Oltre l'HDTV:
ambiti, studi e riferimenti normativi internazionali

Oltre che cosa? Sappiamo cos'è l'HD?

Definizione da vocabolario ITU

"A system designed to allow viewing at about three times the picture height, such that the system is virtually, or nearly, transparent to the quality of portrayal that would have been perceived in the original scene or performance by a discerning viewer with normal visual acuity."

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Acuità visiva = 1 grado secondo = 1/60 di grado

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Angolo di vista verticale = 18,9 gradi

Punti visibili = 18,9 * 60 = 1135 punti

Il formato 1080 rispetta questa caratteristica

Allora abbiamo l'HD?

"A system designed to allow viewing at about three times the picture height, such that the system is virtually, or nearly, transparent to the quality of portrayal that would have been perceived in the original scene or performance by a discerning viewer with normal visual acuity."

Per avere la trasparenza bisogna che i pixel non solo siano presenti nel numero giusto ma che mantengano la loro informazione originaria

A pixel array of 1 080 × 1 920 pixels is indeed a **necessary condition** to deliver HDTV programs to the end user

Potential problems may arise however when a pixel array having 1 080 × 1 920 pixels is taken to also be a **sufficient condition** to deliver HDTV programs to the end user, since this is not necessarily true

Note – ITU-R Recommendation BT.1203 lists functional and operational requirements to be met when compressing HDTV video signals with MPEG-2 (H.262) or MPEG-4 (H.264/AVC) compression. Video signals subjected to excessive compression or excessive dawnsampling at any point along their signal path from image capture to image presentation to the end user would fail to meet the image quality requirements specified in ITU-R Recommendation BT.1868".

Con i televisori a schermo piatto è facilissimo capire se la condizione necessaria è soddisfatta

Il marchio HD 1080 ne è un esempio

Nulla sappiamo dire se anche la condizione sufficiente è raggiunta in quanto non abbiamo il riferimento a disposizione.

test empirico domestico sul set top box o IRD.

Quali scenari per andare oltre l'HD?

Al momento 5 risposte

1. Some parties propose that the next step of broadcasting should be 3DTV
2. Some parties propose that it should be UHDTV
3. As many as at least three new colorimetries have been proposed for new broadcasting services.

4. Some parties are evaluating television image improvements in the temporal domain (increasing the number of pictures per seconds), rather than in the spatial domain (increasing the number in samples per image).

5. The last CES (International Consumer Electronics Show), has stressed the use of television sets as a pivotal points that would support all media applications and platforms: terrestrial, satellite, cable broadcasting, recorded media, as well as the internet in all its applications.

The IEC International Electrotechnical Vocabulary (IEV) defines:

three-dimensional television (which it abbreviates as "3-D television")

as

"television in which the three-dimensional appearance of the scene is reproduced" adding a Note that clarifies that "Processes which can reproduce a three-dimensional appearance include stereoscopic television and holographic television."

The IEC International Electrotechnical Vocabulary (IEV) also defines:

stereoscopic television

as

"three-dimensional television in which each eye is presented with a different picture corresponding to binocular viewing of the scene".

Frame Compatible Plano-Stereoscopic 3D-HDTV

Frame Compatible: ha lo stesso formato di un frame HD, contenendo sia l'immagine destra che quella sinistra;

Plano: è presentato su di una superficie piatta;

Frame Compatible Plano-Stereoscopic 3D-HDTV

Stereoscopic 3D: è composto da due immagini destinate ad essere viste, simultanemente o quasi simultaneamente, una con l'occhio destro ed una con l'occhio sinistro per dare una percezione simile alla visione binoculare.

3D-HDTV: booh !!! Il sistema proposto è SD

I formati Frame Compatibili

720p@50,60 Top and Bottom Format

1080i@50,60 Side by Side Format

1080p@24 Top and Bottom

720p@50, 60 Side by Side

1080p@24 Side by Side.

The FC formats are coded using H.264 AVC compression in the DVB specification.

