SUBGROUP 8

Integral Data Test for Minor Actinide Data

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Fast reactor benchmark

A.Benchmark Calculation for the FCA-IX critical assembly

The FCA-IX assembly series consist of seven uranium fuelled cores which are built so as to cover the wide range of neutron spectrum shape and to test fission and capture cross sections of higher actinides such as U-235, Pu-239, U-238, Np-237, Pu-238, Pu-242, Am-241 and Am-243.(Ref.1, 2) The assemblies IX-1 to IX-6 were composed with

enriched metal uranium, and diluent materials were graphite for the assemblies IX-1 to 3 and stainless steel for the assemblies IX-6 to 6. The assembly IX-7 was composed with 20 % enriched meatal uranium, without diluent materials.

Using the new evaluated file JENDL-3.2, the FCA-IX assembly series were analyzed and compared with the results calculated with the old file JENDL-3.1.

Figs. 1 and 2 show the comparison of effective multiplication factors. The results calculated with JENDL-3.2 give remarkable improvement for the underestimate of JENDL-3.1. Figs. 3 - 6 show the C/E values for the central fission reaction rate ratios of N-237, Pu-238, Am-241 and Am-243 to U-235, respectively. The results of JENDL-3.2 are several percents smaller than those of JENDL-3.1. The dependence of the C/E values on the core spectrum can be observed for three JENDL libraries.

B. Analyses of irradiated actinides data at PFR (Ref. 3)

The 21 actinide nuclides have been irradiated by using the fast reactor core of PFR on the period from 1985 to 1988. The total irradiated net times were 550 days. The irradiated oxide sample nuclides are as follows:

Cm-248, Cm-246, Cm-244, Cm-243
Am-243, Am-241
Pu-244, Pu-242, Pu-241, Pu-240, Pu-239, Pu-238
Np-237
U-238, U-236, U-235, U-234, U-233
Pa-231
Th-232, Th-230

These samples have been analyzed with the use of mass spectrometry and alpha spectrometry at ORNL, and they have being measured at JAERI under the cooperation program between Japan and U.S. in OMEGA project.

These analyzed data are collected and investigated to use as the present benchmark data for the minor actinides.

References

1)T. Mukaiyama et al.: Actinides Integral Measurement in FCA Assemblies, Nuclear cross Section for Technology, Proc. Inter. Conf., santa Fe, May, 1985.

2)S. Okajima et al.: Evaluation and Adjustment of Actinides Cross Sections Using Integral Data Measured at FCA, Nuclear Data for Science and Technology, Proc. Inter. Conf. Mito, 1988.

3)T. Sizuki et al.: Analyses Irradiated Fuel at PFR, private communication, 1994.

