

VR Researches in KRISS

Jan 21. 2019

Hyun Kyoon Lim, Ph.D. Principal Scientist, Professor

Center for Medical Metrology
Dept. of Medical Physics

University of Science and Technology (UST)

Korea Research Institute of Standards and Science (KRISS)

Lawnmower
Man
Jeff Fahey
1992



1111

VR small conference 2018

Venue: KRISS

Date: Jul 25, 2018





Peers brosnan





Example: Diagnosis of asthma

```
<observation classCode="OBS" moodCode="EVN">
  <templateId root="2.16.840.1.113883.10.20.22.4.4"/>
  <!-- Problem Observation template -->
  <id root="d11275e7-67ae-11db-bd13-0800200c9a66"/>
  <code code="409586006"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="Complaint"/>
  <statusCode code="completed"/>
  <effectiveTime>
    <low value="1950"/>
  </effectiveTime>
  <value xsi:type="CD" code="195967001"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="Asthma"/>
  ...

```

Code is the
question:
"what is the
complaint?"

Value is the
answer:
"Asthma"

SC24 WG9 & Web3D Meetings

▶ Meeting Date January 20-25, 2019, Seoul, Korea

▶ Meeting Place Grand Ambassador Seoul Associated with Pullman, Seoul, Korea
<https://www.ambatel.com/grand/seoul/en/main.do>

▶ Hosts KATS (Korean Agency for Technology and Standards) and RRA (National Radio Research Agency)

▶ Organizer KSA (Korean Standards Association)

To be held in parallel with Web3D teleconference / ISO ZOOM meeting

January 21-22 (Web3D meetings) at 9:00-18:00 KST (Web3D teleconference)

January 23-24 (SC24 WG9 meetings) at 9:00-18:00 KST (ISO ZOOM meeting, to be arranged by Gerry)

January 25 (Web3D meetings) at 10:00-12:00 KST (Web3D teleconference)

VR Metrology and Integration (Chair: Myeong Won Lee, Suwon U.)

16:00-16:30 VR studies at Korea Research Institute of Standards and Science, Hyun Kyoong Lim (KRISS)

16:30-17:00 ISO/IEC JTC 1 VR AR for education, Myeong Won Lee (Suwon U.)

VR studies at
Korea Research Institute of
Standards and Science,

I have been working
at ISO/TC 173 WG 11.

Four assistive devices



From China, Japan, and Korea
Northern East Forum as a Chair
(2010~2014)

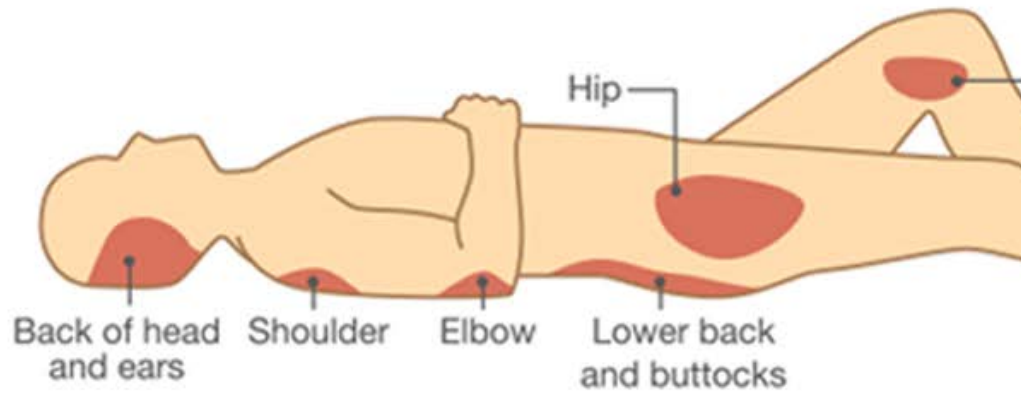


ISO TC 173 WG 11, Since 2014

ISO/TC 173: Assistive products

WG 11: Assistive products for tissue integrity





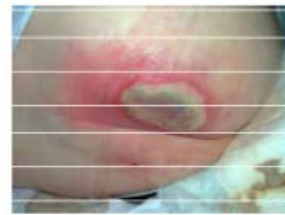
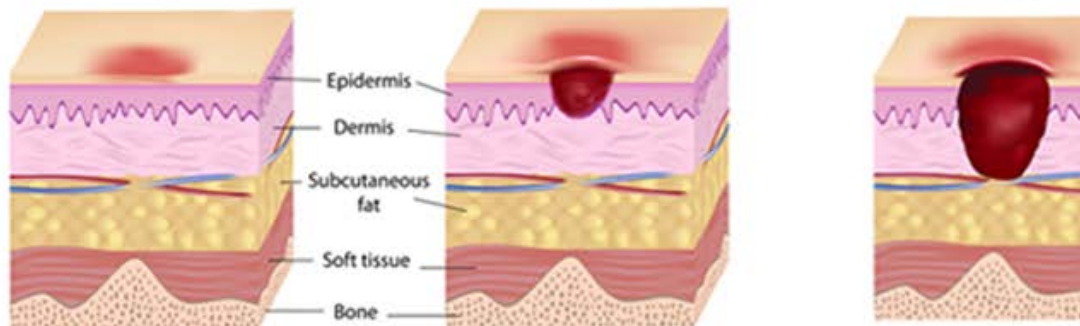
Vulnerable areas to check for



Stage 1

Stage 2

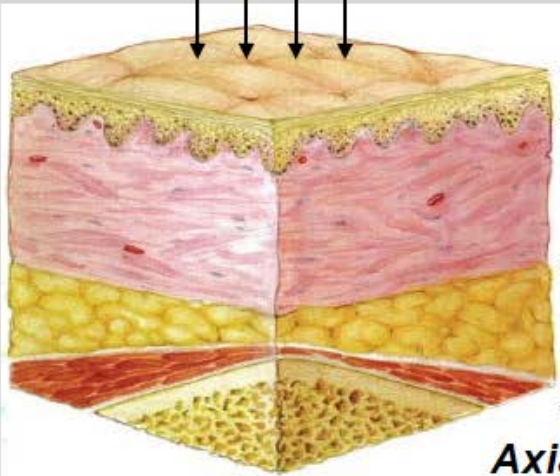
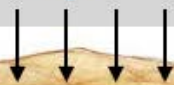
Stage 3



If poor standards of care in a Care Home has caused a loved one to suffer a bed sore you could be entitled to claim compensation.

