





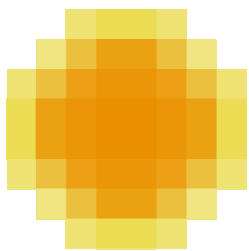
Terrestrial TV Broadcasting planning and digital transition

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Cali

- *Cali huele a caña de azúcar y sabe a salsa. En el Valle del Cauca se vive con la amabilidad de su gente y se aprecia la hermosura de sus paisajes.*



<http://www.colombia.travel/es/turista-internacional/destino/cali-y-valle-del-cauca>

Cali – Capital mundial de la Salsa



The ITU guidelines

TRANSITION TO DIGITAL TV

About this presentation

- Part of this presentation is based on the experience of the ITU DTV Roadmap projects for 9 countries in Central, South Americas and the Caribbean.
- This projects was financed by CAF in 8 countries and with ITU resources in Guyana.
- 3 More Countries are in process of develop DTV Roadmaps with ITU funding.



CAF: Banco de Desarrollo de América Latina

Radio Frequency Spectrum Management
Workshop, Mayagüez, PR



About the Guidelines

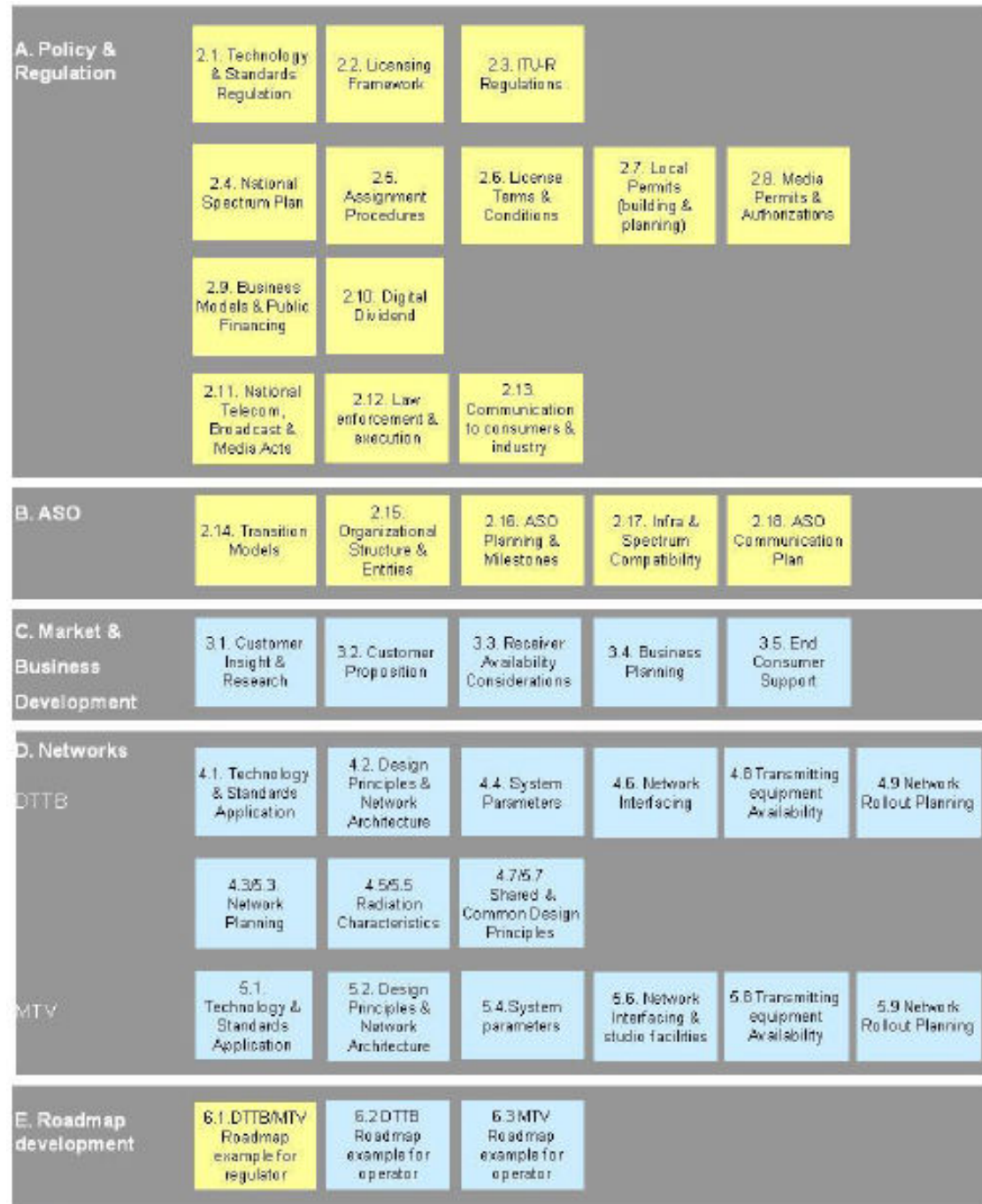
- 2009 funded by KCC: for African countries (80 % general)
- 2011 (KCC): Guidelines Updated to reflect the different ITU rules and requirements in Region 3 (Asia Pacific)
- Addition of New Chapter on Archives Migration
- 2013 Project funded by MIC, Japan
- Incorporate
 - updated information, new technologies,
 - satellite TV, cable TV, IPTV
- Tokyo, April 2013: Group of experts
 - Jan Doeven, Peter Walop, Gu-Yean Hwang
 - Colin Knowles
 - Junji Kumada, Yukihiro Nishida, Sharad Sadhu, Kazuyoshi Shogen
- In cooperation with
 - Roger Bunch, vice-chairman of ITU-R Study Group 6
 - ITU BR and BDT
- Spanish versión of the Guidelines supported by CAF in 2014.

Challenge for DTV

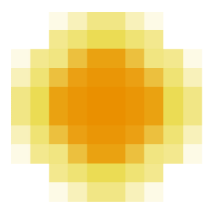
- Efficient spectrum management and the transition from analogue to digital broadcasting are critical issues for policy makers, regulators, broadcasters and other stakeholders
- Given the increasing demand for limited radio-frequency resources and spectrum scarcity.

The Guidelines

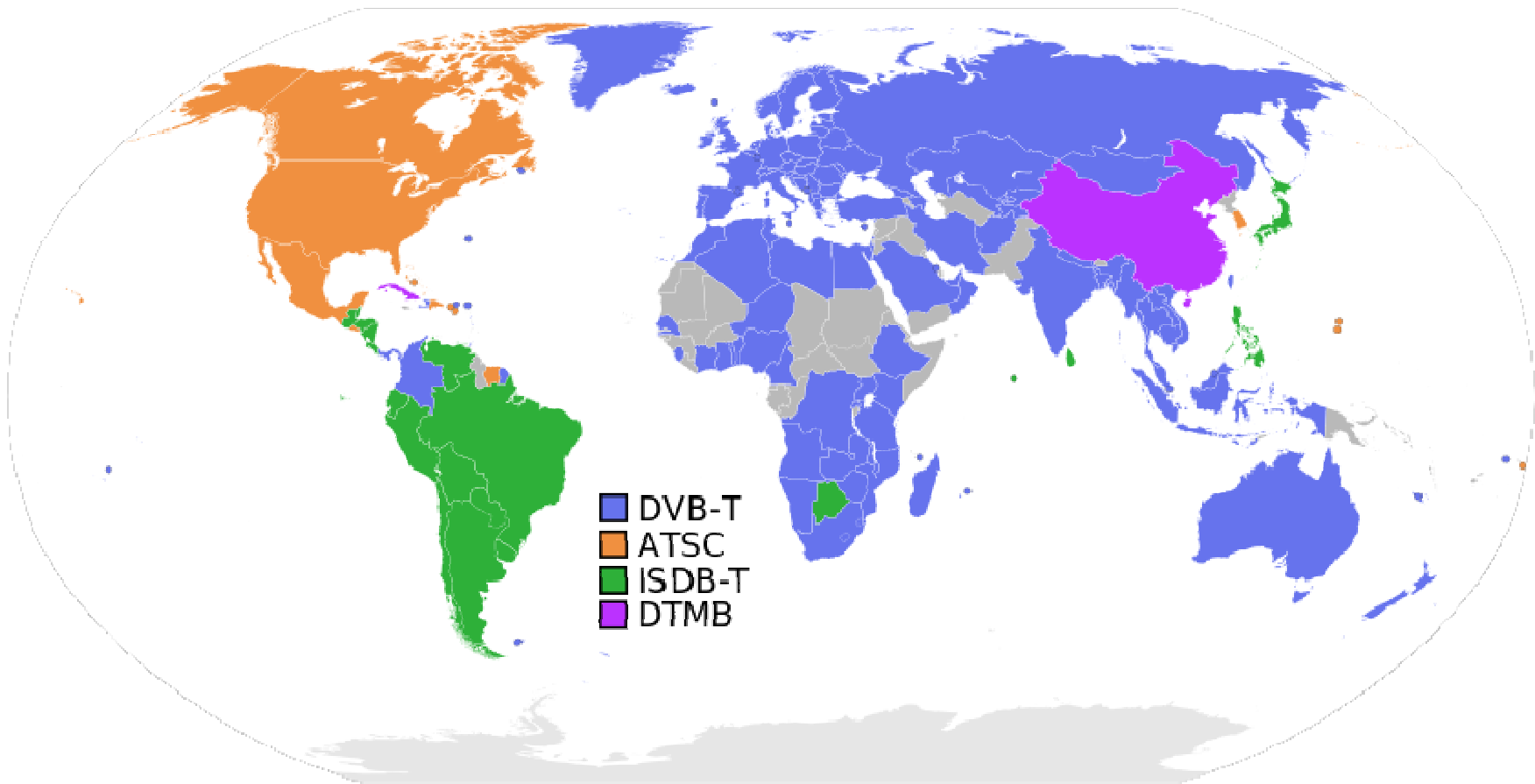
A – Section 1	Policy and Regulation;
B- Section 2	Analog Switch-Off (ASO)
C – Section 3	Market and Business development
D – Section 4 and 5	Networks (DTTB and MTV);
E – Section 6	Roadmap development.
Annex A	Implementation of the GE06 Agreement
Annex B	More detailed information on some regulatory topics
Annex C	More detailed information on some DTTB network topics
Annex D	More detailed information on some MTV network topics
Annex E	Guidelines for migration of broadcast archives from analogue to digital
Annex F	Television broadcasting via satellite
Annex G	Television broadcasting via cable TV networks and IPTV