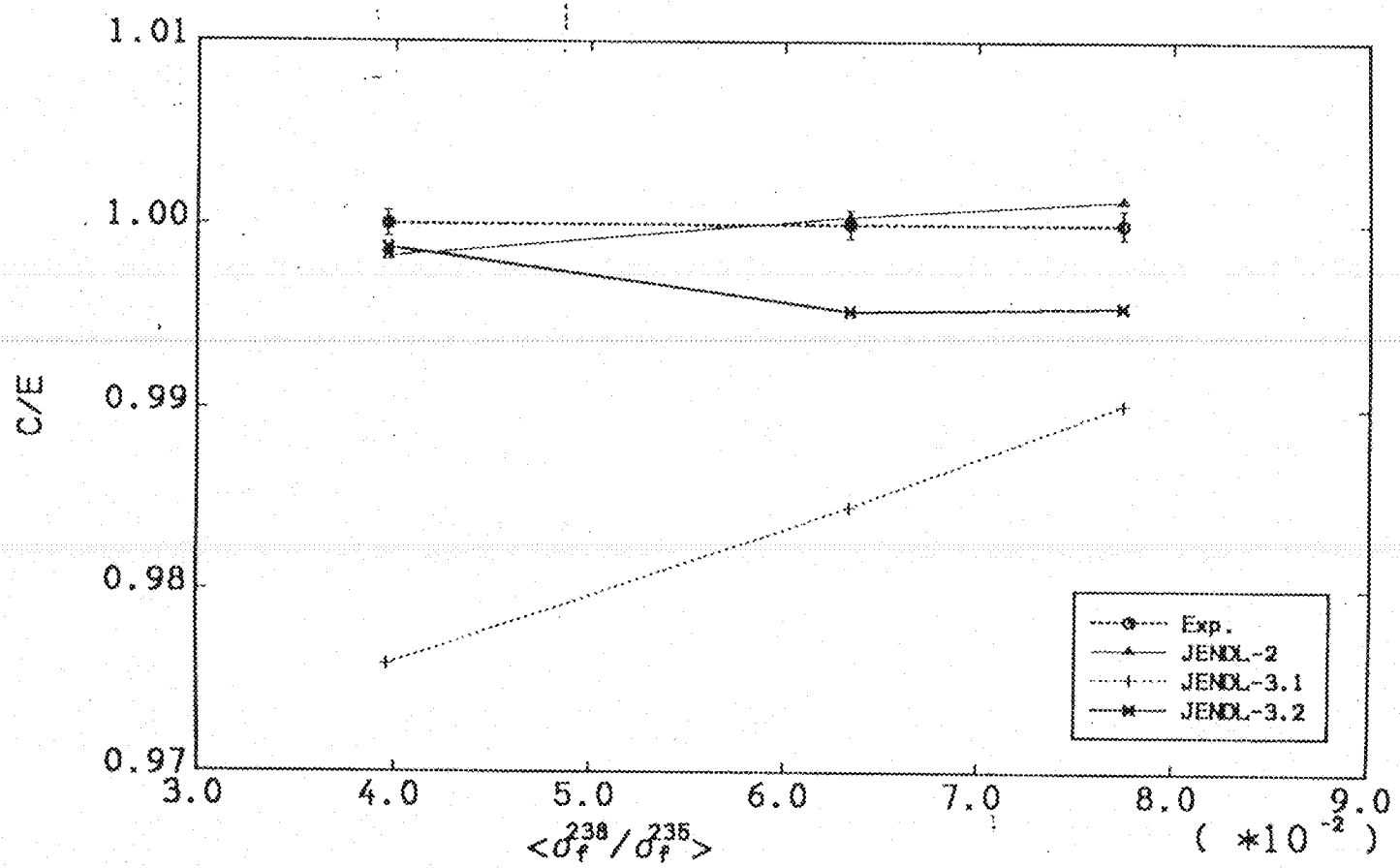

Fig. 1 C/E of k_{eff} for FCA-9-1, FCA-9-2, FCA-9-3 (Graphite Moderator)

