excitation probabilities. In our approach, these excitations come about in two ways: the first is through the direct coupling of the spin vector to the quantized electromagnetic field; the other is through fluctuations in the particle orbit. It is the vertical fluctuations (in the direction of the magnetic field) which induce spin transitions. Through the Heisenberg equations of motion, these fluctuations in turn can be related to the quantum fluctuations in the electromagnetic fields. The field fluctuations build up the fluctuations in the orbit and radiation damping prevents them from growing indefinitely.

The part of the fluctuations in the vector $\vec{\omega}$, which is responsible for the spin excitations, can then be written in the simple form

$$\delta\vec{\omega} = \frac{e}{2mc}\,[g\boldsymbol{B}'_{q} + (2\boldsymbol{e}_{r} + \boldsymbol{f}(g))\boldsymbol{E}'_{qz}]$$

where $\boldsymbol{B}'_{q}$ and $\boldsymbol{E}'_{qz}$ are the free quantum fields in the rest frame of the electron and $\boldsymbol{e}_{r}$ is a unit vector in the radial direction. The resonance factor $\boldsymbol{f}(g)$ is proportional to g-2: being a function of γ it is essentially equal to 0 except in a narrow interval where there is resonance between the vertical fluctuations and the spin motion. The transition probabilities between the spin levels now are determined by correlation functions of along the classical orbit. For $\boldsymbol{f}(g) = 0$, the result found in this way for the transverse polarization of the electrons agrees with the earlier result [5].

An interesting additional observation concerns the resonance factor $\boldsymbol{f}(g)$. In our approach one sees that the resonance does not have a purely depolarizing effect. As a function of γ, the polarization close to the point of resonance initially decreases, from 0.92 to −0.17, but then increases to 0.99 before finally decreasing again to 0.92. It is thus possible, at least in principle, to exceed the "maximum" value 0.92 close to the resonance.

Conclusions

Returning to the question of the relation between the polarization effect and the Unruh effect one sees, as already stated, that they are of a similar nature. Transitions between spin levels are caused by quantum fluctuations of the vacuum fields along the electron orbit, in the same way as field fluctuations induce transitions in a linearly accelerated detector. In this sense, both the electrons and the detector are heated by the accelerating motion through a vacuum.

However, there is also an essential difference between the two cases. For uniform linear acceleration, the excitation spectrum has a universal thermal character. This is not the case for the "circular Unruh effect" where the excitation spectrum depends on characteristics of the detector. Using circulating electrons, the effects of Thomas precession are important and fluctuations in the orbit cannot be neglected.

ADDITIONAL REFERENCES

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John Bell Symposium

A Symposium on Quantum Physics, in memory of John Stewart Bell who died on 1 October 1990, will be held at CERN on 2-3 May. The programme includes talks by A. Aspect, H. Rauch, A.J. Leggett, K. Gottfried, A. Shimony, G.C. Ghirardi, J. Leinaas and R. Jackiw. Further information: Jeanne Rostant, Theory Division, CERN, CH-1211 Genève 23 (Tel./Fax: +41 (22) 767 42 22 / 39 14; Bitnet: rostant @ cernvm.cern.ch).

World Lab Fosters Third World Excellence

Establishing a "new equilibrium" in the distribution of knowledge between east and west, north and south can provide a "new way out" for undeveloped countries by allowing the creation of scientifically based cultures which have the capacity to generate wealth from limited material resources. But one has to act directly because if one "applies European logic", this process would never have started even in our "corner of the planet". Action must also span all disciplines since "only a strong civilization creates science". Most important of all, experience in creating the great laboratories of Europe implies that solutions will mostly spring from initiatives by individuals.

These remarks by Professor Antonino Zichichi help one understand the principles which guide the International Centre for Science Culture (ICSC), better known as the World Laboratory. Founded by Professor Zichichi, its President, in 1986, the World Lab works to extend the Erice heritage in improving the training of, and opportunities for, scientists based in poorer countries. Erice is the home of the Ettore Majorana Centre for Scientific Culture that celebrated its 25th Anniversary last year with the first award of the Science for Peace Prize (see *Europhysics News* **21** (1990) 219). Housed in two converted monasteries and a former convent in the famous medieval hill-top town, the Centre has hosted some 100 schools and 480 courses attended by 44000 participants from 103 countries, a great demonstration of "international collaboration without ideological position". Erice also gives its name to the world renowned Statement written by P.A.M. Dirac, P.L. Kapitza and A. Zichichi whose 10000 signatories declare themselves morally bound to work purely in the interests of science — a "new rôle for science".

World Laboratory

The World Lab builds upon the Erice principles through collaborative projects in science and technology with existing institutions. The Lab's operating budget comes largely from Italy, the USSR and China, but this does not imply that it is just another funding agency. Each beneficiary country in fact handles local projects, thus requiring only a very small administrative team at the headquarters in Lausanne, Switzerland.

The Erice experience also provided a wealth of essential experience and contacts so that distinguished colleagues can help identify unique projects. The result is that Professor T.D. Lee of Columbia University was instrumental in setting up in 1986, Beijing's Center for Advanced Science and Technology of which he is the Director. The Center is a branch laboratory established with governmental agreement that ensures independence and effectiveness in running projects in China. It employs 50 scientists and 30 students and, aside from research in high energy

Professor S.P. Kapitza (left) receiving on behalf of his father Academician P.L. Kapitza the first Scienza per la Pace Prize from Professor A. Zichichi last November in Erice, Sicily.
The other winners were P.A.M. Dirac and A.D. Sacharov, E. Teller and V.F. Weisskopf.