



Spectrum Usage and User Requirements for Terrestrial Electronic News Gathering, Television Outside Broadcasts and Electronic Field Production in Australia

Andrew King

Network Manger, Strategic Communications

Broadcaster Outline

- Free to Air (Terrestrial)
 - 2 national networks (govt owned)
 - ABC, SBS
 - 3 commercial operators in each market
 - 7, 9, 10 Networks (capital cities) and their regional affiliates
 - Remote markets 2 operators
 - Satellite DTH and terrestrial
- **ABC, 7, 9,10 Networks hold nation-wide licences for ENG/OB**

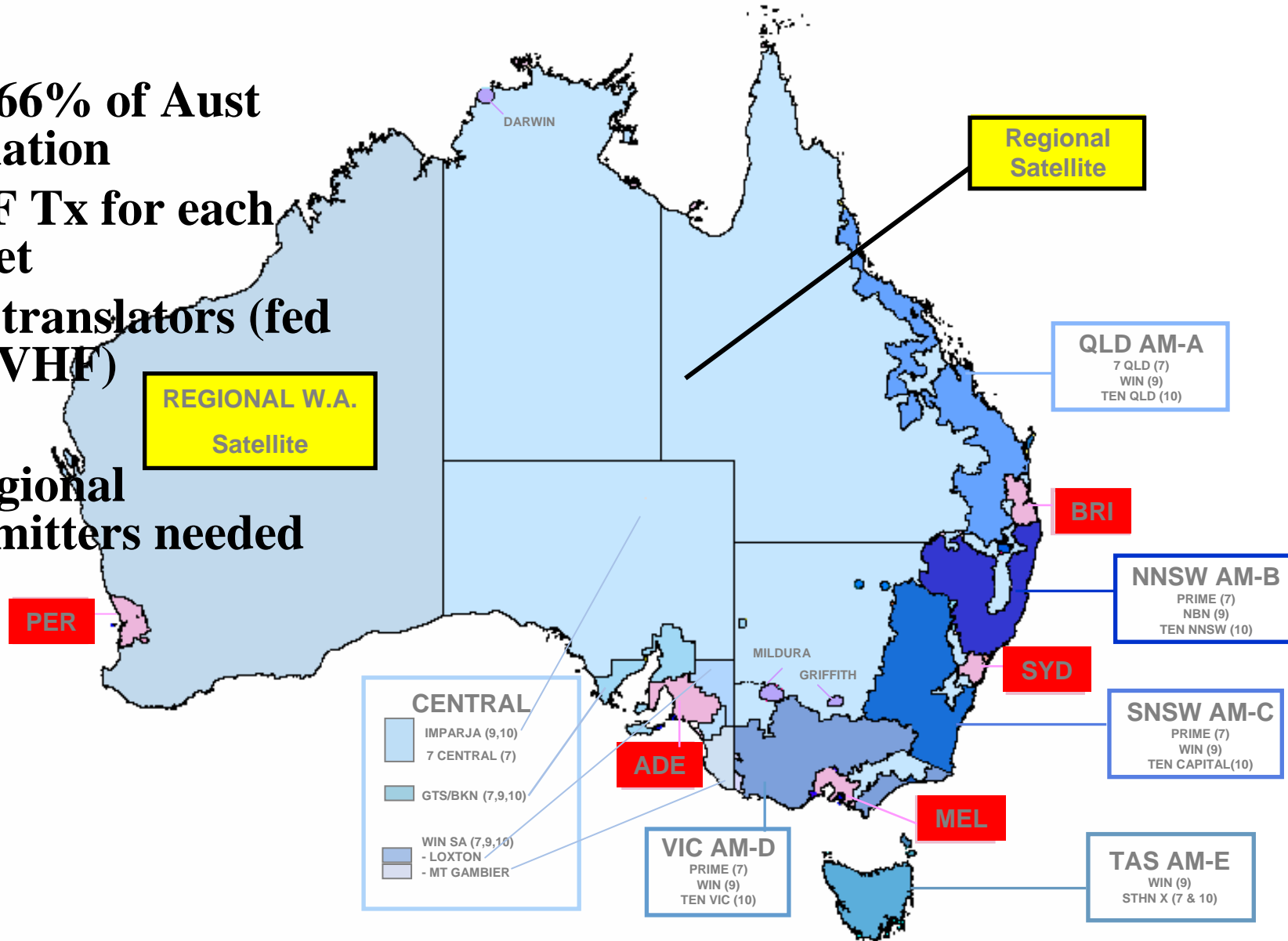
Broadcaster Coverage

5 Cities 66% of Aust Population

1+1 VHF Tx for each market

20 UHF translators (fed from VHF)

220+ Regional transmitters needed



Broadcaster's Use of Spectrum

AUSTRALIAN RADIOFREQUENCY spectrum ALLOCATIONS CHART

The spectrum is a continuous range of electromagnetic radiation encompassing the radio spectrum through infrared, visible, ultraviolet and X-rays.

The radiofrequency spectrum is that part of the radio spectrum which is used for transmitting radio waves. The radiofrequency spectrum is a natural resource that is used but not exhausted, it is used by being occupied and the efficiency of its use depends on coordination among users in order to increase confidence in its use.

The chart illustrates how the radio-frequency spectrum is divided among services in Australia. It is derived from the Australian Radiocommunications Plan (January 2002), which is based on the International Telecommunications Union (ITU) Radio Regulations.

The radiofrequency spectrum is divided into several broad frequency bands for reference.

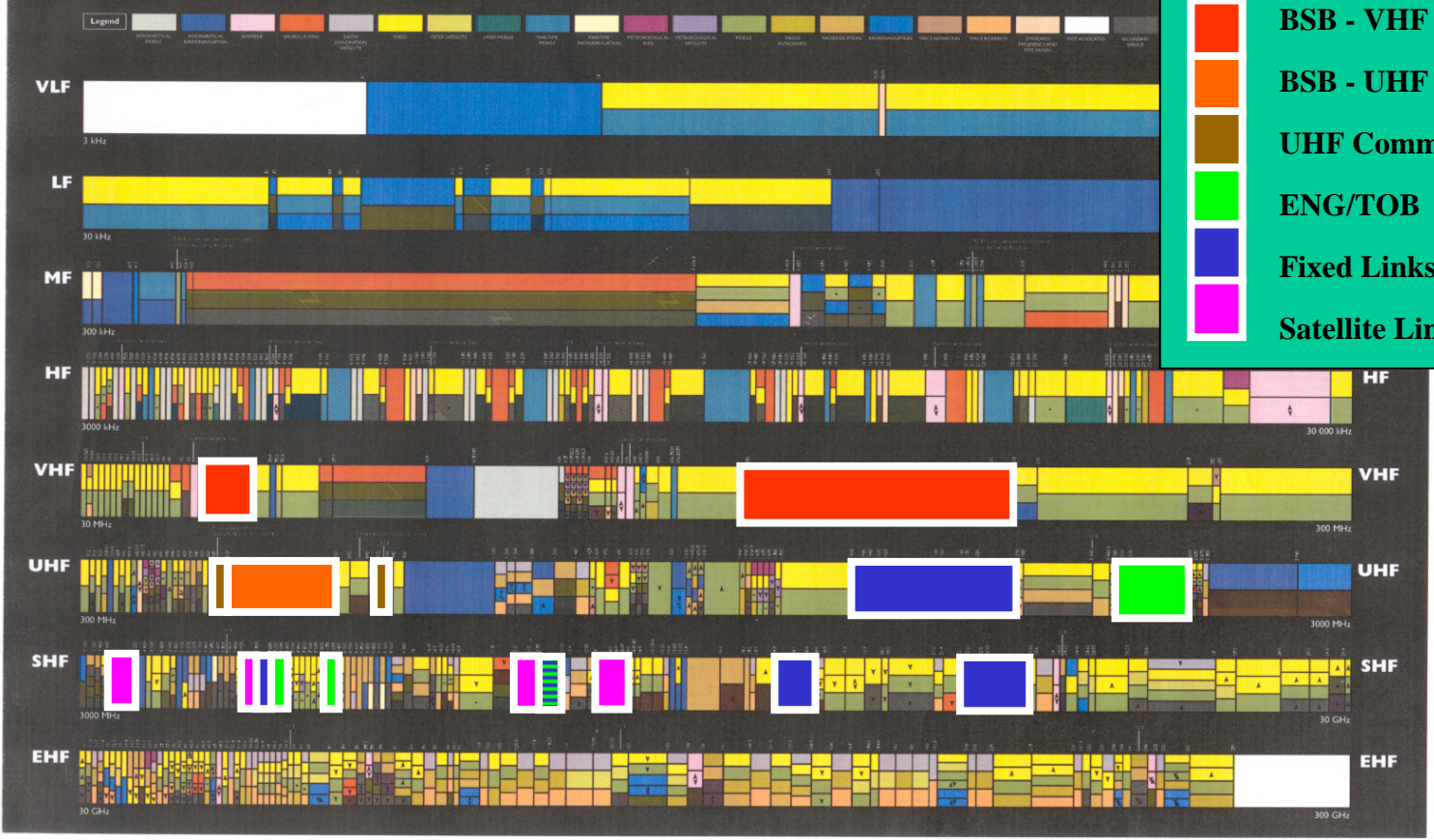
The ITU nomenclature for these bands is as follows:

- VLF Very Low Frequency 3-30 kHz
- LF Low Frequency 30-300 kHz
- MF Medium Frequency 300-3000 kHz
- HF High Frequency 3-30 MHz
- VHF Very High Frequency 30-300 MHz
- UHF Ultra High Frequency 300-3000 MHz
- SHF Super High Frequency 3-30 GHz
- EHF Extremely High Frequency 30-300 GHz



Australian Communications Authority 2002

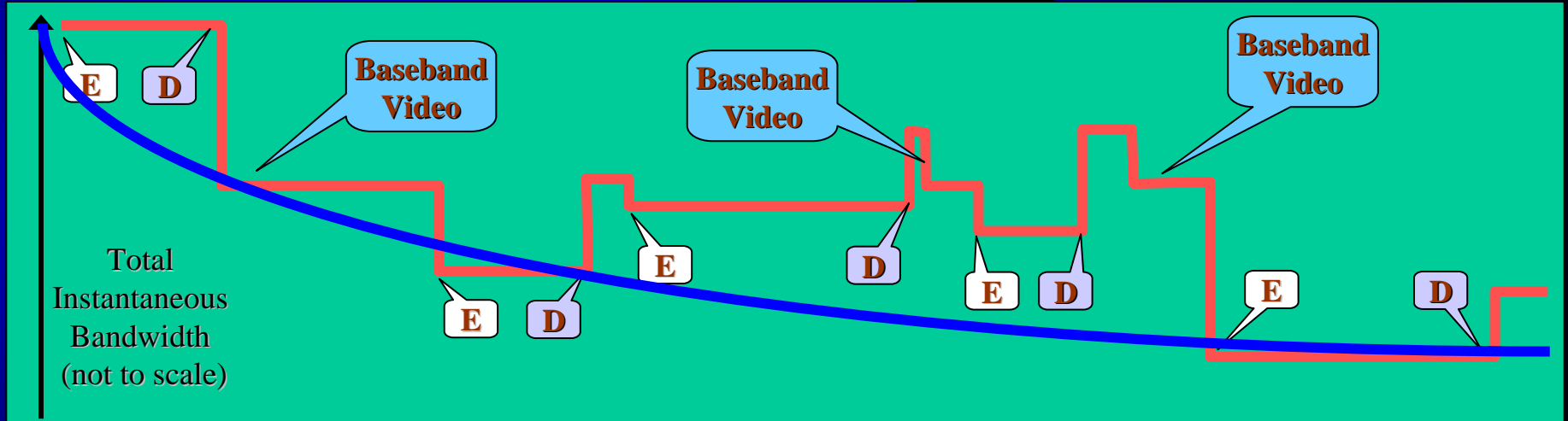
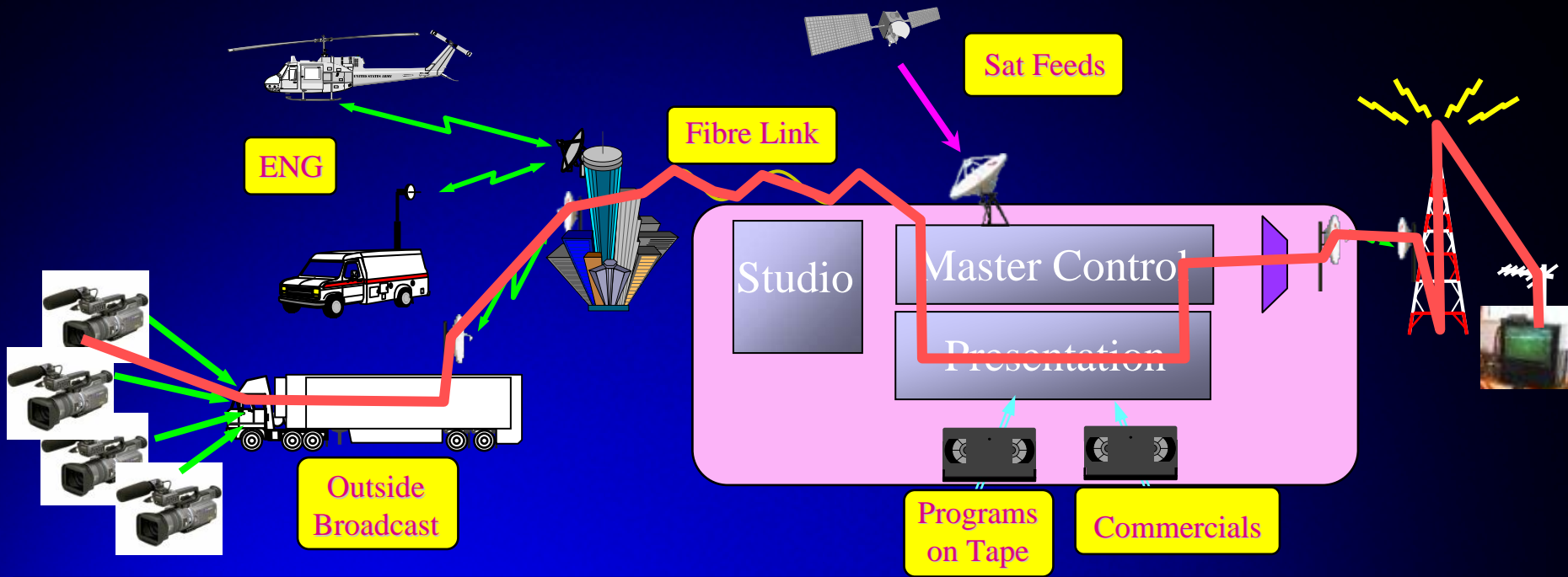
Australian Communications Authority



Legend:

- BSB - VHF
- BSB - UHF
- UHF Comms + Mics
- ENG/TOB
- Fixed Links
- Satellite Links

The Television Production Process



Video Compression

- Compression reduces bandwidth
- BUT loses information
- ADDS artefacts
- CREATES concatenation problems
 - We often have five sequential encode – decode sectors between the camera and the viewer

User Requirements

- Wireless Cameras
- Radio Microphones
- Order Wires (Production Control)
- Data Circuits
- Transmission Links
- Broadcast