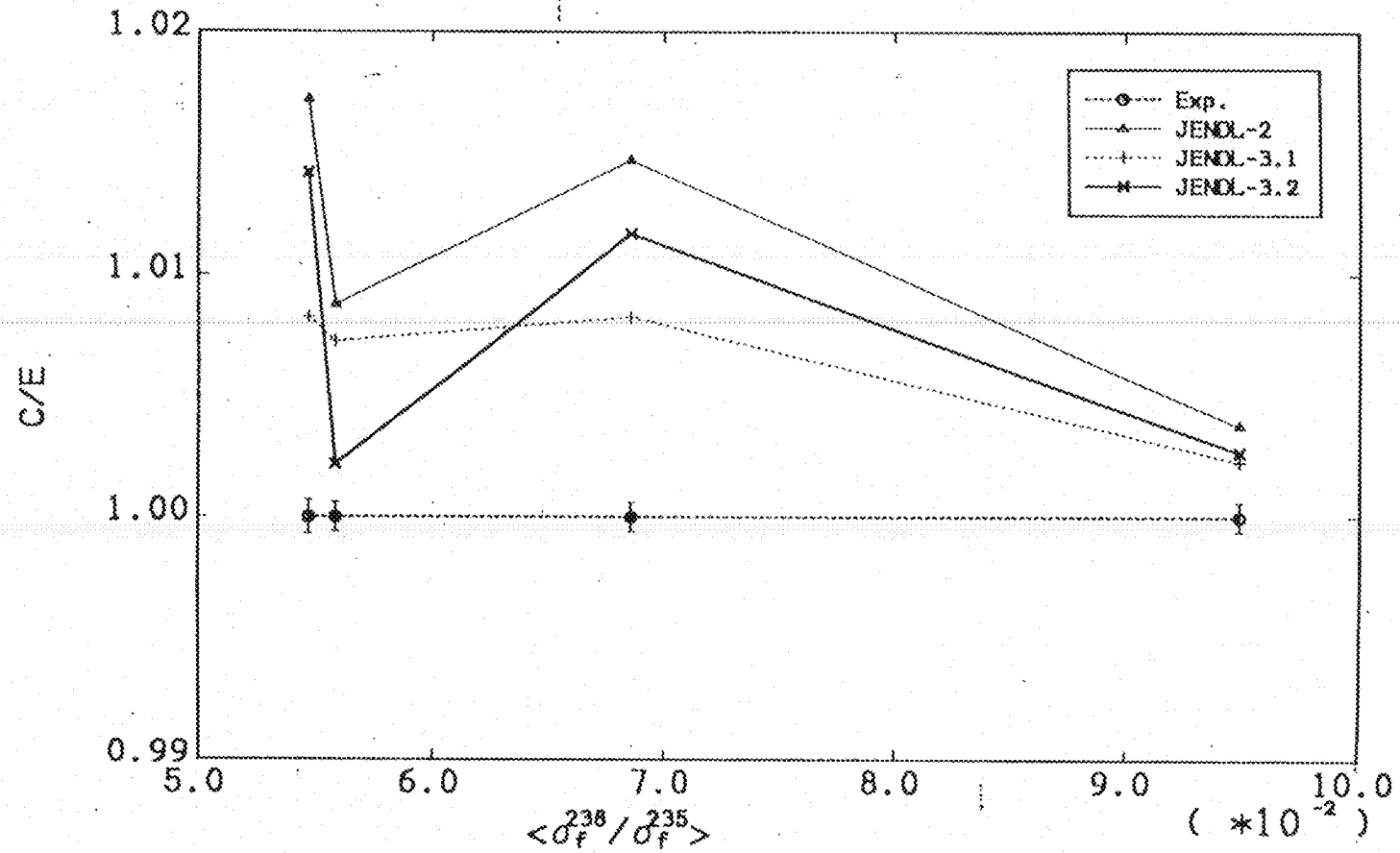

Fig.2 C/E of k_{eff} for FCA-9-4, FCA-9-7, FCA-9-5, FCA-9-6 (SUS Moderator)

