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Design of the Equipment to Verify the Number of Spent CANDU Fuel Bundles

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Abstract

As national and international safeguards inspectors insert the sensor of the verification equipment between the stacked trays, they confirm the number of spent fuel bundles stacked on row or column selected randomly. But, the dimension of tray used for storing spent fuels and the structure material of the ultrasonic bolt attached on the bottom of pond make difficult for the equipment's sensor to approach to the fuel bundle. In order to verify the spent fuel bundles effectively, it is necessary to develop the new safeguards equipment that is able to solve this problem. This paper shows the design concept to develop this new equipment and whether this equipment will be suitable for the safeguards purposes or not.

1.

2 3 16 24
 CANDU 600MW (UO2)
 3,500MWD/t 1
 68g (IAEA) 가 , 가
 120
 (SQ: Significant Quantity) 8 kg
 가 [1]. IAEA
 (Irradiated Direct -Use Material)
 가 16 4
 1997
 가 IAEA
 4 2001 IAEA 186 PDIs (Person
 Day Inspection)
 1 7
 1992 IAEA 2001
 72 PDIs [2]. , 가 2, 3,
 4 1
 IAEA 가
 IAEA

2.

1 4 1 1
 IAEA 가 ,
 (HM -4)
 CANDU 가
 IAEA CDM(Core
 Discharge Monitor), SFBC(Spent Fuel Bundle Counter)
 [1,3,4].
 IAEA
 Cs -137

(Method H)
 (Method K) [1].
 IAEA
 CDM, SFBC 가 Method K
 Method H Stacked tray Method H
 Method K IAEA 가
 IAEA 가

3.

3.1

IAEA 가 1
 1, 2 1
 2, 3, 4 1 ()
 : 24) 가 76mm
 가 (63mm)
 120mm IAEA 2, 3, 4 가
 , IAEA
 16 19
 1, 2, 3, 4 (Ultrasonic
 Bolt Seal) 가 IAEA
 IAEA

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Method K, H
1, 2
[5].

가 16 19

가

3.2

3 가

4

가

가

가

[6].

(19mm)

가

5

(19mm)

157°

가

4

가

가

가

360

가

가

IAEA

가

IAEA

가

4.

(23° 30°)

, 23°

가 가 (6)

23°

가

5.

가

가

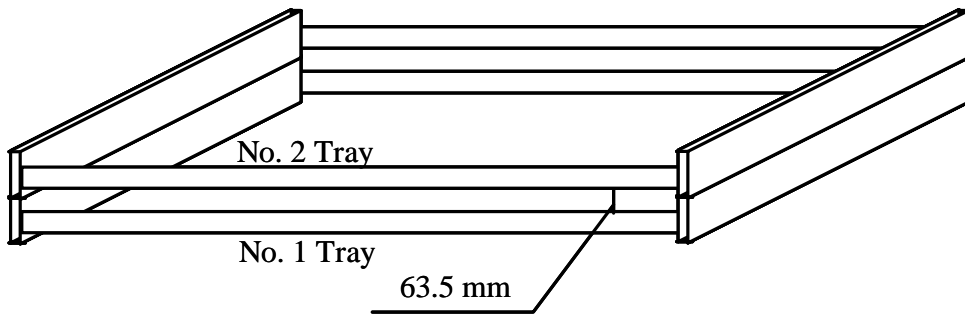
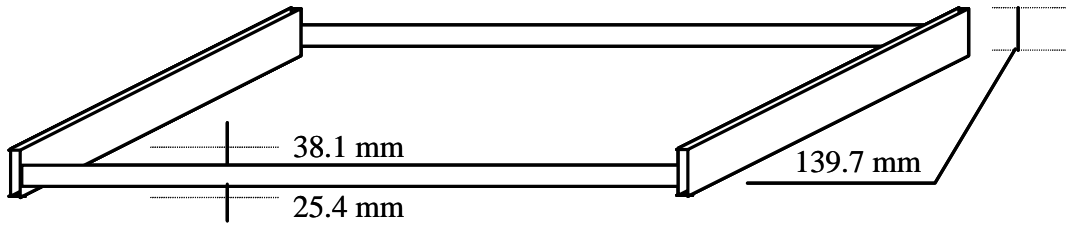
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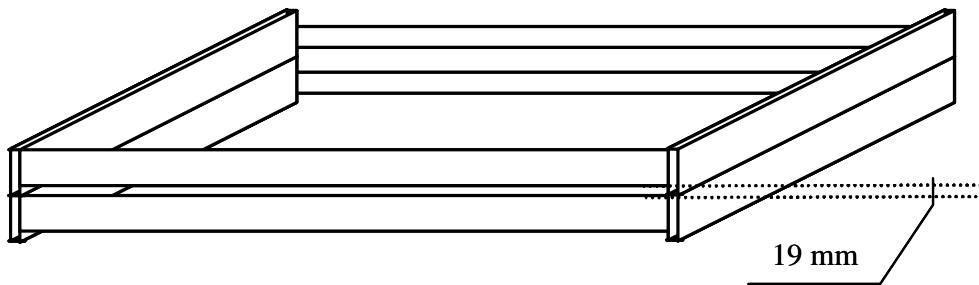
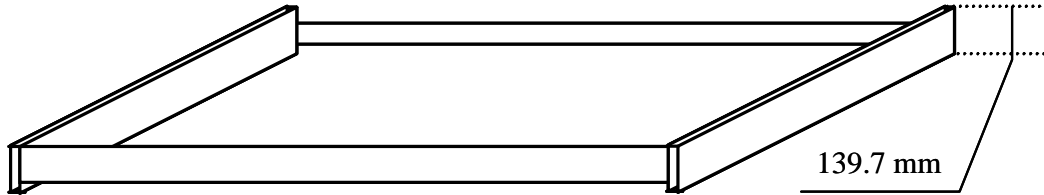
(SSAC)

