7. Typical running time: If the estimate of the spectral radius of the iteration matrix has been well chosen, the running time could vary from less than one minute to over one-half hour. This wide variance depends on the boundary conditions, the number of mesh points, and the convergence criterion.
8. Present status: In use
9. *References:* J. B. Callaghan, P. H. Jarvis, and A. K. Rigler, BAFL-1—A program for the solution of thin elastic plate equations on the Philco-2000 computer. WAPD-TM-255 (April 1961). R. B. Smith and C. H. Hunter, The BKS system for the Philco-2000 computer. WAPD-TM-233 (April 1961).
10. Material available from Philco:
    Binary program deck
    Symbolic program tape
    Referenced documents

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SPAN-3

1. Name of program: SPAN-3
2. Computer for which program is designed: Philco-2000 Programming system: TAC
3. Nature of problem solved: This shielding design program calculates uncollided gamma fluxes, total gamma dose rates, and total energy absorption at points outside of sources of gamma rays. It also calculates fast neutron dose rates and thermal neutron fluxes at points outside of fission neutron sources. The basic geometry is cylindrical. Source strengths may be specified over a sector of a cylinder in the form $S(r,z)S(\theta)$. Sources are in the form of sectors of cylindrical annuli contained in the region of source strength specification. Shield regions are in the form of cylindrical annuli cut by planes normal to the axis and semi-infinite slabs. Gamma energies are limited to 30 energies from 0.5 to 10 Mev. A library contains cross sections and buildup parameters for most common elements found in shields.
4. Method of solution: Three-dimensional Gaussian quadrature is used in the integration of the exponential point kernel over the source region.
5. Basic physics approximations in the problem formulation: Total gamma dose rates and energy absorption are given by a product of an uncollided factor which can be calculated by exponential attentuation with a buildup factor which can be represented as the sum of two exponentials. Fast neutron dose rates and thermal neutron fluxes are given by empirical kernels which are in the form of sums of two or three exponentials. Neutron doses and fluxes can only be calculated in water regions or in voids beyond water regions. For thermal neutron flux the temperature of this water must satisfy either $60°F \leqq T \leqq 180°F$ or $450°F \leqq T \leqq 650°F$.
6. Restrictions on the problem: This program requires a 32K Philco-2000 computer and must be run within the BKS system.
7. Typical running time: 5 to 30 sec to calculate the flux at one field point due to one source at one or more energies. This number is relatively independent of the number of energies and depends most heavily on the number of shield regions between source and field point. Roughly, a 20 shield region might lead to a 20 sec running time. These times per field point are in addition to setup time which is negligible in problems running over one minute.
8. Present status: In use
9. *References:* W. H. Guilinger, N. D. Cook, and P. A. Gillis, SPAN-3—A shield design program for the Philco-2000 computer. WAPD-TM-235 (February 1962).
    R. B. Smith and C. H. Hunter, The BKS system for the Philco-2000 computer. WAPD-TM-233 (April 1961).
10. Material available from Philco:
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    Referenced documents

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