Electronic News Gathering

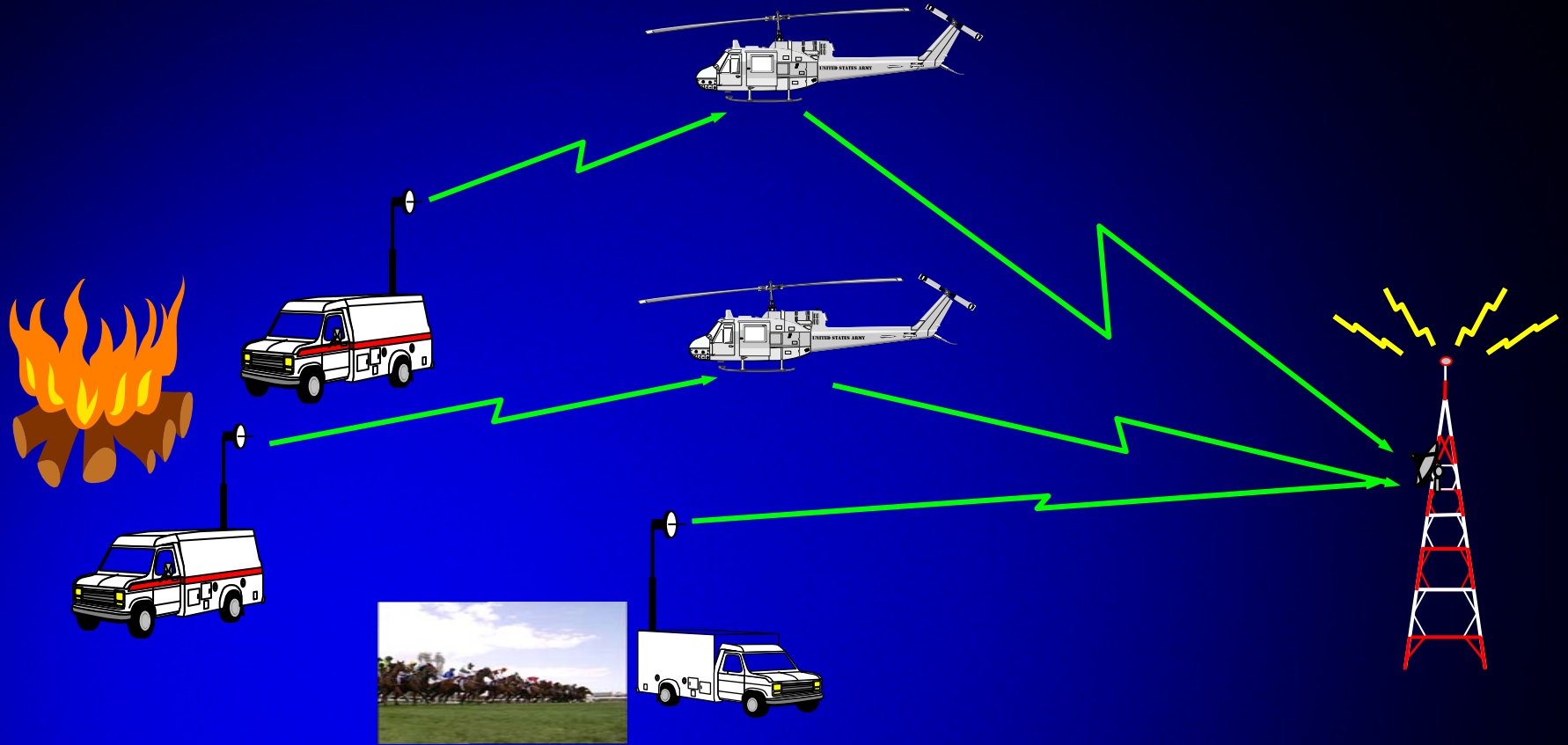
- Primarily covering news events
 - Broadcaster has no control over location or timing of event
 - Usually several broadcasters competitively cover the same event
 - Often ENG provides vital information for disaster relief in emergencies
- Operational Characteristics
 - Rapid response
 - Unplanned deployment
 - Generally short deployments
 - Live-to-air and live-to-studio for program compilation
 - OH&S considerations
- Spectrum Characteristics
 - Must work on obstructed paths
 - Must allow for long and short links
 - Must allow signals from any location
 - Maximise immediacy and reliability of signal transmission
 - Allow broadcasters to operate in contiguous channels
 - Available for immediate and unrestricted use at all times

Equipment

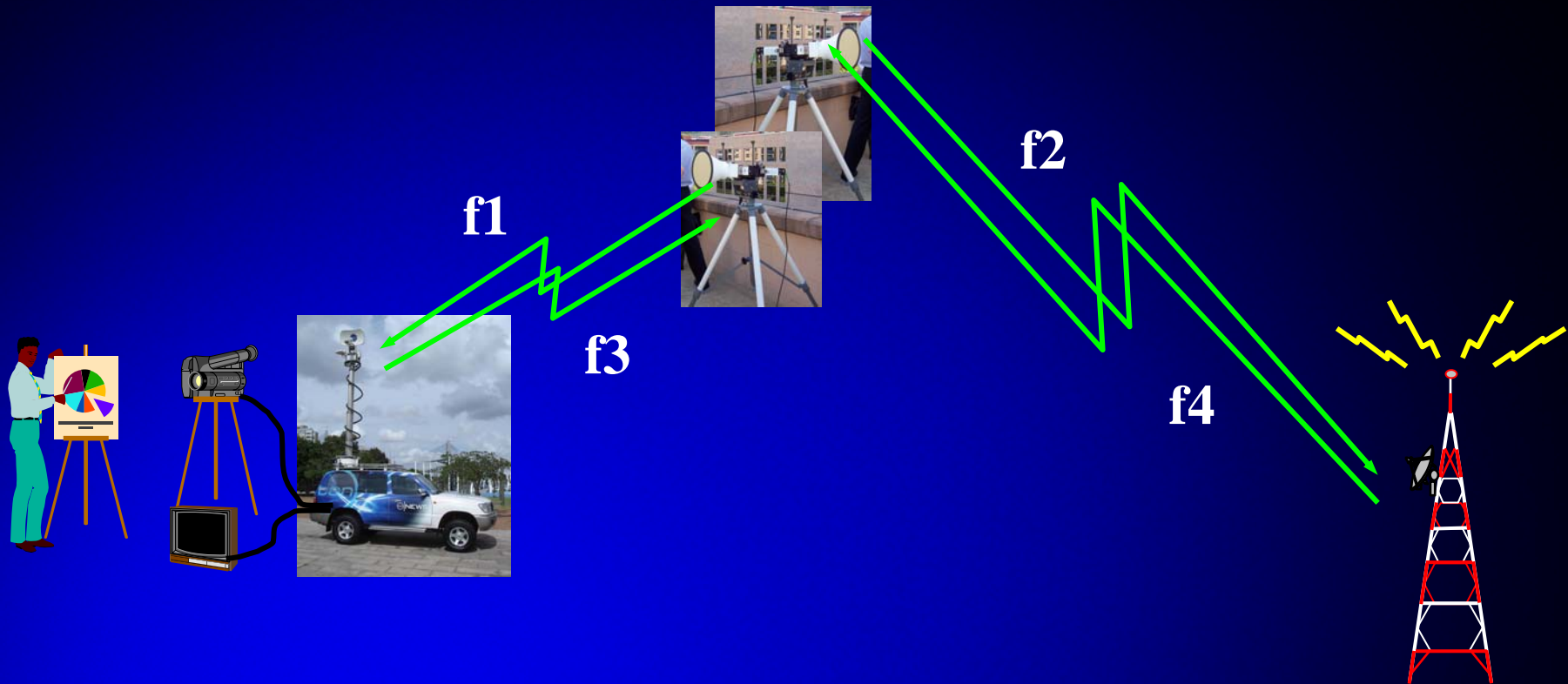
- Wireless Cameras
- ENG vehicles
- Helicopter platforms (camera and relay)
- Portable Links
- Central Collection Sites