Government led
 Market led

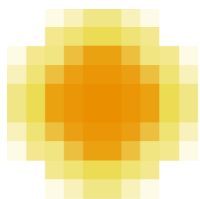
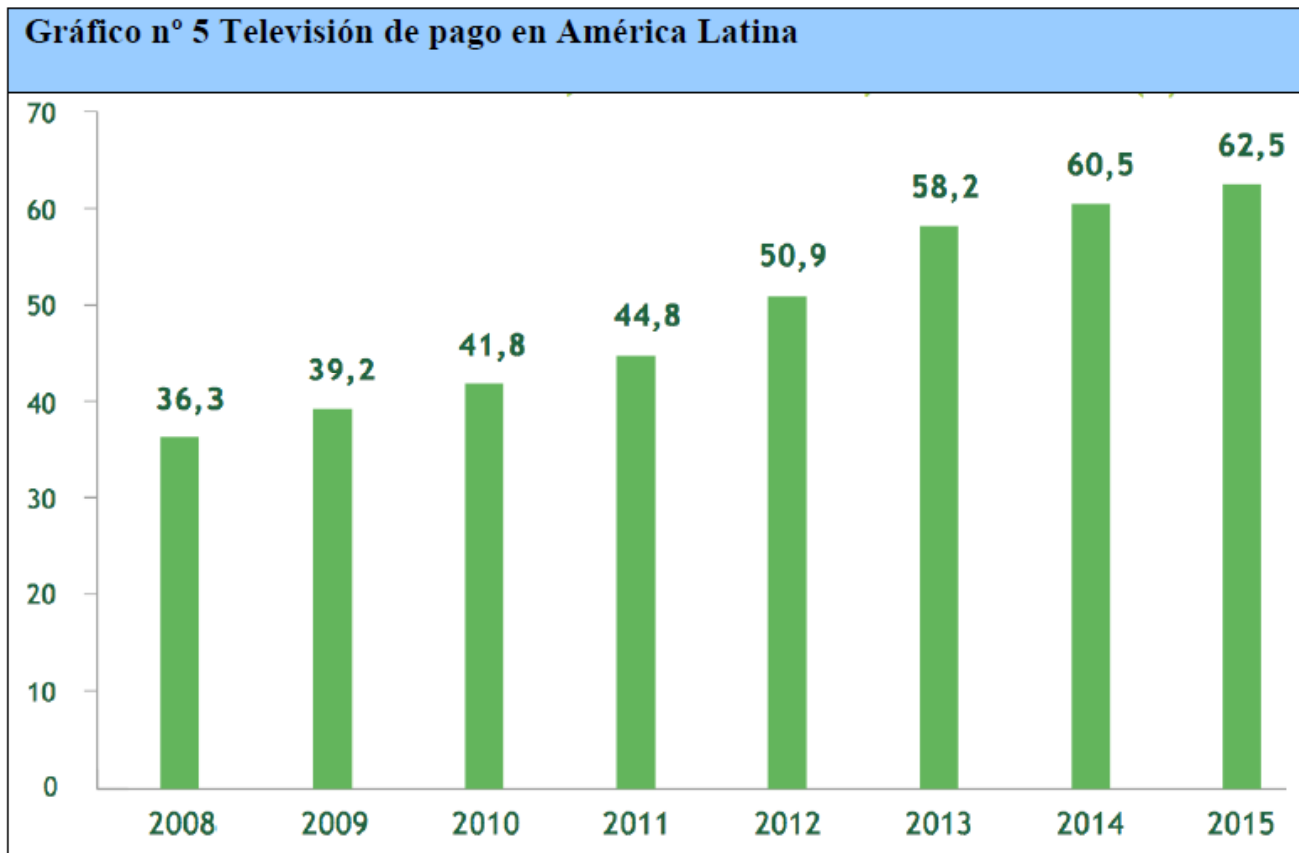


Status of DTV worldwide (2016)



Source: Wikipedia, not updated

Pay TV penetration in Latin America



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Radio Frequency Spectrum Management Workshop, Mayagüez, PR



Status of Digital TV Transition in Latin America

- Most countries already began DTV transmission (Pilot tests or commercial deployments)
- Dominant Standard is the Brazilian version of ISDB-T
- Most countries have decided to have simulcast and make an Analog Switch-off by regions (between 2019 and 2022).
- An agreement for frequency coordination is necessary (similar to Rio-81 or Geneva-06 for region 1)

Status of Digital TV Transition in Latin America

- Mix of technologies in borders, and no studies about compatibility.
- Some particular Issues in Caribbean islands, Guyanas and Venezuela. (European channelization vs American channelization).
- Additional challenges after WRC-15 decisions about second digital dividend (614MHz to 698MHz).

Issues in Caribbean islands, Guyanas and Venezuela



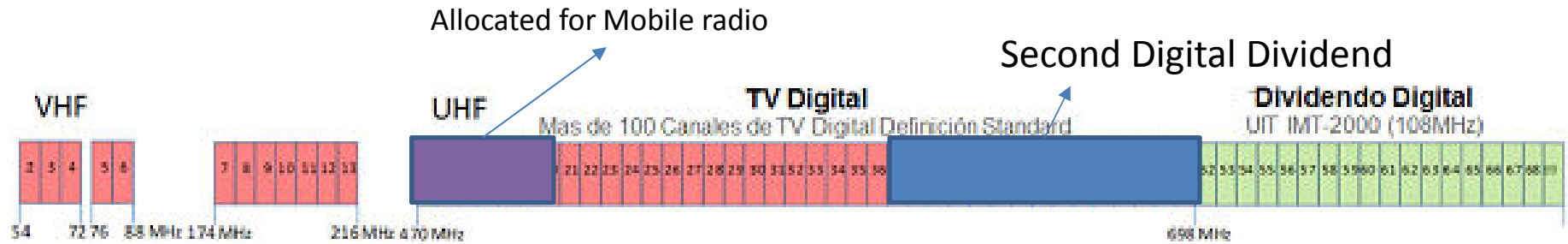
Some comments about ATSC

- Originally not developed with high spectral efficiency in mind, or mobility or interactivity.
- Some evolution recently makes it similar to other standards (OFDM, mobility, etc).
- FCC and Industry Canada decisions in WRC-15 rise some questions about the future of terrestrial TV in North America.