Particolare attenzione è data al problema della sicurezza psicofisica legata ai sistemi 3D

Il Report ITU-R BT2160 è il repository delle informazioni sulla safety. Giappone e Corea sono particolarmente attivi nella valutazione degli effetti sulla salute derivanti dai sistemi 3D

Gli argomenti oggetto di studio sono:

Visual comfort and discomfort in viewing stereoscopic images

- Discrepancies between left and right images
- Depth range, distribution and change in parallax

Visual fatigue in viewing stereoscopic images

- inconsistency between vergence and accommodation
- parallax amount and lateral/depth motion

Chi fa che cosa nel 3DTV

- Europa:

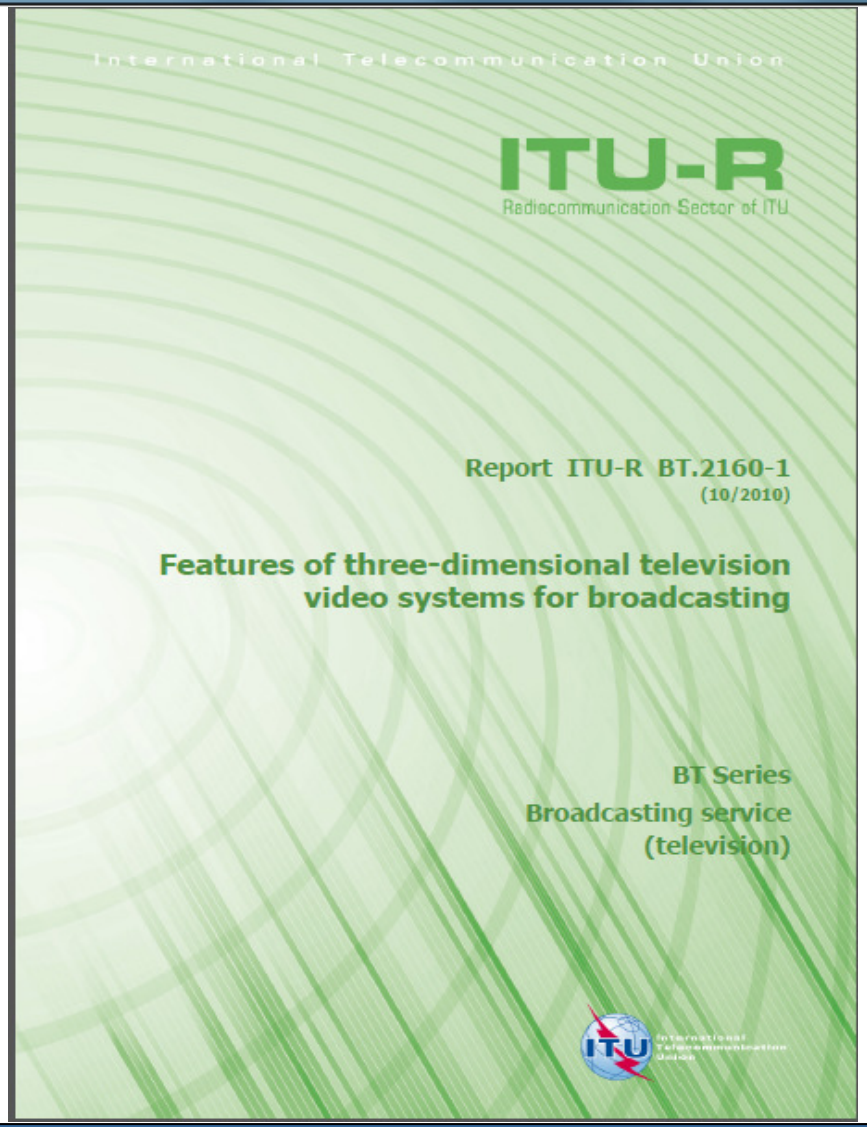
  11 nazioni, 20 broadcasters

- Nord America:

  2 nazioni, 6 broadcasters

- Asia:

  2 nazioni, 3 broadcasters


International Telecommunication Union
ITU-R
Radiocommunication Sector of ITU
Report ITU-R BT.2160-1
(10/2010)
Features of three-dimensional television video systems for broadcasting
BT Series
Broadcasting service (television)

