

TANDBERG
Television



sharing **your vision**



www.tandbergtv.com



**ENG:
Experiences of a worldwide active
system supplier**

ITU Seminar

*Spectrum Usage and User Requirements
for Terrestrial Electronic News Gathering
Recommendation 723 (WRC-03)*

Geneva, 8 March 2006

Contents

- ▶ Introduction
- ▶ ENG Systems
 - ▶ Example 1: 2.5 GHz System
 - ▶ Example 2: 2.5 GHz + 10 GHz System
- ▶ Technology today
- ▶ Ongoing Projects
- ▶ Challenges
- ▶ Comments on Question ITU-R 89-1/6
- ▶ Comments on Question ITU-R 93/6
- ▶ Industry Outlook
- ▶ Discussion



Introduction

- Rainer Horn

Technical Director at Tandberg TV AVS , Germany

**Tandberg Television AVS
GmbH & Co. KG.**

phone: +49 6124 7239 15

mobile: +49 177 72 88 301

fax: +49 6124 723929

email: rhorn@tandbergtv.com



Introduction

- Tandberg TV

Market leader in provision of open solution for digital broadcasting

Based in Norway / UK

Broadband, cable, satellite, wireless, IP

More than 600 employees worldwide

Offices in Asia, Australia, Europe, USA

Sales, 24/7 customer support



Introduction

Tandberg AVS

- Since 2001 part of TANDBERG TV
- Based in Germany, Heidenrod-Kemel
- long time experience in ENG – analogue and digital
- Digital transmission systems for many years
- Broadcast applications
- Surveillance & security applications
- Digital, system & RF infrastructure



Introduction

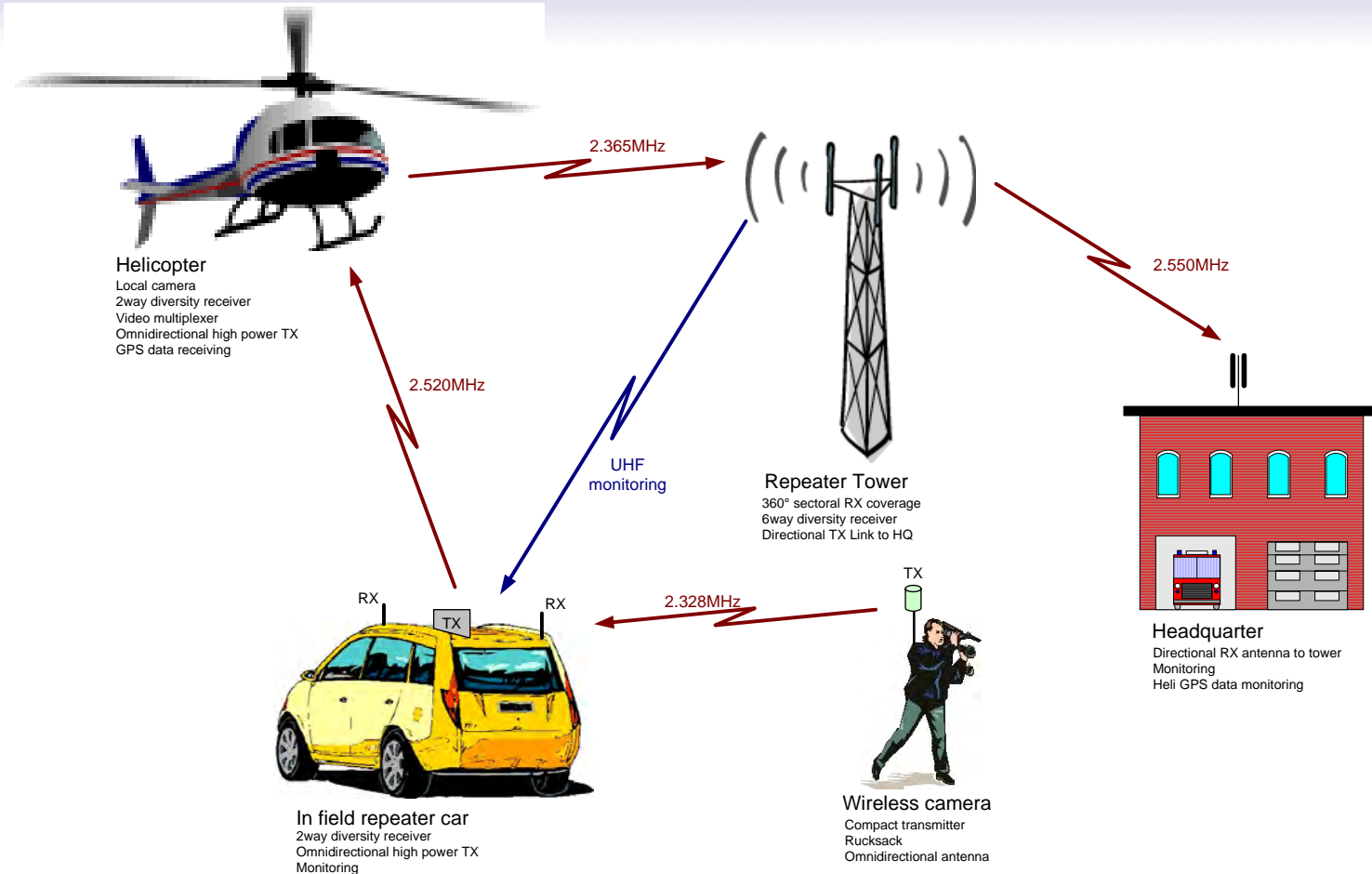
Argentina	Greece	Poland
Australia	India	Portugal
Austria	Indonesia	Saudi-Arabia
Belgium	Italy	Singapore
Brazil	Japan	Slovenia
Bulgaria	Lebanon	Spain
PR China	Macedonia	Sweden
Croatia	Malaysia	Switzerland
Czech Republic	Mexico	Taiwan
Denmark	Netherlands	USA
Finland	Norway	Uzbekistan
France	New Zealand	Vietnam
Great Britain	Nigeria	