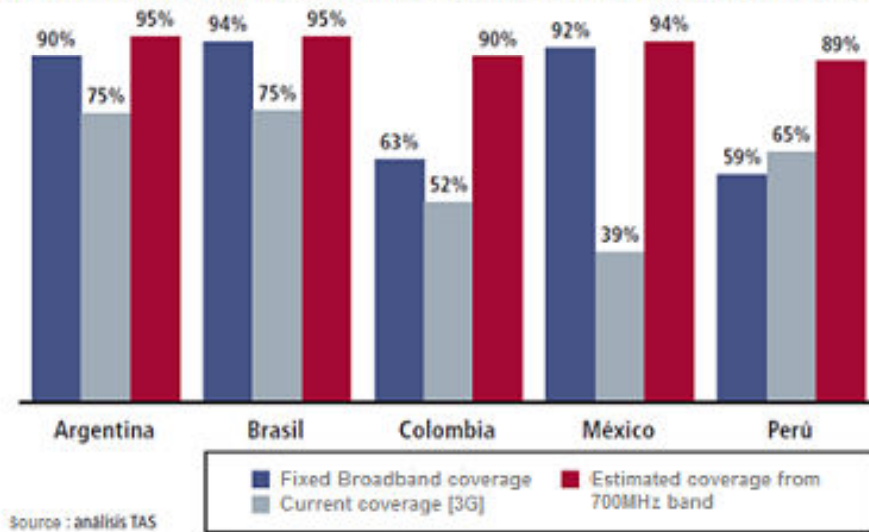
Challenges for Broadcasters

Spectrum Scarcity, UHDTV, Internet,
Mobile networks

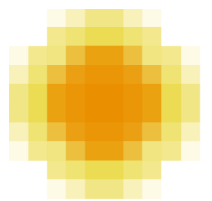
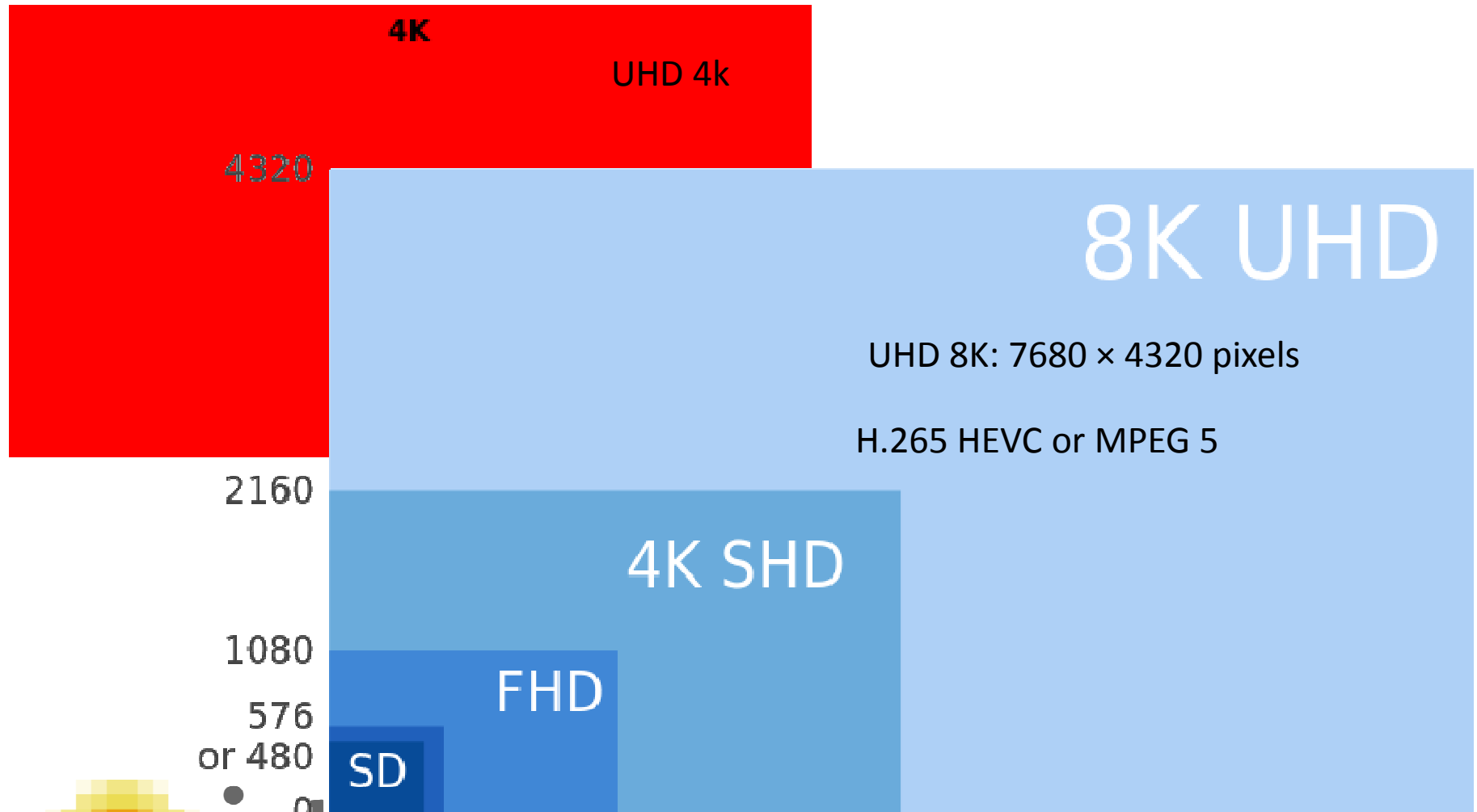
Spectrum – Digital Dividend



Mobile Broadband extra coverage reached based on 700MHz spectrum



Ultra High Definition, MPEG 5



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H.265 (HEVC)

- **High Efficiency Video Coding (HEVC)** is a video compression format, a successor to H.264/MPEG-4 AVC (Advanced Video Coding), that was jointly developed by the ISO/IEC Moving Picture Experts Group (MPEG) and ITU-T Video Coding Experts Group (VCEG) as ISO/IEC 23008-2 *MPEG-H Part 2* and ITU-T *H.265*. MPEG and VCEG established a Joint Collaborative Team on Video Coding (JCT-VC) to develop the HEVC standard.
- HEVC is said to double the data compression ratio compared to H.264/MPEG-4 AVC at the same level of video quality. It can alternatively be used to provide substantially improved video quality at the same bit rate. It can support 8K UHD and resolutions up to 8192x4320.

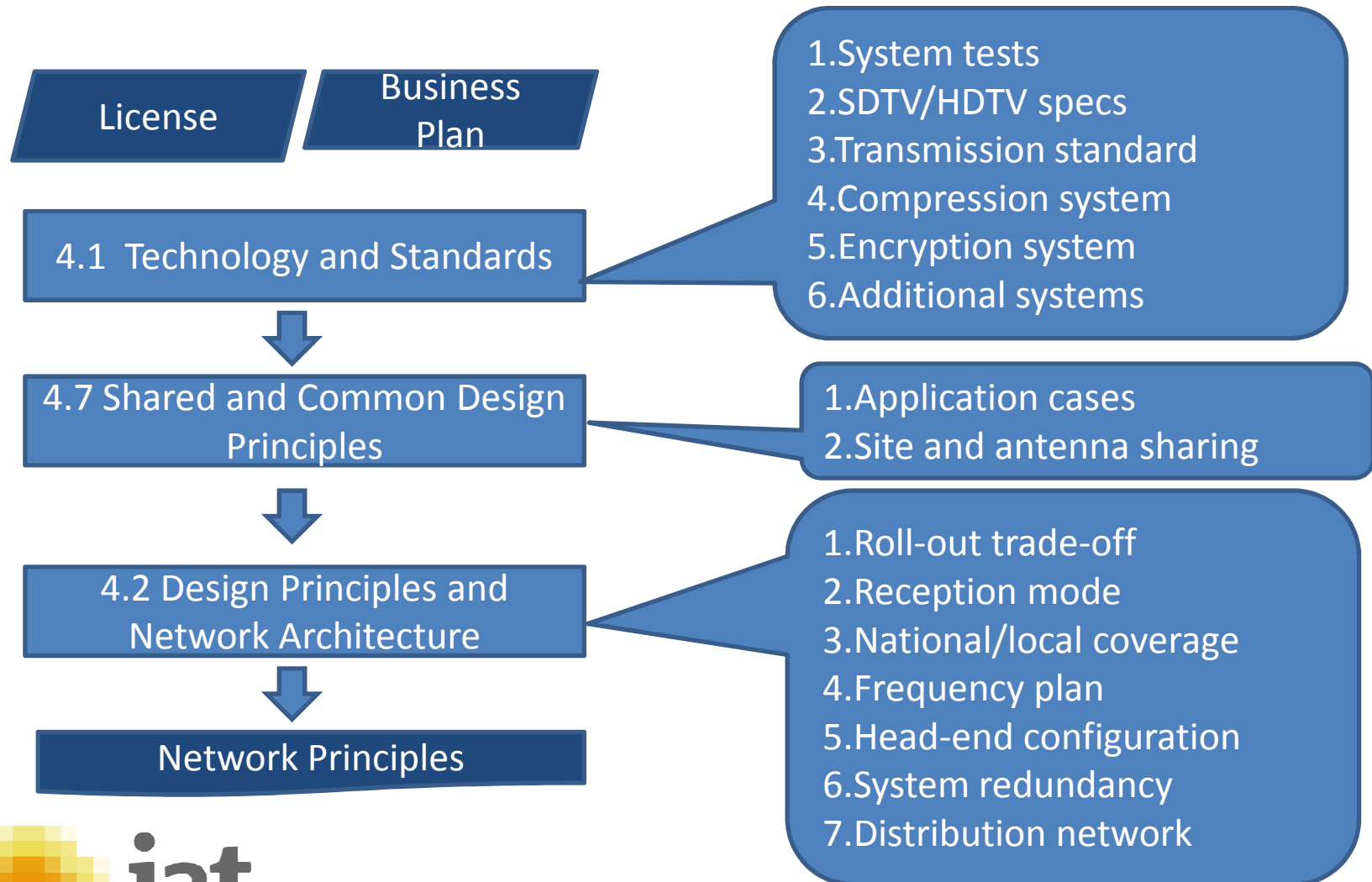
Source: http://en.wikipedia.org/wiki/High_Efficiency_Video_Coding