UHDTV

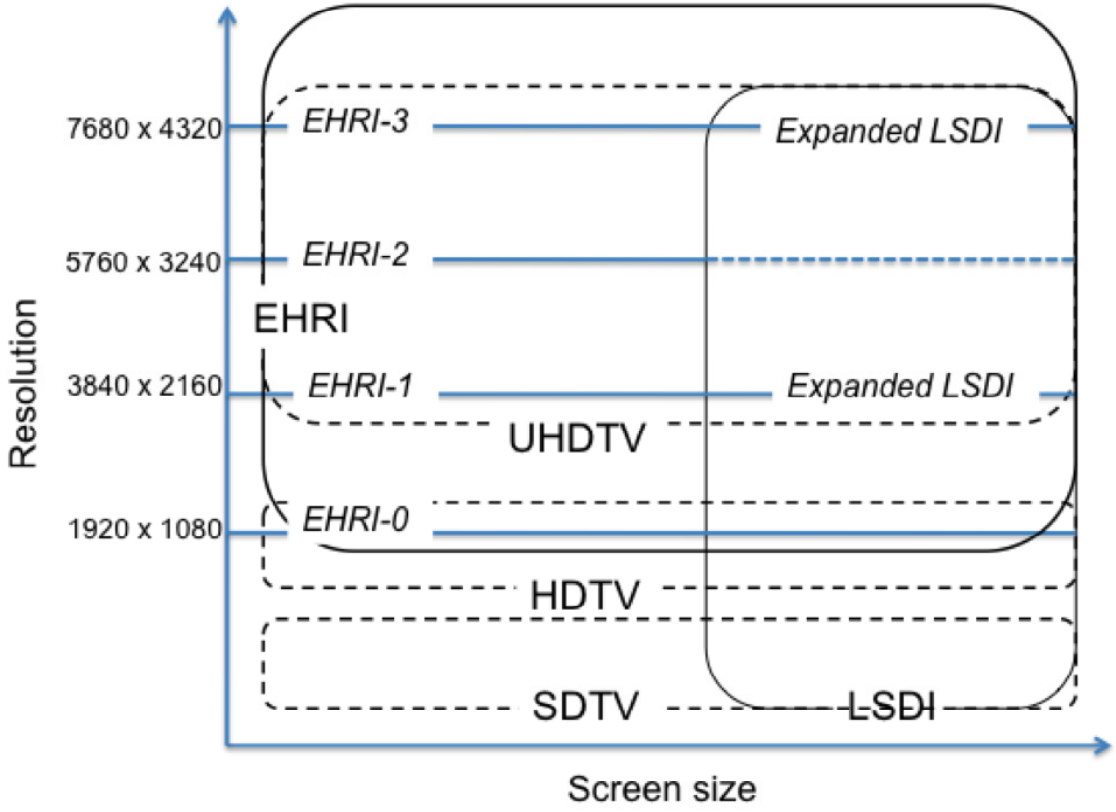
PRELIMINARY DRAFT NEW REPORT ITU-R BT.[UHDTV]

THE PRESENT STATE OF
ULTRA HIGH DEFINITION TELEVISION

Television has built its history on the fundamental desire of human beings to extend their audio-visual senses spatially and temporally.

HDTV is one of the great achievements of television. People in many countries are now enjoying the benefits of HDTV, and people in the rest of the world will soon benefit in the near future.

The attainment of this goal is limited in some aspects; e.g. the field of view of HDTV is only 30 arc-degrees. Our natural desire to overcome such limitations has led us to the concept of UHDTV.


7680 x 4320
EHRI-3
Expanded LSDI
5760 x 3240
EHRI-2
EHRI
3840 x 2160
EHRI-1
Expanded LSDI
UHDTV
1920 x 1080
EHRI-0
HDTV
SDTV
LSDI
Resolution
Screen size

Application

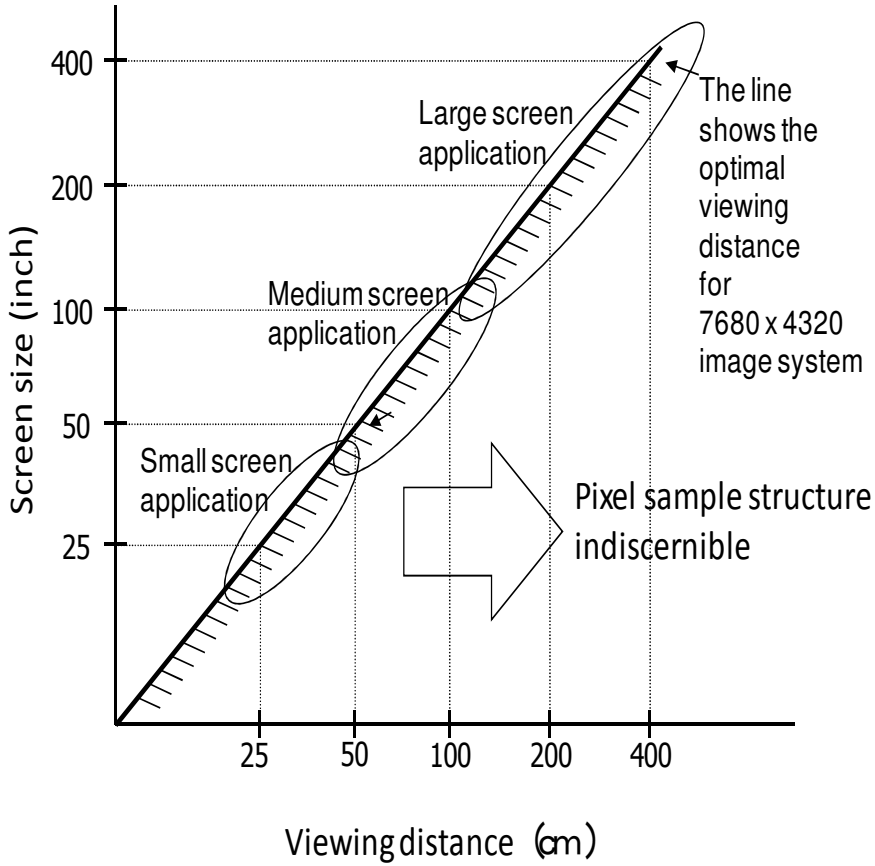
Compared with current HDTV, the UHDTV application should bring considerably improved benefits to its viewers. Those benefits may include:

