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**SUN KIM**, University of Illinois at Urbana-Champaign  
*Sums of squares and Bessel functions*

In 1934, the Russian mathematician A. I. Popov stated, but did not rigorously prove, a beautiful series transformation involving  $r_k(n)$  and certain Bessel functions. We provide a proof of this identity for the first time, as well as for another identity, which can be regarded as both an analogue of Popov's identity and an identity involving  $r_2(n)$  from Ramanujan's lost notebook. Furthermore, we establish a new transformation between a series consisting of  $r_k(n)$  and a product of two Bessel functions, and a series involving  $r_k(n)$  and the Gaussian hypergeometric function. This transformation can be considered as a massive generalization of well-known results of G. H. Hardy, and of A. L. Dixon and W. L. Ferrar. This is joint work with B. C. Berndt, A. Dixit and A. Zaharescu.