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NOTES ON ANALYTIC FEYNMAN INTEGRABLE FUNCTIONALS

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ABSTRACT. In this paper we establish the analytic Feynman integrability (and the Fresnel integrability) for a very large class of functionals on multi-parameter Wiener space. Many previous results in the literature, including results by Chang, Johnson, Park and Skoug, then follow from our results as corollaries.

1. Introduction. In a recent expository essay [**9**], Nelson calls attention to some functionals on Wiener space which were discussed in the book of Feynman and Hibbs [**6**] and in Feynman's original paper [**5**]. These functionals have the form

$$F(x) = \exp\left\{\int_0^T \int_0^T W(s_1, s_2; x(s_1), x(s_2))\, ds_1\, ds_2\right\}. \tag{1.1}$$

In [**8**], Johnson and Skoug examine the Feynman integrability of functionals on Wiener space of the form

$$F(\vec{x}) = \exp\left\{-\int_a^b \langle A(s)\vec{x}(s), \vec{x}(s)\rangle\, ds\right\}. \tag{1.2}$$

Since then, Chang, Johnson and Skoug [**3**], and Park and Skoug [**10**] extended the theory to include functionals of the form

$$F(x) = \exp\left\{-\int_0^T \cdots \int_0^T \langle A(s_1, \ldots, s_n)(x(s_1), \ldots, x(s_n)), (x(s_1), \ldots, x(s_n))\rangle\, ds_1 \cdots ds_n\right\}. \tag{1.3}$$

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