Sorry if we did miss any and of course the

"Volvo Ocean Race"

our best live promotion, daily on Eurosport

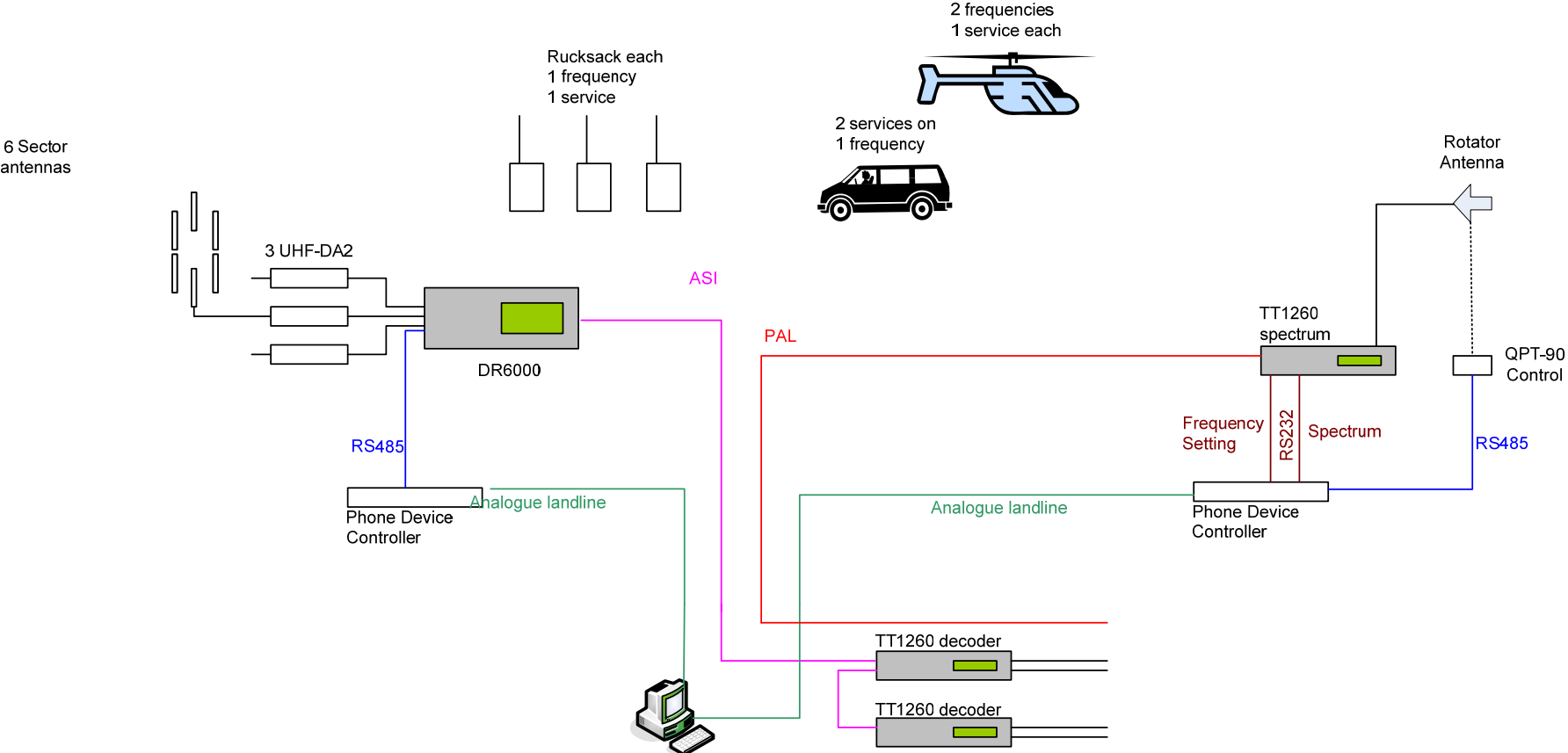
ENG System Principles



