Typical Scope of Works
Satellite Earth Station Audit

1. Introduction

The purpose of this document is to describe the typical scope of works for a satellite earth station site audit. In practice, the scope of works for any particular site audit will depend upon the number of antennas, the types of facilities and the number of services passing through them. Any time restrictions, restrictions on access to the site, or issues regarding availability of test equipment, monitoring points, or documentation, will necessarily limit the completeness of the final report.

The actual scope of works will always be tailored to the particular customer's needs and budget.

2. Background

Typical reasons for conducting a satellite earth station site audit include:

- Station is old, and the customer wants recommendations on how best to maintain/upgrade to the latest technologies.
- Station is being sold/purchased, and the customer wants an independent assessment to determine current value.
- Station is new, and the customer wants an independent assessment before final acceptance from the installer and before making final payment.
- Station staff have proposed upgrades/changes, and the customer's management want an independent review before approving the project.

The nature and extent of the audit will depend upon the reasons for conducting the audit and exactly who will be receiving the final audit report.

3. Scope Of Works

3.1 General

The overall scope of works for a satellite earth station site audit covers the following main topics:

- Documentation review, including any available site plans, block diagrams, level diagrams, transponder plans, link budgets, or equipment manuals.
- Site inspection, including photographs of site and equipment, inventory of installed satellite equipment and facilities, spectrum analyser measurements of transmit and receive levels and carrier spectra.
- Performance review, including system performance, effectiveness of ground segment equipment, effectiveness of space segment arrangements, and identify any deficiencies.
- Final report, including recommendations regarding the future operations, maintenance and/or upgrades at each site visited.

3.2 Documentation Review

Review of any available documentation available, prior to the site visit, will make the site visit more efficient.

However such documentation is not always available, or is sometimes not easily available in electronic form. Especially for older sites. In such cases, part of the site visit will be spent locating and reviewing any documentation available on site. Original documentation will be reviewed against current site status to identify any changes that may not have been documented.

Any missing documentation, such as carrier plans, and equipment manuals, may need to be procured from the satellite operators or equipment vendors after the site visit.

3.3 Site Inspection

The site inspection will include some or all of the following, depending upon the details of the particular site:

- Obtain exact site latitude & longitude from GPS.
- Obtain full site address, including contact name, phone numbers, details of staffing levels etc.
- Take digital photographs of the antenna equipment, noting any signs of rust/corrosion, paint damage, maintenance/lubrication of bearings and motors, earthing points, lightning protection, ladders, waveguide pressurisation/dehydration equipment, types of coax cables and power supplies to outdoor equipment, any areas for crane access to antennas if required for future maintenance.
- Take digital photographs from antennas towards satellites, noting any obstructions, interference, or EMR safety issues.
- Take digital photographs of cable-ways/trenches between building and antennas, noting locations of earthing points, lightning/surge protection, building entry points, access/security/safety issues.
- Identify the locations of all satellite indoor equipment, and determine types and lengths of any cables/waveguide interfacility links. Sketch locations and IFL path on site map if available.
- Take digital photographs of indoor equipment, noting rack locations, earthing arrangements, status of front panel displays, location of equipment and cabling in racks, power supplies, etc.
- Compare equipment rack layouts with documentation, if available, and document any changes.
- Inventory of all satellite earth station equipment.
- Review earthing, air conditioning, fire, security, and safety arrangements in equipment room(s).
- Availability of independent power points for test equipment. Availability of receive and transmit monitoring points, both at IF and RF parts of the earth station.
- Make measurements of levels and carrier spectra, on transmit and receive, at IF & RF. If possible to be done via monitoring points intended for this purpose, but if these are not available then may need to coordinate traffic outages with customer to make measurement if possible.
- Compare measured carrier spectra and levels with those expected from transponder plans, etc and note any areas of improvement possible.
- On modem front panel, or via remote interface, read and document all modem current settings, for receive and transmit, including data rates, modulation, coding, power levels, BER, EB/No, etc.
- Review any available remote control and alarm systems on site.
- Review power arrangements, including AC, DC, UPS, diesel generators, etc.
- Identify any failed/faulty equipment, or redundancy issues.
- Inventory/review availability of on-site test equipment, spares, documentation, etc.
- Discussion with on-site personnel to identify any known issues or areas of concern.

3.4 Performance Review

This part of the audit will involve some calculations, based on measurements made on site, review of equipment settings and status, transponder plans, and equipment specifications.

These calculations will review some or all of the following, where applicable:

- Comparison of measured levels and spectra versus transponder plans, and optimum link budgets, identifying any necessary changes or possible improvements in performance.
- System noise level and intermodulation product optimisation, identifying any equipment being driven beyond recommended power levels.
- Quantify any efficiency improvements in either bandwidth or throughput which may be possible by replacing modems with newer models utilising latest modulation, coding, ACM, CinC/PCMA options.

3.5 Final Report

A quick summary of any major issues identified during the site visit will be provided to the customer prior to leaving the site.

A more detailed report of all of the information gathered and issues found will be produced after the consultant has returned home, and will be delivered to the customer approximately 1 month after completion of the site visit. The final report will include a detailed report document, along with a CD-ROM containing copies of all photographs taken on site, and electronic copies of any equipment manuals and data-sheets, or other documentation used during the review.

Topics to be addressed by the final report will include the following, where appropriate:

- Antenna & Tracking System Maintenance
- Cabling and waveguides, including waveguide dehydration.
- Satellite Equipment Inventory
- Test Equipment
- Manuals and System Documentation
- Redundancy, Automatic Switch-over & Spares
- Earthing & Lightning Protection
- Backup Power Supplies & Power Distribution
- Monitor & Control
- Security, Staffing Levels, Site Access & Emergency Communication
- Carrier Levels
- Fire Alarms & Fire Suppression Systems
- RF Interference Issues & EMR
- Space Segment Utilisation
- Disaster Recovery Options

Garry Hausfeld
Hausfeld Consulting
PO Box 1186
Dee Why, NSW 2099
Australia
Email: ghausfeld@ieee.org

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