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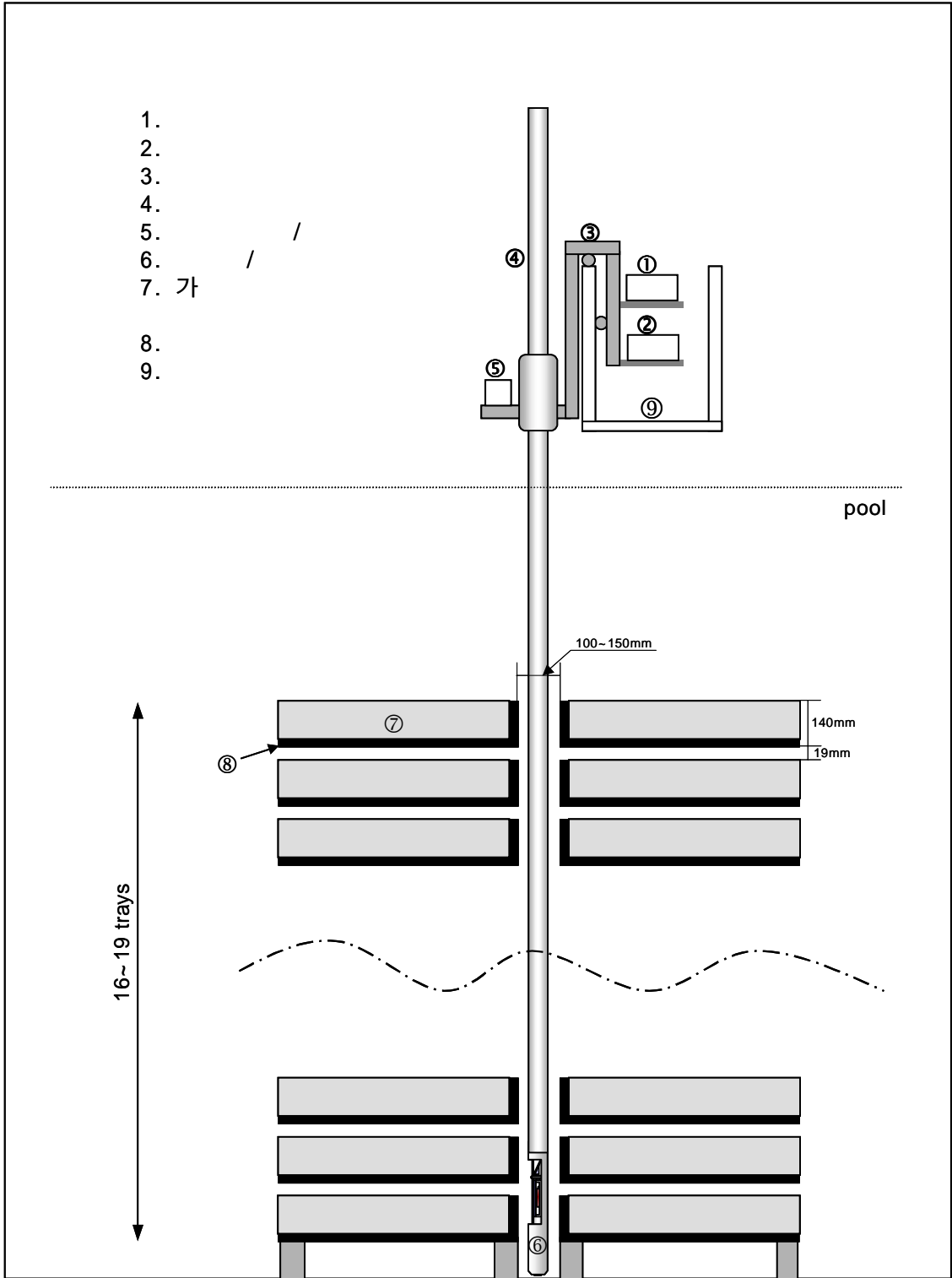
1. IAEA, "Safeguards Criteria 1991 -1995" (1994)
2. IAEA, "Verification of Spent Fuel Bundle Transfer from Spent Fuel Bay to Dry Storage at Wolsung -1" (1996)
3. , " CANDU " , KAERI/RR - 1918/98
4. IAEA, "The CANDU Course (Session 10 ; Verification of Irradiated CANDU Fuel Bundles (Method K)" (1993)
5. , " " , 2000
6. Won Woo Na, "New Approach for Safeguards Verification of Spent Fuel Bundles by the Underwater Camera System", INMM Annual Meeting, (2001).