Soft tissues at the Support Surfaces

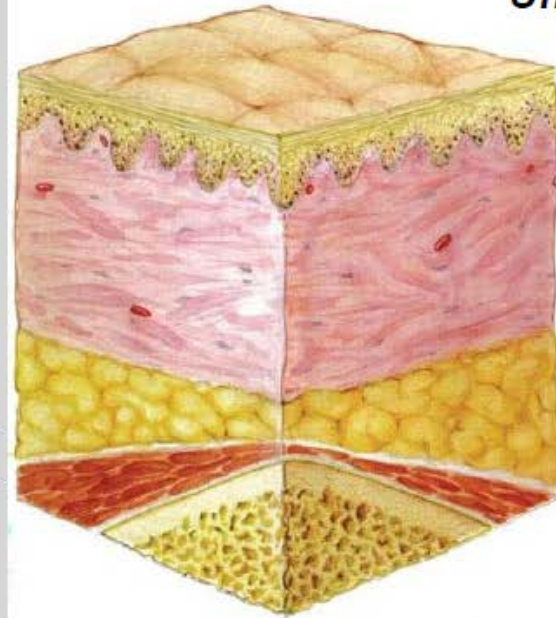
*F perpendicular
(Normal)*



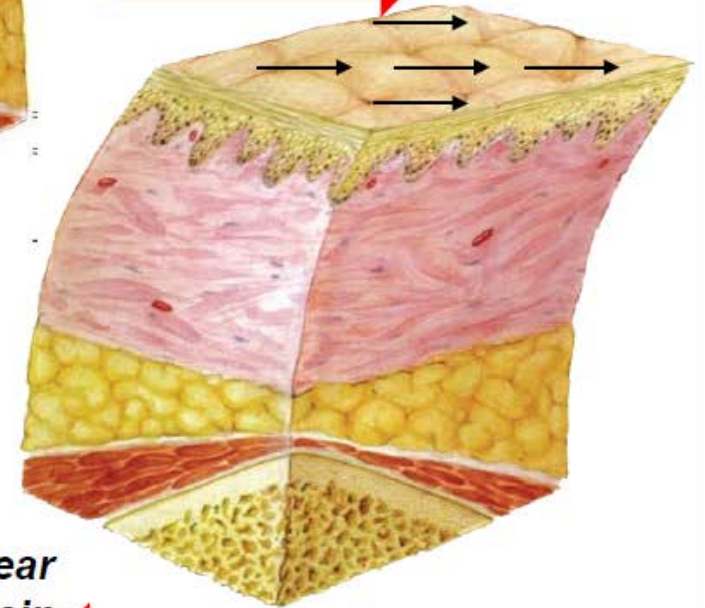
*Axial
Strain*



Undeformed



*F parallel
(shear)*



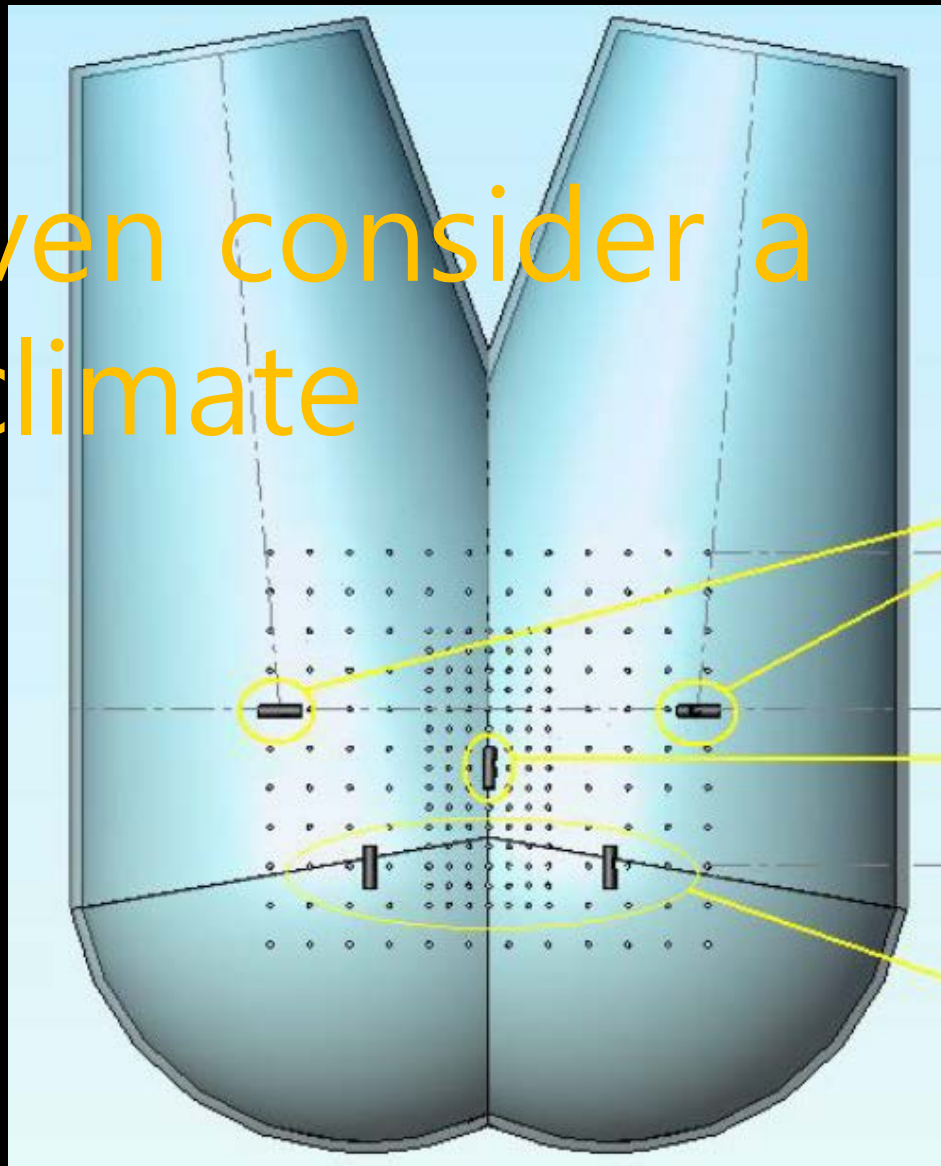
*Shear
Strain*





People are trying to make a magic mattress

They even consider a
micro climate



One more important thing
than A Magic Mattress ???

Small wish
for this group

**Please make a document
for a general solution
NOT for a particular solution.**

**Eventually, it will take more time if you see a
particular one.**

Introduction to KRISS









**Professors of construction
design**



Location: Daejeon

Staff: 750

Budget: \$ 140 Million

Research Field:

