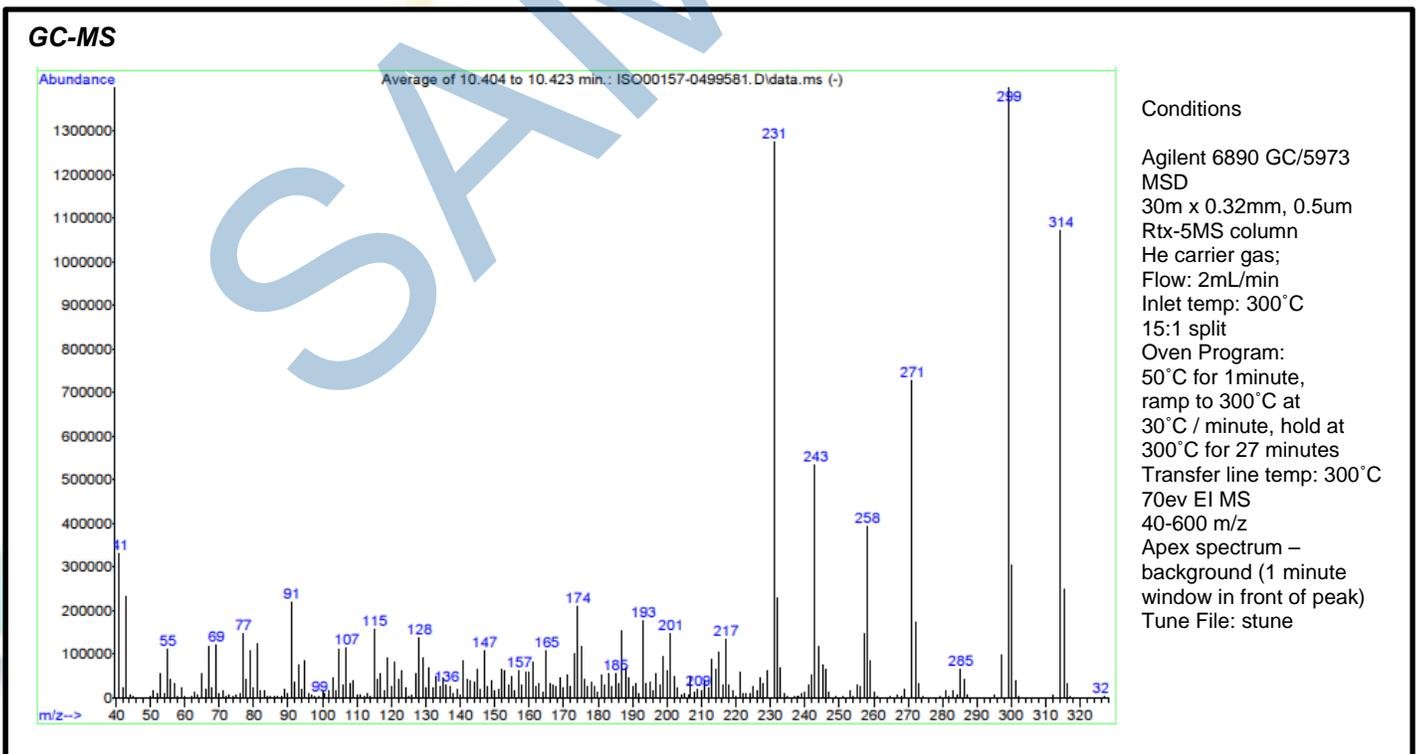
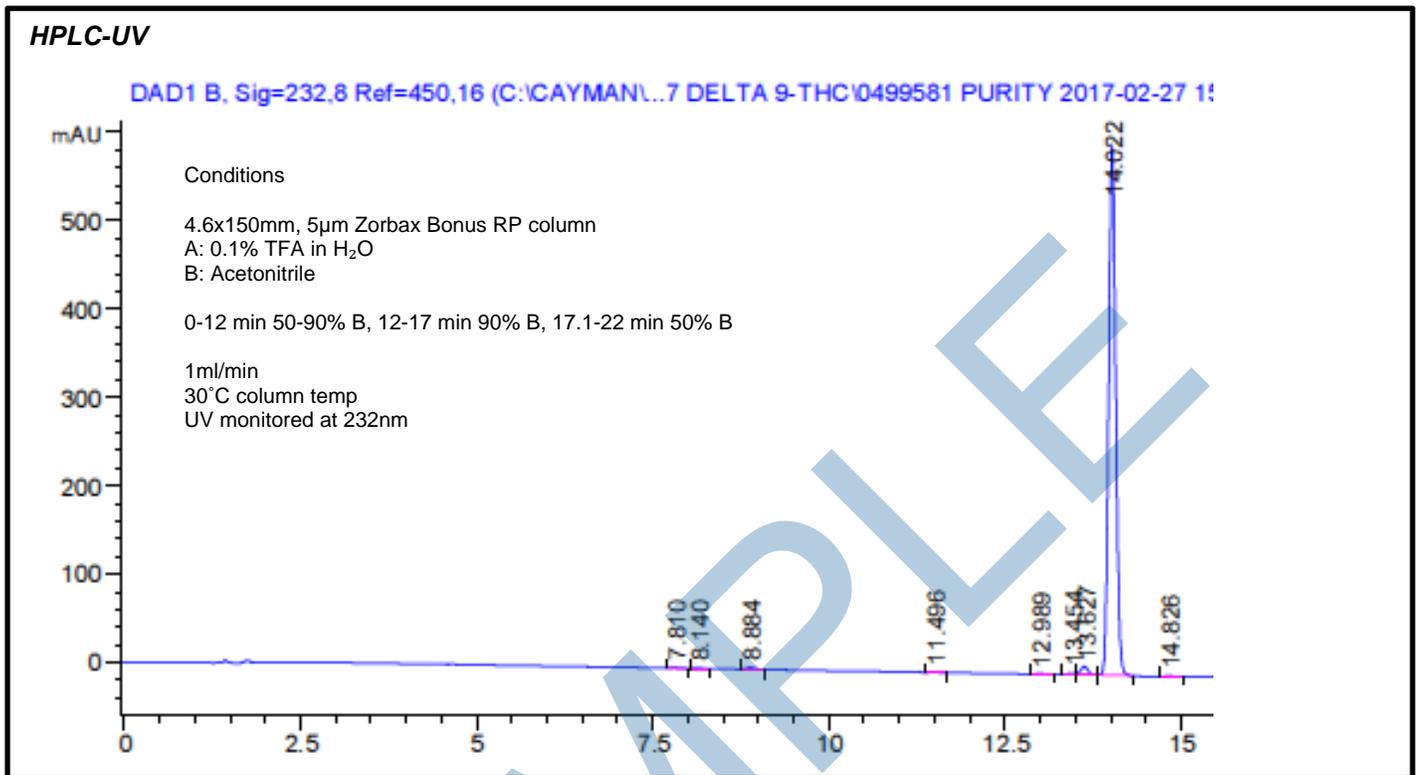
All measurement uncertainties are expressed as expanded uncertainties in accordance with ISO 17025 and Guide 34 at the approximate 95% confidence interval using a coverage factor of k=2.