UHDTV

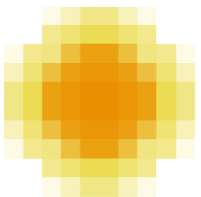
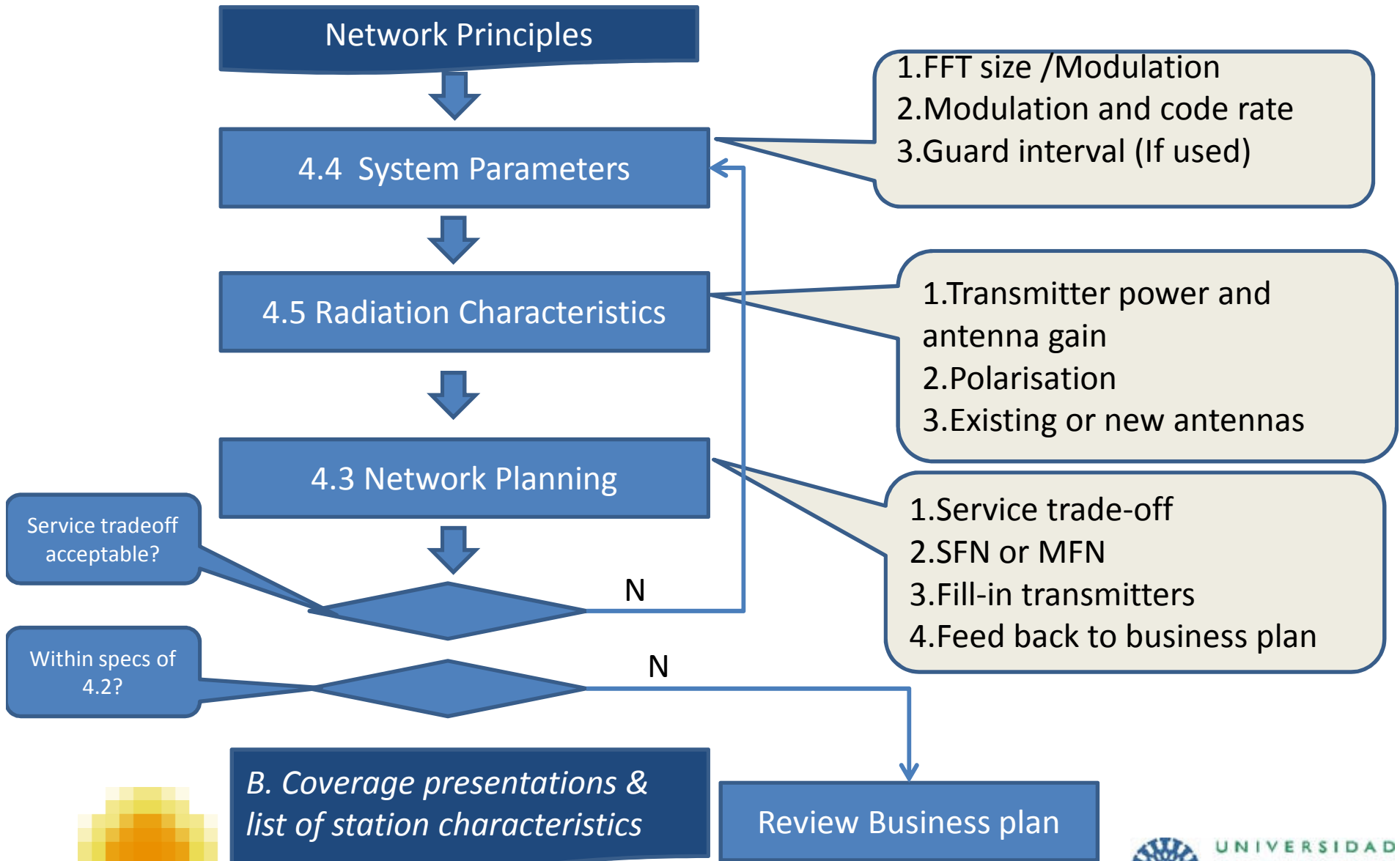
- Corresponds to Recommendation ITU-R BT.2020.
- Developed by WP6C

DTV NETWORK PLANNING CONSIDERATIONS

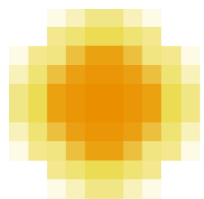
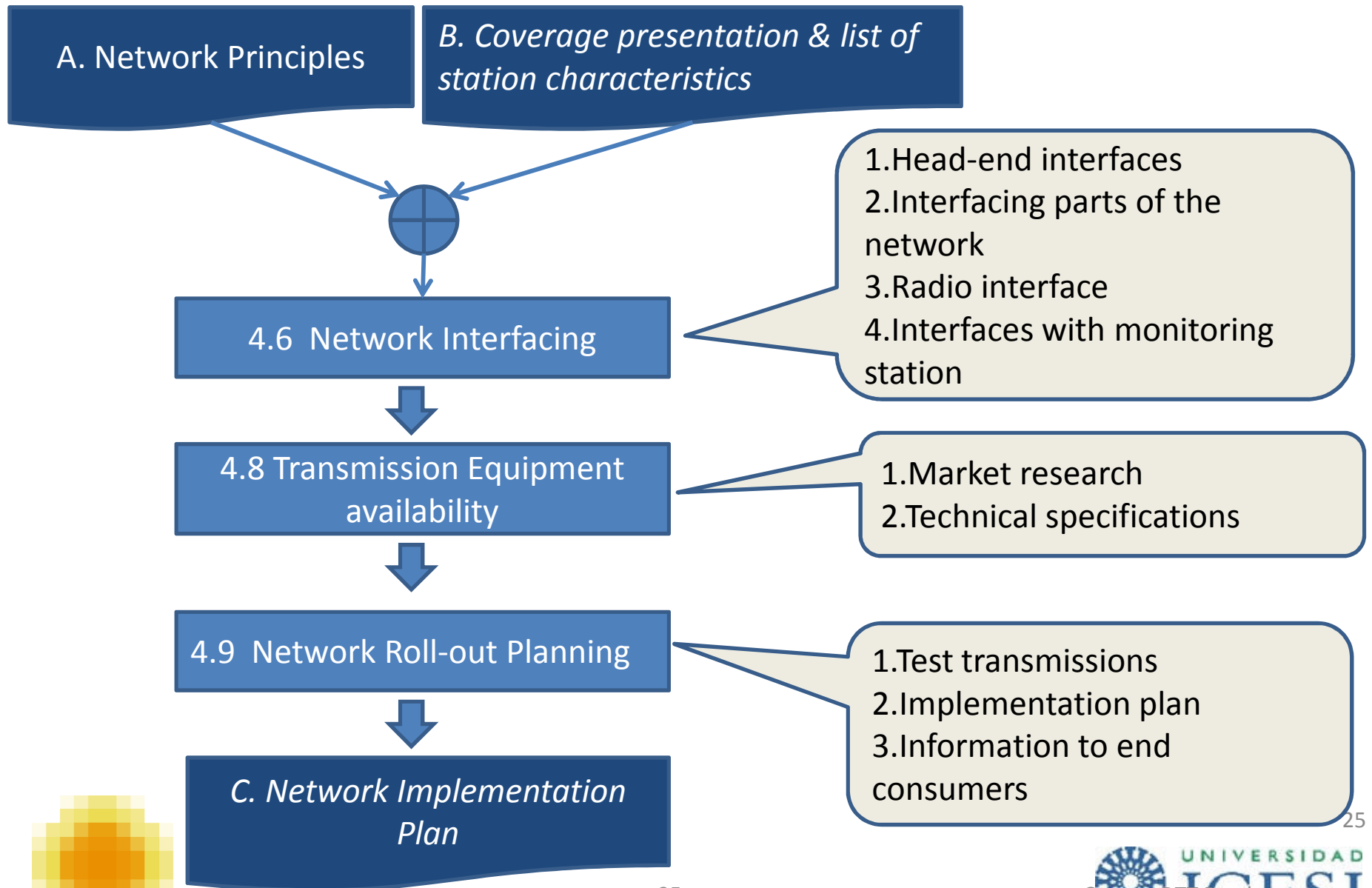
Network Principles