Physics, Biology,

Chemistry

Medical field, etc

mol

K

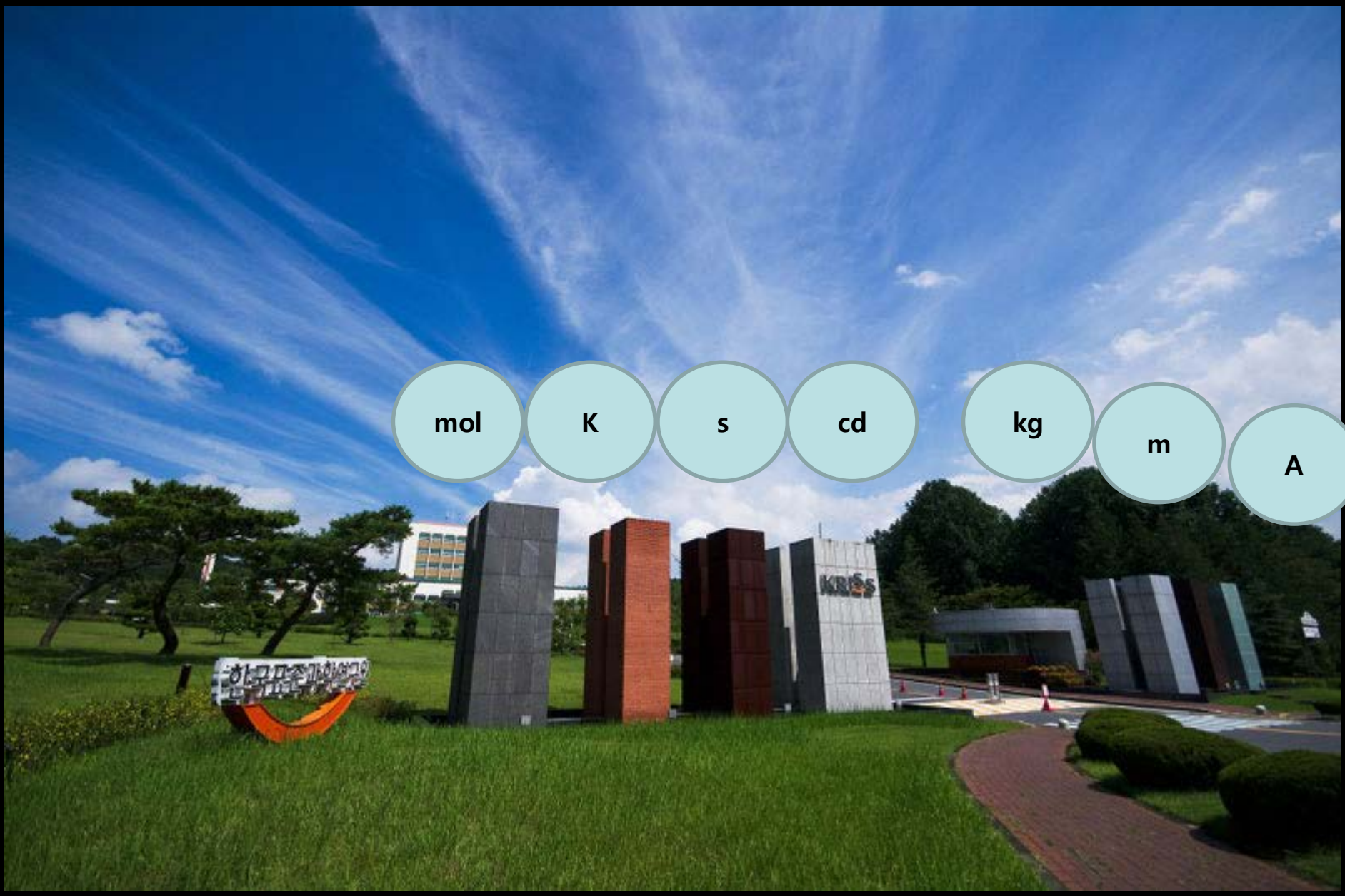
s

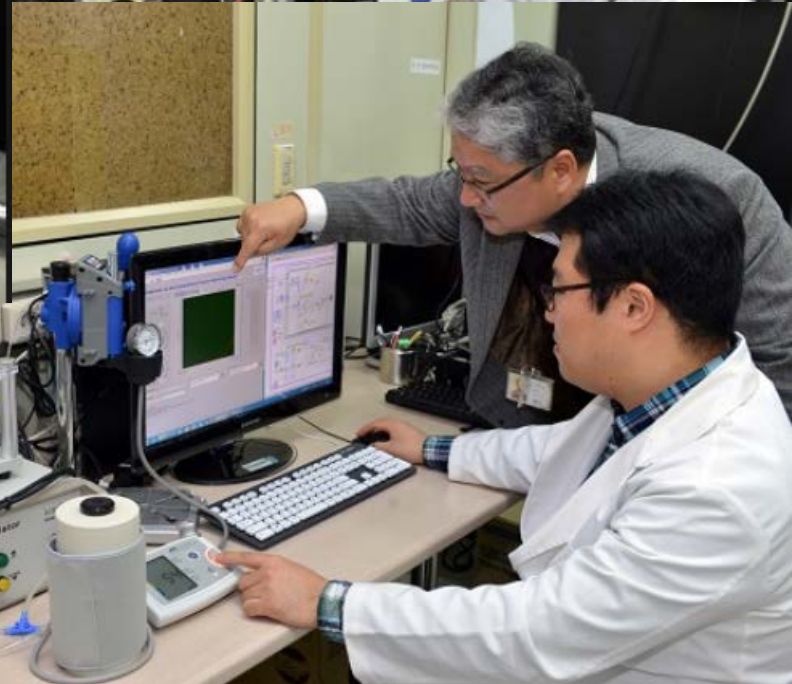
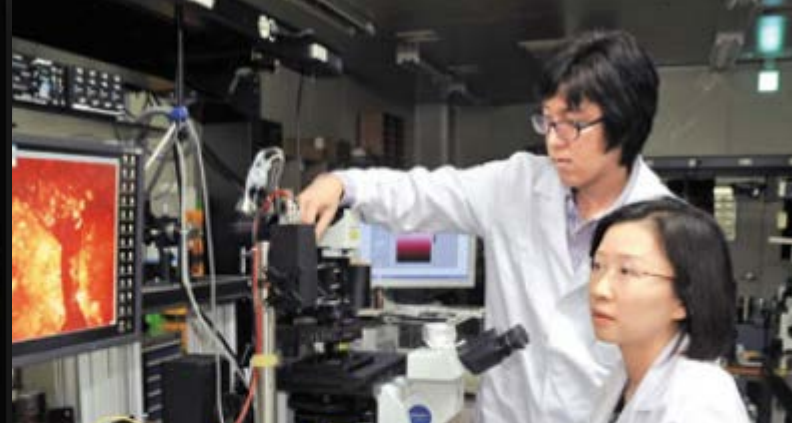
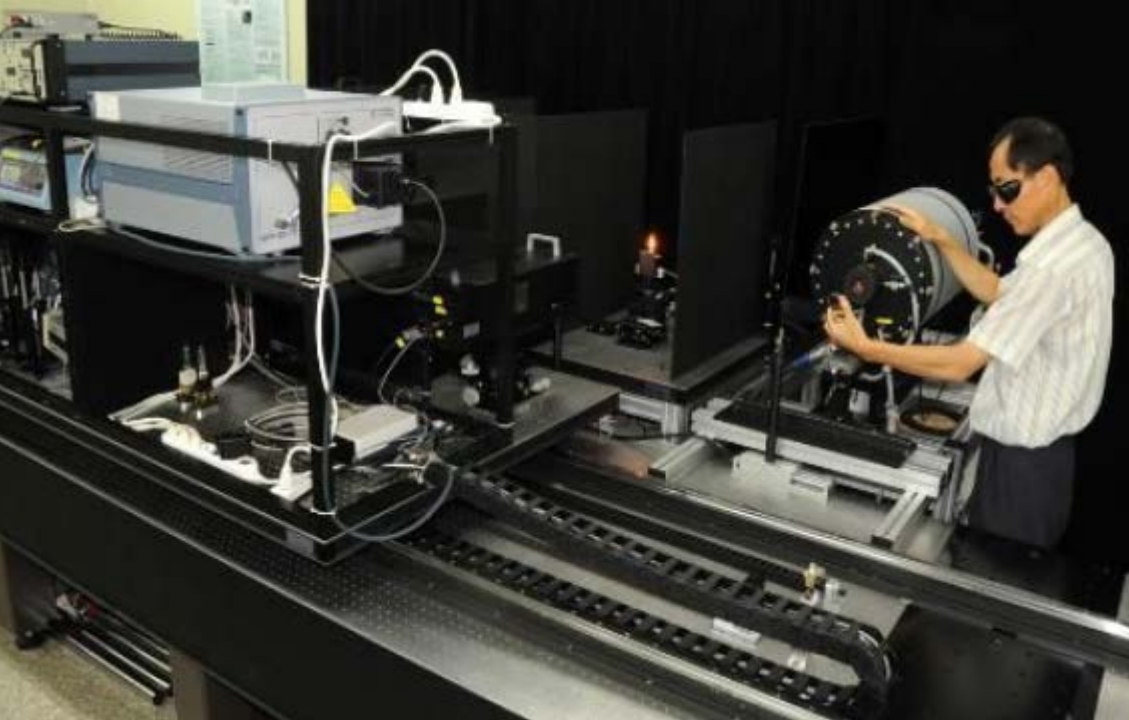
cd

kg

m

A





한



Key comparison

A grayscale photograph of a university campus. In the foreground, there is a grassy area with a curved path leading towards a series of tall, rectangular stone pillars. One of the pillars has the letters 'KRIS' on it. To the left, there is a circular stone structure with Korean text. In the background, there are trees and a building. The sky is bright with some clouds. The text 'Key comparison' is overlaid in the center of the image.

