



# IN-TUNNEL SUCCESSES

## Around the World

**v2-22**  
Special edition RADIAFLEX® anniversary



# RFS TRANSFORMS COMMUNICATIONS IN TUNNELS

**As our world-renowned RADIAFLEX radiating cables turn 50, it's the ideal time to take a closer look at why so many organizations around the world rely on our ingenious invention to bring reliable, high-quality wireless communications to tunnels.**

RADIAFLEX radiating cables take contoured wireless coverage everywhere the cable is installed to eliminate the need for traditional antennas in confined spaces. After five decades, these innovative broadband cables are still the world's leading solution for in-tunnel wireless connectivity, and are delivering uninterrupted communications in some of the world's most high-profile and challenging tunnels. And we continue to lead the way with future-ready solutions that take 5G underground.

RADIAFLEX cables deliver everything needed to improve in-tunnel wireless communications today and tomorrow.

## **SUPPORT ANY APPLICATION**

RADIAFLEX cables support multiple operators, frequency bands and technologies so they can deliver all mission-critical and commercial wireless services in tunnels.

## **FUTUREPROOF INVESTMENTS**

RADIAFLEX cables support all services up to 6 GHz and provide ultra-wideband frequency coverage to 3.8 GHz with no stopbands so it's easy to take advantage of new spectrum, upgrade to 5G underground and support new services.

## **ACCELERATE IN-TUNNEL WIRELESS SPEEDS**

Combining vertically polarized and horizontally polarized RADIAFLEX cables creates near-perfect MIMO conditions in tunnels and set a world record for in-tunnel download speeds in 2018, reaching 560 Mb/s.

## **IMPROVE COMMUNICATIONS QUALITY**

RADIAFLEX cables ensure low longitudinal and coupling losses, can be tailored for maximum performance over longer cable runs, and are optimized to deliver mission-critical communications with complete reliability.

## **INCREASE FIRE SAFETY**

RADIAFLEX cables meet all major international flame and fire-retardance standards and achieved the top Construction Products Regulation (CPR) rating of B2ca with a d0 droplets rating.

**A complete range of robust, high-performance RADIAFLEX cable connectors, clamps, and cable ties ensures installations are efficient and cost-effective.**







# PROJECTS CLOSE UP



## GRAND PARIS EXPRESS

France | 2 Phases, 2021-2030

RFS RADIAFLEX® radiating cables have been selected to deploy a 2x2 MIMO private LTE network. The cables fulfilled all projects needs with regard to future-readiness and the highest fire safety requirements according to the European Construction Product Regulation (CPR).



## METRO RIO DE JANEIRO

Brazil | 2020

After the World Championship and Olympics, best-in-class RADIAFLEX® is selected again for Rio's latest 4G multi-band, multi-operator in-tunnel wireless network deployments.



## SINGAPORE METRO

Singapore | 2019-2020

Extension of world-class public transportation system relying again on long-term first choice RADIAFLEX.

## FOLLOBANEN

Norway | 2019-2020

The Follobanen project features a unique 4x4 MIMO solution deployed in Norway, which set the world record for in-tunnel download speeds in 2018. RFS' vertically polarized RAY and horizontally polarized RLK product families take advantage of unique cross-polarization effects to optimize MIMO conditions in tunnels.




## NEW YORK METRO

USA | 2019

High capacity wireless systems in multiple subway and railway tunnels in dense urban New York City area.

# IN-TUNNEL PROJECT HIGHLIGHTS

RFS in-tunnel solutions are deployed in some of the most iconic tunnels in the world — old and new. Here's a summary of key projects\* that leverage our solutions.

PROJECT   DESCRIPTION	YEAR	PROJECT TYPE
<b>ARMENIA</b>		
Yerevan Metro	2017	Metro/Subway
<b>AUSTRALIA</b>		
Queensland Rail	2021	Rail
<b>AZERBAIJAN</b>		
Baku Metro	2016	Metro/Subway
<b>BRAZIL</b>		
 Platforms (28 units) Petrobras   UHF Radio 450MHz retrofit DMR	2019	Vertical/Enterprise
Rio De Janeiro Metro	2020	Metro/Subway
Tunel Transolimpica   Urban tunnel, SISO implementation	2018	Road
<b>BULGARIA</b>		
Sofia Metro line 1	2013	Metro/Subway
Sofia Metro line 2	2013	Metro/Subway
Sofia Metro line 3	2015-2017	Metro/Subway
Sofia Metro line 4	2018-2020	Metro/Subway
<b>CANADA</b>		
Canadian Metro   Public Safety and WiFi	2019	Metro/Subway
Mining Projects Across Canada   AMBRA partnership	2018-2022	Mining

