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CONVERSE MEASURABILITY THEOREMS FOR YEH-WIENER SPACE

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Cameron and Storvick established a theorem for evaluating in terms of a Wiener integral the Yeh-Wiener integral of a functional of x which depends on the values of x on a finite number of horizontal lines. Skoug obtained the converse of the theorem in case of one horizontal line. In this paper we extend Skoug's result to the case of a finite number of horizontal lines.

1. Introduction. Let $C_1[a, b]$ denote the Wiener space of functions of one variable, i.e., $C_1[a, b] = \{x(\cdot) \mid x(a) = 0 \text{ and } x(s) \text{ is continuous on } [a, b]\}$. Let $R = \{(s, t) \mid a \leqq s \leqq b, \alpha \leqq t \leqq \beta\}$ and let $C_2[R]$ be Yeh-Wiener space (or 2 parameter Wiener space), i.e., $C_2[R] = \{x(\cdot, \cdot) \mid x(a, t) = x(s, \alpha) = 0, x(s, t) \text{ is continuous on } R\}$. Let ν be Wiener measure on $C_1[a, b]$ and let m be Yeh-Wiener measure on $C_2[R]$. For a discussion of Yeh-Wiener measure see [1], [3] and [4]. $\boldsymbol{R}$ will denote the real numbers and $\boldsymbol{C}$ the complex numbers. We shall use the following notation for the Cartesian product of n Wiener spaces $\overset{n}{\times} C_1[a, b] = C_1[a, b] \times \overset{(n)}{\cdots} \times C_1[a, b]$ and $\overset{n}{\times} \nu = \nu \times \overset{(n)}{\cdots} \times \nu$ will denote the product of n Wiener measures on $\overset{n}{\times} C_1[a, b]$.

Let $\alpha = t_0 < t_1 < \cdots < t_n = \beta$ be a subdivision of $[\alpha, \beta]$. Define $\varphi\colon \overset{n}{\times} C_1[a, b] \to \overset{n}{\times} C_1[a, b]$ by

$$\varphi(y_1, y_2, \cdots, y_n) = \left(\sqrt{\frac{t_1 - t_0}{2}} y_1, \sqrt{\frac{t_1 - t_0}{2}} y_1 + \sqrt{\frac{t_2 - t_1}{2}} y_2, \cdots, \sqrt{\frac{t_1 - t_0}{2}} y_1 + \cdots + \sqrt{\frac{t_n - t_{n-1}}{2}} y_n\right).$$

Then φ is $1 - 1$, onto and continuous with respect to the uniform topology. Let $G\colon C_2[R] \to \overset{n}{\times} C_1[a, b]$ be defined by $G(x) = (x(\cdot, t_1), x(\cdot, t_2), \cdots, x(\cdot, t_n))$. Then G is a continuous function from $C_2[R]$ onto $\overset{n}{\times} C_1[a, b]$.

In [1] Cameron and Storvick evaluated certain Yeh-Wiener integrals in terms of Wiener integrals. In particular they obtained the following theorem;

THEOREM A (*n-parallel lines theorem*). *Let $f(y_1, y_2, \cdots, y_n)$ be a real or complex valued functional defined on $\overset{n}{\times} C_1[a, b]$ such that*