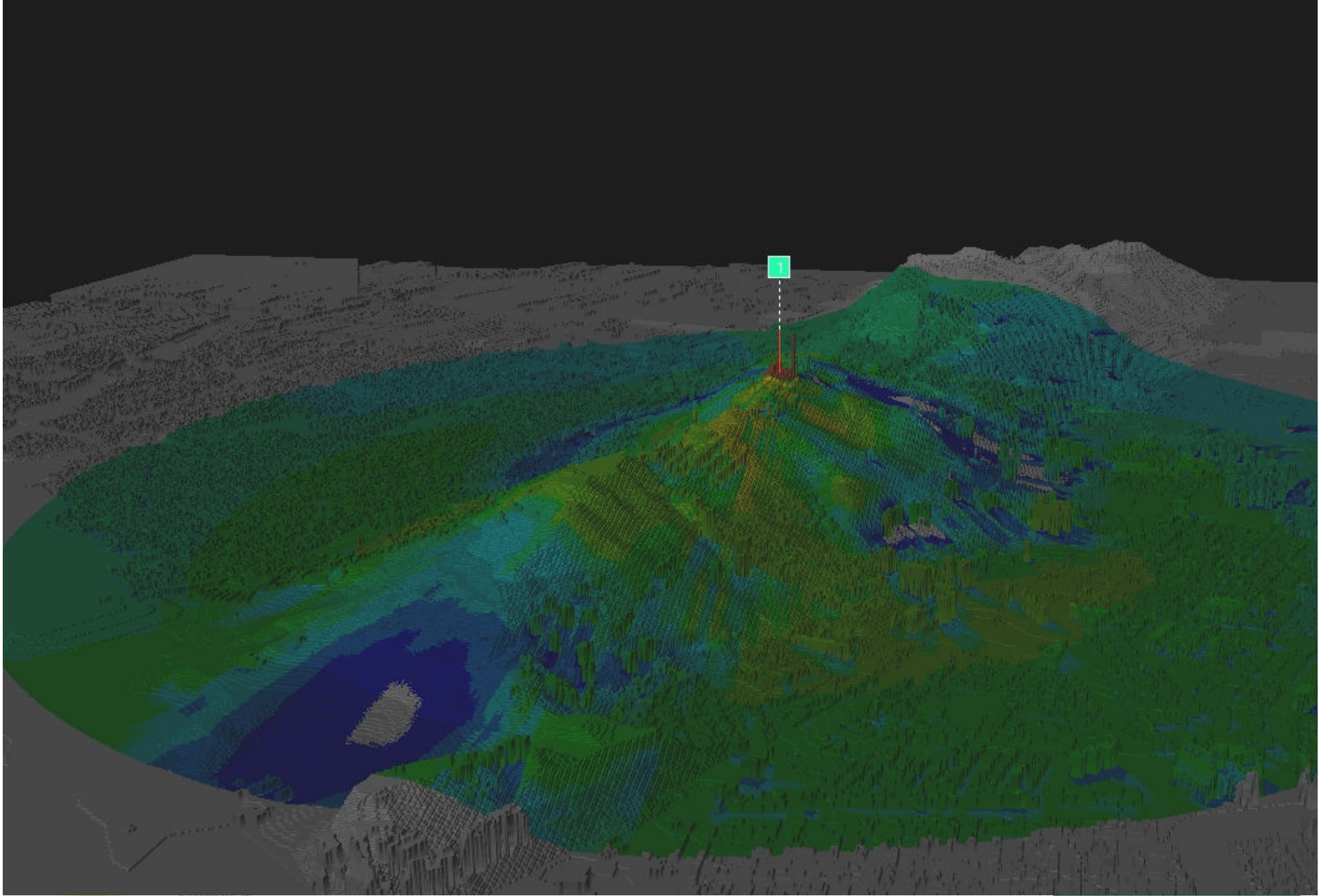


Service Planning

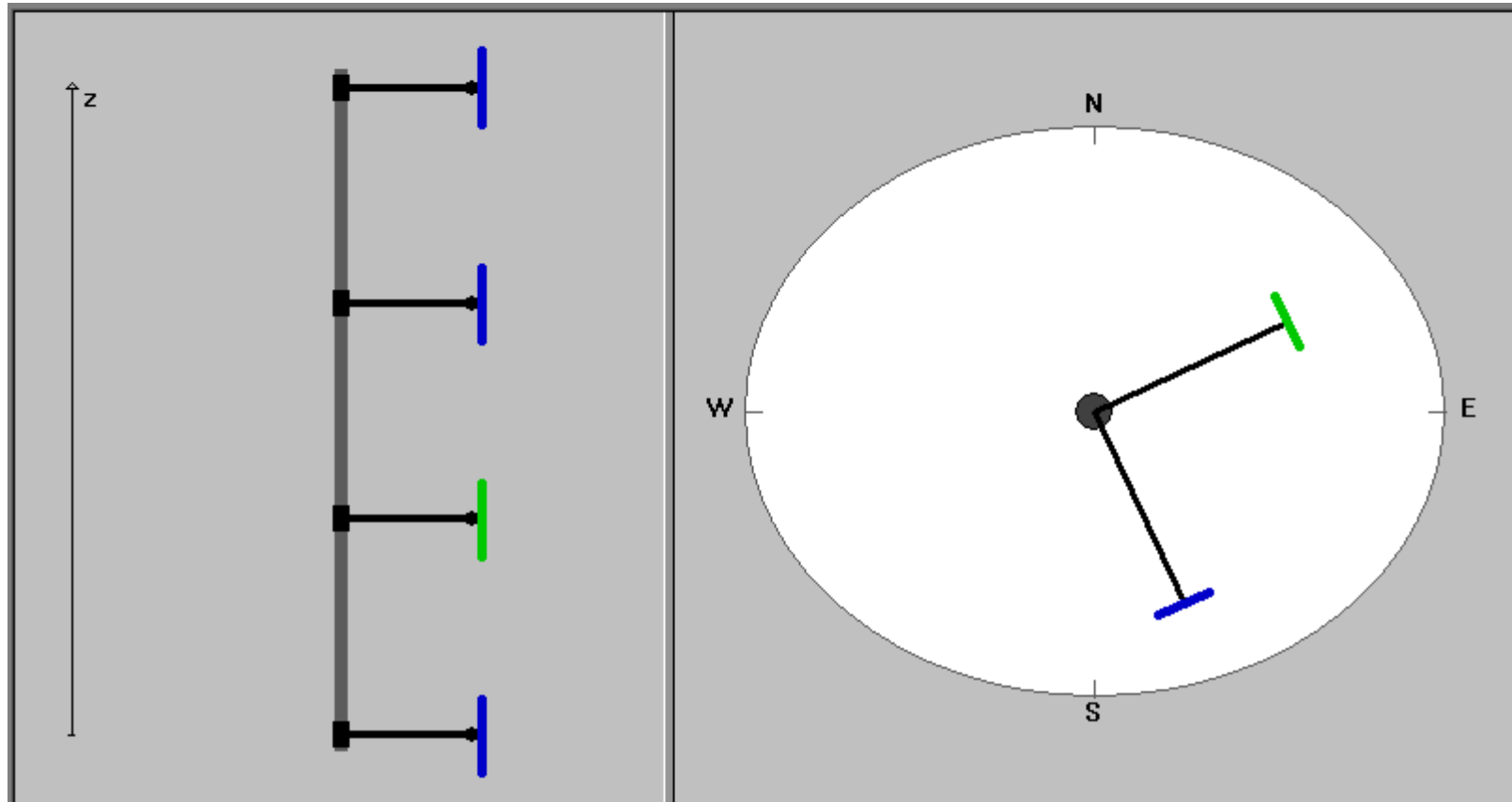


Network implementation planning (1)

