



Technology, Distribution
& Archive

Implementing the “new” digital broadcasting plans for Africa - Options and Strategies

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BBC



New Readers Start Here...

- The Geneva-06 plan allocated spectrum from 470-862 MHz (chs 21 – 68) for broadcasting across Africa.
- WRC-07 co-allocated 790-862 MHz for mobile services.
- The band above 790 MHz is already used in many African countries for other services, so they couldn't benefit from this first "digital dividend".

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68



New Readers Start Here...

- WRC-12, therefore, also allocated the band 694-790 MHz to mobile services.
- Since WRC-12 the ITU has worked closely with the ATU and sub-Saharan African countries to produce a new plan giving at least 4 layers of coverage below 694 MHz.

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68



ITU/ATU Process

www.itu.int/ITU-R/terrestrial/broadcast/ATU/index.html

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International Telecommunication Union

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ATU GE06 Frequency Coordination Meetings

Broadcasting Services

- Our Bands
- MIFR
- Plans
- HFBC
- Forum
- FAQ
- On-line services/Software
- Reference documents

Planning Tools

[eTools](#) - run compatibility calculations and other routines
[GE06Calc](#) - View compatibility results (output of eTools)
[FindMeChannel](#) - shows assignments on co or adjacent channels within selected distance.
[SRTM3](#) - effective height calculator, also available in TerRaNotices
[UHF TV Channel-Frequency Table](#)

Workshop and Frequency Coordination Meeting on the Transition to Digital Terrestrial Television and the Digital Dividend
16 - 20 2012 - Kampala, Uganda

Main webpage
Program [English](#)
INFO 1 - [Check List](#)
INFO 2 - [Frequency Assignment Method](#)
INFO 3 - [BRIFIC Installation Guide](#)
INFO 4 - [Input Data Description](#)
INFO 5 - [Definition of Margins](#)

[ATU Kampala Final Report](#) [English](#) [French](#)

ATU GE06 Planning Iteration Results

Iteration 21
results, statistics, notices
Deadline for submissions: 15.02.2013

Iteration 20
[results](#), [statistics](#), [notices](#)

Iteration 19
[results](#) [mdb](#) [notices](#)

Iteration 18
[results](#) [mdb](#) [notices](#)

Iteration 17
[results](#) [mdb](#) [notices](#)

Coordination des Fréquences GE06 pour pays de l'Afrique Centrale
27 - 31 August 2012
Douala, Cameroun

Iteration 16
[results](#) [mdb](#) [notices](#)

Iteration 15
[results](#) [mdb](#) [notices](#)

