

TVC Microwave Transmission Corridor: Technical Briefing Paper

Statement of Professional Experience

1. My full name is Robert Ian Goodwin. I am employed by Kordia™ Limited as a Senior Engineering Consultant.
2. I hold the qualification of Bachelor of Engineering (Electrical) and was a registered engineer in terms of the (now replaced) Engineer's Registration Act 1924 from 1971 until 2004.
3. I have over 30 years experience in the design and implementation engineering of television, radio and satellite transmission systems and frequently undertake consultancy work in these areas.
4. I have authority to give evidence on behalf of Kordia™ Limited in relation to the notice of requirement that has been lodged by Kordia™ Limited for the effective roll over the existing Designation of the Microwave Corridor from the TVNZ studios in the Auckland CBD to the Waiatarua Broadcasting and Telecommunications Facility on the Waitakere Ranges.

Statement of Professional Experience

5. My full name is Adam Charles Tommy. I am employed by Kordia™ Limited as a Broadcast Network Architect.
6. I hold the qualification of Bachelor of Engineering (Electrical & Electronic). I am a Chartered Professional Engineer and a Member of the Institute of Professional Engineers New Zealand.
7. I have over 18 years' experience in the design and implementation engineering of television, radio and digital communications systems, and in the calculation and analysis of electromagnetic radiation and fields.
8. I am a member of the joint Standards Australia / Standards New Zealand TE-007 technical committee for human exposure to electromagnetic fields. I am also a member of the Ministry of Health's Inter-agency committee on electromagnetic radiation which provides advice to the Director General of Health. Through my participation in these committees I have gained an understanding of potential health effects that can be related to RF-field exposure. I am very familiar with the New Zealand Standard for maximum exposure to radiofrequency fields (NZS 2772:1:1999).

9. I have authority to give evidence on behalf of Kordia™ Limited in relation to the notice of requirement that has been lodged by Kordia™ Limited for the effective roll over the existing Designation of the Microwave Corridor from the TVNZ studios in the Auckland CBD to the Waiatarua Broadcasting and Telecommunications Facility on the Waitakere Ranges.

Importance of Corridor

10. Kordia provides networking facilities for most major broadcasters and ISP (Internet Service Provider) entities in New Zealand. Their programme and data traffic is carried by protected “ring” network architecture to all major provincial centres and television transmitter sites in the North Island. Traffic for the South Island is carried by this ring.
11. The ring consists of a fibre circuit between Auckland and Wellington on its eastern side and a digital microwave (DMR) linking system between Auckland and Wellington on its western side. There are local access points on both of these routes.
12. The DMR linking system between the Television New Zealand (TVNZ) television centre (referred to as TVC) in Victoria St and Kordia’s Waiatarua transmitter site (WTA) on the Waitakere range forms an integral part of the protected ring referred to above. The Microwave Transmission Corridor that this linking system “beam” occupies has been Designated in the former Auckland City Council’s Isthmus and Central Area District Plan’s and in the Waitakere City Council’s District Plan under the Resource Management Act 1991. All three plans are now administered by the Auckland Council.
13. As mentioned the network ring is used to distribute and provide linking for a variety of important broadcasting and data services. In particular:
 - Distribution of TVNZ’s TV One and TV2 analogue television services to all major transmitter sites in New Zealand (expected to be discontinued in 2013);
 - Distribution of the Freeview terrestrial digital television serve to the main transmitter site in New Zealand (ongoing);
 - Linking of television services for TVNZ, TV Works and Triangle Television to the Freeview satellite headend at Avalon (Lower Hutt) (ongoing);
 - Linking of television and radio services for Parliament TV and Radio New Zealand to the Freeview terrestrial (DTT) headend at TVC (ongoing).

- Data traffic for most of the second-tier ISPs (Orcon, World Exchange, Compass etc) (ongoing).
14. Should a fault occur on, say, the fibre route, traffic can be re-routed via the DMR route to maintain continuity of services. Similarly the fibre provides protection against a DMR link fault. If a simultaneous fault occurred on both routes a major disruption to broadcasting and data services would occur. The same comment applies if the second fault occurred before the first was fixed.
 15. To maintain high network availability of this vital ring linking system it is essential the availability of all the individual linking systems that form part of the ring is also extremely high. This then reduces the likelihood of experiencing the catastrophic consequences associated with a double failure, as mentioned above.
 16. If a building or other structure obstructed the corridor the linking system would be adversely affected, possibly to the point of being completely interrupted if a significant part of the corridor cross-section was obstructed. This, in turn, would put the total ring linking system at risk.
 17. Hence Kordia Ltd regards the integrity of this transmission corridor to be strategically important to its national network business and regards it essential that all reasonable steps should be taken to preserve its integrity.

Technology Alternatives

18. One alternative to using the transmission corridor would be to establish a fibre route between TVC and Waiatarua. A preliminary survey and route analysis was undertaken in 1997 and based on this it is estimated it would cost \$1.5 – 2.0 million to provide a fibre system with the necessary capacity. Allowing a further \$1.5 – 2.0 million for the fibre terminal equipment at both ends (16 x STM-1 circuits) the total cost would be in the range of \$3 – 4 million. This costing assumes no difficulties are encountered in obtaining the necessary local body consents for such a fibre route.
19. Another alternative would be to establish a new radio terminal in the Auckland CBD that could be used as an alternative to the TVC terminal. The installed cost for the new microwave radio equipment, antenna support structure, antennas, power system, fibre to connect to TVC is estimated at \$2.0 – 3.0 million. This option assumes a location could be found that has sufficient radio path clearance to not require a designated transmission corridor from that new site to WTA.
20. Although technically feasible both of these alternatives are very expensive as they need to be engineered to a standard that ensures Kordia continues to be a

provider of high reliability linking services, able to compete in the network services marketplace.