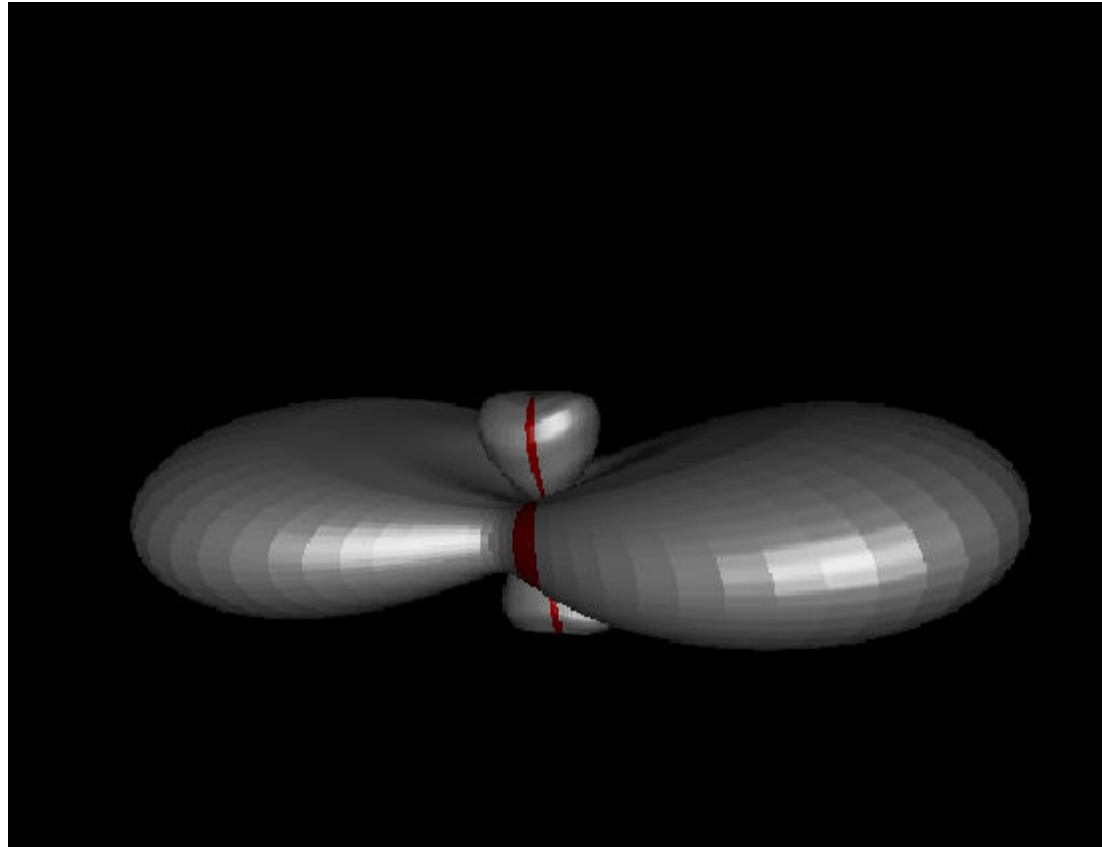




Planning – Antenna configuration



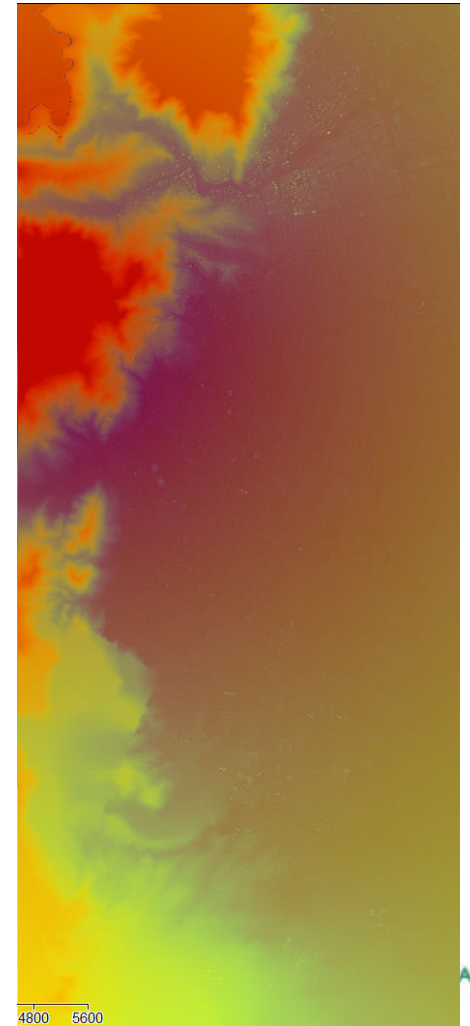
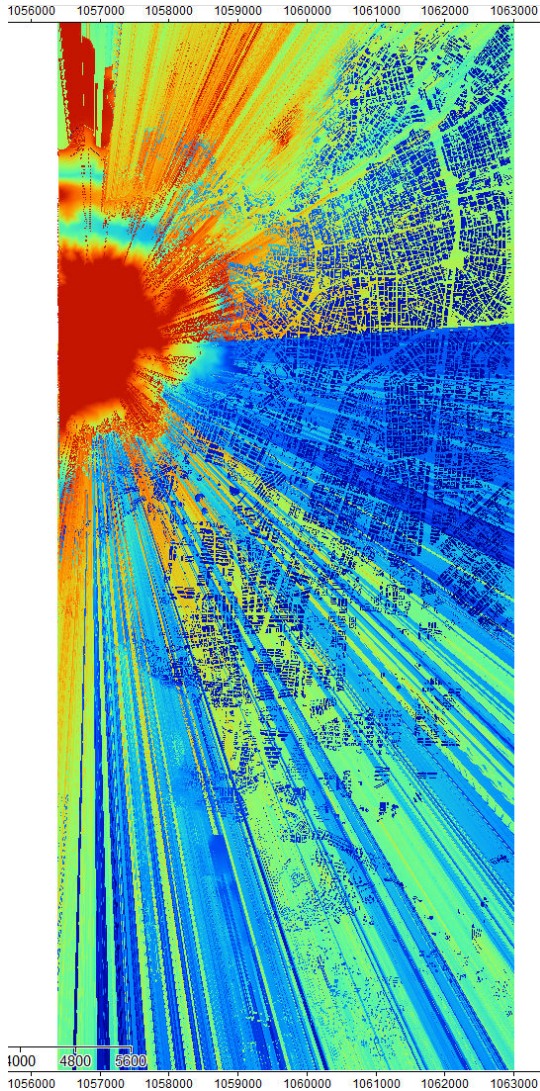
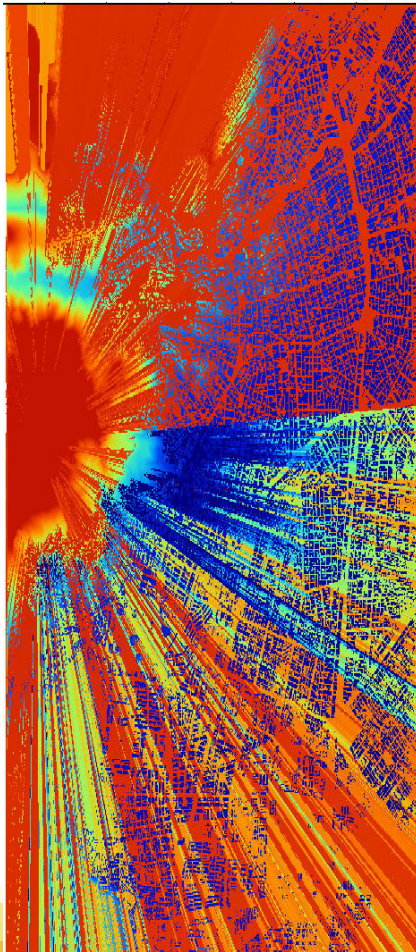
Antenna Pattern



Some Propagation models for TV

- Hata statistical model
- Longley – Rice, also know as ITS (some improvements made recently)
- Xia – Bertoni
- Different statistical models combined with edge diffractions like Deygout.