TANDBERG
Television

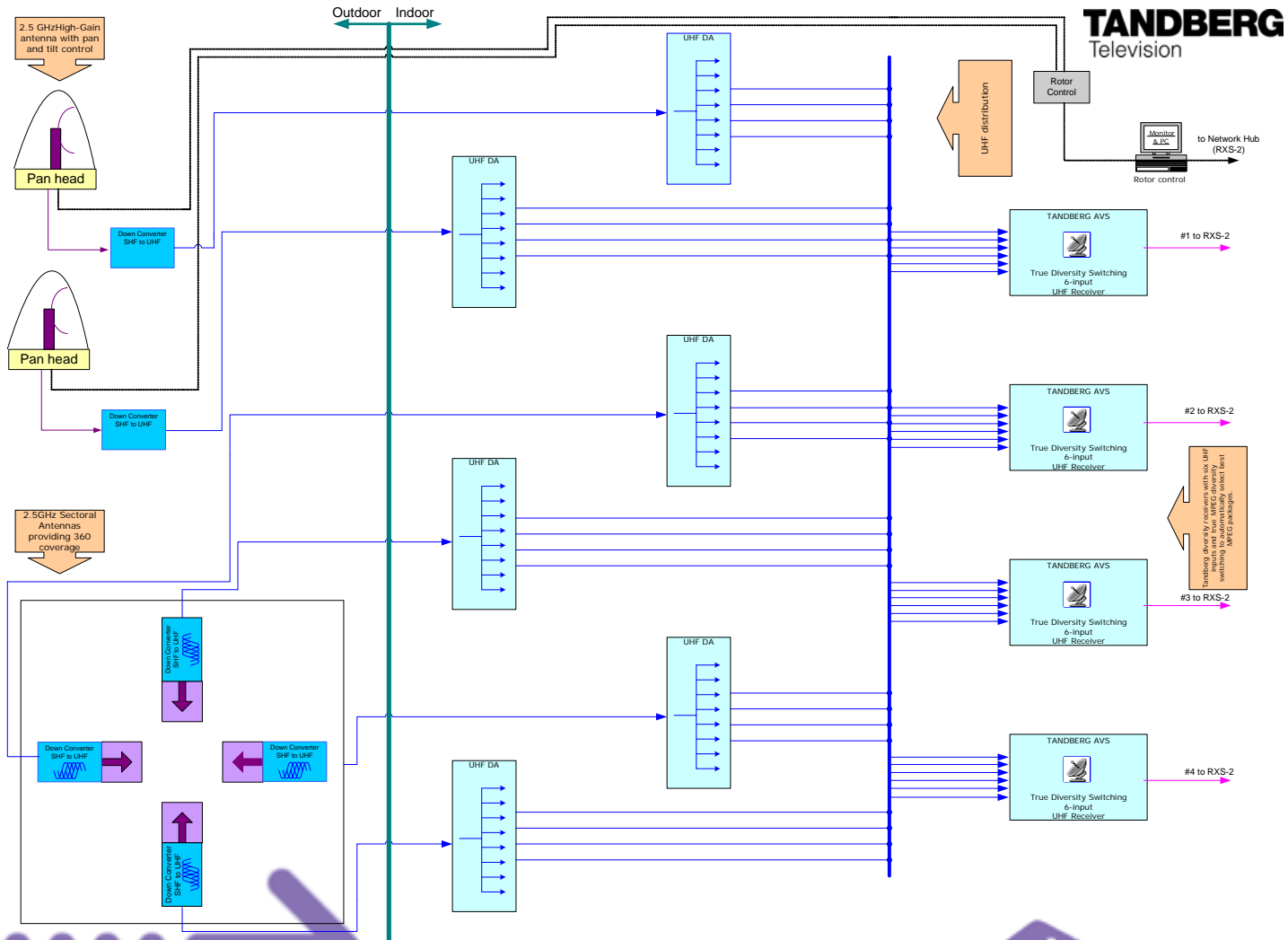
FILENAME	CAR-HQ_2.VSD	DATE	25.06.04	DRAWN BY	HAHNM
----------	--------------	------	----------	----------	-------

