



Australian Government

ICTRFN803 Analyse a satellite communications system

Release: 1

ICTRFN803 Analyse a satellite communications system

Modification History

Release	Comments
Release 1	This version first released with ICT Information and Communications Technology Training Package Version 2.0.

Application

This unit describes the skills and knowledge required for a new installation project, an upgrade of capacity or technology in an existing network or as a result of convergence to next generation networks (NGN).

It applies to individuals working as supervisors and engineers, who plan, design and implement satellite communications systems.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Unit Sector

Telecommunications – radio frequency networks

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Research satellite communication systems	1.1 Research satellite applications with various orbit types for assessing their spatial positioning for specific purposes 1.2 Analyse and report on architecture, major subsystems and critical components in communication systems of recently launched commercial satellite 1.3 Research and report on multiple access techniques and their typical applications
2. Analyse uplink	2.1 Determine uplink and downlink criteria that impact on carrier to noise

and downlink variables	ratio 2.2 Determine up/down link criteria that impact on baseband signal to noise ratio 2.3 Determine critical parameters of a satellite system 2.4 Research common types of baseband signal processing, and their spectral and noise improvement parameters for determining criteria for link budget evaluations
3. Conduct link budget analysis	3.1 Produce satellite link budget and calculate link margin for satellite system with specified modulation types 3.2 Analyse relationship between bit error ratio (BER) for given energy per bit per noise power density (E_b/N_0) and forward error correction (FEC) parameter for determining operational performance of link
4. Analyse properties of geostationary satellites	4.1 Calculate look angles for geostationary satellite from any receiving location 4.2 Research and report on frequency re-use in conjunction with polarisation selection and use of spot beams 4.3 Analyse and specify major features of very small aperture terminal (VSAT) systems, and calculate link reliability in high rainfall regions

Foundation Skills

This section describes language, literacy, numeracy and employment skills incorporated in the performance criteria that are required for competent performance.

Skill	Performance Criteria	Description
Reading	1.1-1.3, 2.4, 4.2	Interprets complex technical information in a variety of forms and applies the knowledge gained to solve complex problems by making informed judgements and assumptions
Writing	1.2, 1.3, 3.1, 4.2	Uses clear, specific and industry related terminology to prepare detailed reports containing recommendations for relevant personnel
Numeracy	2.4, 3.1, 3.2, 4.1, 4.3	Uses and applies knowledge about space and shape, including angle properties, when analysing variables

		Determines link budgets by selecting antennae size, power requirements, link availability and bit error rate (BER) by solving complex mathematical formulas
Get the work done	1.2, 2.1-2.3, 3.1, 3.2, 4.1, 4.3	- Gathers and analyses data and seeks feedback to improve plans and processes - Makes high impact decisions in a complex and diverse environment, using input from a range of sources - Identifies key factors that impact on decisions and their outcomes, drawing on experience, competing priorities and decision making strategies where appropriate - Operates from a broad conceptual plan, developing the operational detail in stages, regularly reviewing priorities and performance during implementation, and identifying and addressing issues as the work progresses - Addresses complex problems involving multiple variables, using formal analytical, lateral thinking techniques, experience and knowledge to focus on the root cause - Takes responsibility for high impact decisions in complex situations involving many variables and constraints

Unit Mapping Information

Code and title current version	Code and title previous version	Comments	Equivalence status
ICTRFN803 Analyse a satellite communications	ICTRFN8181B Analyse a satellite communications	Updated to meet Standards for Training Packages	Equivalent unit

Code and title current version	Code and title previous version	Comments	Equivalence status
system	system		

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=a53af4e4-b400-484e-b778-71c9e9d6aff2>

Assessment Requirements for ICTRFN803 Analyse a satellite communications system

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Performance Evidence

Evidence of the ability to:

- analyse satellite communications system architecture
- produce a satellite link budget and calculate link margin for a range of digital modulation types
- calculate the look angles for a geostationary satellite from any receiving location
- analyse and specify the major features of very small aperture terminal (VSAT) systems.

Note: If a specific volume or frequency is not stated, then evidence must be provided at least once.

Knowledge Evidence

To complete the unit requirements safely and effectively, the individual must:

- identify and perform antenna calculations including:
 - gain
 - beamwidth
 - polarisation
 - effective isotropic radiated power (EIRP)
- define bit error rate (BER) and how it affects satellite communications
- outline carrier and noise ratio
- explain constellation and eye diagrams
- outline distance to satellite and typical delays
- summarise frequency spectrum (satellite bands)
- explain gain-to-noise-temperature G/T ratio
- outline geostationary orbit
- explain link budget calculation
- explain look angle calculations

- describe low earth orbiting (LEO) satellites
- evaluate the following modulation types suitable for satellite communications:
 - n-FSK:
 - 2FSK
 - 4FSK
 - n-PSK:
 - 2PSK
 - 4PSK
 - 8PSK
 - 16PSK
 - n-QAM:
 - 16 QAM
 - 256QAM
- define spread spectrum techniques including:
 - direct sequence
 - frequency hopping.

Assessment Conditions

Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the workplace. Noise levels, production flow, interruptions and time variances should be typical of those experienced in the telecommunications – radio frequency networks field of work and include access to:

- a site on which satellite analysis may be conducted
- data, calculators and appropriate software tools.

Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards.

Links

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