ENG - Covering A Major News Story

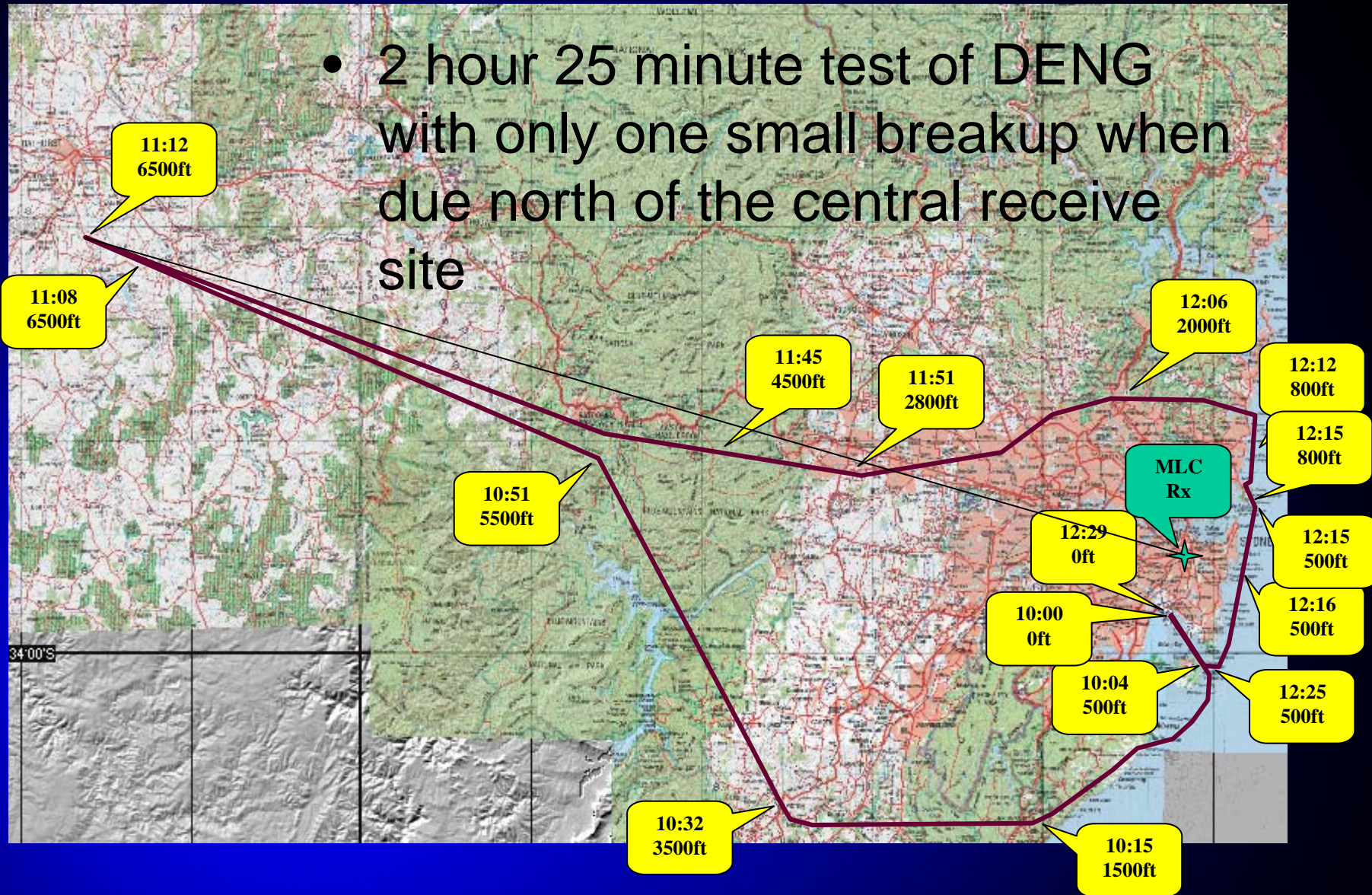


ENG - Two Way Interview

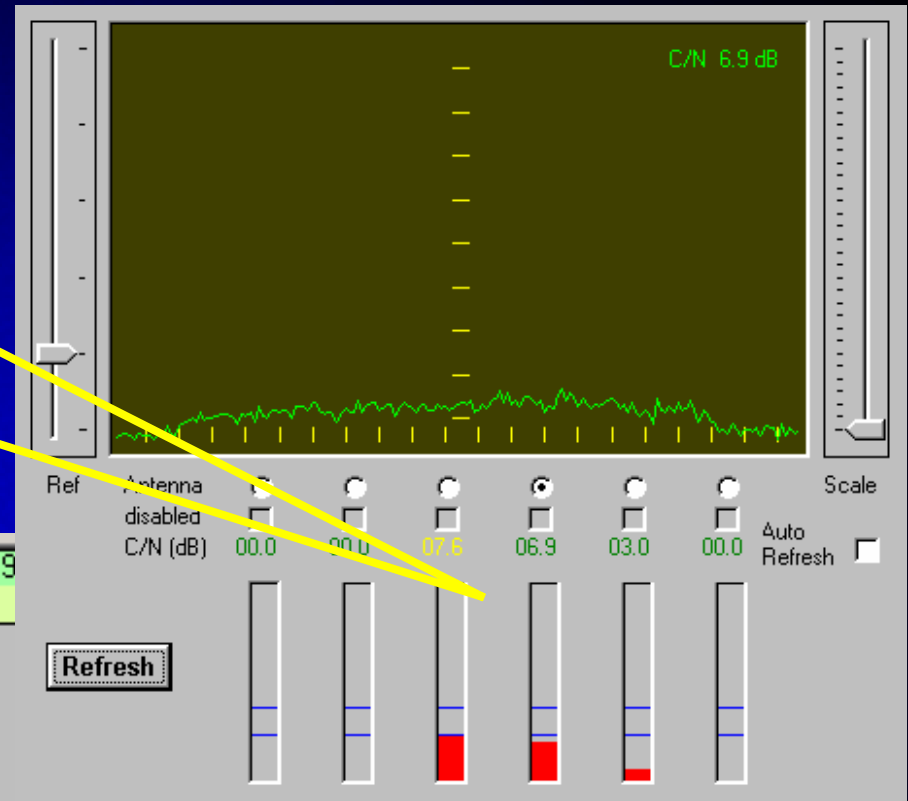
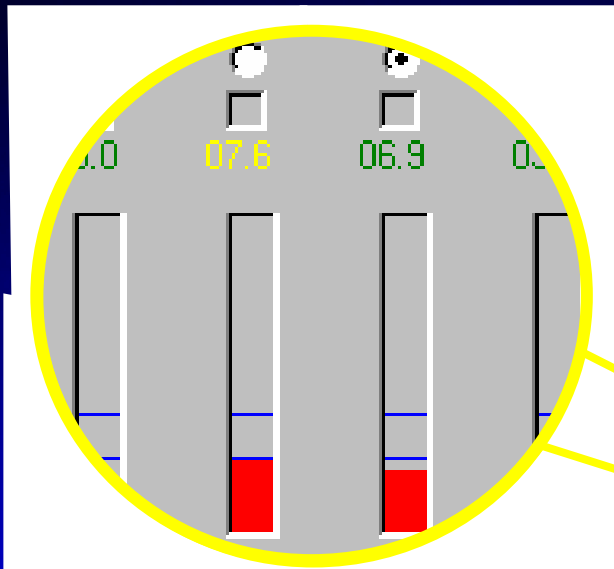


