TAMS TECHNICAL REPORT

BRC TAMS (TELEVISION AUDIENCE MEASUREMENT SURVEY)

TECHNICAL REPORT

2017

INTRODUCTION

The Broadcast Research Council has provided the Television Audience Measurement service to the South African Industry since January 2015.

The television viewing data produced are based on the viewing behaviour of a panel of households representing the television universe population of South Africa as defined by the Establishment Survey. The panel is recruited and controlled by a set of household characteristics known to be important influences on television viewing patterns.

Every panel household has a Nielsen UNITAM Peoplemeter attached to each television set in the home. Using a handset they "log in" their viewing, including any visiting guests viewing.

The meter's viewing information is transferred electronically to the central server via a cellular network. Validation and quality control programmes are run on the data, followed by weighting and calculation processes before it is made available to the Industry daily from Monday to Friday.

DEFINITION OF TERMS

Audio Signature

Audio signature is a continuous, low-bandwidth digital stream that uniquely characterises the given audio material.

Establishment Survey (ES)

The Establishment Survey (ES) is a large scale full-national survey that is designed to define the characteristics of the South African TV population. The TAMS panel households are recruited based on demographics and geographic distribution of the television viewing population as defined by the Establishment Survey. The TAMS Universe, population and household estimates are also derived from the ES.

Household Master

The repository containing the specific demographic and equipment information for each household. This database also contains the full history of contact with the household from the day of recruitment to the day of de-installation.

In-Tab

In-Tab refers to good reporting homes successfully validated and weighted.

Logging

Registering individual viewing via the people meter remote control

Polling

Polling is the data collection method achieved through data transmission from the panel home to the production centre using GPRS technology installed in the Peoplemeter's transmission unit

TAMS Universe

The TAMS Universe consists of all private households in South Africa across all communities with Eskom mains electricity and at least one working TV set. TAMS data is released for adults 15 years and older, and children between the ages 4-14 years living in these household, including visitors.

TV Ratings

A TV rating is the proportion of viewers, averaged across a time period [e.g. a commercial spot or break, a ¼ hour or a programme] and percentaged on the total universe in the relevant group [e.g. 'all adults' or 'females'].

APPROACH TO TAMS

The TAMS system is based on seven steps of Television Audience Measurement. They are:

Step 1. The Establishment Survey (Universe and Sampling)

A large scale survey designed to define the characteristics of the population to be represented.

Step 2. The TAMS Panel (Recruitment and Installation)

An appropriate number of households selected on the basis of a statistical design to represent the most important population characteristics.

Step 3. The Peoplemeter

The electronic measurement device which monitors the channel that a television set is tuned to and the individuals present in the room while the television set is switched on. Individual demographics are captured through a Peoplemeter remote control unit.

Step 4. Polling (Data Collection Method)

Data transmission from the panel home to the production centre takes place between 02h00 and 06h00 daily, using GPRS technology installed in the peoplemeter's transmission unit.

Step 5. The Production Software (Pollux Data Processing)

A data processing system which collects data, performs quality control, executes data validation and weights the daily viewing data.

Step 6. TV Broadcaster Log Import (Event Data)

The Service Provider makes use of a newly developed module in the proprietary Media Pad system to produce daily programme and spot logs in Industry formats based on broadcaster transmission logs.

Step 7. The Analysis Software (Data Delivery)

The software through which television audience data is analysed by data users, available through software bureaus.

Step 1: Universe and Sampling

TAMS Universe

The panel is national and reflects the television viewership of all people in private households, with Eskom mains electricity, with at least one working television set. The daily TAMS data comprises adults 15 years and older, and children between the ages 4-14 years, and guest viewing.

TAMS Universe updates, using population and household estimates from the Establishment Survey, occurs twice a year. The Universe for DStv households is updated concurrently using audited DStv subscriber figures for the mid-fieldwork period of the Establishment Survey.

Sample Design

The current TAMS sample is made up of 2918 installed homes that translates to approximately 11 500 individuals (age 4 +). Future panel expansions will be planned to reach at least 4000 homes, recommended by the TAMS independent auditor.

The TAMS panel sample is drawn using an area stratified probability method. A slightly disproportionate sample design is applied to households by area as follows:

Area	2017 TAMS Panel	2016 Establishment Survey
Metro	45%	44%
Urban	31%	29%
Rural	24%	27%

Panel Controls

The representativeness of the TAMS panel is structured so that it is controlled by four variables which are deemed to correlate with television viewing. These characteristics are referred to as panel controls.