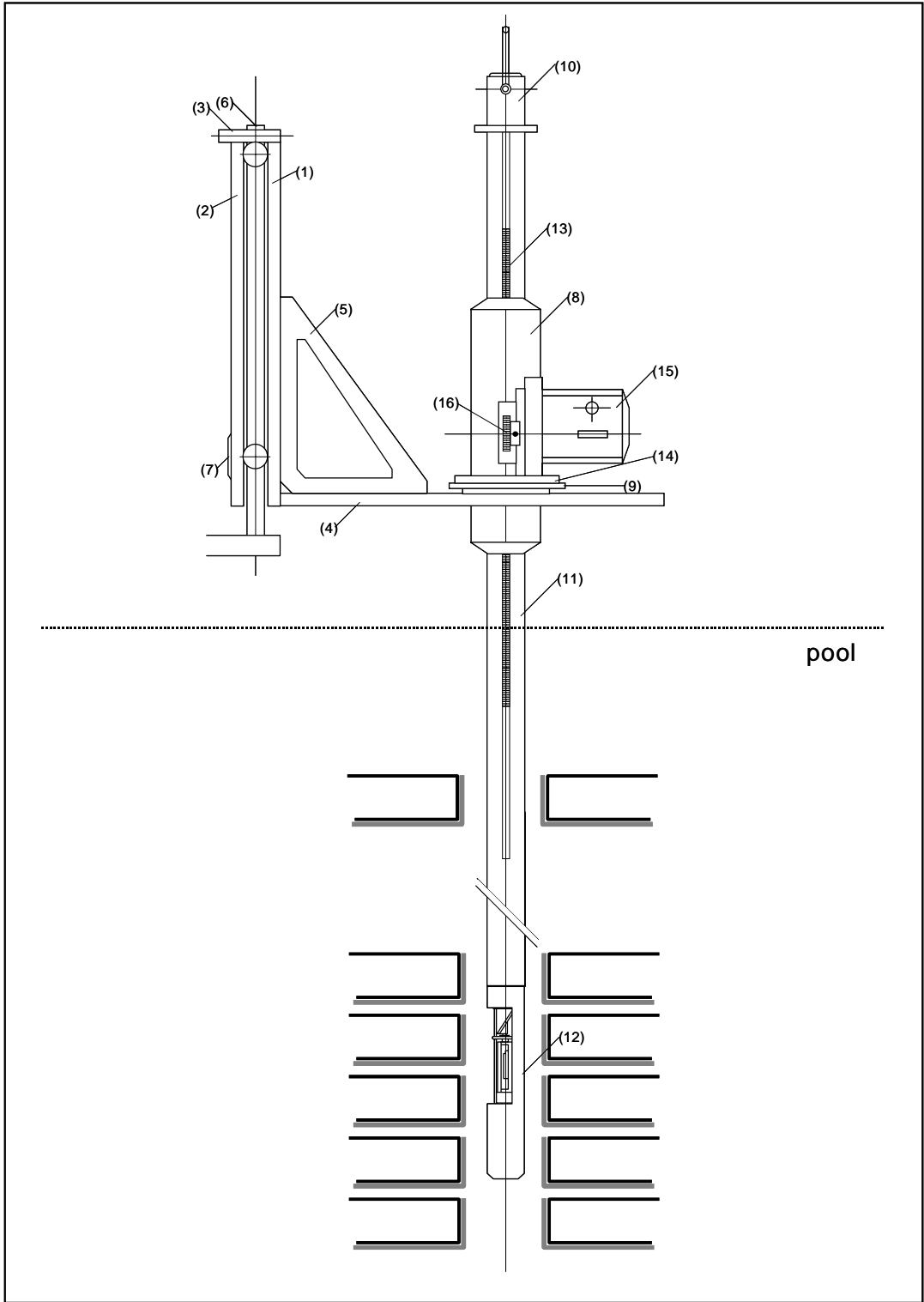
1. 1



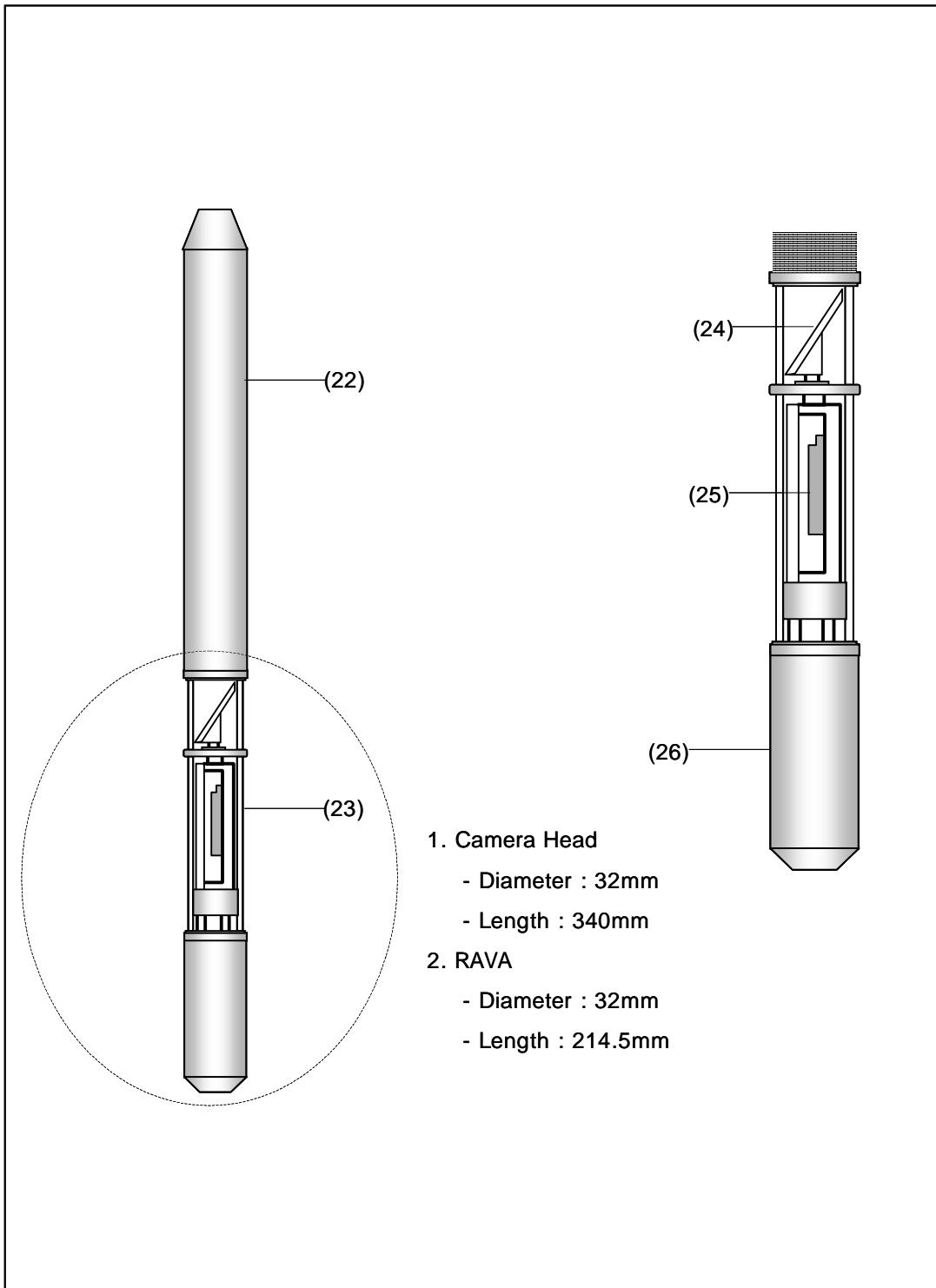
