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IN-TUNNEL SUCCESSES

Around the World

V3-25



RFS TRANSFORMS COMMUNICATIONS IN TUNNELS

Since its launch in 1972, RADIAFLEX® has constantly evolved to maintain its status as a leading solution for in-tunnel communications. Let's look at why it is trusted by organizations worldwide to deliver reliable, high-quality wireless communications.

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).



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 | 2019-2024

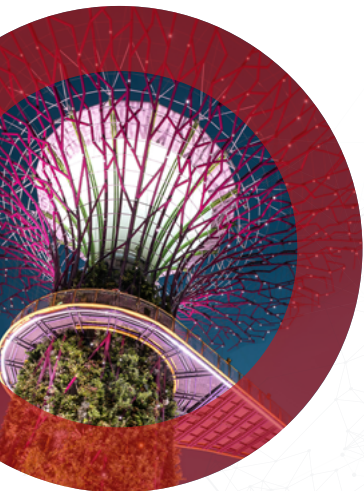
High capacity wireless systems in multiple subway and railway tunnels in dense urban New York City area.



SINGAPORE METRO

Singapore | 2019-2024

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



IN-TUNNEL PROJECT HIGHLIGHTS

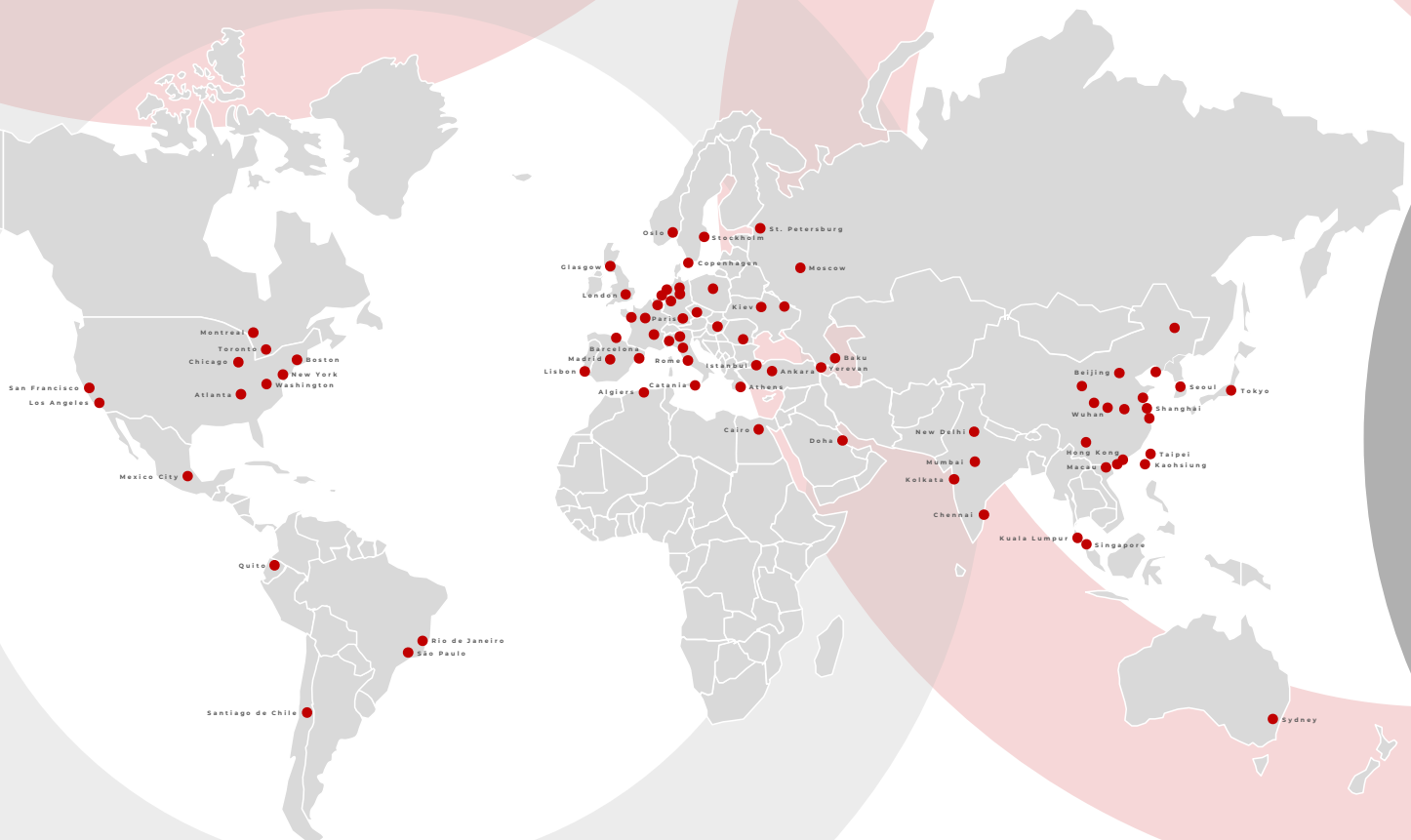
RFS in-tunnel solutions are deployed in some of the most iconic tunnels in the world — old and new. Here's a summary of key projects* that leverage our solutions, in-tunnel & selected in-building.