Degrees of equivalence D_i and expanded uncertainty U_i (at a 95% level of confidence) for nominal value 10 kg

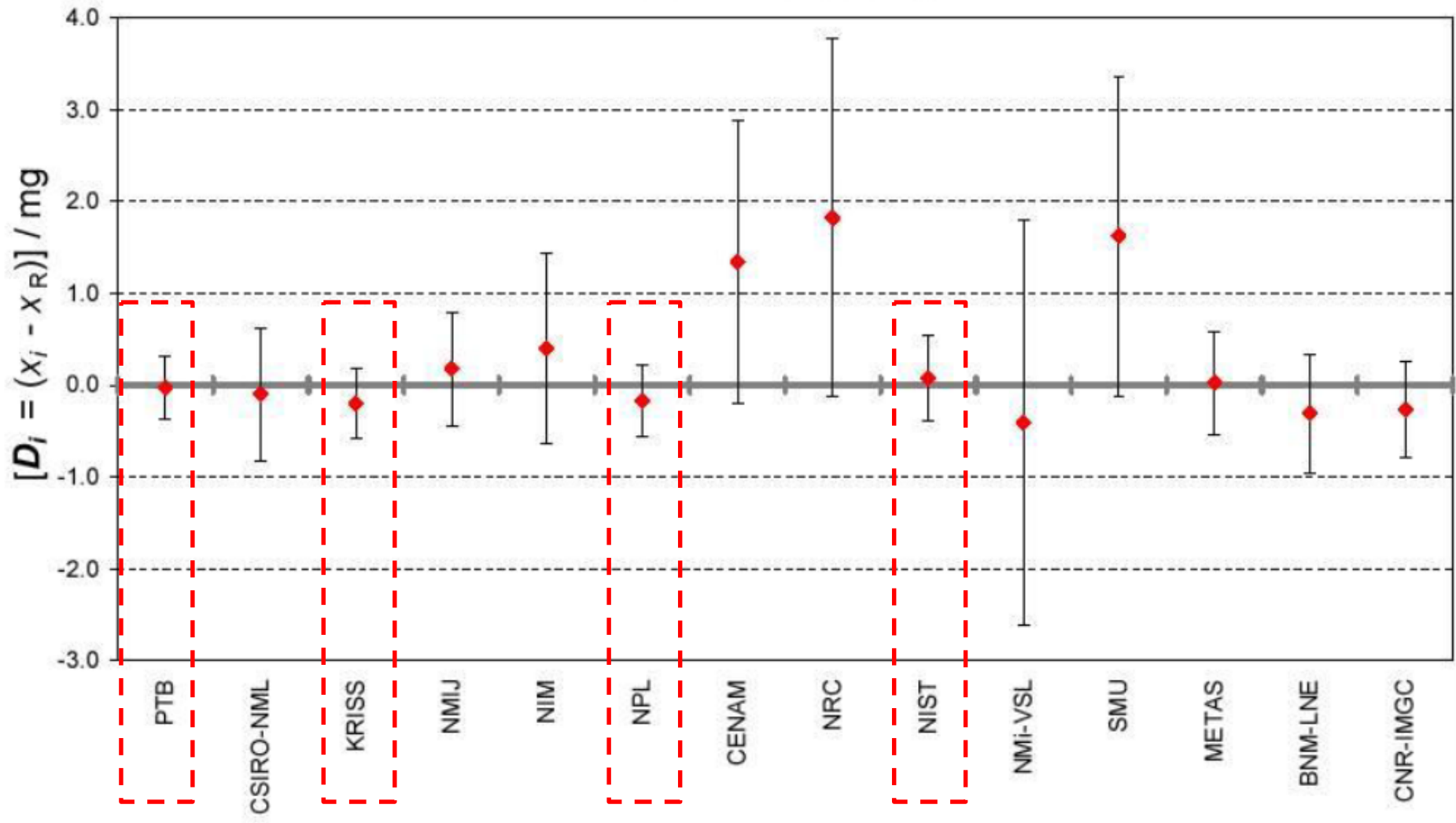


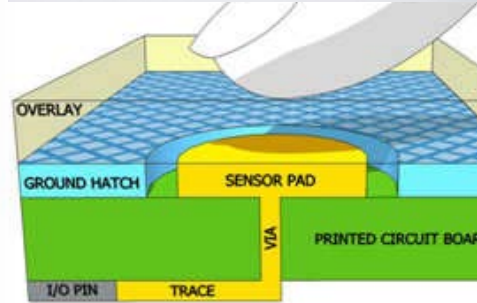
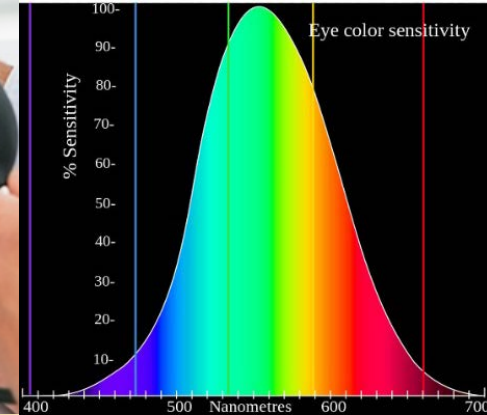
그림 3. Key comparison 예(10 kg 표준)

How do VR
research at the
national metrology
institute?

Hard Metrology

vs.

Soft Metrology



XVIII IMEKO WORLD CONGRESS (2006)

**Hard
Metrology**

Soft Metrology



Wong-Baker FACES™ Pain Rating Scale



©1983 Wong-Baker FACES™ Foundation. Used with permission.

