Progress report of NMIJ/AIST
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1. International comparisons and SIR contributions.

• The NMIJ/AIST has took part in the CCRI(II) key comparisons of ^{241}Am, ^{125}I and 2nd run of ^{32}P radioactivity measurements.

• The NMIJ/AIST has organized the RMO key comparisons of ^{139}Ce radioactivity measurement as AMPM-RI(II)-K3-04. The ^{139}Ce liquid source in standard ampoules were prepared by NMIJ/AIST and ampoules were sent to APMP participants of BHABHA, INER, KRISS, NIM, OAP, PSPKL and neighboring RMO of CSIR-NML (South Africa) and VNIIM (Russia). To link this RMO comparison to the BIPM/SIR, one ampoule was also sent to the BIPM. In total, 6 laboratories have reported their results with their own methods, and the draft report has been prepared.（Please see a draft report titled as "APMP comparison of the activity measurements of Ce-139".）

• The "portability of the calibration factors of ionization chambers" project was continued in parallel with the ^{139}Ce comparison. NMIJ/AIST sent ampoule sources of ^{51}Cr, ^{57}Co, ^{60}Co, ^{85}Sr, ^{134}Cs and ^{137}Cs to the SIR of BIPM, and some of these sources were also sent to ANSTO, BHABHA, INER, KRISS, NIM, OAP, PSPKL and CSIR-NML. Electric output from each ampoule sources measured with their standard IC have been simulated by EGS-4 Monte-Carlo code and results will be reported in the coming ICRM meeting.

• The comparison of β-emission rate from a large area source of ^{36}Cl was finished and got reasonable agreement as shown in the figure 1. The results of NIST and VNIIM were adjusted to comparable to other results with 0.6keV threshold, estimated from beta spectra by VNIIM. The VNIIM also pointed out two visible faint lines due to the KX-emission of ^{36}Cl with energy E=2.40 keV and of the X-emission from Al substrate of the source with energy E=1.49 keV as shown in the figure 2. They claimed that these peaks may cause about 0.05% increment of the results, but these effects are also depends on inner gas and wall condition, more investigations are needed on this point.

• Bilateral base of supplementary comparisons have been submitted for ^{51}Cr (between NMIJ/AIST, INER and VNIIM), and for ^{134}Cs (between NMIJ/AIST, VNIIM, BNM-LNHB and INER). Radioactive sources were prepared by NMIJ/AIST, and each one of these sources was send to SIR to be able to compare the KCRV. The results of ^{134}Cs of SIR was just obtained and showed in the figure 3. The results of ^{51}Cr were also in good agreement as shown in the figure 4.

2. Standardization and calibration services.

- Several measurement systems of Japan Radioisotope Association (JRIA) were calibrated with the primary standard sources from NMIJ/AIST, and JRIA was officially recognized as the secondary standard organization in Japan.

- Domestic comparison of ^{201}Tl was submitted between NMIJ and several medical institutes and radioactive pharmaceutical manufactures.

- New production techniques for area source using a inkjet printer have been tested in NMIJ/AIST. The new printing machine with several surface conditioner and different types of inks were investigated. It is now possible direct printing on Al surface and also plastic.

- Remote control calibration system has been studied and tested between NMIJ/AIST, JRIA and NIRAS for ^{18}F measurement.

3. Plans for fiscal years of 2005 and 2006.

- NMIJ/AIST will continue “Portability of the calibration factors of ionization chambers” program within the framework of APMP. In addition, several mono-energetic gamma sources will be sent to the participant labs and SIR to establish the response functions of each ionization chamber.

- The new production method of area sources will apply to make very low level surface sources for calibration of imaging plate system and try to adopt the clearance test of radioactive waste.

- Remote calibration will be continued and expand to some other secondary standard equipments using computer network system to reduce the load of primary standard lab of NMIJ/AIST.

