Frequency Shift Repeater

In-Band FSR:
RPT865 (GSM 900MHz) / **RPT885** (GSM 1800MHz) / **RPT895** (GSM 1900MHz)
RPT915 (CDMA 450MHz) / **RPT935** (CDMA 800MHz) / **RPT995** (CDMA 1900MHz)

Out-of-Band FSR:
RPT866 (GSM 900MHz) / **RPT886** (GSM 1800MHz) / **RPT896** (GSM 1900MHz)
RPT916 (CDMA 450MHz) / **RPT936** (CDMA 800MHz) / **RPT996** (CDMA 1900MHz)

The Frequency Shift Repeater (FSR) is designed to solve problems of weak mobile signal, which can expand more coverage than RF repeater and reduce investment for the areas where fiber optic cable is not available.

The whole FSR system consists of two parts: **Donor Unit** and **Remote Unit**. They transparently convey and amplify the wireless signal between the BTS (Base Transceiver Station) and mobiles via RF wave at different frequency from the BTS.

The **Donor unit** receives the BTS signal via a direct coupler closed to the BTS (or via open air RF transmission through the Donor Antenna), then converts it from the working frequency to the link frequency, and transmits the amplified signal to the **Remote Unit** via the Link Antennas. The **Remote Unit** will reconvert the signal to the working frequency and provide the signal to the areas where network coverage is inadequate. And the mobile signal is also amplified and retransmitted to the BTS via the opposite direction.

As per the method of receiving BTS signal by the Donor Unit, two types of FSR are available:

- **Cable-Access FSR:** to receive BTS signal via a direct coupler closed to the BTS (recommended);
- **Wireless-Access FSR:** to receive BTS signal via a Donor Antenna (applicable when no line of sight can be viewed between the Donor Unit and the Remote Unit as the Donor Unit is installed on the BTS tower).

And both types of FSR can be sorted into 2 sub-categories as per the availability of link frequency:

- **In-Band FSR**: the link frequency is within the working band of BTS;
- **Out-of-Band FSR**: the link frequency is out of the working band of BTS.

FEATURES

- Aluminum-alloy casing has high resistance to dust, water and corroding;
- Best solution to eliminate mutual interference due to sharing the same frequency;
- No stringent isolation requirement for antenna installation;
- Easy to choose installation site;
- RS-232 ports provide links to a notebook for local supervision and to the built-in wireless modem to communicate with the NMS (Network Management System) that can remotely supervise repeater's working status and download operational parameters to the repeater.

APPLICATIONS

To expand signal coverage or fill signal blind area where signal is weak or unavailable.

- Outdoor: Airports, tourism regions, golf courses, tunnels, factories, mining districts, villages, highways…
- Indoor: Hotels, exhibition centers, basements, shopping malls, offices, parking lots, …

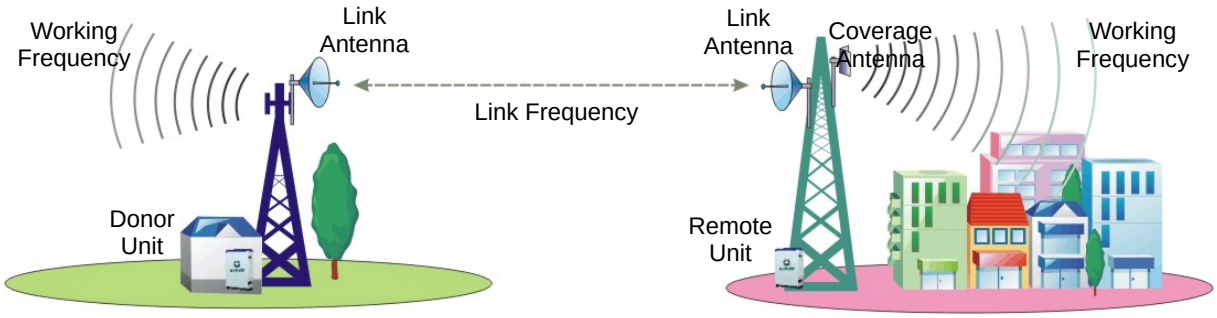
The FSR is mainly applicable to such case:

- The area to be covered is far away from the BTS and has no fiber optic connection;
- The distance between the BTS and the area to be covered is 20 km around.