RADIAFLEX: In More Than Half of all Metros and Subways Worldwide

Over the last 5 decades, RADIAFLEX has become the go-to solution for mission-critical and commercial connectivity in underground rail settings.


Comprehensive contoured coverage, adaptability to new standards, and RFS's 'built to last' promise means it is **now deployed in 51.34% of metro and subway systems across the globe.**

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





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PROJECT DESCRIPTION	YEAR	PROJECT TYPE
ARMENIA		
Yerevan Metro	2017	Metro/Subway
AUSTRALIA		
Queensland Rail	2021	Rail Tunnel
Melbourne West Gate Tunnel	2024	Road Tunnel
AZERBAIJAN		
Baku Metro	2016	Metro/Subway
BRAZIL		
Oil 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 Tunnel
São Paulo Metro	2010	Metro/Subway
BULGARIA		
Sofia Metro line 1, line 2	2013	Metro/Subway
Sofia Metro line 3	2015-2017	Metro/Subway
Sofia Metro line 4	2018-2020	Metro/Subway
CANADA		
Canadian Metro Public Safety and WiFi	2019	Metro/Subway
Mining Projects Across Canada AMBRA partnership	2018-2022	Vertical/Enterprise
Montreal Metro	2017	Metro/Subway
PTC Positive Train Control Radio Project	2017	Rail Tunnel
Road Tunnel in British Columbia	2017	Road Tunnel
Toronto Metro	2017	Metro/Subway
CHINA		
Jinan Metro line R3	2017	Metro/Subway
Jinan R1 LTE	2017	Metro/Subway
Kunming Line 5	2019	Metro/Subway
Lanzhou Line 1 Mission critical	2017	Metro/Subway
Lanzhou Line 2	2022	Metro/Subway
Nanning Line 3 LTE	2017	Metro/Subway
Nanning Line 3 Mission critical	2017	Metro/Subway
Nanning Line 4	2019	Metro/Subway
Nanning Line 5	2021	Metro/Subway



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CHINA (...)		
Qingdao R3 Police	2017	Metro/Subway
Qingdao R3 Tetra/LTE	2017	Metro/Subway
Wuhan Line 6, Line 7, Line 8, Line 11, Line 12 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
COLOMBIA		
Servicom Tunel Renacer, Bogotá – Villavicencio Mission critical radio	2017	Road Tunnel
CZECH REPUBLIC		
Prague Metro	2017	Metro/Subway
CYPRUS		
Ledra Palace In-building coverage	2016	Vertical/Enterprise
DENMARK		
Cityringen Metro Copenhagen	2017	Metro/Subway
EQUADOR		
Quito Metro Mission critical	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
FRANCE		
Frejus Road Tunnel	2020	Road Tunnel
 Grand Paris Express	2021-2030	Metro/Subway
Lyon Metro	2022	Metro/Subway
Rennes Metro	2017	Metro/Subway
GERMANY		
Berlin 380-kV Electric Line	2021	Vertical/Enterprise
Berlin Metro Line 5	2017	Metro/Subway
Bielefeld Metro	2017	Metro/Subway
DB Stuttgart 21	2021-2022	Rail Tunnel
Hamburg Airport Railway	2019	Rail Tunnel
Hamburg Metro Extension line 4	2017	Metro/Subway