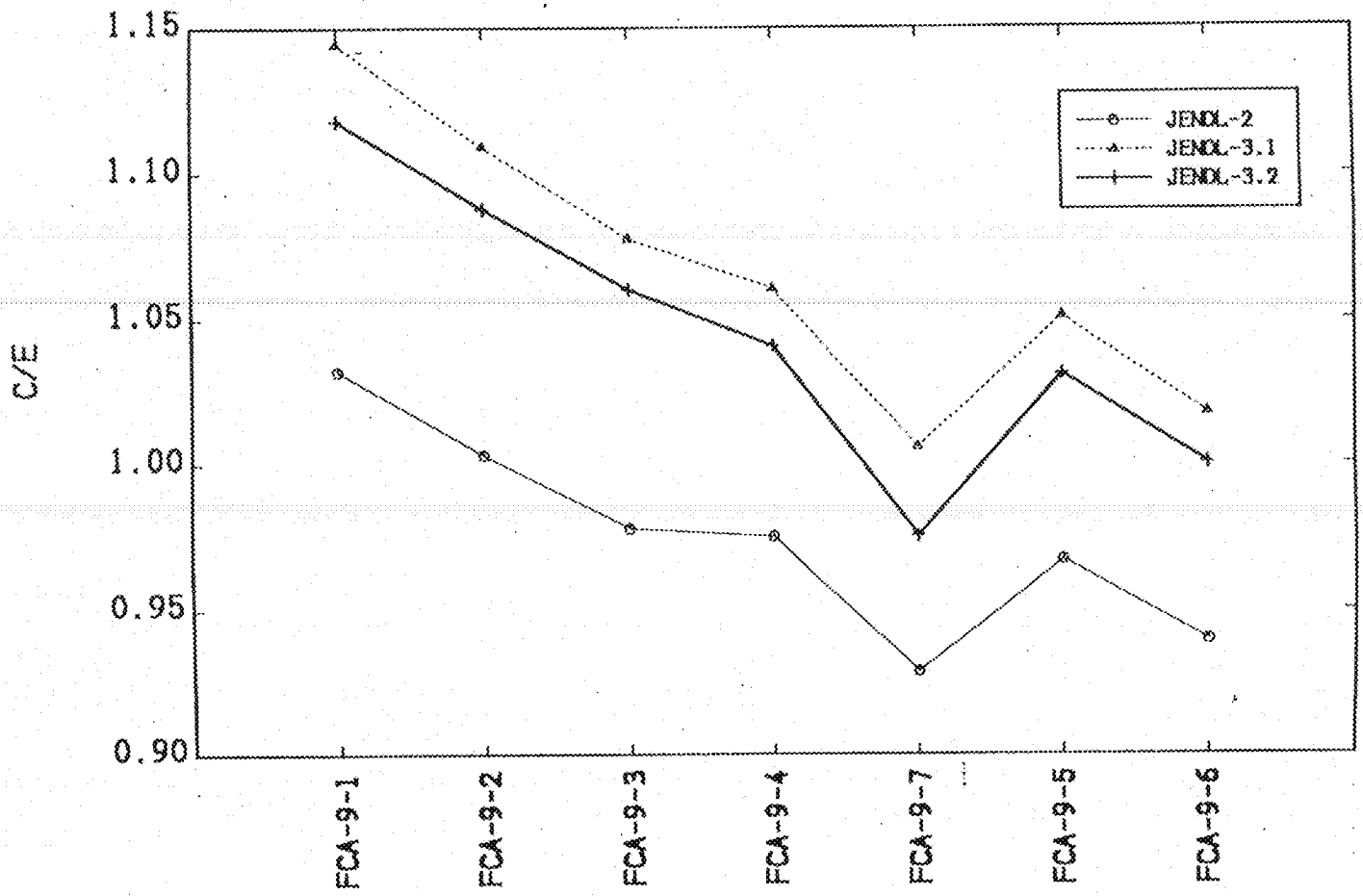

Fig. 3 Np-237 fission rate ratio relative to U-235 fission

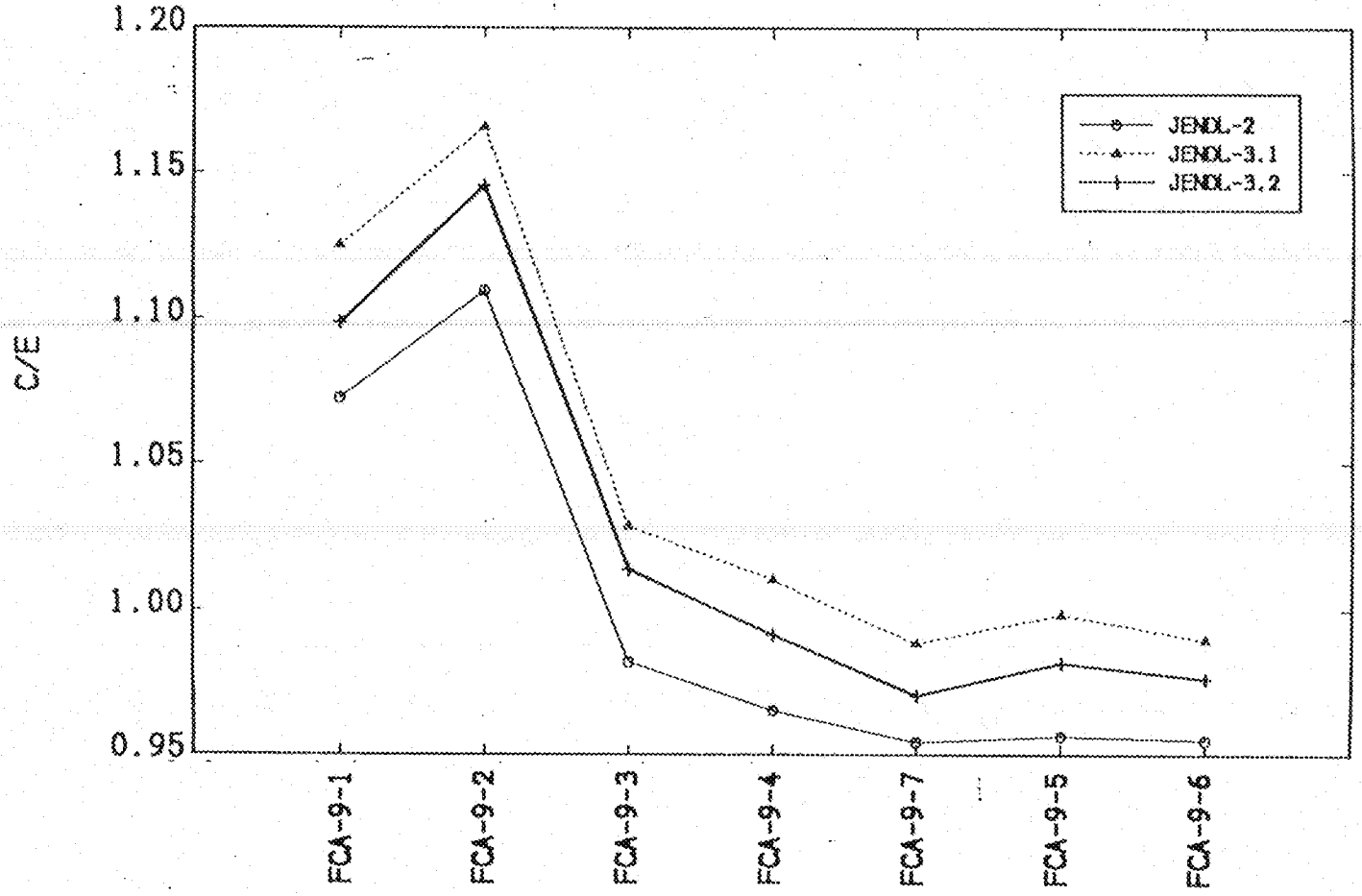