**Hard
Metrology**

Soft Metrology

S_{standard}

**Reference
Data**

Certification

Uncertainty

Reproducibility

Standard Data

**Standard
procedure**

Research data

Traceability

Calibration **Scientific** **Quantitative
Measurement**

Data

Test procedures

Engineering Data

Non Scientific

Multi-users

Internet Search

Questions data

No Experts

No Scientific data

Non uniform data

Analysis

Background, after 2020



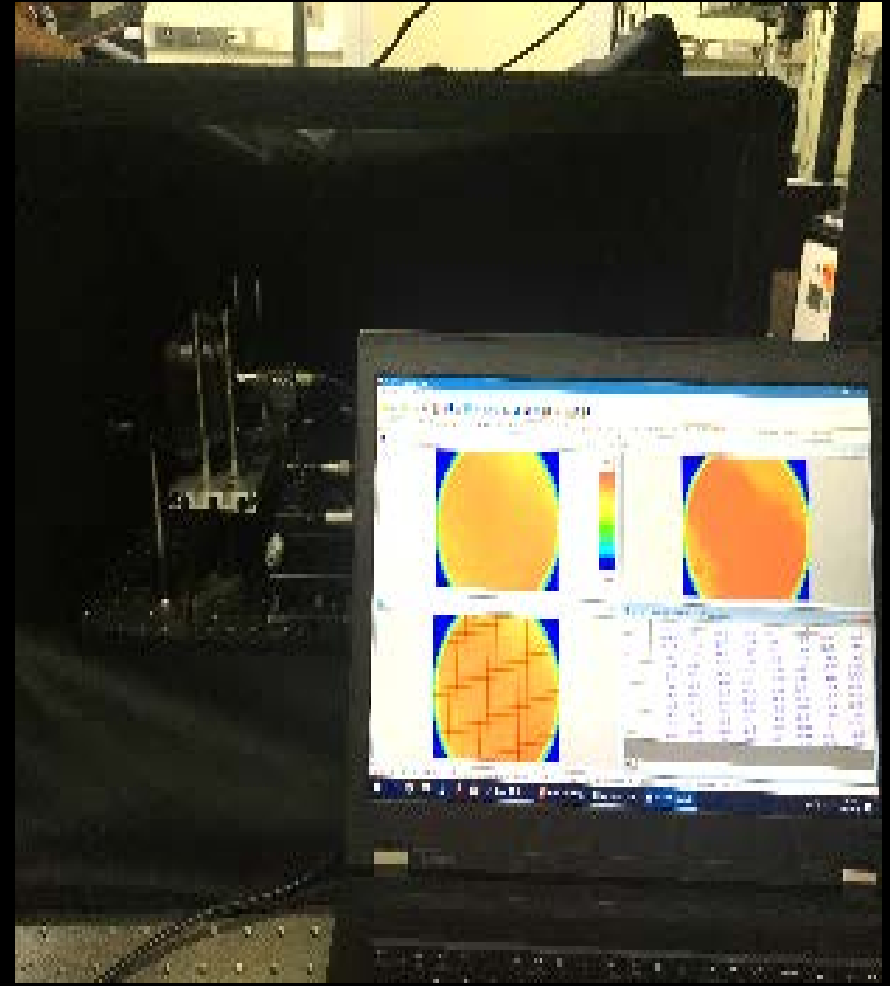
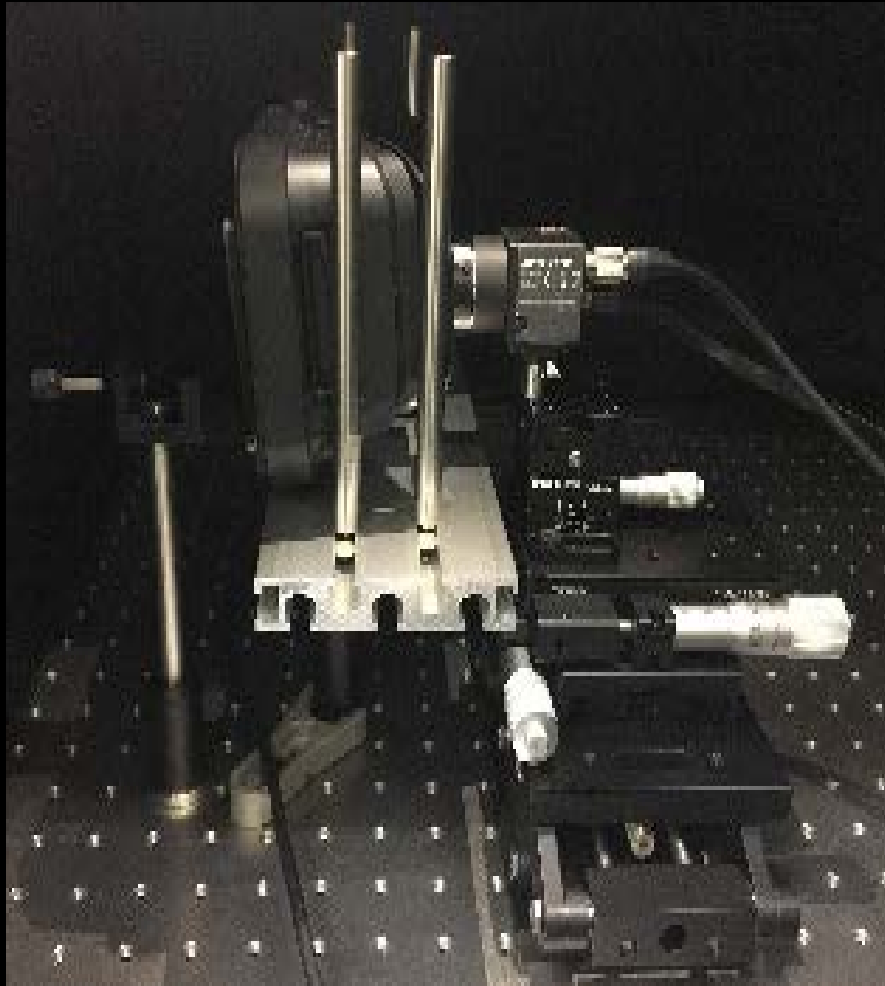
- Medication strategy
- Treatment plan
- Drug effect
- :