DENG Helicopter Test

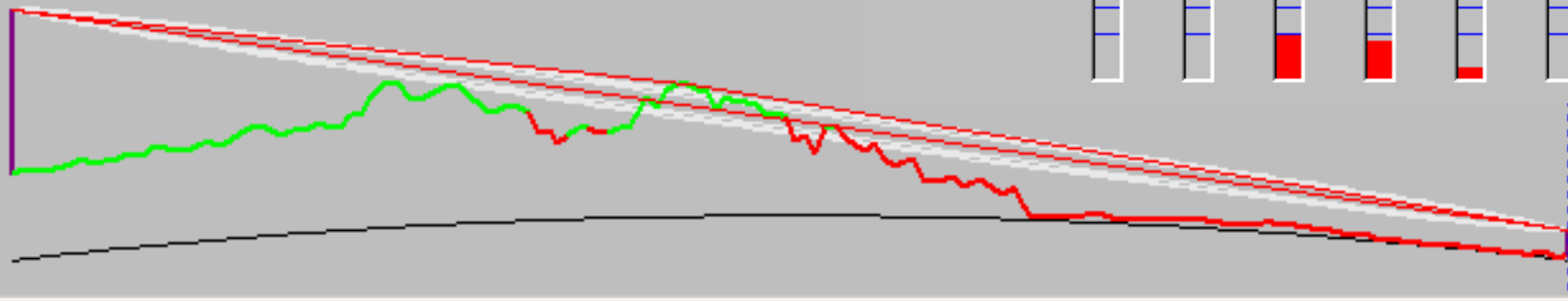
- 2 hour 25 minute test of DENG with only one small breakup when due north of the central receive site



Bathurst - 154km



Elevation=40.0m Azimuth=105.7° Obstruction at 66.9
PathLoss=185.7dB Rx level=-127.6dBm Rx level=0.09μV



Transmitter



Helicopter

Receiver

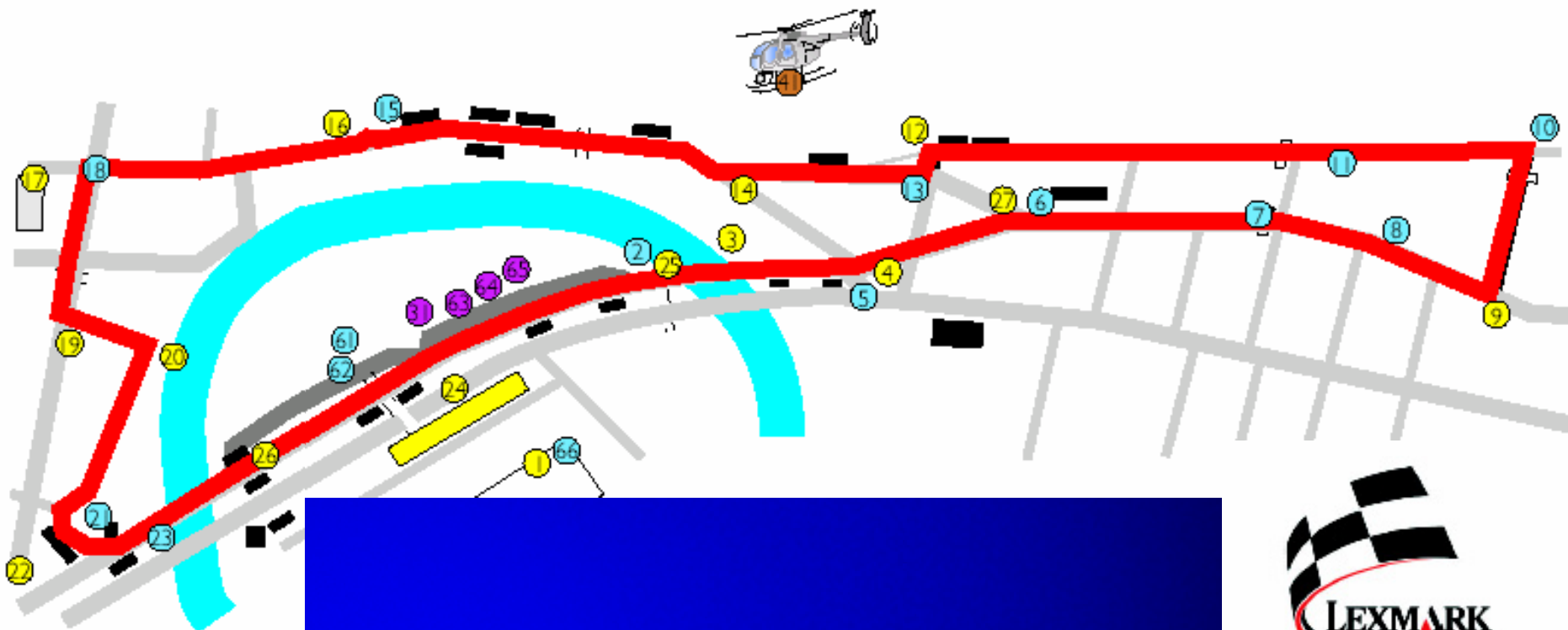


MLC

Outside Broadcast

- Coverage of
 - major sporting events
 - concerts, street parades, nationally significant events, etc
- Operational Characteristics
 - Planned deployment
 - Often require multiple links (wider bandwidth required)
 - Deployments may be from a day to weeks
 - Live-to-air and rehearsals/pre-records
 - OH&S considerations
- Spectrum Characteristics
 - Camera-related spectrum
 - Must work on obstructed paths
 - Allow for rapidly varying paths
 - Allow for rapidly moving transmitters
 - Work for airborne platforms
 - Link-related spectrum
 - Must allow for long and short links
 - Must allow signals from any location
 - Maximise reliability of signal transmission

Indy 300 / V8 Supercars Round 11



INDY 300
V8 Supercars
ROUND 11
Version 3
2005

Indy 300 / V8 Supercars Round 11

- 31 cameras (cabled)
- 1 Satellite Uplink (Optus)
- >10 x UHF Comms Channels
- Wireless Camera Links
 - 6 Pitcam digital camera links
 - >8 V8 incar analog uplinks
 - switched on 6 frequencies
 - 1 multiplexed V8 incar digital downlink
 - >4 CHAMP car analog uplinks
 - switched on best 3 of 4 frequencies
 - 4 CHAMP car analog downlinks
 - 1 Flycam
 - 1 Helicopter camera
 - *Used 364MHz spectrum*
 - *required re-use of several frequencies and co-ordination with network and other broadcaster ENG needs*

