



**Australian Government**

# **ICTRFN804 Produce radio link budgets**

**Release: 1**

# ICTRFN804 Produce radio link budgets

## Modification History

| Release   | Comments                                                                                                     |
|-----------|--------------------------------------------------------------------------------------------------------------|
| Release 1 | This version first released with ICT Information and Communications Technology Training Package Version 7.0. |

## Application

This unit describes the skills and knowledge required to plan and calculate fixed and mobile radio link budgets.

It applies to individuals working as network engineers who take responsibility for establishing layout of a digital radio system to minimise transmission loss and optimise system performance.

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

| ELEMENT                                          | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elements describe the essential outcomes.</i> | <i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>                                                                                                                                                                                                                                                                                                                                     |
| 1. Analyse suitability of radio systems          | 1.1 Evaluate spectral efficiency of functional elements of mobile radio systems and determine optimal frequency utilisation<br>1.2 Analyse features of radio communication systems and evaluate effectiveness of required applications<br>1.3 Compare features and specifications of antennas used in radio systems to assist with radio link budgets<br>1.4 Report on suitability and ways to improve radio systems to relevant personnel |
| 2. Calculate a radio link budget                 | 2.1 Calculate path loss using variables in required propagation models and create power link budget<br>2.2 Evaluate power link budget against allowable power margin specifications                                                                                                                                                                                                                                                        |

| ELEMENT                                            | PERFORMANCE CRITERIA                                                                                                                                                                                                                           |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                    | 2.3 Evaluate modulation types and spectral efficiency according to required standards<br>2.4 Confirm radio power link budget achieves required criteria                                                                                        |
| 3. Complete evaluation and planning documentations | 3.1 Complete an evaluation report on performance of radio systems and recommend system improvements<br>3.2 Document processes used to determine optimal power link budget for a radio system<br>3.3 Communicate findings to relevant personnel |

## Foundation Skills

*This section describes those language, literacy, numeracy and employment skills that are essential to performance but not explicit in the performance criteria.*

| SKILL                   | DESCRIPTION                                                                                                                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Numeracy                | <ul style="list-style-type: none"><li>Analyses, synthesises and performs calculations using highly embedded mathematical information in a broad range of tasks and texts</li></ul>                                                                                                                          |
| Oral communication      | <ul style="list-style-type: none"><li>Liaises with personnel about technical, operational and commercial matters using specific and language, using relevant listening and questioning techniques</li></ul>                                                                                                 |
| Writing                 | <ul style="list-style-type: none"><li>Uses clear, specific and industry-related terminology to complete and update specific workplace documentation and when presenting recommendations to relevant personnel</li></ul>                                                                                     |
| Planning and organising | <ul style="list-style-type: none"><li>Determines job priorities and works to perform clearly defined and familiar tasks</li><li>Uses systematic, analytical processes in complex situations, gathering required information and identifying and evaluating options against predetermined criteria</li></ul> |
| Problem solving         | <ul style="list-style-type: none"><li>Diagnoses faults in different situations, adapts procedures and modifies activities depending on operational contingencies, risk situations and environments</li></ul>                                                                                                |
| Technology              | <ul style="list-style-type: none"><li>Demonstrates sophisticated knowledge of principles, concepts, language and practices associated with the digital world and identifies consequences of new technology</li></ul>                                                                                        |

## Unit Mapping Information

Supersedes and is equivalent to ICTRFN801 Produce a radio link budget.

## Links

Companion Volume Implementation Guide is found on VETNet -

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

# Assessment Requirements for ICTRFN804 Produce radio link budgets

## Modification History

| Release   | Comments                                                                                                     |
|-----------|--------------------------------------------------------------------------------------------------------------|
| Release 1 | This version first released with ICT Information and Communications Technology Training Package Version 7.0. |

## Performance Evidence

The candidate must demonstrate the ability to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to:

- produce at least two fixed radio link budgets and at least two mobile radio link budgets.

In the course of the above, the candidate must:

- analyse signal degradation characteristics of radio paths and calculate power budgets for various distances and antenna heights versus transmitted power
- research at least two constraints imposed by mobile phone frequency allocations and simulate carrier to interference radiation patterns around a cell site
- create evaluation reports on radio system performance
- document at least two processes used to determine power link budget.

## Knowledge Evidence

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including knowledge of:

- high frequency (HF), very high frequency (VHF), ultra-high frequency (UHF) and microwave receiving techniques
- functions and features of modulation methods, including:
  - AM
  - FM
  - digital
- functions and features of:
  - multiplexing systems
  - operation of transmitters and receivers
  - propagation methods
  - radio communication systems

- weigh factors affecting radio frequency (RF) path loss
- RF technologies
- personal safety issues
- spectral efficiency of functional elements on mobile radio systems
- antennas
- radio system evaluation reports and system improvements
- organisational policies and procedures, covering:
  - personal safety
  - communication methods with relevant personnel
- evaluation reports on radio system performance
- • required legislation, codes, company work practices, regulations and standards, work health and safety (WHS) requirements for scoped work.

## Assessment Conditions

Skills in this unit must be demonstrated in a workplace or simulated environment where the conditions are typical of those in a working environment in this industry.

This includes access to:

- a telecommunications operations site
- mobile telephony devices and equipment
- networked computers and required software.

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

## Links

Companion Volume Implementation Guide is found on VETNet -

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