Two forms of panel controls are employed, namely:

Primary controls comprising a matrix formed by interlacing the highest priority controls:

- Area
- Province
- Race
- Pay TV vs. non-Pay TV

Secondary controls are applied to ensure that the profile with respect to a number of additional demographics is maintained. All secondary controls are household based and are not interlaced:

- Household Size

Step 2: Recruitment and Installation

Recruitment

Nielsen recruit households, as well as demographic data from national representative survey sources of the highest quality, approved by the BRC, according to the Establishment Survey sample characteristics.

The recruitment questionnaire is administered either face to face or by telephone. The head of the household is targeted for the interview, and in instances where he or she is not available, a suitable adult household member is interviewed.

Panel Turnover and Renewal

Panel turnover occurs by forced panel rotation and natural attrition:

Forced rotation is triggered when a household:

- Continues to be non-compliant after several attempts of re-education.
- Falls within a demographic panel control that is over installed.
- Exceeds a participation tenure of 8 years.

The main causes for natural attrition are:

- The relocation of a household to an area where the sample is balanced or over installed.
- The household's electricity has been suspended for more than 6 weeks.
- The household no longer has a working TV set.

Data Confidentiality

It is critical that the identity and characteristics of panel homes is kept confidential. A Panel Confidentiality Agreement is signed by Nielsen and the household at the point of installation.

Household Master File and Panel Member Contacts

Nielsen's production software system contains a central repository for all panel member classifications and records, including demographic and equipment connected to TV sets within the household. Each contact event with the household is captured on the master file.

Demographic and TV equipment updates

- Update interviews – are conducted annually with each household either face to face or telephonically.
- Helpline – Panel members are requested to inform Nielsen of any demographic or televisual equipment changes by calling the telephone helpline, or by sending an SMS text or email message.
- Service call job cards – TAMS field technicians submit household demographic and equipment changes via the job cards that are returned daily.

Panel Household Training and Education

Upon installation, panel households are given a Welcome Pack and the TAMS field technician coaches panel members on how to register household member and guest viewing. Installation is followed by a Welcome Call by a panel management counsellor, who ensures that the household understands what is expected in terms of participation on the TAMS panel. Further education may take place at this stage.

TAMS newsletters are distributed to panel households quarterly to educate all members of the household, to encourage "good button pushing" compliance and

remind them to use the Nielsen Call Centre when there are changes to household members and television equipment.

Panel Member Incentives

Each TAMS household receives a cash incentive, twice per annum. The cash is transferred into a cash card that is given to the household upon installation.

Exit Study

When households are de-installed from the panel, an adult member of the household is requested to take part in an exit interview. Questions regarding how to improve the experience of a TAMS panel household are asked. Results from this survey assist in planning for future panel issues, including "button pushing" compliance, incentive schemes and panel literature; the long-term aim being to build a compliant continuous panel.

Quality Control

Stringent quality control procedures are performed daily to warrant the integrity of the TAMS data. Quality control reports are run daily at an aggregated level, by home, by television set and by panel member to identify and resolve issues of either a technical or behavioural nature. Data from households that are found to be non-compliant with respect to these parameters are excluded from the daily released data stream.

Technical compliance includes making sure that the metering equipment in each home is functioning optimally, and that all TV sets are metered.
Behavioural compliance involves ensuring that each eligible household member registers his or her viewing, as well as guest viewing, accurately.

Trial Period

Prior to its contribution to in-tab reporting, each newly installed home undergoes a minimum trial period of 3 days. This evaluation period has two main functions:

- Allowing for "button pushing" behaviour to normalise
- Ensuring that a technical review can be conducted to verify the quality of the meter installation.

Before a home is considered to have passed the trial period and permitted into production, its data is assessed against the following set of minimum standards:

- To have polled successfully for most days.
- Not to have been rejected in the validation process during the trial period.
- To exhibit stable registering of viewing.

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Quality Control Reports

Several quality control reports are generated daily to analyse the performance of panel households following the editing and automated rejection rules. Typical quality control measures include the following:

- Uncovered viewing – when the television set is on but no one is registered as viewing.
- Long viewing sessions – this may be indicative that panel members are not logging off when leaving the room or that there is a technical issue with the metering equipment.
- Nil viewing by set – a set that has not been viewed for a sustained period.
- Nil viewing by home – this may be related to nil viewing by set.
- Nil viewing by individual – a panel member has not watched television for a sustained period
- No reference/unknown channel – audio signatures cannot be matched against reference content.