Helicopter Relay / Incar



Pit Cams



Ten's OB Schedule

2006							2006							2006							2006 OB Days											
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S												
January							May							September							January	OBs	Days	%								
						1	1	2	3	4	5	6	7					1	2	3	January	2	31	6%								
2	3	4	5	6	7	8	8	9	10	11	12	13	14	4	5	6	7	8	9	10	February	17	28	61%								
9	10	11	12	13	14	15	15	16	17	18	19	20	21	11	12	13	14	15	16	17	March	17	31	55%								
16	17	18	19	20	21	22	22	23	24	25	26	27	28	18	19	20	21	22	23	24	April	21	30	70%								
23	24	25	26	27	28	29	29	30	31					25	26	27	28	29	30	May	14	31	45%									
30	31																				June	16	30	53%								
February							June							October							July	18	31	58%								
		1	2	3	4	5				1	2	3	4							1	August	22	31	71%								
6	7	8	9	10	11	12	5	6	7	8	9	10	11	2	3	4	5	6	7	8	September	21	30	70%								
13	14	15	16	17	18	19	12	13	14	15	16	17	18	9	10	11	12	13	14	15	October	20	31	65%								
20	21	22	23	24	25	26	19	20	21	22	23	24	25	16	17	18	19	20	21	22	November	9	30	30%								
27	28						26	27	28	29	30			23	24	25	26	27	28	29	December	4	31	13%								
March							July							November							Total	181	365	50%								
		1	2	3	4	5					1	2			1	2	3	4	5	Max number of simultaneous OBs = 4												
6	7	8	9	10	11	12	3	4	5	6	7	8	9	6	7	8	9	10	11	12	Legend											
13	14	15	16	17	18	19	10	11	12	13	14	15	16	13	14	15	16	17	18	19	Genre 1											
20	21	22	23	24	25	26	17	18	19	20	21	22	23	20	21	22	23	24	25	26	Genre 2											
27	28	29	30	31			24	25	26	27	28	29	30	27	28	29	30				Genre 3											
April							August							December							Genre 3 multiple events											
					1	2		1	2	3	4	5	6					1	2	3	Genre 4											
3	4	5	6	7	8	9	7	8	9	10	11	12	13	4	5	6	7	8	9	10	Genre 5											
10	11	12	13	14	15	16	14	15	16	17	18	19	20	11	12	13	14	15	16	17	Genre 6											
17	18	19	20	21	22	23	21	22	23	24	25	26	27	18	19	20	21	22	23	24	Genre 7											
24	25	26	27	28	29	30	28	29	30	31				25	26	27	28	29	30	31	Setup / Test / Rehearsal Days											

Electronic Field Production

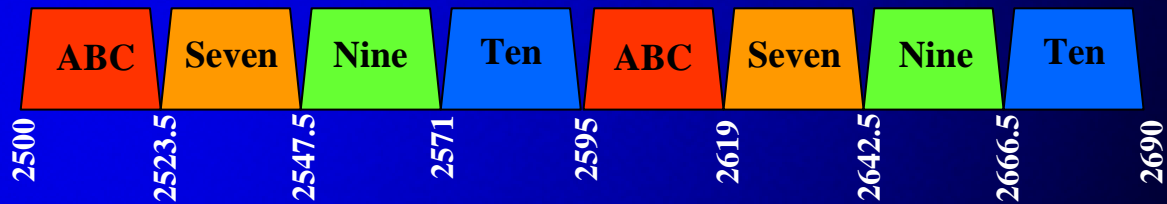
- Wide range of applications
- Characteristics
 - Planned deployment
 - More elaborate television production values
 - Deployments may be from a day to weeks
 - Live-to-air and recorded for later production/broadcast

Bands Used for ENG & OB

- 2 500 – 2690 MHz
- 7 100 – 7450 MHz
- 12 7590 – 13 250 MHz

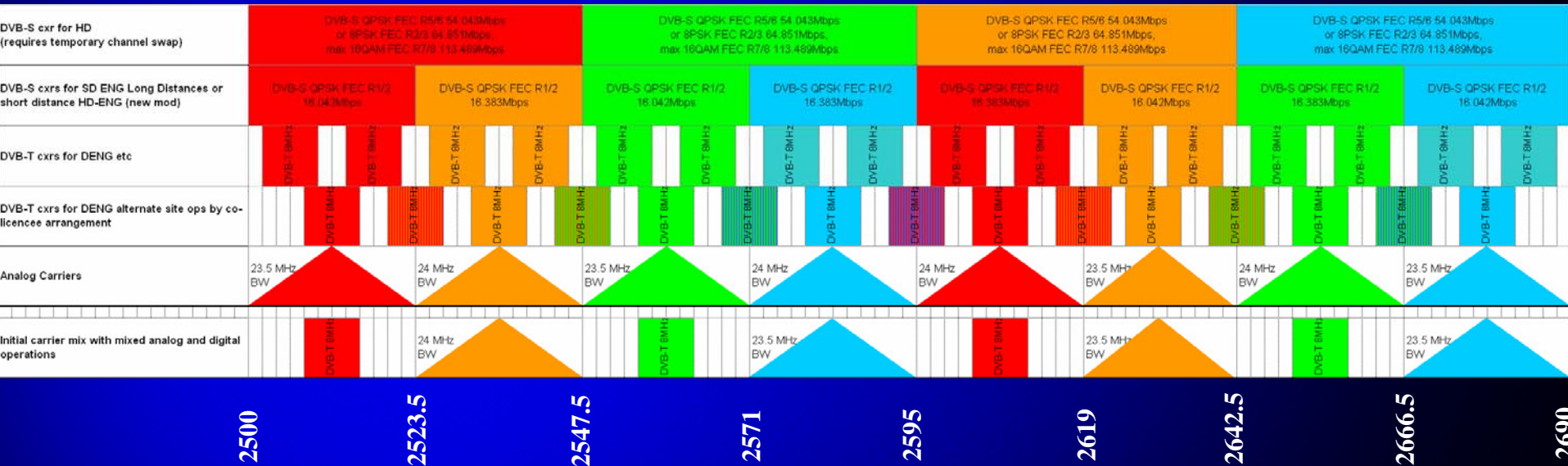
2.5GHz Band

- Four broadcasters each have a 23.5MHz and 24MHz allocation
- Networks are converting ENG to digital
 - ABC, Nine implemented digital nationwide
 - Ten a mix of analog and digital
 - Seven mainly analog



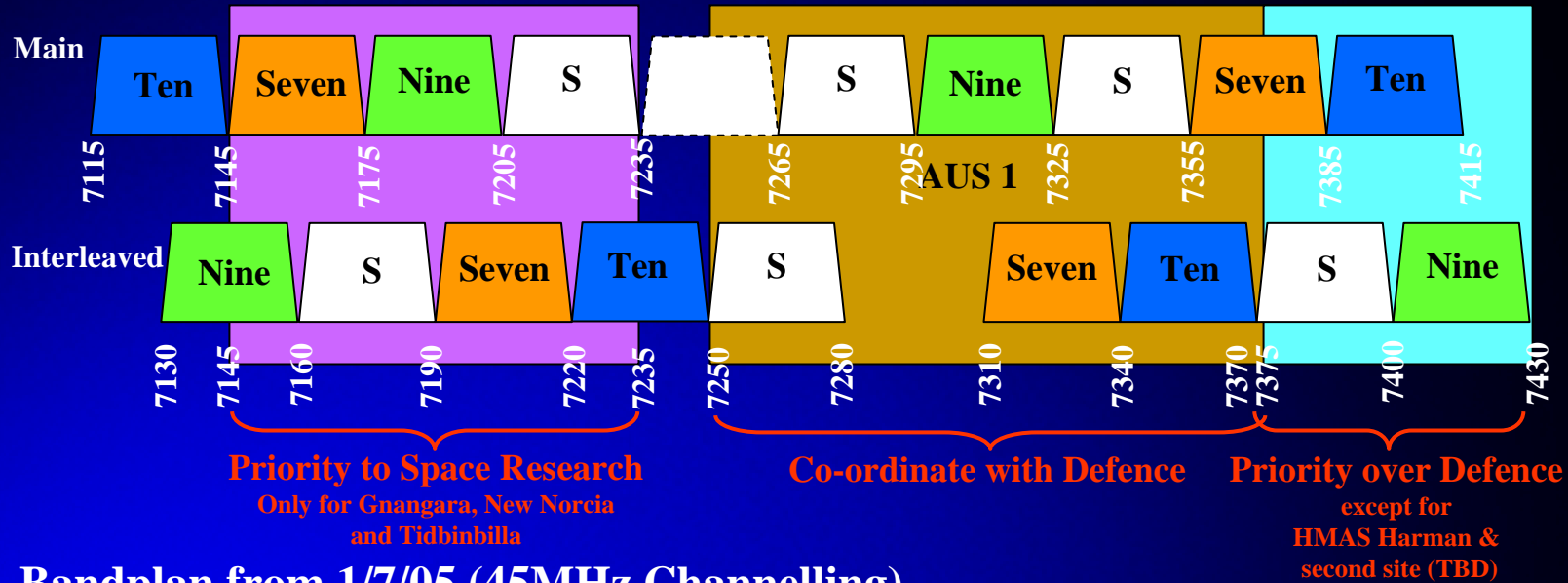
2.5 GHz A to D Transition Plan

- Options
 - Analog
 - Interleaved Analog and Digital
 - SD DVB-T with 4MHz guardbands
 - Aggregated channels for HD in the future