- Patients
- Seniors
- Young
- Safety & reliability



- H/W features
- Contents features
- Evaluation criteria
- Guild lines for contents
 - Speed
 - Resolution
 - Lenz features



Measurement devices

H/W Lenz features

RED	Display		NOON		Gear VR		Google Cardborad	
	Result	stdv	Result	stdv	Result	stdv	Result	stdv
Luminance	90.36	0.395 (0.87%)	85.8061	0.3201 (0.75%)	83.7595	0.2399 (0.57%)	83.9471	0.7332 (1.75%)
BLUE	Display		NOON		Gear VR		Google Cardborad	
	Result	stdv	Result	stdv	Result	stdv	Result	stdv
Luminance	29.5241	0.0954 (0.65%)	27.6099	0.0669 (0.48%)	26.8199	0.1752 (1.3%)	28.0572	0.2815 (2.00%)
GREEN	Display		NOON		Gear VR		Google Cardborad	
	Result	stdv	Result	stdv	Result	stdv	Result	stdv
Luminance	317.8331	0.728 (0.45%)	275.0849	1.1731 (0.85%)	292.6972	0.66 (0.45%)	285.9852	2.3458 (1.64%)

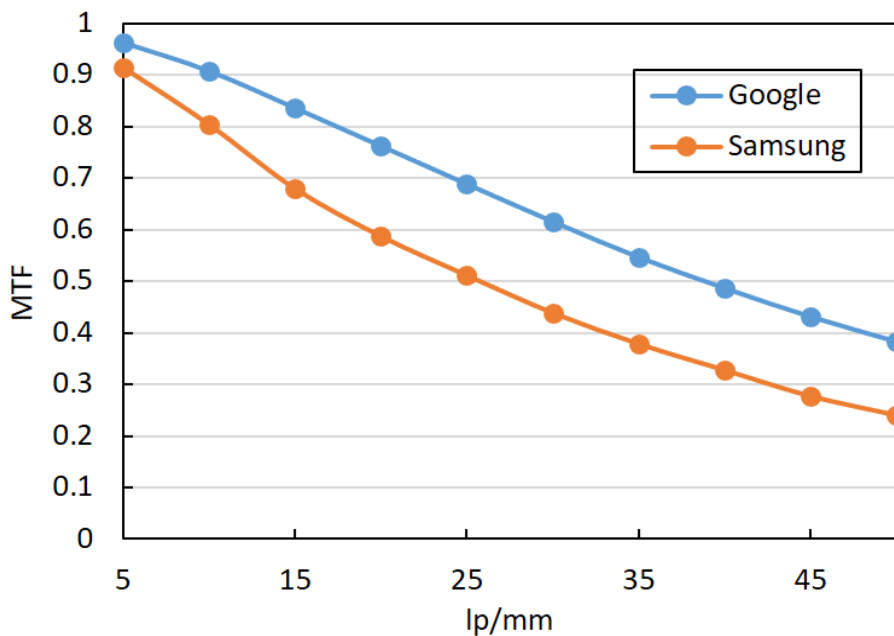


Focal length		Green (546 nm)	Yellow (587 nm)
Google cardboard lens	Effective Focal Length (EFL)	43.6 mm	43.9 mm
	Back Focal Length (BFL)	41.5 mm	40.1 mm
Samsung Gear VR lens	Effective Focal Length (EFL)	40.2 mm	40.35 mm
	Back Focal Length (BFL)	37.6 mm	37.8 mm

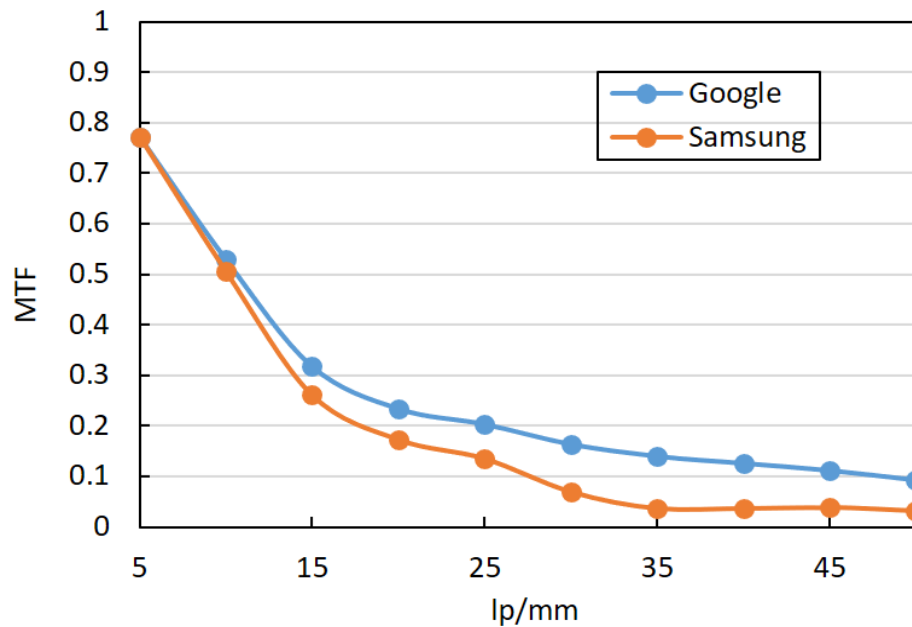
Focal length	Blue (486 nm)	Green (550 nm)	Red (640 nm)
Google cardboard lens	43.19 mm	43.60 mm	44.06 mm
Samsung Gear VR lens	39.86 mm	40.2 mm	40.56 mm

