SPECTRUM · BROADCASTING · ECONOMIC TRANSFORMATION

The Technological Transformation of Broadcasting

Ghana's analogue-to-digital terrestrial television transition

Peter Djakwah, Senior Manager, Engineering, NCA, Ghana
Vice Chair, ITU-R Study Group 6

GE06 to 5G

A treaty obligation, a national switch-off, and a spectrum auction

The 694 MHz line

Where broadcasting ends and mobile broadband begins

August 2026

NCA 5G spectrum award process

OUTLINE

- SYNOPSIS
- GE06 · THE GENEVA 2006 AGREEMENT
- INSTITUTIONAL ARCHITECTURE · 2010
- THE NATIONAL STANDARDS
- CONFORMANCE AND ENFORCEMENT
  - THE NUMBERS AND NATIONAL DTT LABORATORY
  - ACCREDITED LABORATORIES, TEST SUITE AND CONFORMANCE LOGOS
  - COVERAGE VERIFICATION AND MONITORING SYSTEMS
- GE06 IN PRACTICE · REPLANNING THE BAND
- THE NETWORK
- WHAT THE DIVIDEND HAS FETCHED
- UTILISATION
- NEXT GENERATION STANDARDS
  - DAB TRIAL
  - THE WAY FORWARD FOR DAB

THE SYNOPSIS – 2010 to 2026

Ghana built a complete digital broadcasting regime — National Committees, frequency plan, plan, receiver standards, test laboratories, monitoring centres — and reaped all the dividends.

Between 2010 and 2023 the Authority re-planned the UHF band with the ITU, harmonised a receiver specification across ECOWAS, built a national digital terrestrial television laboratory, accredited twenty-one international test laboratories and certified over five hundred receiver models, built a nation-wide DTT network with two multiplexes, licensed digital television channels, and established a national monitoring system. What remaines undone is to replicate the successes in other sectors of the broadcasting and telecommunications industries



- Second largest economy in West Africa
- Population of 34.4 million, 56% under 25 yrs
- Recognized as one of West Africa's most stable, peaceful democracies
- A major economic hub in Africa, serving as a top global producer of gold and cocoa
- The first sub-Saharan nation to gain independence (1957)

GE06 · THE GENEVA 2006 AGREEMENT

A frequency plan, not merely a deadline

GE06, is commonly remembered for its switch-off dates. Its operative content is a **digital frequency plan**: an agreed set of assignments and allotments for each administration in Regions 1 and 3, entered in the Plan and protected internationally.

An administration's digital entries are protected from the date of entry. Its **analogue** assignments lost international protection at the end of the transition. After that, an analogue transmitter still radiating has no treaty standing against a neighbour's conforming digital service.

UHF BAND

17 June 2015

End of protection for analogue, 470–862 MHz

VHF BAND

17 June 2020

Extended date for a defined group of countries

For planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz

Ghana is a signatory; the migration was undertaken in accordance with GE06

WRC 2007 · FIRST DIVIDEND

790 – 862 MHz

- Allocated to the mobile service on a primary basis in Region 1, co-primary with broadcasting, and identified for IMT
- Effective 17 June 2015 — the GE06 transition date — though over seventy Region 1 administrations took it up immediately by footnote
- Band plan: 2 × 30 MHz paired, 791–821 / 832–862 MHz

WRC 2012 · SECOND DIVIDEND

694 – 790 MHz

- Allocated to the mobile service, on a primary basis in Region 1 and identified for IMT
- Took effect after WRC-15, which confirmed the lower edge at 694 MHz and settled the technical conditions
- Band plan: APT700 paired, 703–748 / 758–803 MHz

INSTITUTIONAL ARCHITECTURE · 2010 to 2016

Two committees, one secretariat, six years

JANUARY – AUGUST 2010

National Digital Broadcasting Migration Technical Committee

Drew together stakeholder ministries, departments and agencies with industry and educational institutions. Tasked to develop the policy guidelines for the shift, and dissolved once it reported.

AUGUST 2010 – 2016

Digital Broadcasting Migration Implementation Committee (DBMC)

Thirteen members from stakeholder institutions, carrying policy implementation, integrated planning, budgeting, public communication and performance monitoring. Its mandate ran until six months after migration; its secretariat sat in the NCA's Broadcasting Unit.

The design was sound; the mandate ended earlier than expected.