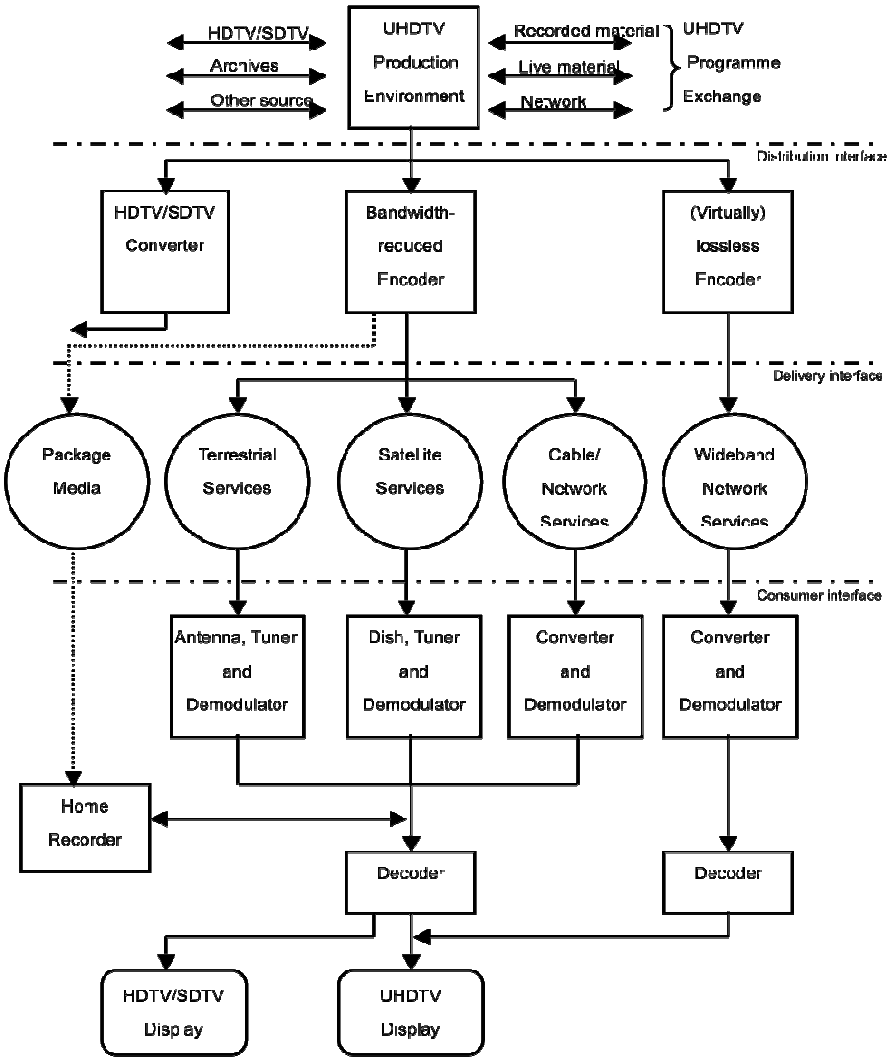
- **stronger sensation of reality or presence;**
- **higher transparency to the real world;**
- **more information.**

It may be presented in:

- living rooms;
- personal spaces in mobile and non-mobile environments;
- collective viewing locations such as theatres.

Each screen should be well suited to the particular form of usage.