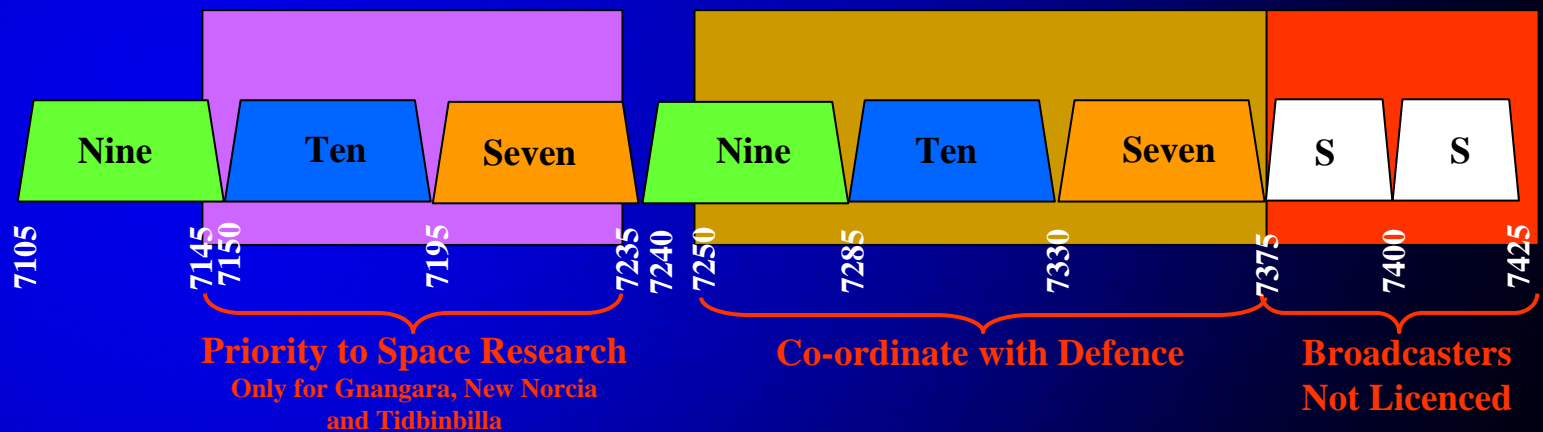


7.2GHz Band

Bandplan to 30/6/05 (30MHz Channelling)

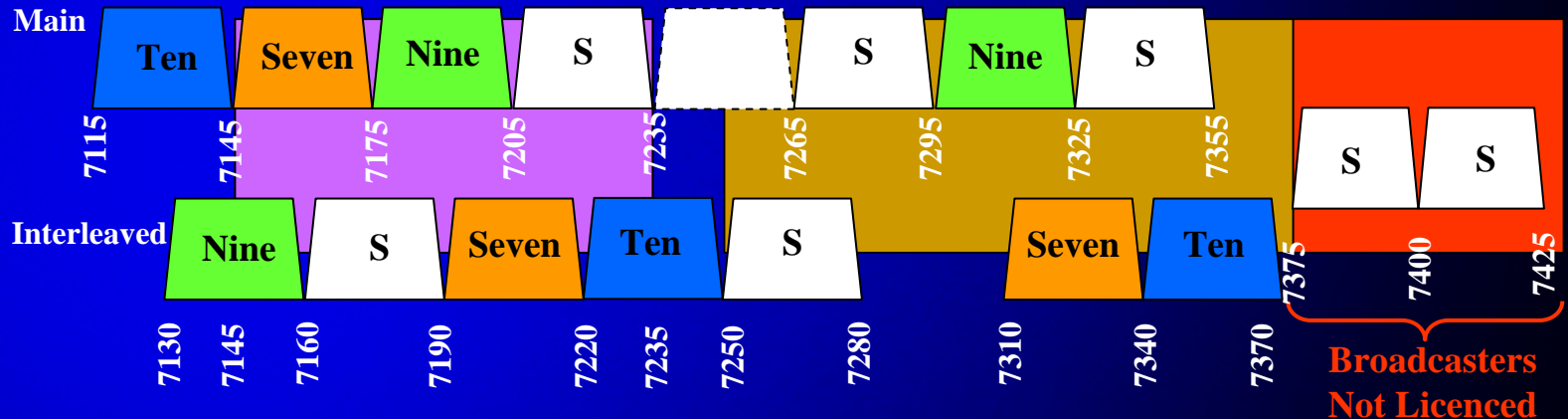


Bandplan from 1/7/05 (45MHz Channelling)