Separating a short policy committee from a long implementation committee, and housing the secretariat inside the regulator, is good practice. The report of the Technical Committee was adopted by Government as the Policy Document, and this became the template for the DBMC.

THE NATIONAL STANDARDS · 2010 to 2019

A transmission standard, and receiver standards

Layer	Adopted	Effect
Transmission	DVB-T2 · ETSI EN 302 755	Second generation, chosen while peers were still adopting DVB-T
Video · audio	MPEG-4 AVC · HE-AAC	Roughly half the bitrate of MPEG-2 for equivalent quality
Interactivity	MHEG-5	A declared API for electronic programme guides and added services
Receiver	Ghana Standard GS1099	Minimum specifications consulted on, board-approved, then published as a national standard. First edition for DTT receivers in **2014** and second edition in **2019** for DTT, DTH & combo receivers, with HEVC functionality mandated



"This document … sets minimum requirements for a free-to-air DTT receiver which will result in a low cost, low maintenance unit providing basic functionality"

Receiver Standard Adopted across ECOWAS

The specification was taken up as a harmonised sub-regional standard, deliberately to create economies of scale in receiver manufacture across the bloc.

Grounded in statute

Section 5(c) of the NCA Act 769 and section 66 of the Electronic Communications Act 775 provide the consumer-protection mandate the receiver regime rests on.

CONFORMANCE AND ENFORCEMENT –NUMBERS AND NATIONAL DTT LABORATORY · 2012 to 2019

A specification is worthless without a test regime

1

National DTT Laboratory for surveillance and verification testing of receiver samples and market surveillance testing

21

Accredited test laboratories across nine countries, with a test suite developed in collaboration with Sony against the minimum specifications

518

Free-to-air receiver models certified by the end of the first quarter of 2019, with the approved list published openly

8

Offices with broadcast monitoring systems — Accra (HQ), Ho, Koforidua, Kumasi, Takoradi, Tamale, Sunyani, Bolgatanga

200

Digital Television stations recorded continuously and stored for 90 days

Objective quality measurement

A drive-test system captures signal strength, carrier-to-noise, modulation error ratio, bit and packet error rates and constellation data — turning coverage claims into measurements.

Automated fault detection

Monitoring detects video freeze, black frames and audio silence per channel and logs deviations, so licence conditions can be enforced on evidence rather than complaint.

Detection of illegal channels

Channel scanning detects illegal channels in operation, as well as transmission irregularities, so the appropriate regulatory measures can be taken

Market Surveillance

Officers go to the markets and border posts to detect illegally imported receivers, and also pick certified receivers at random for surveillance testing

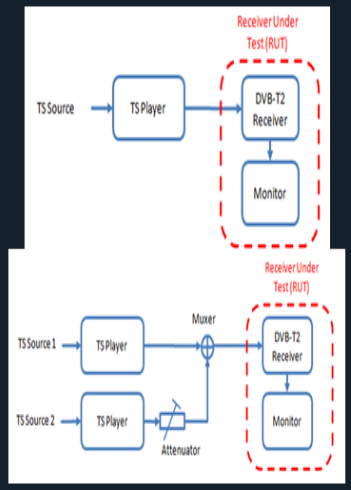
CONFORMANCE AND ENFORCEMENT – ACCREDITED LABORATORIES, TEST SUITE AND CONFORMANCE LOGOS

21 accredited labs across the world:

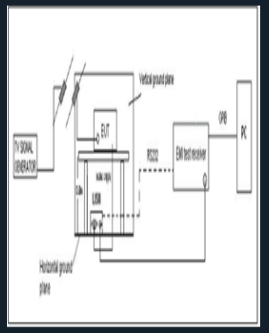
South Korea (7)
Japan (3)
China (1)
South Africa (1)
Malaysia (1)
Taiwan (4)
United Kingdom (2)
Turkey (1)
Poland (1)