Quality Control Remedies

Whether for newly installed or longer-term homes, action is taken to resolve the technical or behavioural issues that have been identified:

- Re-training the home on a monitoring basis until more data is collected. Such households are excluded from production during the monitoring period.
- Calling the household to complete the diagnosis of any concerns and take remedial action.
- Pass the home directly to the TAMS field technician in the event of a more significant issue that requires a visit to the household to rectify.
- In the case of repeated non-compliance, particularly behavioural issues, it may be necessary to remove a home from the panel if re-educations have failed to produce change.

Coincidental Study

On-going coincidental checks are conducted throughout the year. The aim of this survey is to provide a snapshot of the accuracy of the metered data by comparing respondent claims made at the point of the survey versus the raw meter statement of the home.

Each panel member's behaviour is coded under the following labels:

- Person watching and button pressed
- Person watching and button not pressed
- Person not watching and button pressed
- Person not watching and button not pressed

Household co-incidental scores are then aggregated to produce an overall compliance score for the panel.

Step 3: The Measurement Instrument - Peoplemeter and Reference site

Peoplemeter

A Peoplemeter is an electronic device installed in TAM households which is able to monitor all TV set activity and the individuals present in the room while the TV set is switched on.

A remote control unit is used to identify which members in the household are viewing. The South African TAM panel currently makes use of the UNITAM Meter.

UNITAM Channel Identification Methods

UNITAM uses two main methods of channel identification that are totally independent (i.e., they do not require any cooperation on the side of the broadcasters): audio tracking and InfraRed streams processing.

Audio Tracking

Audio tracking is based on a proprietary content identification technology at its core called "Content Tracking System" or "CTS". CTS comprises a set of techniques and methods that can recognise an unknown clip of audio material among a virtually unlimited number of reference clips generated from known audio streams. In order to do this, CTS converts the audio signal into 'signatures', a continuous, low-bandwidth digital stream that uniquely characterises the given audio material. A powerful pattern correlation engine within CTS is then used to identify an unknown piece of content, by scanning its 'new' signatures against a large set of previously generated reference signatures. The right content is identified through analysing the correlation values according to proprietary algorithms. One of the distinctive features of UNITAM tracking technology is given by its binary output (either a perfect match or no match at all). This provides extremely stable data and accurate viewing data.

Infrared Streams Processing

Besides the audio signature stream, UNITAM meters are able to produce a parallel stream of information captured from all remote controls used in conjunction with the measured TV ("infrared stream"). This functionality is not used in South Africa.

This second stream of information is processed in combination with the audio stream to provide more detailed information about the viewing session, including for example, Teletext usage, interactivity, fast channel surfing, and other types

of "click through" activities. The infrared stream is also an effective way to avoid any ambiguity when reporting viewing situations in which two or more channels may be transmitting the same signal (i.e., same audio track in "simulcast" channels). For this purpose, the UNITAM system automatically follows every action performed by all remote controls in the vicinity of the TV set under measurement, and uses this information to resolve the ambiguity by determining the actual broadcast among various matching candidates.

UNITAM Installation

In a typical set-up, the following equipment is installed at the panel household:

- **UNITAM meter** unit:

- **Remote Control**: a device used by the panel members (and guests) to register all their viewing activity (identification of the panel members who are watching and changes in their viewing activity).

- **Combox Unit**: an electronic device that polls all the meters installed in the panel household via Radio Frequency communication and collects the data generated. The Combox stores the collected data and sends it to the base server via telephone communication.

The Combox is protected against power failure with a battery backup, and can store in its 2MB memory more than 200 hours of viewing information. UNITAM meters are equipped with up to 8 ports that are available for additional devices.

UNITAM meters are nonintrusive (no TV sets or devices need to be opened or modified in any way), in that they simply require a by-pass connection, which is inserted into the audio signal path and a 'transparent' antenna connection as part of the installation process, the field technician records which type of device is connected to each port. This 'device type' value is used by the central system to determine which type of recognition process, if any, is to be applied to the signatures.

UNITAM meters also include a 'sensor' port that must be connected to the TV set's audio output if available, or otherwise to a tiny microphone attached to the TV set's speaker. This port can be used for "source detection" purposes. This permits identification of the platform or device being viewed. Once the active port has been determined, the meter generates audio signatures continuously from that port, as long as it remains active, regardless of the type of device connected to it. These signatures are transmitted to the base office during the daily polling process.

