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RECORD #223

TITLE: Consideration of Measurement Uncertainty When Measuring  
Radiation Levels Approaching Regulatory Limits

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

August 3, 1990

MEMORANDUM FOR: Malcolm R. Knapp, Director, DRSS, Region I  
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Office of Nuclear Reactor Regulation

SUBJECT: CONSIDERATION OF MEASUREMENT UNCERTAINTY WHEN MEASURING  
RADIATION LEVELS APPROACHING REGULATORY LIMITS

We have recently become aware of a letter transmitting a notice of violation that appeared to send an incorrect message to licensees. The incorrect message is that licensees must consider inherent uncertainties in valid measured values when measuring radiation levels approaching regulatory limits and must establish procedural limits that are less than the regulatory limits by an amount that equals (or exceeds) the "instrument error." That message is incorrect.

The following statement was made by the NRC in response to a petition for rule-making with regard to limits for surface radiation levels of packages prepared for transport (44 FR 22233, April 13, 1979): "As with any regulation, the (safety) limits must be given as exact, precise values. The methods of demonstrating compliance with these limits are usually left to the regulated person. Any method which provides a reasonable demonstration of compliance will be accepted. In most cases, exact measured values are not required." This statement is still valid.

All measurements are inherently imprecise and inaccurate to some degree. Inevitably, there will be cases involving transportation of radioactive materials in which a valid measurement by the shipper shows a radiation level below the limit and a valid measurement by the receiver shows a radiation level above the limit. Absent evidence that the shipper's measurement is invalid, there is no reason to assume that the shipper's measurement is incorrect and, consequently, that the shipper had inadequate control over shipping of packages.

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In summary, our position is that the result of a valid measurement obtained by a method that provides a reasonable demonstration of compliance or of noncompliance should be accepted and that the uncertainty inherent in that measured value need not be considered in determining compliance or noncompliance with a regulatory limit. Thus, only the measured value (and not the sum of the measured value and its uncertainty) need be less than the value of the limit to demonstrate compliance with the limit. Conversely, only the measured value (and not the measured value less its uncertainty) need be greater than the value of the limit to demonstrate noncompliance with the limit.

The Office of Enforcement concurs in this position.

/s/  
LeMoine J. Cunningham, Chief  
Radiation Protection Branch  
Division of Radiation Protection  
and Emergency Preparedness  
Office of Nuclear Reactor Regulation

/s/  
John W. N. Hickey, Chief  
Operations Branch  
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\*See previous concurrence

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