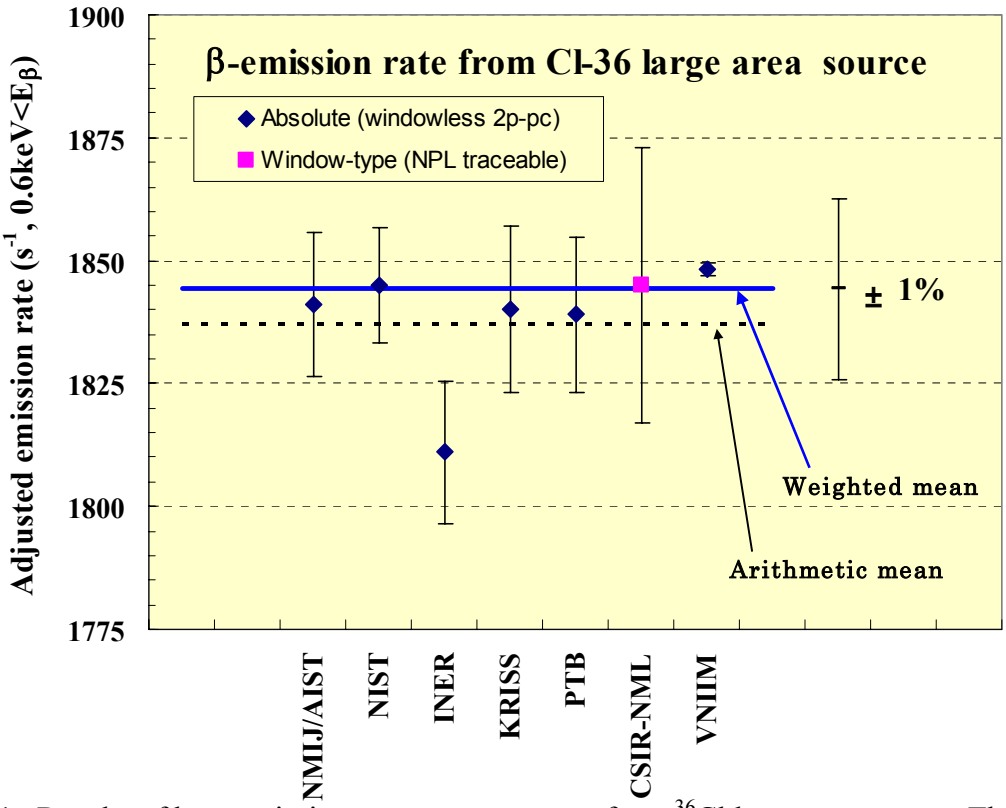

Figure 1. Results of beta emission rate measurements from ^{36}Cl large area source. The test sample was 10cm by 10cm active area source from AEA Technology. The source was sent to participant labs and back to NMIJ/AIST. In this figure, results of NIST and VNIIM are adjusted to the threshold methods, estimated from beta spectra by VNIIM.

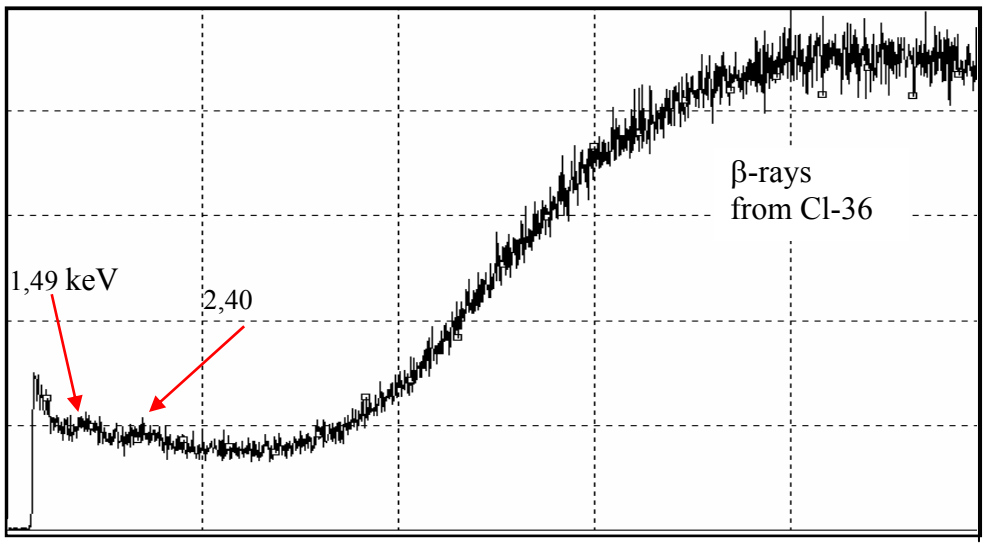

Figure 2. The beta spectrum of low energy part measured by VNIIM. The 1.49 keV peak is corresponded to the K-X rays from Al, and 2.40 is due to X rays from EC decay channel (about 1.9%) of ^{36}Cl. These peaks were not found in the spectrum of NMIJ/AIST because of low efficiency of X-rays for CH_4 counting gas. These effects are not so serious for most laboratories with larger uncertainties at this moment, but should be carefully checked again.