Fig. 4 Pu-238 fission rate ratio relative to U-235 fission

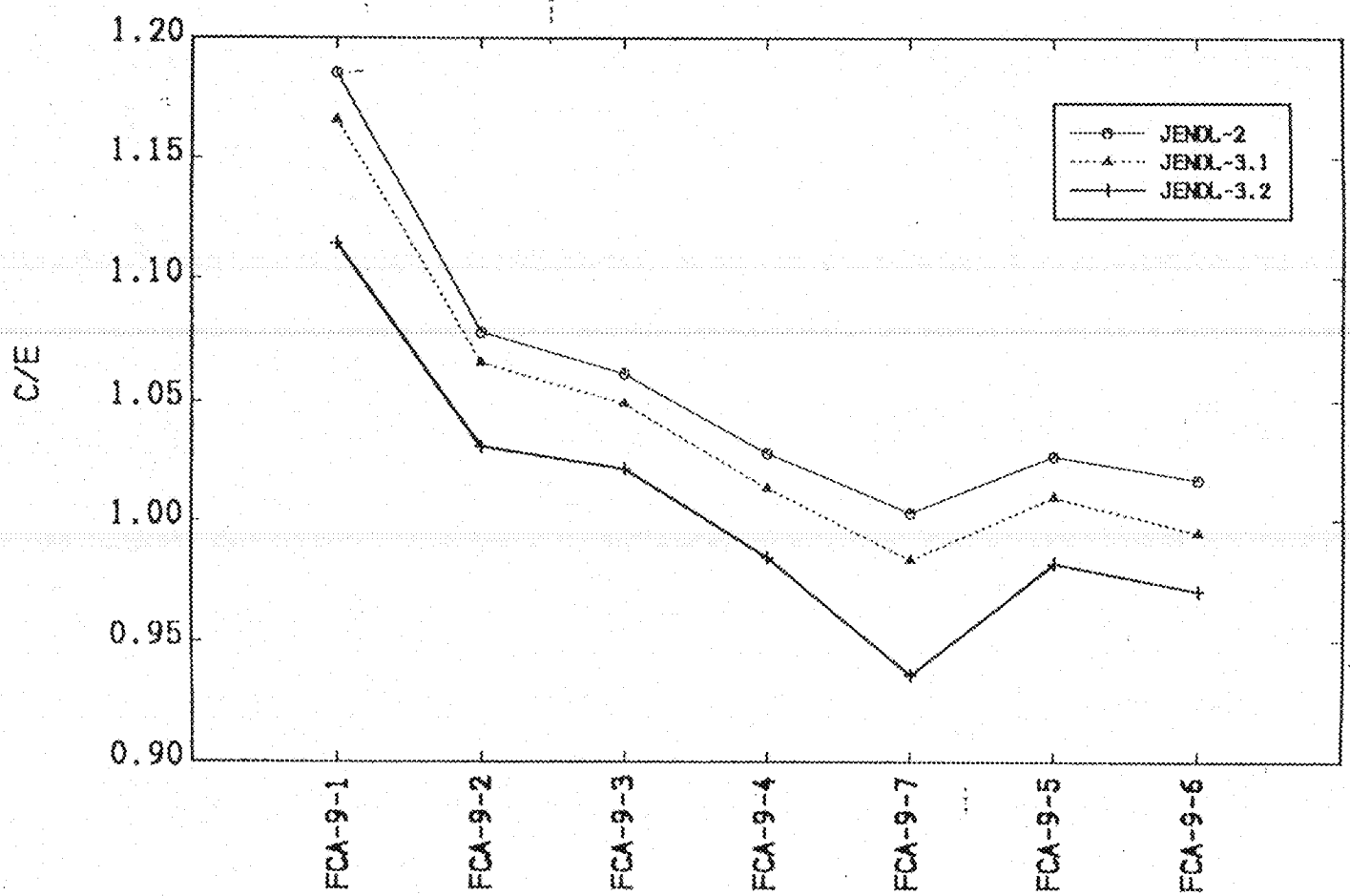

Fig. 5 Am-241 fission rate