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Hard X-ray resonance in sapphire crystal cavities using back diffraction Y.-H WU, Y.-W TSAI, Y.-Y CHANG, Dept of Physics, National Tsing Hua University, C.-H CHU, National Synchrotron Radiation Research Center, DAVID G. MIKOLAS, C.-C FU, Institute of Nano Engineering and Microsystems, National Tsing Hua University, S.-L CHANG, National Synchrotron Radiation Research Center & Dept of Physics, National Tsing Hua University, DEPT OF PHYSICS, NATIONAL TSING HUA UNIVERSITY TEAM, NATIONAL SYNCHROTRON RADIATION RESEARCH CENTER COLLABORATION, INSTITUTE OF NANO ENGINEERING AND MICROSYSTEMS, NATIONAL TSING HUA UNIVERSITY TEAM — The Fabry-Perot type resonators using back diffraction from sapphire crystals for hard X-ray was investigated. On the basis of its less absorption and hexagonal structure, the resonator in sapphire crystals underwent a pure 2-beam diffraction which could enhance the resonance interference and improve finesse compared with the one in silicon crystals. The resonators were manufactured from sapphire crystals using microelectronic lithography process with thickness of a few tens μm. With synchrotron radiation of energy resolution ΔE=0.82 meV at 14.315 keV, X-ray back diffraction from two monolithic sapphire crystal plates shows resonance fringes clearly resulting from coherent interaction inside the energy gap of the (0 0 30) reflection. These experimental results of sapphire cavities imply the potential application for X-ray optics.

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