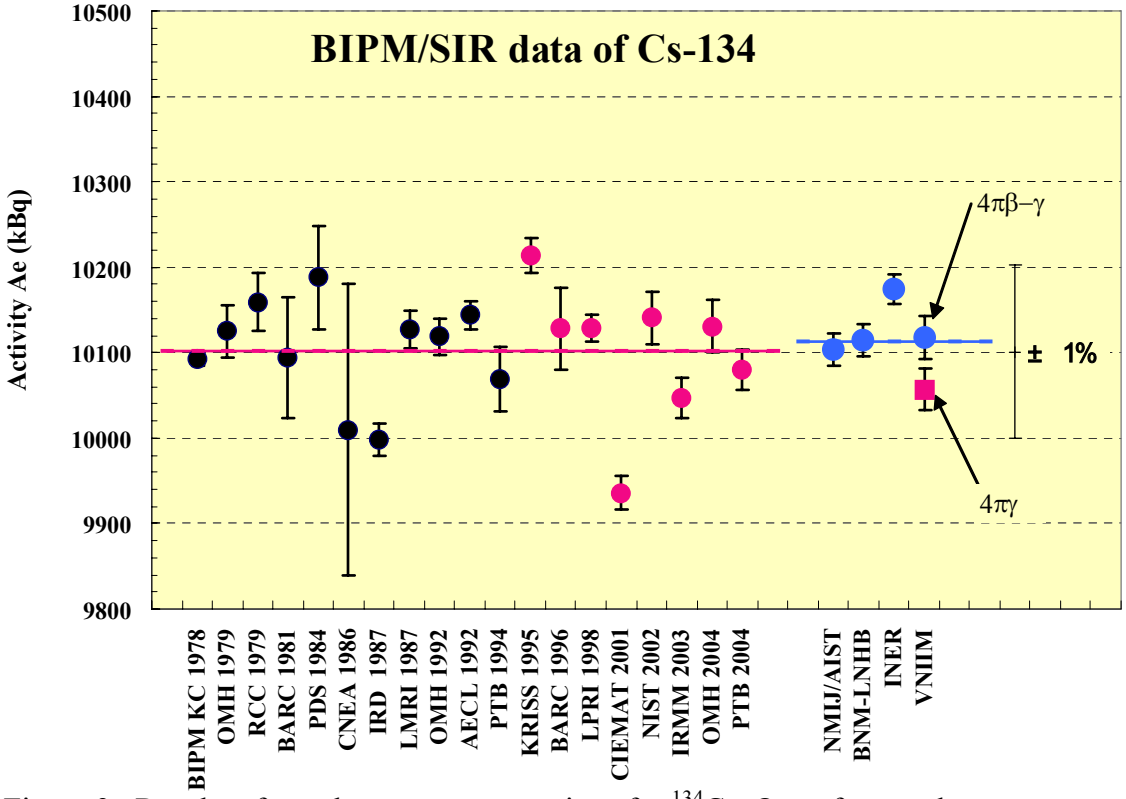

Figure 3. Results of supplementary comparison for ^{134}Cs. One of ampoule was sent to the BIPM/SIR. The VNIIM submitted normal 4πβ–γ coincidence counting and also 4πγ counting with two large NaI(Tl) detectors of 200mm dia. by 100mm height and 40mm dia. by 10mm depth of well. We found good agreement in our present results and also the arithmetic mean is in agreement with that of past SIR data as shown in this figure.

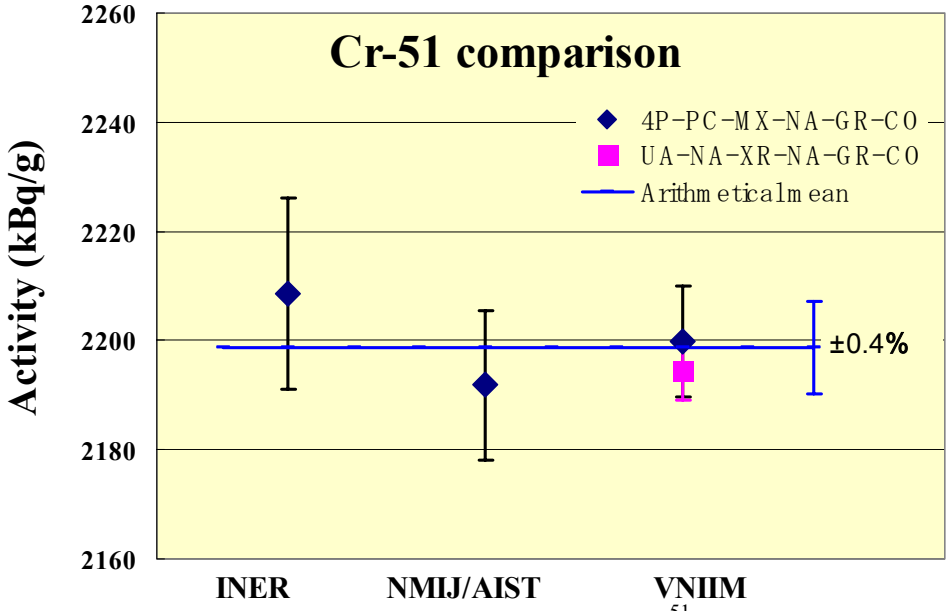

Figure 4. Results of bilateral supplementary comparison for ^{51}Cr. The NMIJ/AIST and INER tried to measure with normal 4πβ–γ coincidence method. The VNIIM measured with normal 4πβ–γ coincidence method, and in addition, they challenged to the 4πX(NaI)-γ(NaI) coincidence using a 0.1mm^{t} by 20mm$^{\phi}$ NaI(Tl) detector for KX-γ coincidence. Both methods were in good agreements and the final results shows very small uncertainty (0.24 % k=2) for ^{51}Cr measurement.