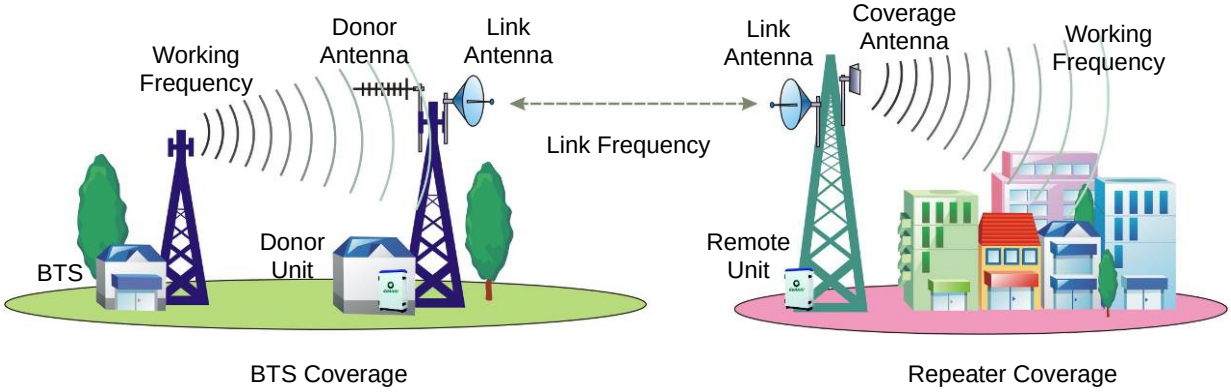
In comparison with RFR (RF repeater) and FOR (fiber optic repeater), the FSR has the following benefits and disadvantages:

Pro	Con
• No more self-oscillation and easy to choose installation location; • For Cable-Access type, pure BTS signal picked up by the Donor Unit will greatly reduce the signal noise; • The Remote Unit can be installed out of the BTS coverage; • A full 360-degree coverage can be realized.	• The total cost of equipment is higher; • A certain frequency resource is required to be occupied as the Link Frequency; • A line of sight shall be viewable between the Link Antennas.

APPLICATION DIAGRAM



Application Diagram of Cable-Access FSR



Application Diagram of Wireless-Access FSR

TECHNICAL SPECIFICATIONS

- Specifications of GSM Frequency Shift Repeater (900MHz, 1800MHz, 1900MHz)

		Donor Unit	Remote Unit
Working Frequency (customizable)	Uplink	890~915MHz / 1710~1785MHz / 1895~1910MHz	
	Downlink	935~960MHz / 1805~1880MHz / 1975~1990MHz	
Link Frequency		Customizable	
Transmission Distance		≤ 20km	
No. of Channels (for channel shift)		1 or 2	
Frequency Error		≤ 0.05ppm	
Output Power (customizable)	Uplink	Cable-Access: ≥ 0dBm Wireless-Access: ≥ 30dBm	≥ 33dBm
	Downlink	30~40dBm (1W~10W)	37~43dBm (5W~20W)
Downlink Input Level		Cable-Access: ≥ -10dBm / Wireless-Access: ≥ -70dBm	
Gain		Cable-Access: ≥ 45dB Wireless-Access: ≥ 85dB	≥ 90dB
Gain Adjustment Range		1~31dB @ step of 1dB	
Voltage Standing Wave Ratio (VSWR)		< 1.3	
Noise Figure		< 5dB (only for uplink)	
Spurious Emission	Within working band	≤ -15dBm/30kHz	
	Out of working band (Δf > 2.5MHz)	9kHz~1GHz: ≤ -36dBm/100kHz 1GHz~12.75GHz: ≤ -30dBm/30kHz	
In-Band Intermodulation Attenuation		≤ -40dBc/30kHz	
Out-of-Band Suppression	Per band	Δf > 2.5MHz: < -40dBc (downlink); Δf > 10MHz: < -60dBc (uplink)	
	Per channel	Δf > 1.98MHz: < -44dBc (downlink); Δf > 1.98MHz: < -38dBc (uplink)	
In-Band Ripple		≤ 3dB p-p	
System Delay		≤ 10μSec	
I/O Impedance		50Ω	
RF Connector		N-Type (Female)	
Temperature Range		Operation: -25°C ~ +55°C / Storage: -30°C ~ +60°C	
Relative Humidity Range		≤ 95% (non condensing)	
Power Supply (customizable)		DC +24V / DC -48V / AC 220V±15%, 50Hz / AC 110V±15%, 50Hz	
Backup Power Supply (optional)		4 hours	
Casing Level		IP65	
Dimensions		630mm X 400mm X 230mm	Output power @37~40dBm: 570mm X 325mm X 215mm Output power @40~43dBm: 630mm X 400mm X 230mm
Weight		33kg	Output power @37~40dBm: 27kg Output power @40~43dBm: 35kg
Remote Monitoring/Control via NMS		Supported	
ALC (Automatic Level Control)		Supported	

