



# IN-TUNNEL SUCCESSSES

Around the  
World

  
**WE SIMPLIFY** **5G**  
THE EVOLUTION TO



# RFS TRANSFORMS COMMUNICATIONS IN TUNNELS

RFS is the global leader in communications solutions for tunnels. Our in-tunnel solutions have been delivering high quality, uninterrupted communications in some of the world's most high-profile and challenging tunnels for more than four decades. Today, we continue to demonstrate our leadership with innovative, future-ready solutions that bring 5G to tunnels.

Our RADIAFLEX® radiating cables are at the heart of our in-tunnel solutions. These innovative broadband cables eliminate the need for traditional antennas in confined spaces. And they are one of the main reasons wireless communications providers around the world choose our solutions for the toughest in-tunnel applications.

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're ideal for any public safety and commercial wireless applications in tunnels.

## FUTUREPROOF INVESTMENTS

RADIAFLEX cables support all services up to 6 GHz and include 5G-ready cables that provide ultra-wideband frequency coverage to 3.8 GHz with no stopbands between 610 MHz and 3.8 GHz.

## ACCELERATE IN-TUNNEL WIRELESS SPEEDS

Combining vertically polarized and horizontally polarized RADIAFLEX cables optimizes 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 feature low longitudinal and coupling losses and can be provided with coupling loss configurations that are optimized for longer cable runs.

## 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).



## 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.



## 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.



## NEW YORK METRO

USA | 2019

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



## SINGAPORE METRO


Singapore | 2019-2020

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



# 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>		
Metro Yerevan	2017	Metro/Subway
<b>BRAZIL</b>		
Tunel Transolimpico   Urban tunnel, SISO implementation	2018	Road
Oil Platforms (28 units) Petrobras   UHF Radio 450MHz retrofit DMR	2019	Vertical/Enterprise
 Rio De Janeiro Metro	2020	Metro/Subway
<b>BULGARIA</b>		
Metro Sofia Line 3	2017	Metro/Subway
<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
Canadian Metro   Public Safety and WiFi	2019	Metro/Subway
<b>CHINA</b>		
Jinan Metro line R3	2017	Metro/Subway
Jinan R1   LTE	2017	Metro/Subway
Lanzhou Line 1   mission critical radio	2017	Metro/Subway
Nanning Line 3   LTE	2017	Metro/Subway
Nanning Line 3   mission critical radio	2017	Metro/Subway

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





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<b>CHINA</b>		
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
Zhuhai Macau Bridge	2018	Metro/Subway
Kunming Line 5	2019	Metro/Subway
Nanning Line 4	2019	Metro/Subway
Wuhan Line 5	2019	Metro/Subway
Wuhan Line 6 Phase 2	2019	Metro/Subway
Xian Line 1 Extension	2019	Metro/Subway
<b>COLUMBIA</b>		
Servicom   Tunel Renacer, Bogota - Villavicencio, mission critical radio	2017	Road
<b>CZECH REPUBLIC</b>		
Metro Prague	2017	Metro/Subway
<b>DENMARK</b>		
Cityringen Copenhagen	2017	Metro/Subway
<b>EQUADOR</b>		
Quito Metro   mission critical radio	2017	Metro/Subway
Metro De Quito   Subway Line 1 Quito - TETRA 450 project and materials	2018	Metro/Subway
Metro De Quito   Subway Line 1 Quito - TETRA 450 RADIAFLEX® installation	2019	Metro/Subway
<b>FRANCE</b>		
Metro Rennes	2017	Metro/Subway
 Grand Paris Express	2021-2030	Metro/Subway
<b>GERMANY</b>		
Berlin Metro Berlin, Line 5	2017	Metro/Subway
Bielefeld Metro	2017	Metro/Subway
Metro Hamburg, extension line 4	2017	Metro/Subway
<b>HONG KONG</b>		
Metro   LTE upgrade Phase II	2017	Metro/Subway
MTR Liantang Station	2017	Metro/Subway




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<b>HONG KONG</b>		
Zhuhai-Macau Bridge	2017	Road
Shatin to Central line   Commerical System	2018	Metro/Subway
Metro Hong Kong 4G   Upgrade Phase III-CT133-18E	2019	Metro/Subway
Tuen Mun to Chek Lap Kok Car Tunnel	2019	Road
<b>INDIA</b>		
Delhi Metro	2018	Metro/Subway
<b>ITALY</b>		
Metro Florence	2017	Metro/Subway
Railway tunnel - Monte Poggio Maria, Sicilia	2017	Rail
<b>KOREA</b>		
Seoul Incheon Airport Extensions   mission critical radio	2017	Vertical/Enterprise
<b>KUWAIT</b>		
Sheik Jaber Overwater Causeway	2017	Road
<b>NETHERLANDS</b>		
Gaasperdammer tunnel	2017	Road
<b>NORWAY</b>		
Multiple Road Tunnels   mission critical radio	2017	Road
 Follobanen	2019-2020	Rail
<b>QATAR</b>		
Doha Metro and Lusail Light Rail	2017	Metro/Subway
<b>ROMANIA</b>		
Metro Bucharest Line 4 Extension   mission critical radio	2017	Metro/Subway
<b>SINGAPORE</b>		
Changi Airport Line Metro   commercial radio	2017	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
 Singapore Metro	2019-2020	Metro/Subway



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<b>SPAIN</b>		
Metro Madrid	2017	Metro/Subway
<b>SWITZERLAND</b>		
CERN Super Proton Synchrotron (SPS)	2017	Vertical/Enterprise
<b>TAIWAN</b>		
High Speed Railway	2017	Rail
Kaohsiung Metro Red Line and Orange Line	2017	Metro/Subway
Taipei MRT Xin - I Line, Lu- Zhou Line and Xin-Zhuang Line	2017	Metro/Subway
Kaohsiung Metro Green Line   2 X RLKU MIMO	2018	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
Taiwan High Speed Railway	2018	Rail
TY International Airport Metro	2018	Metro/Subway
Taipei Metro Red Line   2 X RLKU MIMO	2019	Metro/Subway
Taiwan Railway 2nd Period Project	2019	Rail
<b>THAILAND</b>		
Bangkok metro Green Line Extension   mission critical radio	2017	Metro/Subway
Bangkok Blue Line Extension   Commercial and Tetra networks	2018	Metro/Subway
Bangkok Blue Line   Existing Station Improvement	2019	Metro/Subway
<b>UNITED KINGDOM</b>		
London Crossrail Project	2017	Rail
<b>UNITED STATES OF AMERICA</b>		
Los Angeles Metro	2017	Metro/Subway
MARTA, Atlanta, GA	2017	Metro/Subway
New York East Side Access Rail	2017	Metro/Subway
Atlanta Metro	2019	Metro/Subway
California Metro Operators Various Projects   Public Safety	2019	Metro/Subway
 New York City Metro   Public Safety	2019	Metro/Subway



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