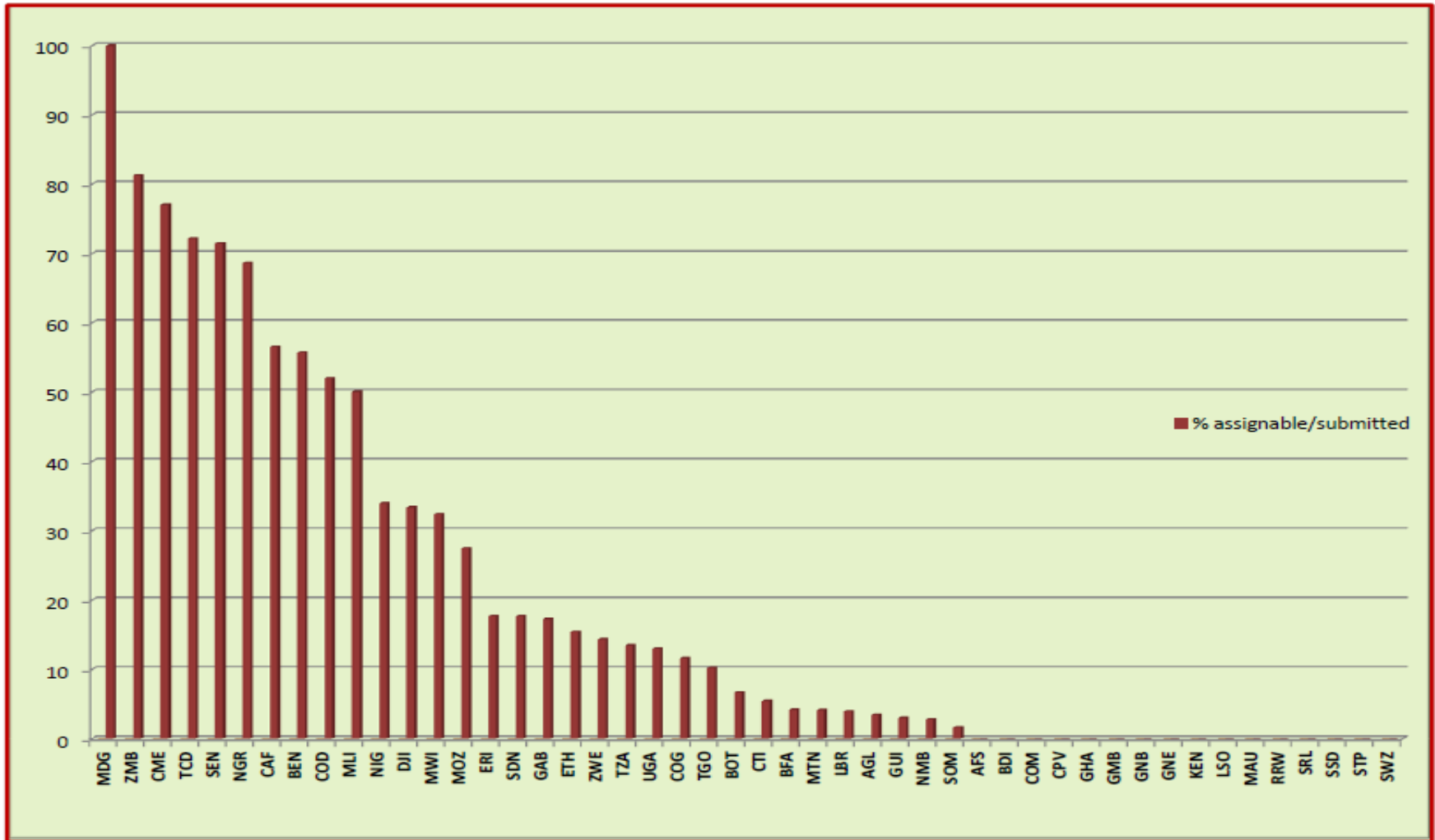
SADC Frequency Coordination Workshop
20 - 24 August 2012
Johannesburg, SA