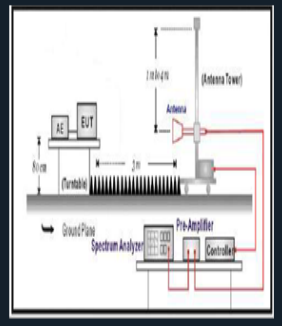


SI/PSI Test setup



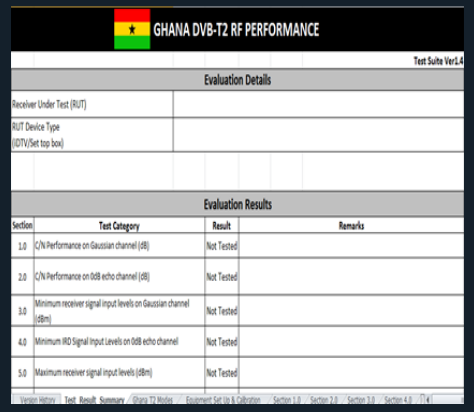
EMC Test setup





digitalghana HD

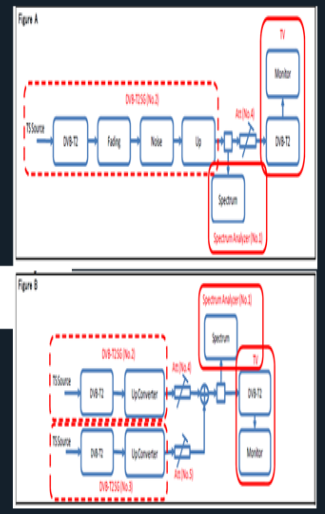
digitalghana SD







RF Test setup



CONFORMANCE AND ENFORCEMENT – COVERAGE VERIFICATION AND MONITORING SYSTEMS

Table 1: Summary of results for the entire country

Region	NCA Coverage		Knet Coverage using NCA Methodology		Knet Coverage
Greater Accra	95.68	95.68	99.27	99.27	95.55
Ashanti	74.57	74.57	92.24	92.24	91.00
Western	63.25	61.87	72.93	66.67	88.70
Western North	76.82		49.64		
Central	67.32	67.32	76.74	76.74	81.54
Eastern	66.28	66.28	84.72	84.72	89.39
Volta	94.10	82.62	92.07	77.99	88.00
Oti	44.90		17.88		
Bono*	50.39	50.64	88.61	86.15	83.97
Ahafo	28.85		0.00		
Bono East	55.15		85.28		
Northern	80.30	75.13	84.25	54.57	80.31
Savannah	54.17		12.35		
North East	73.67		0.00		
Upper East	97.22	97.22	0.00	0.00	96.50
Upper West	85.13	85.13	43.45	43.45	89.22
TOTAL		**74.88376**		**84.141423**	**88.7**

*Region where transmission downtimes affected measurement outcome.




Tamale


Bolgatanga

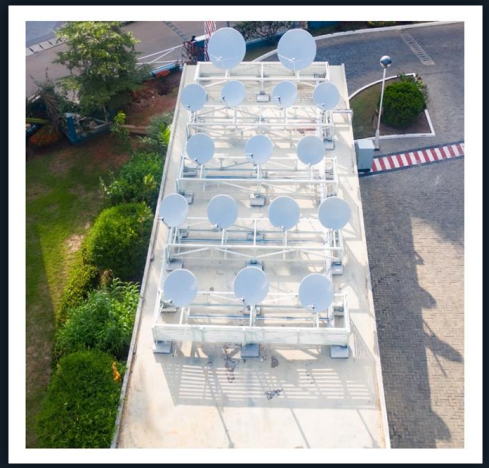

Ho


Kumasi


Koforidua


Takoradi









GE06 IN PRACTICE · 2013

Re-planning the band, entry by entry

470–694
The megahertz range re-planned, to amend Ghana's entries in the GE06 Plan

11
Allotment areas created, replacing station-by-station analogue planning

106
Existing UHF assignments suppressed from the GE06 Plan to make room

4
Coverage layers notified nationally — three in one allotment area



Coordinated with six administrations

Togo, Benin, Côte d'Ivoire, Niger, Liberia, and São Tomé and Príncipe — each holding a veto in practice over entries that affect them, and each on its own migration timetable.

Twelve channels to five pay operators

Assignments were made to commercial DTT pay networks alongside the state free-to-air platform — GOtv, Crystal TV, First Digital, Cable Gold and Fly TV — so the band carries two business models at once.