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GERMANY (...)		
Munich Metro	2021-2022	Metro/Subway
S-Bahn Karlsruhe	2020	Rail Tunnel
Stuttgarter Straßenbahn	2021-2022	Metro/Subway
Tesla Factory	2021	Vertical/Enterprise
GREECE		
Gold Mine Skouries	2023-2024	Vertical/Enterprise
Athens Metro	2023-2024	Metro/Subway
HONG KONG		
Metro Hong Kong 4G Upgrade Phase I-CT125-15E	2016	Metro/Subway
Metro Hong Kong 4G Upgrade Phase II-CT130-16E	2017	Metro/Subway
MTR Liantang Station	2017	Metro/Subway
Hong Kong-Zhuhai-Macau Bridge	2017	Road Tunnel
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 Tunnel
Tseung Kwan O to Lam Tin car tunnel	2020	Road Tunnel
HK Airport APM	2021	Metro/Subway
Kai Tak car tunnel	2021	Road Tunnel
Central Kowloon Route Building Electrical & Mechanical works, Traffic Control	2023	Road Tunnel
Trunk Road T2 Traffic Control and Surveillance System (TCSS)	2023	Road Tunnel
Tsing Ma Control Area Traffic Control and Surveillance System	2023	Road Tunnel
The Aberdeen Tunnel & Tate's Cairn Tunnel Traffic Control and Surveillance System	2023	Road Tunnel
The Tseung Kwan O Tunnel Radio Telephone System and Radio Rebroadcasting System	2023	Road Tunnel
MTR Contract CT149-21E DCS Network for 5G	2024	Metro/Subway
INDIA		
Delhi Metro	2018	Metro/Subway
ITALY		
Autostrade per l'Italia Italian highways	2018-2022	Road Tunnel
Circumvesuviana Railway	2017	Rail Tunnel
DAS in Trains	2017-2019	Vertical/Enterprise
Florence Metro	2017	Metro/Subway
Italian Highways	2021	Road Tunnel




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ITALY (...)		
Italian Railways	2017	Rail Tunnel
Italian Railways Italian part of European corridor TEN-T Rhein-Alps	2018-2020	Rail Tunnel
Milano Metro 4	2022	Metro/Subway
Monte Poggio Maria Railway tunnel, Sicilia	2017	Rail Tunnel
Catania Metro	2023-2024	Metro/Subway
Roma Metro line C	2024	Metro/Subway
High Speed Railways (Bolzano, Genova, Palermo, Roma, Napoli, Bari, Sardegna)	2024	Rail Tunnel
ENEL Green power	2024	Vertical/Enterprise
Shipyards	2023	Vertical/Enterprise
JAPAN		
Tokyo Metro/MEGURO Line	2020-2022	Metro/Subway
Toyoko and Sotetsu LINE	2022	Metro/Subway
KUWAIT		
Sheik Jaber Overwater Causeway	2017	Road Tunnel
MACAU		
Macau LRT Barra line	2021	Metro/Subway
Macau LRT SPV line & Hengqin line	2022	Metro/Subway
MALAYSIA		
KVMRT2 Commercial	2020	Rail Tunnel
KVMRT2 Tetra	2020-21	Rail Tunnel
LRT3 Signaling	2021	Rail Tunnel
MONGOLIA		
Oyu Tolgoi mine	2022	Vertical/Enterprise
MONTENEGRO		
Smokovac-Matsevo Highway 49 tunnels	2022	Road Tunnel
NETHERLANDS		
Gaasperdammer Tunnel	2017	Road Tunnel
NEW ZEALAND		
Auckland City Rail Link	2023	Rail Tunnel