ENG System Example 1: 2.5 GHz System



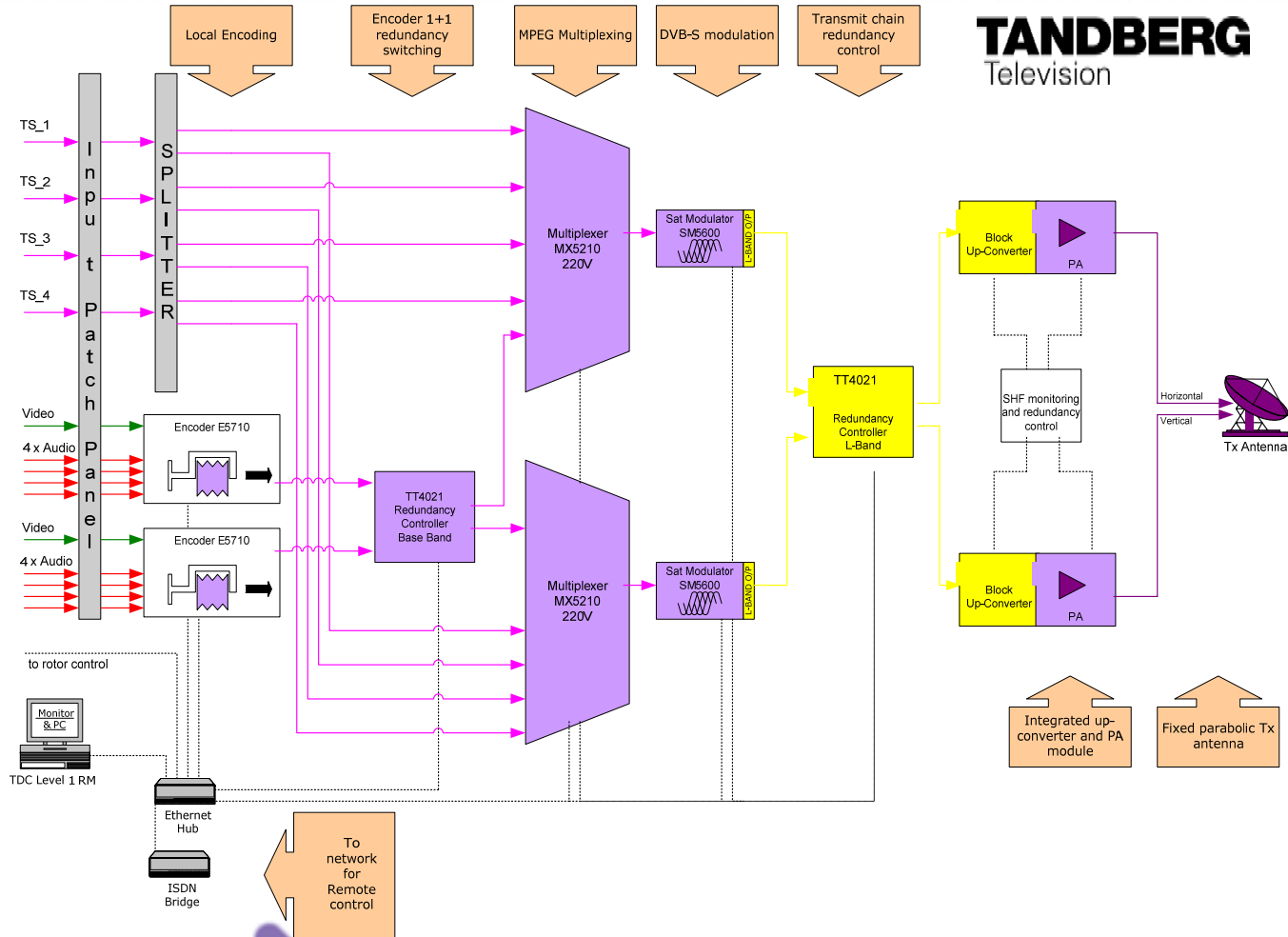
ENG System Example 2: 2.5 GHz + 10 GHz

- Tower RX



ENG System Example 2: 2.5 GHz + 10 GHz

- Tower TX



Technology today

SDTV (PAL and NTSC)

MPEG2 Encoding (4:2:0 and 4:2:2)

DVB-T COFDM (2k) Modulation **6, 7 or 8 MHz**

3-20 MBit/s Video Bit rate

Frequency Ranges: 1.9-2.1, 2.3-2.7, 3.3-3.6, 5.8, 7.2, 7.8, ...

Fixed Links: DVB-S (QPSK, 8PSK)

Block down converter RF->UHF, filtered and broadband

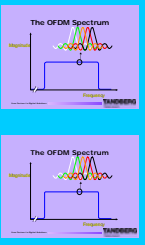
6 way MRC diversity receiver (esp. at higher frequencies)



Technology today

FFT-MRC diversity

Demodulator



The OFDM Spectrum

The OFDM Spectrum

Carrier blending according to individual confidence value

Examine each carrier on each received spectrum. Combine as necessary to reconstruct all carriers as perfectly as possible