Iteration 14

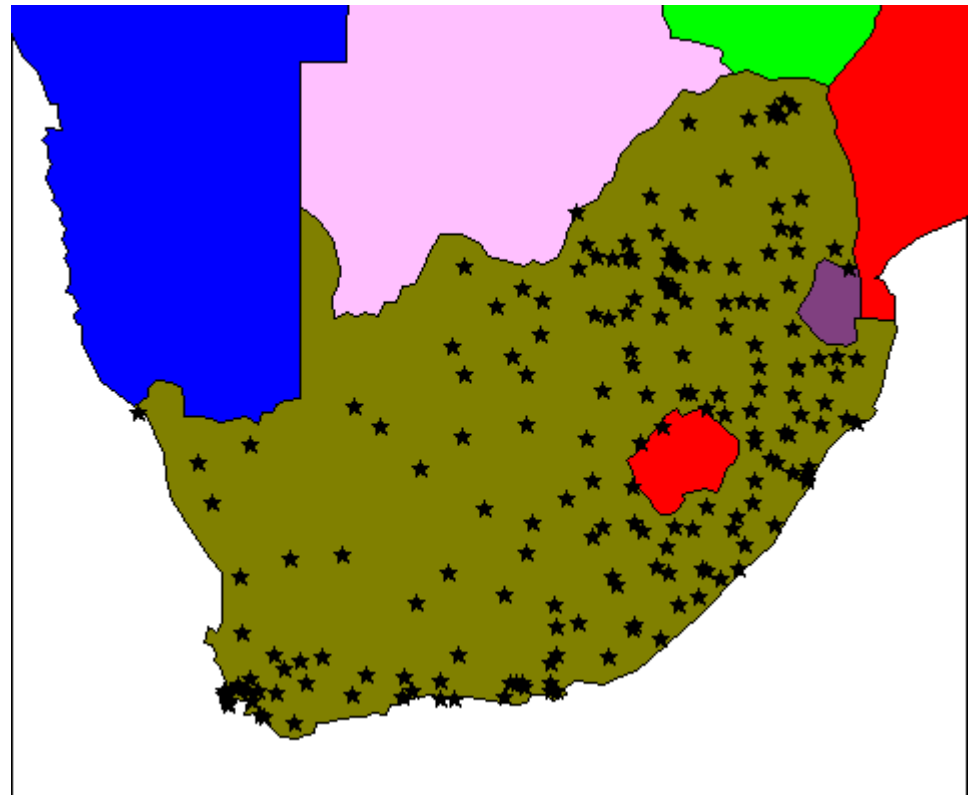
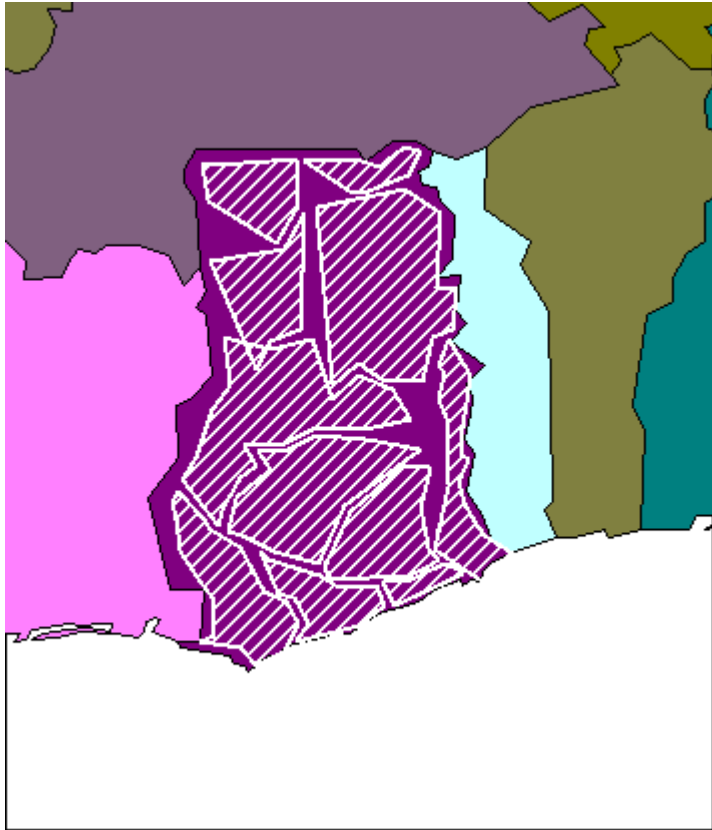


The Results So Far...

ITERATION 20



Allotments & Assignments



Next Steps

- Modify the GE06 Plan
 - The final stage of the ATU/ITU process
- Start planning for implementation
 - Technical
 - Administrative
 - Commercial
 - Consumer & marketing



Once the coordination is done, the hard work starts

- Deciding when and how to roll-out DTT networks is a decision that will need to be taken by each country
- External constraints:
 - Agreed GE06 transition date (15 June 2015)
 - Bilateral agreements with neighbours



Planning & Implementation Choices

- MFN or SFN
 - Fixed or Portable Reception
 - Guard Interval
 - Modulation & Code Rate
 - Multiple-Input-Single-Output (MISO)
 - Time-Frequency Slicing (TFS)
 - PLPs, PARS and FEFs
- These are both likely to have been chosen *before* the re-planning exercise



HELP!