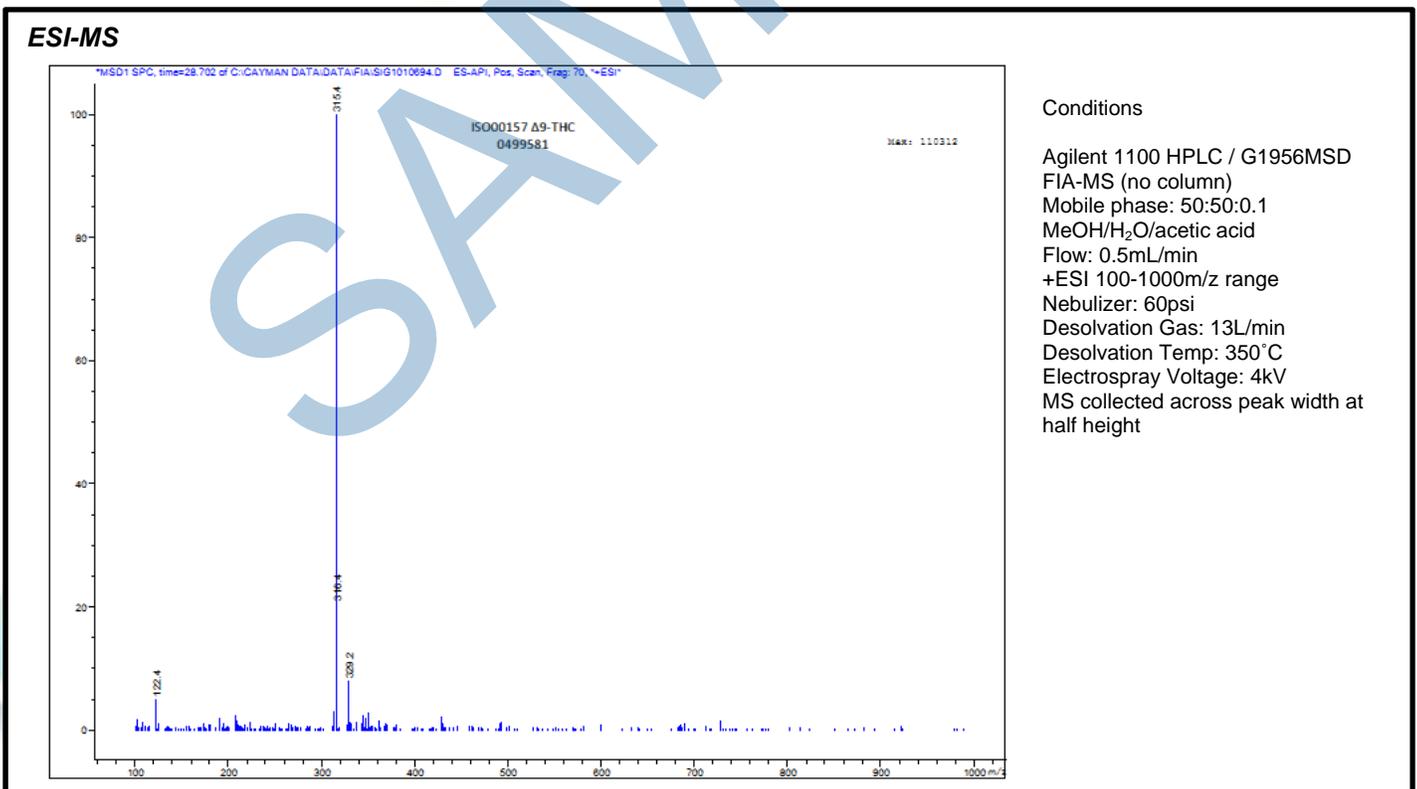
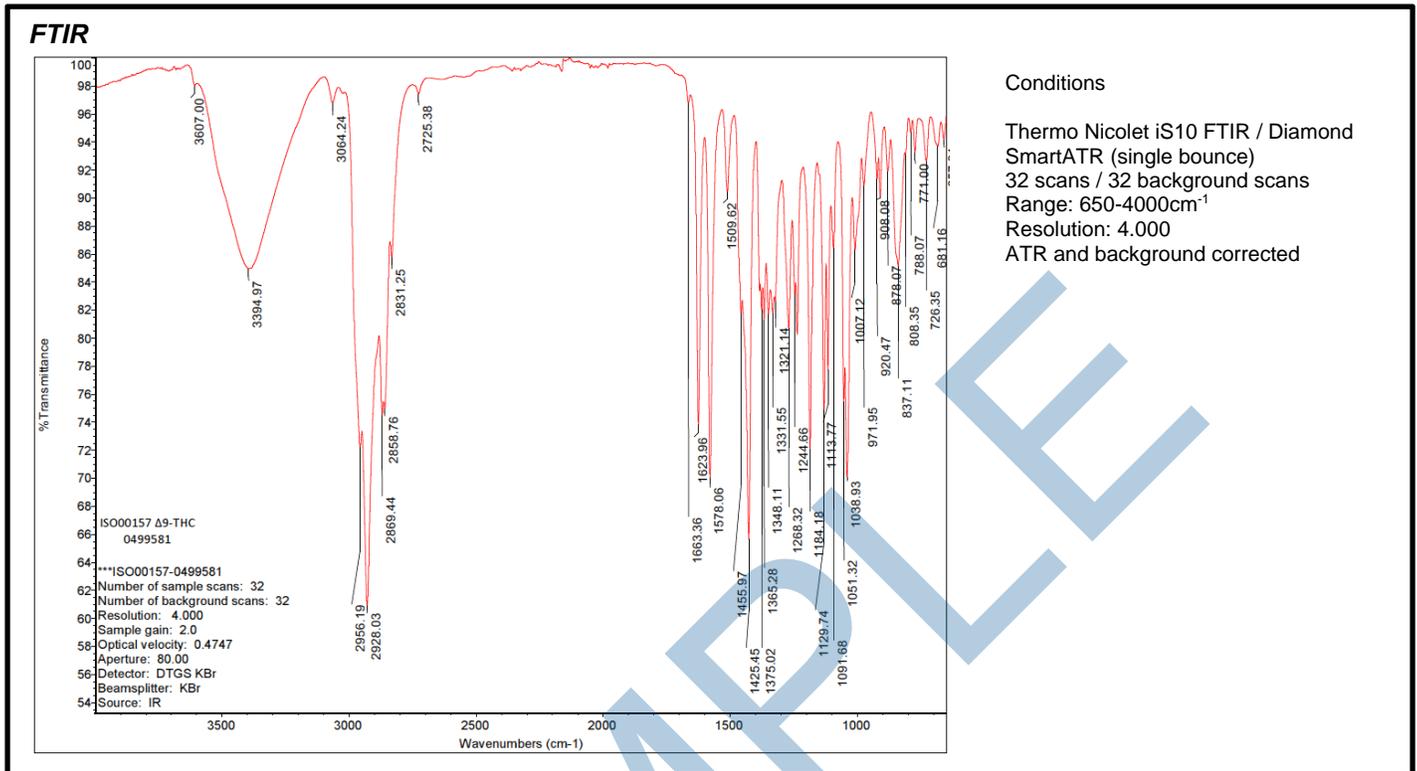
Cayman Chemical certifies that this standard meets the specifications stated in this certificate and warrants this product to meet the stated acceptance criteria through the expiration date when stored unopened as recommended.