UNITAM Remote Control

Each UNITAM meter has a dedicated remote control, which is user-friendly and suitable for all age groups. All household members have a dedicated button

on the remote control and are registered by the UNITAM Peoplemeter accordingly. There is a very simple procedure for guests to log on, also indicating sex and age for further analysis. UNITAM meters are capable of recording data to the second, 24 hours per day.

UNITAM Meter Display

The UNITAM meter has an LED display for messages in text, and includes an optional buzzer that can be turned on or off by the meter software in order to enhance the panel member's compliance. Feedback for all panel members button pushing is provided by the graphic display of the meter. The meter can support multiple languages.

During the TV session the meter reminds the panel members to declare the presence of new viewers, if any, every 30 minutes.

UNITAM Data Transmission – COMBOX

When more than one TV set needs to be measured, a UNITAM Combox is installed in each household. The Combox is an electronic device that polls all the meters installed in the home via RF communication (DECT) and collects the data generated by them.

The Combox stores the collected data and sends it to the central processing site. Signatures that come out of the captured content which are then sent to a central processing site via a GPRS connection. It also includes a custom user interface through which panel members declare their presence in front of the TV.

UNITAM Reference Site

A reference site is simply a collection of receivers connected to reference meters which generate audio signatures for each channel to be monitored, and servers to gather these generated audio signatures. Each channel to be monitored requires its own separate feed, via a receiver, which then feeds into a reference unit, which generates the audio signature and stores it on the server. The UNITAM reference site is constantly monitored by the surveillance software which makes sure that each decoder is actually tuned to the correct channel and is in fact providing an output. If the surveillance system suspects that a decoder has stopped working or some other issue, then it can be programmed to send an e-mail or SMS messages to Nielsen operations staff warning that there could be a problem with that particular station. The problem can then be rectified immediately.

A backup reference site exists in an off-site secure location. This site also serves as a disaster recovery system.

Step 4: Viewing data collection method (Polling)

All the household's viewing activity for the day is stored in the Peoplemeter, ready to be collected. The data collection method known as Polling commences at 2h00 in the morning, where the Nielsen Pollux system retrieves the stored viewing information. Polling of all households is completed before 6h00.

Once polling has been successfully completed, rigorous automated validation checks are run on the data of all households. Households that do not pass the validation checks are rejected and excluded from the data delivery for that day. Examples of rejected households would be those who have constant viewing hours, or an unknown channel where an audio signature is not matched by the reference meter.

A series of polling reports are reviewed by the data production team to establish how many good reporting households there are and to act on correcting rejected households for the next day.

Step 5: The Production Software (Data processing)

The Edit Rules

The edit rules filter out viewing data that does not conform to set standards. The following edit rules apply:

- Uncovered Viewing: this has been set in South Africa to reject any
- household where total logged-in time was less than 10% of total time the TV set was switched on. The South African situation is different from many countries in that TV sets are often left on for security reasons when panel members leave the house. There is also reason to believe that the TV is used to calm pets or babies.
- All viewing gaps are processed as gaps in viewing. In some countries viewing data is imputed into the gaps.
- All non-broadcast device activity (e.g. DVD) is but none of this viewership is included in the daily viewing statistics.
- Unreferenced broadcast channels (unknown channels): If a household views an unknown channel, and viewership exceeds the set threshold, the household is rejected from the daily in-tab.
- Constant Viewing: If a household views TV for the full 24 hours, by one or more members, the household is rejected from the daily in-tab.

Daily weighting of TAM data

RIM Weighting:

Each day is treated as new survey by the production system (Pollux), and is re-weighted to the population on a daily basis. The reason is that each day inevitably sees households coming back to report after a period of non-reporting or reliably

reporting households dropping off the panel because of meter problems, lightning strikes, telephone suspensions, or noncompliance issues etc.

Each new day could therefore potentially see skews within the panel, because the sample is deviating from the 'ideal'. The daily weighting process removes these skews from each of the weighting variables by weighting each RIM to the correct population size.

The RIM method firstly weights the good reporting households to Household population; this is known as the "Pre-weight" as it this process produces a weighted household population base, with skews removed, which becomes the input to the second stage, the individual weighting procedure. Then Pollux performs multiple iterations of the data, to arrive at its final 'best fit' for that day.