2. 2, 3, 4



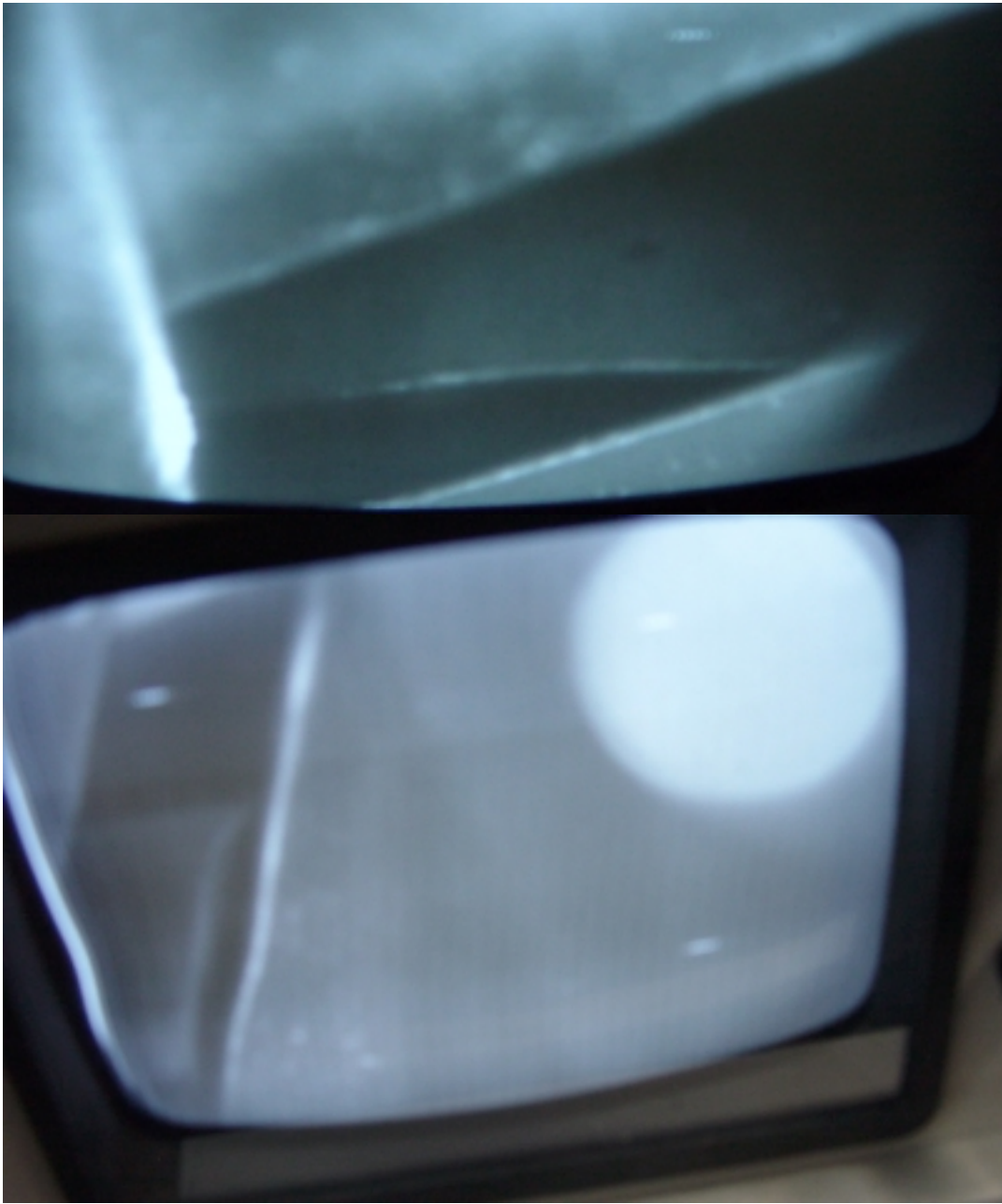
3.



4. 가



- 1. Camera Head
 - Diameter : 32mm
 - Length : 340mm
- 2. RAVA
 - Diameter : 32mm
 - Length : 214.5mm



6.

SCAI -2