Approval: Title: Cayman Chemical ISO Quality Manager

Certification Date: 13OCT2017

Supplemental Data (Neat Material)





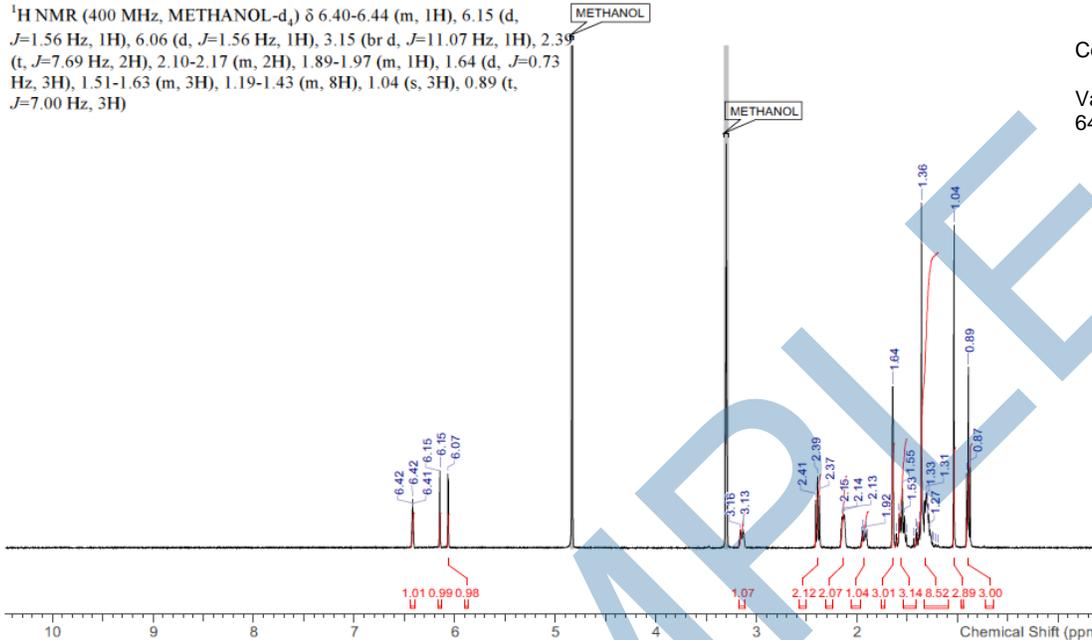
NMR *not within scope of ISO 17025/Guide 34 accreditation

File Name	\\sulfur\private\inmrd\2017\ITS-1567-57_20170222 ITS-1567-57_20170222_01\ITS-1567-57_20170222_001.fid\fid		
Date	Feb 22 2017	Nucleus	1H
Solvent	METHANOL-d4	Number of Transients	64
		Frequency (MHz)	399.9678
		Temperature (degree C)	26.000

¹H NMR (400 MHz, METHANOL-d₄) δ 6.40-6.44 (m, 1H), 6.15 (d, J=1.56 Hz, 1H), 6.06 (d, J=1.56 Hz, 1H), 3.15 (br d, J=11.07 Hz, 1H), 2.39 (t, J=7.69 Hz, 2H), 2.10-2.17 (m, 2H), 1.89-1.97 (m, 1H), 1.64 (d, J=0.73 Hz, 3H), 1.51-1.63 (m, 3H), 1.19-1.43 (m, 8H), 1.04 (s, 3H), 0.89 (t, J=7.00 Hz, 3H)

Conditions

Varian Inova 400MHz NMR
 64 scans



Homogeneity

A minimum injection of 2.5µg was used to determine homogeneity. Homogeneity was determined by HPLC from 12 randomly selected bottles from early, middle and late fill positions.

	Result	Acceptance Criteria
%RSD	0.94%	≤3%

The recommended minimum quantity for use is 2.5µg. Quantities below this have not been evaluated.

Stability

The effect of the components of stability on the combined standard uncertainty of the CRM property value are considered negligible unless indicated in stability studies.

Short Term Stability

A decrease in concentration was observed at 60°C during the two week accelerated stability study. No decrease in the concentration was observed at ambient temperature during the study. This data supports cold shipment of this product.

Long Term Stability

Long term stability data predicts 3 year stability at the -20°C storage temperature. Long term stability studies are ongoing and the Certificate of Analysis will be updated upon study completion.

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Revision History

Revision #	Date	Reason for Revision
01	13OCT2017	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 SD02 v 1.0