\*Contact RFS for earlier references (1970's to 2016)



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<b>CANADA</b>		
Montreal Metro	2017	Metro/Subway
PTC   Positive Train Control Radio Project	2017	Rail
Road tunnel in British Columbia	2017	Road
Toronto Metro	2017	Metro/Subway
<b>CHINA</b>		
Jinan Metro line R3	2017	Metro/Subway
Jinan R1   LTE	2017	Metro/Subway
Kunming Line 5	2019	Metro/Subway
Lanzhou Line 1   Mission critical radio	2017	Metro/Subway
Lanzhou Line 2	2022	Metro/Subway
Nanning Line 3   LTE	2017	Metro/Subway
Nanning Line 3   Mission critical radio	2017	Metro/Subway
Nanning Line 4	2019	Metro/Subway
Nanning Line 5	2021	Metro/Subway
Qingdao R3   Police	2017	Metro/Subway
Qingdao R3   Tetra/LTE	2017	Metro/Subway
Wuhan   Line 6 LTE, Line 7 LTE, Line 8 LTE, Line 11 LTE, Line 21 LTE	2017	Metro/Subway
Wuhan Line 5	2019	Metro/Subway
Wuhan Line 6 Phase 2	2019	Metro/Subway
Xi'an Line 1 Extension	2019	Metro/Subway
Zhuhai Macau Bridge	2018	Metro/Subway
<b>COLOMBIA</b>		
Servicom   Tunel Renacer, Bogota – Villavicencio, mission critical radio	2017	Road
<b>CZECH REPUBLIC</b>		
Prague Metro	2017	Metro/Subway
<b>CYPRUS</b>		
Ledra Palace   In-building coverage	2016	Vertical/Enterprise
<b>DENMARK</b>		
Cityringen Metro Copenhagen	2017	Metro/Subway




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<b>EQUADOR</b>		
Quito Metro   Mission critical radio	2017	Metro/Subway
Quito Metro   Subway Line 1 Quito – TETRA 450 project and materials	2018	Metro/Subway
Quito Metro   Subway Line 1 Quito – TETRA 450 RADIAFLEX® installation	2019	Metro/Subway
<b>FRANCE</b>		
Frejus Road Tunnel	2020	Road
 Grand Paris Express	2021-2030	Metro/Subway
Lyon Metro	2022	Metro/Subway
Rennes Metro	2017	Metro/Subway
<b>GERMANY</b>		
Berlin 380-kV Electric Line	2021	Enterprise
Berlin Metro   Line 5	2017	Metro/Subway
Bielefeld Metro	2017	Metro/Subway
DB Stuttgart 21	2021-2022	Rail
Hamburg Airport Railway	2019	Rail
Hamburg Metro   Extension line 4	2017	Metro/Subway
Munich Metro	2021-2022	Metro/Subway
S-Bahn Karlsruhe	2020	Rail
Stuttgarter Straßenbahn	2021-2022	Metro/Subway
Tesla Factory	2021	Vertical/Enterprise
<b>HONG KONG</b>		
Hong Kong Airport Automated People Mover	2021	Metro/Subway
Hong Kong Metro 4G   Upgrade Phase III-CT133-18E	2019	Metro/Subway
Kai Tak Car Tunnel	2021	Road
Lam Tin to Tseung Kwan O Car Tunnel	2020	Road
Metro   LTE upgrade Phase II	2017	Metro/Subway
MTR Liantang Station	2017	Metro/Subway
Shatin to Central Line   Commerical System	2018	Metro/Subway
Tuen Mun to Chek Lap Kok Car Tunnel	2019	Road
Zhuhai-Macau Bridge	2017	Road
<b>INDIA</b>		
Delhi Metro	2018	Metro/Subway