ratio relative to U-235 fission

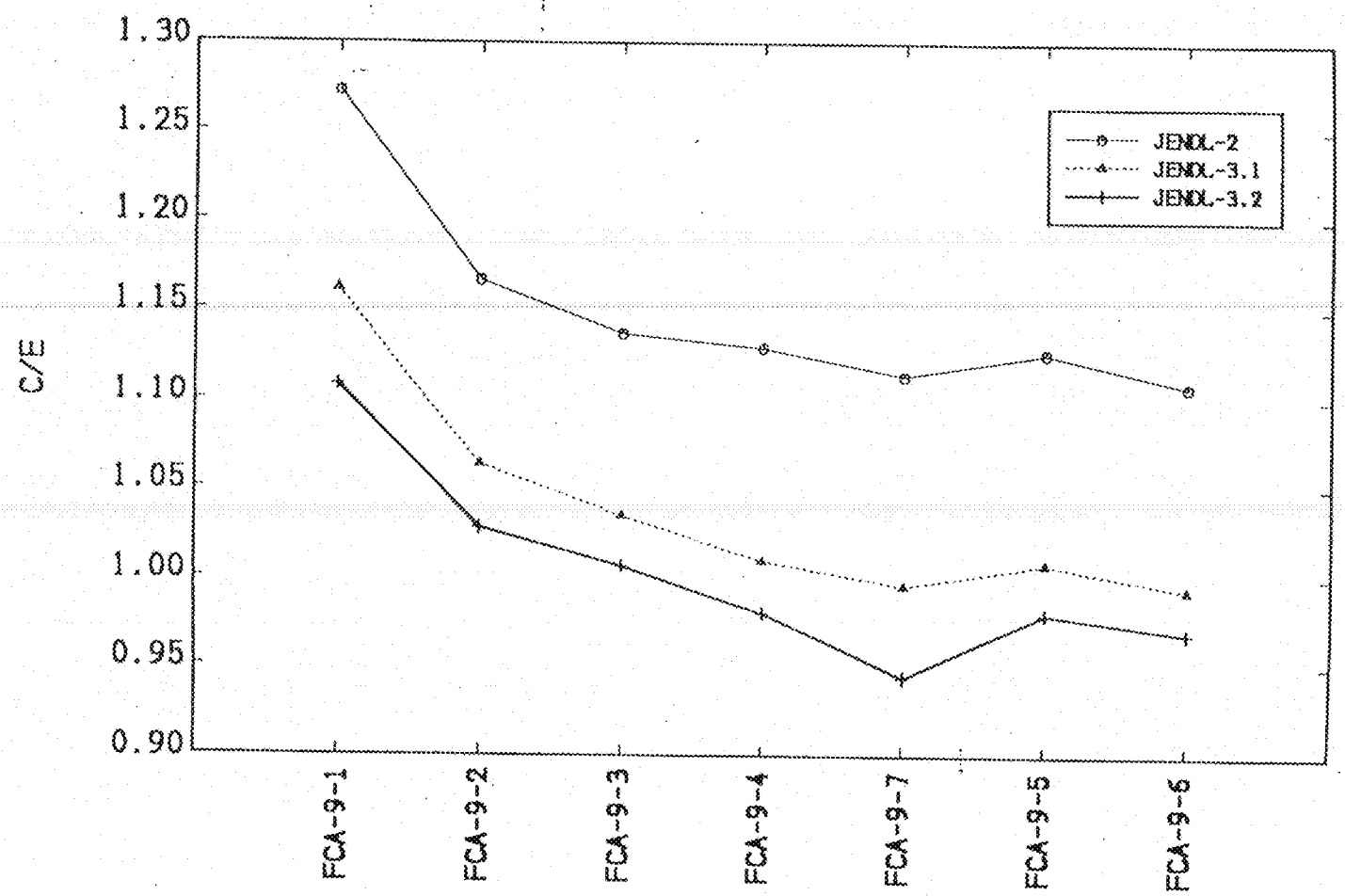

Fig. 6 Am-243 fission rate ratio relative to U-235 fission