EBU – TECH 3348



Frequency and Network Planning Aspects of DVB-T2

<http://tech.ebu.ch/docs/tech/tech3348.pdf>



DVB-T2 offers much flexibility

- For example, with FFT size and guard intervals:

		GI-Fraction						
		1/128	1/32	1/16	19/256	1/8	19/128	1/4
FFT	T_U [ms]	GI [μ s]						
32k	3.584	28	112	224	266	448	532	<i>n/a</i>
16k	1.792	14	56	112	133	224	266	448
8k	0.896	7	28	56	66.5	112	133	224
4k	0.448	<i>n/a</i>	14	28	<i>n/a</i>	56	<i>n/a</i>	112
2k	0.224	<i>n/a</i>	7	14	<i>n/a</i>	28	<i>n/a</i>	56
1k	0.112	<i>n/a</i>	<i>n/a</i>	7	<i>n/a</i>	14	<i>n/a</i>	28



Converted to km...

FFT	1/128	1/32	1/16	19/256	1/8	19/128	1/4
32k	8.4	33.6	67.2	79.8	134.4	159.6	
16k	4.2	16.8	33.6	39.9	67.2	79.8	134.4
8k	2.1	8.4	16.8	20.0	33.6	39.9	67.2
4k		4.2	8.4		16.8		33.6
2k		2.1	4.2		8.4		16.8
1k			2.1		4.2		8.4

- This will have implications a bit later...



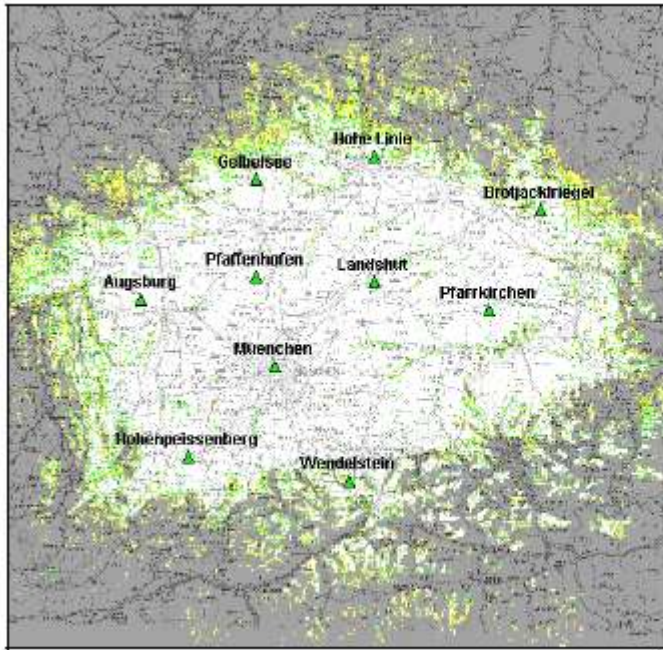
Data Rates (example)