EMR Health Effects

21. As the microwave beam within the corridor passes, in general, well above ground level the electromagnetic radiation (EMR) levels at street level will be extremely low, even for people walking directly below the corridor. If a building was constructed so that its roof height just “touched” the lower boundary of the corridor and a person was standing on the roof of the building (effectively in the path of the beam), then the EMR levels would be higher. This situation has been analysed in the estimation of worst case levels in an area that the public could have access to at any point along the corridor described here.
22. The maximum EMR power flux density that a person would be exposed to in the situation described above is estimated at 40 $\mu\text{W}/\text{cm}^2$ (microwatts per square centimetre). This is 4% of the maximum permissible limit of 1,000 $\mu\text{W}/\text{cm}^2$ specified in the New Zealand standard NZS 2772.1: 1999 for the frequency band used by the linking transmitters.
23. This is the maximum EMR level expected along the corridor based on the situation described above – most areas along the corridor would be much lower.
24. It can be confidently stated that no known adverse health effects will occur due solely to the operation of this microwave link.
25. While there will be other existing RF services in the general vicinity of the microwave corridor that will contribute EMR to the environment, and these EMR levels have not been calculated, EMR levels in publicly accessible areas in the Auckland city environment are expected to be low (in comparison with the public limit in NZS 2772:1:1999), as is the maximum estimated level for this microwave link.
26. If, as in paragraph 16, a building is built close to either end of the Microwave Corridor that obstructs part or all of the Corridor, the EMR levels of a person standing within the Corridor may approach the maximum EMR exposure limit for the general public in the New Zealand Standard.

Validation of the Microwave Corridor Dimensions

27. The transmission corridor was first defined over 25 years ago. Since then the frequency band the linking transmitters operate in has been lowered from 7.7 – 8.3 GHz (“W” band) to 6.4 – 7.1 GHz (“T” band). Although the lower frequency

now being used requires a proportionately wider corridor clearance, the present corridor dimensions would still be effective in protecting the microwave signal.

28. The dimensions on the attached table aggregate the tables defining the respective sections of the Microwave Transmission Corridor previously recorded on the respective district plans of the Waitakere City, Auckland City Isthmus and Central Area District Plans.

Ian Goodwin

11 July 2012

Adam Tommy

12 July 2012

The location of the TVC is: WGS84, Longitude: 174.76120E, Latitude: -36.84827S.

Waiatarua transmission station location: Longitude: 174.56805E, Latitude: -36.92629S

Path Length From TVC (km)	Total Corridor Width (m)	Maximum Obstruction Height Above Mean Sea Level (m)
0.000	6.8	62.6
0.025	6.8	63.0
0.050	6.8	63.4
0.075	6.8	63.8
0.100	6.8	64.2
0.125	6.8	64.6
0.150	6.8	65.0
0.175	6.8	65.4
0.200	6.8	65.8
0.225	6.8	66.2
0.250	6.8	66.6
0.275	6.8	67.0
0.300	6.8	67.3
0.325	6.8	67.7
0.350	6.8	68.1
0.375	6.8	68.5
0.400	6.8	68.9
0.425	6.8	69.3
0.450	6.8	69.7
0.475	6.8	70.1
0.500	6.8	70.5
0.525	6.8	70.9
0.550	6.8	71.3
0.575	6.8	71.7
0.600	6.8	72.1
0.625	6.8	72.5
0.650	6.8	72.9
0.675	6.8	73.3
0.700	6.8	73.7
0.725	6.8	74.1
0.750	6.8	74.5
0.775	6.8	74.9
0.800	6.8	75.3
0.825	6.8	75.7
0.850	6.8	76.1
0.875	6.8	76.5
0.900	6.9	76.8
0.925	7.0	77.2
0.950	7.1	77.6
0.975	7.2	77.9
1.00	0.3	78.3
1.10	7.6	79.7
1.20	7.9	81.1
1.30	8.2	82.6
1.40	8.5	84.1
1.50	8.8	85.5
1.60	9.1	87.0
1.70	9.3	88.5
1.80	9.6	90.0

1.90	9.8	91.5
2.00	10.0	93.0
2.10	10.2	94.5
2.20	10.4	96.1
2.30	10.6	97.6
2.40	10.8	99.1
2.50	11.0	100.7
2.60	11.2	102.2
2.70	11.4	103.8
2.80	11.6	105.3
2.90	11.7	106.9
3.00	11.9	108.4
3.10	12.1	110.0
3.20	12.2	111.6
3.30	12.4	113.2
3.40	12.5	114.7
3.50	12.7	116.3
3.60	12.8	117.9
3.70	12.9	119.5
3.80	13.1	121.1
3.90	13.2	122.7
4.00	13.3	124.3
4.5	13.9	132.4
5.0	14.4	140.6
5.5	14.8	148.8
6.0	15.2	157.2
6.5	15.5	165.6
7.0	15.8	174.2
7.5	16.0	182.8
8.0	16.2	191.4
8.5	16.3	200.2
9.0	16.4	209.0
9.5	16.4	218.0
10.0	16.4	227.0
10.5	16.4	236.0
11.0	16.3	245.2
11.5	16.1	254.4
12.0	15.9	263.7
13.0	15.4	282.6
14.0	14.7	301.8
15.0	13.7	321.3
16.0	12.4	341.2
17.0	10.6	361.6
18.0	8.2	382.5
19.0	6.8	403.2
19.1	6.8	405.2
19.2	6.8	407.2
19.3	6.8	409.2