analysis proves that the patterns of moire interferometry and geometrical moire are governed by identical relationships.

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USE OF A HgI_2 SOLID STATE DETECTOR IN GAMMA-RAY DENSIMETRY

M. Pasi, O. Shahal and A. Matmor

Most of the γ-densimeters now in use have an ionizing chamber as a detector. The rate measurement is quite stable, but the fact that all the photons are counted, without energy selection, leads to serious perturbations due to the build-up effect (a secondary radiation-matter interaction effect, generating low-energy photons, which competes with the normal Beer-Lambert absorption effect). The alternative use of a scintillator-detector (permitting the selection of the desired medium-energy photons) solves the problem, but has another disadvantage, the instability of the counting rate, due to dependence on the high-voltage applied and the ambient temperature (the built-in photomultiplier being the main source of instability).

We have built a new type of γ-densimeter, working with a mercuric iodide solid state detector (built by the Yissum Co. Jerusalem). The counting rate is independent of the applied high voltage and the ambient temperature, within the ranges 200 to 1100 V and 20 to 60°C.

The possibility of collecting, during weeks, rate figures with internal deviations no greater than ±2, permitted introducing improvements in the calibration of the instrument. The often-used linearization of the density/counting-rate response curve is of course incorrect, the dependence being exponential. However, also the improved method of building an exponential curve between the two calibrated limits of the density-range is inaccurate, because the μ-factor of the absorption-equation (=the mass-absorption-coefficient, MAC), which depends on the atomic composition of the medium, changes continuously within the measured density range. Therefore, the building of an accurate response-curve requires the splitting of the range into several sub-sections; the correlative values of the density/counting-rate pair of each limit between two sub-sections are experimentally measured, the mean MAC value within each sub-section is calculated and in this way a new polyexponential chain-shaped calibration curve is built; such a curve affords increased physical accuracy.

We have added a microprocessor with a special program to the instrument. When put in calibration mode, the instrument automatically records the several correlative figure pairs, calculates all the MAC values, builds the poly-exponential chain curve and stores it in the memory. When put in measuring mode, the instrument reads the counting rates, transforms them to density values through the internally stored calibration table and directly displays the digital density figure.

We have built a prototype of the instrument, which has successfully passed field tests. A commercial version will be built soon.