400
200
100
50
25
Screen size (inch)
Large screen application
Medium screen application
Small screen application
The line shows the optimal viewing distance for 7680 x 4320 image system
Pixel sample structure indiscernible
25
50
100
200
400
Viewing distance (cm)


HDTV/SDTV
Archives
Other source
UHDTV
Production
Environment
Recorded material
Live material
Network
UHDTV
Programme
Exchange
Distribution interface
HDTV/SDTV
Converter
Bandwidth-
recuced
Encoder
(Virtually)
lossless
Encoder
Delivery interface
Package
Media
Terrestrial
Services
Satellite
Services
Cable/
Network
Services
Wideband
Network
Services
Consumer interface
Antenna, Tuner
and
Demodulator
Dish, Tuner
and
Demodulator
Converter
and
Demodulator
Converter
and
Demodulator
Home
Recorder
Decoder
Decoder
HDTV/SDTV
Display
UHDTV
Display

Optimal horizontal viewing angle and optimal viewing distance in image heights (H) or various digital image systems

Image system	Reference	Aspect ratio	Pixel aspect ratio	Optimal horiz. viewing angle	Optimal viewing distance1)
720 × 483	Rec. ITU-R BT.601	4:3	0.88	11°	7 H
640 × 480	VGA	4:3	1	11°	7 H
720 × 576	Rec. ITU-R BT.601	4:3	1.07	13°	6 H
1 024 × 768	XGA	4:3	1	17°	4.4 H
1 280 × 720	Rec. ITU-R BT.1543	16:9	1	21°	4.8 H
1 400 × 1 050	SXGA+	4:3	1	23°	3.1 H
1 920 × 1 080	Rec. ITU-R BT.709	16:9	1	32°	3.1 H
3 840 × 2 160	Rec. ITU-R BT.1769	16:9	1	58°	1.5 H
7 680 × 4 320	Rec. ITU-R BT.1769	16:9	1	96°	0.75 H

Quale futuro per UHDTV?

- It will probably **never** be possible to implement a UHDTV broadcasting service in the frequency bands currently assigned to terrestrial broadcasting, since it will not be possible to achieve the amount of bit-rate reduction necessary to fit the data rate required by UHDTV into the capacity of current terrestrial broadcasting channels.

- It may be possible to implement a 3 840 × 2 160 UHDTV broadcasting service in the 12 GHz satellite-broadcasting band in the medium future, when more efficient source-coding and modulation methods will have been developed and implemented in a reliable and viable way. Some experts think that this goal may be attained in **about ten years' time**, based on studies currently under way on improved source coding and modulation methods. It remains to be seen whether, at that time, the 12 GHz band will be too densely populated to accommodate the new UHDTV services.

- It will probably be possible to implement a 7 680 × 4 320 UHDTV broadcasting service in the 22 GHz broadcasting service in the far future, when another quantum leap in the efficiency of source coding and modulation methods will have been developed and implemented. Some experts think that this goal may be attained in perhaps **10 to 20 years**. It remains to be seen how the 22 GHz satellite broadcasting band will be structured at that time, and which applications will be earmarked for it.

Miglioramenti del secondo ordine !!!

- ampliamento dello spazio colore come proposto da Giappone e Korea

- incremento della risoluzione temporale (frame rate a 120 F/s)

Sarà questo il vero punto di svolta?

use of television sets as a pivotal points that would support all media applications and platforms:

- terrestrial, satellite,
- cable broadcasting,
- recorded media,
- as well as the internet in all its applications.

THE END

Aldo Scotti, laureatosi al Politecnico di Milano in Ingegneria Elettronica con indirizzo Comunicazioni, è dal 1985 in Rai ed in RaiWay sin dalla sua costituzione, ove è responsabile dell'Unità Organizzativa Innovazione, Certificazione, Sperimentazione Radioelettrica. La sua area di competenza spazia dalla valutazione dell'esposizione umana ai campi elettromagnetici allo sviluppo e gestione di reti di controllo del segnale radiotelevisivo, dallo sviluppo e certificazione di mezzi e sistemi di misura alla valutazione e certificazione della qualità della copertura dei servizi radiotelevisivi in condizioni fisse e mobili, per concludere infine con la partecipazione all'attività di normazione nazionale ed internazionale in ambito CEI (*Comitato Elettrotecnico Italiano*) ed ITU (*International Telecommunication Union*) dove è responsabile di un Rapporteur Group sulla revisione della raccomandazione ITU-R BT 1735.