Propagation Models

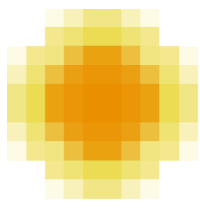
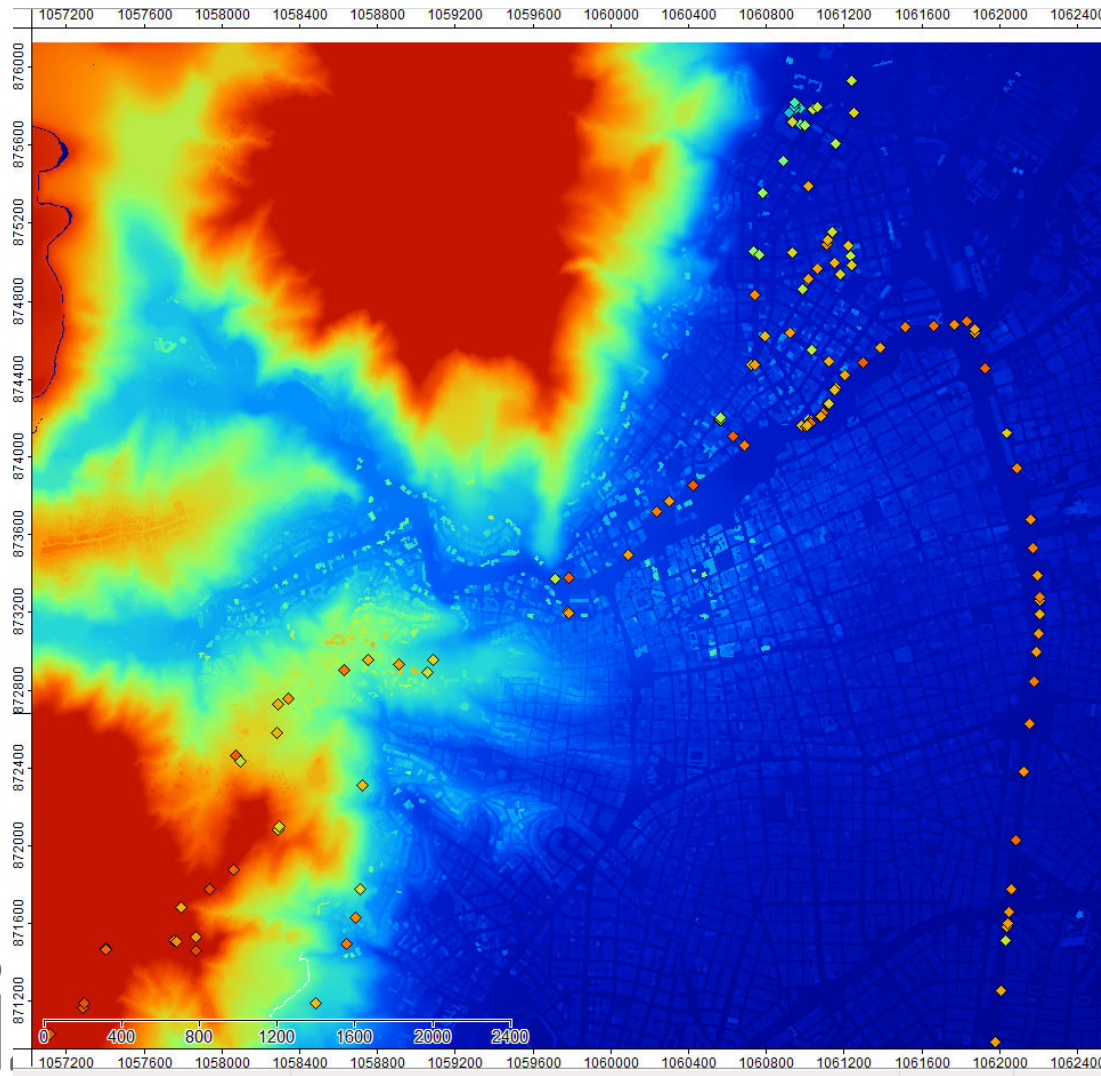


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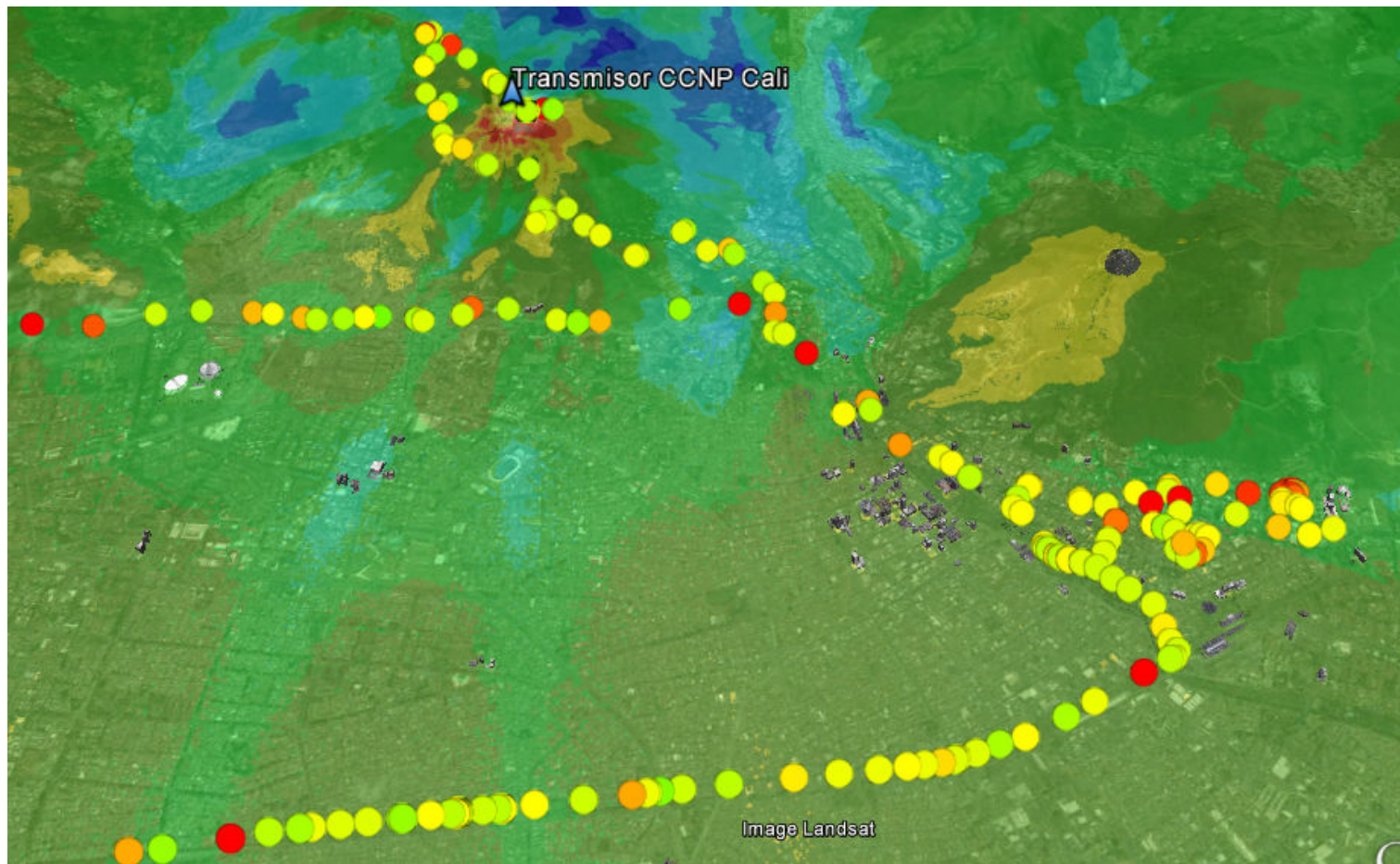
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Drive test



Drive test - Cali



The transmitters of the CCNP are located on *Cristo Rey* Hill, at 1440 MASL, 6kW for each channel and 13dBi gain on the antenna array.

Transmitter Data

Tx/Rx parameters: 1 Cristo Rey

General Patterns Channels Site **Advanced**

Address: Cristo Rey

Info (1):

Info (2): F3E

Network ID/BSC/RNC: CCNP

Mobility mgmt entity:

Sys. architect. evol. gateway:

Station ID/BSIC/PHY_ID: 0

TAC/LAC: 0

Icon display Std display


Icon ...