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NORWAY		
 Follobanen Rail	2019-2020	Rail
Multiple Road Tunnels Mission critical	2017	Road Tunnel
Ulriken Tunnel	2020	Rail Tunnel
POLAND		
DAS in Trains	2022-2024	Vertical/Enterprise
Metro Warsaw	2021	Metro/Subway
SAUDI ARABIA		
Metro Riyadh	2018	Metro/Subway
SOUTH KOREA		
Seoul Incheon Airport Terminal 1, Terminal 2 Mission critical	2017	Vertical/Enterprise
Incheon Airport Parking lots	2020	Vertical/Enterprise
KTX (High Speed Railway) Mission critical	2015	Rail Tunnel
QATAR		
Doha Metro and Lusail Light Rail	2017	Metro/Subway
ROMANIA		
Bucharest Metro Line 4 Extension Mission critical radio	2017	Metro/Subway
SINGAPORE		
Changi Airport Line Metro commercial radio	2017	Metro/Subway
Thomson East Coast Line Metro Construction radio, Mission Critical, Commercial radio	2017	Metro/Subway
 Singapore Metro	2019-2020	Metro/Subway
Circle Line extension Tetra	2020	Metro/Subway
Downtown Line extension Commerical	2022	Metro/Subway
Downtown Line extension Tetra	2020	Metro/Subway
Downtown Line extension Commerical	2022	Metro/Subway
Circle Line extension Commercial	2021	Metro/Subway
Downtown Line extension Commercial	2021	Metro/Subway
Integrated Train Testing Center	2022	Vertical/Enterprise
Thomson East Coast Line Tetra - additional scope	2022	Metro/Subway
Sengkang-Punggol LRT upgrade Tetra	2022	Metro/Subway
NSEW upgrade Tetra	2023	Metro/Subway
Jurong Region Line Tetra	2024	Metro/Subway
North South Corridor Tetra	2025	Road Tunnel




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SPAIN		
Madrid Metro	2017	Metro/Subway
SWITZERLAND		
CERN Super Proton Synchrotron (SPS), Large Hadron Collider (LHC)	2017-2022	Vertical/Enterprise
Lötschberg Base Tunnel	2018	Rail Tunnel
TAIWAN		
High Speed Railway Mission critical system	2017	Rail Tunnel
Kaohsiung Metro Red Line and Orange Line	2017	Metro/Subway
Taipei MRT Xin - I Line, Lu- Zhou Line and Xin-Zhuang Line Mission critical system	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 2 X RLKU MIMO	2018	Rail Tunnel
TY International Airport Metro Mission critical system	2018	Metro/Subway
Taipei Metro Red Line 2 X RLKU MIMO	2019	Metro/Subway
Taiwan Railway 2nd Period Project 2 X RLKU MIMO	2019	Rail Tunnel
TW Railway Mission critical system	2020-2021	Rail Tunnel
MRT BANNAN line Mission critical system	2021	Metro/Subway
Tai-Power ZHANGHUA plant tunnel	2021	Vertical/Enterprise
MRT WENHU Line Signaling system	2021-2022	Metro/Subway
TSMC FAB/Research Center	2020-2024	Vertical/Enterprise
THAILAND		
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
TURKEY		
New Istanbul Airport Metro Line	2020-2021	Metro/Subway
UNITED ARAB EMIRATES		
Etihad Railways	2021	Rail Tunnel



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UNITED KINGDOM		
London Crossrail Project	2017	Rail Tunnel
London LPT2 (London Power Tunnel 2)	2024	Vertical/Enterprise
London Elizabeth Line	2024	Rail Tunnel
East Coast Mainline GSM-R upgrade	2023	Rail Tunnel
London Thames Silvertown Tunnel	2024	Road Tunnel
Trans Pennine Upgrade	2024	Rail Tunnel
BT "under Glasgow" Telecom Tunnel	2024	Vertical/Enterprise
UNITED STATES OF AMERICA		
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
ZIMBABWE		
Zimplats Mine	2023	Vertical/Enterprise



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2022

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