- Specifications of CDMA Frequency Shift Repeater (450MHz, 800MHz, 1900MHz)

		Donor Unit	Remote Unit
Working Frequency (customizable)	Uplink	450~457.5 MHz / 824~849MHz / 1880~1890MHz	
	Downlink	460~467.5 MHz / 869~894MHz / 1960~1970MHz	
Link Frequency		Customizable	
Transmission Distance		≤ 20km	
No. of Channels (for channel shift)		1 or 2	
Frequency Error		≤ 0.05ppm	
Output Power (customizable)	Uplink	Cable-Access: ≥ 0dBm Wireless-Access: ≥ 30dBm	≥ 33dBm
	Downlink	30~40dBm (1W~10W)	37~43dBm (5W~20W)
Downlink Input Level		Cable-Access: ≥ -10dBm / Wireless-Access: ≥ -70dBm	
Gain		Cable-Access: ≥ 45dB Wireless-Access: ≥ 85dB	≥ 90dB
Gain Adjustment Range		1~31dB @ step of 1dB	
Voltage Standing Wave Ratio (VSWR)		< 1.3	
Noise Figure		< 5dB (only for uplink)	
Spurious Emission	Out of band per channel	Δf ≥750kHz: ≤ -45dBc/30kHz Δf ≥1.98MHz: ≤ -65dBc/30kHz	Δf ≥900kHz: ≤ -42dBc/30kHz Δf ≥1.98MHz: ≤ -59dBc/30kHz
	Within working band	≤ -15dBm/30kHz	
	Out of working band (Δf > 2.5MHz)	30MHz~1GHz: ≤ -36dBm/100kHz	
In-Band Intermodulation Attenuation		≤ -15dBm/30kHz	
Out-of-Band Suppression	Per band	Δf > 2.5MHz: < -40dBc (downlink); Δf > 10MHz: < -60dBc (uplink)	
	Per channel	Δf > 1.98MHz: < -44dBc (downlink); Δf > 1.98MHz: < -38dBc (uplink)	
In-Band Ripple		≤ 3dB p-p	
System Delay		≤ 10μSec	
I/O Impedance		50Ω	
RF Connector		N-Type (Female)	
Temperature Range		Operation: -25°C ~ +55°C / Storage: -30°C ~ +60°C	
Relative Humidity Range		≤ 95% (non condensing)	
Power Supply (customizable)		DC +24V / DC -48V / AC 220V±15%, 50Hz / AC 110V±15%, 50Hz	
Backup Power Supply (optional)		4 hours	
Casing Level		IP65	
Dimensions		630mm X 400mm X 230mm	Output power @37~40dBm: 570mm X 325mm X 215mm Output power @40~43dBm: 630mm X 400mm X 230mm
Weight		33kg	Output power @37~40dBm: 27kg Output power @40~43dBm: 35kg
Remote Monitoring/Control via NMS		Supported	
ALC (Automatic Level Control)		Supported	

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