Update: info 1=code - info 2=town

Effective height... Constraint... Load .TRX Save .TRX

Reference coordinates: -76.33570 3.25570 1448 4DMS

convert



Site color: [Cyan]

Site code (TRIG): ID;CALL_S upd file..

Ext. radius: Radius (Km) 75.0000 Step (Km) 75.0000

Poly->Rad Rad->Poly

Sector: Limit dist. (km) 500.00 Sector (deg) start 0 end 0

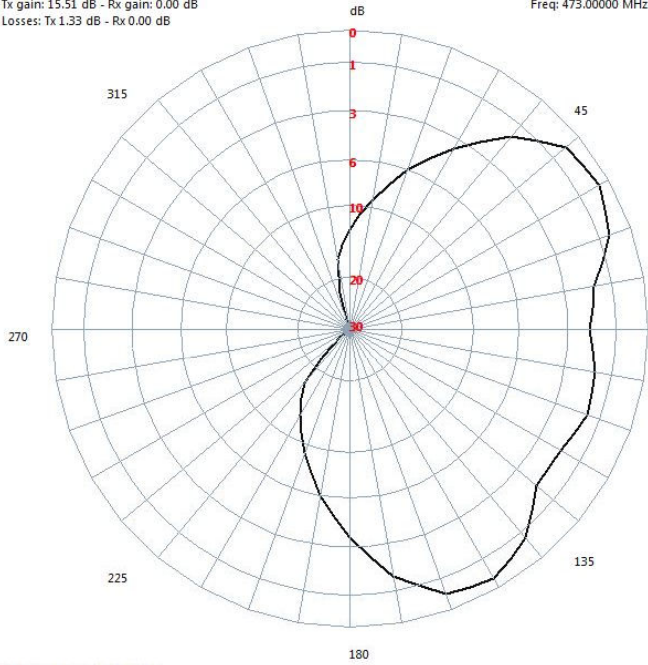
Sect->Poly Del. poly.

Aceptar Cancelar

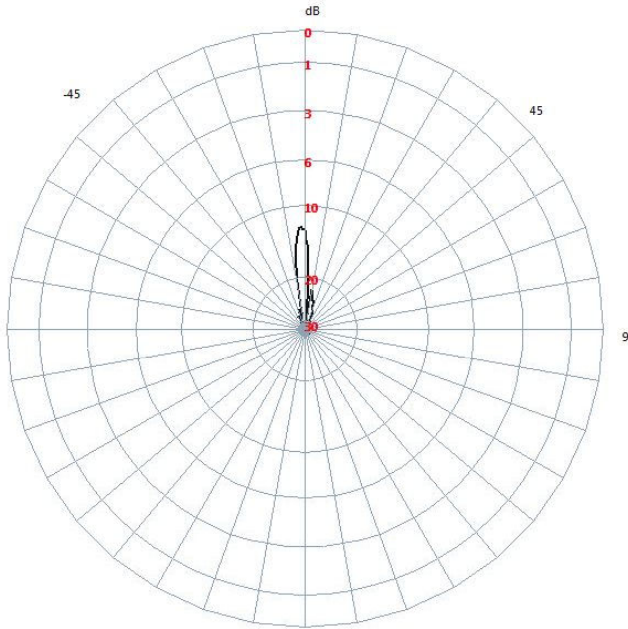
Transmitter Data

Nom. power: 6200 W
Tx gain: 15.51 dB - Rx gain: 0.00 dB
Losses: Tx 1.33 dB - Rx 0.00 dB

Rad. power: 162327.4 W
Freq: 473.00000 MHz

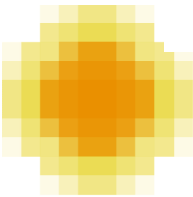


Site #: 1 - Horizontal pattern



Site #: 1 - Vertical pattern

Cristo Rey - Cristo Rey
Frequency: 473.00000 MHz - Power: 162327.35938 Watts
Antenna: 68.00 meters - Azimuth: 0.00 ° - Tilt: 0.000 °
-76.33570 3.25570 1448 4DMS



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Transmitter Parameters

Tx/Rx parameters: 1 Cristo Rey

General Patterns Channels Site **Advanced**

Type (0) Signal (41) Modulation (25) NFD

Tx/Rx A (0) DVB 6MHz (41) 64-QAM 3/4 (25)

Cover. threshold (dBuV/m)* 42

Rx threshold (dBuV/m)* 42 upd...

Launch delay (us) 0

Carrier 2

C/N (dB) 18 thresh.

Frequency offset (kHz) 0.0000

Channel (#) 22 ...

Availability % 0.00000

% 70 95 99 other ...

Activity ul/dl (%) 100 / 100

C/I req N=0/N=1 0.0 0.0

Initial power 6200.00000 Init

C/I Steady Tropo

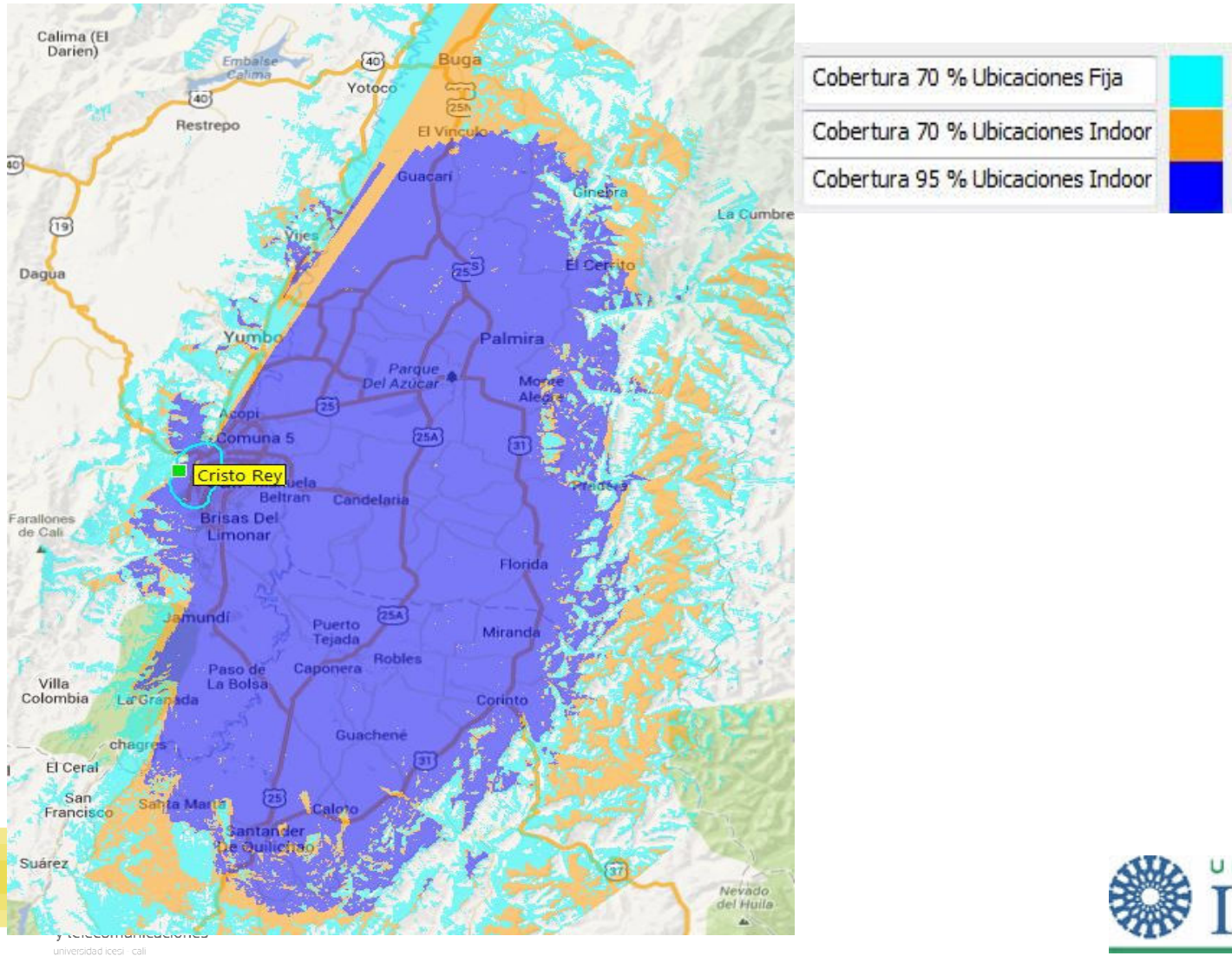
Floor offset 0

Active set

*Thresholds

Aceptar Cancelar

Coverage Estimation



THANK YOU