Focal length and Chromatic aberration

On-Axis MTF



10 degrees Off-Axis MTF



Resolution

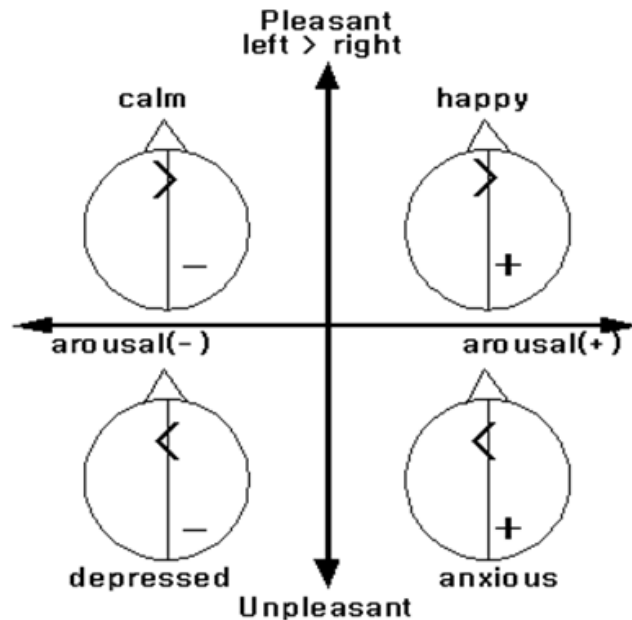
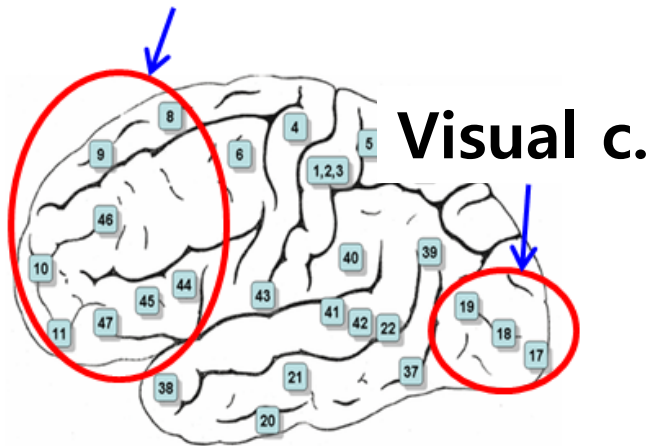
Where MTF: Modulation Transfer Function

- Measurement Devices for Optical property: Luminance & Chromaticity
- UA-10 (TOPCON)
- 5 DoF manual stage
- Dark room
- Basic testing has done for three HMD
 - ❖ Lens → Luminance & Chromaticity

- VR single lens was evaluated using spherical system, focus meter, and MTF meter.
- New measurement systems were needed for the wide viewing angle & exit pupil area.
- Two devices were evaluated and found similar values.
- IEC TC110 WG12 Eyewear display

뇌파, 호흡, 심전도 측정으로
정확한 데이터 수치 확보

Frontal cortex

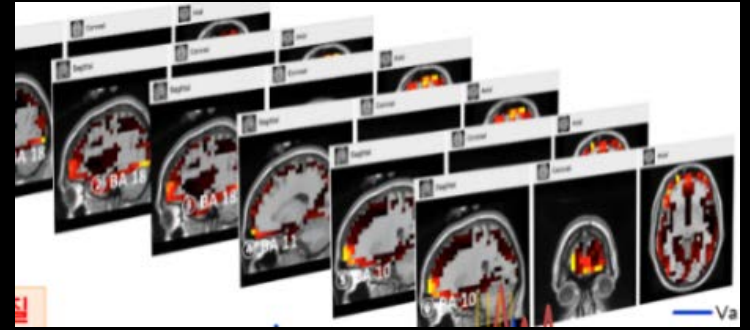


Attraction

Attention

**Sustained
Attention**

**Attention
Engagement**



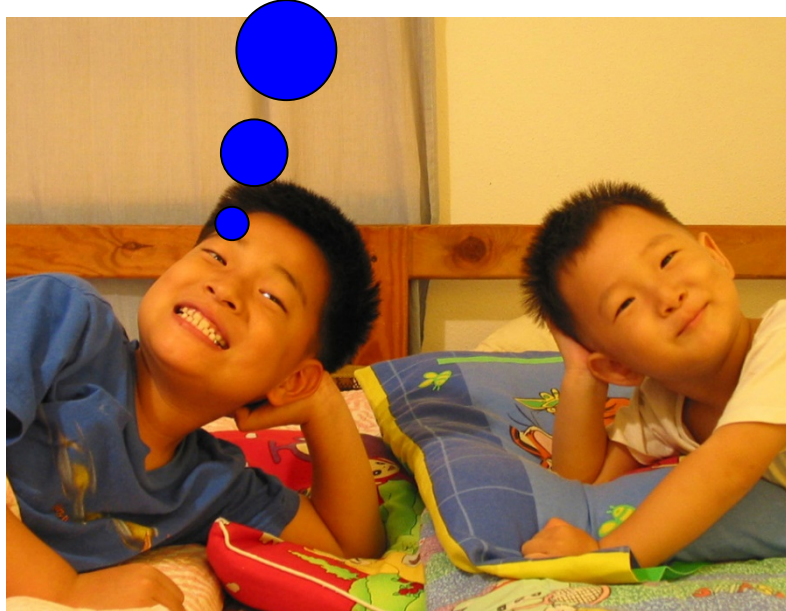
Engrossment

Flow

- Test protocol: Adventure game
- Immersion process measure using EEG
- Breathe, heart rate, skin temp, etc.
- Subject grouping:
Sensitivity to reward vs. punishment

Thank you
감사합니다!
Kamsa-hap-nida

Questions
&
Comments



hlim@kriss.re.kr / 010-4741-7343