Digital terrestrial television — retained
470 – 694 MHz · eleven allotment areas, four layers

Second dividend
694 – 790 · WRC-12

First dividend
790 – 862 · WRC-07

↑ broadcasting, now carrying far more services than analogue did

↑

↑ auctioned for 5G ·

↑ auctioned for 4G

THE NETWORK

A state-funded national multiplex platform

CONTRACT, JULY 2015

US$82.3m

Government of Ghana contract with K-Net Ltd for the national transmission network

TRANSMISSION

42 sites

At least two transmitters per site, for redundancy and multiplex capacity

COVERAGE TARGET

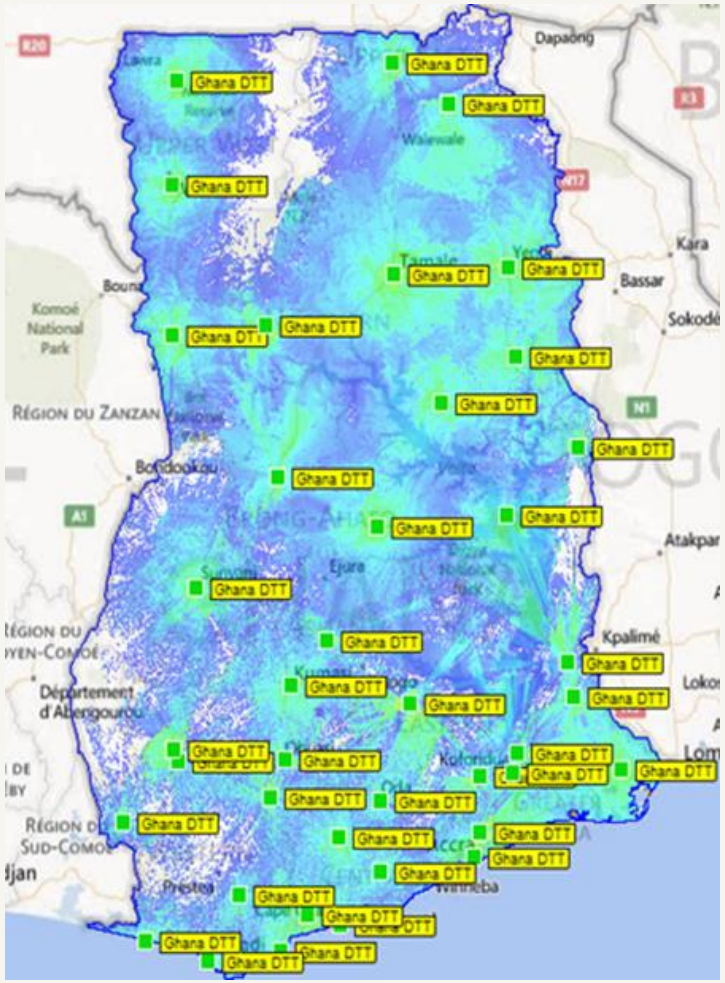
95% / 89%

Population coverage and land-area coverage respectively

MULTIPLEX STRUCTURE

1 + 1 + 1

One national multiplex, plus one regional multiplex in every region, plus one additional expansion for pay TV and premium content



A single wholesale carrier

Rather than each broadcaster operating its own transmitters, the state built one platform and broadcasters became tenants on it. The Central Digital Transmission Company Limited was constituted as the national DTT network operator.

The structural consequence

Separating transmission from content is the efficient design, and it is what makes the spectrum saving real. It also concentrates risk: a single carrier's cost base and reliability now determine every free-to-air broadcaster's reach.

WHAT THE DIVIDEND HAS FETCHED

Ghana reserved and sold the dividend for mobile broadband (4G and 5G)

Year	Band	Assignment	Consideration	Implied price per MHz and notes
2015	800 MHz · first dividend	2 × 10 MHz to MTN Ghana	US$67.5m	≈ US$3.4m First dividend, created at WRC-07
2018	800 MHz · first dividend	2 × 5 MHz to Telecel Ghana	US$30m	≈ US$3.0m First dividend, created at WRC-07
2025	800 MHz · first dividend	2 × 5 MHz to Telecel Ghana	US$20m	≈ US$2.0m First dividend, created at WRC-07
2026	700 MHz · second dividend	2 lots of 2 × 10 MHz to MTN Ghana	US$100.9m bid	≈ US$1.8m Second dividend, created at WRC-12

The 2026 reserve is set at roughly half the price realised in 2015

For spectrum that propagates marginally better. The SMP applicant's 40% premium raises it to US$2.5m per MHz.