Ongoing Projects

HDTV

COFDM (2k) 8 MHz

MPEG2 for first generation

MPEG4 H.264 in future

Receiver and Transmitter: New quality requirements due to 64 QAM

Signal distribution and multiplexing

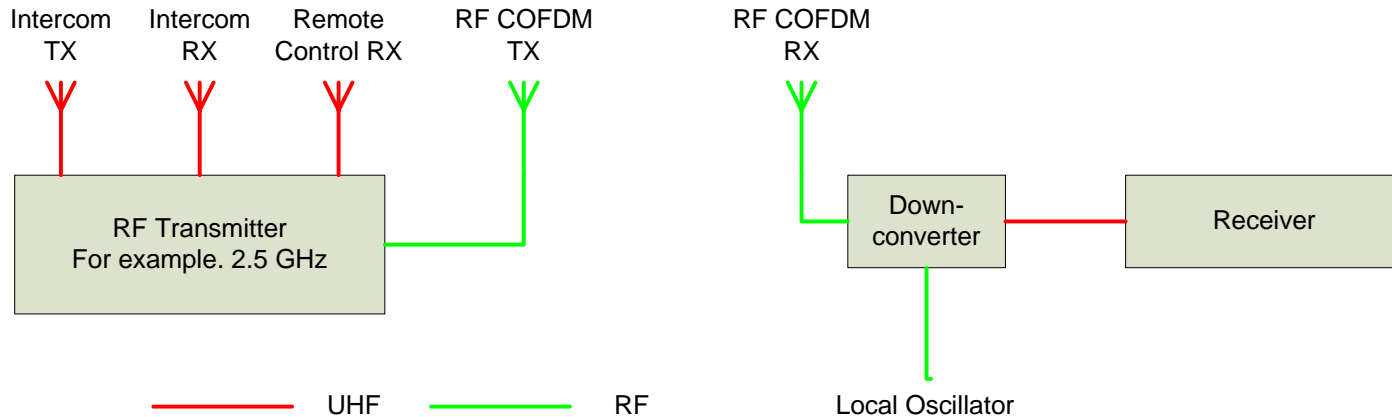
Combining Streams (MUX)

Combining Receive-Sites (Switch)

Distribution Streams by IP



Challenges from the frequency perspective



RF:

- Interaction of different Video-Links
- Interaction with different radio services (UMTS, GSM1800)
- Distortion by ISM Services

UHF:

- Broadcast transmitters
- Intercom

Frequency conversion:

- Interaction with mobile communication services

Comments on Question ITU-R 89-1/6

- Received picture and sound quality
 - Scalable video
 - Using presets: robustness vs. quality
- Number of Sound channels
 - 2-4 channels (some used for remote control or data)
- Latency:
 - <100ms for talkback systems, otherwise parameter not that important
- Transmission channel bandwidth
 - DVB-T compliant: 8MHz, 2k, QPSK, 16QAM, 64 QAM, ½ FEC, 1/4 guard
- Equipment size:
 - Small transmitters (like a battery)
 - Integration of all functions in one box (encoder, modulator, up converter, power amplifier) with low power consumption (e.g. 1W COFDM power (16QAM, 8MHz) with 13% efficiency in Tandberg products)



Comments on Question ITU-R 89-1/6

- Talkback, Return video
 - Technology available for return audio and return video
- Delivery of Content
 - Relay technology for offline delivery
 - Flexible microwave links
 - Steerable antennas on TX and RX site in combination with basic omni antennas



Comments on Question ITU-R 93/6

- Frequency Requirements:
 - RF: COFDM 8 MHz channels are needed but not more !!!
 - Remote control: UHF 50 kHz
 - Intercom: UHF 50 kHz
- Frequency bands:
 - Band should not exceed 10% rel. bandwidth in respect of costs
 - 1.9-2.1, 2.3-2.7, 3.3-3.6 GHz are well approved and give reasonable ranges
- Additional technical and operational factors:
 - For permanent installations a tower is recommended without TX on it !!!!
 - Higher frequencies means less coverage per transmitter
 - Higher bandwidth means higher costs of the complete system
 - TX with 1W or more should have an output (channel) filter to avoid noise
 - RX should have an input filter to keep the sensitivity high
 - **TX Power is only one factor for the system performance !!!**
 - **Power control loop RX/TX: Additional data channel, optimize RF output**

Comments on Question ITU-R 93/6

- **Sharing bands:**

- Sharing bands needs discipline: Everyone (!) should use as little power as possible
- Using standardised equipment, following ETSI and RTTE 1995/5/EC
- Frequency management: Implementation of a easy to use “mechanism” managed by regulation

- **Comments / Ideas / Visions**

TX Power is only one factor for the system performance !!!

- Power control loop RX/TX: Additional data channel, optimize RF output.
- Online mechanism to allocate a frequency: The database “knows” all services, handles all requests and assigns a frequency and the max. output power to the user or directly to the wireless link



Industry Outlook

- DENG should be considered as a constantly growing application which soon will replace most analogue systems.
- In the near future DENG will find the way also in TV studio applications due to improvements in encoder/decoder technology.
- Therefore Frequency Coordination- and Management is vital in international and national regulation bodies



TANDBERG

Television



©TANDBERG Television 2003.

- Questions ???