The tables below show the current and new RIM structure. The new RIM structure became effective on 5th June 2017:

RIM Household Current	Categories
Province	9
Language	4
Area/Community size (old)	4
Pay TV / DSTV bouquet	3
PVR in Household	2
Household Size	3
Total number of categories	25

RIM Household New	Categories
Province	9
Race	4
Area (new)	3
Pay TV vs No Pay TV	2
Household Size	3
Total number of categories	21

RIM Individuals Current	Categories
Age groups	8
Kids/adults x Pay TV/DStv bouquet	6
Kids/adults x Gender	4
Kids/adults x Province	18
Kids/adults x Language	8
Kids/adults x LSM's	14
Kids/adults x Area/Community Size	8
Kids/adults x PVR ownership	4
Total number of categories	70

RIM Individuals New	Categories
Age groups	8
Kids/adults x Pay TV vs No Pay TV	4
Kids/adults x Gender	4
Kids/adults x Province	18
Kids/adults x Race	8
Kids/adults x Area (new)	6
Total number of categories	48

Calculating Universe Estimates

A Universe Estimate (UE) is the estimated population of the Television Audience Measurement (TAM) in each market.

Definition of Fixed & Floating Universes

A demographic with a "fixed universe estimate" will have the daily sum of weights equal the published Universe Estimate (UE). This demographic is used in calculating the daily weights and is referred to as a "weighting demographic". Conversely, a demographic with a "floating universe estimate" will not have the daily sum of weights equal to the published UE as they may vary every day.

Guest Weighting

Guest viewing in the sample is used to compensate the viewing of the individuals on the panel when they watch TV in another house. For that reason the guest weight is derived from the sample. When "logging in", guests declare their age and gender and assume the home language of the household.

Step 6: TV Broadcaster Log Import (Event Data)

The Service provider uses a newly developed module in the proprietary Media Pad system to produce daily programme and spot logs in Industry formats based on broadcaster transmission logs.

Every morning the broadcasters send the Nielsen post transmission reconciled broadcast logs. The logs are imported in Media Pad system from every TV station that supplied a log. TV stations that do not provide a log will not be processed and events will not be available.
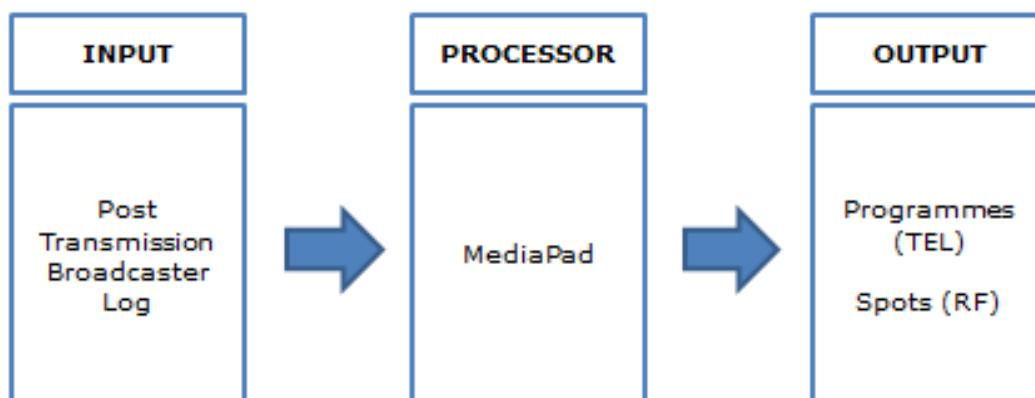
Logs are checked for inconsistencies (gaps, overlaps, spelling, duplicated or incorrect flighting codes and genres) and these are rectified. Once the quality control checks are completed for all stations, the daily output files for programmes (TEL) and spots (RF) are produced and delivered to Data bureaus according to a data delivery schedule.

STEP 7: Data Delivery

Once the viewing data has been validated, weighted and processed, industry data files in a TX4 format (viewing data) are generated to be released to TV Analysis Software suppliers. The industry files are put onto the FTP server by 10h00, the day after viewing for Sunday-Thursday data and by 11h00 for Friday-Saturday data, for TV Analysis Software Suppliers to access.

The broadcast event data for a particular day is exported as RF and TEL files and made available to the TV Analysis Software Suppliers in the same fashion.