Modulation	Code rate	Scattered Pilot Pattern 1 & 2						
		GIF						
		1/128 [Mbit/s]	1/32 [Mbit/s]	1/16 [Mbit/s]	19/256 [Mbit/s]	1/8 [Mbit/s]	19/128 [Mbit/s]	1/4 [Mbit/s]
QPSK	1/2	6.8	6.6	6.5	6.4	6.1	6.0	5.5
	3/5	8.2	8.0	7.8	7.7	7.3	7.2	6.6
	2/3	9.1	8.9	8.6	8.5	8.2	8.0	7.3
	3/4	10.2	10.0	9.7	9.6	9.2	9.0	8.3
	4/5	10.9	10.7	10.4	10.2	9.8	9.6	8.8
	5/6	11.4	11.1	10.8	10.7	10.2	10.0	9.2
16-QAM	1/2	13.6	13.3	12.9	12.8	12.2	12.0	11.0
	3/5	16.4	16.0	15.6	15.4	14.7	14.4	13.2
	2/3	18.2	17.8	17.3	17.1	16.4	16.0	14.7
	3/4	20.5	20.1	19.5	19.3	18.4	18.0	16.6
	4/5	21.9	21.4	20.8	20.6	19.6	19.2	17.7
64-QAM	5/6	22.8	22.3	21.7	21.4	20.5	20.1	18.4
	1/2	20.4	20.0	19.4	19.2	18.3	18.0	16.5
	3/5	24.6	24.0	23.3	23.1	22.0	21.6	19.8
	2/3	27.3	26.7	25.9	25.7	24.5	24.0	22.1
	3/4	30.7	30.0	29.2	28.9	27.6	27.0	24.8
	4/5	32.8	32.1	31.1	30.8	29.4	28.8	26.5
	5/6	34.2	33.4	32.5	32.1	30.7	30.0	27.6
	1/2	27.3	26.7	25.9	25.6	24.5	24.0	22.1
256-QAM	3/5	32.8	32.1	31.1	30.8	29.4	28.8	26.5
	2/3	36.5	35.7	34.6	34.3	32.7	32.1	29.5
	3/4	41.1	40.1	39.0	38.6	36.8	36.1	33.2
	4/5	43.8	42.8	41.6	41.1	39.3	38.5	35.4
	5/6	45.7	44.7	43.4	42.9	41.0	40.1	36.9

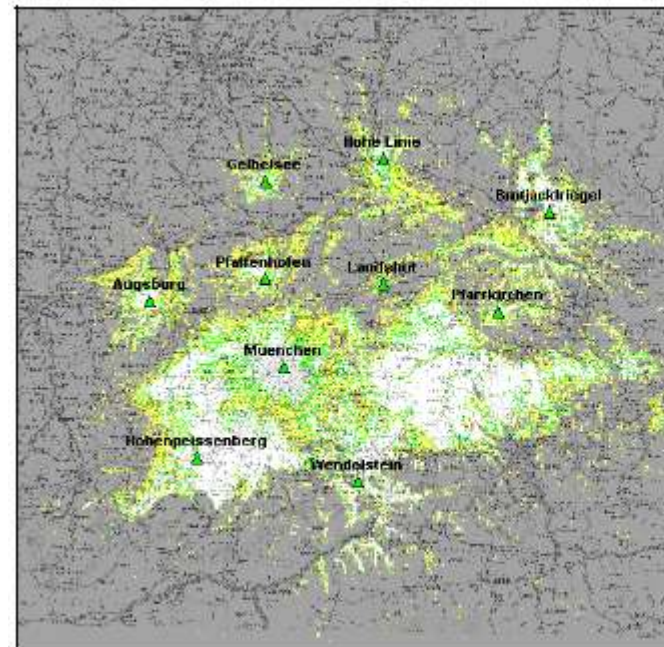
More tables available in Annex 2 of EBU Tech 3348