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<b>ITALY</b>		
Autostrade per l'Italia   Italian highways	2018-2022	Road
Circumvesuviana Railway	2017	Rail
DAS in Trains	2017-2019	Vertical/Enterprise
Florence Metro	2017	Metro/Subway
Italian Highways	2021	Road
Italian Railways	2017	Rail
Italian Railways   Italian part of European corridor TEN-T Rhein-Alps	2018-2020	Rail
Milano Metro 4	2022	Metro/Subway
Monte Poggio Maria Railway tunnel, Sicilia	2017	Rail
<b>JAPAN</b>		
Tokyo Metro	2020-2022	Metro/Subway
<b>KOREA</b>		
Seoul Incheon Airport Extensions   Mission critical radio	2017	Vertical/Enterprise
Seoul Airport Line	2020	Metro/Subway
<b>KUWAIT</b>		
Sheik Jaber Overwater Causeway	2017	Road
<b>MALAYSIA</b>		
KVMRT2   Commercial	2020	Rail
KVMRT2   Tetra	2020-21	Rail
LRT3 RE60	2021	Rail
<b>MACAU</b>		
Macau LRT - Barra line	2021	Metro/Subway
<b>NETHERLANDS</b>		
Gaasperdammer Tunnel	2017	Road
<b>NORWAY</b>		
 Follobanen Rail	2019-2020	Rail
Multiple Road Tunnels   Mission critical radio	2017	Road
Ulriken Tunnel	2020	Rail




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<b>QATAR</b>		
Doha Metro and Lusail Light Rail	2017	Metro/Subway
<b>ROMANIA</b>		
Bucharest Metro Line 4 Extension   Mission critical radio	2017	Metro/Subway
<b>SINGAPORE</b>		
Changi Airport Line Metro   Commercial radio	2017	Metro/Subway
Circle Line extension   Commercial	2021	Metro/Subway
Circle Line extension   Tetra	2020	Metro/Subway
Downtown Line extension   Commercial	2021	Metro/Subway
Downtown Line extension   Tetra	2020	Metro/Subway
Integrated Train Testing Center	2022	Rail
 Singapore Metro	2019-2020	Metro/Subway
Thomson East Coast Line Metro   commercial radio	2017	Metro/Subway
Thomson East Coast Line Metro   construction radio	2017	Metro/Subway
Thomson East Coast Line Metro   mission critical radio	2017	Metro/Subway
Thomson East Coast Line Metro   Tetra - additional scope	2022	Metro/Subway
<b>SPAIN</b>		
Madrid Metro	2017	Metro/Subway
<b>SWITZERLAND</b>		
CERN Super Proton Synchrotron (SPS)	2017-2022	Vertical/Enterprise
Lötschberg Base Tunnel	2018	Rail
<b>TAIWAN</b>		
High Speed Railway	2017	Rail
Kaohsiung Metro Green Line   2 X RLKU MIMO	2018	Metro/Subway
Kaohsiung Metro Red Line and Orange Line	2017	Metro/Subway
MRT Bannan line	2021	Metro/Subway
MRT Wenhua line	2021-2022	Metro/Subway
Taipei Metro Blue Line   2 X RLKU MIMO	2018	Metro/Subway
Taipei Metro Green Line   2 X RLKU MIMO	2018	Metro/Subway
Taipei Metro Orange Line   2 X RLKU MIMO	2018	Metro/Subway
Taipei Metro Red Line   2 X RLKU MIMO	2018	Metro/Subway





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<b>TAIWAN</b>		
Taipei Metro Red Line   2 X RLKU MIMO	2019	Metro/Subway
Taipei MRT Xin, I Line, Lu- Zhou Line and Xin-Zhuang Line	2017	Metro/Subway
Taiwan High Speed Railway	2018	Rail
Taiwan Railway 2nd Period Project	2019	Rail
TW Railway	2020-2021	Rail
TY International Airport Metro	2018	Metro/Subway
Zhanghua coast line	2021	Road
<b>THAILAND</b>		
Bangkok Metro Green Line Extension   Mission critical radio	2017	Metro/Subway
Bangkok Metro Blue Line Extension   Commercial and Tetra networks	2018	Metro/Subway
Bangkok Metro Blue Line   Existing Station Improvement	2019	Metro/Subway
<b>TURKEY</b>		
New Istanbul Airport Metro Line	2020-2021	Metro/Subway
<b>UNITED ARAB EMIRATES</b>		
Ethiad Railways	2021	Rail
<b>UNITED KINGDOM</b>		
Glasgow Metro	2018-2022	Metro/Subway
London Crossrail Project	2017	Rail
<b>UNITED STATES OF AMERICA</b>		
Atlanta Metro	2019	Metro/Subway
California Metro Operators Various Projects   Public Safety	2019	Metro/Subway
Los Angeles Metro	2017	Metro/Subway
MARTA, Atlanta, GA	2017	Metro/Subway
 New York City Metro   Public Safety	2019	Metro/Subway
New York East Side Access Rail	2017	Metro/Subway



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