MANAGEMENT THROUGH KEY PERFORMANCE INDICATORS

The TAMS Panel is rigorously monitored by the BRC to ensure compliance to global best practice in TV Audience Measurement, which in turn warrants data accuracy, data integrity and cost efficiency. It is also imperative that the TAMS Panel be kept up to date to reflect changes in the TV landscape.

The mechanisms of TAMS Panel oversight are:
* Performance benchmarking against a set of panel health key performance indicators.
* A Monthly Score Card measuring contractual compliance, with penalties for non-compliance.
* Monthly feedback to the TAMS Technical Committee at the BRC headquarters.
* Annual independent TAMS Audits by an international Auditor, to ensure best practice.

PANEL HEALTH KEY PERFORMANCE (KPI'S)

A primary set of KPI's have been laid out in the TAMS Contract between the BRC and Nielsen to guarantee a minimum level of performance for the TAMS Service.

These KPI's underpin global best practice in TV Audience Measurement, and lay the foundation for the data integrity and data accuracy of the highest standard. Penalties for non-compliance are defined for each KPI.

KPI Definitions:

1. TV Coverage: The number of working TV sets on the panel, to which a Peoplemeter is attached, expressed as a percentage. (Total metered TV sets in home/Total number of working TV sets in home).
2. Average Weekly Reporting Households: An average count of households reporting during a week
3. Panel Balance: The extent to which the sample proportions of certain demographic variables match the universe proportions of those demographic variables.
4. Primary Panel Controls: The principal set of demographic variables to which the panel sample must adhere.
5. Secondary Panel Controls: A subordinate set of demographic variables to which the panel sample must adhere. Thresholds for these subordinate variables will be more loosely defined than the primary set of variables.
6. Household Tenure: The number of consecutive months/years that a household exists on the TAMS Panel, from the date of installation to the date of de-installation.
7. RIM Weighting Efficiency HHs: The household weighting efficiency % refers to the degree to which the panel represents the household universe set out in the ES
8. RIM Weighting Efficiency Individuals: The individual weighting efficiency % refers to the degree to which the panel represents the individual universe set out in the ES
9. Household participation in the Co-Incidental Quality Check: the number of installed households that participate in the Co-Incidental Check at least once per annum.
10. Co-Incidental Compliance Index: An overall annual compliance index based on the respondents that answered the co-incidental survey questions (i.e. excluding other family members).
11. Demographic and equipment updates: the % of the panel for which the household master database will be updated once per annum.

MONTHLY SCORECARD

At the end of each month, Nielsen's monthly performance is measured against each of the KPI targets. This monthly report card is used concurrently to monitor Nielsen's performance, but also indicates the overall health of the TAMS Panel, and highlight's potential problem areas that need to be addressed.

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MONTHLY FEEDBACK TO THE TAMS TECHNICAL COMMITTEE

Nielsen reports monthly to the BRC and presents to the TAMS Technical Committee which comprises industry media measurement and broadcast experts.

The feedback sessions typically cover:

- An overview of the TAMS operation's performance, against the KPI targets
- Viewing behaviour changes
- Universe Updates
- Testing of data
- TAMS Projects that are implemented from time to time to keep the service up to date and reflective the changes in the TV landscape, such as the proliferation of channels.

ANNUAL TAMS AUDIT

An independent Television Audience Measurement expert has been assigned to monitor, evaluate and audit the implementation of activities and to make recommendations to the BRC and TAMS Technical Committee.

At the beginning of each year, the scope of the audit is defined by the Auditor in consultation with the BRC. Areas which are typically covered in the Annual Audit include:

- Universe Updates
- Panel Balance and Sample Selection
- Recruitment, Installation, Training of new households
- Panel Turnover
- Validation rules/Database Check Edits
- Panel Quality Control
- Motivation (Incentives)
- Polling
- RIM Weighting
- Panel updates (demographics, TV characteristics etc.)
- Coincidental Survey
- Technical visits, installation, maintenance etc.
- Metering
- Viewing data issues

The Auditor requests various technical reports from Nielsen for inspection to verify compliance in the areas listed above. The Auditor also evaluates the extent to which the TAM Panel reflects the changing television landscape.

Upon the completion of the Annual Audit, the Auditor presents his findings and recommendations to the BRC and TAMS Technical Committee and various

industry stakeholders. A full Audit report on the TAMS service is also delivered to the BRC and posted onto the BRC website – www.BRCSA.ORG.ZA.