DVB-T2 vs DVB-T: an example from Germany



DVB-T2
8 MHz, ch 47
16k, 64-QAM-2/3
GI 1/4 (448 μ s)
C/N = 17.5 dB
22.6 Mbit/s



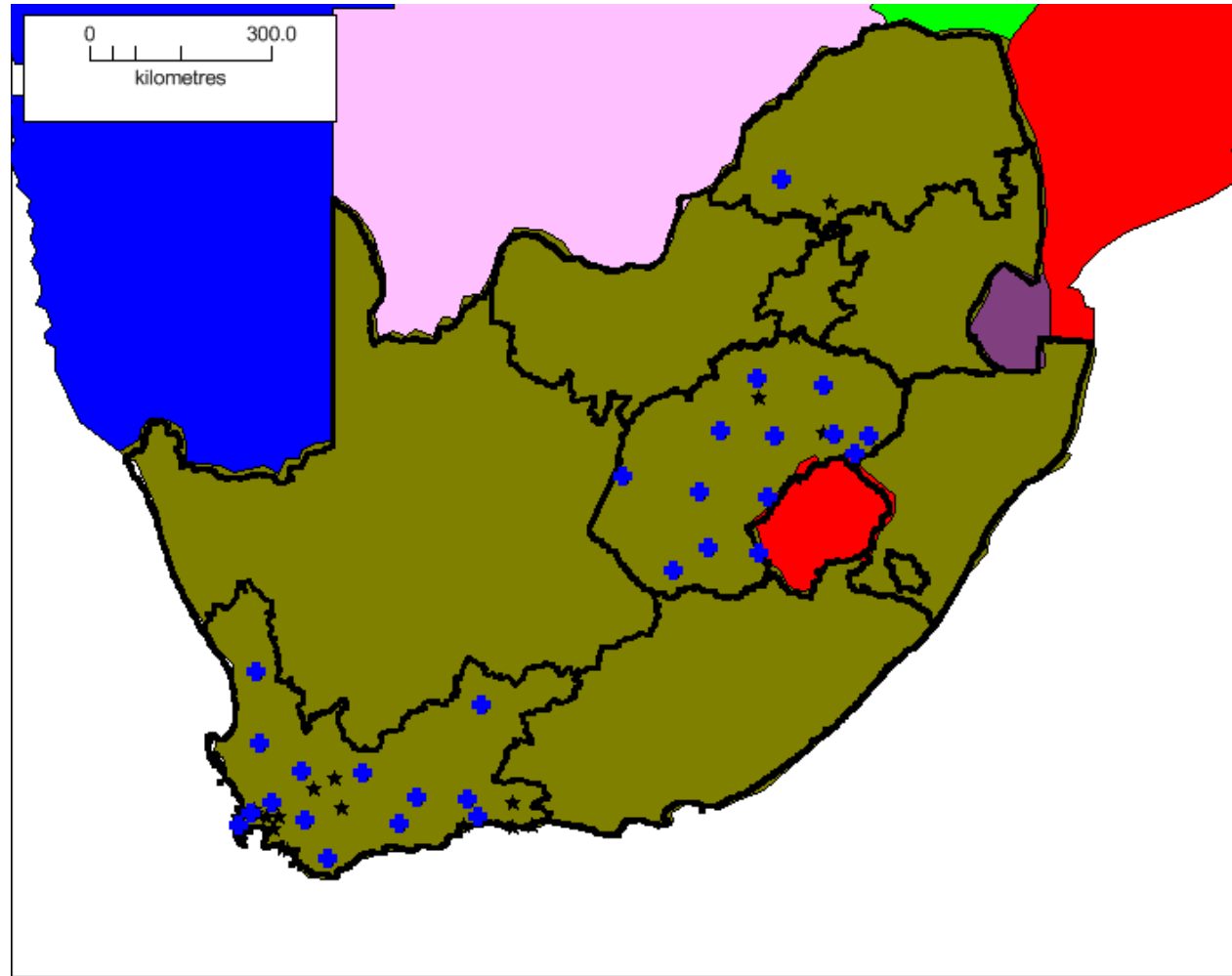
DVB-T
8 MHz, ch 47
8k, 16-QAM-2/3
GI 1/4 (224 μ s)
C/N = 17.2 dB
13.3 Mbit/s



Size Limitations of SFNs

Western Cape
and Free State
both >400km
across

Careful planning
needed – tx
placement,
timing, antenna
patterns



Implementation Choices

- Multiplex feeds to site:
 - Re-broadcast link – difficult in SFNs
 - Landline - expensive
 - Terrestrial microwave link -
 - Satellite feed – cost-effective if for many sites
- Transmitter Synchronisation in SFN:
 - GPS timing
 - Megaframes



In summary

- Planning and coordinating a network is only the start
- Implementation involves making lots of technical decisions
- System performance will be a compromise between frequency use, robustness & capacity



Thank you!

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