5G has 70th population coverage obligations on national anniversary date

The 2026 licences for 5G will carry 70% population coverage by **6 March 2027**

NEXT-GENERATION STANDARDS

What comes after DVB-T2

Path	What it offers	Cost of adoption
Stay on DVB-T2, add additional multiplexes and upgrade the codec	Adding capacity with new multiplex. Moving from AVC to HEVC or VVC raises capacity within the same transmission layer — more services, or UHD, with no change to the network	Receiver fleet must decode new codec. Decisive if sizeable number is AVC-only.
DAB	Migration from analogue radio to digital	Cost of trial and receiver adoption promotion

The codec decision is the one that is being made right now, implicitly, by whatever specification the subsidised receivers were bought against

DIGITAL AUDIO BROADCASTING · AUGUST 2023

Radio has the same problem, one band lower

707
FM stations authorised nationally at the end of 2022

513
On air — the rest not on air

18
Stations simulcast in the trial — 11 in Accra, 7 in Kumasi

27%
Of the national population inside the trial footprint

The driver is congestion, not quality

In Accra and Kumasi the FM band is full. Nearly two hundred applications are outstanding due to frequency constraints. Under the Electronic Communications Act the Authority is obliged to address that constraint, and digital multiplexing is the only mechanism that creates capacity without new spectrum.

Built on television's dividend

DAB+ runs in VHF Band III, 174–230 MHz — spectrum released by the television migration and planned for digital radio under GE06. The trial platform was dimensioned for eighteen audio services and distributed to the transmitters over fibre and satellite.

1,100 receivers procured for trial

- 800 desktop radios
- 200 car adaptors
- 100 portable solar-powered receivers
- Quality and coverage measurements taken during trial

Launched 22 August 2023 — the first DAB+ deployment in West Africa and the fourth on the continent

THE WAY FORWARD FOR DAB

From trial to commercial service

The tender

The trial was successfully concluded after one (1) year.

In October 2024 the Authority invited applications for a DAB+ multiplex operator authorization.

Stated aims: transition the trial to a commercial service, and create a structured environment that supports both digital sound broadcasting and a vibrant receiver market.

The Authority has selected a multiplex operator and is engaging in financial negotiations for the buy back of the trial equipment.

FOUR THINGS THE COMMERCIAL PHASE WILL SETTLE

Scarcity alleviation in competitive locations

A platform dimensioned for Two multiplexes can only absorb 32 stations. Congestion shifts from frequency assignment to carriage slot.

One operator is a carriage monopoly

A single authorisation raises access terms, pricing and non-discrimination regulatory questions from day one — the same structure as the television carrier, and it needs the same safeguards.

Exclusivity in digital will drive excitement and growth

All eighteen trial services were simulcasts of existing FM stations. With no content available only on DAB+, a listener has no reason to buy a receiver — and without receivers there is no business case for carriage.

The car is the real market

Most radio listening happens in vehicles, and Ghana's fleet is dominated by imported used cars with no DAB+ head unit. This, not transmission, is the binding constraint.

UTILISATION OF DIGITAL TELEVISION SERVICES

Migration has resulted in the proliferation of digital television channels and services and services

TYPE OF TELEVISION SERVICE	Q1 2026	Q2 2026	IN OPERATION	NOT IN OPERATION
Digital Terrestrial Free-To-Air Television Programme Channel (Nationwide Coverage)	44	41	36	5
Digital Terrestrial Free-To-Air Television Programme Channel (Regional Coverage)	7	7	7	0
Digital Terrestrial Pay Television (Service and Network)	4	4	4	0
Digital Terrestrial Television (Network only)	1	1	1	0
Digital Terrestrial Radio Service on TV Multiplex	8	8	2	6
Satellite Television Broadcasting (Pay TV Direct-To-Home Bouquet)	3	3	3	0
Satellite Television Broadcasting (Free-To-Air Direct-To-Home Bouquet)	8	8	8	0
Satellite Television Broadcasting (Free-To-Air Direct-To-Home Single Channel)	100	96	62	34
Digital Cable Television	1	0	0	0
Television over Internet Protocol (Pay TV)	1	1	0	1
Subscription Management Service for a Satellite Television Broadcasting (Pay TV Direct-To-Home Bouquet)	1	1	1	0
Total	**178**	**170**	**124**	**46**

IN CLOSING

Ghana built the frequency plan, the network, the standard, the the laboratories and the monitoring systems. The unfinished work is to work is to replicate the successes in other sectors of the broadcasting broadcasting industry.

THANK YOU.