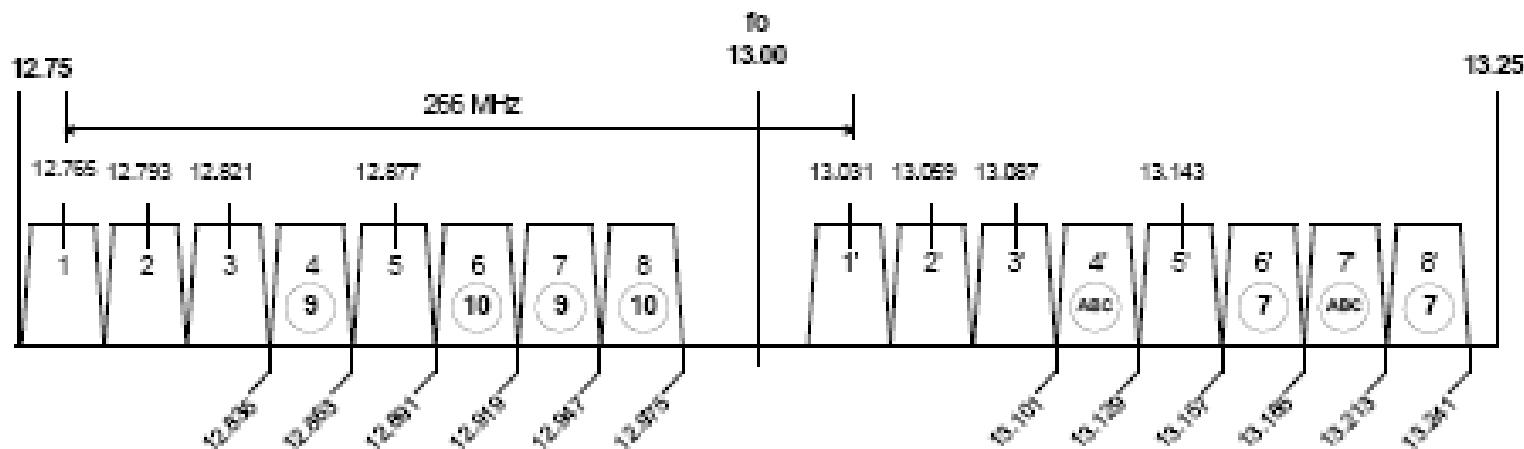


7.2GHz Band

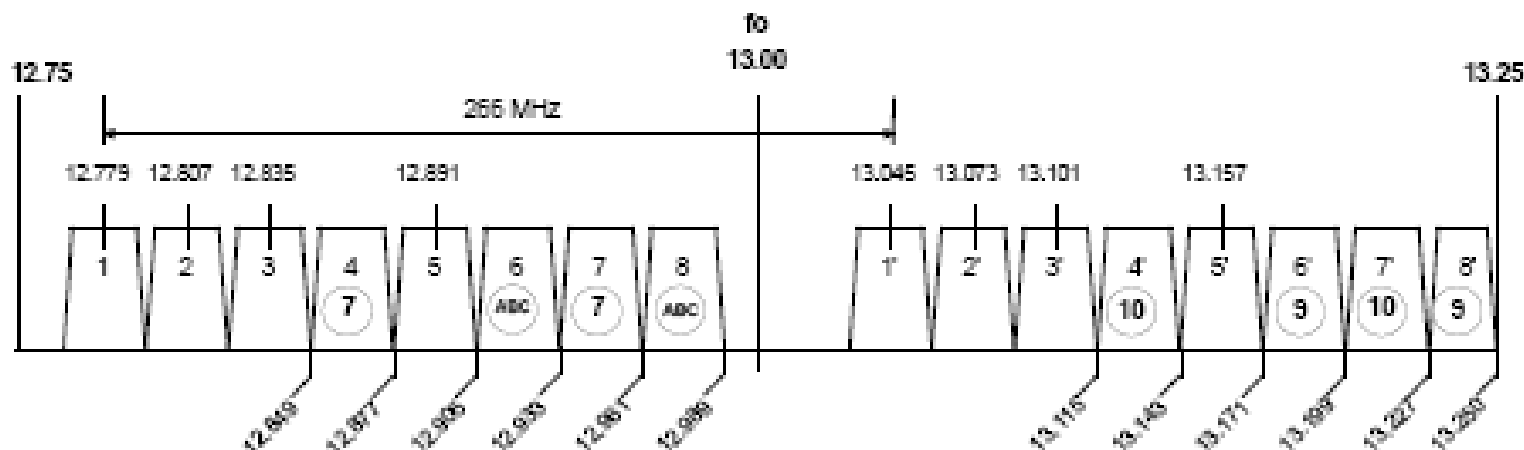
Bandplan from 1/7/05 (45MHz Channelling)



13GHz Band



MAIN



INTERLEAVED

TOB Network Licences : 7 = Seven Network; 9 = Nine Network; 10 = Ten Network; ABC = ABC Network.

Band Sharing

- ENG

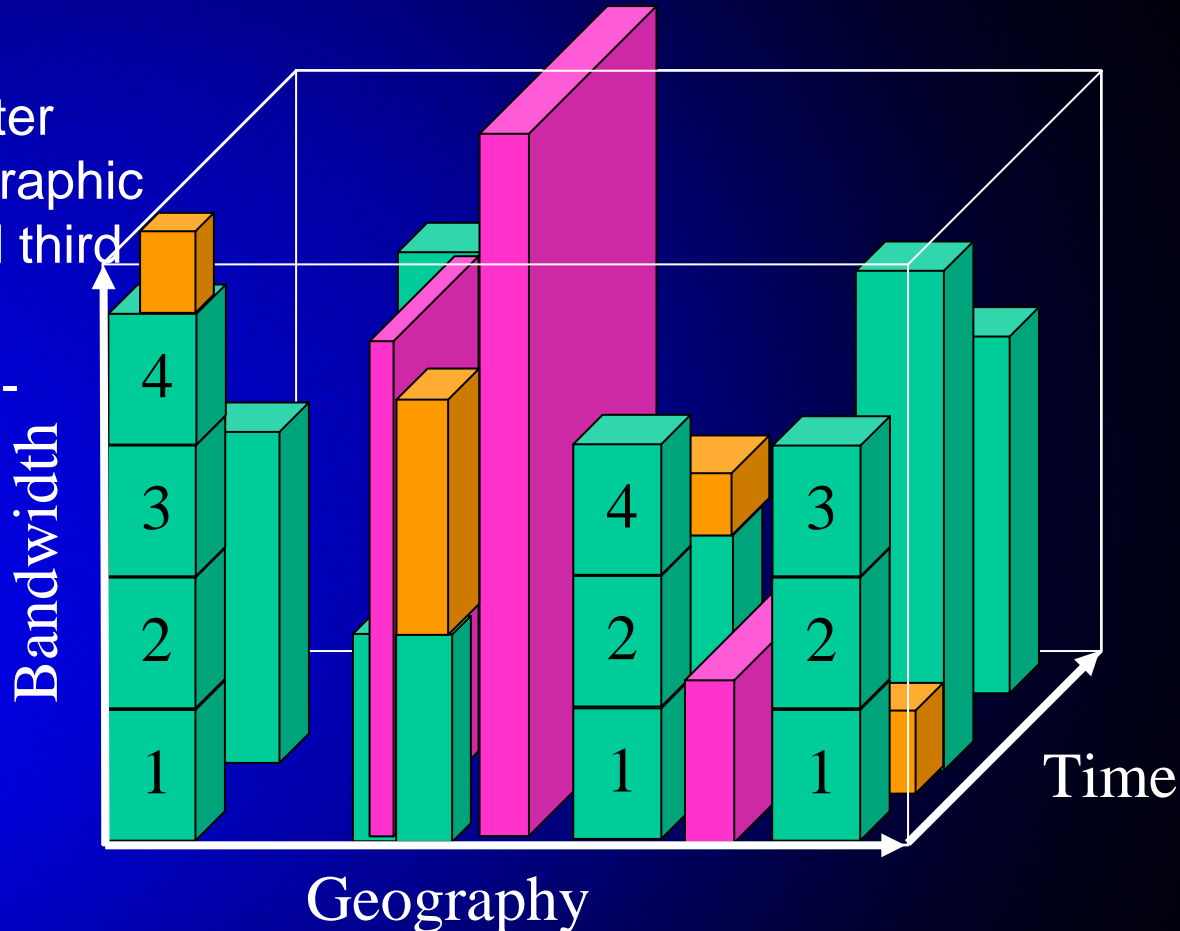
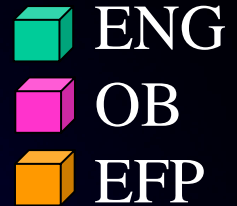
- Often competitive events require immediate co-ordination for interference resolution

- OB

- Often single broadcaster event in any one geographic area needs authorised third party use
- Peaks managed by co-ordination

- EFP

- Planned events that are somewhat flexible in timing to avoid ENG and OB activities



Who's Watching

- ENG is important for News which draw large audiences
 - 38% of Australian population view evening news in one day
 - 76% in one week
 - 91% in one month

source : Oztam Data July 2005 1700-1930 news and current affairs programmes
- OBs are important as Sport broadcasts are popular
 - Australian Rules Football 91% of population view in any season
 - Australian Open Tennis 80% of population view some part of the tournament
 - Cricket (2005 -06 summer season includes 1 day matches and 5 day tests) 85% of population view a broadcast
 - V8 Supercars (Motor Racing) 57% of population view a broadcast over the season of 25 rounds

source : Oztam

Conclusions

- Australian broadcasters make extensive use of ENG, OB and EFP as they provide production facilities for compelling content, essential for the viability of free-to-air commercial television
- These activities require characteristics that are unique to spectrum below 3GHz
- The band is used heavily for programs with wide audience appeal
- Many broadcast events have large spectrum requirements, these would not be able to be covered without sharing and co-ordination between broadcasters of adjacent channels
- Viewer display size & high definition requirements in the future will increase usage and the need for sharing adjacent channels



Thank You